MINISTRY OF DEVELOPMENT OF INFORMATION TECHNOLOGIES AND COMMUNICATIONS OF THE REPUBLIC OF UZBEKISTAN

TASHKENT UNIVERSITY OF INFORMATION TECHNOLOGIES NAMED AFTER MUHAMMAD AL-KHWARIZMI

Allowing to the protect

Head of the department, Candidate of pedagogical sciences Ganieva B.I

_____

2018 y. "_____"_____

GRADUATING DIPLOMA WORK

under the topic of

"Using cloud computing technologies in library service"

Graduating student	_____	Khudoyberdiev A.
	sign.	
Supervisor:	_____	Ganiyeva B.
	sign.	
Reviewer:	_____	Kamilov N.
	sign.	
Advisor of SLA	_____	Haydarbekova M.
	sign.	

TASHKENT 2018

**MINISTRY OF DEVELOPMENT OF INFORMATION TECHNOLOGIES
AND COMMUNICATIONS OF THE REPUBLIC OF UZBEKISTAN
TASHKENT UNIVERSITY OF INFORMATION TECHNOLOGIES
NAMED AFTER MUHAMMAD AL-KHWARIZMI**

**The faculty of Professional education in the field of Information
Communication technologies**
Department of Information and library systems
5350600 – "Informatization and library science" direction

CONFIRM

Head of department _____

2018 year "____" _____

T A S K
to

Khudoyberdiev Azimbek's graduating diploma work under the topic
USING CLOUD COMPUTING TECHNOLOGIES IN LIBRARY SERVICE

1. Confirmed with university's order which in 2017 y. "21" December, № 1820

2. Date of giving the work to protection _____

3. Information about the work: graduating diploma work is based on creating communication between libraries, librarians and users via Internet and cloud computing technologies. It helps to exchange information, news and file uploading.

4. The meaning of calculating-explaining writings (list of created tasks) plan was created, the goals and objectives of the work were determined, thematic publications and information collected.

5. The list of graphic materials: 44 figures, 8 tables

6. The task was given in _____

Supervisor _____
signature

The task was received _____
signature

7. Advisors for chapters of the work:

| Name of the chapter | Advisors | Date, signature | Signature |
		The task was given	The task was received
Chapters 1 – 3	Ganiyeva B.		
Chapter 4	Haydarbekova M.		

8. Graphic of doing the work:

#	Name of the chapters	The work was done (date)	Signature of supervisor
1.	Entrance		
2.	Analysis of using cloud based technologies in libraries		
3.	Creation model and algorithm of innovation library news system		
4.	Main technological results of innovation library news and file cloud system		
5.	Safety of life activity		

Graduating student _____   201__ year "____" _____
                      signature

Supervisor   _____   201__ year "____" _____
                      signature

This final qualifying work is dedicated for today's information and library organizations to address the urgent issues. Main aim of the work is creating communication between users and librarians, as well as, making accessible to users from distance in order to take Library information. A web site was created using web programming languages and cloud computing technologies to further enhance the relationship between users and librarians. In addition, the system's functional and organizational structure of the scheme and algorithms to solve the current issues are given too. This final qualifying work has scientific and practical significance.

Mazkur bitiruv malakaviy ishi bugungi kunda axborot kutubxona muassasalari oldida turgan dolzarb masalalarni yechishga bag'ishlangan. Bu ishning asosiy maqsadi axborot kutubxona muassasalarining foydalanuvchilar uchun ochiqligi va foydalanuvchilar bilan chambarchas bog'langanligini ta'minlashga yordam beradi. Bu ishda foydalanuvchilar va kutubxonachilar aloqasini yanada rivojlantirish uchun veb dasturlash tillaridan, bulutli texnologiyalardan foydalangan holda veb sayt yaratildi. Bundan tashqari tizimning funksional hamda tashkiliy tuzilmasi, masalalar sxemasi va ularni yechish algoritmlari keltirib o'tildi. Mazkur bitiruv malakaviy ishi ilmiy va amaliy ahamiyatga ega.

Данная выпускная квалификационная работа посвящена современным информационным и библиотечным организациям для решения неотложных проблем. Основная цель работы - создать связь между пользователями и библиотекарями, а также сделать доступным для пользователей с расстояния, чтобы получить библиотечную информацию. Веб-сайт был создан с использованием языков веб-программирования и технологий облачных вычислений для дальнейшего улучшения отношений между пользователями и библиотекарями. Кроме того, дана также функциональная и организационная структура системы схемы и алгоритмов для решения текущих проблем. Выпускная квалификационная работа имеет научное и практическое значение.

CONTENT

INTRODUCTION

Today, we are living in a technological era, Information is exploring in great measure and users' needs are also growing hugely. Finding the special information according to needs of the knowledge society and to provide better services libraries are adopting myriad new types of technologies. The recent innovative technology trend in information centers and libraries is utilizing of cloud computing as a strategic method for the aim of supporting effective library services with quality in a cost or economic way. Cloud technology is the latest revolution after Personal computer and International Network in Information technology industry.

In our country it is noted with, law to informatizate our society. It is pointed about state policy of mediating of society in the 4 - item of "About informatization" act of The Republic of Uzbekistan. From this, in informatizating system the government policy directed to create national mass media emphasizing the world modern tendencies of perfecting and developing informational resources and technologies.

In fact, the number of internet websites, their users and workers in this specialty is increasing. Our President Sh.M.Mirziyoyev gave special attention to being ready using incomparable possibilities of internet and modern informational technologies when events are going on intensely in the world.

Nowadays, our country pay attention improving of information-communicational technologies and using internet branches effectively. Several adopted law-documents in Republic of Uzbekistan such as order "About Develop of computerizing and current information-communicational technologies" on May 30 in 2002, "About additional arrangements for evolving information-communicational technologies once more" on November 16 in 2005, "About organizing public information branch of Uzbekistan" on September 28 in 2005, likewise, "About forming national branch and ordering to use the world information branches" by the estakblishment of Ministry of Uzbekistan, on February 5 in 1999, "About statute to order making information resources,

passing in branches and order distributing by internet " on march 26 in 1999, "About perfecting of forming in specialty of connection and informatization" on September 23 in 2002, "About developing standard judicial base of informatization field" on November 22 in 2005.

Cloud computing gives a great chance to users which they are able to access personal files, details or official documents without installation any types of applications to their own computers. Cloud computing is providing of bringing together collection of documents and resources stored in various personal computers, servers and other tools into one place and putting them on the cloud for the utilize of the user community. Using above mentioned files do not require any specific place from users to access their own database, so it is called "cloud". Without a doubt, in this technological world Cloud Computing is one of the latest, hottest and value added term in the field of Computing and Library Service. After analyzing these theories, it is clear that cloud computing one of the important and developed technology in today's world.

The actuality of the topic. Today hundreds of new information flow around us and libraries have to be able to collect them in order to provide users' necessities, as well as, with the developments in computer system, network and information technologies, libraries face to huge challenge, such as resource storing and sharing, various personal services requirement, and providing up-to-date information. In order to solve these problems and using digital libraries with full and effective way, the existing library space and time constraint problems must be solved. Cloud computing technologies are an effective and modern technology to promote digital libraries development. The need to provide convenience for users: the provision of essential and effective services, such as time, distance, and expenses, and the solving of these issues determines the relevance of the topic.

The subject of cloud computing has been becoming more and more popular for the past years. There are many tools regarding this service important for libraries. The points of view of personnel and managers of each organization are vital for

taking necessary steps for applying the new technologies. This diploma work examines the attitudes of the using cloud computing facilities, its benefits and concerns in library.

The aim of the research. Librarians and users have to be able to communicate with each other with innovative way. Firstly, during the process users can take new information about libraries, services and cloud computing. On the other hand, librarians are also able to communicate and sharing their ideas about their specialty.

Main purpose of this work is to find out new ways of communication between specialists and users, as a result libraries become more open and connected. To carry out this task I have lent services of cloud computing system.

The **main tasks** are:
- Analyzing of the cloud computing systems in the world;
- To examine of which kind of cloud computing services are used in the world for libraries effectively and widely;
- To analyze technologies to create programmatic complex of cloud service for information library establishments' specialists;
- Using of cloud computing technologies in library service and their advantages.
- To create functional, organizational structure, list of issues and main algorithms for programmatic complex of Innovation Library News System.

Methodological principles of the topic. This research is based on libraries innovative news, different kinds of information about cloud computing, services and materials.

Objects of this research are Information library centers of Uzbekistan, and as a **subject** of this study of creating website based on Cloud computing technology and online information service for which specialists and users are able to communicate with one another, as well as, specialists can save their links, notes to the system.

CHAPTER I. ANALYSIS OF USING CLOUD BASED TECHNOLOGIES IN LIBRARIES

1.1 History, basic definitions, conceptions and types of the cloud computing technologies

Initial period of the 1960s, the starting concepts of time-sharing became mostly used via Remote Job Entry[1]. IBM and DEC corporations were first examples which mostly associated with this terminology.

Solutions for full-time-sharing were available by the early 1970s on such platforms as Multics, Cambridge CTSS, and the earliest UNIX ports (on DEC hardware). The "data center" model where users offered jobs to experts to run on IBM machines was overwhelmingly predominant.

In the 1990s, telecommunications companies, who previously submitted primarily dedicated point-to-point data circuits, began offering Virtual Private Network services with comparable quality of service in a lower cost. Switching traffic gave them great chance to balance server use, they could use overall network bandwidth more efficiently. the cloud symbol was begun to use to denote the border point between what the provider had to do for and what users were responsible for. Cloud computing extended this demarcation to cover the network infrastructure, as well as, all servers. As computers became in more connections , scientists and technologists created new ways to make large-scale computing power which more users could utilize through time-sharing. They experimented with algorithms in order to find optimum infrastructure, platform, and applications to prioritize Central Processing Units and increase effectiveness for end users. Since 2000s, cloud computing has started to use more widely. In August 2006, Elastic Compute Cloud[2]

[1] White, J.E. "Network Specifications for Remote Job Entry and Remote Job Output Retrieval at UCSB". *tools.ietf.org.* Retrieved 2016-03-21.

[2] *"Announcing Amazon Elastic Compute Cloud (Amazon EC2) - beta"*. Amazon.com. 24 August 2006. Retrieved 31 May 2014.

system was introduced by Amazon. Google released Google App Engine in beta in April 2008[3].

In early 2008, the first open-source software which based on private and hybrid clouds was introduced by NASA's Open Nebula, this project was funded by the RESERVOIR European Commission.

By mid-2008, Gartner explored new idea for cloud computing terminology "to shape the relationship among consumers of IT services, those who use IT services and those who sell them and observed that "organizations are switching from company-owned hardware and software assets to per-use service-based models" so that the "projected shift to computing ... will result in dramatic growth in IT products in some areas and significant reductions in other areas."

In February 2010, Microsoft Azure was released by Microsoft, which was already announced in 2008. July 2010, Rackspace Hosting and NASA launched together an open-source cloud-software known as OpenStack. Main aim of the OpenStack project was helping organizations offering cloud-computing services which associated with standard hardware. NASA's Nebula platform and Rackspace's Cloud Files platform were early code creators. There were also had lots of open source offering and along with other open-source solutions such as CloudStack, Ganeti and OpenNebula, it has attracted attention by some important communities.

On March 1, 2011, IBM SmartCloud framework was introduced IBM in order to create Smarter Planet.Among the various components of the Smarter Computing foundation, cloud computing is a critical part. 2012's June played an important role in Cloud computing Oracle announced the Oracle Cloud. Because they created three main part of the cloud computing includes: Applications as a

[3] _"Introducing Google App Engine + our new blog"_. Google Developer Blog. 2008-04-07. Retrieved 2017-03-07.

service(SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) layers which all of them were integrated with IT solutions[4,5].

Basic Definitions

What is Cloud Computing?

Cloud computing is not a new type of innovation technology that suddenly realized on the web but cloud is a new form of computing. Cloud computing is a kind of computing technology which is able to use in sharing the resources and services, documents, files videos over the internet rather than using these services and resources on local computer, servers, nodes or personal devices. Applications, networks, connection, servers and resources combination is well-known as 'cloud'. Cloud computing is acting as a resources pooling technology for accessing limitless computing services and resources as per demand of users and it is possible to compare with models of pay as you use or utility model same as used for mobile services usages and electricity consumption. Cloud computing technology is the utilize of hardware and software that are mentioned as a service over the Internet. The name is based on the utilize of a cloud symbol as an abstraction for the complex architecture it contains in system charts, diagrams. With cloud computing it is easy to distance services which means users are able to use their data, software and computation in anytime and anywhere. Secondly, Cloud computing is an emerging and innovative technology example was created by Distributed Computing, Parallel Computing, Grid Computing and Distributed Databases combination, that provides data storage, computerization, and communication resources as service which according to user's need in a scalable and virtualized network. Cloud computing has been becoming the biggest and most important solution for providing on-demand, reliable, safe and dynamically scalable computing infrastructure for many services and applications.

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[4] "Larry Ellison Doesn't Get the Cloud: The Dumbest Idea of 2013". Forbes.com. Retrieved 12 October 2014.
[5] "Oracle Cloud, Enterprise-Grade Cloud Solutions: SaaS, PaaS, and IaaS". Retrieved 12 October 2014.
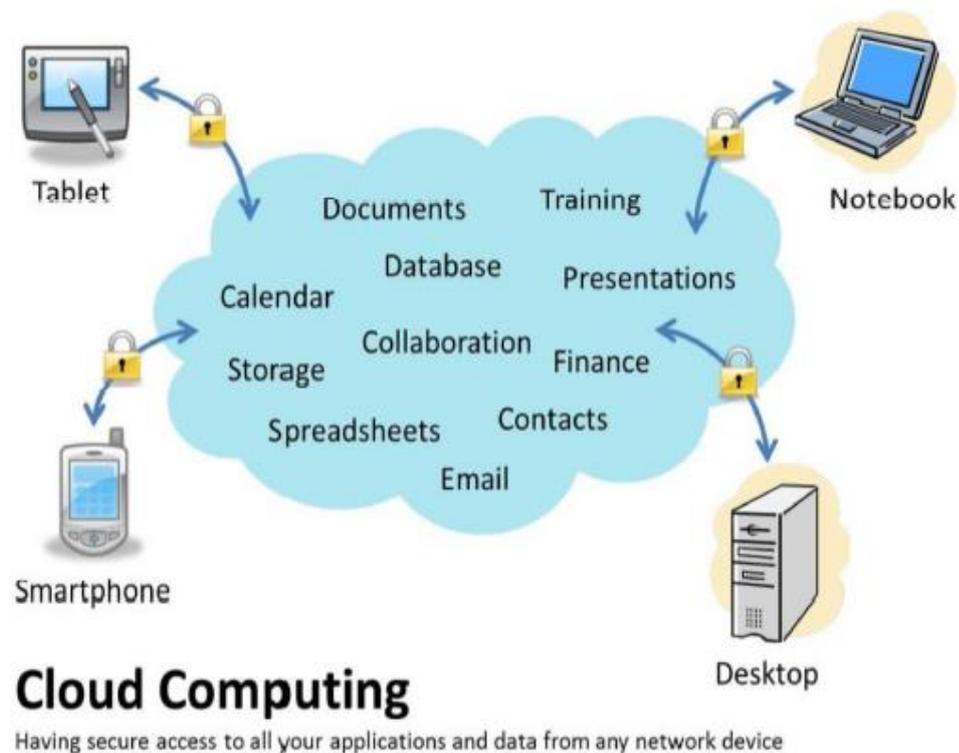
Figure 1.1: Secure access to applications and data via network device.

Cloud computing enables myriad massive scale sharing, which helps to utilizers to access technology enabled services without being knowledgeable of, expertise with, or full of technology infrastructure supports controlling the system and security.

Cloud Computing is a kind of computing technology which is excellent in sharing computing resources and services over the internet on pay-per-use basis rather than housing these services and resources locally or on some personal devices, which requires huge investment for any organization or an individual willing to deploy IT resources.

Essential Characteristics[6]:

Private self-service. Users are able to privately supply computing capabilities, such as server time and data storage in network, as needed automatically without going any service's provider or without involving in human interaction.

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[6] *Boniface, M.; et al. (2010), Platform-as-a-Service Architecture for Real-Time Quality of Service Management in Clouds, 5th International Conference on Internet and Web Applications and Services (ICIW), Barcelona, Spain: IEEE, pp. 155–160, doi:10.1109/ICIW.2010.91*

Broaden access to the network. All services and opportunities are available on the International network and accessed through standard mechanisms that promote to use mobile phones, laptops, personal computers and other devices.

Resource collection. The provider's computing resources play an important role in serving to billions of consumers with using a multi-tenant structure, with various virtual, physical and logical architecture. Consumers' demand is the main factor in assigned and reassigned dynamically their resources. In this process customer has not got any knowledge about controlling, exact location of the provided resources, specify location of the files at a higher point of the abstraction, such as, country, state, or datacenter. Data storage, sharing process, cloud memory, network bandwidth, and virtual machines, security, signal processing are main examples of resources.

Rapid stretching. Capabilities are able to spread fast, easy and elastic way, all processes work automatically, to quickly scale out and rapidly released to quickly scale in. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time.
Availability of the capabilities are unlimited and can be purchased in any amount and at any time to the individual and corporation consumers.

Well-developed service. The most important value of the cloud computing is controlling and optimizing resources are automatically via type of services, more precisely storage, bandwidth, active user accounts and processing. Utilized service can monitor, control and report about resource consumption for both the provider and consumer.

Types of Cloud Computing

Public cloud

It is the traditional model of cloud computing system which is predicted of when they think about cloud computing. In this model, vendors dynamically share resources via hard drive space, RAM, and processor power on a peer to peer user basis through web applications.

•**Unlimited access-** it is possible to access anywhere and anytime your data with internet access and a compatible device such as a cell phone, laptop computer.

•**Unlimited data capacity-** Public cloud computing is flexible to meet your business' growing data storage and processing needs[7].

Hybrid cloud

This model combines business' hardware with cloud computing. Generally, one of the business applications such as Exchange Server 2012 or Microsoft Dynamics will interact with a vendor-hosted service. For example: *Cisco*, traditionally recognized for networking hardware, offers IronPort Email Security as their hybrid solution and *Google*, known for hosted solution, offers Postini email archiving.

• **Hardware:** User have to purchase hardware to interact with the hosted solution in order to use the hybrid cloud computing system.

• **Software:** Along with hardware needs, user will need to have or buy the software to control and store their data[8].

Community cloud

A **community cloud model** refers to a cloud computing infrastructure set up by group of two or more organizations that are likely to have common requirements for a cloud computing services for example, mission, security requirements, policy, and compliance considerations hence, they can agree on implementing a typical infrastructure that is secured, cost effective and reliable.

Private cloud

Private cloud is also known as "internal cloud computing", Private cloud computing is the next generation of virtualization. While similar to virtualization at the server, workstation and application levels, private cloud computing has enhanced features that appeal to many businesses. Two examples of private cloud solutions

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[7] Rouse, Margaret. "What is public cloud?". Definition from Whatis.com. Retrieved 12 October 2017.
[8] Désiré Athow. "Hybrid cloud: is it right for your business?". *TechRadar*. Retrieved 22 April 2017.

are VMware v Cloud and Citrix VDI. These two Cloud solutions play an important role in cloud system which helps to improve the communication and data collection.

• **High data security-**while data is flowing via the network, security is provided in high quality, as a result no one hacked the data.

• **Simple compliance enforcement-** According to the vertical market, government regulations may forbid business' from using hybrid or traditional cloud computing versions. Private cloud computing allows to take pluses of cloud computing features while controlling all regulated data onsite and secure.

• **IT network control customization-** Keeping the cloud in a private, they are become free to exchange their network to meet their specific users' needs.

Cloud Computing Service Models

Cloud Providers offer services that can be grouped into three categories:

1. **Software as a Service (SaaS):** A complete application is offered to users and consumers, service according to the demand, in this model. A single instance of the service runs on the cloud & multiple end customers are serviced. On the customer's side, there is no need for upfront investment in servers or software licenses, while for the provider, the costs are lowered, since only a single application needs to be hosted & maintained. Google, Sales force, Microsoft, Zoho companies provide service via Saas to their customers.

2. **Platform as a Service (Paas):** Here, a layer of software, or development environment is encapsulated & offered as a service, upon which other higher levels of service can be built. There are given a freedom to the customer to build his own programs and applications, which run on the provider's architecture and infrastructure. The most important factor of this method are manageability and scalability requirements of the applications, Combination of OS and application servers are offered by PaaS providers, such as LAMP platform (Linux, Apache, MySQL and PHP), restricted J2EE, Ruby, as well as, Google engine provide this service. Platform as a Service plays an essential role in cloud system, which helps to build own programs and applications according to customer and user needs.

3. **Infrastructure as a Service (Iaas):** Some common examples are Amazon, GoGrid, 3 Tera for the IaaS. IaaS provides basic data storage and computing capabilities as standardized services over the network. Servers, data storage systems, networking equipment, data centre space are pooled and made available to handle workloads. **There are also other common cloud computing service types:**

1. Storage as a service (STaaS)

2. Security as a service (SECaaS)

3. Data as a service (DaaS)

4. Database as a service (DBaaS)

5. Test environment as a service (TEaaS)

6. Desktop virtualization

7. Backend as a service (BaaS)[9]

After analyzing cloud computing types and service models it is important to claim that they connected with each other as in the given picture:

The Cloud Computing Definitions
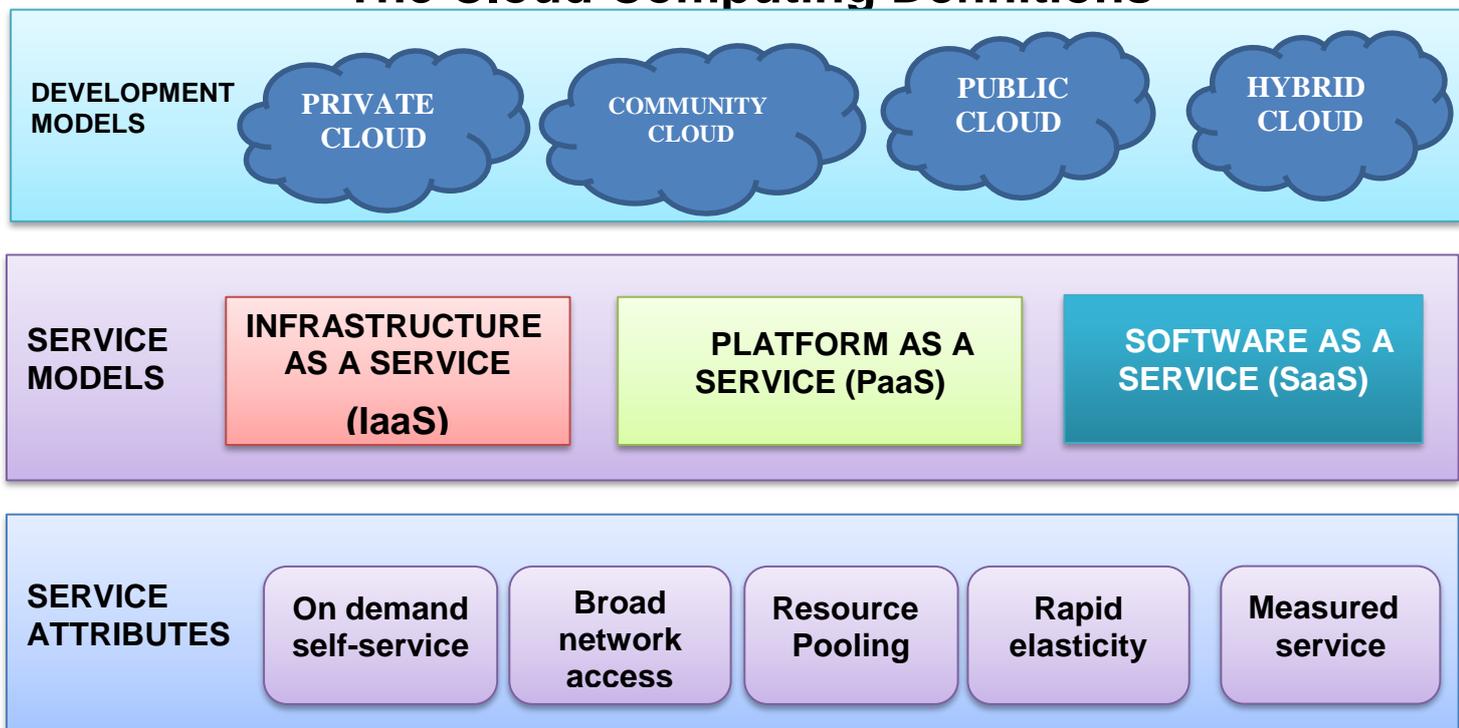
Figure 1.2 Combination structure of the Cloud computing models, services and attributes.

[9] Chou, Timothy. *Introduction to Cloud Computing: Business & Technology*.

1.2 Most popular cloud computing systems and their working principles.

Top 10 Leading Cloud Companies

There is great competition among huge companies creating their own Cloud computing service in order to make huge profit from their services. According to Forrester Research calculations the quantity of global public cloud market will reach $178 billion in 2018, up from $146 billion in 2017, and it will maintain to grow at a compound annual growth rate (CAGR) of 22%. In every section of the cloud computing, more clearly public, private, or hybrid cloud systems continue to grow rapidly. AWS vs. Azure vs. Google Cloud are leading the cloud technology market, they are titans who wage a deep-pocketed battle between each other. As well as there also plenty of middle sized contenders and cloud start-ups (Alibaba, IBM, HP Enterprise). Old school tech giants in cloud computing is influential and extraordinary. They are deeply associated with their main business model that there is no way for embracing a new type – or they fear the new model because it could destroy their current business[10].
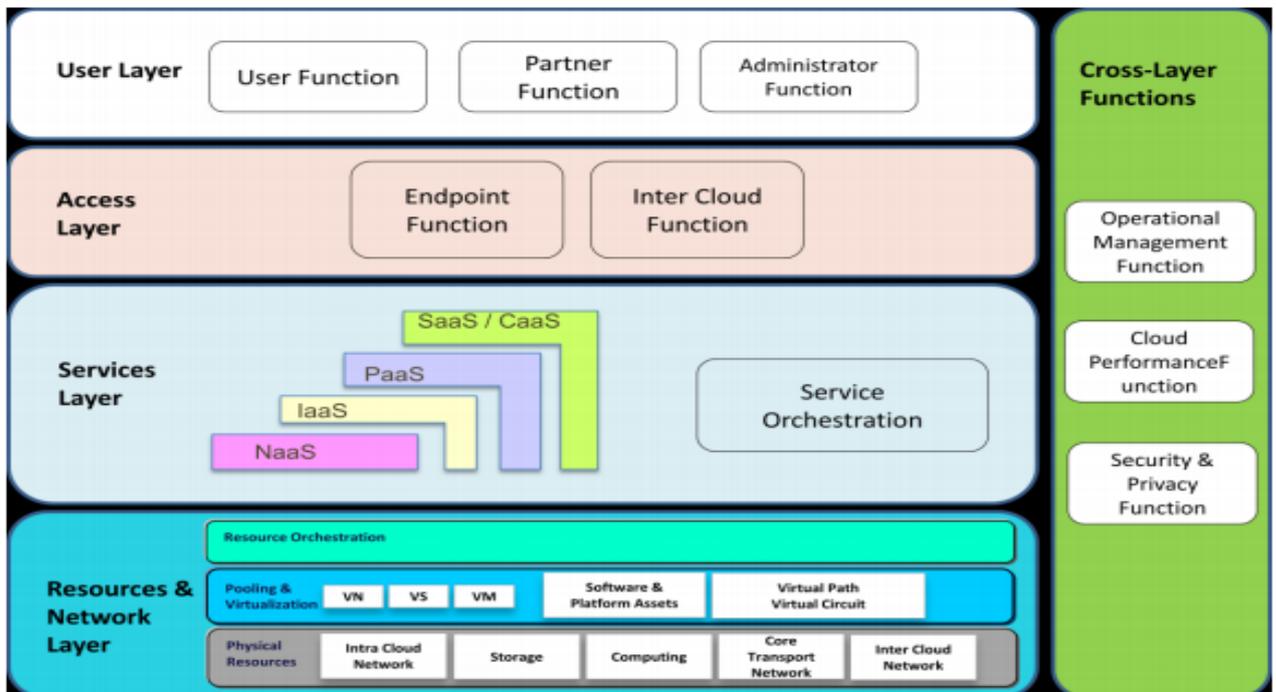

Figure 1.3 Cloud computing functional reference architecture

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[10] *Cloud Computing 2018: Using the Cloud to Transform Your Business*

Amazon

Amazon Web Services (**AWS**) is owned by Amazon.com that supplies on-demand cloud computing services and platforms to individual person, private and public companies and even governments, on a paid subscription basis[11].

In 2017, AWS offered more than 90 services in a wide range including computing services, storage, networking, database, analytics, application services, deployment, IT management, mobile communication, developer tools for everyone, and tools for the Internet of Things. EC2(Elastic Compute Cloud) and S3(Amazon Simple Storage Service) are the most popular between services.[12].

AWS creates huge measure cloud computing amount more quickly and cheaply than building an actual physical server. All services are paid based according to usage, but each service level usage in different methods. According to Synergy Group in 2017, AWS is a dominant 34% of all cloud system (IaaS, PaaS) while the next three followers Microsoft, Google, and IBM have 11%, 8%, 6% respectively.[13]
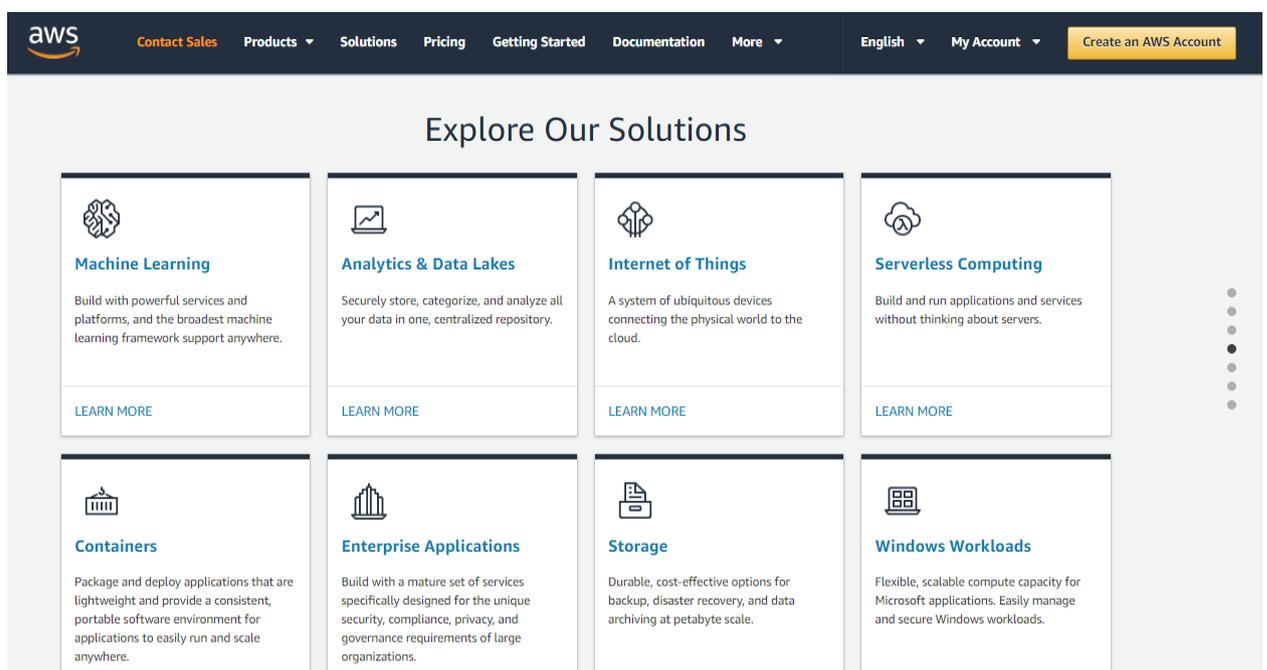

Fig. 1.4 Main interface of Amazon Web services *https://aws.amazon.com/?nc1=h_ls*

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11 *"Amazon Now Has Three CEOs"*. *fortune.com. Retrieved 16 November 2017*
12 "What is Cloud Computing by Amazon Web Services | AWS". Aws.amazon.com. Retrieved 2013-07-17.
13 *"Amazon - Press Room - Press Release"*. *phx.corporate-ir.net. Retrieved 8 June 2017.*

In AWS offers hundreds of services via online with easy way. So it is used around the world. In order to use its products and services users have to create an account (Fig. 1.5).

Figure 1.5. Creating an AWS Account

As you can see fig 1.6 it is possible 12 months of free tier access, but after that, users need to pay their accounts. In order to create an account user just needs to enter his or her **E-mail address**, **Password** and **AWS account name.**

Figure 1.6. Form for Creating an AWS account

After creation of account it is possible to use all of services according to our needs. As we have already mentioned there are given hundreds of products (Fig 1.7).
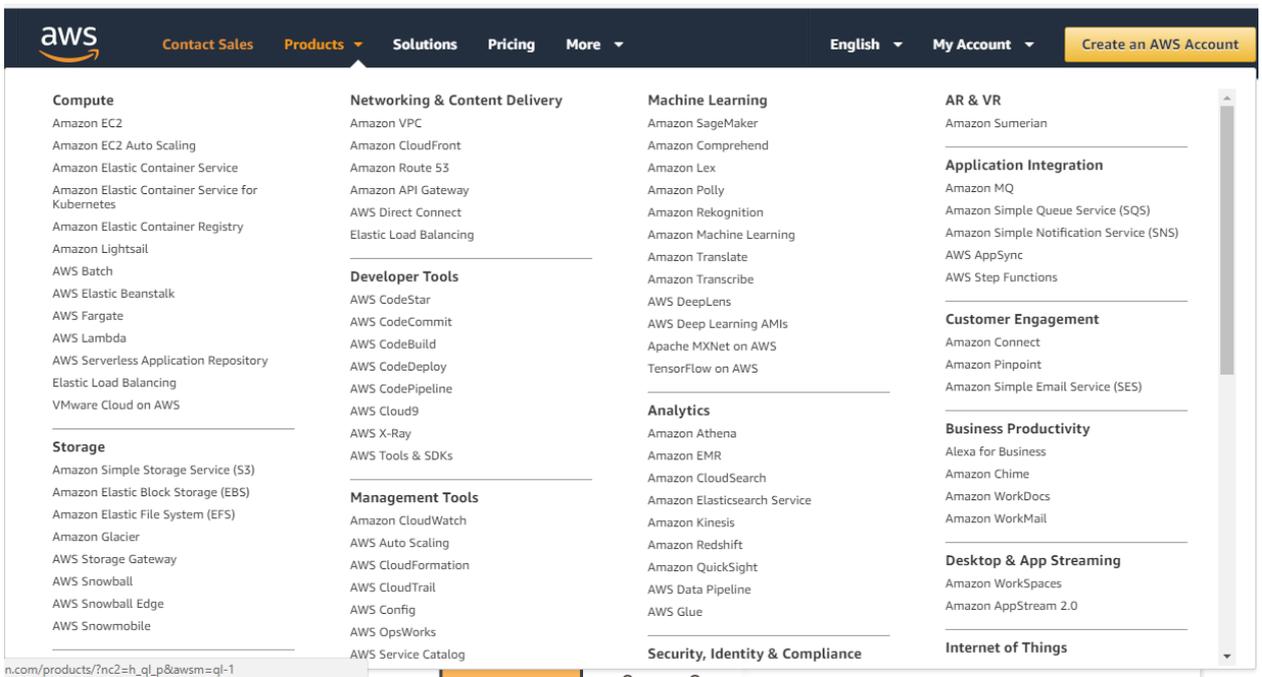
Figure 1.7. All products and services

It can be clearly seen in figure 1.7 there are myriad cloud service offered by Amazon, if the take just **Management Tools** from **Products.** There are offered 13 services:
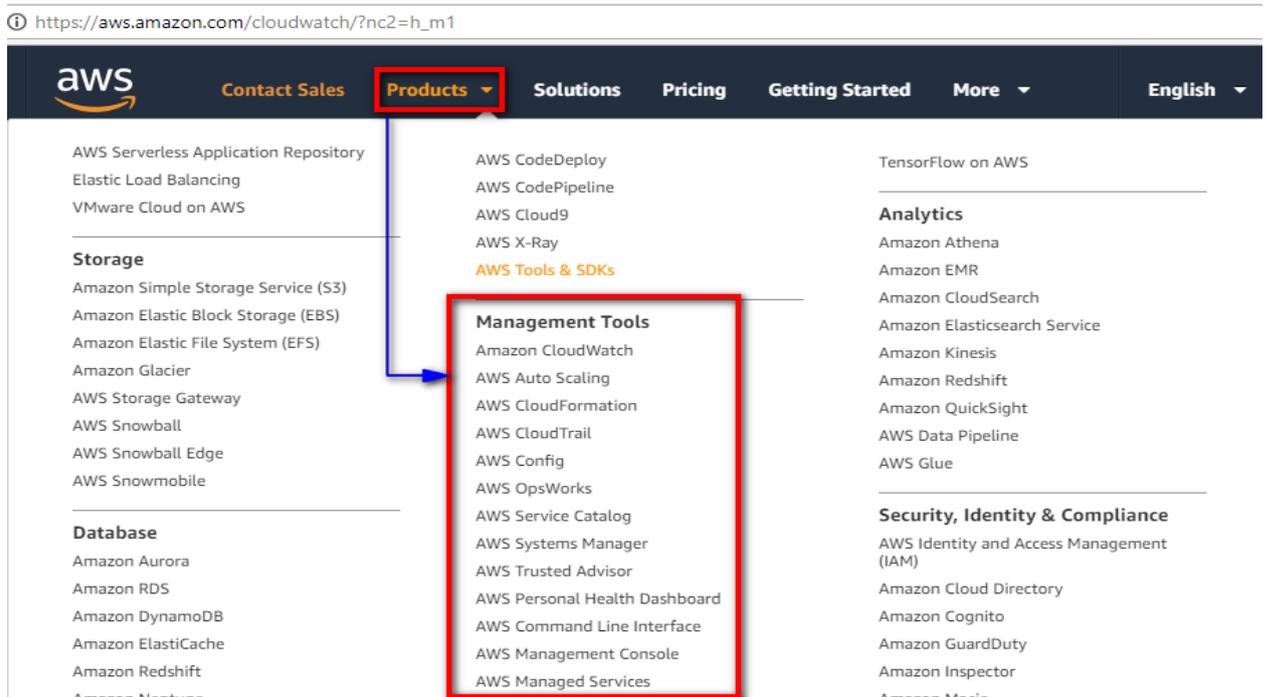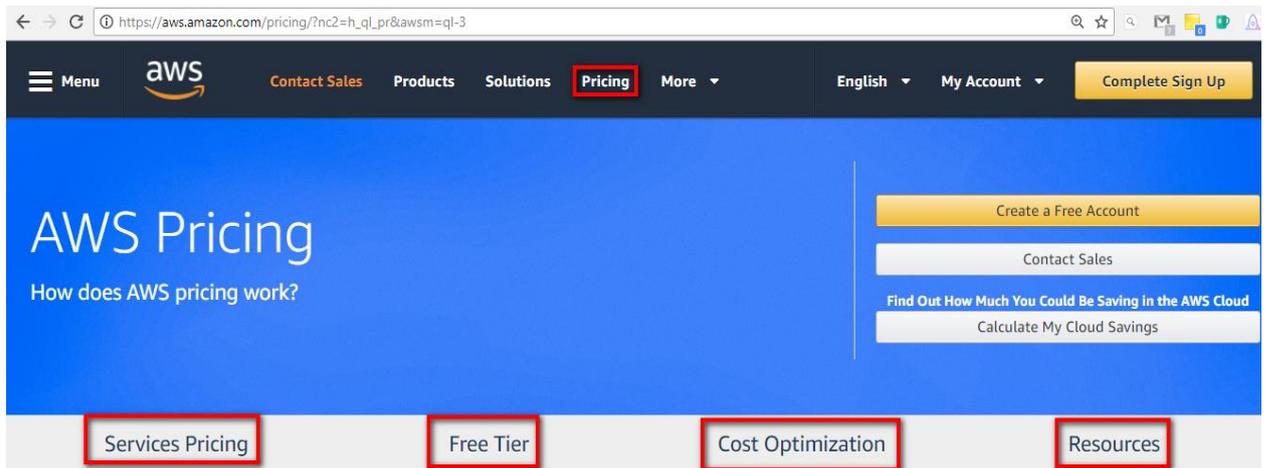

Figure 1.8 Management Tools products list from AWS.

Now the question arises "How much does it cost Amazon services" at this point user just needs to click **pricing** part of the website (Fig 1.9).
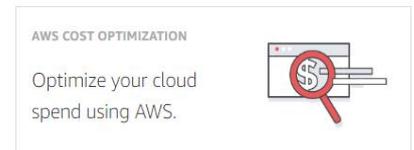
20

Figure 1.9 Cost calculation in AWS.

In **pricing** part of the AWS it is possible to take an information about services prices: **Service Pricing, Free Tiers, Cost Optimization** and **Resources.**

After analyzing the AWS services and products, it can be clearly shown that, why Amazon is the most successful IT company in the world.

Microsoft Azure

Microsoft presented Microsoft Azure for the cloud computing service in order to create for building architecture, testing systems, deploying configuration, and managing applications and services through a international network of Microsoft-managed data centers. It offers software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS) and it is associated with many different computing programming languages, essential tools and frameworks, including both Microsoft-specific and third-generation software engineering and systems. In February 1, 2010 "Windows Azure" renamed "Microsoft Azure"[14] which was Azure announced in October 2008 and released.   Microsoft has included the cloud computing with full services, Azure, and put two of its biggest cash cows – Office

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[14] Upcoming Name Change for Windows Azure". Microsoft Azure. March 24, 2014. Archived from the original on March 24, 2014. Retrieved August 29, 2016.

and SQL Server – in Azure for public to use. Amazon recently added DevOps supporter for Kubernetes explorations.
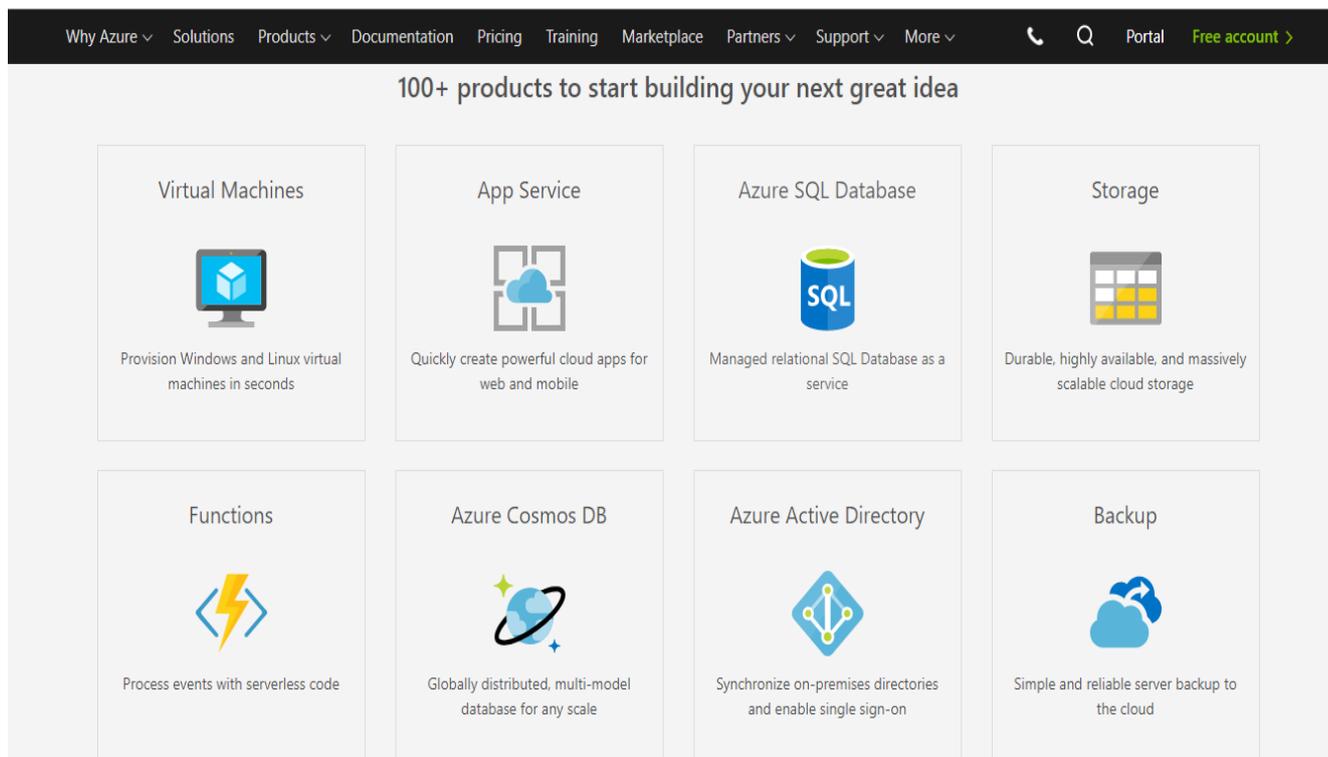

Figure 1.10 Main interface Microsoft Azure platform https://azure.microsoft.com/en-us/

There are also offered huge quantity of services, it is possible to find any kind information about services and products on the Microsoft Azure.

Google Cloud Platform

Google Cloud Platform, created by Google corporation, is a suite of cloud computing services that runs on the same infrastructure and architecture that Google uses internally for its end-user products, such as Google Search and YouTube. Along with a set of management tools, it supplies a series of cloud services which include computing service, data storage, data analytics and machine learning system. In order to registration users have to use their credit card or bank account details.[15] Despite its dominance – and its great ambition for the cloud – Google is running third in the race for cloud market share. Google is dominating in AI and Machine Learning, two very hot sections for the years ahead.

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[15] "Google Cloud Products". cloud.google.com. Retrieved 2017-06-02.

One of its huge advantages of the Google Cloud Platform is price: it is between 40 percent and 50 percent cheaper for identical services on Amazon Web Services and Azure[16].
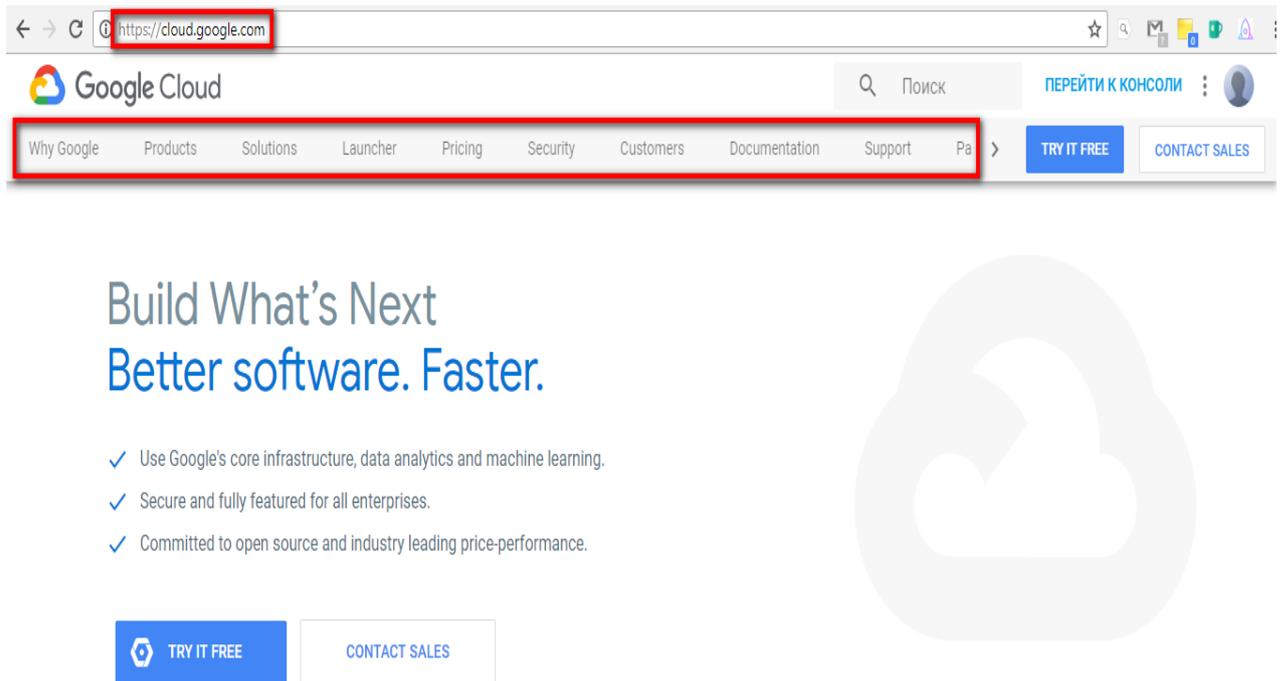

Figure 1.11 Google Cloud Platform cloud services *https://cloud.google.com/*

IBM. There is huge combination system in cloud offerings in IBM cloud, such as, Watson, BlueMix and SoftLayer, all of them in a single brand called IBM cloud that offers more than 170 services with SaaS, PaaS, IaaS and other cloud services. That includes compute, network communication, data storage, management systems, providing security, analytics, mobile, developer, IoT, blockchain and migration[17]. IBM cloud system is also one of the most successful cloud company in the world. The management layer of the IBM cloud framework includes IBM Tivoli middleware. Management tools provide capabilities to regulate images with automated provisioning and de-provisioning, monitor operations and meter usage.

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[16] "Google Cloud Machine Learning family grows with new API, editions and pricing". *Google Cloud Platform Blog.* Retrieved 2018-01-04.
[17] *"Cloud Auditing Data Federation"* *(PDF). Retrieved 11 September 2017.*

23
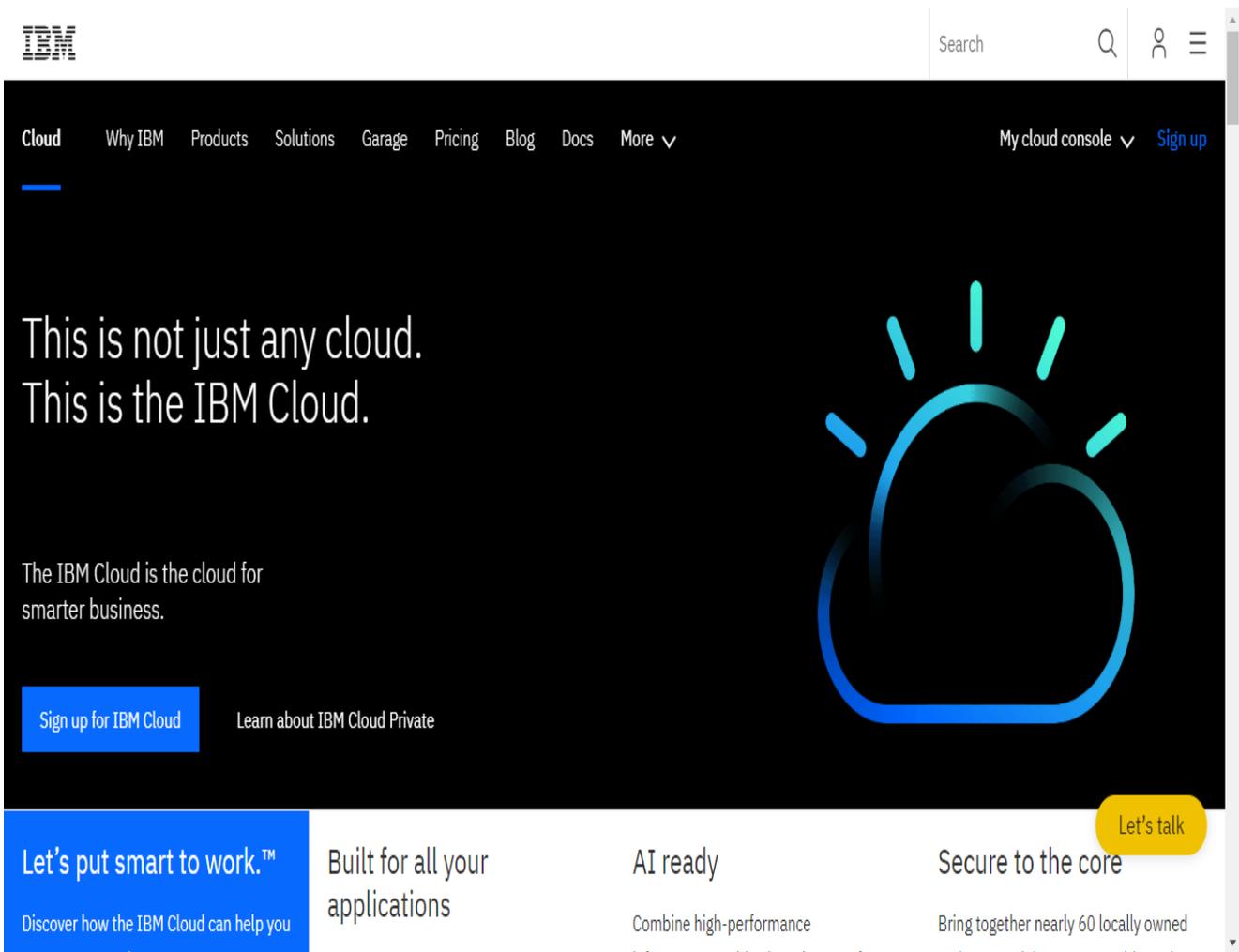
Figure 1.12 IBM Cloud service www.ibm.com

Alibaba

Alibaba also started their business in e-commerce and moved into cloud services, like Amazon. It is the largest cloud computing company in China, but it has an international level, with 18 data center regions and 42 availability zones around the world. Like Amazon, Alibaba's initial steps started in small businesses with basic IaaS and PaaS offerings and as it has expanded measure, it expanded according to needs. The company's offerings cover seven main categories: Elastic Services, Domains and website, Storage and CDN and Analytics[18].

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[18] "Alibaba Cloud Opens New Data Center in India | Alizila.com". *Alizila.com*. 2017-12-19. Retrieved 2018-04-20.
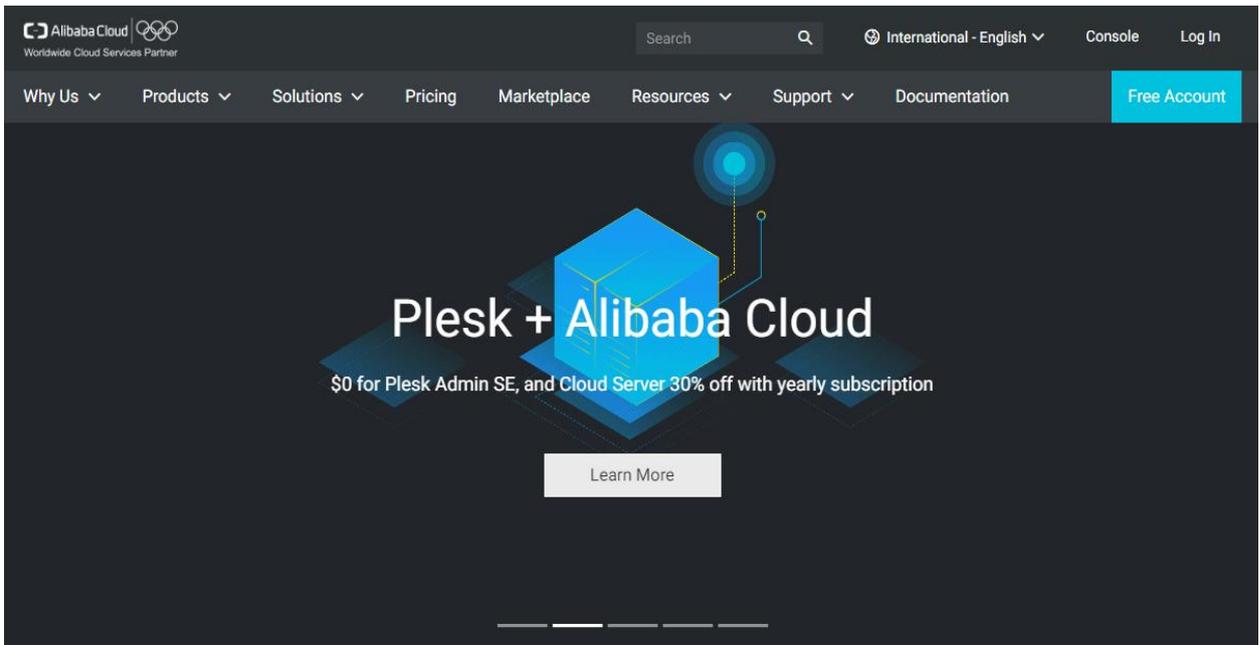
Figure 1.13 Main interface of the Alibaba cloud www.alibabacloud.com

Figure 1.14 Physical location of the Alibaba Cloud zones

As it can be seen that Alibaba No.1 Public cloud vendor in China from 2014, it has 18 global data center regions and 1300+ CDN nodes in 43 available zones.

HP Enterprise

Hewlett-Packard (HP) that created public cloud, private cloud, hybrid cloud, management in private cloud, and other cloud services via their **HP**

25

Cloud computing system. It was the huge combination of **HP Converged Cloud** business unit and HP Cloud Services, which is the OpenStack technology-based public cloud. It is used by commercial organizations so they can mixture public cloud services with their own internal IT resources to offer hybrid clouds, or a mix of different cloud computing platforms made up of private and public clouds.[19]

VMware

Data center extension, disaster recovery, and data center replacement services were offered in the initial period. VMware's leadership in datacenter virtualization provides it with a high profile among commercial customers. It recently sign contract in order to struck deals with Amazon to connect VMware customers to AWS[20].

Pivotal

EMC and VMware created pivotal which was called Cloud Foundry, this system is based on a PaaS service which supplies a new method to create and improve software systems rapidly and update it based on users' opinion. There is also training courses for customers to improve their own apps and offered statistic tools[21].

Oracle

One of the greatest cloud computing companies is **Oracle Cloud** which was created and offered by Oracle Corporation. It provides cloud servers, data storage, network communications, different applications and myriad services which is connected with Internet of Oracle Corporation managed data centers[22].

Oracle Cloud provides four main services:

1) Infrastructure as a Service (IaaS),

2) Platform as a Service (PaaS)

3) Software as a Service (SaaS)

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[19] *Layo, Irmee. "HP Launches New Products, Cloud OS and the Moonshot - CloudTimes". Retrieved 3 September 2016.*

[20] Introducing VMware's Early Access Program for VMware vCloud Air Virtual Private Cloud OnDemand

[21] *"Cloud Foundry python-buildpack Release Notes". Retrieved Mar 14, 2016.*

[22] "Enterprise Cloud Computing SaaS, PaaS, IaaS | Oracle Cloud". *cloud.oracle.com*. Retrieved 2017-11-16.

4) Data as a Service (DaaS).

These services help to create, manage, connect, and expand applications via the cloud. This platform is actually based on lots of open programming languages (SQL, HTML5, REST, etc.), open-source resuources (Kubernetes, Kafk, etc.), and different of programming languages, databases, tools, and frameworks including Oracle-specific, Open Source, and third-party software and systems[23].

Methods for Cloud Computing Cost Calculation

Mentioned the potential financial benefits of cloud service, many companies are want to find out actual cost of the cloud model could save them. In addition, lots of IT corporations need to mixture a business case for cloud computing before they can get cloud projects accepted. However, calculating cloud costs is practically difficult according to myriad factors can influence the final cost. There are given major factors and quick overview which play an important role in cloud and cloud service pricing. It is possible to use similar factors in order to estimate actual cost any type of cloud services.

Services: First of all, users need to analyze that which kind of particular cloud services they want to utilize. Each company has a little bit different type of services available, so user will need to do some findings if you want to compare costs. In addition, users don't need to forget any related services according to their needs; If I take as an example Amazon Elastic Cloud Compute (EC2), calculate whether you will also need balancing services, which will influence the final price of the system. **Instances:** It is also important to know "instance" terminology for consumers, which means type of server based on users needing. While people are using the cloud computing, they have to know about memory, storage, programming, Objective requirements and GPUs. The instances users choose will play compelling role in your actual costs, so consumer want to be sure that you select the size of the server without purchasing more than users need.

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[23] Oracle Corporation. "Oracle Cloud Career Choices". *education.oracle.com.* Retrieved 2018-02-02.

Geographic position: Price sometimes depends on which of the customer's cloud data centers you want to utilize. Generally, when users select data centers according to their physical location, it will get the best performance and lowest price. Despite, some corporations may choose a particular region for some workloads because of legal requirements, and in some cases organizations may select a data center outside of their location to find out their unexpected recovery or tax continuity requirements.

Operating System: Operation system fees is one of the important aspects in calculating cloud costs. The vendors usually allow you to utilize Windows or Linux servers with the licensing fees, but it might be more cost effective to exchange existing license agreement to the cloud.

Free programs: Users have to check with the provider offerings to analyze free services and how much time they are able to use them. Because all of the leading public cloud companies offer free parts in their services. [24]

Technical support: What level of support will be needed by users for the workloads while they are running in the cloud? More precisely, today's business-production world will require faster and reliable support response than dev or test environments. Many of the vendor companies provide varied of methods of support depending on users' needs, and those levels impact on cloud prices. **Utilization:** Some cloud computing companies offer their quantity of the work nearly 24 hours in a day, while other vendors will work for only a few hours each week or month. Because of the amount of time which influence of cloud costs, users' utilization level will impact on utilizers' monthly and weekly bill respectively. Many of the vendor companies provide varied of methods of support depending on users' needs, and those levels impact on cloud prices.

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[24] Hussam Abu-Libdeh, Lonnie Princehouse, and Hakim Weatherspoon, "RACS: A Case for Cloud Storage Diversity," in *Proceedings of the 1st ACM Symposium on Cloud Computing* (New York: ACM,2010), 229–40, doi: 10.1145/1807128.1807165.

1.3 Using of cloud computing technologies in library service and their advantages

Library resources have great connection with data collection, storage, organization, processing and analysis of information, in this communication also connected with Information technology.

Library specialty has many problems in the profession because of applications of IT. New conceptions and technology advancements are being mixture in order to improve services in the libraries and satisfy the needs of the knowledge society. Libraries start to become automatically which is the basic need towards advancement followed by networks and more effort are towards virtual libraries. The emergence of digital library, internet consumption, web applications for libraries, consortium practices leads to the development in library profession. Cloud computing technology is known as the third revolution after Personal computer and IT, because it a completely new type of IT technology. This new type of technology method is using of cloud computing technologies for lots of purposes and for improving economically in library functions[25].

There are given some examples which libraries are adopting Cloud Computing technologies in their service:

1. OCLC (Online Computer Library Center)

2. Calibre (software which works in cloud system)

3. Evergreen

4. PMB (Open source integrated library system)

5. Koha (Open source integrated library system)

6. VuFind(Open source integrated library system)

7. LibKi[26].

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[25] Kumar, D. A., & Mandal, S. (2013). Development of cloud computing in integrated library management and retrieva lsystem. International Journal of Library and Information Science, 5(10), 394-400.
[26] "The Role of Academic Libraries in Universal Access to Print and Electronic Resources in the Developing Countries, Chinwe V. Anunobi, Ifeyinwa B. Okoye". Unllib.unl.edu. Retrieved 9 September 201

OCLC (Online Computer Library Center)

OCLC is a "nonprofit, membership, computer library service and research organization dedicated to the public purpose for furthering access to the world's information and reducing information costs.[27] It has more than 60,000 libraries in 112 countries and territories around the world.
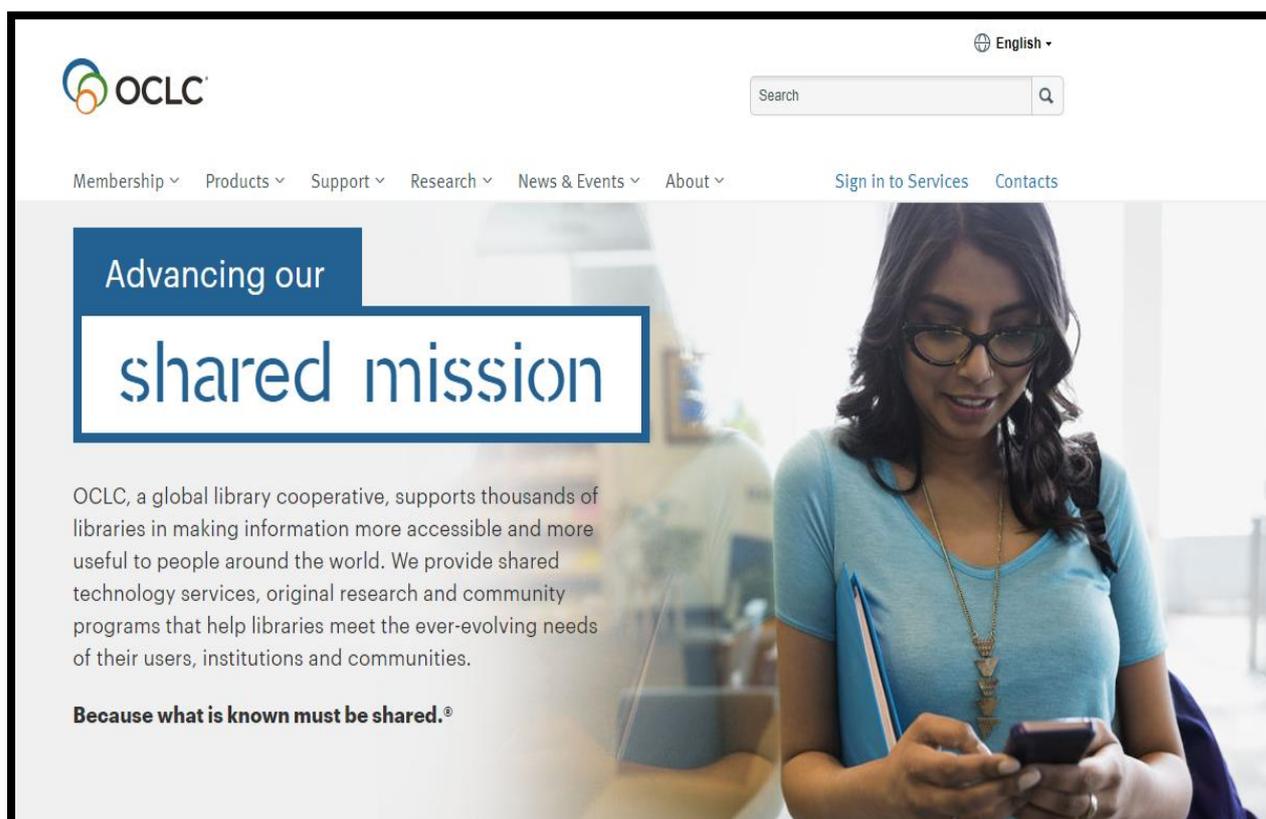

Figure 1.15 Main interface of the OCLC website www.oclc.org

As you can see the figure 1.15, OCLC, a global library cooperative, supports thousands of libraries in making information more accessible and more useful to people around the world. They provide shared technology services, original research and community programs that help libraries meet the ever-evolving needs of their users, institutions and communities. There are given an information about: **Membership, products, support, research, news&events, and about** parts (Fig 1.16).

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[27] About OCLC, OCLC. Retrieved May 18, 2008.

Figure 1.16 Including information about OCLC

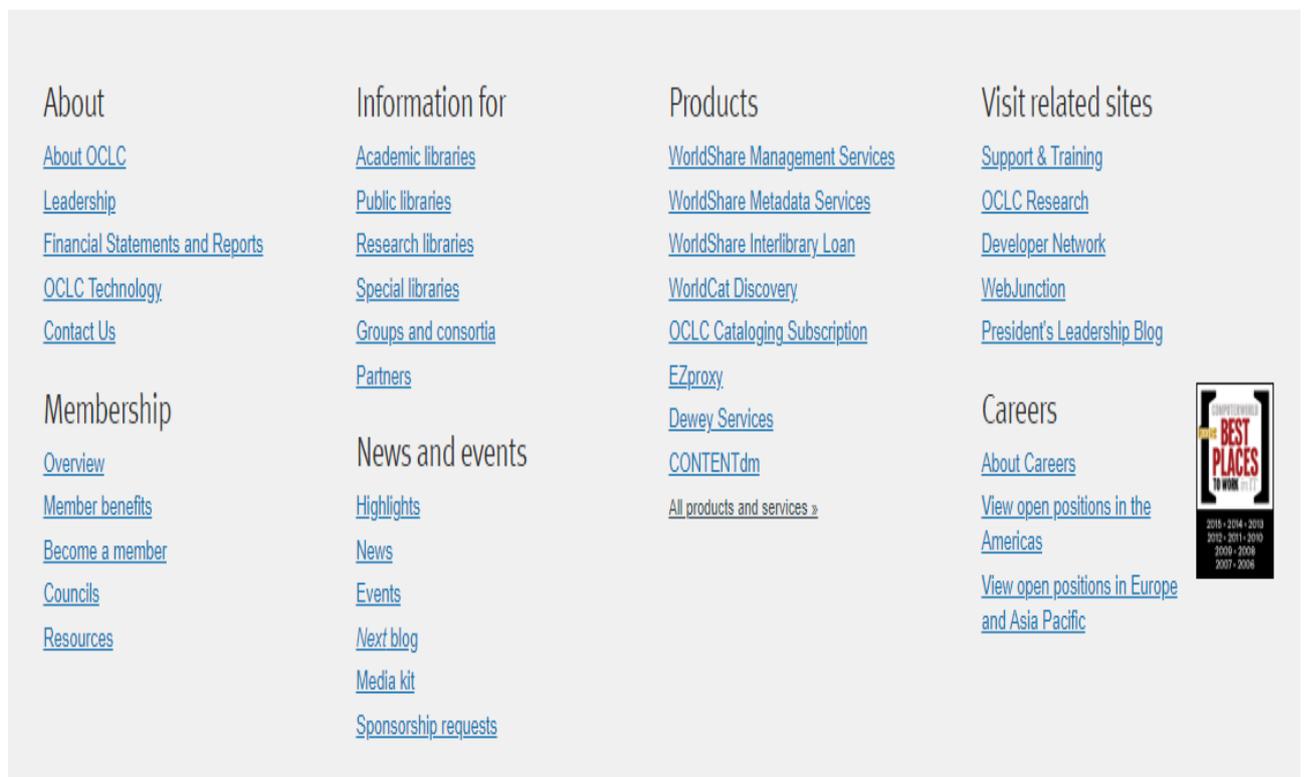
Figure 1.17 Links for OCLC services and products.

At the end point of the web site given is links which help to follow easy and faster. Users are able to find out resources, files, directions according to their needs. OCLC system based on cloud system which all its followers and participants connect via internet and are able to find out books, papers, and videos according to their interest.

Figure 1.18 Library types and groups in OCLC library.

As it shown at the figure 1.18 OCLC divided libraries according to their type:

- ✓ Public Libraries;
- ✓ Academic Libraries;
- ✓ Special Libraries;
- ✓ Research Libraries;
- ✓ Groups & Consortia;
- ✓ Schools;

Evergreen

It is also open source integrated library system (ILS) designed by the Georgia PINES consortium and used in over 1,800 libraries of all types, worldwide. Utilized for managing, cataloging, and circulating files and materials.[28] Development

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[28] Open Source ILS Continues to Expand. ALA TechSource. Retrieved on 2013-08-29.

priorities for Evergreen are that it be stable, robust, flexible, secure, and user-friendly.
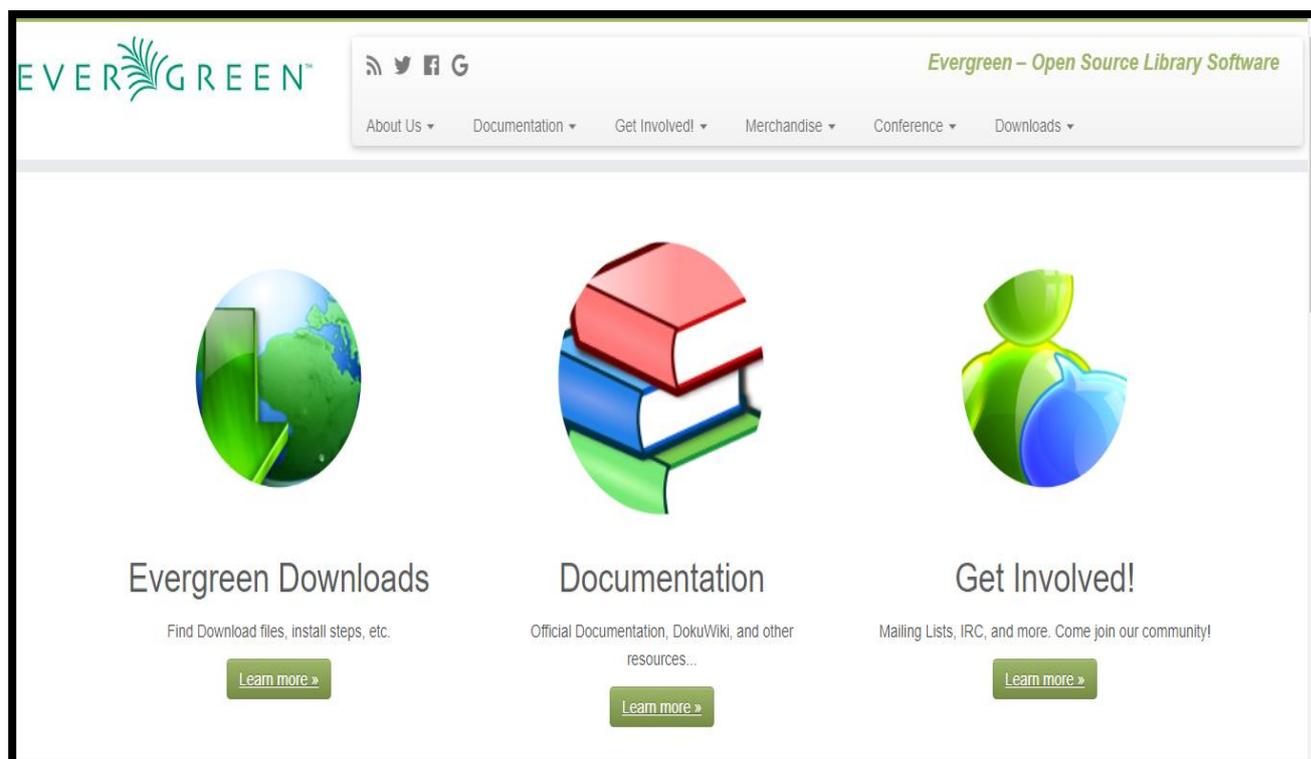
Figure 1.19 Web interface of the Evergreen- Open Source Library Software
http://evergreen-ils.org/

The Evergreen Project develops an open source ILS (integrated library system) used by more than 2,000 libraries around the world. The software, also called Evergreen, is used by libraries to provide their public catalog interface as well as to manage back-of-house operations such as circulation (checkouts and check-ins), acquisition of library materials, and (particularly in the case of Evergreen) sharing resources among groups of libraries.

The Evergreen Project was initiated by the Georgia Public Library System in 2006 to serve their need for a scalable catalog shared by (as of now) more than 275 public libraries in the state of Georgia. After Evergreen was released, it has since been adopted by a number of library consortia in the US and Canada as well as various individual libraries, and has started being adopted by libraries outside of North America.

Evergreen development community is still growing, with about eleven active committers and roughly 80 individuals who have contributed patches (as of April, 2016). However, the Evergreen community is also marked by a high degree of participation by the librarians who use the software and contribute documentation, bug reports, and organizational energy. As such, Evergreen is very much about both the developers *and* the users. Because of the nature of ILSs, Evergreen has an interesting mixture of functionality. For example:

- Evergreen is a metadata search engine
- Evergreen is a transaction processing engine
- Evergreen is just another web application
- Evergreen is based on a robust, scalable, message-passing framework – OpenSRF[29]

PMB open source integrated library system

PMB is an open source integrated library system with innovative features, including RSS, associated readings, and the ability for patrons to leave comments.

PMB follows the rules of the library science. The software provides 4 essential features:

- the library management,
- the watch and the documentary products,
- the publication of editorial content
- the electronic document management.

It provides an integrated portal of news and management of Web 2.0 content and is the only ILS that doesn't use a third-party CMS for the management of the portal. It is multilingual (100% English & French, 80% Spanish and Italian) and even

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[29] https://evergreen-ils.org/about-us/

supports Arabic (translation and UTF-8 support) since its 3.0.5 version of November 2006.[30]

Figure 1.20 PMB services interface.

This interface includes hundreds of services such as, using demo version, downloading, documentation process, community, as well as, PMB software includes hosting, counselling, development, training session, integration to the existing migration, helpline and portal conception.

Figure 1.21 Koha free library system logo

30 "Page listing PMB Services customers on their official Website".

Koha is an open source Integrated Library System (ILS), used world-wide by public, school and special libraries. The name comes from a Māori term for a gift or donation.

Koha is a web-based ILS, with a SQL database (MySQL preferred) backend with cataloguing data stored in MARC and accessible via Z39. 50 or SRU. The user interface is very configurable and adaptable and has been translated into many languages. Koha has most of the features that would be expected in an ILS, including: Various Web 2.0 facilities like tagging, comment, Social sharing and RSS feeds

- Union catalog facility
- Customizable search
- Circulation and borrower management
- Full acquisitions system including budgets and pricing information (including supplier and currency conversion)
- Simple acquisitions system for the smaller library
- Ability to cope with any number of branches, patrons, patron categories, item categories, items, currencies and other data
- Serials system for magazines or newspapers
- Reporting
- Reading lists for members
- Off-line Circulation.
- On- line Circulation
- Segmentation of the line[31].

Cloud technologies is the most important key of the system. Because patrons exchange resources from distance, when some patron enter one file, everyone can use.

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[31] "Koha 3.2.3 is now available | Koha Library Software Community". Koha-community.org. Retrieved 2011-08-18.

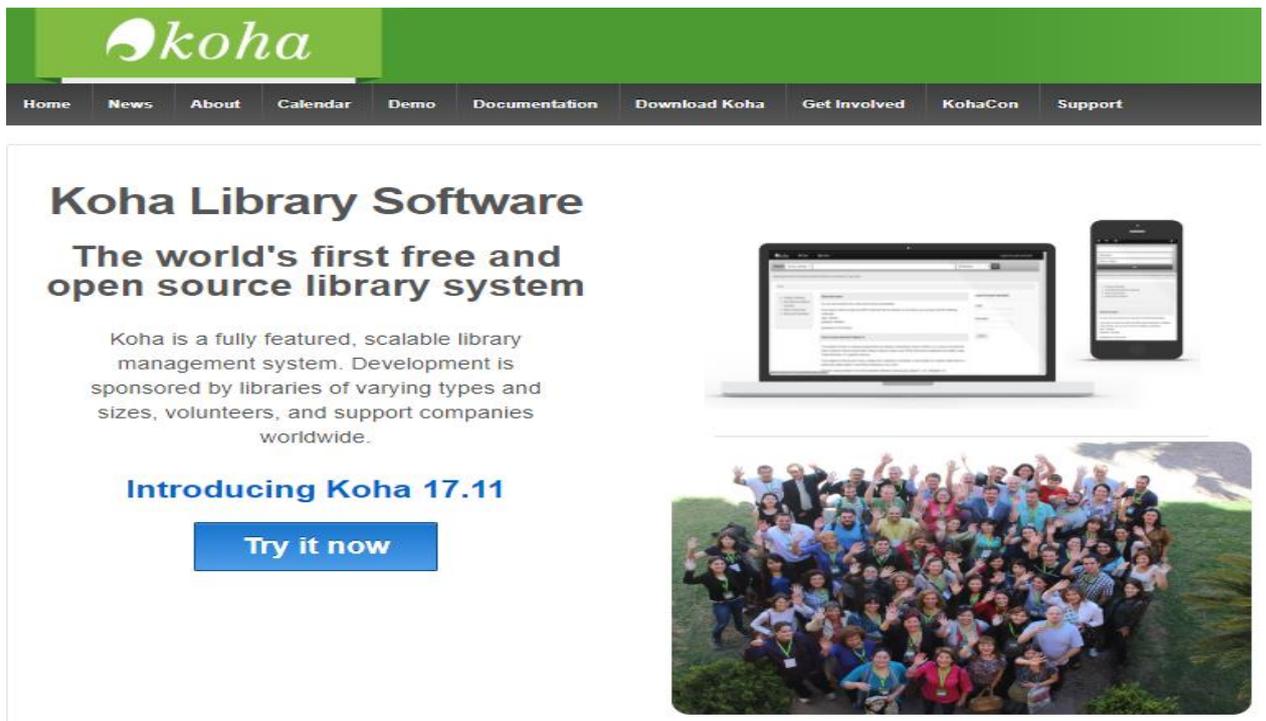*Figure 1.22 Introduction part of the Koha community. https://koha-community.org/*

List of Koha demonstration installations maintained by various libraries and support vendors. Please feel free to list your demo here as long as you provide public access to at least the OPAC and it is running a version of Koha that can be freely obtained by anybody without restriction. The current development version is referred to as "master" in the table below. On www.koha-community.org/demo you could find a similar list.

Version	MARC flavor	OPAC	Staff interface	Staff login	Provider
master	MARC21 + UNIMARC + ElasticSearch	See sandboxes page	See sandboxes page	test / test	BibLibre, ByWater, PTFS
18.05.00.000	MARC21	http://koha.adminkuhn.ch/	http://koha.adminkuhn.ch:8080/	demo / demo	Admin Kuhn GmbH (Switzerland)
17.11.04.000	UNIMARC	https://demo.biblibre.com/	https://intranet-demo.biblibre.com/	test / test	BibLibre (France)
17.11.00.000	MARC21	https://opac-kohademo.equinoxinitiative.org/	https://staff-kohademo.equinoxinitiative.org/	demo / demo	Equinox Software, Inc. (USA)
17.11.02.000	MARC21	http://demo1.orex.es	http://intra1.orex.es/	admin / admin	Orex (Spain)
17.05.03.000	UNIMARC	http://catalogue.demo1705-koha.test.biblibre.eu	http://pro.demo1705-koha.test.biblibre.eu	test / test	BibLibre (France)
17.05.05.002	MARC21	https://catalog.bywatersolutions.com/	https://intranet.bywatersolutions.com/	bywater / bywater	ByWater Solutions (USA)
17.05.06.000	MARC21 + RDA	https://demo.calyx.net.au	https://demo-admin.calyx.net.au	anne / koha	CALYX (Australia)
17.05.06.000	MARC21	https://demo.mykoha.co.nz/	https://demo-intra.mykoha.co.nz/	staff / staff1	Catalyst (New Zealand)
17.05.06.000	MARC21	https://koha-opac-demo.kreablo.se/	https://koha-demo.kreablo.se/	Bibliotekarien / kreablo	Kreablo AB (Sweden)
16.11.15.000	UNIMARC	http://catalogue.demo1611-koha.test.biblibre.eu/	http://pro.demo1611-koha.test.biblibre.eu	test / test	BibLibre (France)
16.05.14.000	UNIMARC	https://kopac.tamil.fr/	https://kpro.tamil.fr/	demo / demo	Tamil (France)
16.05.03.000	MARC21	http://library.software.coop	http://library.software.coop:8080	demo / demo	TTLLP Software Coop (England)
3.22.21.000	UNIMARC	http://catalogue.demo322-koha.test.biblibre.eu	http://pro.demo322-koha.test.biblibre.eu	test / test	BibLibre (France)

Figure 1.23 Koha Demo Installations list

Advantages of cloud computing technologies in library service

- **Lower costs** - Cloud computing is based on the principle of exchanging resources it gives to users also the benefit of sharing its costs. Customer do not have to spend a lot of money hardware, such as powerful servers, large datacenters and software applications. Customer needs only internet system and basic Personal Computers with not high requirements. Ordinary laptops, netbooks or mobile phones are in an adequate. As a result, users only pay for their real consumption. These may be services, hardware resources or architecture or applications with their combination.

- **Less IT employees** – Customer also does not need a lot of employer's IT department in such huge range. There is only need to provide security in connection and PC with web browser. After all, the technical support such as back-ups, recovery, virus protection, updates, software and hardware stability and functionality, helpdesk and support is maintained by the provider of a service.

- **No special knowledge** - client (customer) also does not need to have a high knowledge about hardware and complex software applications at all. Client just uses a service throught web browser. Hardware resources can be shared between all clients and managed by usage or their requirements.

- **Easy to upgrade** - massive increase of performance (such as speed or storage size) is provided immediately after simple order and applied by "a few clicks". Data center can provide higher performance than common desktop PC or, on the other hand, can be very efficient and deliver just what customer needs at the moment (low performance) and thus again it saves resources and money. This approach saves also time, costs for new hardware, transport, is power (energy) efficient and as a result saves the environment, which is very discussed issue these days.

- **Instant access anywhere** - one of the most important benefit is availability of a service anywhere. What is needed for accessing the service is computer connected to the internet. There is no dependence on platform (PC, MAC, mobile phone, car etc.).

- **Security** - is a very discussed issue in the Cloud Computing service providing and could be put in both pros and cons as you see in a while. Service is protected by usage an authorization. Users identify themselves by using an ID (Username) and Password (or also more sophisticated method such as chip, fingerprint, face detection etc. can be used). Communication between client and provider servers is secured. Data center is protected by firewalls and kept in secured buildings.

- **Requirements** - technology, which customer needs are very simple. Important is only terminal as a laptop, desktop, mobile phone, netbook etc. with web-browser, internet connection and usually also created account on a service at provider's place.

Conclusion for the chapter I

After analyzing above mentioned themes it is clear that cloud computing is new type of technology which plays an important role in today's technological era. Cloud computing history was associated with 1960s and now it is the most important method in computing, networking, data storage, IT management, security, analytics, mobile, developer, IoT, block chain and migration. The research allowed us to widen our horizon and delve deeper into more trends that spread like wildfires more recently as the cloud computing. The study allowed researchers to search and look into more solutions for the libraries and assisted librarians to critically think and gathered all the data to come up with a passable solution plan so to facilitate and pave the road for more flourishing services. The best option of all types of cloud was the private cloud to eliminate threats of divulging data and reduced concerns when it came to compliance requirements

Digital-data preservation represents a threat to digital libraries. Data is an essential part of a library, and its storage is of the utmost importance. Digital-data storage requires extreme durability and scalability. As well as, there are given successful companies which work on cloud computing technologies such as, Amazon, Alibaba, Google, and so on. These companies offer hundreds of services to the individual and company users.

CHAPTER II. CREATION MODEL AND ALGORITHM OF INNOVATION LIBRARY NEWS SYSTEM

2.1 Technical requirements for creation of Innovation library news system

1. **Hypertext Markup Language**, usually abbreviated as a **HTML**, is the standard markup language which is used to create web pages and web blogs.

2. **Cascading Style Sheets CSS** is a style sheet language used for describing the presentation with different styles of a document written in a markup language;

3.**JavaScript** it is a new type of coding technology which is a high-level, dynamic, typed, and interpreted programming language system. It is possible in JavaScript for adding animation and interaction in a webpage;

4.**PHP**, Python, Ruby which helps to connect Data with database to display data in the web pages and web blogs.

5.Querying a **MySQL** Database;

1. Hyper Text Markup Language, HTML, short for Hypertext Markup Language, is the predominant markup language for the creation of web pages. It provides a means to describe the structure of text-based information in a document — by denoting certain text as headings, paragraphs, lists, and so on — and to supplement that text with interactive forms, embedded images, and other objects. HTML is written in the form of labels (known as tags), surrounded by less-than ($<$) and greater-than signs ($>$). HTML can also describe, to some degree, the appearance and semantics of a document, and can include embedded scripting language code which can affect the behavior of web browsers and other HTML processors.[32]

2. Cascading Style Sheets (**CSS**) **C**ascading **S**tyle **S**heets, fondly referred to as CSS, is a simple design language intended to simplify the process of making web pages presentable. CSS handles the look and feel part of a web page. Using CSS, you can control the color of the text, the style of fonts, the spacing between paragraphs, how columns are sized and laid out, what background images or colors

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[32] https://www.w3.org/html/

are used, layout designs, variations in display for different devices and screen sizes as well as a variety of other effects. CSS is easy to learn and understand but it provides powerful control over the presentation of an HTML document. Most commonly, CSS is combined with the markup languages HTML or XHTML[33].

3.JavaScript *JavaScript* is an easy-to-use ***object-oriented script language*** designed for creating dynamic web page of website that link resources on both clients and servers. Netscape's JavaScript called as the glue that holds website Web page together. This means that **JavaScript** will work on any platform (Windows, Linux, Mac, etc.). You don't need any special tools to use. You can write program text editor. Because it is completely associated with in a ***web browser***, it is integrated with HTML. its programs are executed by a **Netscape JavaScript** interpreter normally built right into the ***web browser***. When ever the ***Web browser*** requests a web page, the server sends the full web page, including HTML and **JavaScript** statements, over the internet to the client[34].

4. PHP is a server-side scripting language designed for web development but also used as a general-purpose programming language. Originally created by Rasmus Lerdorf in 1994, the PHP reference implementation is now produced by The PHP Group. PHP originally stood for *Personal Home Page*, but it now stands for the recursive backronym *PHP: Hypertext Preprocessor*.

PHP code may be embedded into HTML code, or it can be used in combination with various web template systems, web content management system and web frameworks. PHP interpreter implemented as module in the web server or as a Common Gateway Interface (CGI) executable usually processes PHP code. The web server combines the results of the interpreted and executed PHP code, which may be any type of data, including images, with the generated web page. PHP code

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[33] "What is CSS?". World Wide Web Consortium. Retrieved 2010-12-01
[34] "JavaScript data types and data structures - JavaScript | MDN". *Developer.mozilla.org*. 2017-02-16. Retrieved 2017-02-24.

may also be executed with a command-line interface (CLI) and can be used to implement standalone graphical applications[35].

During the 2010s there have been increased efforts towards standardization and code sharing in PHP applications by projects such as PHP-FIG in the form of PSR-initiatives as well as Composer dependency manager and the Packagist repository.

5. MySQL is an open-source relational database management system (RDBMS). In July 2013, it was the world's second most widely used RDBMS, and the most widely used open-source client–server model RDBMS. It is named after Michael Widenius' (who is a co-founder of MySQL) daughter, My, while "SQL" stands as the abbreviation for Structured Query Language. MySQL was owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, now owned by Oracle Corporation. For proprietary use, several paid editions are available, and offer additional functionality[36].

Technical requirements

Table 2.1 Requirements to the system.

Equipment/Software	Minimum Configuration
Server	RAM 16 Gb HDD 20 TB
OS	Windows, Linux, Mac
LAMP	Linux, Apache, MySQL, PHP
Network	Be sure to have at least a high-ping internet connection(Such as DSL or Cable, Optic)

[35] "CSS developer guide". *Mozilla Developer Network*. Retrieved 2015-09-24.
[36] *"What is MySQL?"*. *MySQL 5.1 Reference Manual. Oracle. Retrieved 17 September2012. The official way to pronounce "MySQL" is "My Ess Que Ell" (not "my sequel")*

2.2 Architecture of system and information model of database

A **system architecture** or **architecture of the system** is the conceptual model that includes structure, behavior and views of the mentioned system.[37] An architecture description is a format description and represent of a system, organized in a way that supports reasoning about the structure and behavior of the system. Given a system architecture consists of four main components. They are:

- ✓ **Users**
- ✓ **Librarian**
- ✓ **Cloud database**
- ✓ **Gadgets**

Users are ordinary people who are able to use and consume information. This information related to libraries' services, links, news, cloud information and downloading full texts.

Librarian is a person who works in a system professionally. The main task of the librarian in this system architecture is collecting information, uploading news, files and communicate with other libraries. At this point every library is able to become informed about other libraries' services, their improvements in library sphere and also exchanging information in the field of library science.

Cloud database structure consists of four main database **news, files, links** and **cloud information.** These four databases are upload by libraries in order to give information about their library.

Gadgets such as, PC, laptop, mobile phone and tablet are used by both librarians and users in order to take information about given news, links and cloud information from anywhere and anytime.

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[37] Hannu Jaakkola and Bernhard Thalheim. (2011) "Architecture-driven modelling methodologies."
In: *Proceedings of the 2011 conference on Information Modelling and Knowledge Bases XXII*. Anneli Heimbürger et al. (eds). IOS Press. p. 98
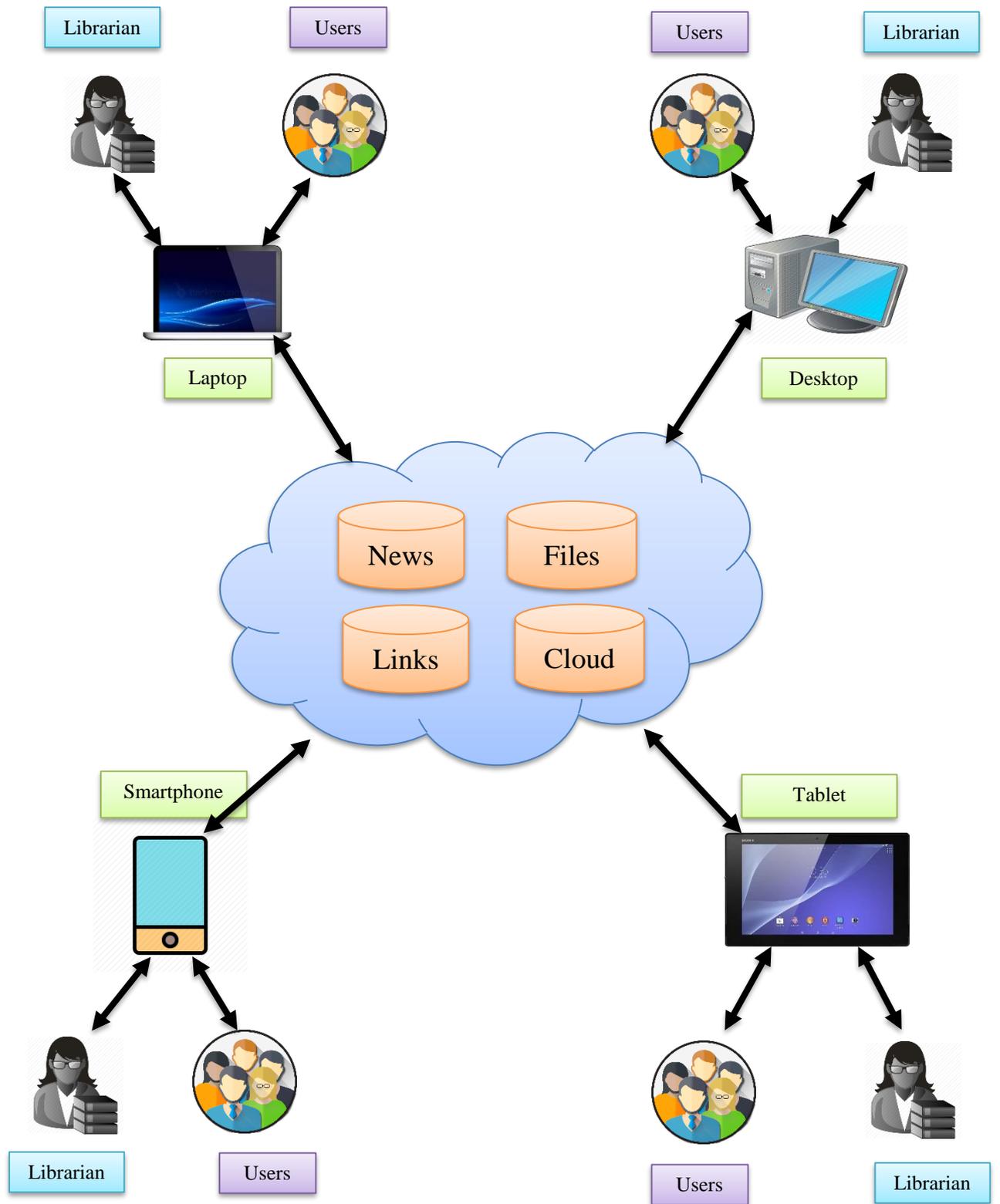
Figure 2.1 Architecture of the system.

Information model of the system

System information modelling (SIM) is a generic term used to describe the process of modelling complex connected systems. System information models are digital representations of connected systems, such as electrical instrumentation and control, power and communication systems. The objects modelled in a SIM have a 1:1 relationship with the objects in the physical system. Components, connections and functions are defined and linked as they would be in the real world.[38]
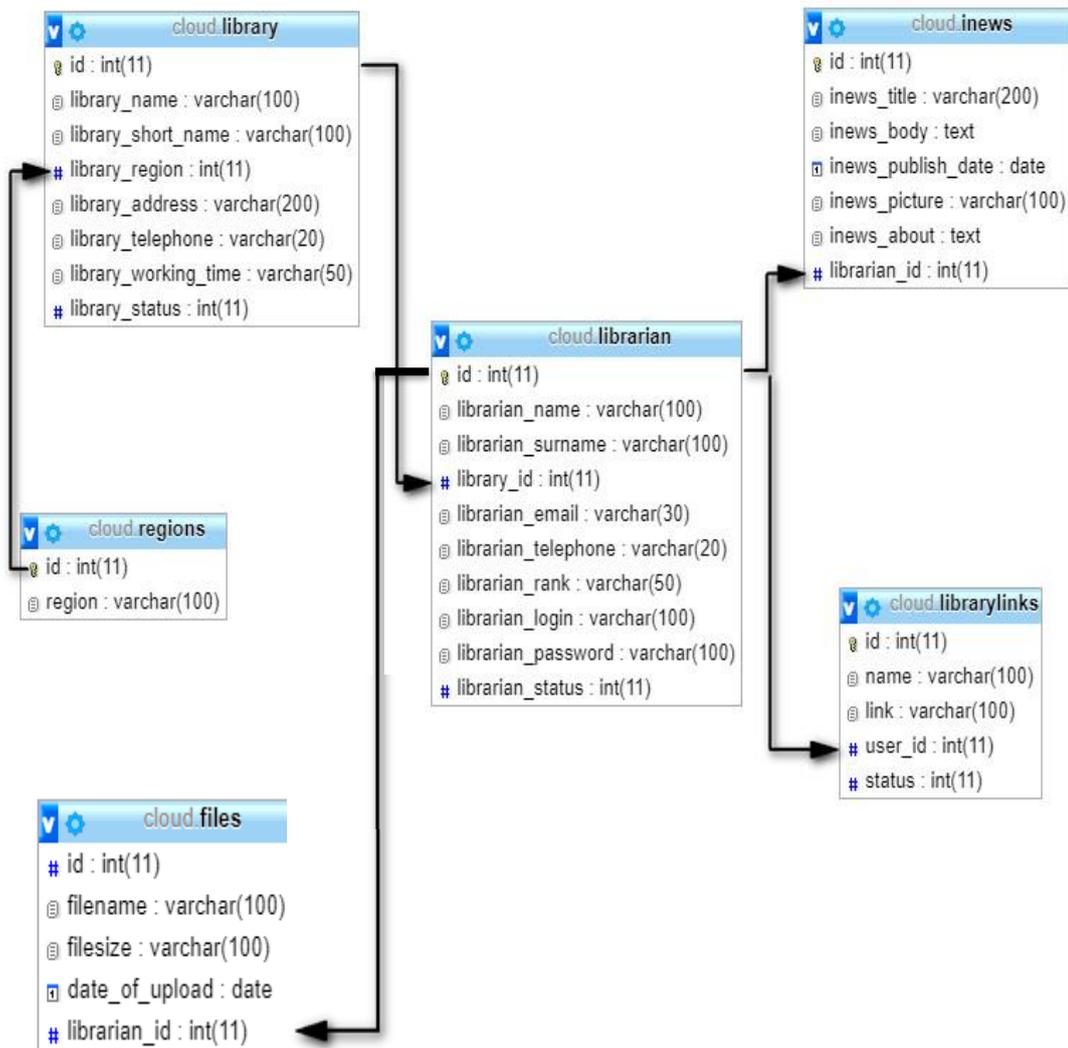

Figure 2.2 Information model of the System

Information model of the system includes 6 tables; they are:

Table 2.2 Files

Name	Type
Id	Int
Filename	Varchar
Filesize	Varchar
date_of_upload	Date
librarian_id	Int

Table 2.1 includes files which uploaded by librarians in the cloud database.

Table 2.3 ITnews

Name	Type
Id	Int
inews_title	Varchar
inews_body	Text
inews_publish_date	Date
inews_picture	Varchar
inews_about	Text
librarian_id	Int

Table 2.4 Librarian

Name	Type
Id	Int
librarian_name	Varchar
librarian_surname	Varchar
library_id	Int
librarian_email	Varchar
librarian_telephone	Varchar
librarian_rank	Varchar
librarian_login	Varchar

Name	Type
librarian_password	Varchar
librarian_status	Int

Name	Type
Id	Int
library_name	Varchar
library_short_name	Varchar
library_region	Int
library_address	Varchar
library_telephone	Varchar
library_working_time	Varchar
library_status	Int

Name	Type
Id	Int
Name	Varchar
Link	Varchar
user_id	Int
Status	Int

Name	Type
Id	Int
Region	Varchar

2.3 Algorithms of cloud computing solutions in the system general working algorithm for system: Registration, uploading process, searching system

There are used some algorithms in the system, more clearly, registration, adding news, file uploading and searching system.

Registration is divided into 2 parts: **Library registration** and **Librarian registration**. Below mentioned algorithm illustrates **Library registration** process
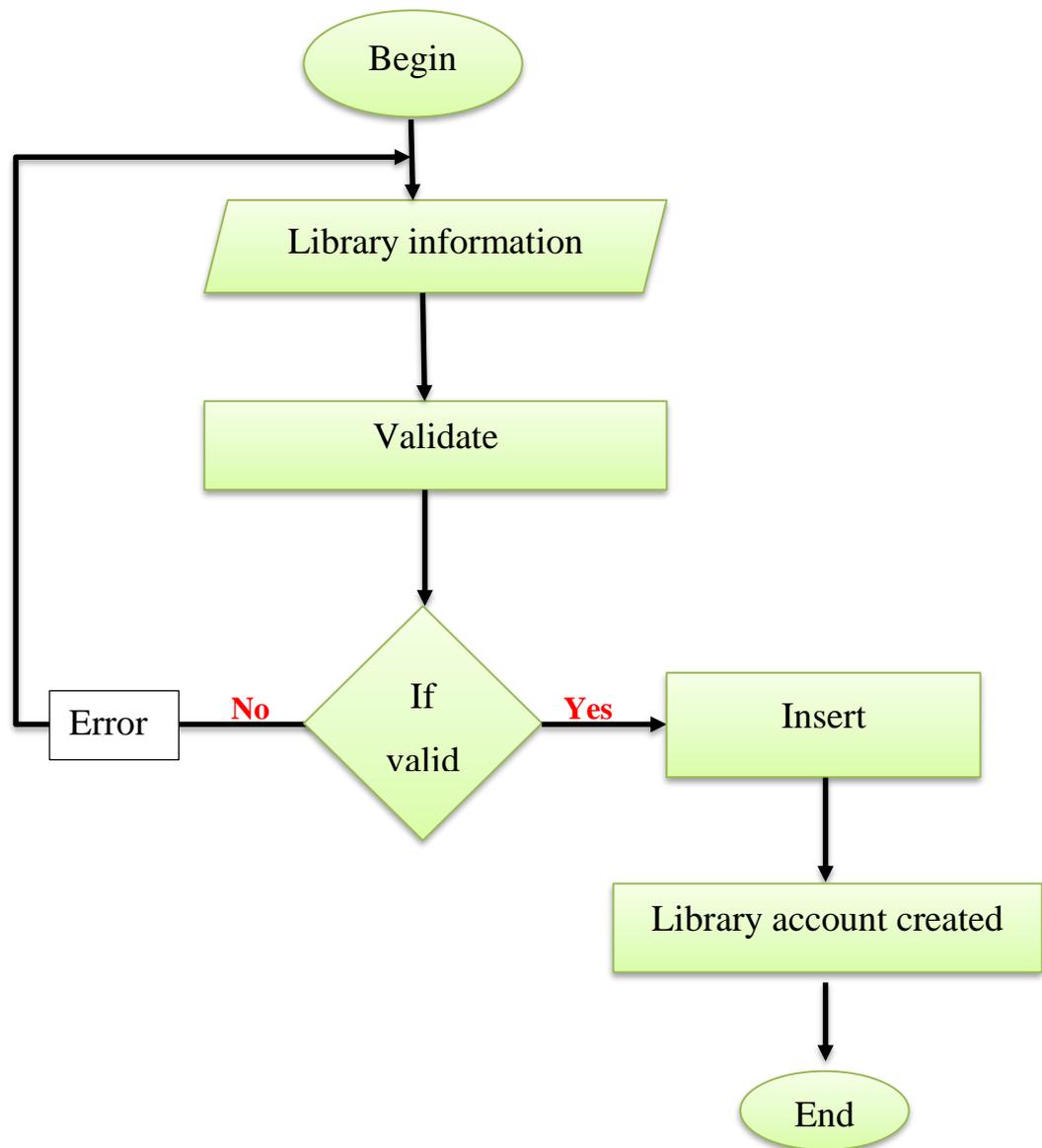

Figure 2.3 Library registration algorithm

In library registration process librarian have to enter **library information** such as, library name, short name, region, address, telephone, working hours and status forms, after that administrator check all the entered information personally. If information is true Library account created if not the registration finishes unsuccessfully.
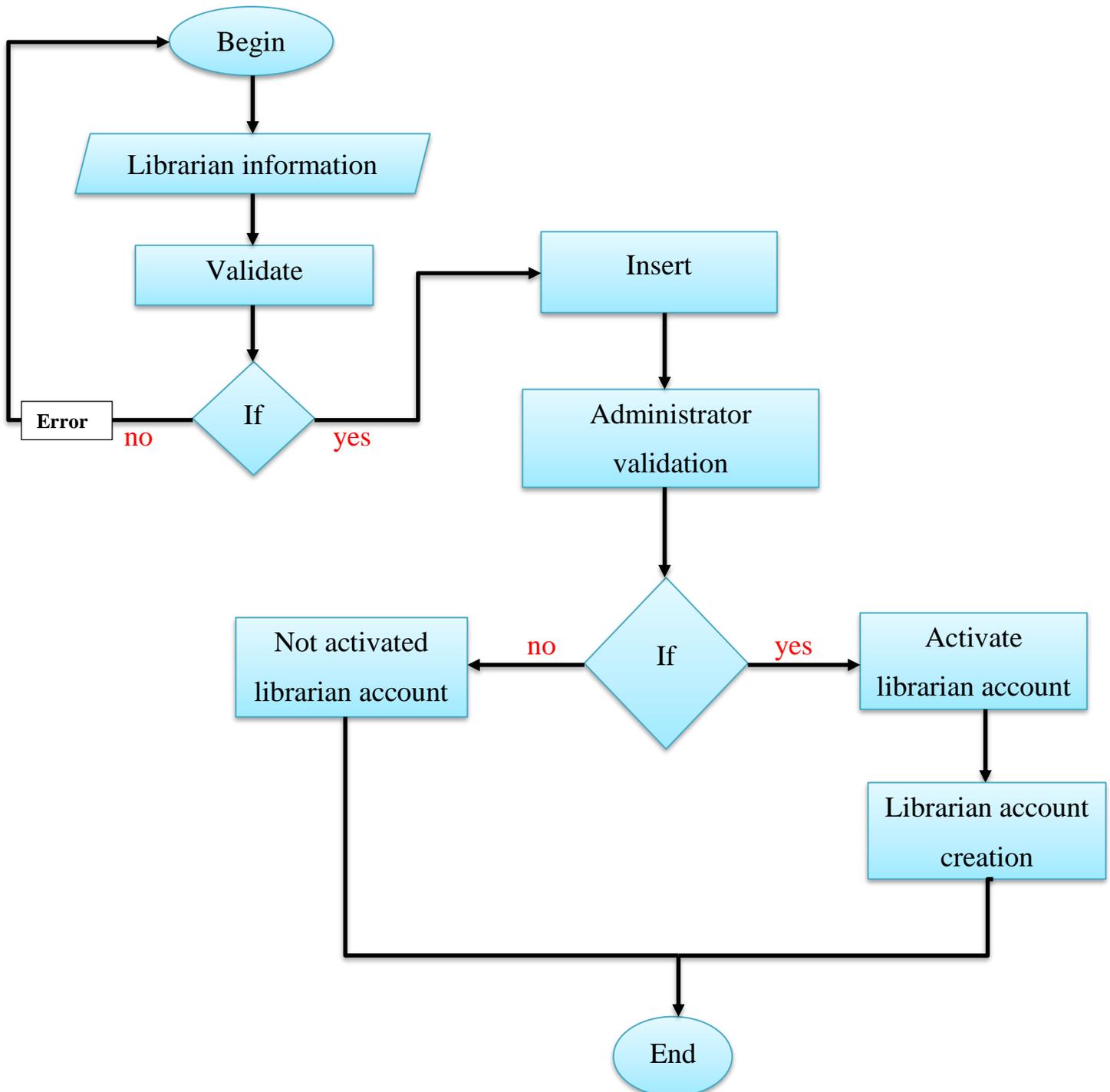

Figure 2.4 Algorithm for Librarian registration

In the Librarian registration process starts after Library registration, librarian fill required forms with his or her information and system check all the required information.   After that, filled information checked by administrator by asking directly mentioned library staff. If this library has this librarian **librarian account** created, if not given a permission to create an account.
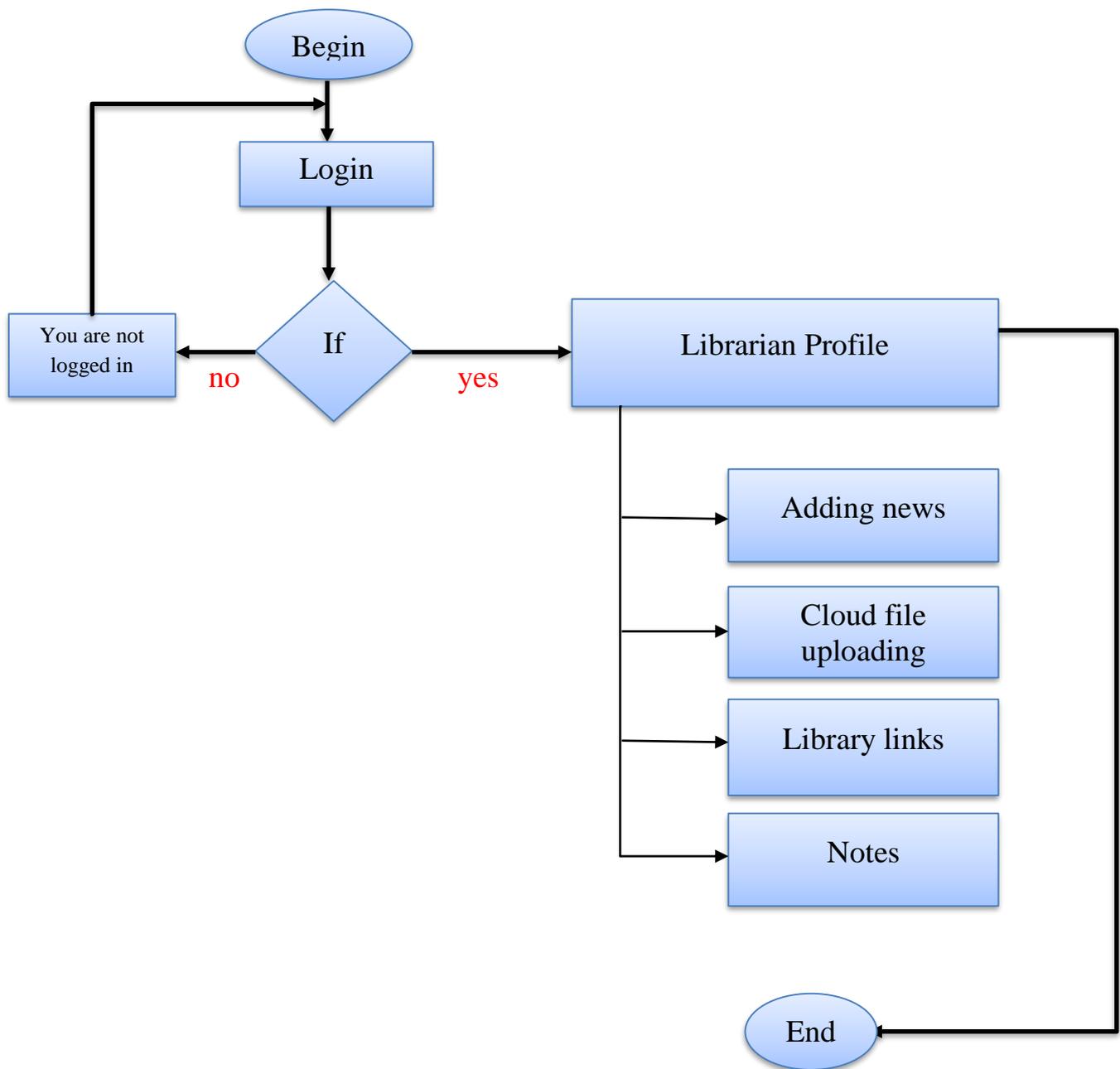
Uploading process algorithm

Figure 2.5 Uploading process algorithm

In the uploading process, librarian enters his or her profile with login and password. If login and password are true process continues successfully, if not process gives a message "You are not logged in, please make registration". Librarians are given a permission for four main things, they are: adding news, cloud file uploading, creating links and note important information.

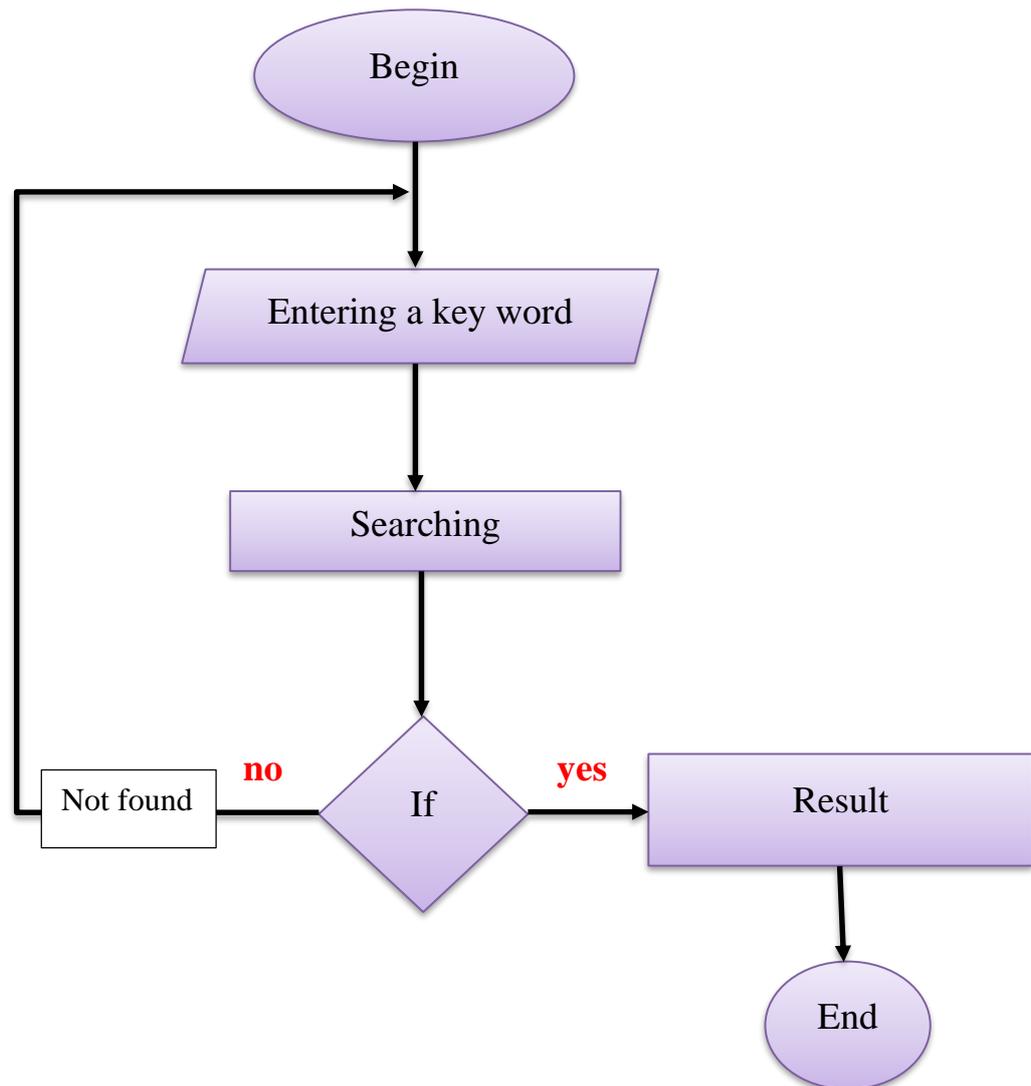**Searching system algorithm**.

Figure 2.6 Searching system algorithm

In the searching system user or librarian enter a keyword or words according to their need after that, system search it from the system database. If there is something related to key word or words result is found, if not there is shown a message Not found.

Conclusion for the chapter II

In the second chapter of the graduate diploma work we analyze main technological and software requirements according to the intendent system.

First of all, we paid attention to the main important software programming languages for creating this system such as, HTML, CSS, PHP, Java Script. However, we also claimed minimum technological requirements: Internet, Hardware, Operation System, LAMP and so on. These software programming languages are used in any kind of programs for instance when we need to create web site, blogs we use HTML, CSS, PHP or Java Script.

Secondly, we mentioned what kind of the architecture and information model of the system are being used, how librarians and users communicate with each other. As you can see from the Figure 2.1 architecture consists of 4 parts: Librarians, users, devices and database. Information model includes 7 tables; they are:

- Files
- ITnews
- Library
- Librarian
- Librarylinks
- Regions

These tables collect information and connects each other in order to improve communication of the system. In the last part of the second chapter we analyzed about algorithms of cloud computing solutions in the system general working algorithm for system: Registration, uploading process, searching system and how do they work and how they connected each other.

In the next chapter of the graduate diploma work, functional structure and tasks scheme were shown.

CHAPTER III. MAIN TECHNOLOGICAL RESULTS OF INNOVATION LIBRARY NEWS AND FILE CLOUD SYSTEM

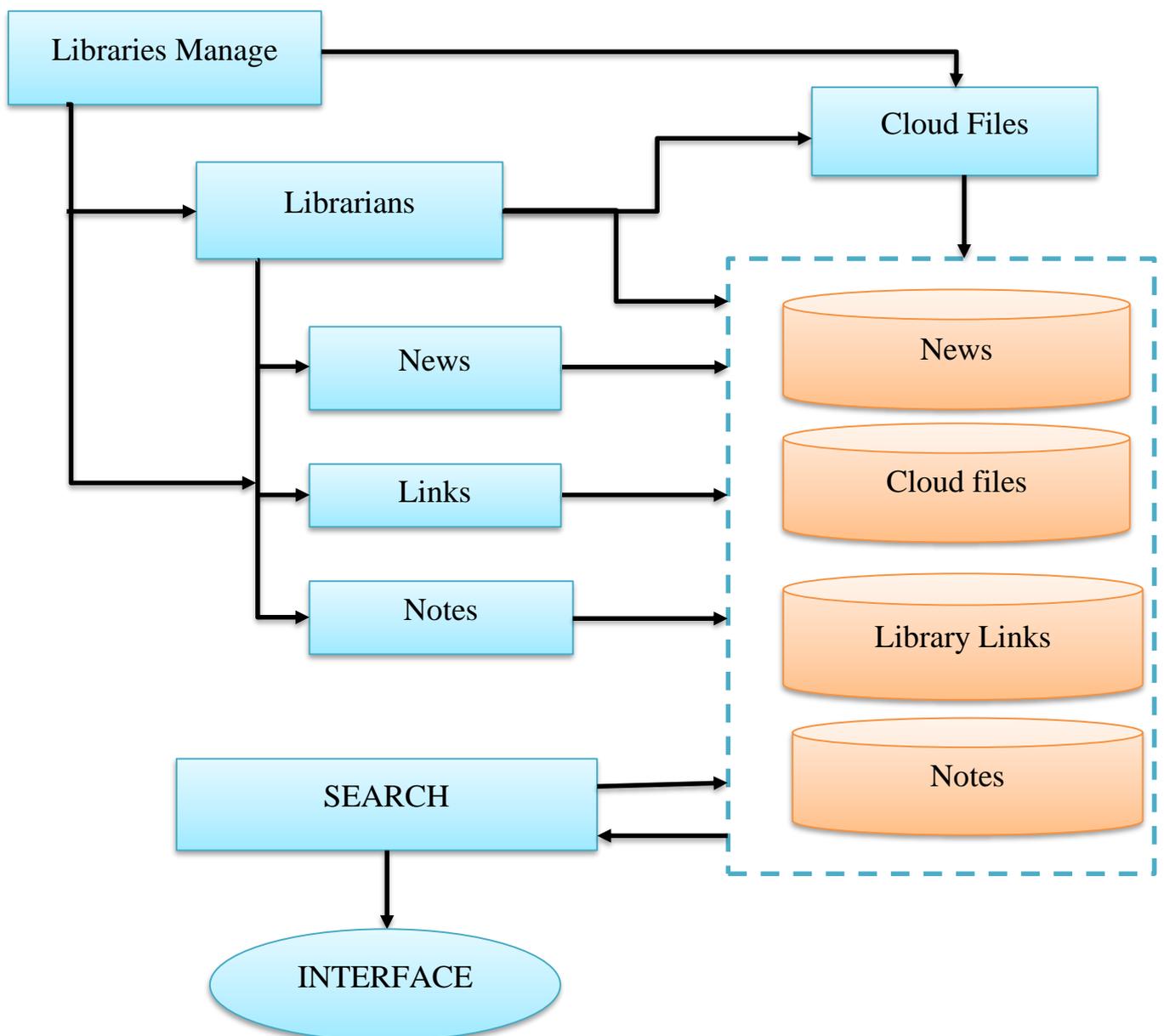## 3.1 Functional structure and tasks schema of the system

Figure 3.1 Functional structure of the system.

In functional structure Libraries manage librarians, librarians upload news, links, notes, files to the cloud system. Users and librarians use this information via interface. They can use searching system in order to find out what kind of information they need.

3.2 Organizational structure of the system

A functional organization structure is a hierarchical organization structure where people are grouped according to their specialization. These group are supervised by a functional manager with expertise in the same field. This expertise helps him effectively use the skills of employees, which ultimately helps organizations in achieving its business objectives.

In this kind of organization structure, people are classified according to the function they perform within the organization. The organizational chart for a functional organization structure shows the president, vice president, finance department, sales department, customer service, administration, etc.

Each department will have its own department head who will be responsible for the performance of his section. This helps the organization control the quality and uniformity of performance.

These different departments are sometimes referred to as "silos". This means the system is vertical and disconnected. The communication flows through the department heads to the top management.

Here, all authority (i.e. budget allocation, resource allocation, decision making, etc.) stays with the functional manager. Usually, the position of the project manager does not exist in this type of organization structure. Even if this position exists, the role of the project manager will be very limited and he will need permission from the functional manager to fulfil his requirements. The project manager may have the title of a coordinator or an expediter.[39] System consists of 4 main worker they are Director, deputy director, administrator, and editor.

This system only needs 5 specialists which can control and manage the system. Controllers are Director, deputy director. Managers are administrator and editor. Administrator validates libraries and librarians information, editor checks news.

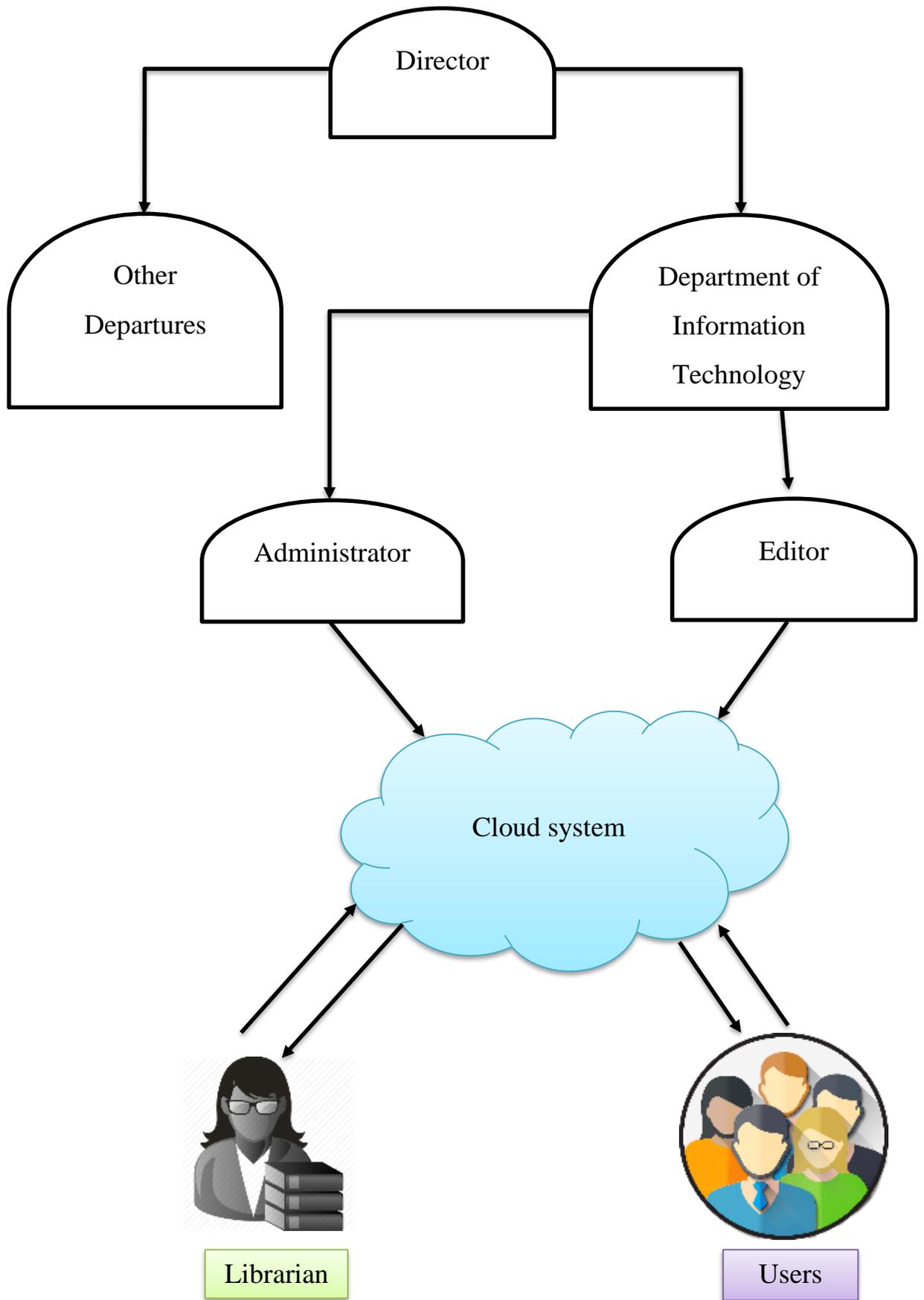[39] PDG Review (2015) on structure functions

```
                    ┌─────────────────┐
                    │    Director     │
                    └─────────────────┘
            ┌──────────────┴──────────────┐
    ┌───────────────┐             ┌─────────────────┐
    │     Other     │             │  Department of  │
    │   Departures  │             │   Information   │
    │               │             │   Technology    │
    └───────────────┘             └─────────────────┘
            ┌─────────────┐                 │
    ┌───────────────┐             ┌─────────────────┐
    │ Administrator │             │     Editor      │
    └───────────────┘             └─────────────────┘
```

Cloud system

Librarian

Users

Figure 3.2 Organizational structure of the system.

Table 3.1 Requirements for staff members

Departure staff	Function	Skills
Director	Managing and control of the general system of the library.	Achieved higher education in library science, professional skills in library science specialty
Deputy director	To fulfill the duties assigned to him or her by the Director	Achieved higher education in library science, professional skills in library science specialty
Administrator	Security, managing, making improvements, content manager of the system	Programming skills: HTML, CSS, PHP, MySQL, good at with databases and cloud system
Editor	Validate articles, check errors	Achieved higher education in library science, professional skills in library science specialty, and understanding IT technologies, Internet
Librarian	Article writing skills and adding news to the system	Achieved higher education in library science, professional skills in library science specialty, and understanding IT technologies, Internet

User	Is able to take general information about libraries, their services and new type of technologies	User has to be able to understand to use an Internet, and working with websites.

3.3 User guideline of the system

1) Guideline for librarian

First of all, librarian need to do registration to the website. Registration process divided into two parts: library registration and librarian registration. Open the browser and write down http://cloud.uz and then website is opened.
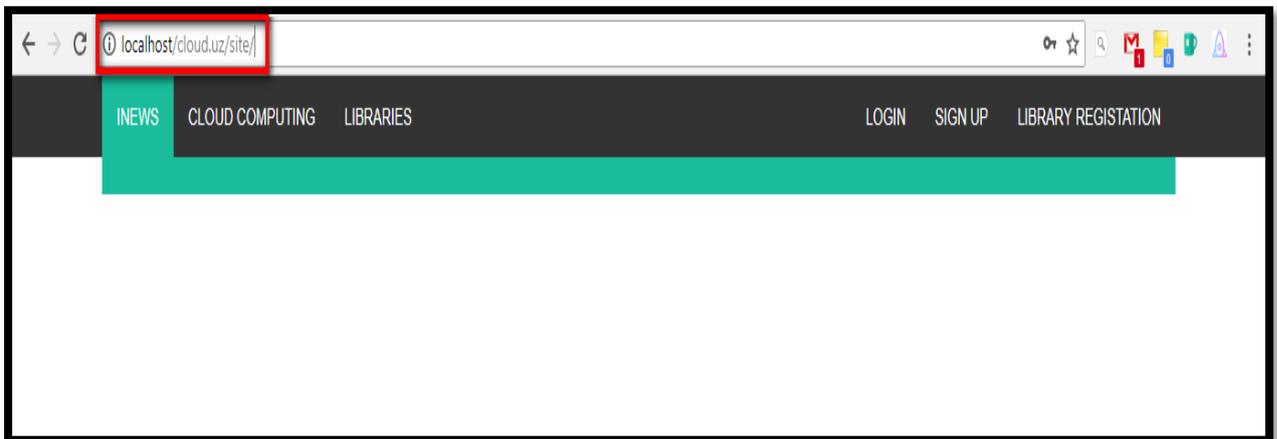

Figure 3.3 http://cloud.uz link in the browser

We choose **Library registration** part and we are offered form to fill. In library registration librarian have to fill all information truly and accurately. There are given 6 forms have to be completed they are: Library name, Library short name, Library Region, Library Address, Library Telephone and Libraries Working hours. In addition, people have to tick "I'm not robot" part and write solution to the problem.

Figure 3.4 Form filling for Library registration.

After forms filled we have to click **Registrate** and library account was created and we are shown a message "Jarayon muvaffaqiyatli yakunlandi!"
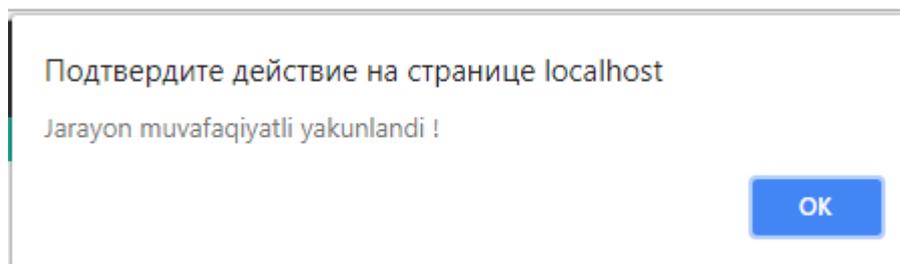

Figure 3.5 A message for successful library registration

Second process of the registration is **librarian registration,** librarian has to click **"Sign Up"** and there is also given a form for fill; Librarian have to choose his or her library, Librarian Name, Librarian Surname, Librarian Email, Librarian Telephone, Librarian rank, Librarian Username and Password for using system. After that he or she click "Sign Up". These two process very important to become understandable, firstly library was registrated to the system. Secondly, patrons attached to the registrated library. If library is not registrated librarian never cannot login or sign up to the system. More precisely, Library account created, Librarian attached this library account.
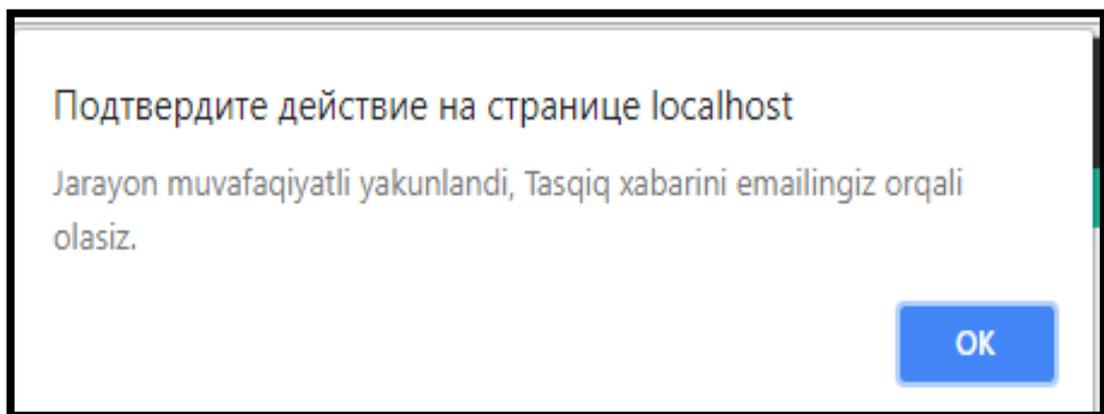
58

Figure 3.6 Librarian registration

Figure 3.7 A message for successful librarian registration.

After librarian fills librarian information form administrator validates information and activate librarian status (Fig 3.10-3.11). After activation librarian is able to log in the website. So, librarian has to use true and accurate information.
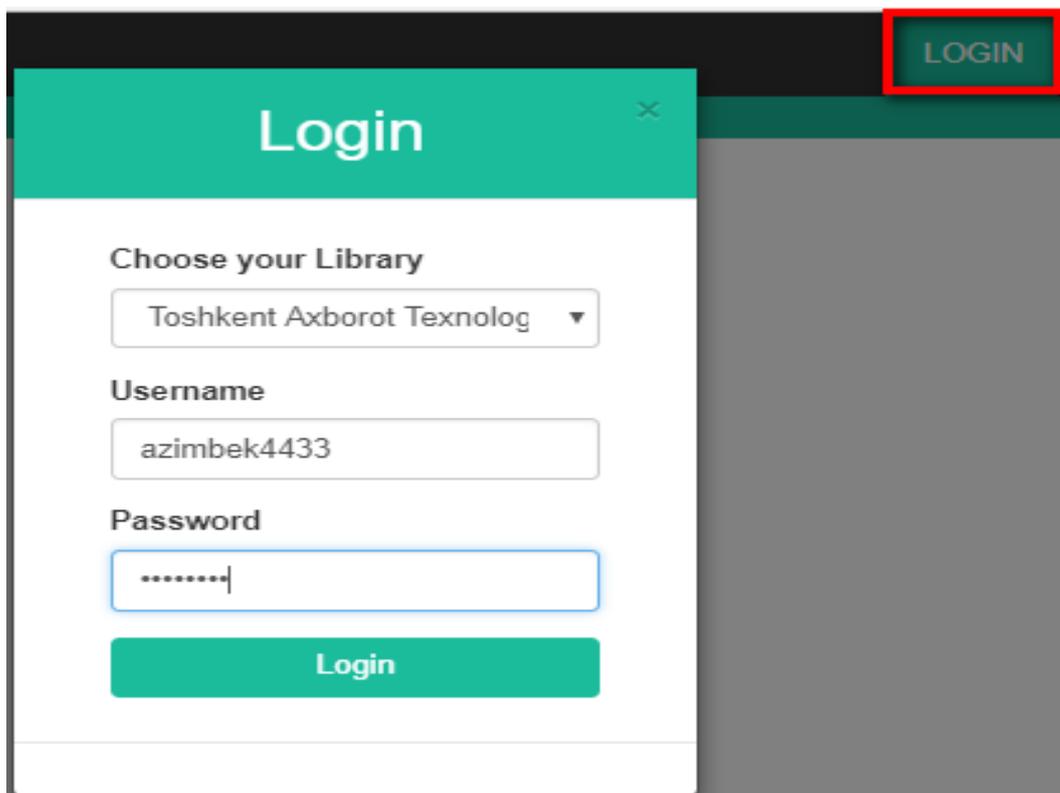
Figure 3.8 Login for Librarian account

After that Librarian enters his or her own account and can add news about library where he or she works.

Guideline for Administrator.

Main tasks for Administrator are validating library and librarian information, and sharing his or her knowledge with librarians in order to improve their IT skills.

Figure 3.9 Administration Panel
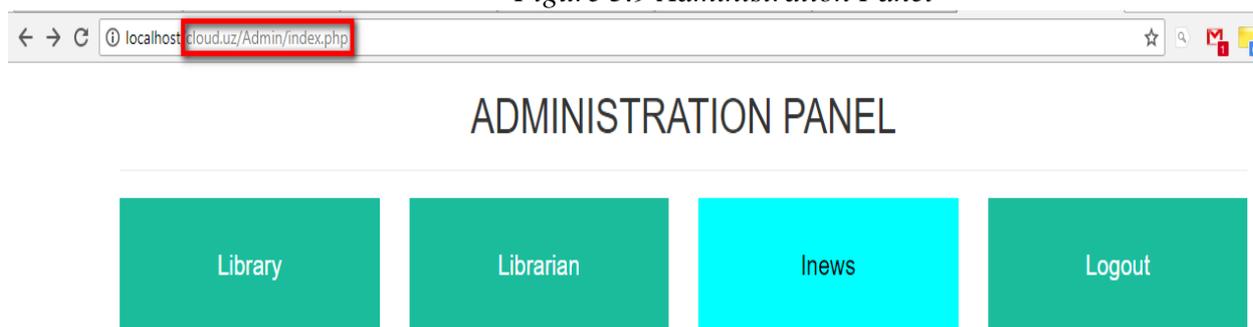
Administration Panel consists of 3 main parts: Library, Librarian and Inews.

If admin click Library button there is shown Libraries information and their status. Administrator is able to Activate or not Activate library, Edit and Delete the library. So, admin can control all libraries in the system.

Figure 3.10 Libraries Information for administrator.
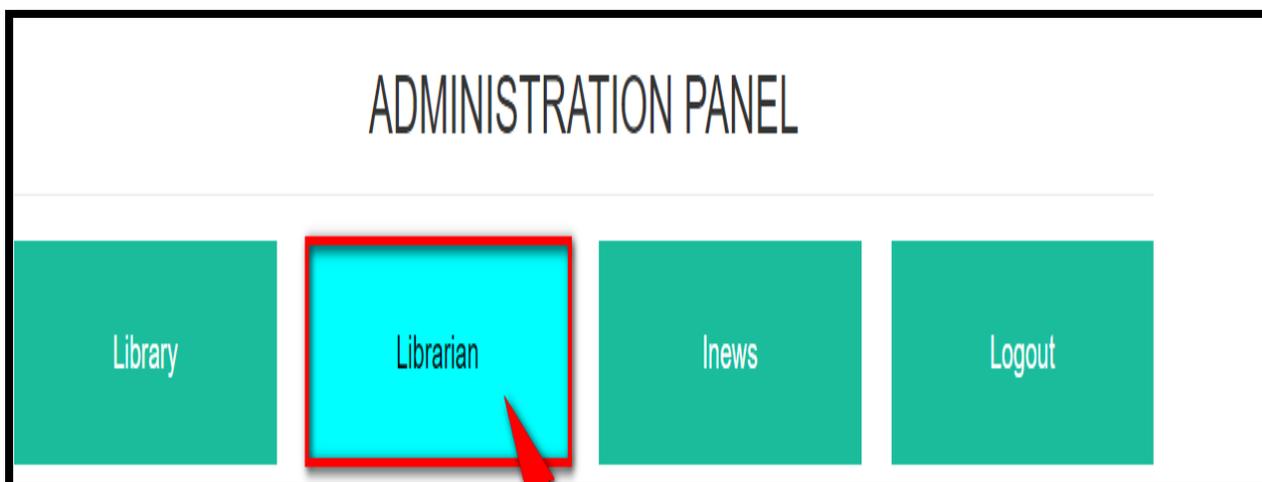
Figure 3.11 Librarian information

Administrator also check all information of librarian from Librarian button, this validating process very important, because another person registrate himself as a patron some kind of library, he can add unreliable news or illegal things to the system. As a result, responsible person is not find and it is difficult to punish him or her. Administrator is able to check librarians according to libraries information, for instance administrator has got library phone numbers, he or she can call to the staff and asked questions about intended person.

Figure 3.12 Librarian information

Administrator validate of the librarian by asking directly his or her library staff, after that Status changed from 0 to 1 and permission is given for entering the website as a librarian. If information is not appropriate permission is not given for librarian and deleted from system.

Figure 3.13 Activation process of the Librarian status

As I have already mentioned, Administrator is able to share his or her IT knowledge with librarian, if **inews** button is clicked this form is shown.

Figure 3.14. Adding news form for Administrator

In this part administrator adding news with title, text and date, there is also possible to adding pictures and files, with clicking **Create** button.

Conclusion for Chapter III

To sum up, functional and organizational structure are the most important part of the system, both of them play a vital role in creating any kind of system. Firstly, functional structure indicates which kind of functions are done in the system and how they are managed or how these functions are connected with each other.

On the other hand, organizational structure shows requirements for employees, hierarchy of the system: Director, deputy director, Administrator, editor, librarian and user. And also, there are given guidelines with pictures for librarian, administrator and user, which help them to work effectively and faster. First of all librarian registrate the library where she or he works, secondly, add himself or herself as patron to the designated library and be able to add news and files to the system. Administrator validate all the information according to given information.

CHAPTER IV. LIFE SAFETY AND ECOLOGY
4.1. Planning a health and safety management system

Planning means the process by which the objectives and methods of implementing the health and safety policy are decided. It is concerned with allocating resources (e.g. money, time or effort) to achieve objectives and decide priorities. It ranges from general topics dealing with the direction of the whole organization to detailed issues concerned with standard-setting and the control of specific risks.

Health and safety management performance is often expressed as a series of negative outcomes, such as an absence of injuries, ill health, incidents or losses. But it is often a matter of chance whether dangerous events cause injury or loss. An effective planning system for health and safety requires organizations to set up, operate and maintain a management system that can detect, eliminate and control hazards and risks. Where there are long latency periods before a health problem becomes apparent, such as asbestosis or lung cancer caused by asbestos fibre inhalation, the planning process is particularly important.

As the goal is to prevent harm coming to people at work, workplace precautions have to be provided and maintained to achieve this at the point of risk. Risks are created in the workplace as resources and information are used to create products and services in the manufacturing process. This business activity model also applies to other industries including construction, education, leisure, hospitals and local authorities.

Workplace precautions to match the hazards and risks are needed at each stage of the business activity. They can include machine guards, electrical safeguards, flammable liquid storage, dust controls, safety instructions and systems of work.

Planning a health and safety management system involves:

- Creating and implementing suitable management arrangements, RCSs (Risk Control Systems) and workplace preventative measures. They should be

proportionate to the hazards and risks of the organization and appropriate for its needs;

- Using, maintaining and when necessary enhancing the system to accommodate changes.

It is necessary to answer three key questions:

- Where are we now?

- Where do we want to be?

- How do we get there?

The answers at site level will be different to those at the headquarters in a large multi-site organization. These questions should be asked at all levels in an organization to obtain an overall picture. For planning to be effective it must be properly coordinated throughout the organization to avoid overlaps and omissions.

The health and safety planning process comprises three sections:

-correct information about the existing situation;

-suitable benchmarks against which to make comparisons;

-competent people to carry out the analysis and make judgements.

To answer the question 'Where are we now?' an organization has to compare the current situation against both the health and safety management framework described earlier and specific legal requirements. This analysis provides a view of the current state of the health and safety management system. Further judgement may be necessary to establish if the system is:

- adequate for the organization and the range of hazards/risks;

- working as intended and achieving the right objectives; and

- delivering cost-effective and proportionate risk control in the workplace.

The law will have a direct effect on deciding 'Where do we want to be?' It is the starting point which will have been long passed by organizations wishing to be world leaders. However, some organizations may still have to make considerable effort to achieve the minimum legal standards.

The practical decisions necessary to answer 'How we get there' might be concerned with new pieces of the health and safety management systems or revising existing parts; it might be the use of risk assessments or COSHH assessments; or it might be the design of RCSs.

4.2. Sources of health and safety information

When anybody, whether a health and safety professional, a manager or an employee, is confronted with a health and safety problem, they will need to consult various items of published information to ascertain the scale of the problem and its possible remedies. The sources of this information may be internal to the organization and/ or external to it.

Internal sources which should be available within the organization include

- accident and ill-health records and investigation reports;

- absentee records;

- inspection and audit reports undertaken by the organization and by external organizations such as the HSE;

- maintenance, risk assessment (including COSHH) and training records;

- documents which provide information to workers;

- any equipment examination or test reports.

External sources, which are available outside the organization, are numerous and include

- health and safety legislation;

- HSE publications, such as Approved Codes of Practice, guidance documents, leaflets, journals, books and their website;

- International (e.g. International Labour Office, ILO), European and British Standards;

- health and safety magazines and journals;

- information published by trade associations, employer organizations and trade unions;

- specialist technical and legal publications;

- information and data from manufacturers and suppliers;

- the internet and encyclopedias.

See chapter 18 for more information and web site addresses. Many of these sources of information will be referred to throughout this book.

Safe systems of work

What is a safe system of work?

A safe system of work has been defined as:

The integration of personnel, articles and substances in a laid out and considered method of working which takes proper account of the risks to employees and others who may be affected, such as visitors and contractors, and provides a formal framework to ensure that all of the steps necessary for safe working have been anticipated and implemented.

In simple terms, a safe system of work is a defined method for doing a job in a safe way. It takes account of all fore- seeable hazards to health and safety and seeks to eliminate or minimize these. Safe systems of work are normally formal and documented, for example in written operating procedures but, in some cases, they may be verbal.

The particular importance of safe systems of work stems from the recognition that most accidents are caused by a combination of factors (plant, substances, lack of training and/or supervision, etc.). Hence prevention must be based on an integral approach and not one which only deals with each factor in isolation. The adoption of a safe system of work provides this integral approach because an effective safe system:

- is based on looking at the job as a whole;

- starts from an analysis of all foreseeable hazards, for example physical, chemical, health;

- brings together all the necessary precautions, including design, physical precautions, training, monitoring, procedures and PPE.

It follows from this that the use of safe systems of work is in no way a

replacement for other precautions, such as good equipment design, safe construction and the use of physical safeguards. However, there are many situations where these will not give adequate protection in them- selves, and then a carefully thought-out and properly implemented safe system of work is especially important. The best example is maintenance and repair work, which will often involve, as a first-stage, dismantling the guard or breaking through the containment, which exists for the protection of the ordinary process operator. In some of these operations, a permit-to-work procedure will be the most appropriate type of safe system of work.

The operations covered may be simple or complex, routine or unusual

Whether the system is verbal or written, and whether the operation it covers is simple or complex, routine or unusual, the essential features are forethought and planning – to ensure that all foreseeable hazards are identified and controlled. In particular, this will involve scrutiny of:

- the sequence of operations to be carried out;

- the equipment, plant, machinery and tools involved;

- chemicals and other substances to which people might be exposed in the course of the work;

- the people doing the work – their skill and experience;

- foreseeable hazards (health, safety, environment), whether to the people doing the work or to others who might be affected by it;

- practical precautions which, when adopted, will eliminate or minimize these hazards;

- monitoring systems to ensure that the defined precautions are implemented effectively.

Development of safe systems

Role of competent person

The competent person appointed under the MHSW Regulations and/or the CDM Coordinator appointed under the CDM 2007 Regulations should assist managers to draw up guidelines for safe systems of work. This will include, where necessary,

particularly in construction work, method statements. The competent person should prepare suitable forms and should advise management on the adequacy of the safe systems produced.

Role of managers

Primarily management is responsible for providing safe systems of work, as they will know the detailed way in which the task should be carried out.

Management is responsible to ensure that employees are adequately trained in a specific safe system of work and are competent to carry out the work safely. Managers need to provide sufficient supervision to ensure that the system of work is followed and the work is carried out safely. The level of supervision will depend on the experience of the particular employees concerned and the complexity and risks of the task.

When construction work is involved, principal con- tractors will need to monitor sub-contractors to check that they are providing suitable safe systems of work, have trained their employees and are carrying out the tasks in accordance with the safe systems.

Analysis

The safe system of work should be based on a thorough analysis of the job or operation to be covered by the system. The way this analysis is done will depend on the nature of the job/operation.

However, where the potential for loss is lower, a simpler approach, such as job safety analysis (JSA), will be sufficient. This will involve three key stages:

- identification of the key steps in the job/operation – what activities will the work involve?

- analysis and assessment of the risks associated with each stage – what could go wrong?

- definition of the precautions or controls to be taken – what steps need to be taken to ensure the operation proceeds without danger, either to the people doing the work, or to anyone else?

The results of this analysis are then used to draw up the safe operating procedure or method statement.

4.3 Electromagnetic radiation and methods of protection of human health

Among the various physical factors of the environment that may have an adverse effect on human and biological objects are more complex nature of non-ionizing electromagnetic fields especially those related to RF energy.

Electromagnetic fields - a special form of existence of matter characterized by a set of electric and magnetic properties. The main parameters that characterize the electromagnetic field are frequency, wavelength, and the propagation velocity.

Natural sources of electromagnetic fields are divided into two groups. The first - the field of the Earth - a constant electric and constant magnetic field. The second group - the radio waves generated by cosmic sources (the sun, stars, etc.), atmospheric processes - lightning bolts, etc.

Anthropogenic sources are divided into 2 groups:

1. Sources of low-frequency radiation (0 - 3 kHz). This group includes all the systems of production, transmission and distribution of electricity (power lines, transformer substations, power plants, various cable systems), home and office electrical and electronic equipment, including computer monitors, transport on the drive, w / d transport and its infrastructure, as well as the subway, trolley and tram transport.

2. Sources of high-frequency radiation (from 3 kHz to 300 GHz). This group includes functional transmitters - sources of electromagnetic fields in order to transmit or receive information. It is the commercial broadcasters (radio and television), radio (auto and cordless phones, CB radios, amateur radios, cordless phones manufacturing) directed radio (satellite radio, terrestrial relay stations), Navigation (air traffic, navigation, a radio), radars (air communication, navigation, transportation locators, control of air transport). This includes various technological equipment using microwave radiation, variable (50 Hz - 1 MHz) and pulsed fields,

household equipment (microwave oven), image display on a cathode-ray tube (PC monitors, televisions, etc.).

There are the following methods to protect people from electromagnetic effects:

1.   Protection time. It is used when it is impossible to reduce the intensity of radiation at a given point to the permitted level. By designation, notification, etc. limited time finding people in the area expressed influence of the electromagnetic field. Existing regulations stipulated relationship between the intensity of the energy density and the irradiation time.

2.   Protection distance. It is used when you cannot reduce the impact of other measures, including the protection of the times. The method is based on the incidence of the radiation intensity proportional to the square of the distance from the source.

3.   Protecting the distance as the basis for the valuation of sanitary protection zones - a necessary gap between the field sources and residential buildings, office space, etc. Zone boundaries are determined by calculations for each case placing the emitting installation when using it to maximum power output.

Conclusion for Chapter IV

Life safety and ecology are very important for any kind of system. In this graduating diploma work, I analyzed planning a health and safety management system, sources of health and safety information, and electromagnetic radiation and methods of protection of human health. It is also important to note that, Among the various physical factors of the environment that may have an adverse effect on human and biological objects are more complex nature of non-ionizing electromagnetic fields especially those related to RF energy. So users and librarians have to pay attention to the radiation, protection of the human body from the effects of electromagnetic radiation involves the reduction of their intensity to levels that do not exceed the maximum allowable. Protection provided by the choice of specific methods and tools based on their economic performance, reliability and ease of use.

CONCLUSION

Information library establishments take an important place as a main implement in developing of each country. That's why, the update topic is equipping information library establishments with new modern informational communication technologies, organize using of new programs and get automatized of all systems.

The growth in using cloud computing technologies, in which communication is delivered and supported through computer networks such as the Internet, has posed new challenges for library services. Users and librarian are able to access to a universe of digital information through the information superhighway.

In the final qualifying work has been done the following work:

- The analysis of cloud computing technologies in the world;
- Analysis of libraries, which work based on cloud computing technologies and about their services in the world;
- Get information about technologies how to create programmatic complex of online informational servicing for information-library establishments' specialists;
- We have determined common requirements and special requirements for system;
- We have drawn an algorithm of creating automated system and according to this algorithm and we have created an information model;
- Functional and organizational structure have been created;
- We have made guideline for users, librarians, administrators.
- In addition, we give information about life safety to the system.

In the future, libraries will continue to have a unique mission that goes beyond a physical destination. They will provide access to the ever-growing world of information but in a way that goes beyond simple navigation. In summary, library services are an essential component of a quality cloud communicating system. As a result, libraries must evolve their philosophies, missions, and processes.

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