

Cloud Computing Solutions for Integrating Pathology Laboratory Information Systems

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Abstract

The clinical translation and integration of digital pathology into ordinary diagnostic practice has been facilitated by the inclusion of artificial intelligence (AI) algorithms. Clinicians will be able to diagnose diseases more quickly and precisely than with traditional pathology methods thanks to the clinical adoption of platforms based on AI-assisted digital pathology. This will enhance patient outcomes and lay the foundation for modern pathology. Slides can be sent from a local computer to a remote screen over normal TCP/IP services in a matter of seconds by implementing a region-on-demand procedure and an image server. Another precaution against losing presentations and data is to use cloud-based automated backups. The research based on primary data for determine the research used smart PLS software and run result included descriptive statistic, correlation coefficient, confidence interval related to them. By maximizing capacity under resource restrictions, virtualized hardware not only offers reliability but also has the potential to save maintenance costs over time. The ability of cloud technologies to allow several doctors to examine or process pathology pictures simultaneously is another important feature. Because memory and processing capacity in the cloud can be scaled up according to the number of users, simultaneous multi-user slide viewing and processing is conceivable, and users just pay for the computational power needed. Additionally, cloud solutions can drastically lower capital expenses related to IT support (such as installation and maintenance fees), giving hospitals greater access to digital pathology technology. The integration of cloud-based digital systems results in a major reduction of local IT needs, with the onus being transferred to off-site infrastructures.

Keywords: Cloud Computing Solutions (CCS), Integrating Pathology Laboratory (IPL), Information Systems (IS)

Introduction

Cloud computing solutions are also known by the names of cloud solutions or cloud services. The availability of all those resources that are related to computer systems more specifically storage of data and power that is all about computing is involved. These things are done on requirement. There is no interference of the user in the management of all these things actively. Various clouds have many functions that can be seen in many places. The most important place is the center which is related to data. Many things are involved in cloud-based solutions like usage, place related to storing data, and services that are performed on the requirement by the clients[1]. Many other resources are also involved in it which can only be achieved with the presence of connection to the internet. It can only be provided in the presence of a cloud computing framework that is shared by any other person who is providing it. One of the simplest ways that clear the concept of cloud computing is by observing its comparison with electricity. The types of cloud computing are four. In which private clouds, public clouds, hybrid clouds, and multiclouds are involved. Types that are playing leading roles in cloud computing are infrastructure which is taken as a service, platform also taken as a service, and software which is also considered as a service. One another computing is also involved which is serverless computing[2]. One of the most important functions of cloud computing is that it offers flexibility in business as compared to providing its services as a local server. In case of a need bandwidth which is more than that of normal then this requirement can only be fulfilled quickly by the usage of cloud-based service. There I no need to follow a procedure that is out of budget and proves as a burden on your IT infrastructure. Let's consider an example that is all about cloud cloud-based software platform, Zoom [3]. It is a platform that provides audio and video conferencing. It also provides the opportunity to record the meetings and then save all those recorded meetings on the cloud. It seems very

beneficial for the user because he can have access to all those lectures anytime without any difficulty. There is also an app that has access to the developer of the Zoom platform to create apps and build integration in all its functions. Let's discuss certain other examples of cloud computing to develop a good understanding of this complex concept. Emails, Calendars, Skype, and WhatsApp all come under the category of cloud computing apps. These are the apps that are utilized by everyone in their daily routine. In these apps, all cloud features are utilized in which data is accessed automatically[4]. This thing will provide support to our data in the infrastructure of the cloud. These apps provide help in accessing the use of the internet at any time and any place. CloudLIMS is a source that will provide this guarantee that the version of the product available to you is the most advanced. As the new characteristics are released then they will automatically be involved in the latest version without charging any extra charges. In the traditional software, there appeared a need to update all the apps and functions with the appearance of any new function but in the recent versions, there is no such need as all the updates are done automatically. There is no need to install or download the updates in your current apps[5]. All those platforms are capable of doing multiple tasks at a time and all the functions are integrated in a well-mannered way for the sake of business to build and then utilize a personal virtual sandbox. Let's discuss the functions and composition of LIMS which is the acronym for laboratory information management system. It is software that is related to the management of samples and all the data which is associated with it in a very effective manner. This is software that has the capability of automating the flow of work, integration of instruments, and management of all specimens along with all information that is connected with it[6]. Two terms are utilized in an interchanging manner and sometimes in an overlapping manner. These terms are laboratory information system and laboratory

information management system. Their function is to provide support to various types of laboratories. The data which is all about the medical proceedings of patients and their tests and the managing, storing, and processing of that data with the aid of computer software comes under the category of laboratory information system. A laboratory information system is utilized by physicians and lab technicians in coordination with all those people who are inpatient, outpatient, and in that medical testing which is of point of care[7]. The anatomic pathology laboratory which is found in the present time is completely dependent on trustworthy information, that infrastructure that is helpful in the registration of samples. Integration of all findings that are microscopic and gross, regulation of all that workflow which isn't related to laboratory formation of all those reports which are related to sign out. Deliver all these Pathology Laboratory reports to the recipient which are intended throughout the health system. This is the facility that is provided by anatomic pathology laboratory information systems[8]. This technology started many years ago but now it is at that stage that it can provide support to all new evolving technologies[9]. The search for updated and advanced cancer biomarkers and all those sources that appear as a target of therapy requires not only accumulation and analysis of biomolecular data that is heterogeneous but also requires classification of clinical data[10].

Research Objective

The main aim of study on this topic is to develop an understanding of cloud computing solutions which plays a significant role in building integration for pathology laboratory information systems. The understanding of this topic brings a great ease in the pathology laboratories which are dealing with the data of patients.

Cloud Computing Solutions for Integrating Pathology Laboratory Information Systems

LITERATURE REVIEW

Researchers claim that the use of smart health systems for providing health services to a large number of the population is rapidly increasing. due to overpopulation in the world, a larger number of pollution is reaching old age.to provide health-related services and benefits to older people the use of smart health services is preferable Also, the IOT-based big data analysis tools are used in smart health organizations for analyzing data at a larger scale[11]. Studies suggest that the Internet has revolutionized the services provided by health sectors. Using an automation process for generating a large volume of data related to medical institutes is beneficial in the BDA process. The health monitoring system of large health sectors uses the BDA framework to enhance the performance of these monitoring systems[12]. Scholars explain that IoMT is a cloud computing system that is categorized as one of the efficient systems to tackle complicated problems related to health fields[13]. Studies suggest that tele-medication is a process that generates medicines using modern technology-based systems. providing medication during any pandemic condition to remote areas reduces the chances of the spread of infectious diseases. Health-related medical laboratories use IoT to carry out the clinical examination of patents in the lab[14]. In pathology labs the process of medication development and production is done using a clinical informatics system. This system is specialized in processing data with high accuracy and with innovative approach. Clinical practices require the use of bioinformatics as well as biostatistics approaches to improve the service provided by clinical laboratories[7].

Studies shows that using the cloud computing networks for EMR improves the quality of data analyzing process. The one big advantage of cloud computing networks is that they utilize FHIR to solve problems related to big data. For predicting the problems that are prevalent in health sectors cloud computing algorithms are used in routine labs[15]. Studies explain that a large number of pathology labs have been digitalized to develop WSI for diagnostic purposes. FDA approval for the use of WSI for diagnostic poses has increased the demand for DP. ESDIP has approved the digitalization process of pathology labs to achieve accurate data outcomes related to health sectors[16]. Studies suggest that treating patients in remote areas has become possible using cloud computing medical services Cloud computing systems gather the information in EHR form related to remote patients The process of operating medical activities in remote areas has become possible through IoT-based networks. also, the medical data sensing process is controlled by the health industry 4.0[17]. Studies predict that DP is a term that has gained significant importance among physicians and researchers. the DP uses computer-based cloud networking programs to aid the physicians in their disease-related diagnosis process. some researchers have considered DP a great threat to the pathologist as this technology can easily replace the need for a pathologist in a lab[18]. Studies show that economic benefits related to the use of CC in different businesses have increased. the main application of CC is in the health field.in the healthcare-related domains the use of CC has revolutionized the quality of medical services provided to remote areas Using CC in different health sectors around the world helps in tackling the challenges faced by these sectors[19]. Studies reveal that intense has brought people together and is a great source of interconnection between people. the contribution of smart technology in improving the service provided by industries has resulted in great economic benefits.in health institutes and hospitals, the detection of cancer cells in cancer patients is effectively performed using smart AI health systems[20]. Studies elaborate that modern CC networking systems are used in public as well as private health sectors to ensure that these sectors are providing quality services[21]. Studies explain that integrating the modern technology approaches in industrial settings holds critical value. the transformation of information into digital form is done using the digitalized systems. Digitized systems provide standardized opportunities to improve the working of any industry.AI system is an intelligence based programs that aids the intellectual teams of industries in their decision making plans[22]. Studies explain that growth of MCC in health domains hinder due to privacy cpncrens. To secure the digitized information of health sectors they are fully protected sung AI algorithms and IoT based systems. The use of modular encryption in medical and health related settings improves the viability of MCC to store and save digitalized health data[23]. Scholar studies provide insight about the use of cloud IoT in monitoring system of health fields. the cloud IoT system if fully functional system design in structured pattern to achieve high monitoring security. The one big benefit of a Cloud IoT monitoring system is that it can transfer information between different reliable health and clinical sectors [24]. Moreover the efficiency of health institutes to perform collaborative tasks improves. certain risks arise due to the use of cloud computing software in monitoring systems but these risks are overcome by combining the maintaining system based on CC with AI-based software. coming to the AI and CC approach minimizes the risk of data corruption and data loss. Also, CC networks are used along with HIPAA to ensure that data integrity is

maintained[25]. Studies reveal that health data possess unique features that make it a valuable target data for criminals. Criminals can easily hack health data and can use it for illegal purposes. To ensure that no health data is hacked some legal laws are made by governments. According to legal laws, health data cannot be hacked, and maintaining its safety is the duty of health monitoring and management systems. To maintain health data safety at a larger scale blockchain technology is employed along with a cloud computing monitoring system[26]. Studies claim that data consistency feature in the health sector is maintained using IT in medical care programs. the processes associated with data management of the health sector are achieved through IT applications[27]. Scholars predicts that CSPs is a third party system that is built to manage all the EHR of patients. The resources storage and protection feature of CSPs is enhanced through the use of block chain technology[28]. Scholars studies suggest that going through a patient medical history during the course of providing medical treatment is a Time saving activity for both physician and patient. In biomedical labs the process of decision making regarding a patient medical condition is a tough task. to help physician in decision making process the spatial computing system is employed in biomedical labs [29].

Methods

The research determines the cloud computing solution for integrating pathology laboratory information systems. The research based on primary data analysis for measuring the research used smart PLS software and generate result included descriptive statistic, correlation coefficient, also that confidence interval analysis between them. the research study also measuring the theoretical analysis between the cloud computing solutions and integrating pathology laboratory. The system of lab information system has been recently introduced in pathology labs. These information systems are aimed at providing quick, accurate, and hassle-free services to people related to pathology labs. The cloud Computing Solutions for pathology labs mean the deliverance of services related to pathology labs by using the resources of the internet. As we know the use of the internet is not confined to any single phase or field of life but it has affected all the important aspects of pathology labs as well. Following are important implications of cloud Computing Solutions for pathology labs integrating the lab information system.

Cost Effectiveness, Enhanced collaboration and Real-Time Access

Usually, the type of information system used in a pathology laboratory is dependent upon the aspect of the cost of installation of that particular system. The whole model of cloud Computing Solutions for pathology labs is such cost-effective that it can be brought into consideration for installation in pathology labs. The cloud computing system is based on internet resources for integrating the lab information system of the pathology laboratory so it is cost-effective in many ways. The first reason is that there is no need for manual work in such a lab information system so there is less cost which is only used in the installation of the internet. The other reason is that, when it is based on computer-based systems there is very little risk of human error in it. The third benefit is that it can be used for data analysis repeatedly without any major change in cost. This aspect also helps in making such a system cost-effective. The other important implication of cloud Computing Solutions for pathology labs is that they can provide enhanced collaboration of patients related to pathology labs.

As the data related to patients in pathology labs is stored in the form of electrical signals such lab information systems can provide the aspect of collaboration among different multiple pathologists. Sometimes, the case of any patient may get severe to such an extent that the suggestion or examination of a single pathologist is not enough, so there is a need for the collaboration of more than one pathologist. This aspect also helps in enhancing the professional skills of pathologists through their exposure to rare cases for getting experience. At the same time, the data of one pathology lab can be communicated with other pathology labs for the sake of the betterment of the patient. The other important implication of cloud Computing Solutions for pathology labs is real-time access to the medical history of any patient related to pathology labs. As we know the data related to pathology patients is stored in the lab information system of pathology lab so it can be accessed at any place at any time just with the help of the Internet only. This aspect helps reduce the cost of manual work and enhances the reliance on digital means of data storage and data Access. These are important implications of cloud Computing Solutions for pathology labs which can be helpful for Integrating Pathology Laboratory Information Systems.

Automated Backups, Security Measures, and Improved Workflow in Pathology Labs

As we know the importance of data in pathology labs. We know that this data is used for data analysis, results compiling, discussion, and study of new cases, research work, and history of pathology labs. Sometimes if despite using Modern ways of data storage, there occurs any data loss this data can easily be retracted by using automated backups. This aspect has saved data in many ways. The data which is stored in the pathology lab information system is not only related to patients but also related to the equipment of the pathology lab their use, calibration, proper monitoring, and many other aspects. The other important implication of cloud Computing Solutions for pathology labs is that they ensure the security and safety of patients. All the important and personal data of patients is provided to pathology labs. This data includes personal medical history, financial, and other important aspects. So, there is a need for such a secure system that is enabled to prevent any data hacking risk. The cloud computing system has different options for data storage and analysis in such computer-based systems that it may not be missed by anyone. This aspect of the cloud computing system enables to creation satisfactory environment for patients so they can trust well in system of pathology labs. The other important implication of cloud computing system is the increased workflow from pathology labs. As the Cloud Computing system has shifted the work from a manual system to computer-based systems the procedures may take very little time to complete. At the same time, the results of tests are very accurate so there is no need to perform tests again and again. Most of the services of pathology labs have become online which also helps in increasing workflow from pathology labs. Most of the services of pathology labs have become remote as well. All of these aspects help to enhance the rate of workflow from pathology labs. These important implications of cloud computing system in pathology labs are true evidence of applications of cloud computing system in our daily lives.

Seamless Data Exchange and Continuous Maintenance and Improvement of the System

The other important implication of cloud computing system in pathology labs is that it helps in seamless data exchange. All the data

is transferred from one place to another just by using the Internet. This data is transferred in the form of electrical signals from one place to another which can save much time and cost. The other important implication of cloud computing systems in pathology labs is that it is coordinated with modern and advanced means for consistent improvement and maintenance of the system. By using a lab

information system, we may come to know about the condition of equipment used in pathology labs. This understanding will help in better monitoring and maintenance of equipment in pathology labs. All of these important implications of cloud computing system in pathology labs suggest that there will be more benefits of cloud computing system in pathology labs in near future.

Descriptive Statistical Analysis

Table 1: Result of Descriptive Statistical Analysis

Name	No.	Mean	Median	Scale Min	Scale Max	Standard Deviation	Excess Kurtosis	Skewness	Cramér-Von Mises P Value
CCS1	1	1.720	2.000	1.000	4.000	0.749	0.261	0.818	0.000
CCS2	2	1.600	2.000	1.000	3.000	0.632	-0.556	0.587	0.000
CCS3	3	1.460	1.000	1.000	3.000	0.573	-0.283	0.819	0.000
CCS4	4	1.620	2.000	1.000	4.000	0.660	1.855	1.045	0.000
CCS5	5	1.580	2.000	1.000	3.000	0.635	-0.507	0.654	0.000
CCS6	6	1.520	1.000	1.000	3.000	0.608	-0.366	0.747	0.000
IP1	7	1.460	1.000	1.000	3.000	0.607	0.017	0.988	0.000
IP2	8	1.580	1.000	1.000	3.000	0.695	-0.542	0.808	0.000
IP3	9	1.600	2.000	1.000	3.000	0.632	-0.556	0.587	0.000
IP4	10	1.520	1.000	1.000	3.000	0.608	-0.366	0.747	0.000
IP5	11	1.540	1.000	1.000	3.000	0.607	-0.453	0.672	0.000
IP6	12	1.600	2.000	1.000	3.000	0.600	-0.608	0.458	0.000
IS1	13	1.660	2.000	1.000	3.000	0.587	-0.610	0.258	0.000
IS2	14	1.620	2.000	1.000	3.000	0.660	-0.610	0.615	0.000
IS3	15	1.480	1.000	1.000	3.000	0.574	-0.414	0.735	0.000
IS4	16	1.580	2.000	1.000	3.000	0.603	-0.574	0.528	0.000
IS5	17	1.620	2.000	1.000	3.000	0.660	-0.610	0.615	0.000
IS6	18	1.540	1.000	1.000	3.000	0.607	-0.453	0.672	0.000

The above result shown in table 1 represent that descriptive statistical analysis result demonstrate the mean values, median rates, the minimum value, maximum value, also that explain the skewness rates and probability value of each indicators included dependent and independent. The CCS1 to CCS6 these factors consider as independent variables according to the result its mean values is 1.620, 1.580 and 1.520 all of them are present positive average rate between them the standard deviation rates is 74%, 66%, 57% deviation from mean values the overall probability rate is 0.000 shows that 100% significantly level between them the overall minimum rate is 1.000 the maximum value is 3.000 respectively. The IP1 to IP6 consider as mediator variable according to the result its mean value is 1.520, 1.600, 1.460 respectively shows that positive average rate between them. the standard deviation rate is 60% deviate from mean values.

The IS1 to IS6 these are all factor consider as dependent indicator result describe those mean values is 1.660, 1.620, 1.480, 1.580, 1.620 and 1.540 these are all values represent that positive average value of mean. According to the table-1 result shows that information system plays as important role in cloud computing solutions also that its significant relation between them. the standard deviation rate is 57%, 60%, 66% respectively these values shows that positive deviate from mean. Some skewness rates present negative also that some positive relation between them.

Robotics and Automation

Pathology labs are being revolutionised by automation as it reduces human error and streamlines repetitious procedures. Slide preparation, staining, and even preliminary image interpretation are increasingly being done by automated methods. Workflows are also incorporating robotics to do activities like transporting and sorting samples. This expedites the procedure and frees up pathologists to concentrate on more intricate diagnosis and analysis.

Whole Slide Imaging and Digital Pathology Images

Using high-resolution scanners, glass slides are converted into digital slides for use in digital pathology. Pathologists can view and analyse slides on a computer screen with Whole Slide Imaging (WSI), which makes sharing and cooperation easier. Large amounts of data can be stored via digital pathology systems, making it easy for pathologists to access and examine past cases. This shift to digitalisation improves diagnostic precision and makes telepathology possible, where specialists may offer consultations from a distance.

Information Systems for Labs (LIS)

Contemporary Laboratory Information Systems (LIS) are essential to the efficient administration of pathology labs. These systems keep track of samples, handle patient data, and guarantee adherence to legal requirements. Sophisticated reporting tools, connectivity with other healthcare systems, and real-time data tracking are all hallmarks of advanced LIS solutions. As a result, workflows are expedited, data accuracy is increased, and provider communication is improved.

Assurance and Quality Control

Innovations in quality assurance and control are essential to keeping pathology lab standards high. Automated systems that keep an eye on environmental factors, reagent quality, and equipment performance contribute to repeatable and dependable laboratory results. Data analytics-backed continuous quality improvement initiatives spot patterns and potential improvement areas, resulting in more reliable and accurate diagnostic results.

Data management and Cloud Computing

The use of cloud computing is changing the way pathology labs maintain their data. Cloud data storage provides easy access, security, and scalability. Labs can manage growing data volumes thanks to

cloud-based solutions, which eliminate the need for substantial on-premises hardware. Furthermore, cloud platforms promote

cooperation by enabling numerous users, from any place, to access and work simultaneously on the same data.

Correlation Coefficient Analysis

Table 2: Result of Correlation Coefficient Analysis

	CCS1	CCS2	CCS3	CCS4	CCS5	CCS6	IP1	IP2	IP3	IP4	IP5	IP6	IS1	IS2	IS3	IS4	IS5	IS6
CCS1	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CCS2	0.059	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CCS3	0.253	-0.099	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CCS4	-0.013	-0.029	-0.437	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CCS5	0.173	0.179	0.146	-0.190	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CCS6	-0.076	0.229	-0.342	0.492	-0.056	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IP1	0.063	0.010	0.312	-0.362	0.086	-0.269	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IP2	-0.226	0.164	-0.067	0.044	0.008	-0.051	-0.016	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IP3	-0.194	-0.150	0.011	-0.220	-0.219	-0.395	0.115	0.300	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IP4	-0.032	0.229	-0.457	0.642	0.048	0.567	-0.269	-0.051	-0.447	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IP5	0.113	-0.167	-0.139	0.313	0.070	-0.002	0.031	-0.173	0.042	0.052	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IP6	-0.205	0.264	0.128	0.020	-0.073	0.186	-0.044	0.173	0.105	-0.088	-0.395	1.000	0.000	0.000	0.000	0.000	0.000	0.000
IS1	-0.126	0.011	0.049	0.286	0.046	0.215	-0.010	-0.301	-0.205	0.215	0.235	-0.159	1.000	0.000	0.000	0.000	0.000	0.000
IS2	-0.134	0.067	0.039	0.128	0.001	-0.106	-0.063	0.219	0.259	-0.106	-0.037	0.273	-0.075	1.000	0.000	0.000	0.000	0.000
IS3	0.173	0.143	0.180	-0.152	0.224	-0.028	-0.002	0.104	0.198	-0.199	0.060	-0.081	-0.050	0.059	1.000	0.000	0.000	0.000
IS4	0.227	0.346	0.038	0.152	0.009	0.378	-0.183	-0.039	-0.283	0.050	-0.036	0.199	0.162	0.051	0.293	1.000	0.000	0.000
IS5	0.230	-0.172	0.145	0.082	0.001	0.144	0.237	-0.043	-0.029	0.044	0.113	-0.131	-0.127	-0.102	0.059	0.001	1.000	0.000
IS6	0.025	-0.115	0.378	-0.287	0.018	-0.111	0.249	0.016	0.146	-0.327	-0.140	0.264	0.010	0.013	0.002	0.019	-0.037	1.000

The above result shown in table 2 describe that correlation coefficient analysis result describe that some positive and some negative interrelation between the cloud computing solutions and integrating pathology laboratory information systems. These result shows overall significant relation between the dependent and independent variables related to them.

Long-Term Storage and Sharing of Large Digital Pathology Data Sets

The absence of data handling techniques is the main obstacle preventing the broad implementation of AI-assisted digital pathology platforms. Massive volumes of data related to digital pathology may be produced, processed, and archived. The successful integration of AI-assisted digital pathology technologies into normal diagnostic practice thus depends on the establishment of efficient digital data repositories

to store, organise, archive, and retrieve digital pathology images with ease. In addition, it is difficult to share such large amounts of data quickly, securely, and in accordance with HIPAA regulatory requirements. The extensive clinical deployment of digital pathology platforms is also significantly hampered by restricted availability to scanners and other pathology gear and laboratory equipment, as well as bandwidth problems.

The model of figure 1 represents that smart PLS Algorithm model in between CCS and IP also IS. The CCS shows that -0.063, 0.246, -0.678, 0.833, -0.100, 0.808 its shows that 6%, 24%, 67%, 83% also that 10% significantly level with each other. The IP shows that 69% positive and significant link with CCS. The IS shows that 46% positive and significant relation with IP. The model present that 13% positive and significant relation in between CCS and IS respectively.

Smart PLS Algorithm Model

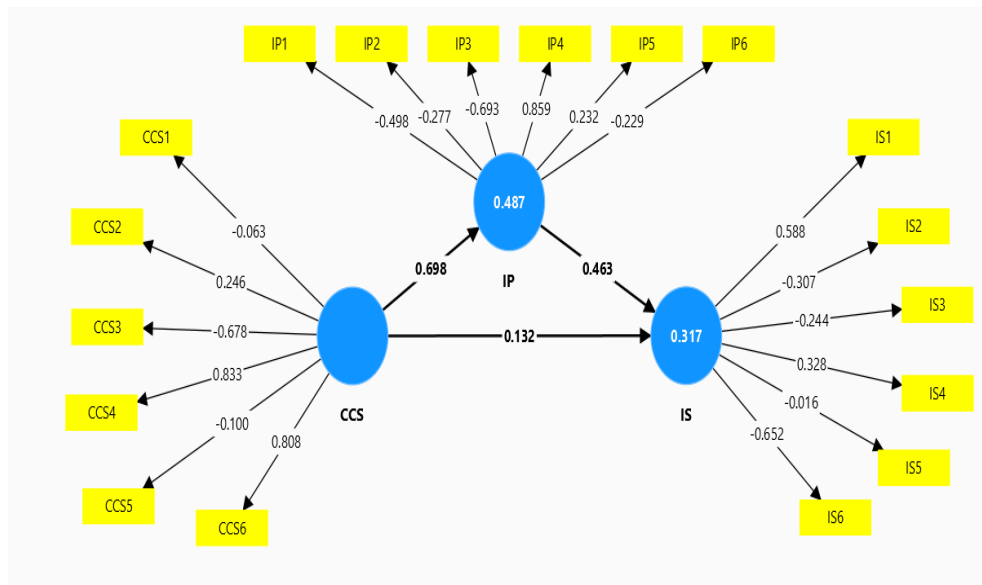


Figure 1: Smart PLS Algorithm Model

Confidence Interval

Table 3: Result of Confidence Interval

Matrix	Original Sample (O)	Sample Mean (M)	2.5%	97.5%
CCS1<-CCS	-0.063	0.048	-0.482	0.595
CCS2<-CCS	0.246	0.185	-0.511	0.645
CCS3<-CCS	-0.678	-0.252	-0.820	0.842
CCS4<-CCS	0.833	0.374	-0.895	0.911
CCS5<-CCS	-0.100	0.017	-0.504	0.615
CCS6<-CCS	0.808	0.385	-0.842	0.895
IP1<-IP	-0.498	0.082	-0.751	0.779
IP2<-IP	-0.277	0.092	-0.570	0.662
IP3<-IP	-0.693	0.109	-0.800	0.824
IP4<-IP	0.859	-0.107	-0.901	0.908
IP5<-IP	0.232	-0.036	-0.646	0.659
IP6<-IP	-0.229	0.095	-0.675	0.738
IS1<-IS	0.588	0.232	-0.675	0.797
IS2<-IS	-0.307	0.041	-0.693	0.747
IS3<-IS	-0.244	0.111	-0.716	0.765
IS4<-IS	0.328	0.340	-0.620	0.845
IS5<-IS	-0.016	0.053	-0.435	0.680
IS6<-IS	-0.652	-0.144	-0.809	0.817

The above result shown in table 3 demonstrates that confidence interval in between cloud computing solutions and integrating pathology laboratory information system. The result shows that original sample values, the sample mean values also that 2.5% and 97.5% confidence interval between each matrix. The first matrix is CCS1<-CCS its shows that original sample value is -0.063 the sample mean value is 0.048. the IP1<-IP shows that original sample value is -0.498 the sample mean value is 0.082 the 2.5% confidence interval is 75% and 77% respectively. The IP2<-IP it's another matrix its original sample value is -0.277 the sample mean value is 0.092 the confidence interval is 57% and 66% respectively. Similarly, the IS1,2,3,4,5 and 6<-IS these matrices related to the information systems according to the result its original sample value represent the negative rate its -0.307, -0.244, -0.016, -0.652 all of them are consider as negative average rates. The mean value is 0.041, 0.111, 0.340, 0.053 and -0.144 respectively shows some positive and some negative rate between them. the 97.5%

confidence interval is 79%, 84%,68%, 81% all of them are present positive rates between them.

Conclusion

After an overview of these aspects of the implications of cloud computing systems in pathology labs, we may conclude that cloud Computing systems helped in pathology labs in different ways for accurate results, saving time and cost in pathology labs. The administration of pathology laboratories is undergoing fast change due to the increasing need for high-caliber diagnostic services and the development of new technologies. The efficiency, accuracy, and general efficacy of pathology labs can be improved by embracing advances like automation, digital pathology, artificial intelligence, and cloud computing. These developments not only enhance patient care but also put pathology labs in a better position to take advantage of future opportunities and challenges.

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