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A SYSTEMATIC STUDY OF CLOUD COMPUTING SERVICE PROVIDERS AND CYBER SECURITY

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Abstract:

Cloud computing service providers are companies that offer cloud computing services to individuals, businesses, and other organizations. These providers typically own and operate data centers with large amounts of computing resources, such as servers, storage devices, and networking equipment. They make these resources available to customers over the internet, allowing them to access and use them as needed, without having to invest in and maintain their own computing infrastructure. The objective of the study is To find out whether cloud computing services lower the operational cost , To find out the top benefits of cloud computing services. , To find whether cloud computing services makes data backup, disaster recovery and business continuity easier and less expensive. The research method followed here is a combination of empirical and descriptive research. A total of 204 samples have been taken out of which is taken through convenient sampling. The data was collected through field visit and online survey. The SPSS software by IBM was used to calculate the descriptive statistics. In conclusion, cloud computing services are an increasingly popular and beneficial solution for individuals and organizations looking to improve their computing capabilities, reduce costs, and enhance collaboration and productivity.

Key words:

Cloud computing services, Data backup, Infrastructure, Operational cost, Analyse data.

Introduction:

Cloud computing service providers are companies that offer cloud computing services to individuals, businesses, and other organizations. These providers typically own and operate data centers with large amounts of computing resources, such as servers, storage devices, and networking equipment. They make these resources available to customers over the internet, allowing them to access and use them as needed, without having to invest in and maintain their own computing infrastructure. Some of the most well-known cloud computing service providers include:Amazon Web Services (AWS): A subsidiary of Amazon.com, AWS is the largest cloud computing provider in the world, offering a wide range of services such as compute, storage, database, and networking. Microsoft Azure: Microsoft's cloud computing platform, which provides a variety of services such as virtual machines, databases, and artificial intelligence (AI) tools. Google Cloud Platform (GCP): Google's cloud computing offering, which includes services for computing, storage, and networking, as well as machine learning and data analytics.

IBM Cloud: IBM's cloud computing service, which provides access to a range of cloud-based tools and services for businesses, including infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS) options. Oracle Cloud: Oracle's cloud computing platform, which offers services such as compute, storage, and database, as well as

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specialized applications for businesses in various industries. These providers and others like them have revolutionized the way that businesses and individuals approach computing, making it easier and more cost-effective to access powerful computing resources that can be used to build and run a wide range of applications and services. Cloud computing service providers can be categorized into three main types based on the type of services they offer: Infrastructure as a Service (IaaS) Providers: These providers offer customers access to virtualized computing infrastructure such as servers, storage, and networking resources over the internet. Customers can deploy and run their own applications and software on this infrastructure. Examples of IaaS providers include Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform. Platform as a Service (PaaS) Providers: PaaS providers offer a platform for customers to develop, run, and manage their own applications without having to manage the underlying infrastructure. The provider manages the infrastructure, operating system, middleware, and runtime environment, while the customer focuses on developing and deploying their own software. Examples of PaaS providers include Heroku, IBM Cloud, and Oracle Cloud. Software as a Service (SaaS) Providers: SaaS providers offer customers access to software applications over the internet. The software is hosted and managed by the provider, and customers typically pay a subscription fee to access the software. Examples of SaaS providers include Salesforce, Microsoft Office 365, and Dropbox. It's worth noting that some providers offer services that span multiple categories. For example, Amazon Web Services offers both IaaS and PaaS services, while Microsoft Azure offers IaaS, PaaS, and SaaS services. Ultimately, the type of cloud computing service provider a customer chooses will depend on their specific needs and requirements. Cloud computing services offer many benefits, including: Cost Savings: Cloud computing eliminates the need for

organizations to purchase and maintain expensive hardware, reducing the cost of IT infrastructure and maintenance. Scalability: Cloud computing services can scale up or down quickly to meet changing business needs, allowing organizations to only pay for what they need. Flexibility: Cloud computing services allow employees to access applications and data from anywhere, using any device, making it easier for remote workers to stay connected and productive. Disaster Recovery: Cloud computing services can provide a secure and reliable backup solution in case of disaster, ensuring business continuity. Improved Collaboration: Cloud computing services enable team members to work together on documents and projects in real-time, improving collaboration and productivity. Automatic Updates: Cloud computing services automatically update software and security measures, eliminating the need for manual updates and ensuring data is always protected. Sustainability: Cloud computing services can reduce energy consumption and carbon emissions, making them a more sustainable option for organizations.

Aim:

To study the benefits provided by the cloud computing serivices.

Objective:

- To find out whether cloud computing services lower the operational cost

- To find out the top benefits of cloud computing services.

- To find whether cloud computing services makes data backup, disaster recovery and business continuity easier and less expensive.

- To find whether cloud computing services help in running an infrastructure more efficiently.

- To observe the different uses of cloud computing services.

Review of literature:

Roger smith(2009) explains about the the on-demand delivery of IT resources over the Internet with pay-as-you-go pricing. Instead of buying, owning, and maintaining physical data centers and servers, you can access technology services, such as computing power, storage, and databases, on an as-needed basis. The three main types of cloud computing include Infrastructure as a Service, Platform as a Service, and Software as a Service. Each type of cloud computing provides different levels of control, flexibility, and management so that you can select the right set of services for your needs. **Joshua S. Parker(2012)** Federal, state, and local government agencies have followed industry into the world of cloud computing, a collection of computing models that enable significant cost savings and increased efficiency by making possible widespread measures to store and revisit the collected data for future analysis. **Minakshi Lahiri and James L. Moseley(2013)** Cloud computing is currently the buzzword in the Information Technology field. Cloud computing facilitates convenient access to information and software resources as well as easy storage and sharing of files and data, without the end users being aware of the details of the computing technology behind the process. This article explores cloud technology as an emerging new computing trend for delivering educational services; it evaluates the benefits of using cloud computing in education; discusses concerns about the cloud; and attempts to discover whether cloud computing truly enables efficient management of resources, thereby improving efficiency of educational institutions. **Neil Robinson and Lorenzo Valeri(2011)** This chapter provides an analysis of the technological challenges of cloud computing and associated services, and will support the argument that the benefits of using clouds hinge on finding appropriate technological answers to the security, privacy and trust challenges. **Jonathan Cave and Tony Starkey(2011)** Diverging interpretations and legal uncertainties could well endanger the development of innovative cloud service models, as they can adversely affect the trustworthiness of such services: how can users invest in the cloud without a clear perspective on the compliance of the chosen solution with the applicable legal framework, or on the guarantees offered by the service provider. **Simon Handler and Lily Liu(2020)** Cloud services can rely on servers spread across different data centers, even different countries. This is illustrated by an important fact: for the largest cloud providers, some of their largest customers are themselves. Companies like Google and Microsoft build products like G Suite or Office 365 on top of their IaaS and PaaS offerings in Google Cloud Platform (GCP) and Microsoft Azure. **Nayan B. Ruparelia(2016)** Every undertaking has a cost and a benefit associated with it. Consuming cloud services is no different. This chapter considers the cost element of your using a cloud service and the price you pay for it after assessing various pricing regimes, known as price models. (Price models are also referred to as pricing models.) To offset the price you pay for the cloud service, you need to realize a commensurate benefit. That benefit is assessed by considering value models that can be related to cloud computing. **Vidyanand Choudhary and Joseph Vithayayhil(2013)** How does the adoption of cloud computing by a firm affect the organizational structure of its information technology (IT) department? To analyze this ques-tion, we consider an IT department that procures IT services from a cloud computing vendor and enhances these services for consuming units within the firm. Our model incorporates the competitive environment faced by the cloud vendor, which affects the price of the cloud vendor. **Daniel Fiott(2020)** Any discussion about the digitalisation of defence is hampered by the imprecision of associated terms and words. 'Cyber', 'the cloud', 'Internet of Things' (IoT),

'block chain' and 'quantum computing' are widely used but their exact meaning or application can be quite fuzzy. The truth is that

we may be intellectually ill-equipped to understand the full intricacies and implications of digitalisation, even if the economic rationale for digitalisation is clear. **Jared Carstensen(2012)** It is clear that Cloud Computing has achieved escape velocity from the massive hype that initially had it tethered in low orbit to the point that it has now joined the ranks of popular culture. Survey after survey identifies security as people's number one concern about Cloud Computing. IT organisations decide to continue existing on-premises deployment practices (often using a private Cloud environment) because they have higher confidence in the security of their own environment. **Maziar Peihani(2017)** An important trend in the world of computing is the rise of cloud technology, whereby on-demand and self-service computing resources are delivered through the internet. The 'cloud' is a disruptive technology that challenges some of the entrenched business models of the IT industry, offering important benefits such as greater flexibility, scalability and utility-based pricing. This paper explores the use of cloud technology by financial institutions and the factors that impact further adoption of cloud technology in the financial sector. **Nayan B. Ruparelia(2016)**Security is holistic, not only for your organization's use of cloud services but also on behalf of the users sourcing those services, the applications associated with them, and the devices that allow access to the services. Additionally, we consider data integrity and privacy from an end-to-end perspective: from the user to the data center and back to the user. In this chapter we consider these issues and also legal and compliance issues related to data and its use. We extend this discussion to include data sovereignty and jurisdiction issues, since these are especially of concern to those of us who use these services. **Larry Combs(2013)** Basically, cloud computing is distributed computing in which the provider supplies the computing infrastructure including computers, software, and data storage. Subscribers pay for the use of this infrastructure

on a monthly basis, as opposed to making large upfront investments for in-house computing hardware and software. **Ijeoma Onyeji-Nwogu(2017)** One major hindrance for the uptake of cloud-based solutions that enable processing of large volumes of data is the state of cloud computing in developing countries. The scope for cloud computing is much smaller in developing countries than in developed ones. Apart from a lack of awareness, cloud adoption is typically constrained by the high cost of broadband services and limited access to electricity. **Christopher S. Yoo(2011)** Cloud computing has emerged as perhaps the hottest development in information technology. Despite all of the attention it has garnered, existing analyses focus almost exclusively on the issues surrounding data privacy without exploring cloud computing's architectural and policy implications. This Article offers an initial exploratory analysis in that direction. **Frank Cilluffo and Ron Ritchey(2010)** While cloud computing offers limitless possibilities in terms of collaboration and access to data. the indefinable structure of this advanced technology raises several security concerns. The George Washington Policy University Homeland Security Policy Institute hosted a recent forum sponsored by Booz Allen Mamiron and Cisco systems to address the myriad security concerns that arise as cloud computing developments expand. **Bernard Golden(2012)** VirtualisationMany traditional security solutions rely on examining network traffic. In virtualised environments, network traffic often goes from one virtual machine to another without leaving the physical server, rendering network-attached security devices ineffective. Dynamic environmentsVirtualisation environments support dynamic placement and relocation of virtual machines to enable hardware failure resiliency and better application performance. The side effect of this is that security practices that assume a static environment are challenged to operate effectively in a dynamic infrastructure. **Karim Djemame(2013)** Besides this cloud computing creates new cloud-based

services for generating employment. Well, several legal issues are associated with cloud computing like privacy, data security, contact issues, and the issues related to the location of data. Unauthorized access, data corruption, infrastructure failure, or unavailability are some of the risks related to relinquishing the control to third party services; moreover, it is difficult to identify the source of the problem and the entity causing it. **T. Ramluckan and B van Niekerk(2014)** Cloud computing provides a convenient tool for crisis response teams to collaborate and share information no matter where the team members are located. Depending on the type of crisis, there may be differing security requirements for the information, and this can impact how the cloud computing is managed or whether additional security measures should be in place. This paper discusses the possible use of cloud computing as a communication tool in crisis situations, information security requirements for various types of crises, and the security requirements of cloud computing in this role. **V Greiman(2014)** Control over most of the world's data including national security, criminal investigations, medical secrets, intellectual property, and a host of other important rights and responsibilities is governed by a paradigm that is conducted in the Internet 'cloud'. Based on empirical research and an analysis of

international and national legal regimes, case decisions, and forensic case analysis, this paper explores the challenges of reaching into the cloud and the proactive measures that will be necessary to improve legal certainty in the global electronic marketplace. The paper then considers the international and national frameworks necessary for control over the predators in the cloud, and the nature and type of evidentiary and jurisdictional issues that may arise in courts of law and tribunals around the globe.

Methodology:

The research method followed here is a combination of empirical and descriptive research. A total of 204 samples have been taken out of which is taken through convenient sampling. The data was collected through field visit and online survey. The SPSS software by IBM was used to calculate the descriptive statistics. Independent variables are age, gender, educational qualification, occupation, monthly income, marital status. Dependent variables are cloud computing service, lower operational costs, speed, productivity, ability to scale elastically, data backup, disaster recovery, more efficient infrastructure, store, backup and recovery of data, data analysis, testing and building of applications. The statistical tool used by the researcher is SPSS.

Analysis:

Fig 1:
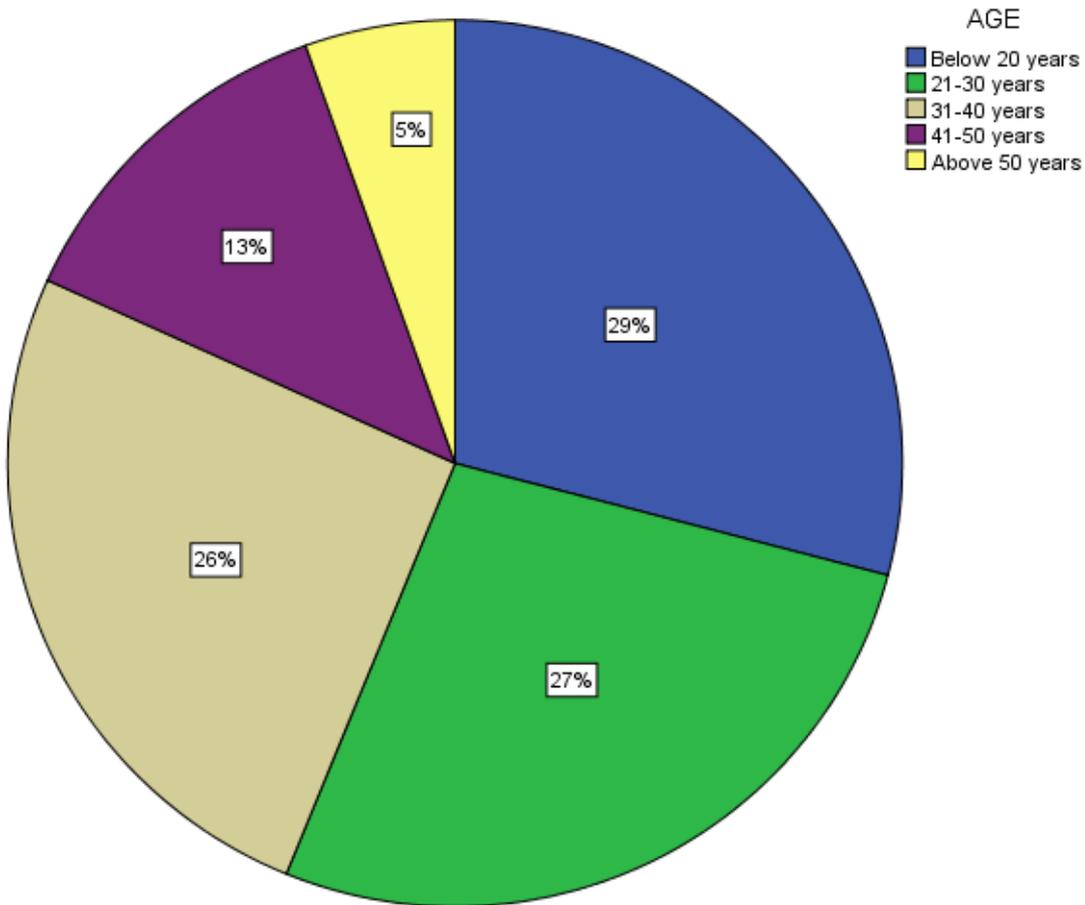
Legend:

It shows the age distribution of the respondents.

Fig 2:

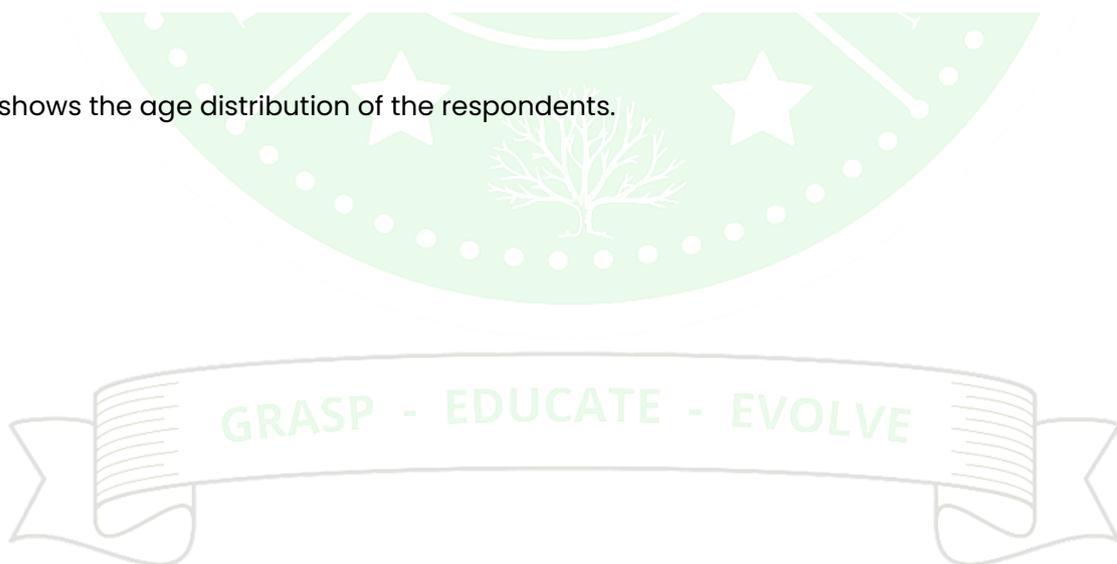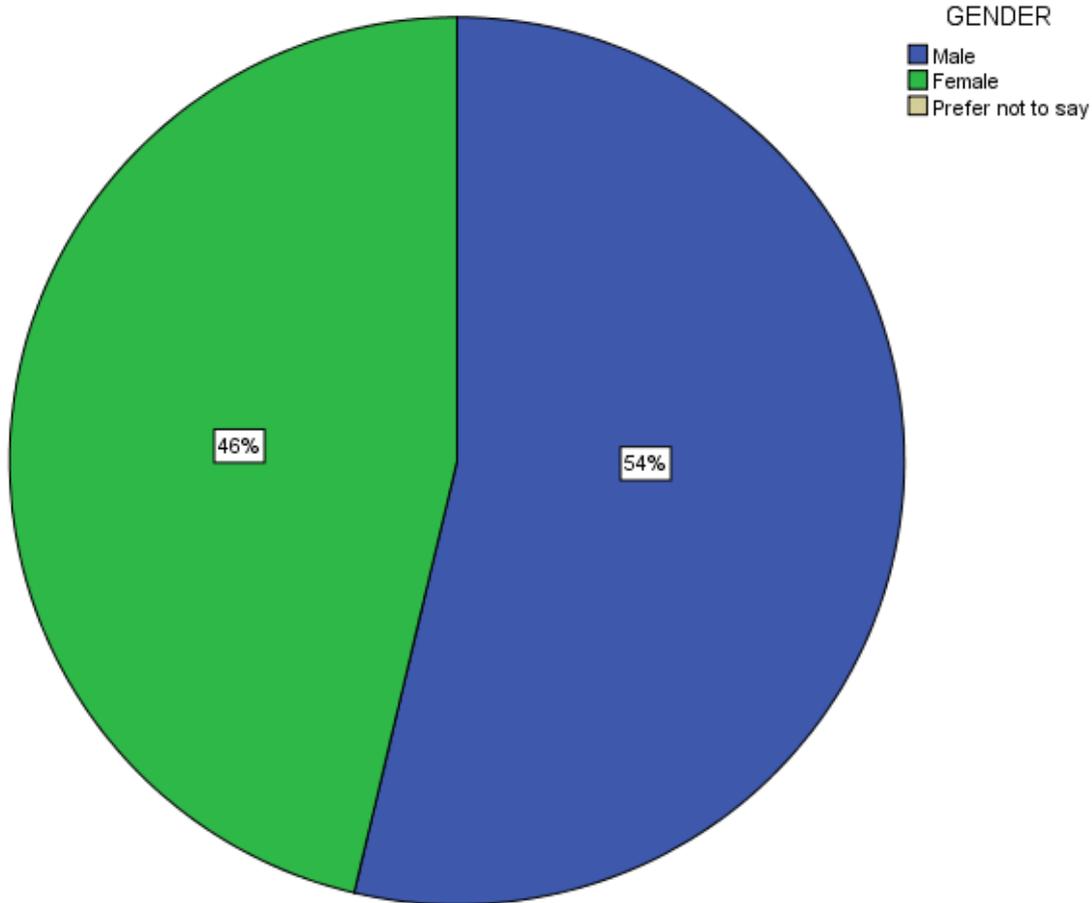**Legend:**

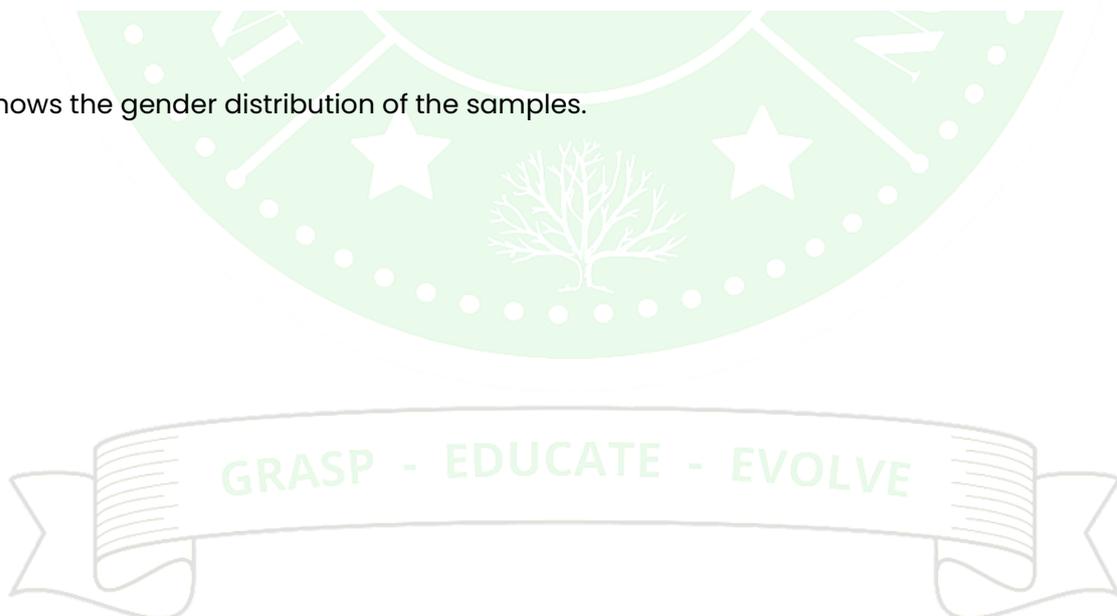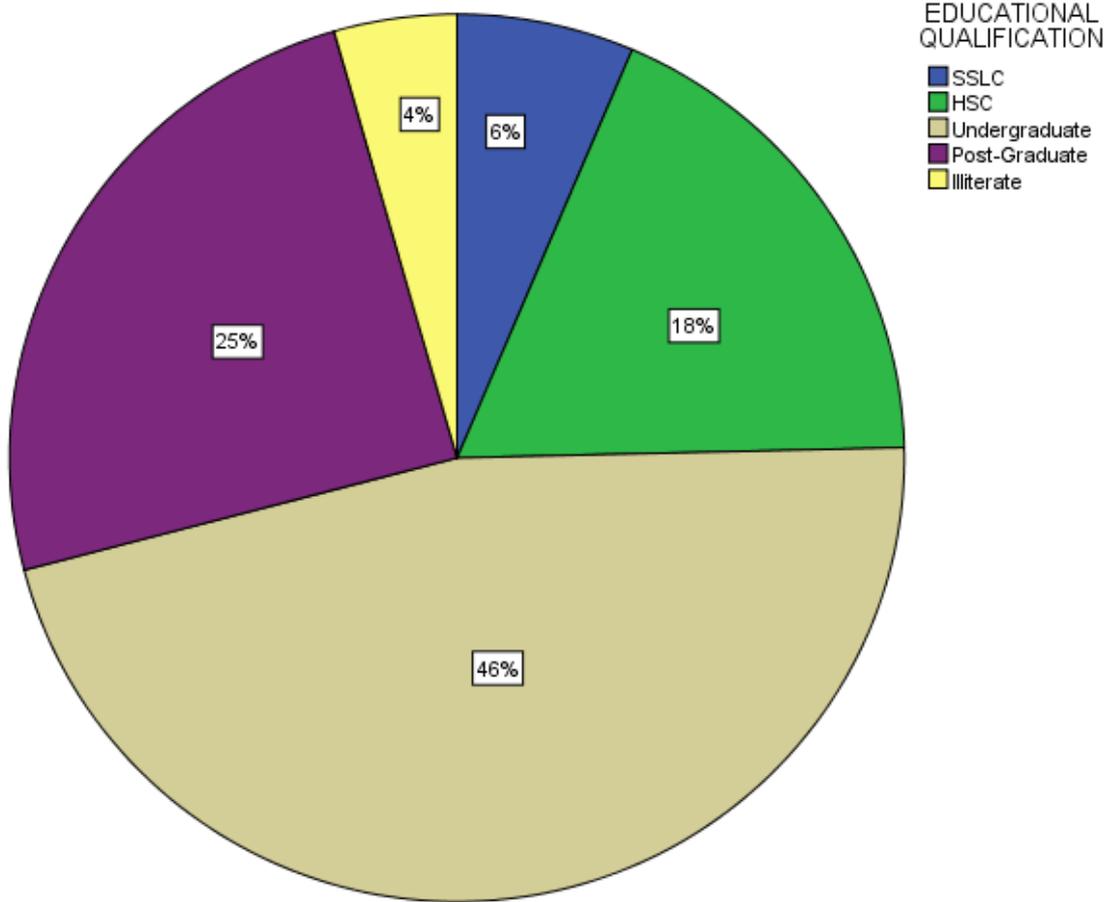It shows the gender distribution of the samples.

Fig 3:

Legend:

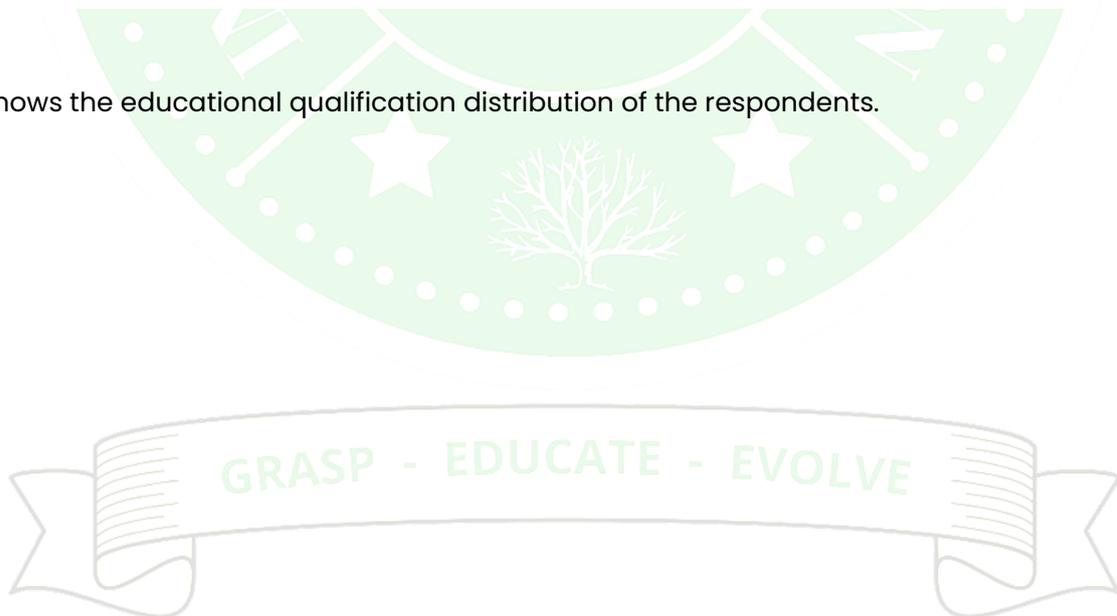It shows the educational qualification distribution of the respondents.
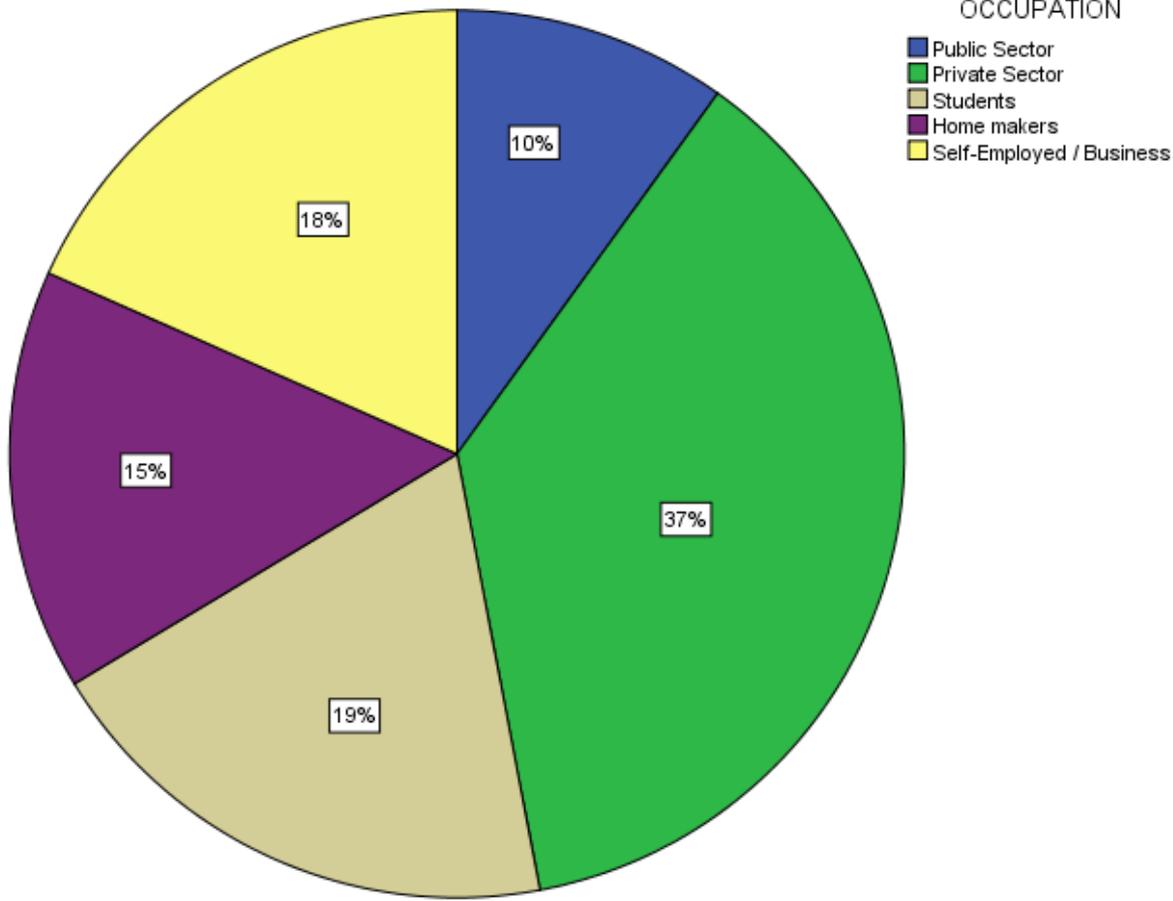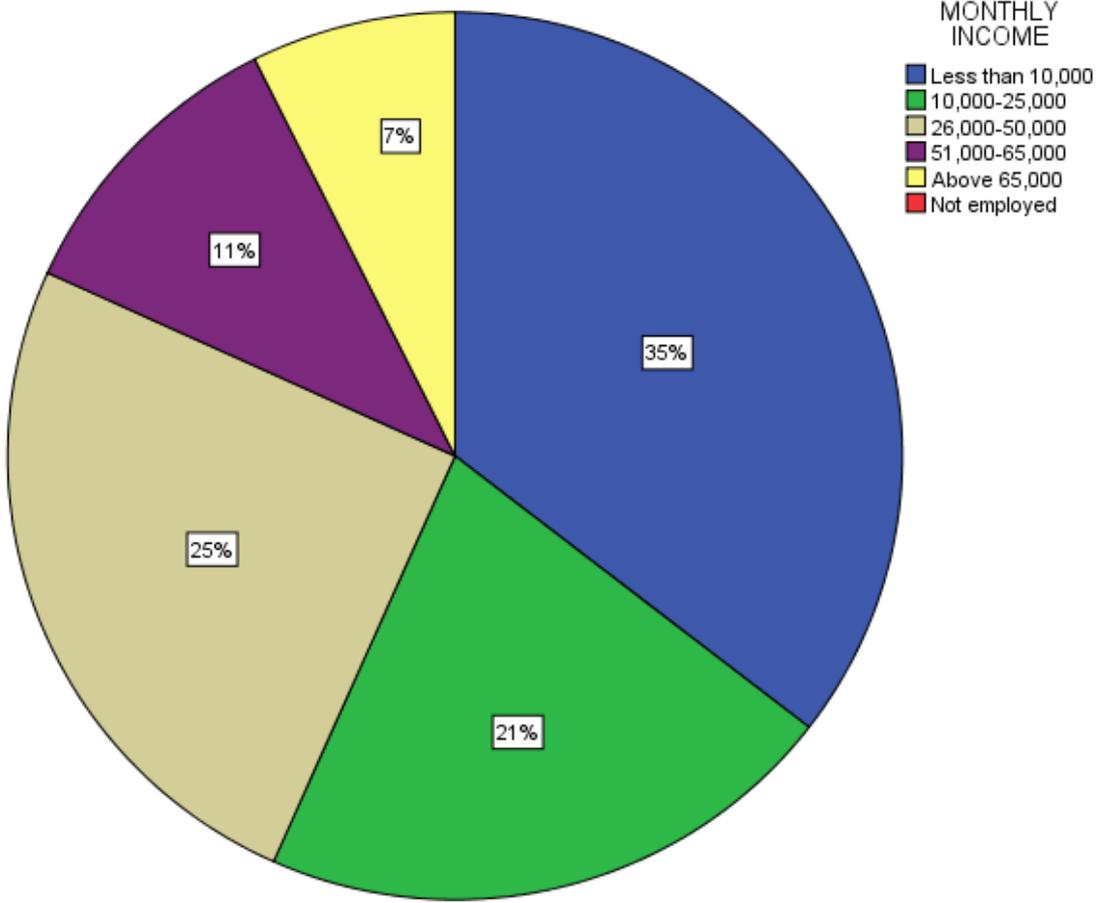
Fig 4:

Legend:

It shows the occupation distribution of the respondents.

Fig 5:

Legend:

It shows the monthly income distribution of the respondents.

Fig 6:
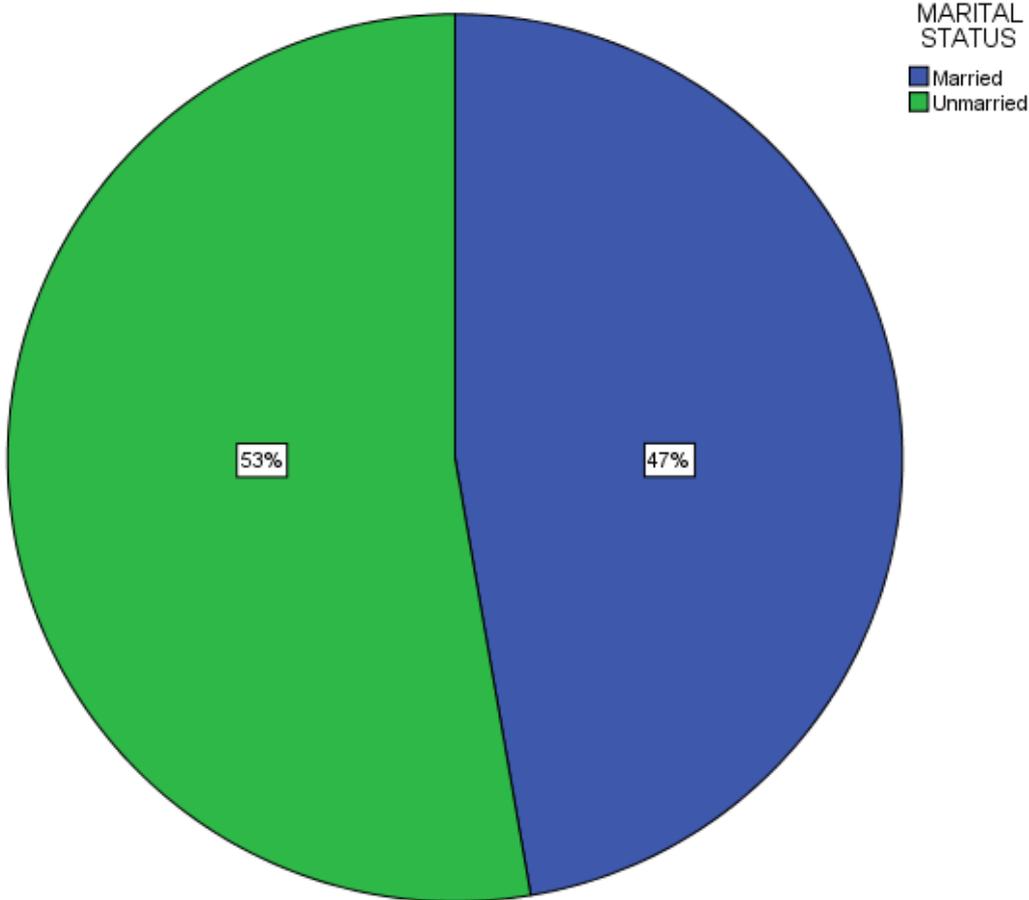
Legend:

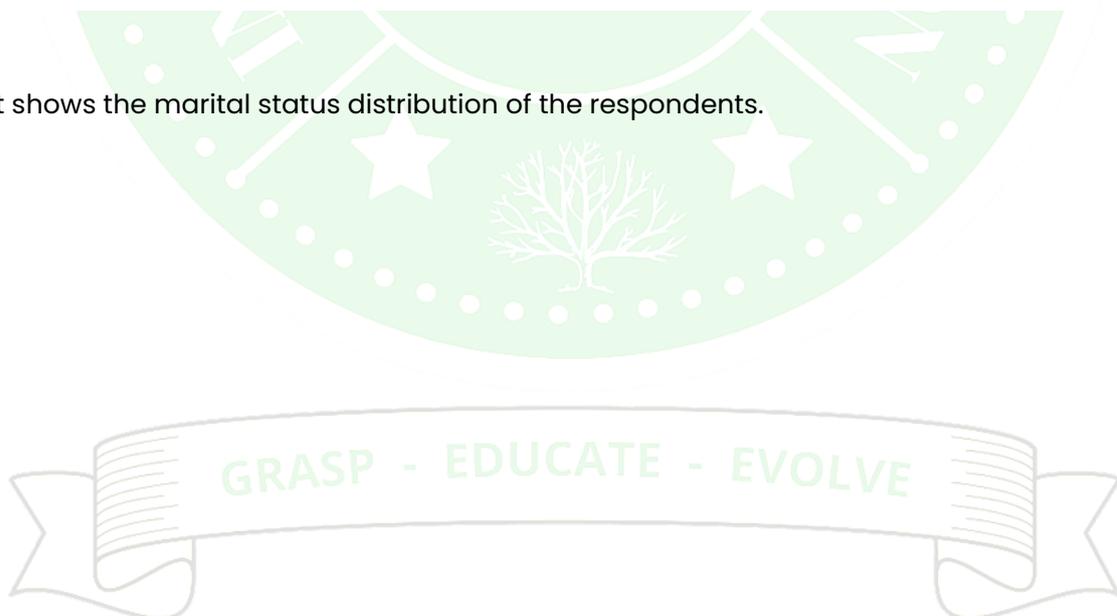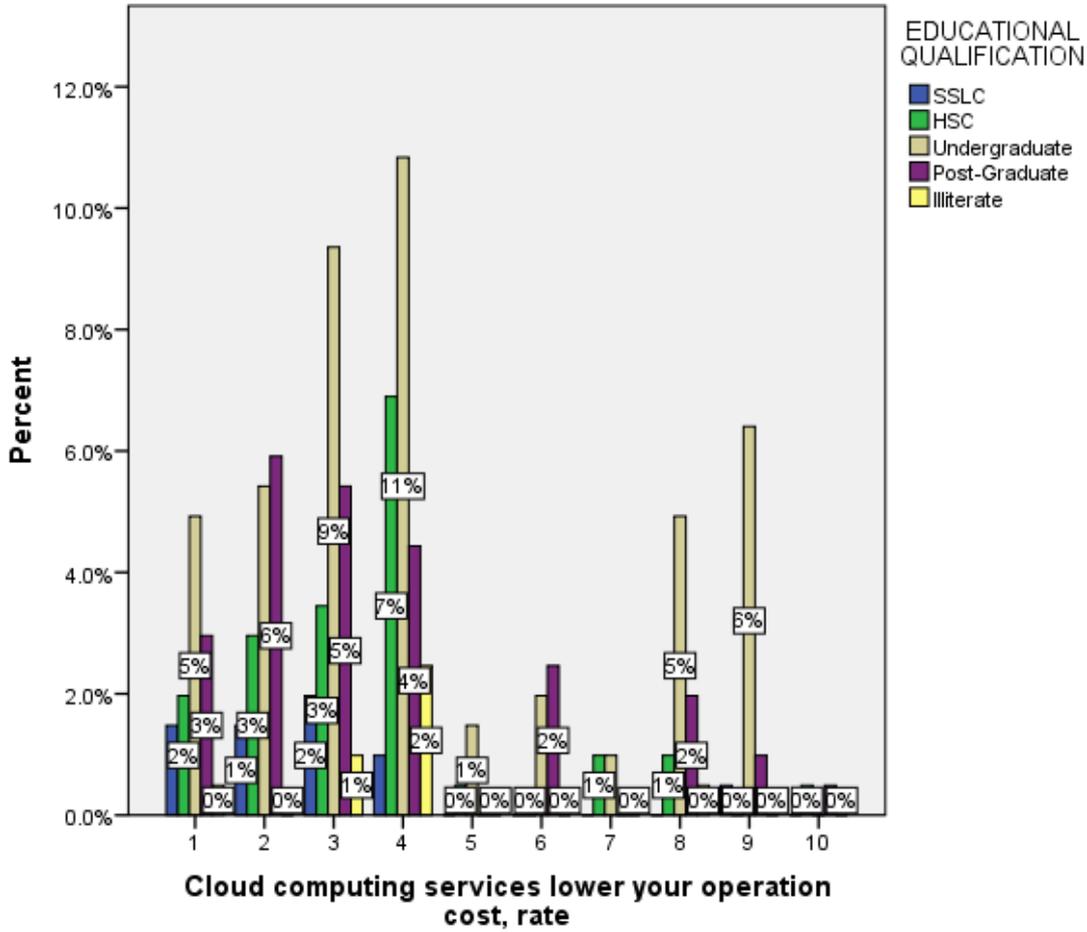It shows the marital status distribution of the respondents.

Fig 7:

Legend:

It shows the educational qualification distribution of the respondents and their opinion on whether cloud computing services lower your operational cost.
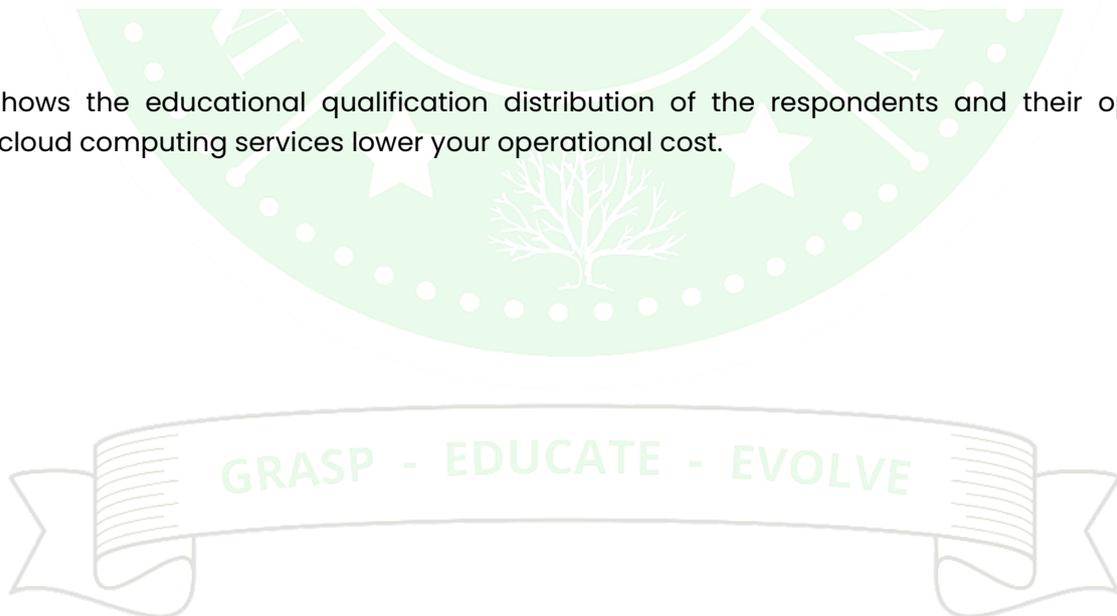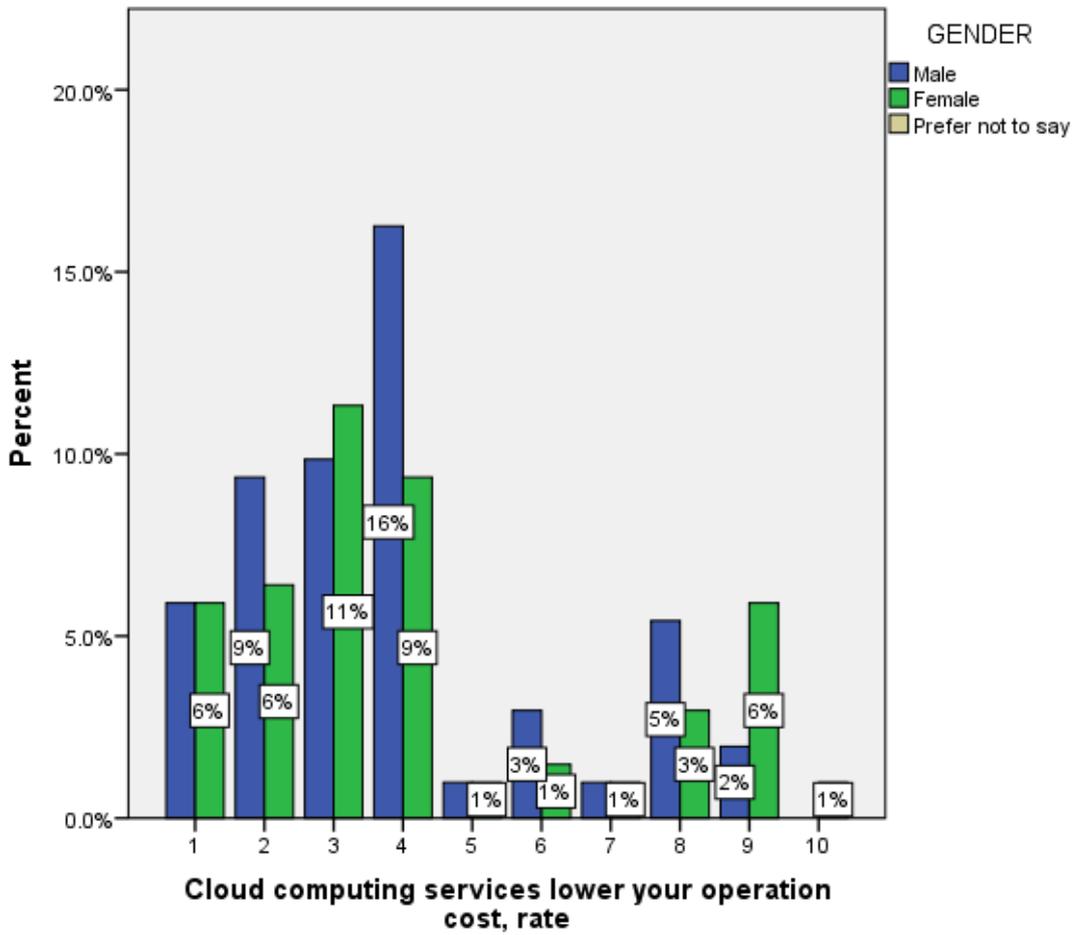
Fig 8:

Legend:

It shows the gender distribution of the respondents and their opinion on whether cloud computing services lower your operational cost.
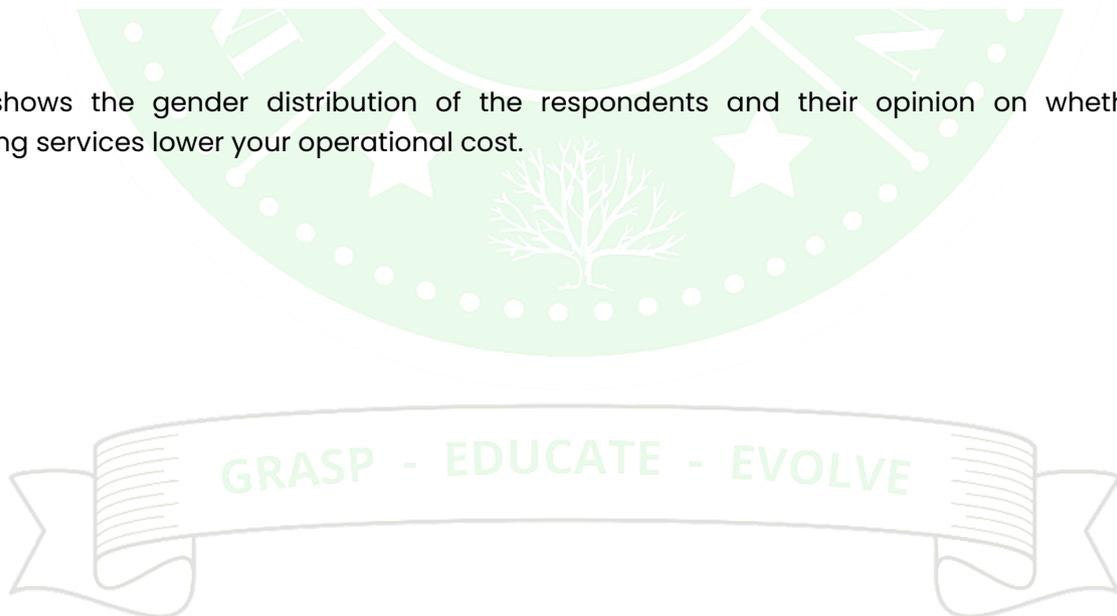
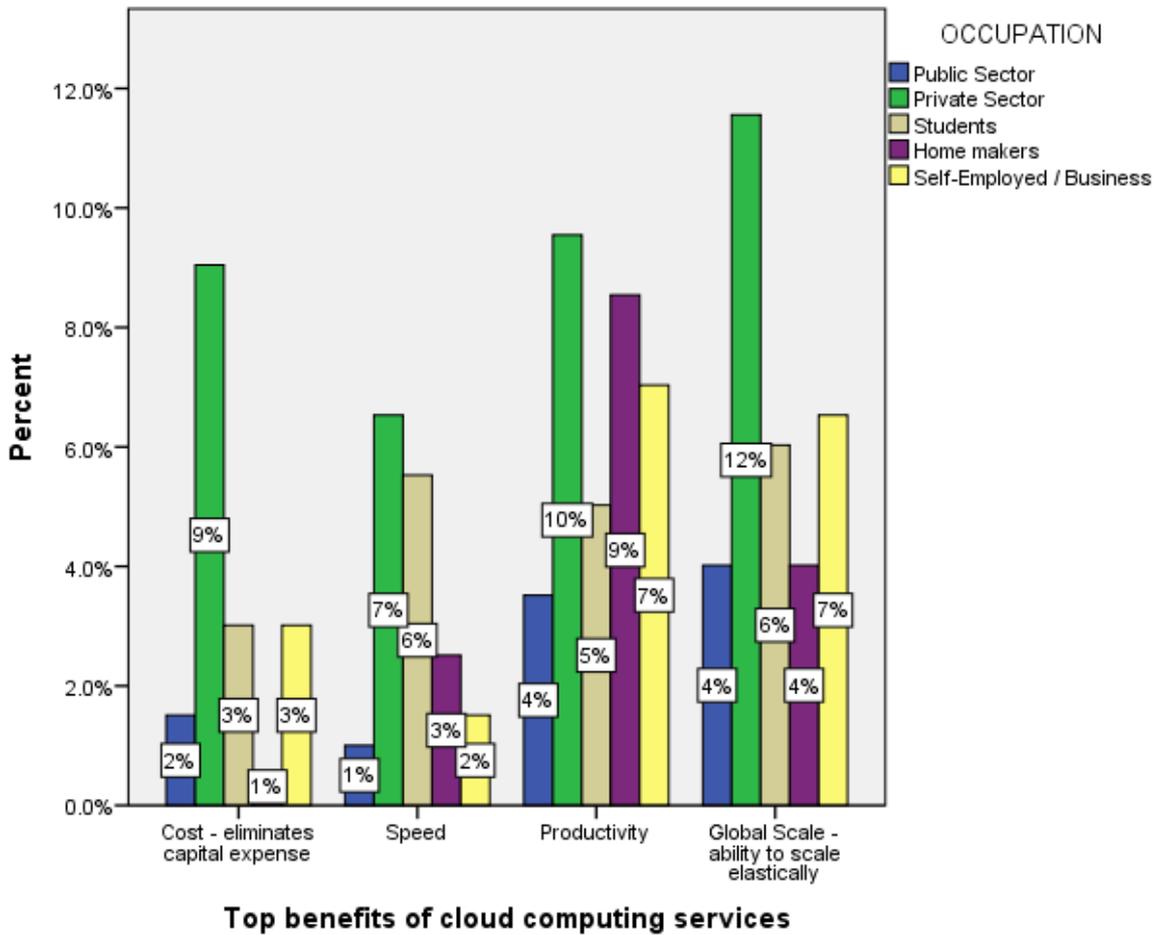**Fig 9:**

Top benefits of cloud computing services

Legend:

It shows the occupation distribution of the respondents and their opinion on top benefits of cloud computing services.
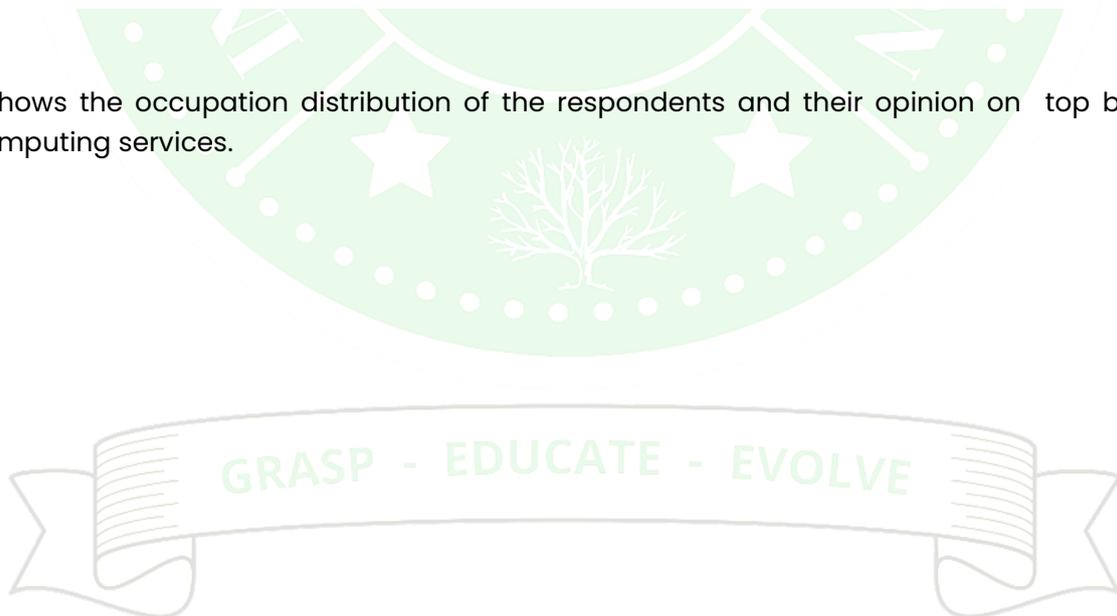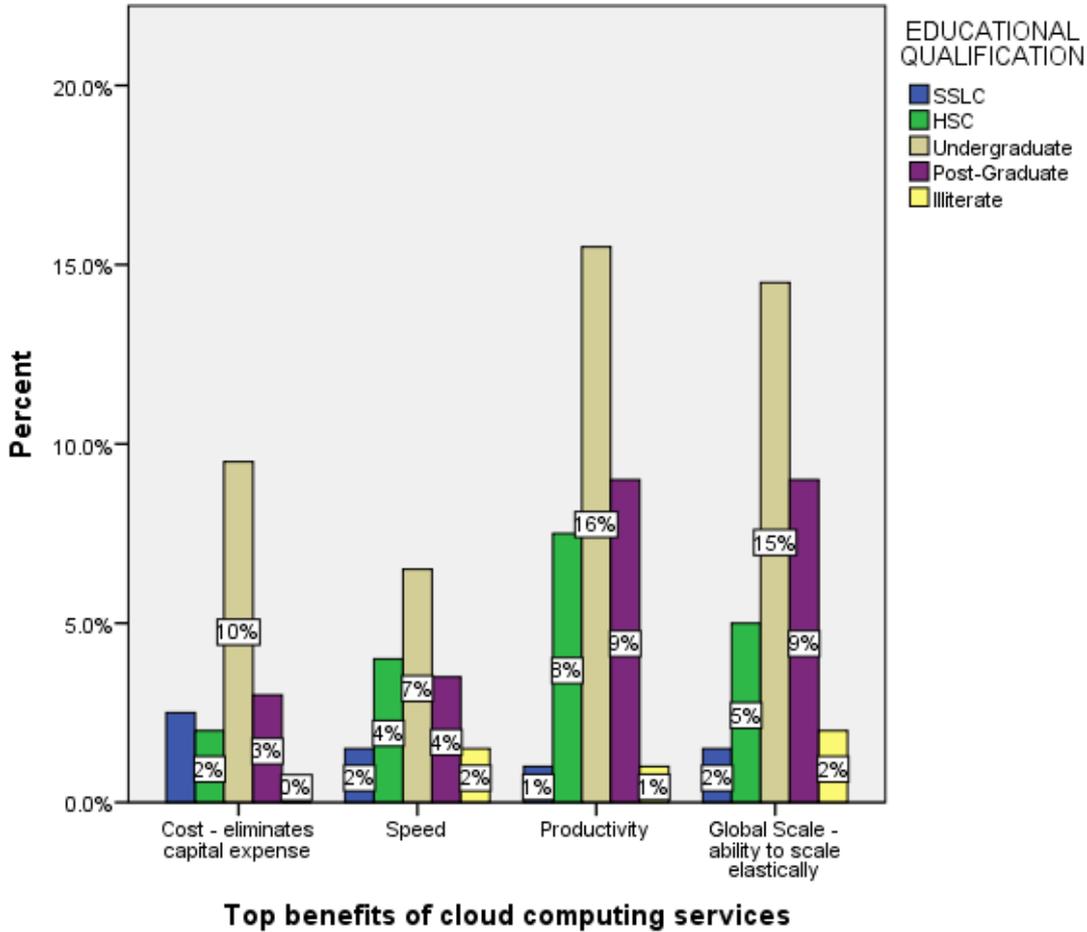
Fig 10:

Top benefits of cloud computing services

Legend:

It shows the educational qualification distribution of the respondents and their opinion on top benefits of cloud computing services.

Fig 11:

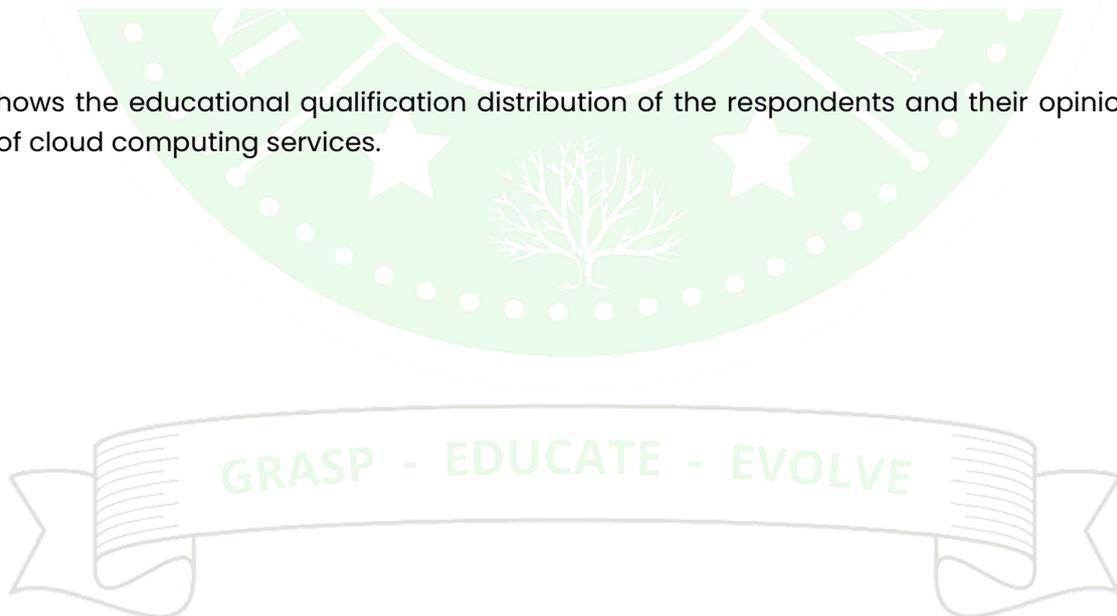Cloud computing services makes data backup, disaster recovery and business continuity easier and less expensive

Legend:

It shows the occupation distribution of the respondents and their opinion on whether cloud computing services makes data backup, disaster recovery and business continuity easier and less expensive.

Fig 12:

Cloud computing services makes data backup, disaster recovery and business continuity easier and less expensive

Legend:

It shows the educational qualification distribution of the respondents and their opinion on whether cloud computing services makes data backup, disaster recovery and business continuity easier and less expensive.
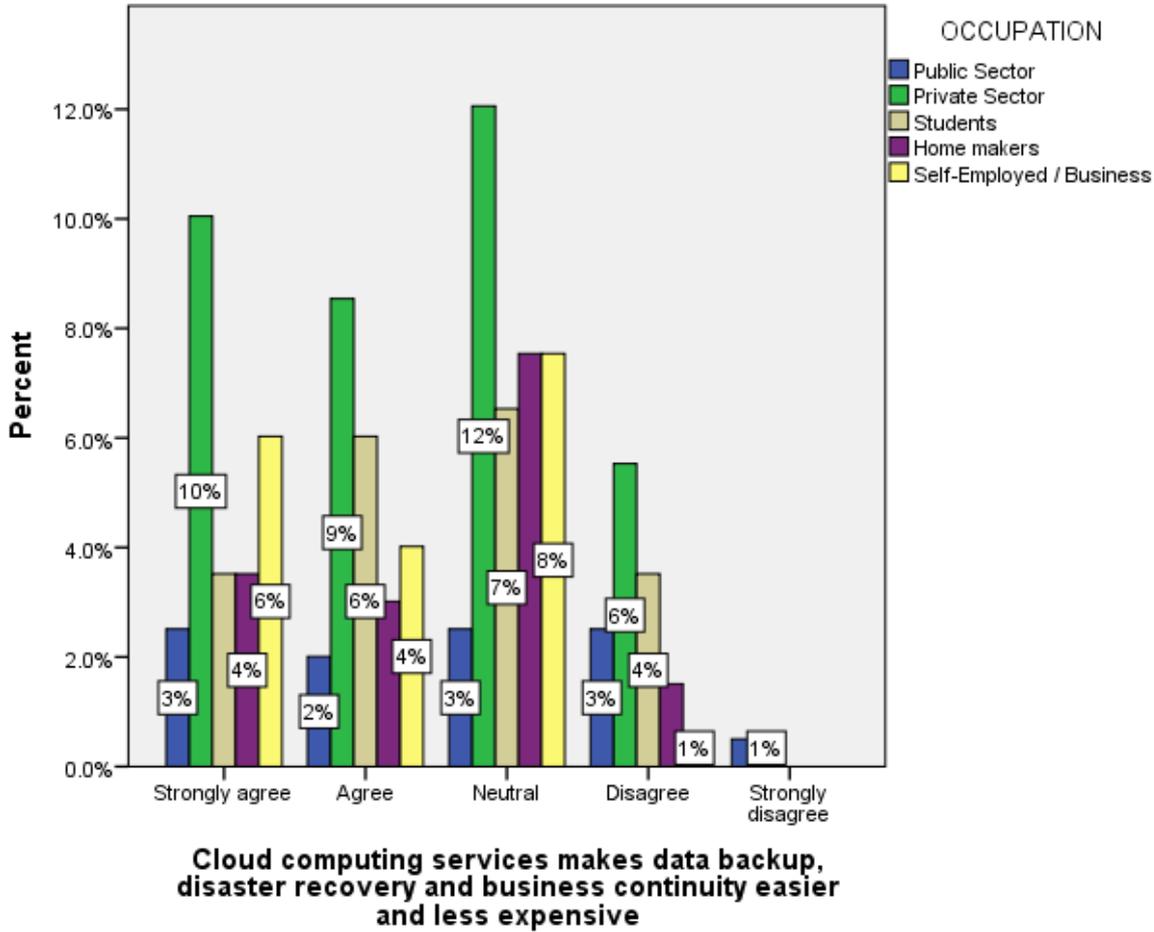
Fig 13:
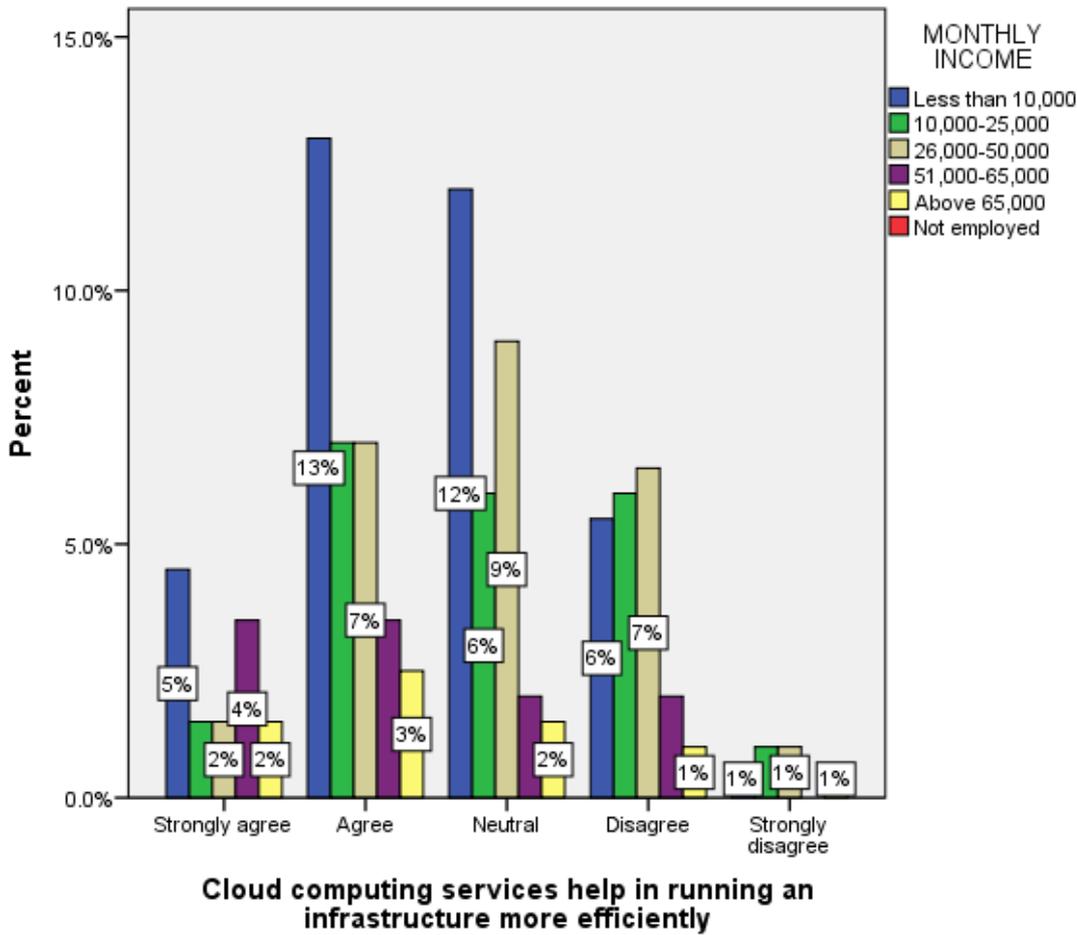
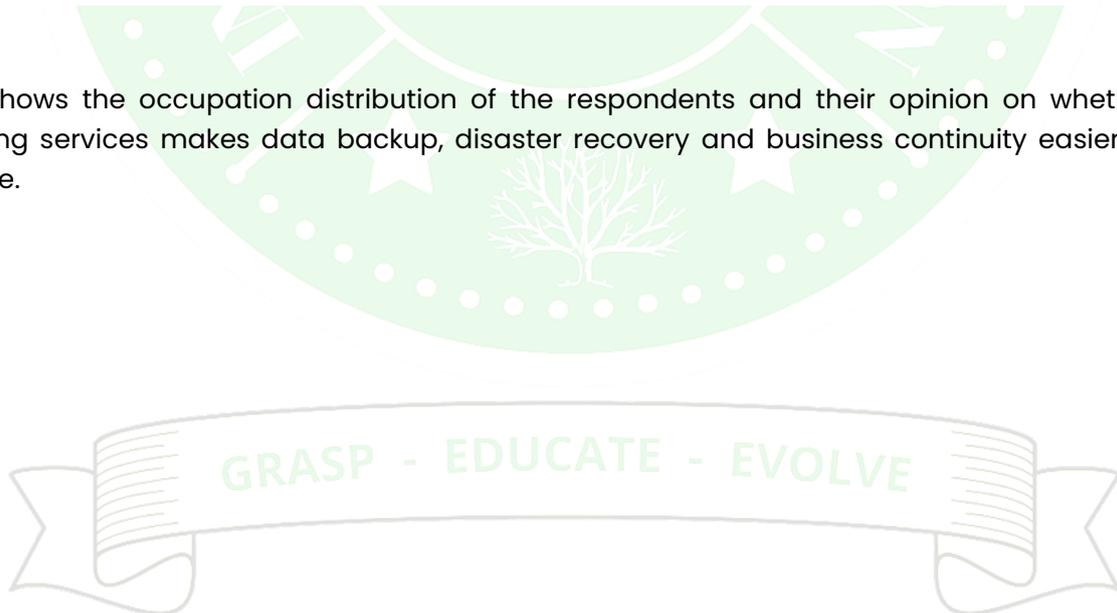Cloud computing services help in running an infrastructure more efficiently

Legend:

It shows the monthly income distribution of the respondents and their opinion on whether cloud computing services help in running an infrastructure more efficiently.

Fig 14:

Cloud computing services help in running an infrastructure more efficiently
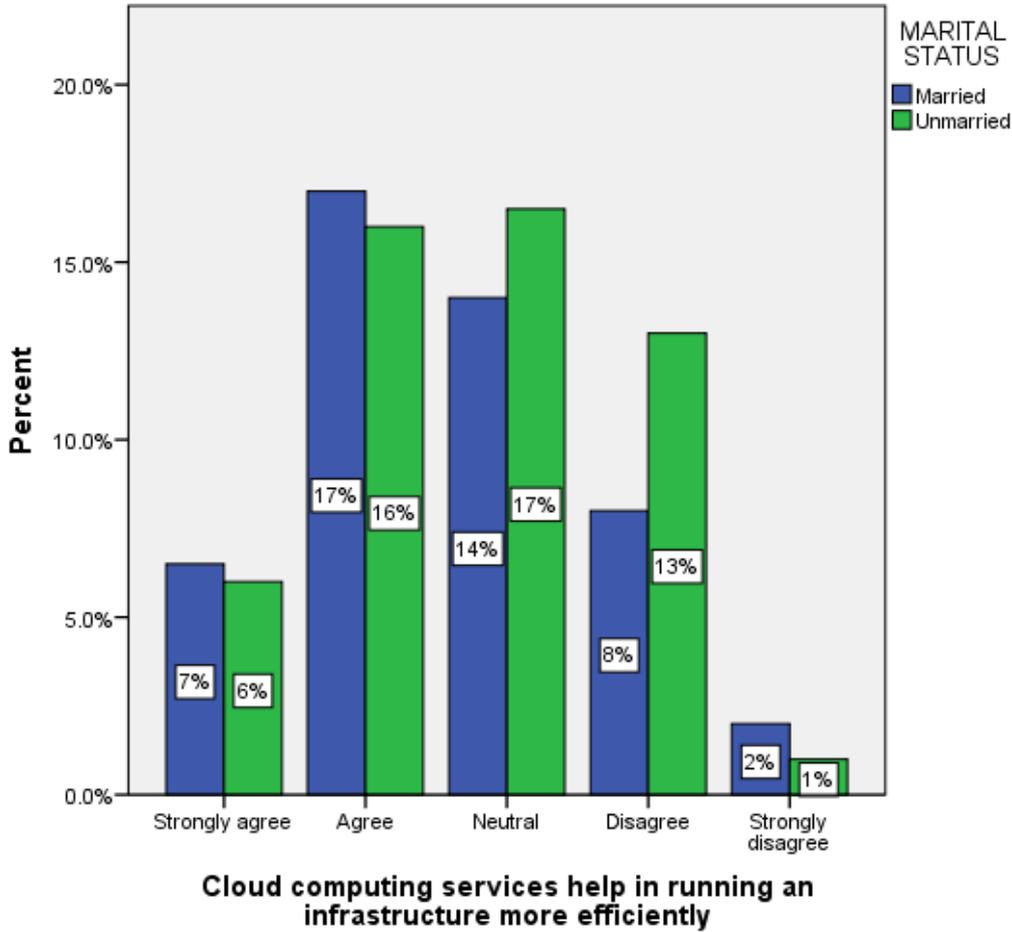
Legend:

It shows the marital status distribution of the respondents and their opinion on whether cloud computing services help in running an infrastructure more efficiently.

Fig 15:

Legend:

It shows the educational qualification distribution of the respondents and their opinion on use of cloud computing services (store, backup, and recover data).

Fig 16:

Legend:

It shows the occupation distribution of the respondents and their opinion on use of cloud computing services (Analyse data).
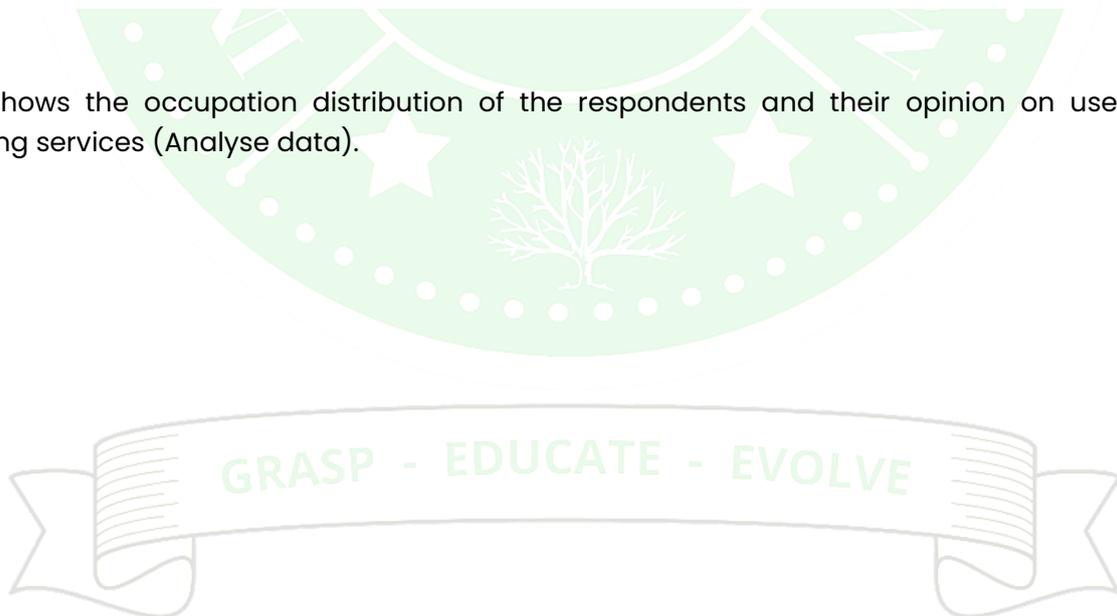
Fig 17:
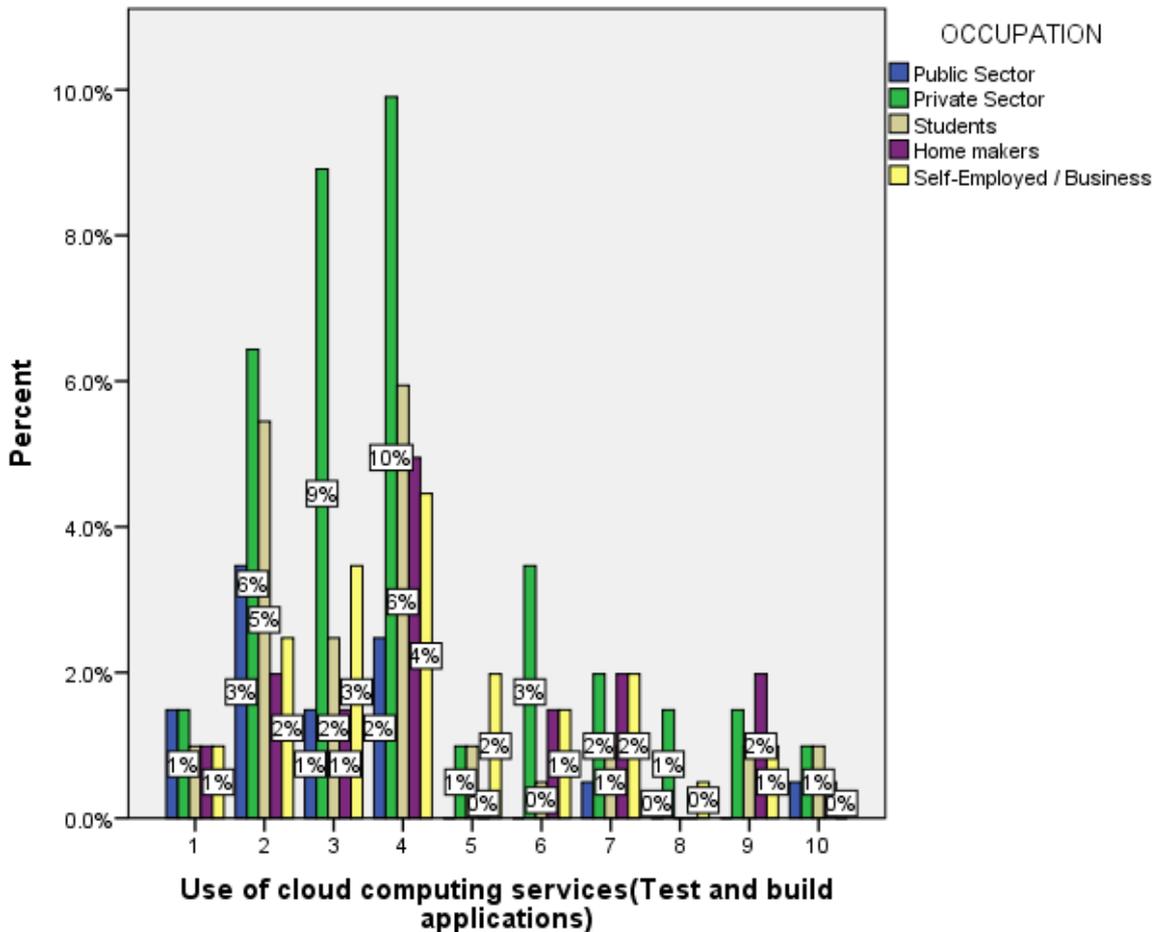
Legend:

It shows the occupation distribution of the respondents and their opinion on use of cloud computing services (Test and build applications).

Result:

In **Fig 7** the highest number of responses was recorded for the option of 4 by 11% of respondents who are undergraduates and the lowest number of responses was recorded for the opinions of 3, 5, 7 and 8 by respondents who have the educational qualification of SSLC, Undergraduates and people who are illiterate for whether cloud computing services lower your operation cost. In **Fig 8** the highest number of responses was recorded for the opinion of 4 by 16% of respondents who are male and the lowest number of responses was recorded for the options of 5, 6, 7 and 10 by 1% of respondents who are both male and female for whether cloud computing services lower your operation cost. In **Fig 9** the highest number of

responses was recorded for Global scale-ability to scale elastically as the top benefits of cloud computing services by 12% of respondents who are occupied in the private sector and the lowest number of responses was recorded for speed and the top benefits of cloud computing services by 1% of respondents who are occupied in public sector. In **Fig 10** the highest number of responses was recorded for productivity as the top benefits of cloud computing services by 16% of respondents who are undergraduates and the lowest option was also recorded for productivity as the top benefits of cloud computing services by 1% of respondents who have completed sslc and people who are illiterate. In **Fig 11** the highest number of responses was recorded for the opinion of neutral by 12% of respondents who

are occupied in the private sector and lowest number of option was recorded for the options of disagreeing and strongly disagreeing by 1% of respondents who are self employed and those who work in the public sector for their opinion on whether cloud computing services makes data backup, disaster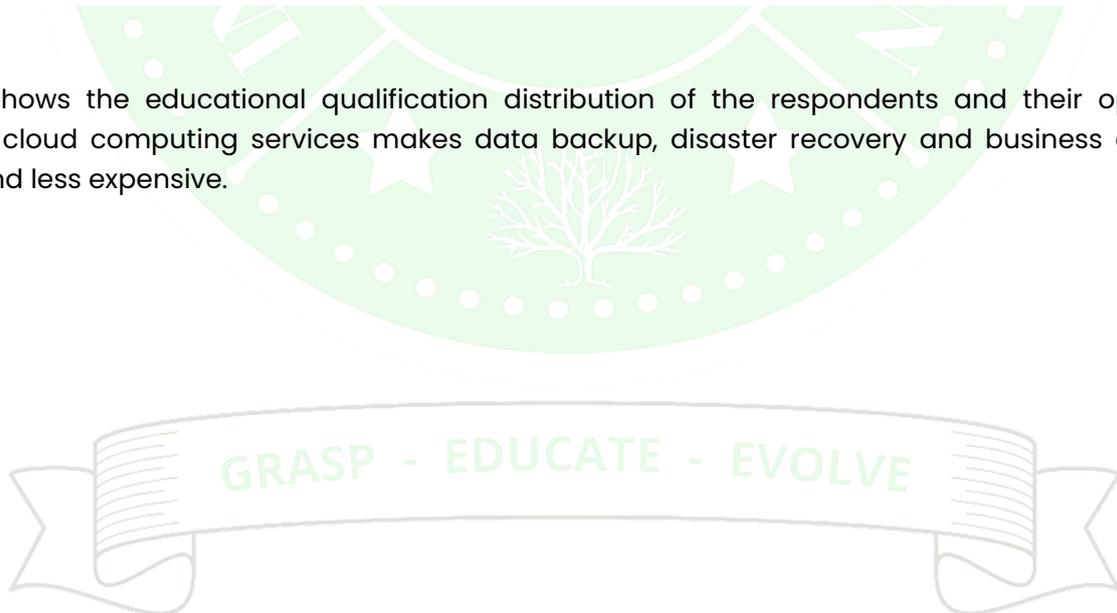 r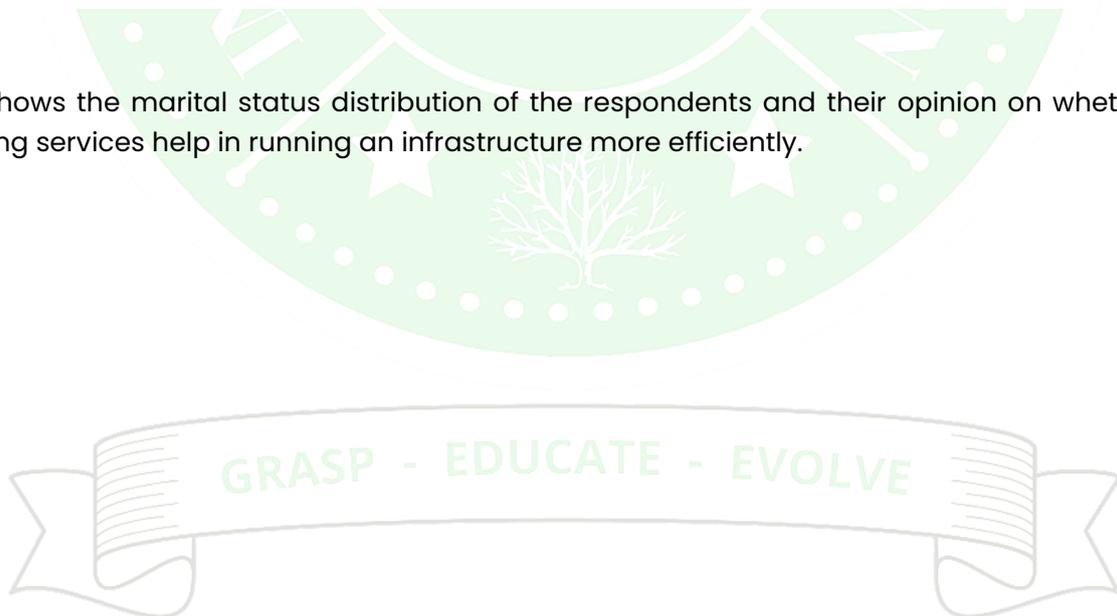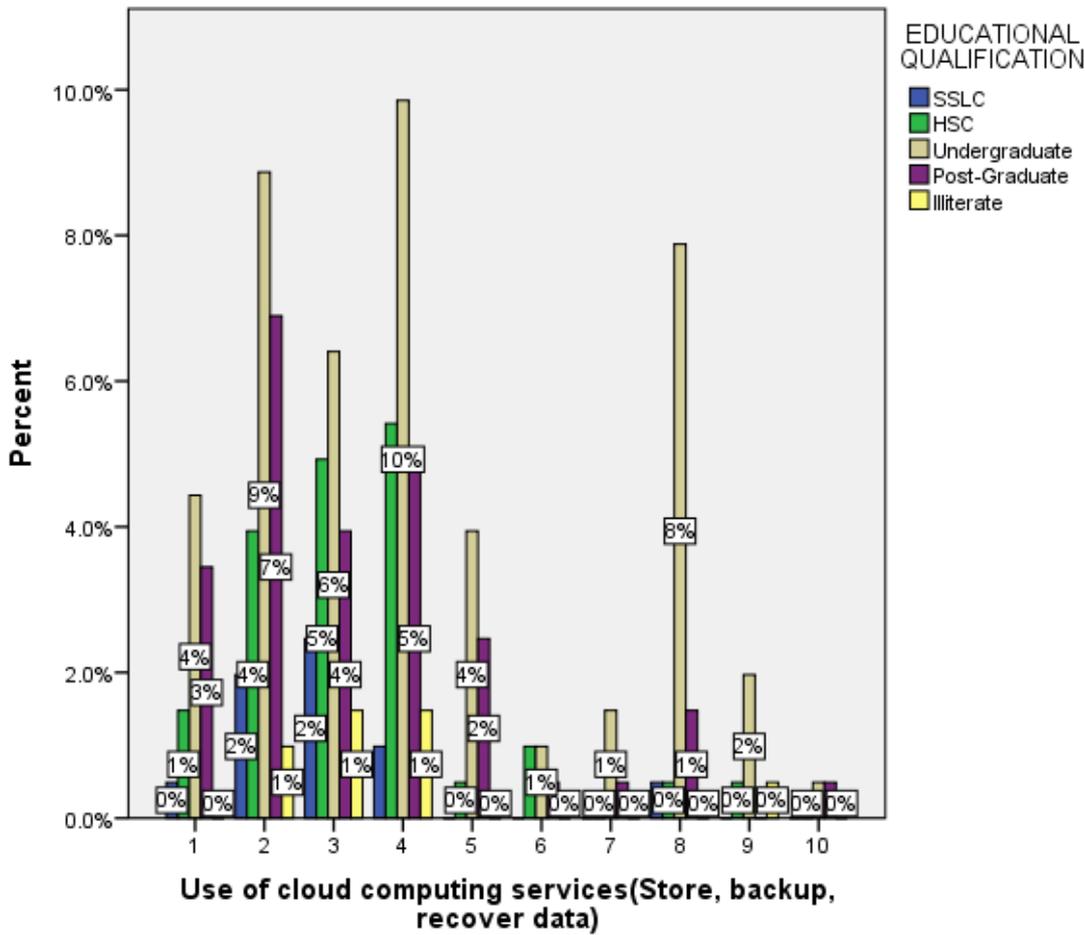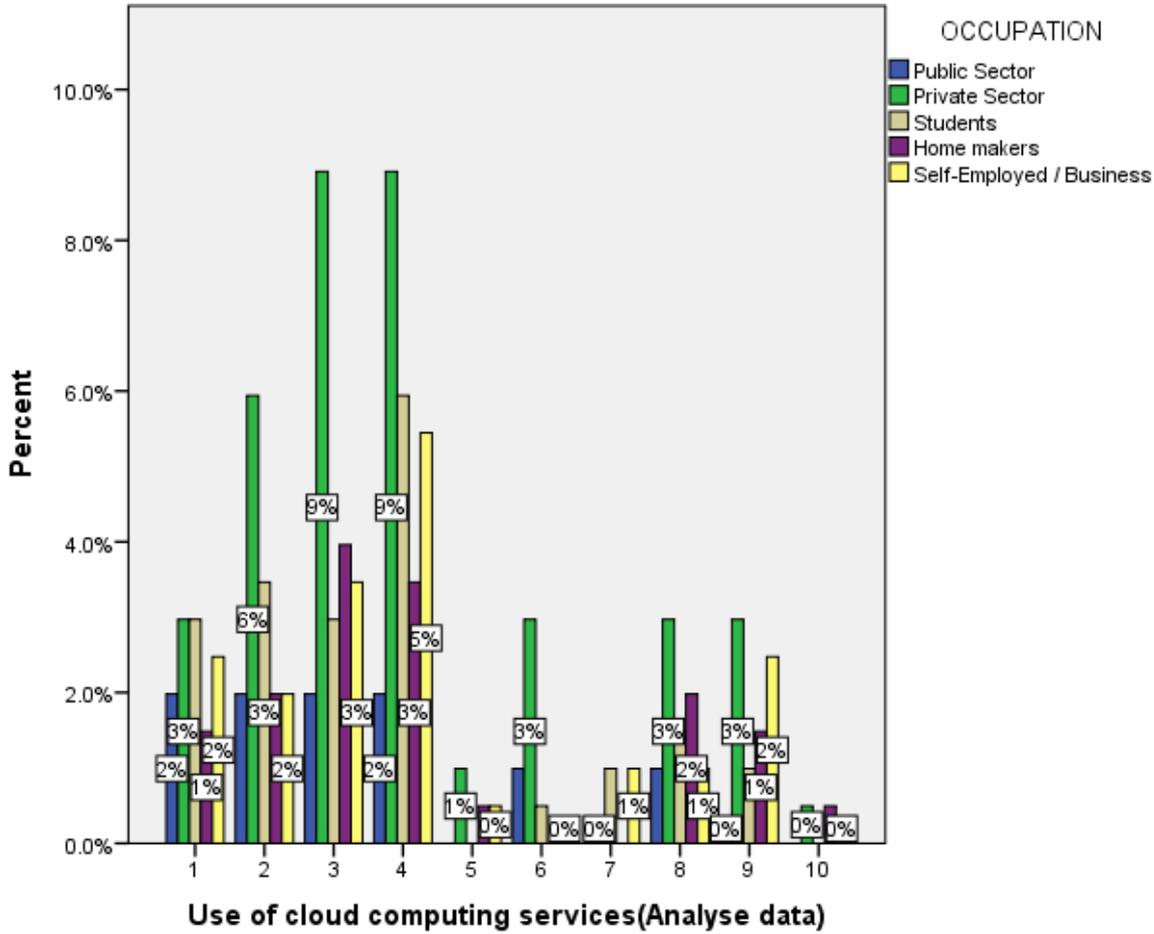ecovery and business continuity easier and less expensive. In **Fig 12** the highest number of responses was recorded for the opinion of neutral by 17% of respondents who are undergraduates and the lowest option observed was of 1% across all the options by people who are illiterate for their opinion on whether cloud computing services makes data backup, disaster recovery and business continuity easier and less expensive. In **Fig 13** the highest number of responses was observed for the option of agreeing by 13% of respondents who earn less than 10,000 monthly and the lowest number of responses was observed for the opinion of strongly disagreeing by 1% of respondents who earn 10,000-25,000, 26,000-50,000 and above 65,000 monthly for their opinion on whether cloud computing services help in running an infrastructure more efficiently. In **Fig 14** the highest number of responses was observed for the opinion of agreeing and neutral by 17% of respondents who are married and Unmarried and the lowest number of responses was observed for the opinion of strongly disagreeing by 1% of respondents who are married for their opinion on whether cloud computing services help in running an infrastructure more efficiently. In **Fig 15** the highest number of responses was recorded for the opinion of 4 by 10% of respondents who are undergraduates and the lowest opinion was recorded for the opinion of 1, 2, 3, 4, 6, 7 and 8 respectively by 1% of respondents who have different educational qualification for store, backup and recover data as the use of cloud computing services. In **Fig 16** the highest number of responses was observed for the opinion of 3 and 4 by 9% of respondents who are employed in the private sector and the lowest number of responses was recorded for the opinion of 1, 5, 7, 8 and 9 by 1% of

respondents who are occupied in different sectors for Analyse data as the use of cloud computing services. In **Fig 17** the highest number of response was recorded for the opinion of 4 by 10% of respondents who are occupied in the private sector and the lowest number of responses was recorded for the opinion of 1, 3, 5, 6, 7, 8, 9 and 10 by 1% of respondents who are employed in different sectors for Test and build applications as the use of cloud computing services.

Discussion:

In **Fig 7** and **Fig 8** when asked whether cloud computing services lower you operational cost a majority of the responses were toward the lower rates on the scale of 1-10 this could be because a lot of respondents are not are not completely aware of the cloud computing services they just have a an idea about these services however Cloud computing is a cost-effective way for businesses to outsource their IT needs and reduce their overall IT costs. With cloud computing, businesses can access the resources they need on an as-needed basis, which eliminates the need to purchase and maintain expensive hardware and software. In **Fig 9** and **Fig 10** when asked their opinion on the top benefits of cloud computing services a large set of respondents have opined for productivity and ability to scale elastically as the top benefits of cloud computing services this could be because it provides access to technology services on an as-needed basis from a cloud provider. Organizations of all sizes and industries can use cloud computing for processes like data backup, email, virtual desktops, software development and testing, big data analytics, and they allow IT departments to expand or contract their resources and services based on their needs while also offering pay-as-you-grow to scale for performance and resource needs to meet service level agreements. In **Fig 11** and **Fig 12** it can be observed that the highest response was marked for the opinion of neutral for cloud computing services make data backup, disaster recovery and business continuity easier and

less expensive this could be because the proponents of cloud computing will tell you that the technology offers the best of both worlds: it provides the storage and ability to share files, yet lets users keep the PCs that they are loathe to give up however cloud computing makes data backup, disaster recovery and business continuity easier and less expensive because data can be mirrored at multiple redundant sites on the cloud provider's network. In **Fig 13** and **Fig 14** when asked whether cloud computing services help in running an infrastructure more efficiently it can be observed that a vast majority of respondents have agreed to the fact that cloud computing services help in running an infrastructure more efficiently this could be because cloud computing can maximize a company's efficiency in so many ways, particularly by suppressing budget, supporting work-from-anywhere trend, and significantly cutting the time needed to process big data aside from these three, there are many other advantages that companies can get by investing in cloud solutions such as scalability and flexibility, data loss prevention, advanced security etc. In **Fig 15** when asked whether to store, backup and recover data as the main use of cloud computing services the opinion was toward the lower rate on the scale of 1-10 this could be because if your Internet connection fails, so does your access to remotely stored data. Cloud based storage is dependent on having an internet connection. If you are on a slow network you may have issues accessing your storage. In the event you find yourself somewhere without the internet, you won't be able to access your files. In **Fig 16** when asked whether data analysis is the main use of cloud computing services the opinion was toward the lower rate on the scale of 1-10 this could be because the respondents are not highly informed about the benefits that cloud comput services provide however Cloud-based analytics assists businesses to become more competitive as they deliver analytical data and results to the end-users, giving them a chance

to make better decisions. Cloud computing can help a data scientist use platforms which can provide access to programming languages, tools and frameworks. In **Fig 17** when asked whether testing and building applications is the main use of cloud computing services the opinion was toward the lower rate on the scale of 1-10 this could also be because the respondents are not highly informed about the benefits that cloud computing services provide however one of the most exciting services the cloud offers is the ability to build applications with speed. When application development and testing are done in a cloud environment, there's no waiting to procure, configure, provision infrastructure, so software and microservices can be updated and released faster. Cloud testing helps organizations overcome the commonly faced problems related to costs and time to market.

Conclusion:

Cloud computing is a recent technological development that has the potential to have a great impact on the world. It has many benefits that it provides to its users and businesses. For example, some of the benefits that it provides to businesses is that it reduces operating cost by spending less on maintenance and software upgrades and focusing more on the businesses itself. But there are other challenges that cloud computing must overcome. People are very skeptical about whether their data is secure and private. There are no standards or regulations worldwide provided data through cloud computing. Europe has data protection laws but the US, being one of the most technologically advanced nations, does not have any data protection laws. Users also worry about who can disclose their data and have ownership of their data. But once there are standards and regulations worldwide, cloud computing will revolutionize the future. Cloud computing services have become an essential part of the modern technology landscape, offering numerous benefits to individuals and organizations alike. Cloud computing services provide on-demand access to a range of

computing resources, such as servers, storage, databases, and applications, over the internet, enabling users to scale their computing resources up or down as needed. In conclusion, cloud computing services are an increasingly popular and beneficial solution for individuals and organizations looking to improve their computing capabilities, reduce costs, and enhance collaboration and productivity.

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