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A WEB BASED JOB SELECTION THROUGH CV ANALYSIS USING NATURAL LANGUAGE PROCESSING.

APPROVAL FORM

The undersigned certify that they have supervised the student Allan S Kamuruko's dissertation entitled web based job selection through cv analysis application using NLP submitted in Partial fulfilment of the requirements for the Bachelor of Science Honors Degree in Information Technology of Bindura University of Science Education.

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EXTERNAL EXAMINER SIGNATURE DATE

Dedication

I dedicate this dissertation to my parents, Mr. and Mrs. Kamuruko, who did a good job of guiding me down the route I've chosen and encouraging each of my aspirations in whichever manner they could. I am aware that they waited a very long time to witness this success.

Acknowledgements

I want to thank and honor the Almighty God for giving me strength and life during my journey. A special thanks also goes out to my parents, two beautiful sisters, and wonderful sisters for their unwavering love and support during the road.

I also want to express my gratitude to Mr. Kanyongo, my supervisor, for his support, encouragement, and direction throughout the project.

I owe BUSE a special debt of gratitude for accepting me, offering me more than I anticipated, and exhibiting exceptional patience and cooperation throughout my learning experience. Mention should also be made of my supervisor, Mr. W. Kanyongo, the Industrial Attachment Supervisor, Mr. Magomelo, Mr. P. Chaka, Mr. C. Zano, Dr. Sakala, who taught me software project management, and the other Lecturers in the Faculty of Science. Mr. Chaka introduced me to databases, Mr. Zano introduced me to computer programming.

Last but not least, a huge thank you to my mentor Chipu Mapondera for encouraging and supporting me to do this research. There are other individuals whose names I was unable to mention. I'm thankful for all of your assistance and support.

Abstract

This study examines the web based job selection through cv analysis application concept for Hr. Department. This been brought about by the short falls of the manual way of analyzing CVs currently being used. To develop an up to standard system, the researcher employed a data gathering technique which is a questionnaire. Respondents expressed concerns over the manual way of shortlisting CVs. This system replaced manual way of shortlisting CVs with a web based job selection through CV analysis applications that analyze thousands of resumes and produce a fair score and then rank candidates based on CV score. Candidate will upload their own CV into the system which will be further used by the system to shortlist them for the position. Thus, the system will enable a more effective way to shortlist candidates from a large number of applicants providing expert workforce for the organization.

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LIST OF ACRONYMS

AI – Artificial Intelligence

BUSE- Bindura University of Science Education

CV- Curriculum Vitae

HR – Human Resource

GB - Gigabytes

NLP – Natural Language Processing

RAM – Random Access Memory

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CHAPTER 1

1.1 Introduction

The process of selecting the best candidate for a job is difficult due to a massive pile of CVs, lack of information about the job and lack of sufficient information of job seekers. (Nguwi, 2021) says hire people on merit and half your problems are gone. Businesses that recruit and select people based on their performances during recruitment performs well. Hence in regard to this issue the research project aim at providing a solution by giving the HR department a web based application that selects the right candidates through CV analysis. The Selection through CV analysis system uses machine learning to analyze the CVs and then rank candidates based on their skills, experiences and education. The system will select the right candidates for particular job based on CV score.

1.2 Background of the Study

The basic idea to come up with this project came from the words of Singapore's first prime minister (Yew, 1965) who stated that "If you want a country to succeed, you must have a system that enables the best man and the most suitable to go into the job that needs them". (Nguwi, 2021) agrees with the former prime minister and states that countries that recruit and select people on merit to fill in public positions tend to do well economically.

Companies face problems associated with nepotism during recruitment and selection. Nepotism can be defined as practice of unfairly giving the best jobs to members of your family when you are in position of power (Zinyemba, 2014). In the public sector, it is considered a particularly toxic phenomenon as it goes against the public interest as citizens generally expect that public employees should deserve their jobs, hired according to merit based criteria (Fisman and Golden, 2017). According to (Thabani, 2017) nepotism in Zimbabwe is of 14%. Nepotism remains the main norm in Zimbabwe and it happens when those in higher management positions influence the recruitment and selection. Top management uses their power to favor friends and family by securing jobs for them. It is standard practice for the organization to post a job opening for application. The selection and recruitment procedure is carried out to fill a position when a candidate has already been found. It's possible that some applicants won't even go through the same recruitment and selection procedures as other applicants. Such

circumstances make the hiring and selecting process laughable. Workers at the Great Zimbabwe University petitioned the Zimbabwe Anti-Corruption Commission and Higher and Tertiary Education Minister over corruption and nepotism amid claims that over 50% of the university staff management is related (Chitagu, 2022). Unavoidably, the majority of the Great Zimbabwe University employees, constituting 65% thereof are related.

According to International journal of Science and Research in 2014, government controlled companies such as parastatals face challenges of recruitment. Political polarization has spilled over into companies. It goes without saying that politicians occasionally have the power to sway the hiring and selection procedure by suggesting individuals for appointment to open positions. Human resource managers typically cooperate out of concern for their careers. Sometimes this leads to the hiring of underqualified staff at the expense of qualified and experienced individuals by the organization. Similar to nepotism, political influence has caused firms to make hiring decisions based on a person's political allegiance, which presents a problem for potential employees. Human resources managers struggle with the question of which political background should employees be chosen because of the country's political polarization between the major political parties.

Technology is constantly improving and helping professionals from different fields to get their job done faster and better (Omnes, 2018). These changes in technology affect the recruiting process as well, so professionals should stay up-to-date with techniques that can help them find the perfect person for a job. Today's technology makes it seem as though anything is possible. The corporate sector has seen numerous changes because to technology. The invention of computers and the internet has substantially expanded the effect in the information age. Many businesses are dependent on computer technology to even run. A roller coaster ride like selection will only get more interesting as new technologies and breakthroughs are developed. For a number of reasons, businesses are moving to online solutions. Since transactions are conducted online, one of the motivations is to lower operational costs. This can be observed in almost every aspect of company, including human resources, where technology has a significant influence on HR procedures.

The success of a business depends entirely on the ability to attract and hire great people (Adewale, 2016). Recruiters must be more selective in their selections as the labor market becomes more competitive and the range of skills available increases. This is because bad hiring decisions can have long-term negative consequences, including high training and

development costs to reduce poor performance and high turnover, which in turn affect employee morale, the creation of high-quality products and services, and the preservation of organizational integrity. In the worst case scenario, the company could fail to meet its goals, losing its advantage over competitors and market share.

An automated way to read CVs is through CV analysis (Partager, 2022). The top skills are found quickly by using it to quickly pre-qualify individuals. Parsing, often known as "résumé parsing," is a method for automatically examining resumes. Massive pile of CVs can now be analyzed using a resume parser which uses natural language processing. This means that every cv can now be analyzed and candidates will be ranked based on their cv score.

1.3 Statement of the Problem

It is a challenging task for the HR department to select deserving candidates from a massive pile of CVs as they tend to skip some CVs for example a company like Econet receives thousands of resumes and it will be difficult to read and analyze all the CVs. However, the problem is that some candidates which deserve the job are skipped which results in the company hiring candidates that do not deserve the job.

1.4 Research Objectives

1. To develop a web based application that selects the best candidate for a job.
2. To produce ranking decisions that would have relatively higher consistency than those of human experts and rank candidates based on CV score.
3. To evaluate the performance of the system compared to the manual way of analyzing CVs.

1.5 Research questions

1. How will the application select the best candidate?
2. How will the application rank candidates?
3. Will the system be useful?

1.6 Research Hypothesis

H1_a: Companies that use AI to analyze CVs and select candidates are more likely to hire best employees.

H1_b: Companies that posts jobs online get the best employees.

1.7 Significance of the study

1.7.1 To the researcher

It will allow the researcher to gain a deeper understanding of the research area, as well as theoretical and practical knowledge, and will motivate the researcher to put theoretical principles into practice in the area under study.

1.7.2 To Companies

Most companies in Zimbabwe are being affected by lack of expert workers which hinders production and performance of a company. In order to reduce this a selection through CV analysis system will analyze every cv and come up with the best candidate for a job.

1.7.3 To the University

The study will help the human resources department and other research projects addressing the study's topic by offering a platform and details on related studies in the area and promoting other related issues.

1.8 Assumptions

The study was based on the following assumptions:

- i. The CVs uploaded by candidates are valid.
- ii. The researcher assumes that every user has an internet connection and a device that can access the web application.

1.9 Limitations

Limitations represent factors such as defects and conditions that are beyond the control of the researcher (Silverman, 2016).

Time Constraints

This study was limited by the scope of time available for the research. This resulted in the researcher focusing on the cv analysis thus leaving the personality test and aptitude test, in order to limit the amount of time needed to undertake the study.

Financial Constraints

The researcher faced financial difficulties because he is a student with no independent source of income and relies on his family for financial support. As a result, the researcher decided to use less expensive techniques, like the internet.

1.10 Delimitation of the research

Delimitations are characteristics that narrow the scope and determine the boundaries of the study set by the researcher (Leedy & Ormrod, 2010). Delimitations are choices made by the researcher and adapted for use in the research to confine it to a particular set of boundaries. The research is focusing on the Human Resources department and can be used in any company domain. This system will be a compact module that can be added to company's official website and is simple for applicants to find. The system will inform the job seekers for the vacancies in the company through the website. The research system will interact with administrator and job candidate activities.

1.11 Definition of Terms

Selection: refers to the process of determining the best candidate from the pool of applicants (Lesiuk, 2022).

Machine learning: is a type of artificial intelligence that allow software applications to become more accurate at predicting outcomes without being explicitly programmed to do so (Burns, 2021).

Artificial Intelligence: is the branch of computer sciences that emphasizes the development of intelligence machines, thinking and working like humans (Saeed, 2020).

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

A literature review is a systematic, topic focused, reproducible method of identifying, evaluating and interpreting existing literature (a body of recorded work) that has been produced by scholars, researchers and practitioners (Lambert & Clinton, 2010). This chapter reviews theories, literature and studies relevant to the area of study. Understanding the research area of selection through cv analysis is the most crucial task. When reviewing the literature, emphasis is placed on how to develop the best system that can meet the needs of job seekers, job creators, and how the system can be easily understood as well as understanding the definition of different terms, and then in developing a system that can fulfil the objectives and answer the research questions. Better selection tactics lead to improved organizational outcomes. The job selection system literature review will be prepared with reference to this framework in order to throw light on the selection process. The core matter is to recognize universal practices which organizations adopt in selection of employees then, to determine how the selection procedures have effects on organizational results (Nel et al., 2004).

2.1.1 Definition of Job Selection

Job selection is the process of identifying an individual from a pool of job applicants with the requisite qualifications and competencies to fill jobs in the organization (SpriggHr, 2020). This HR procedure employs a number of strategies to help distinguish between qualified and unqualified applicants. Placing the right individual in the proper job is implied by the phrase "selection." Recruiters use a variety of techniques during the selection process to determine which applicant is best suited for the position. Some activities include screening, eliminating unsuitable candidates, interviews and conducting an examination (aptitude test, intelligence test, performance test, etc.)

2.2 Relevant theory

2.2.1 The old style of Selection

Recruitment wasn't always as simple as it is now. It was not possible to deliver your resume to the organization in such a short amount of time. It had to be printed, placed in an envelope, and then sent out with the hope that it would reach the organization the next day (NCVM, 2016).

People started creating personal profiles that listed their skills. Businesses started to outsource their hiring requirements as the economy grew. Due to the lack of an internet connection or other support, recruiters had to rely on bulletin boards and paid advertisements in newspapers. Only word of mouth and face-to-face interviews with applicants who brought their resumes were used for recruitment. The fact that CVs were housed in storage filing cabinets made it challenging to locate a certain CV (Opus Recruitment Solutions, 2018).

Ulrich examined the human resource competencies that are still employed in the hiring and selection procedures today in the 1980s. Competency frameworks were developed by many organizations and contain the distinctive qualities, abilities, and experience that each organization demands of potential employees. The right staff can be chosen by organizations using these carefully established frameworks (Cohen, 2015).

2.2.2 The process of Job Selection

The enrollment process's structure, which was plainly described above, suggests that it required revision. The introduction of computerization in HR departments means that hiring processes may now be progressed online and candidates can be selected using a variety of programming skills in place (Johnson and Gueutal, 2011). This ensures a fair selection as all candidates are given equal possibilities. Selection is completed using computer based systems that provide expert cv analysis and aptitude testing to support the online selection process.

Innovation has created to a degree in which job selection can be led on the web and determination of pertinent individuals from wherever on the planet (McConnell, 2021). According to reports 60 percent of the professionals needed for programming enhancement who enroll in the United States are from developing countries, particularly India, and they are selected through online testing. This has made selecting applicants with the highest aptitude reasonable. It is a very effective way for making quick decisions when hiring people for jobs requiring specific skills. More people now look for jobs online (Fotheringham, 2021).

2.2.3 E-Selection

E-selection can be defined as the various forms of technology used to assess the degree to which the candidates fit with the job requirements based on their knowledge, skills and abilities (Stone et al, 2017). E-selection systems are used to manage flow of applications, evaluate the effectiveness of selection processes, and evaluate the knowledge, abilities and skills of job candidates. For instance, CV scanning systems often check CVs for keywords

using AI and provide candidates with quick feedback on their fit for a role (Henderson, 2022). Anybody from anyplace can apply for an advertised job. It is not important if the candidate is in South Africa and the business is in Zimbabwe. The system operates on a 24-hour service which is an advantage.

2.2.4 Benefits of E-Selection

Utilizing the e-selection software will enable recruiters to connect with more candidates both domestically and abroad (HR-ON, 2019). Additionally, statistical analysis will be crucial for hiring managers to determine where candidates saw the job adverts.

Using the e-selection software saves time (Mamatha et al., 2022). With access to the internet, HR manager can post jobs at any time, no matter where you are. In other words, the HR can forgo the paperwork and the process of manually entering data. Because of this, accessing files from the software will speed up the application process in addition to saving HR manager's time.

Using the software allows the HR department to have a better chance of finding the best candidate (Myburgh, 2012). Firstly, a considerably wider audience is reached by internet selection. There is a far larger probability that HR department will locate the ideal candidate if there are more applicants. Secondly, HR department can develop a thorough profile of the ideal prospect with the aid of the e-selection software. With that HR will be able to construct the ideal job description and job offer on the board because the HR department will know exactly it's looking for. The well-researched and measured approach will have a much better effect than simply posting about the position, both in terms of engaging with candidates and finding the right person for the job.

In terms of adaptability, the E-selection process is straightforward (Mamatha, 2022). As a result, it is simple to use and offers a platform from which all HR managers can track the recruiting process and their funnel.

2.2.5 Disadvantages of E-Selection

PC proficiency is required: The application is only open to those with a background in computers. The channel depends on a website; a PC-literate person or organization is needed to be able to use the application.

Massive pool of CVs: Everyone has access to the internet; it is challenging to set a cap on the number of candidates (Joseph, 2019). Organization may be flooded with many CVs from unqualified candidates. In order to solve the problem, businesses must be very detailed and supply as much information they can to find the best person for a job.

Information Reliability risk: The applicant's capacity to falsify and manipulate documents, files, and information implies these risks (Jackson and Mathis, 2009). In other words, not all of the information available online is trustworthy. In his investigation, Schweyer (2001) discovered that statistics indicate that most people have computer twins with similar names and even birthdates. These may be examples of fictitious postings made under someone else's name, which is a type of online identity theft.

2.2.6 Review of Existing Systems

Glassdoor

Glassdoor is a recruitment site that help people everywhere to find a job and company they love, while helping HR department to hire quality talent. Robert Hohman co-founded Glassdoor in 2007 and currently serves as chairperson. Glassdoor was launched online in 2008. The company is now one of the largest and fast-growing job and recruitment sites in the world.

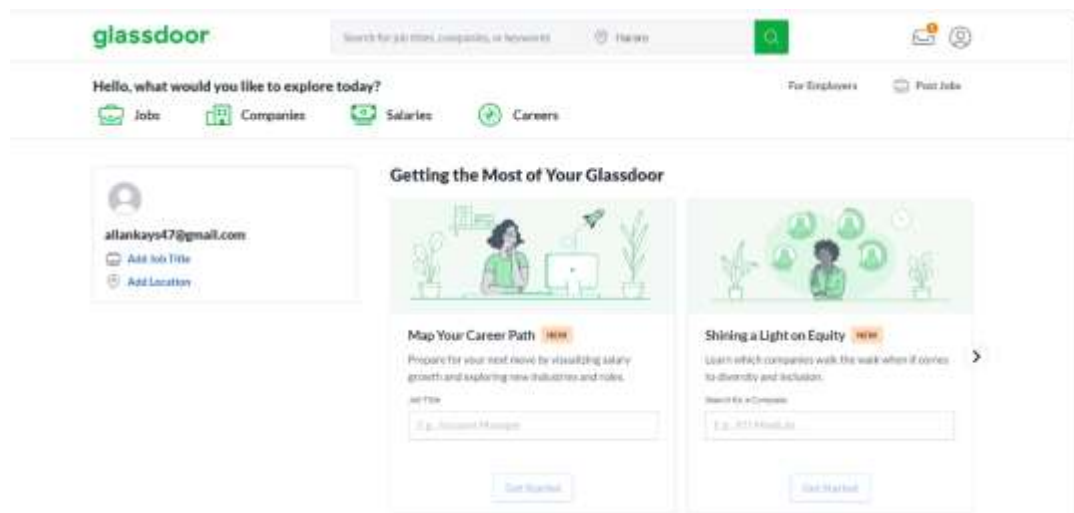


Figure 2. 1 Glassdoor Interface

ZipRecruiter

It is a job site that uses Artificial Intelligence to match applicants to the roles that are right for them. It works 24/7 to send candidate jobs that are a great match for your skills and experience using AI. The companies can reach out to the candidate by just looking at their profile. It saves

time with 1-click apply as recruiters will have candidate's information and no more filling out applications is required.

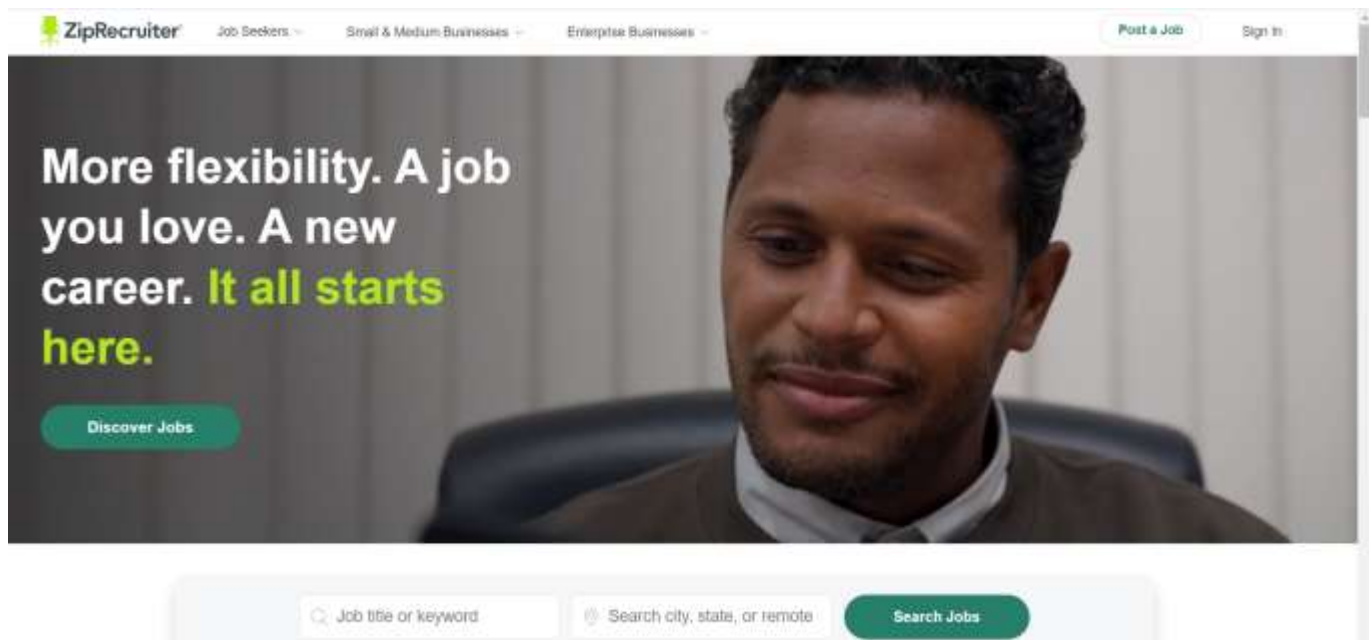


Figure 2. 2 ZipRecruiter Interface

Indeed

Indeed, is the most well-known job search engine. It compiles job listings from countless other job sites, like CareerBuilder, Monster, etc. You can perform a search by state, city or zip code, filter the results by job type, title, pay and other factors, and store the searches for later use. The website uses keyword progression for a more thorough search that greatly improves the results of your inquiry. Indeed, offers the opportunity to upload your CV, which makes it easier for recruiters to find you online.

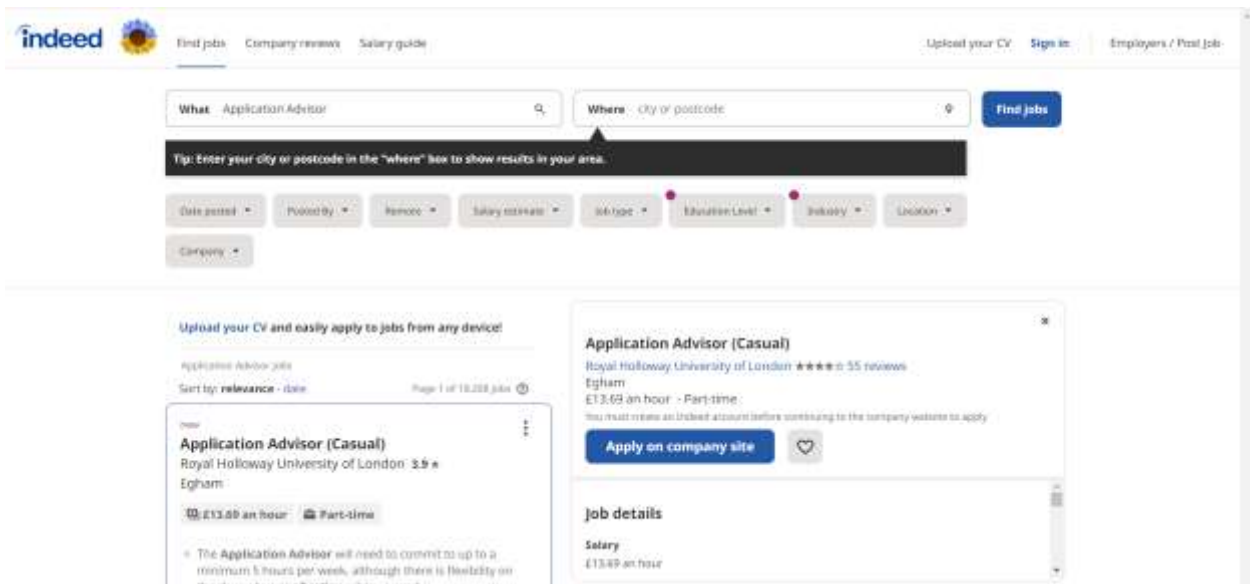


Figure 2. 3 Indeed Interface

LinkedIn

LinkedIn is an American internet service focused on business and employment, LinkedIn is accessible through mobile apps and websites. The platform, which was introduced on May 2003 enables employers to post jobs and job seekers to post CVs. It is primarily used for professional networking and career development. Since 2015, the majority of the business earnings have come from selling access to information about its members to recruiters and sales professionals. It is now a subsidiary of Microsoft and it has 774+ million registered members from over 200 countries.

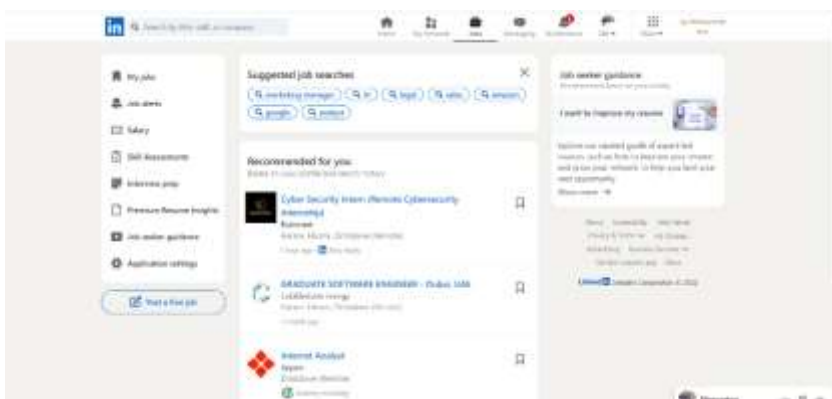


Figure 2. 4 LinkedIn Interface

Vacancy Mail

Vacancy Mail is Zimbabwe's leading job platform or website. It posts jobs and allows job seekers to apply online for free. There is vacancy mail premium where you purchase a premium package using Eco cash, local bank or MasterCard. Vacancy mail premium is a job matching and CV search results enhancement service that allows premium members to benefit from exclusive offers that can cut their job search time from years to weeks. CVs and profiles are matched to job posted on the vacancy mail platform, increasing its visibility and chances of being shortlisted. The profile will appear on top of CV search results in the relevant category.

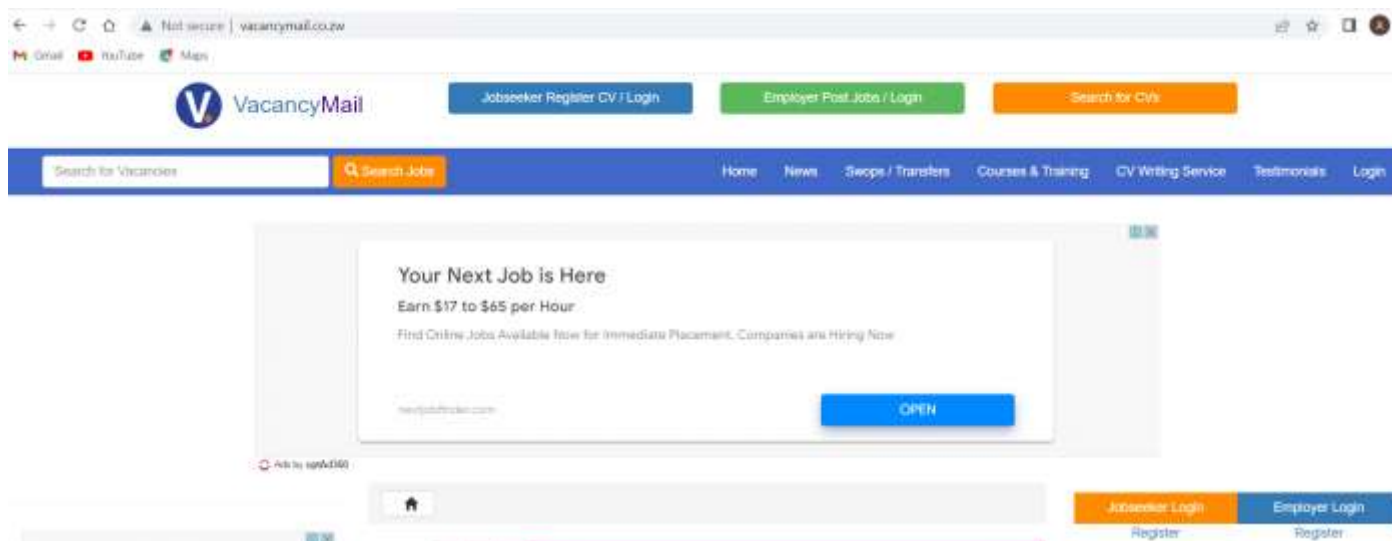


Figure 2. 5 Vacancy Mail

Jobberman

Jobberman is an online employment platform that connects employers with job seekers, allowing employers to publish the requirements for the types of people they are looking to hire. While the applicant uploads his or her credentials to the platform, the system searches for jobs that have been placed on the website and are relevant to those qualifications. Jobberman is a very large network of various African individuals and institutions. Over the years, it has greatly increased work opportunities and decreased the number of unemployment individuals.

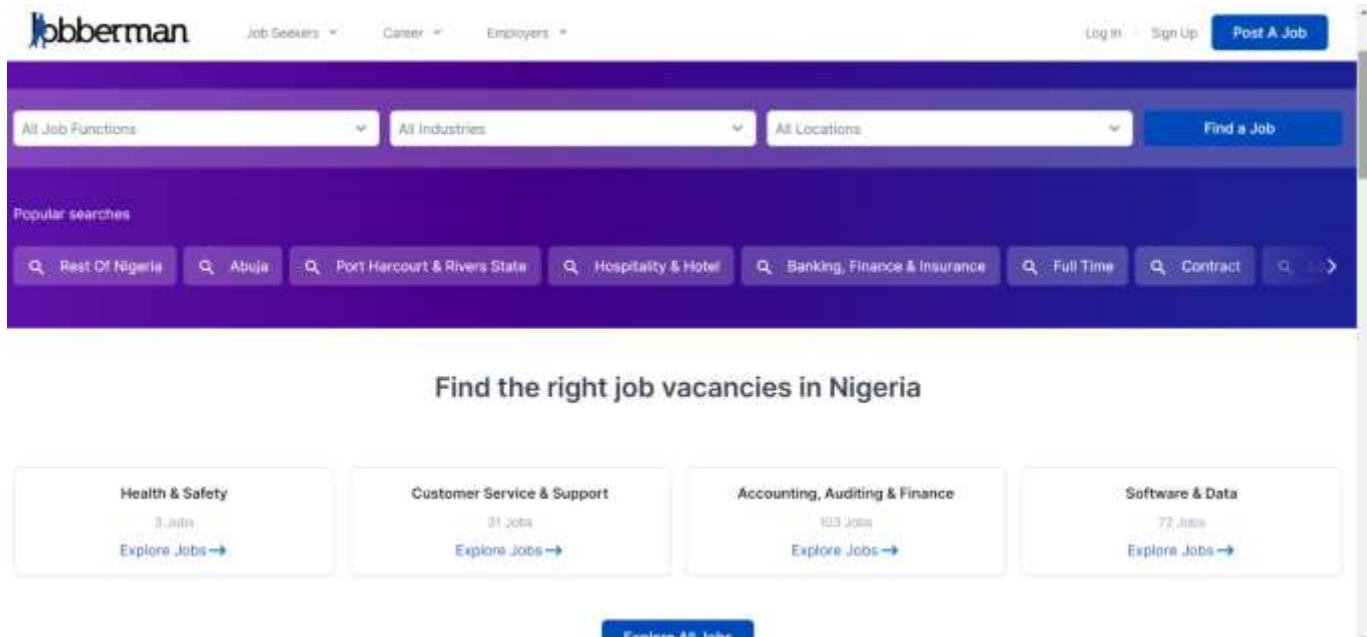


Figure 2. 6 Jobberman Interface

2.3 Theoretical Review

This section reviews significant theories which are relevant to the area of study.

2.3.1 Technology Acceptance Model (TAM)

The TAM is the most important methodology for measuring technology acceptance in IT literature. The theory was developed by Fred Davis and Richard and Richard Bagozzi (Bagozzi et al., 1992; Davis et al., 1989) as an extension of Ajzen and Fishbein's theory (TRA) to explain the behavior of computer users. The theory examines the acceptance of e-selection systems in organizations

According to TAM, a person's behavioral intent to use a system is influenced by two beliefs namely, perceived usefulness and perceived ease of use. Perceived usefulness is defined as the extent to which a person believes that using a system will enhance his or her job performance, and perceived ease of use, defined as the extent to which a person believes that using a system will be free of effort (Venkatesh and Davis, 1996). TAM states that the perceived ease of use also affects perceived usefulness since, other things being equal, the friendlier a system is, the more valuable it can be (Venkatesh and Davis, 1996). However, Davis et al. (1989) TAM believes that perceived usefulness and perceived ease of use are the main factors influencing people's acceptance of computers.

2.3.1.1 Perceived Usefulness (PU)

The extent to which a person believes that employing a particular technology would boost his or her job performance is how perceived usefulness is defined. People are typically rewarded for good work in an organizational setting with raises, promotions, bonuses, and other benefits (Pfeiffer, 1982). A system with a high level of perceived usefulness is one for which the user perceives a favorable link between use and performance.

Employers frequently provide job seekers with complete job information on their websites, including pay statistics, benefits, rewards, and organizational activities (Cober et al., 2000). Many employed job searchers might be attracted to embracing technology for job search if they saw system utility as a prerequisite of e-selection use, such as employing these data and tools to improve the effectiveness of job applications (Tong, 2008).

2.3.1.2 Perceived Ease of Use (PEU)

Perceived ease of use refers to the degree to which a person believes that using a particular system would be free of effort. A user is more likely to adopt an application that they view as being simpler to use than another. A sophisticated system that is challenging to use, on the other hand, is less likely to be accepted because it need a lot of work and attention from the user (Teo, 2001). The perceived usefulness of a technology is influenced by perceived ease of use since perceived complexity of use has an inverse connection with perceived ease of use. TAM thus asserts that perceived usability influences perceived usefulness (Sanchez-Franco and Roldan, 2005).

Similar to how job searchers and HR department would prefer the system if it were simpler than alternative ways of choosing employees, in the context of e-selection.

2.3.1.3 Behavioral Intention (BI)

Bagozzi et al (1992) thinks that new technologies (like e-selection websites) are difficult and people may be hesitant to adopt them. Therefore, before making any attempts to use the new technology, people create attitudes and intentions towards trying to learn how to use it (Tong, 2008). According to Sanchez-Franco and Roldan (2005) research, people who are goal-directed have a high association between perceived usefulness and behavioral intention. The study relates perceived ease of use to perceived usefulness and perceived usefulness to behavioral intention with the following hypothesis:

H1: Perceived Ease of Use (PEU) positively influences Perceived Usefulness (PU) in E-selection adoption. `

H2: Perceived Usefulness (PU) positively influences Behavioral Intention (BI) to use organization's e-selection website.

Technology Acceptance Model (TAM)

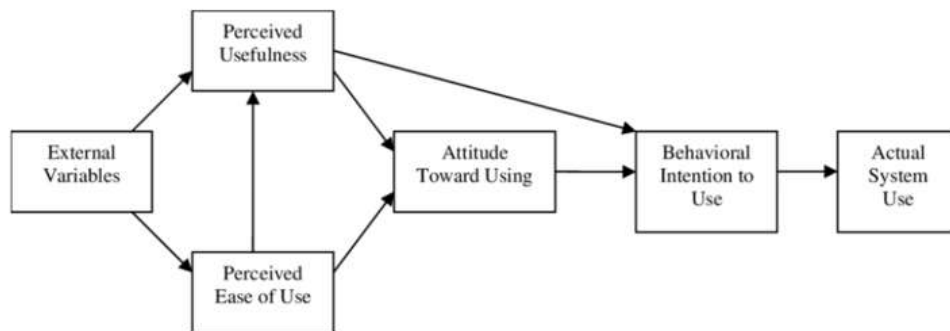


Figure 2. 7 Explaining TAM

2.3.2 Diffusion of Innovation (DOI)

The theory of diffusion of innovation aims to explain how, why, and how quickly new concepts and technologies spread across civilizations. Mostly, the theory had been used in IT related technologies – software, operating systems, intranet use, smart card readers, information systems processes and internet banking. The Diffusion of Innovation (DOI) idea was first presented by E.M. Rogers in 1962. One of the first diffusion theories is this one. Diffusion, according to him, is the "process by which an innovation is conveyed through certain channels over the course of a social network's members". An innovation is an "idea, practice or object that is perceived to be new by an individual or other unit of adoption". Communication is the process of creating and exchanging information with one another in order to understand one another. According to Roger (1995), there are four primary components to innovation that affect how quickly a new idea spreads: the innovation itself, communication channels, time, and consequences or a social system.

Relative advantages, compatibility, complexity, trialability, and observability of an innovation all contribute to its acceptance (LaMorte, 2019). Each of these five qualities is described by

Rogers (2003) in his Fifth Edition. The degree to which an innovation is seen as superior to the concept it replaces is known as relative advantage. The degree to which an invention is viewed as consistent with the existing values, prior experiences, and needs of potential adopters is referred to as compatibility. "The degree to which an innovation is seen as comparatively difficult to understand and use" is the definition of complexity. "The extent to which an idea may be experimented with on a limited basis" is what is meant by trialability. The term "observability" refers to "the extent to which an innovation's results are visible to others."

The key to adoption is that the person must recognize the idea, behavior, or product as new or innovative. This allows for the possibility of diffusion. It first appeared in communication to describe how an idea or product gradually develops traction and spreads throughout a particular social system. The primary factors of innovation adoption include the voluntary nature of the decision to accept a new technology, perceived features of an invention, the social structure in which the innovation will disperse, and the communication channels through which an innovation will reach the adopter. People eventually adopt a new idea, behavior, or product as a part of a social system as a result of this diffusion.

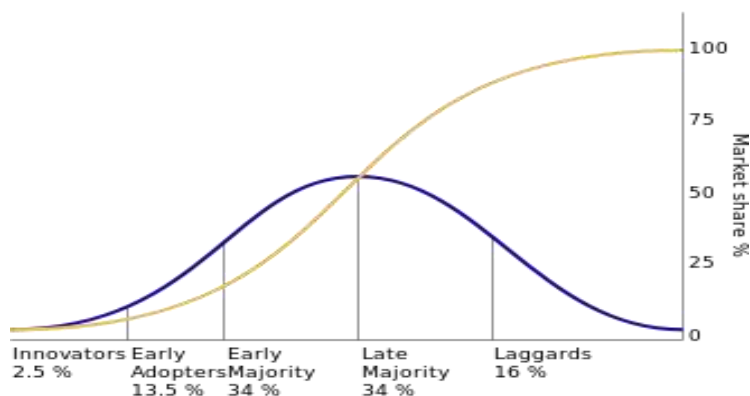


Figure 2. 8 Diffusion Of Innovation

It's critical to understand the traits of the intended audience when promoting an innovation. Innovators, early adopters, early majority, late majority, and laggards are the five kinds of adopters that Rogers established. People who are innovators strive to be the first to test a new idea (Halton, 2021). They are bold, interested in new ideas, eager to take chances, and frequently the first to develop new ideas.

Early adopters are the second fastest category to adopt an innovation (Luenendonk, 2019). They have the highest degrees of opinion leadership on many fronts and are considered by

many as 'the individual to check with' before adopting a new idea. People who are early adopters are thought leaders. They love taking on leadership responsibilities, welcome change possibilities, and don't require knowledge to persuade them to change. They are quite at ease implementing new concepts because they are already conscious of the need for change.

Early majority people are rarely leaders, but they are often the first to adopt new ideas (LaMorte, 2019). Usually, for these folks to adopt an idea, they need to see proof that it actually works. The late majority is resistant to change and will only adopt a new idea once the majority has given it a try. Laggards are extremely traditional and tradition-bound people. They are the most difficult group to influence since they do not readily accept change.

Rarely does literature apply the DOI theory to model the factors that affect e-selection. In a study done in the UK, (Emma and Hugh, 2009) used DOI and Ajzen's theory of planned behavior to identify the variables influencing an organization's decision to implement online job selection. It was found that factors influencing the adoption of corporate websites and commercial job boards are found to differ, with positive beliefs/relative advantage, subjective norms, and negative beliefs emerging in the case of corporate websites and positive beliefs/relative advantage and compatibility for job boards. The findings show some agreement with both Ajzen's and Rogers' variables.

2.3.3 Theory of Constraints (TOC)

The Theory of Constraints (TOC), a change-management concept put out by Eli Goldratt in 1984, can be used by businesses to achieve their objectives. Every system has a constraint that restricts the output of the system. A constraint is a limiting factor that prevents you from making a quick hire and hiring the best man for the job (Wheeler, 2022). Although the theory was primarily focused on manufacturing, it is now obvious that business obstacles may also be found in a company's functional divisions, including HR, marketing, IT, sales, accounting, and finance.

For example, selection procedures may be hindered by failing to attract enough qualified candidates for job vacancies and management reviewing CVs slowly. The theory of constraints can be applied as a procedure in five steps which are:

1. Identify the constraint
2. Decide how to exploit and eliminate the constraint
3. Prioritize or subordinate the constraint

4. Elevate the constraint
5. Evaluate the constraint

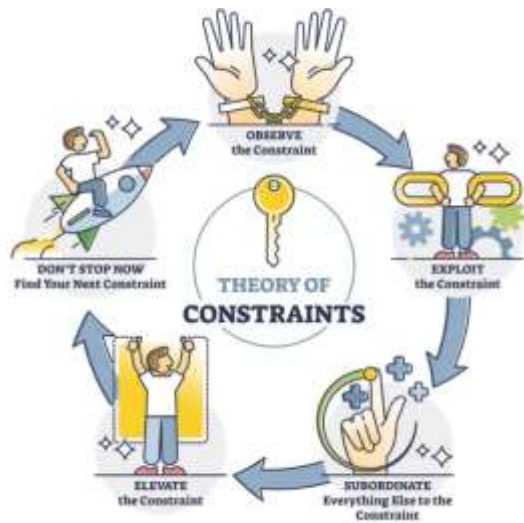


Figure 2. 9 Theory of Constraints Procedures

Identifying a constraint

Employing an audit method can help you identify the constraints because you cannot manage a problem unless you know what it is.

Decide how to exploit and eliminate the constraint

This is accomplished by methodically examining the problems and implementing an improvement strategy. To maximize the pace at which job candidates are selected, the constraint should be the primary focus of all activities.

Subordinate or Prioritize the constraint

The operation will continue to suffer if other regions are placing pressure on the constraint, needing additional battling to deal with it. Thus, the efforts to remove the constraint must be given priority.

Elevate the constraint

Simply altering the process, adding personnel or technology will solve or remove the constraint.

Evaluate the constraint

Sometimes resolving one issue only leads to further problems. So evaluate this, go back to step 1, and repeat the process if any new bottlenecks emerge. Monitoring the initial constraint is also necessary.

Therefore, in job selection there is need to apply more rigorous and analytical thinking in order to find and employ people who are most likely to support your company in resolving its issues and maximize profits (Wheeler, 2022).

2.3.4 Information Systems Success Theory

DeLone and McLean created the information system success theory in 1992. According to their approach, the effectiveness of information systems depends on the quality of the information system itself and its output. The degree of use and the user's reaction to the information system are influenced by these dimensions. As a result, both organizational performance and user attitude are affected.

There should be measurements taken to assess whether the system has achieved its aims and objectives in order to give value for information system management and information system investment (DeLone et.al, 1992).

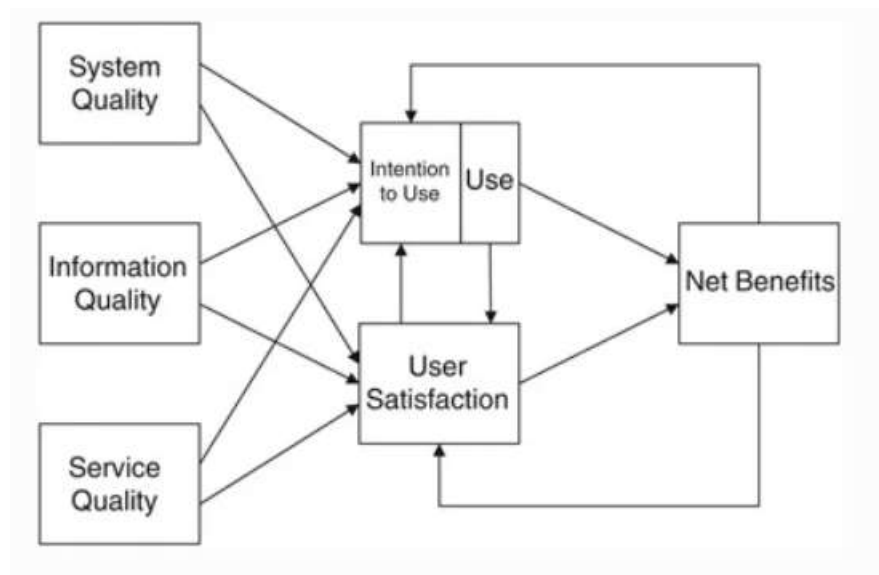


Figure 2. 10 IS Success Model(2003)

The D&M model has also been proven to be a helpful foundation for categorizing IS success measurements. The model has been heavily utilized by IS scholars to analyze and quantify the components of IS success. Additionally, each of the variables used to describe an information system's success was compatible with one or more of the updated model's six main success factors. The attributes of success include:

1. **System Quality** -refers to the desirable specification of information system such as system reliability, flexibility, ease of learning, ease of use, system features, sophistication and response time (HRIS, 2013).
2. **Information quality** - refers to the desired features of management reports and web pages, which are system outputs. As an illustration, consider the following criteria: applicability, clarity, completeness, understandability, value, punctuality, and usability.
3. **Service quality** - refers to the caliber of assistance provided by the IT support team and IS department to system users. For instance, the personnel staff's responsiveness, accuracy, dependability, technical proficiency, and empathetic nature. Adapted from the world of marketing, SERVQUAL is a is the model of service quality that is used for measuring service quality and customer satisfaction (Bhasin, 2021).
4. **System utilization** - refers to how much and how a staff member or consumer makes use of an information system's capabilities. As an illustration, consider how much, how frequently, how often, how appropriately, how extensively, and for what purpose you utilize anything.
5. **User satisfaction** - is the degree to which users are happy with reports, websites, and support services.
6. **Net benefits** - the percentage of success that individuals, groups, organizations, industries, and countries are able to achieve as a result of IS. As an illustration, consider better decision-making, productivity, sales, cost savings, profitability, market effectiveness, consumer welfare, job creation, and economic development.

2.3.5 Success Factors

It is necessary in order to enhance the selection process. Therefore, the Organizations should be concerned with a variety of issues in order for this process to work. The most important ones among them are:

- Organizational leaders and HR managers who have implemented or will implement e-selection systems must make a commitment to ensuring the system's success. They also need to commit resources to those projects, systematically evaluate the e-selection process and results, and increase training for HR staff on how to use the systems effectively and efficiently (Kim & al., 2009)
- Employers must ensure that no candidate is given preferential treatment because of their age, gender transition, handicap, color, religion, or political affiliation, sex, sexual

orientation, marriage, civil union, pregnancy, or motherhood, or union membership or non-membership (Crooner, 2018). For example, “recent” graduates only in a job post is not a good idea.

- The impact of revealing payment information should be taken into account. When wage, salary, or benefits are disclosed online, they must be accompanied by legal requirements. No opportunity for negotiation will be provided. The organization will make its payment rate open to everyone, not just the candidates.
- The hiring manager must make sure the candidates fit the company's aims and characteristics when using the online selection system (Ghazzawi and Accoumeah, 2014). With a population that is becoming more and more diversified, this goal is achieved. Employees from a variety of backgrounds, educational systems, abilities, technical skills, languages, customs, and personal attributes are present in today's workplaces. The workforce's variety enables the company to expand its market reach and boost its intellectual capital.

2.3.6 FAILURE FACTORS

Sun conducted research in 2015 exploring the reasons of recruitment failure. He stated that one of the reasons why selecting the best candidate fails is because of lacking a reasonable personnel test. Information on the CVs is just the words about personal gains, which may be inflated or false. The following stage is to choose the most qualified applicants for the position after reviewing the CVs of the applicants. "The best" requires that a person's knowledge level, attitude, motivation, and emotion be compatible with the position and the culture of the organization, not that their achievement is the highest. As a result, it requires quantitative screening methods, such as testing, assessment centers, and background checks, to evaluate each candidate objectively. The reasonable personnel test should be both reliable and valid (Sun, 2015).

Confidentiality and data protection are contributing to the failure of an e-selection system (Stone et al., 2012). Internet recruiting may be challenging and has generated a variety of concerns, including security and secrecy, especially when it comes to online testing and selection. The majority of job seekers on employment portals are passive job seekers who aren't actively hunting for work. To guarantee that their current employers are not made aware of the information they submit, confidentiality is crucial. The majority of job-related websites must post privacy policies outlining how they handle data storage and usage.

2.4 Resume Parser with Natural Language Processing

Using text processing as a resume analyzer this genuine review outlines an excellent company Job Selection System that employs text mining and machine learning techniques to assist recruiters in selecting the best candidate for a given position. It uses machine learning and text mining techniques to help recruiters choose the ideal candidate for a certain position. The order of the resumes of candidates is determined by a company's requirements at the time of posting. The business can use the ranking to determine which applicants are the best. The four steps for this post's methodologies and model are as follows: collecting applications and looking up keywords in the basis of information for a resume. then, determined by a rating Candidates are ranked and grouped based on their score. Aside from that this program may pull fresh keywords from resumes into increase the depth of knowledge.

2.4.1 Natural Language Processing

Natural language processing is a branch of artificial intelligence and computational linguistics. It can be defined as the process which is involved in the interaction between a computer and natural language i.e. the language, spoken by humans (Sanyal et al., 2017). It is directly related to the field of human-computer interaction.

2.5 Empirical Literature Review

An empirical review can be defined as the analysis of various components of an empirical study that are significant to the current study in some way. In order to resolve a particular research issue, an empirical literature review procedure entails assessing earlier empirical studies.

According to studies, a growing number of job searchers are using online tools to look for work, with almost 70% of them doing so (Jobvite, 2020). Many modern job seekers use the internet as a key resource: in their most recent job search, 79% of Americans who have looked for work in the past two years used online resources, and 34% of them said that this was the most crucial tool at their disposal (Smith, 2015). The speed at which people find jobs increases when they use the internet for job searching, which is a very beneficial outcome (Kuhn and Mansour, 2014). Online job searching is becoming more and more crucial for getting employment as traditional job-seeking strategies like newspaper ads migrate online (Green et al., 2012).

Karaoglu et al conducted research in 2020 which showed the prevalence of online job search activities. More than seventy percent of respondents (72.0%) said they have looked online for information regarding jobs. More than sixty percent (62.3%) of the respondents said they have at least once in their career applied for a job online. Regarding behaviors related to job-searching on social media, the findings indicate that among social media users (79.9% of the sample), roughly one-third (38.8%) had searched on these platforms for details regarding a job. 18.3% of the whole sample, or 22.9% of social media users, had ever applied for a job they discovered on social media.

Most people regarded performing duties related to online job searches quite simple in terms of their digital job-search abilities. A sizable majority (77.2%) found it extremely simple to use email to get in touch with and follow up with potential employers, to complete an online job application (71.9%), to look for opportunities in their area online (69.2%), and to check up services and programs that can assist job seekers online (64.8%). 61.5% of respondents said they could very easily write a professional Cv. One exception was the usage of social media or a personal website to advertise their career talents, which only slightly more than half (51.5%) said was extremely simple.

Hafeez and Farooq (2017) conducted a research to investigate the effectiveness of an online recruitment system and its impact on organizational attraction towards fresh graduate job seekers. 302 recent graduates looking for work in the Lahore region were included in the sample, which was chosen by a questionnaire using stratified random sampling. The findings of this study imply that e-recruitment systems have a favorable effect on candidates and boost the organization's appeal to potential competitors. The findings and conclusions of this study indicate that e-recruitment is more user-friendly and costs less money for job seekers. The association between an e-recruitment System and organizational attraction is found to be strengthened by its favorable effects on cost effectiveness and usability. This means that the organization that implements an e-recruitment strategy gains notoriety among job seekers, and because of the success of e-recruitment and the organization's subsequent notoriety, qualified job candidates will favor joining that organization. The study indicated that the organization's appeal is influenced by the websites' overall quality. The appeal of organizations is negatively impacted by poor quality recruitment websites. The researcher draws the following conclusions after examining the data: e-recruiting positively affects organizational attraction, but this relationship can be impacted by the quality of recruitment websites. In order to attract job

searchers, firms should use electronic recruitment tools, and in order to keep this attraction going strong, they should focus on the quality of their websites.

Cober et al (2000) conducted a research on the quest for the qualified job surfer and found out that online hiring can result in cost savings as well as increased applicant earnings. Companies who switched from traditional to internet hiring reported savings of 95%, while unique businesses attracted as many as 10,000 candidates through their recruitment websites to fill less than 1000 jobs.

Thompsons, Braddy, and Wuensch (2008) studied the impact of organizations and web design on potential job seekers. It was discovered that while both the formatting attractiveness and user - friendliness of online recruitment materials influenced participants' tendencies to pursue jobs, planning was more significant than usability. 182 participants evaluated an online job advertisement to rate marketing formatting attractiveness, usability of the website, organization web appeal, impressions of the organization, and readiness to pursue employment.

Tripathi (2017) conducted an empirical research on recruitment and selection process with reference to private universities in Uttarakhand. The sample size was 150. It was found that the university used website portal sources to recruit candidates the most (50%) out of all the other sources.

Woon (2019) conducted a research on the intention to use e recruitment system. The purpose of this study was to look at how Malaysian job seekers behaved when using an e-recruitment system. Job searchers who intended to apply for positions in the advertising business made up the research population. In this quantitative study, information from a sample of 100 job seekers was gathered using self-administered questionnaires. Both descriptive statistics and inferential statistics were produced using the SPSS statistical program. The adoption of e-recruitment was shown to be largely determined by perceived usefulness, according to the findings. However, the influence of perceived search engine optimization (PSEO) and perceived information content quality (PICQ) was minimal. The results of this study suggest that human resources professionals and recruitment agencies should concentrate on the perceived usefulness of the e-recruitment system to draw in and arouse interest in jobseekers to use e-recruitment system.

Plessis and Frederic (2012) conducted a research on effectiveness of e recruiting: empirical evidence from the Rosebank business cluster in Auckland, New Zealand. Face to face interviews were conducted with 102 companies within that population. A random stratified

cluster sampling and a 36-question questionnaire. According to research conducted at Auckland's Rosebank Business Precinct (New Zealand), e-recruitment is beneficial for some job categories. E-recruitment is revolutionizing how firms choose their staff members. There are some implications for managers that are mentioned, such as the requirement for training for these changes and the significant cost savings on advertising that could be achieved. The recommendations advise that in order to find, choose, and hire the best candidate for the job, HR objectives must be in line with organizational goals.

The literature already stated is relevant to this study because it enables us to comprehend the factors that contributed to the success of earlier online selection systems outside of Zimbabwe. Important success factors can vary depending on the circumstance, but most are applicable to all circumstances. Format attractiveness, usability and quality of websites were all mentioned as general success factors. The success factors should be considered to avoid implementation failure of online selection systems.

2.6 Conclusion

This chapter looked at the literature review that the researcher utilized to develop a skewed perspective on what makes an online job selection system successful. Theoretical reviews and frameworks were both taken into account, and both were identified and briefly discussed. Additionally, the research gap was highlighted and empirical evidence supporting previous studies was discussed. The next chapter discusses the research methodology to be used in this research.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter addresses the research methodology details used in this research. The adopted methodology includes the research design, data collection approaches, research instruments used, population and sample with the selection criteria in addition to the research's main tool for example questionnaire and sampling as well data presentation and analysis techniques.

3.2 Research Method

A research technique is a methodical, deliberate, and planned process for producing data on a particular study subject (McMillan and Schumacher 2010). William (2011) describes research methodology as "a range of tools that are applied for varied sorts of inquiry." The nature of the research must be taken into account when establishing a technique.

3.3 Data Collection Approaches

This study used a mixed methodological approach, therefore the data collection was done using a qualitative and quantitative data collection strategy. Open-ended and closed-ended questionnaires, followed by interviews and the use of secondary data, were the study tools utilized to gather data. Both data collection tools were developed to address important issues in order to meet the study's objectives. The two types of data that are employed in research are primary data and secondary data.

3.3.1 Primary Data

Does a researcher's data come from first-hand sources like surveys, interviews, and experiments? It was gathered using sources specifically for the research project (Anon, 2017). The core data for this study were collected through interviews and questionnaires. Open-ended questionnaires were utilized to collect primary data for this study. Because the material acquired was current, pertinent, and specific to the study's research goals, using primary data was beneficial. Both in-person distribution and email distribution of the questionnaires were done.

3.3.1.1 Primary Sources

The researcher created a questionnaire, which he then revised in accordance with advice from a group of professionals.

3.3.1.2 Benefits of using Primary data

This research study benefited from the utilization of primary data in that:

- Most individuals are familiar with questionnaires. Almost everyone has filled out questionnaires at some point, and most individuals are not afraid to do so.
- Reduced bias. The respondent won't be swayed by the researcher's personal viewpoint in how they answer questions. No verbal or visual cues exist to sway the respondent.
- The information was current.
- The information was clear and important to the study
- It was simple to verify the accuracy of the information.

3.3.1.2 Disadvantages of using primary data

The research project faced the following difficulties as a result of the usage of primary data:

- Both conducting the interviews and collecting the data through questionnaires took time.
- Printing, distributing, and gathering study questionnaires were expensive.
- Dealing with the research participants required effort, effective public relations, and people skills.
- The processing of the information took a long time.

3.3.2 Secondary Data

The advantage of secondary data is that it is easy to collect, less expensive, and particularly useful when field study time is limited. However, one must exercise caution when determining the data's application when using data from other sources.

3.3.2.1 Secondary Sources

The following were done by the researcher using secondary data sources to address the study's theoretical framework:

- Scientific journals, periodicals, and academic magazines.
- Online sources and website.
- Research papers, business articles and reports connected to the study topic.

3.3.2.2 Benefits of using secondary data

This research was helped by the use of secondary data because the data was:

- It was affordable
- Simple to use
- Easily accessible.
- Could be studied in less time

3.3.2.3 Disadvantages of using secondary data

The research study faced the following difficulties as a result of the usage of secondary data:

- The information was occasionally irrelevant to the research project.
- Determining the data's accuracy was difficult
- The data was frequently outdated.

3.4 Population and Sampling

3.4.1 Population

"All elements (individuals, objects, and events) that meet the sample criteria for inclusion in a study" is the definition of population (Burns & Grove, 1993).

The target population in this research are jobseekers, recruiters and HR department in Zimbabwe. With this large population, it is not possible however, to cover all the population hence sampling techniques will be employed to find a representative sample of the population.

3.4.1.1 Population

1. HR, managers all
2. Jobseekers, all

3.4.2 Sampling

The particular group from which you will gather data is known as a sample. The sample size is always smaller than the population as a whole.

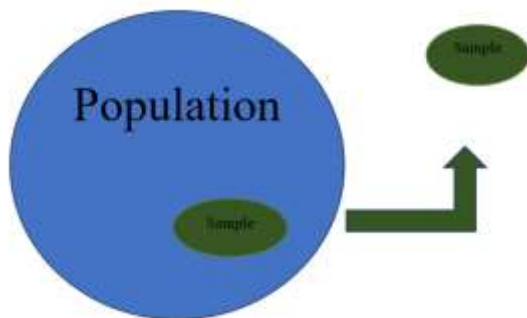


Figure 3. 1 Sampling example

3.4.2.1 Sampling Methods

There are two types of sampling methods:

1. **Probability Sampling** involves random selection, allowing you to make strong statistical inferences about the whole group.
2. **Non-Probability Sampling** involves non-random selection based on convenience or other criteria, allowing you to easily collect data.

3.4.2.2 Probability Sampling Methods

Every member of the population has a possibility of getting chosen when sampling using probability. Mostly quantitative research uses it. Probability sampling techniques are the best option if you wish to generate findings that are representative of the entire population.

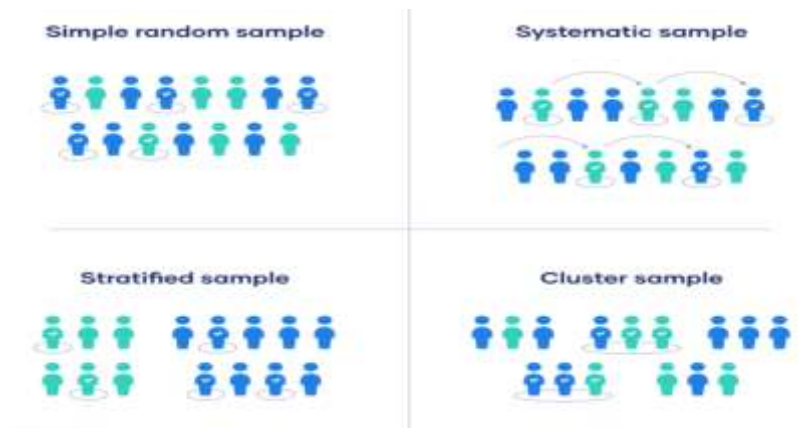


Figure 3. 2 Types of probability sampling

Simple random sample

Every person in the population has an equal probability of getting chosen in a simple random sampling. The entire population should be represented in the sample frame.

Systematic Sample

Simple random sample and systematic sampling are comparable, but systematic sampling is typically a little simpler to carry out. Every person in the population is assigned a number, but instead of assigning numbers at random, people are picked at fixed times.

Stratified Sample

Stratified sampling involves breaking the population up into smaller groups that might have significant differences. By ensuring that each subgroup is fairly represented in the sample, it enables you to reach more accurate findings.

By dividing the population into smaller groups according to the relevant characteristic, you can employ this sampling technique (e.g. gender, age range, income bracket, job role).

Cluster sample

Cluster sampling also involves dividing the population into subgroups, but each subgroup should have similar characteristics to the whole sample. Instead of sampling individuals from each subgroup, you randomly select entire subgroups.

3.4.2.3 Non-Probability Sampling

Individuals are chosen for inclusion in a non-probability sample using non-random criteria, so not every candidate will be. Accessing this kind of sample is simpler and less expensive, but

there is a greater chance of sampling bias. This means that your conclusions may be more limited and that the population inferences you might draw are weaker than with probability samples.

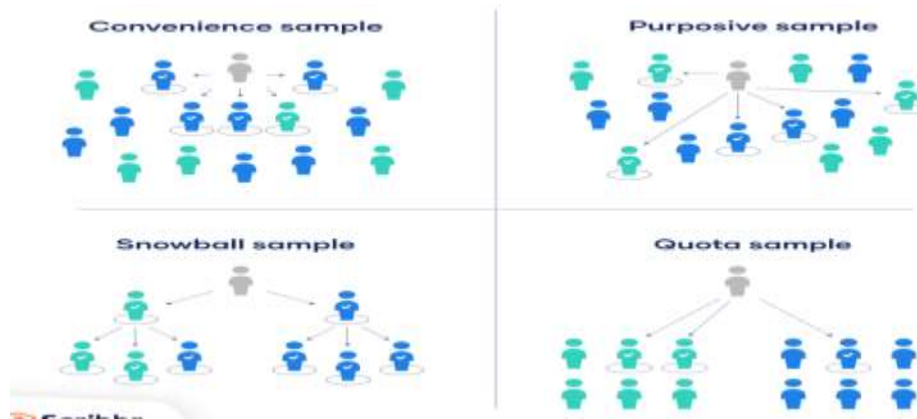


Figure 3. 3 Types of Non-probability sampling

Convenience sampling

A convenience sample simply includes the individuals who happen to be most accessible to the researcher. This is an easy and inexpensive way to gather initial data, but there is no way to tell if the sample is representative of the population, so it can't produce generalizable results.

Purposive sampling

Edmonds and Kennedy (2012) described purposive sampling as the grouping of participants according to preselected criteria germane to the research question(s). With this kind of sampling, also known as judgement sampling, the researcher uses their knowledge to choose a sample that will be most helpful to their research goals. It is frequently used in qualitative research when the researcher prefers to learn in-depth information about a particular phenomenon to drawing general conclusions from statistics or when the population is very small and focused. A successful purposive sample must have precise inclusion requirements and justifications.

Snowball sampling

Snowball sampling can be used to draw people from the population if it is difficult to reach them directly. As you interact with more people, the number of people you have access to grows.

Quota Sampling

Quota sampling is a non-probability sampling technique where researchers compile a sample of people who accurately reflect a population. These people are chosen by researchers based on particular characteristics or attributes. They make decisions and set quotas to ensure that the market research samples are effective at gathering data. The entire population can be based on these samples. The ultimate subset will only be chosen based on the interviewer's or researcher's understanding of the population.

Justification of sampling used

With purposive sampling, the researcher decides “what needs to be known and sets out to find people who can and are willing to provide the information by virtue of knowledge or experience” (Bernard, 2002, p.391). By focusing exclusively on data from a subgroup rather than all potential cases or elements, the researcher adopted an approach that offered a variety of methods to limit the amount of data to be collected. Through the use of purposive sampling, the researcher is able to choose the cases that will best help him respond to the study questions. Additionally, with purposeful sampling, the researchers can select the sample based on the individuals they believe would be good candidates for the study. This form of sample is often used when working with very small samples such as in case study research and when you wish to select cases that are particularly informative (Neuman, 2005).

Eligibility criteria for study participants were as follows:

- Experience and knowledge of the recruitment and selection processes
- Willingness to take part in a digitally recorded interview and a written narrative procedure
- Willingness to permit the publishing of data in the research study and other publications.

Sample Group	Actual Size
HR managers	5
Jobseekers	15
TOTAL	20

Table 3. 1 Target Population

3.5 Research Instruments

Research instruments are the techniques used to collect data from research participants. Semi-structured questionnaires were used to implement this research.

3.5.1 Questionnaires

A questionnaire is a set of written questions for obtaining information from a large audience leading to large data (Sharmila and Umarani, 2011). Questionnaires are used to get information from a small group of people on a wide range of domain. The questions can be open-ended or close-ended conditional to their objectivity. The researcher shared a lot of questionnaires asking the effectiveness of the proposed system compared to the manual way of selecting candidates for a job. The questions were being asked as follows:

1. Are companies using a system in analyzing CVs during recruiting? or They are doing it the manual way?
2. Do you believe that a web based job selection through cv analysis will be useful in selecting best candidates?
3. Is the system accurate in ranking candidates?
4. How do you rate the system?
5. Do you see the significance of having such a system in the HR Department?
6. Do you apply for jobs online?

The questionnaires helped the author to evaluate the performance of the system compared to the other systems or manual way of selecting candidates.

Justification of Questionnaires

Due to their simplicity, comprehensiveness, and affordability, questionnaires were selected as the research tool in this study. Many people who couldn't be reached by other means can now be contacted by questionnaire, which they can respond to via email. Comparatively speaking, designing, creating, and implementing a questionnaire is simpler. Little technical expertise or knowledge is needed. More open-ended questions were utilized in conjunction with some closed-ended questions to elicit extensive qualitative data from the respondents. The biggest benefit of open-ended questions is that they give one the freedom to look further than they initially thought. Closed-ended questions are simple to respond to, simple to code and analyze,

and simple to reject irrelevant or wrong responses, but they do not provide enough information or prompt respondents to provide more information on the answers they have given. Closed-ended questions were complemented by open-ended questions in order to gain a deeper understanding of particular phenomena. The analysis of the results will assist the researcher in generating accurate information.

Advantages of Questionnaires

- **Cost effectiveness** - printing the questionnaires only cost a small amount of money. Questionnaires, however, can be digital, which eliminates the need for printing.
- **Quick results** - replies were gathered quickly, especially for online surveys that immediately update database entries as soon as respondents fill them out.
- **Confidentiality** - Other respondents were allowed to share information without having to reveal their identities, unlike in other techniques when providing information, particularly sensitive material.
- Large-scale data collection was accomplished through the creation and distribution of several questionnaires to responders. This suggests that a lot of information can be collected quickly.

Disadvantages of Questionnaires

- **Misinterpretations** - respondents may interpret the questions incorrectly, and as a result, their responses may not provide the necessary evidence for the topical issue.
- **Research without clarification** - respondents are unable to request clarification in cases where they will not have understood. In the end, they skip the questions.
- **Low response rate or spoils** - Some questionnaires were not returned because the respondents lacked experience, and others may have been returned spoiled.
- It is impossible to convey emotions and behaviors on a questionnaire since they cannot be expressed in words.

3.6 Data Analysis

Data analysis is a technique for gathering and organizing data such that useful information may be extracted from it (Peersman, 2014). Data analysis then converts the obtained data into meaningful information that is helpful in the system's development. Data can often be analyzed both quantitatively and qualitatively. For example, questionnaire responses could be analyzed

qualitatively by studying the meanings of responses or quantitatively by studying the frequencies of responses.

3.6.1 Qualitative Analysis

Understanding words, ideas, and experiences is done through qualitative analysis. You can make use of it to analyze data gathered through surveys and interviews. It's important to think carefully about your decisions and assumptions because qualitative analysis is often extremely flexible and depends on the researcher's judgment. Because qualitative data is difficult to translate into numerical values, it was necessary to code the data from questionnaires and interview transcripts in order to analyze it.

3.6.1.1 Coding

The first step in data analysis is data coding. To make analysis easier, gathered information from questionnaires and interviews must be processed. "Coding is the process of analyzing qualitative text data by taking them apart to see what they yield before putting the data back together in a meaningful way" (Creswell, 2015, p.156). Data coding is used to give meaning to the information that respondents supply. The researcher gives values to the codes in order to assess the data. Data coding simplifies data by summarizing it and removing irrelevant and inaccurate data, making it easier to analyze. Care must be made to prevent data meaning from being lost during coding by creating some codes before to the analysis of responses, then carefully going over each response, identifying any further significant concerns highlighted by the responses, and assigning the relevant codes.

Data Coding Results

The data coding process highlighted that they were need of a system that ranks candidates based on their CVs. It also highlighted that people agreed that the current recruitment being used was not fair as some CVs were being skipped.

3.6.2 Quantitative Analysis

Quantitative analysis (QA) is a method for comprehending behavior that makes use of mathematical and statistical modeling, measurement, and research. Quantitative analysts translate a certain reality into a numerical value.

3.7 System Design

According to Waldo (2013), system design involves a comprehensive plan for the system that is developed by the individuals working on it. To help design the system from findings, activity diagram, entity relationship diagram, unified modified language, database design, Gantt chart and data-flow diagram will be used by the researcher in this paper. The type of data that the system retains is another factor in design.

3.7.1.1 Unified Modelling Language (UML)

A formal model of this suggested system will be constructed utilizing Unified Modelling Language (UML). It is an institutionalized, extensively applicable showing dialect that combines an arrangement of realistic documentation tactics for producing visual models of object-oriented software systems. It integrates methods from component modeling, object modeling, business modeling, and data modeling. It can be used with any process, at any point in the life cycle of software development. UML can also be described as a widely applicable visual demonstration language used to design, illustrate, create, and document software systems. Structural and behavioral UML diagrams are the two fundamental types of UML diagrams. The system will focus on behavioral UML diagram.

Behavioral UML diagram

However, behavioral diagrams can be used to represent the dynamic and ever-changing components of a system. The Behavioral UML employed in this research is the Use Case Diagram.

Use Case Diagram

Use cases are a discrete unit of interaction between a user and a system, which can be either a human or a machine. Use case modeling outlines the intended functionality of a system in a way that users can comprehend. A use case overview shows the functionality provided by a system in terms of actors, the goals they are pursuing in terms of use cases, and any relationships between those use cases. Use cases are a result of the system's disintegration on a larger scale. The use case name appears above or inside a horizontal ellipse to depict it graphically.

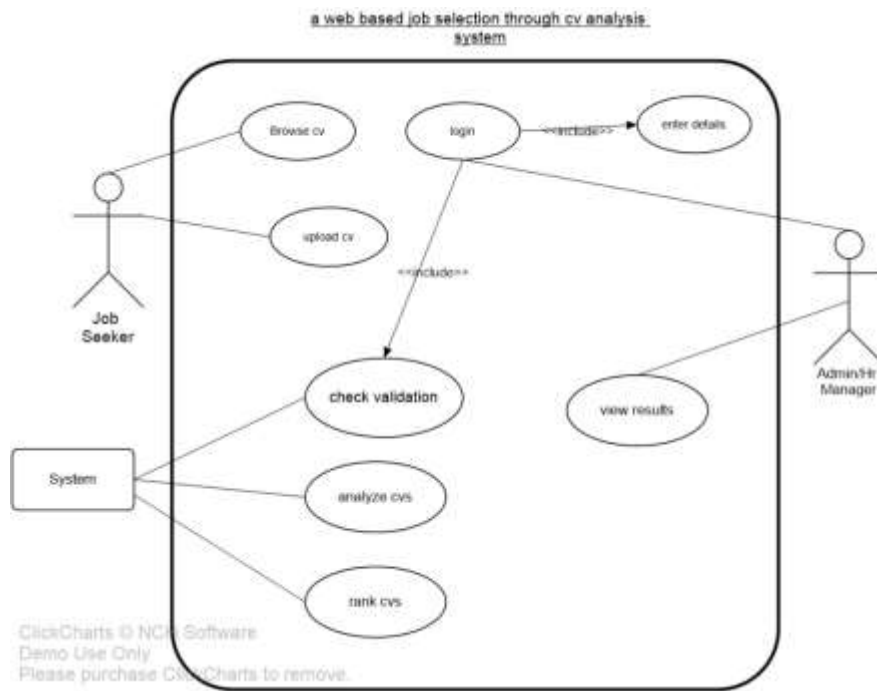


Figure 3. 4 Use case diagram

3.7.1.2 Activity Diagrams

A flow chart used to show how one event leads to the next is called an activity diagram. The control flow is drawn from one operation to another because the event can be thought of as a system operation. This flow may be concurrent, parallel, sequential, or branching.

Flow chart

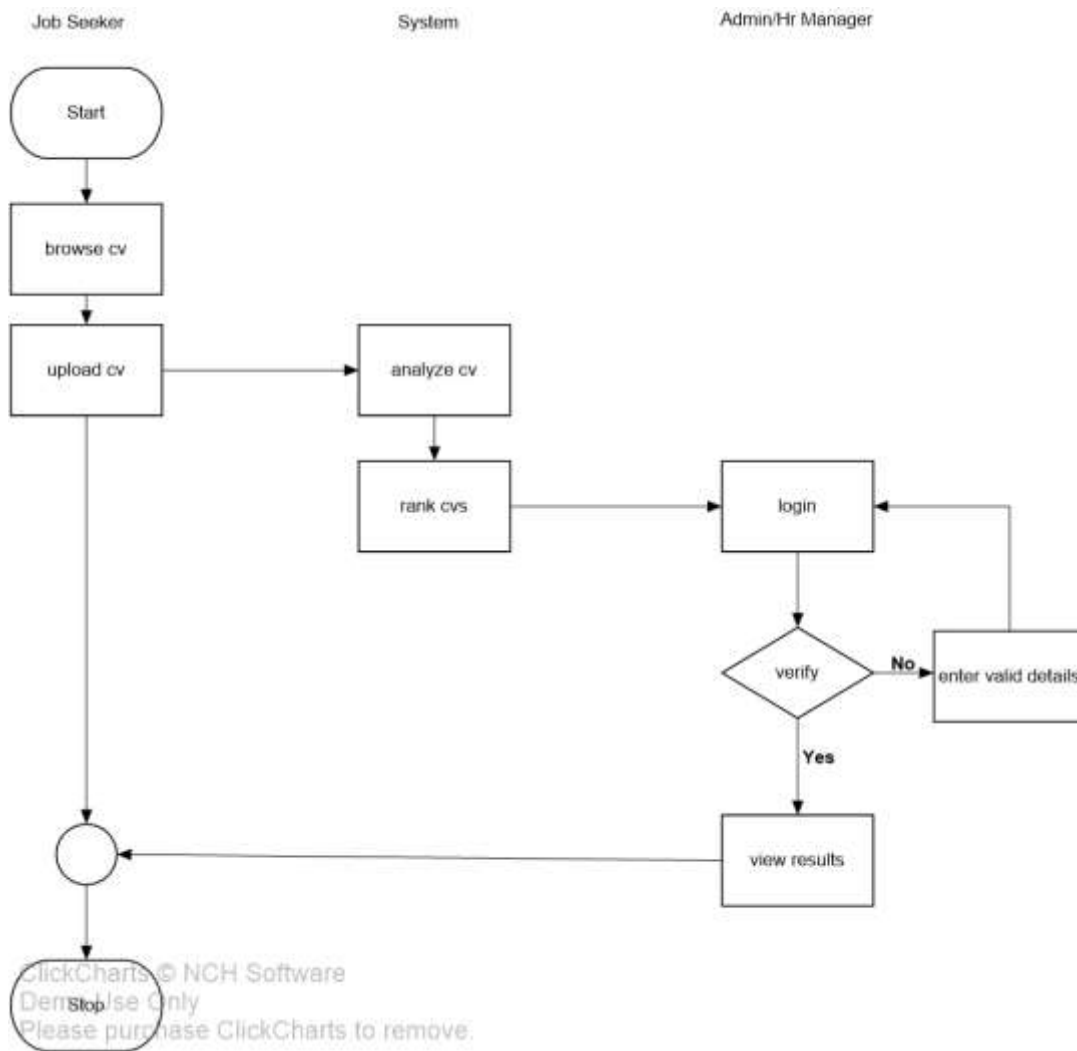


Figure 3. 5 flowchart of the system

3.7.1.3 Entity relationship Diagram

The relationship between individuals, things, places, concepts, or events within an information system is depicted graphically in an entity-relationship diagram (ERD).

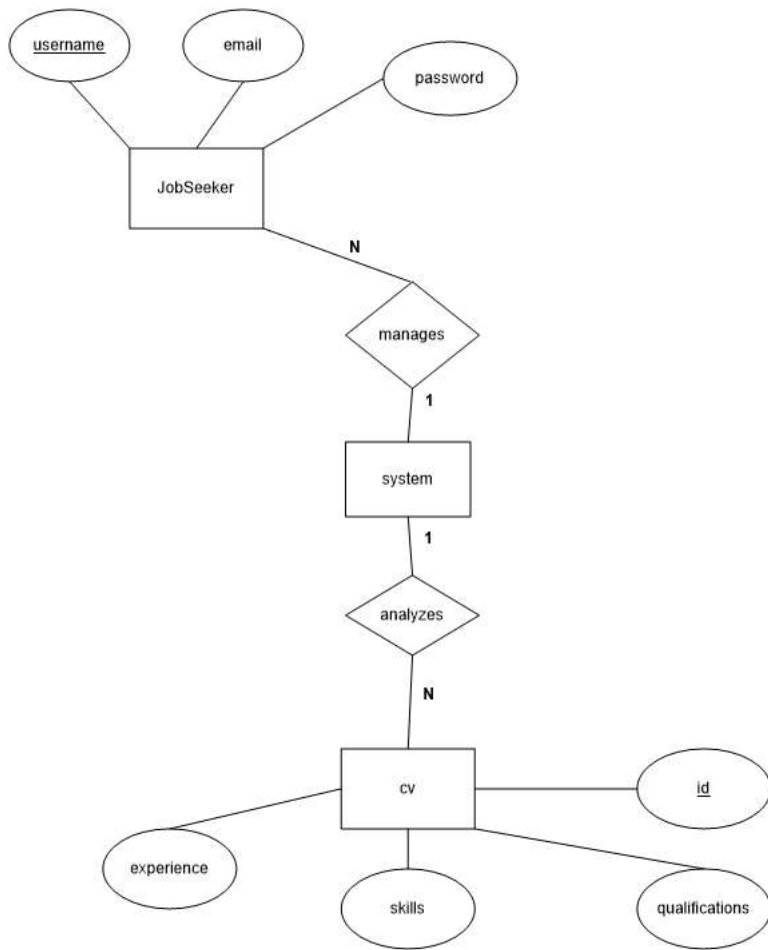


Figure 3. 6 Entity Relationship diagram

3.7.1.4 Database Design

This involves describing the data objects that will be stored in the database, the connections between the various data items therein, and the parameters that control certain data elements like length.

Table / Entity	Properties	Data type	Structure
Tbluser_data	Name	Varchar (13)	Jobseeker's name
	Email	Varchar(30)	Jobseeker's email
	Id	Varchar(20)	Jobseeker's Unique id
	Score	Int	Job Seeker's cv score

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Table 3. 2 Database Design

3.7.1.5 Gantt Chart

A Gantt chart is a type of bar chart used to indicate work elements and relationships within planned tasks and to provide a graphical depiction of the tasks that are scheduled.

Activity	Duration (in weeks)												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Documentation	■	■	■	■	■	■	■	■	■	■	■	■	■
Project Proposal	■												
Chapter 1		■	■										
Chapter 2 literature review				■	■								
Chapter 3 Methodology						■	■	■					
Chapter 4 coding and Testing									■	■	■	■	
Chapter 5												■	■
Maintenance	■	■	■	■	■	■	■	■	■	■	■	■	■

Table 3. 3 Gantt Chart

3.8 REQUIREMENTS

3.8.1 Hardware Requirements

- 1) Corei3 processor
- 2) 4 GB RAM

- 3) 300 GB hard drive memory

3.8.2 SOFTWARE REQUIREMENTS

- 1) Windows 8.1 and above
- 2) Pycharm
- 3) Stream lit
- 4) Python

CHAPTER 4

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1.1 Introduction

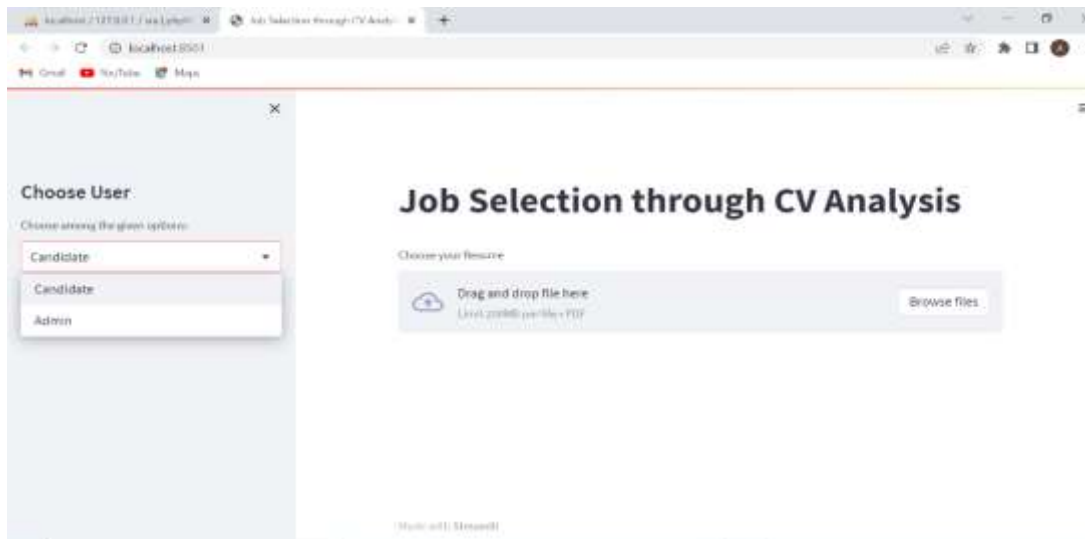
The researcher will use systematic statistical and logical procedures in this chapter to describe, explain, and analyze the data that was gathered during the creation of a web-based application for job selection using cv analysis. The SPSS and kwik surveys web client were utilized for the research's analysis because they can handle both qualitative and quantitative data. In this study, the researcher employed quantitative analysis, and the generated numerical data was converted into useful statistics. In this study, facts are formulated using data collected, and patterns are discovered. The data is represented graphically in tabular form using bar graphs, pie charts, and line graphs.

4.2 Data Presentation and Analysis

The main reason the researcher chose SPSS was because it provides a greater selection of fundamental charts and makes it simple to locate statistical tests. Because Kwiksurveys is a free online survey creator that has been especially created to be quick and simple to use for people of all expertise levels, it is popular. The benefit of an online survey is that it lowers the cost of conducting research by eliminating the need to print several surveys. This method's disadvantage is that it significantly depends on internet accessibility because occasionally the service wasn't down.

4.2.1 Screenshots of the System

Figure 4. 1 Screenshot of the system waiting for CV.



Test 1

Figure 4. 2 test first CV

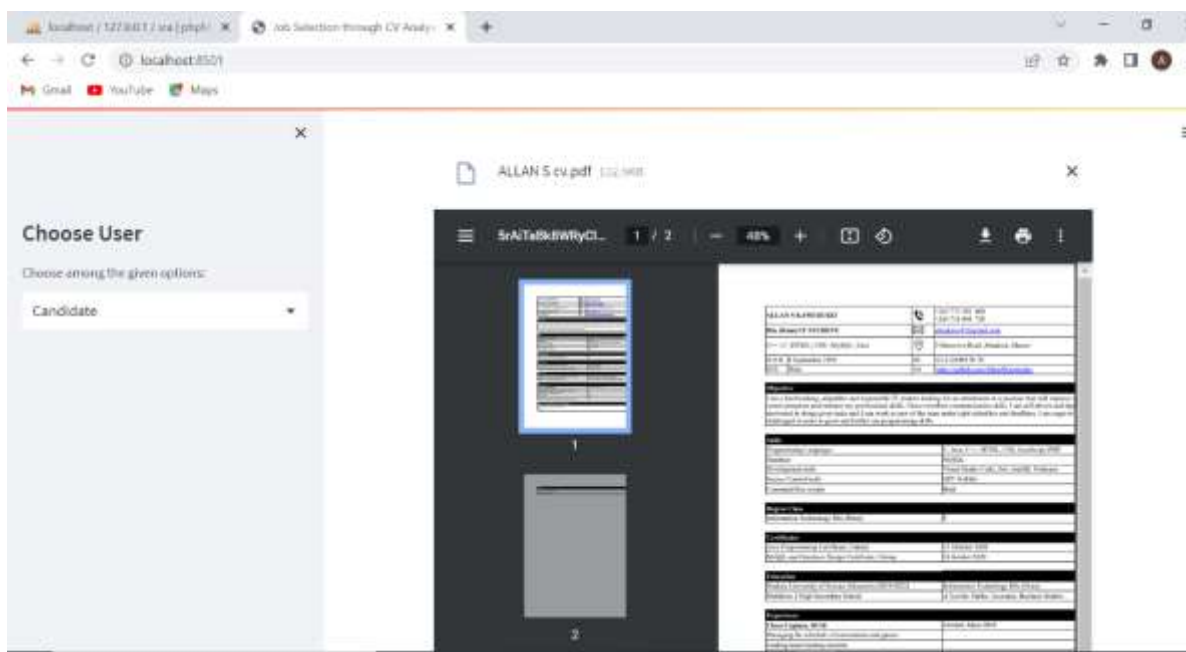


Figure 4. 3 first CV



Test 2

Figure 4. 4 test second CV

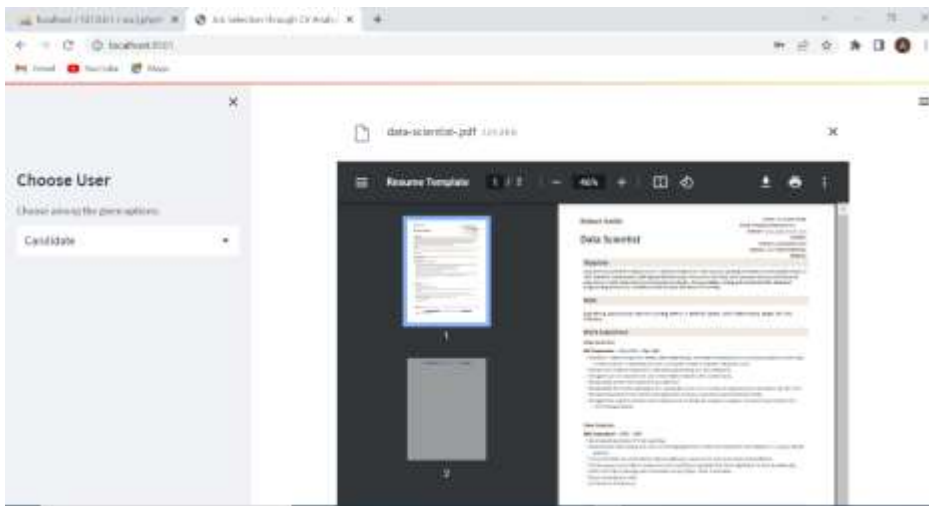
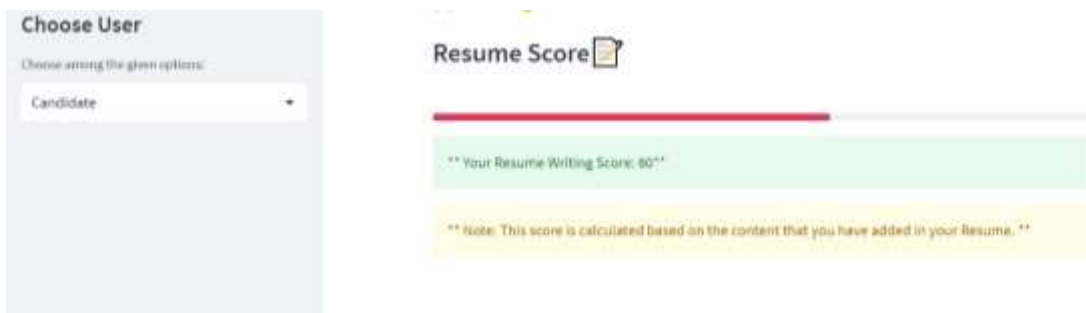


Figure 4. 5 second CV score



Test 3

Figure 4. 6 test third CV

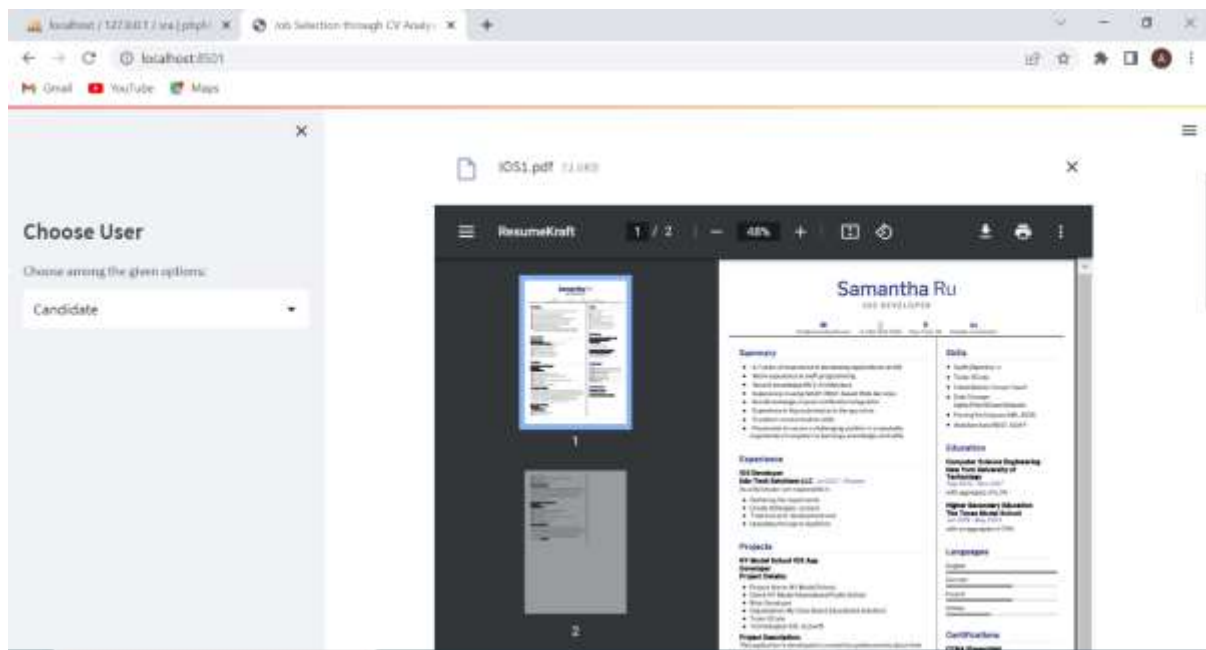
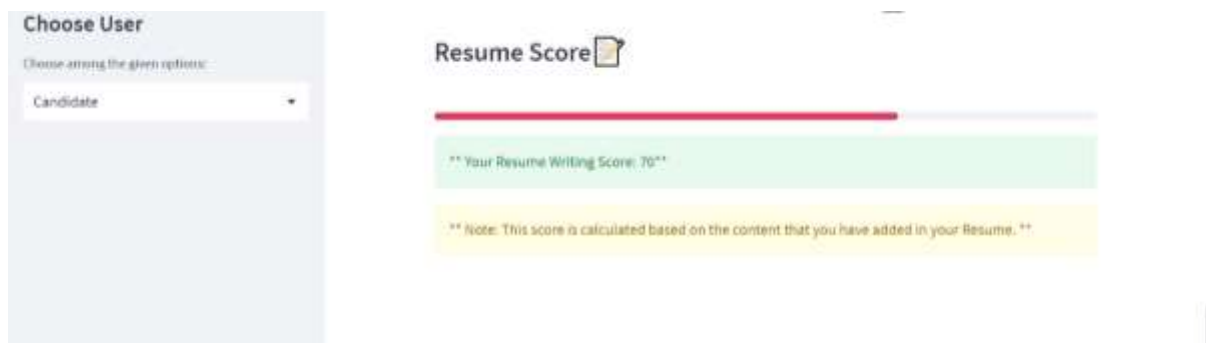


Figure 4. 7 third CV score



Test 4

Figure 4. 8 test fourth CV

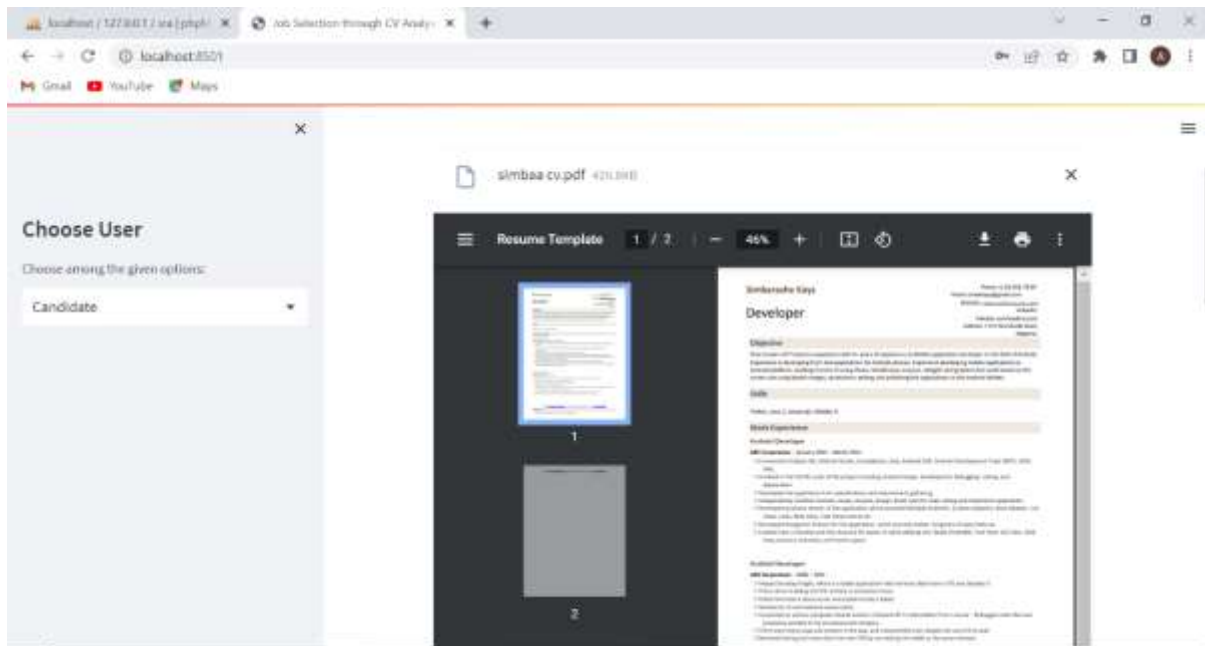
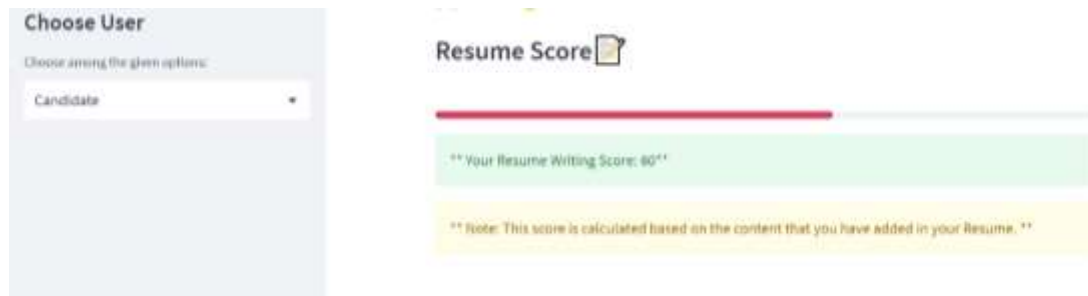


Figure 4. 9 fourth CV score



Test 5

Figure 4. 10 test fifth CV

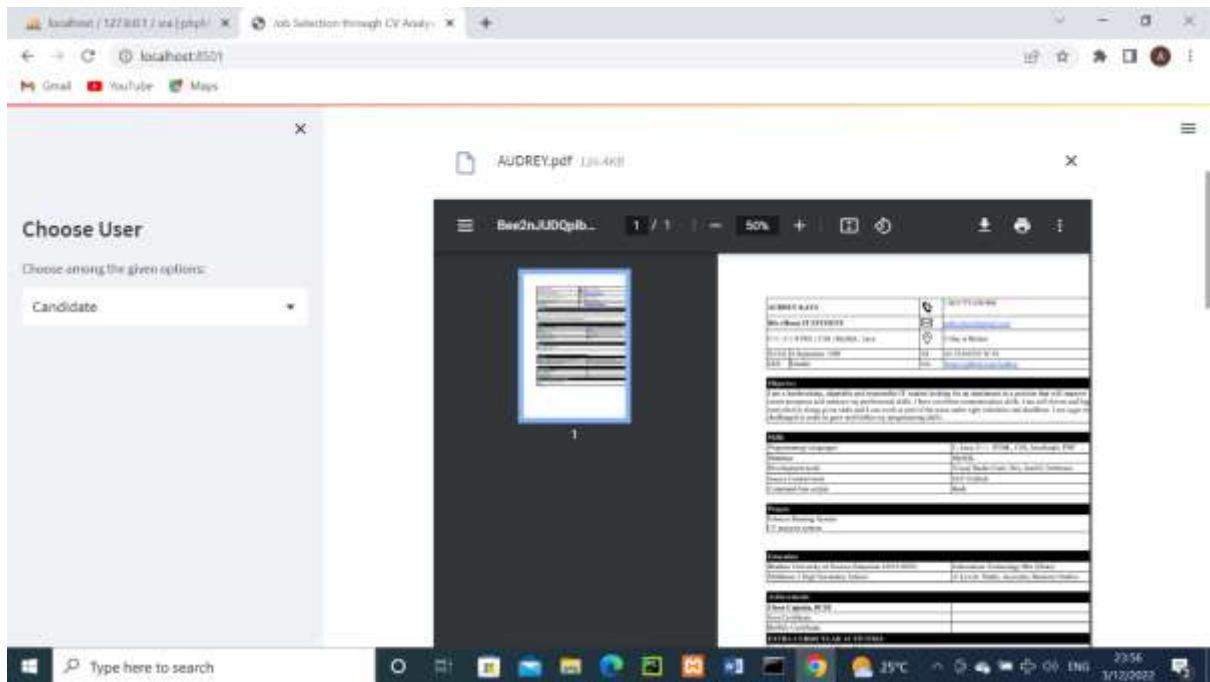
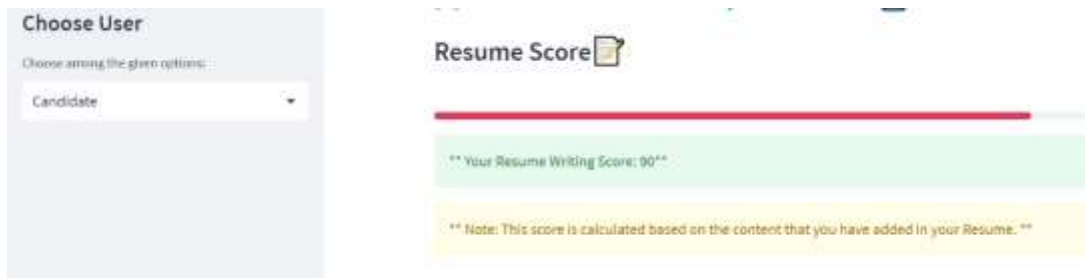


Figure 4. 11 fifth CV score



CV ranking

Figure 4. 12 Admin Login

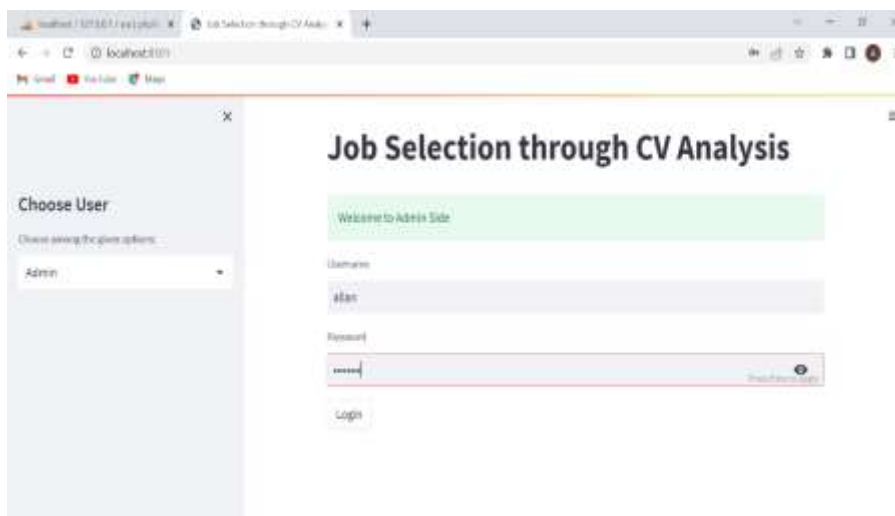
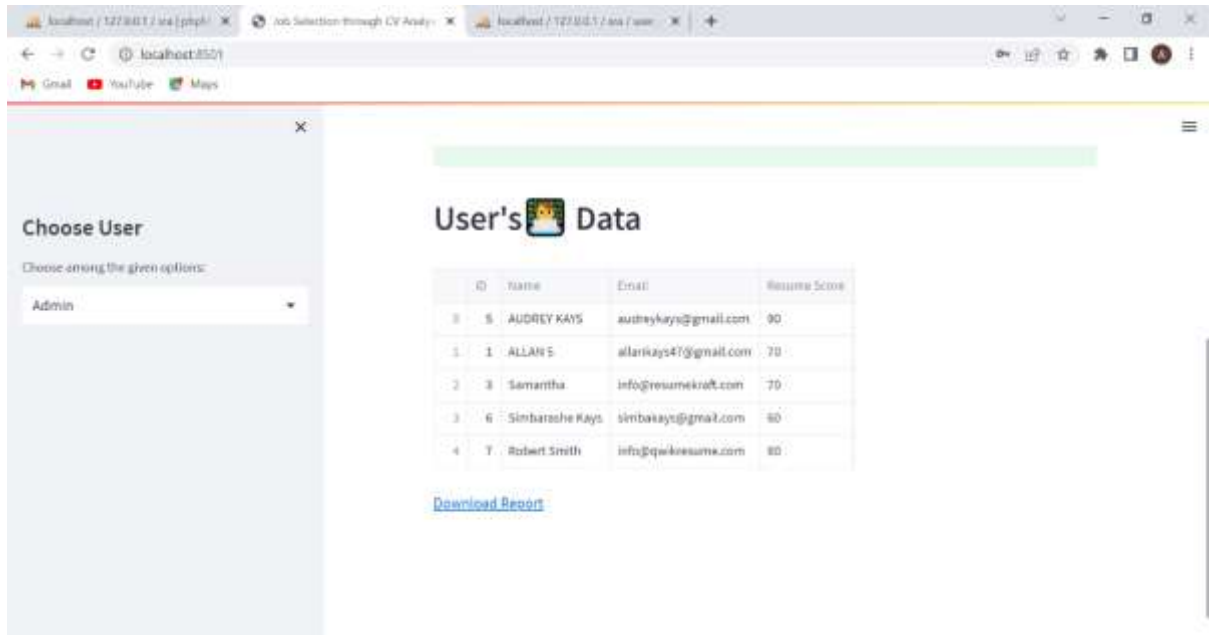


Figure 4. 13 Ranking based on CV performance



Analysis of Screenshots

The 5 tests indicated that the system was able to read the resumes checking certain parameters and rank them based on performance. As shown by the screenshots the system met the first two objectives as it selected the best candidate and put the best candidate on top based on cv performance.

4.3 Evaluation using Questionnaires

4.3.1 Questionnaire Response rate

The number of questionnaires that research participants successfully complete and return compared to the intended sample size is referred to as the questionnaire response rate. The completion rate is calculated as follows: **Response Rate= [(Responses Returned) / (Questionnaires Sent Out)] * 100**. The results of the questionnaire's response rate are summarized below.

Target Group	Questionnaires Sent	Responsive Received	Responsive Percentage
Job Seekers	18	15	83.3%
Hr Managers	7	5	71.42%
Total	25	20	80%

Table 4. 1 Questionnaire Responses

Twenty of the 25 questionnaires that were given for data collection were successfully completed and returned to the researcher, as shown in Table 3.2 above. This resulted in an 80% response rate. In general, the response rate was high enough to guarantee a reliable data analysis and the accuracy of the research results. The strong follow-up and persistent reminders via phone voice conversations, instant messaging, and emails were credited with the high response rate.

4.3.2 Hr. Managers and Jobseeker’s response and analysis

The analysis of the questionnaires results from the HR Managers and Job Seekers is covered in this part.

Question 1: Are companies using a system in analyzing CVs during recruiting? or They are doing it the manual way?

This section was created to determine how many businesses use web-based systems for recruiting candidates. It is evident from the table below that 90% of businesses in Zimbabwe analyze CVs by hand. As a result, this group will provide an accurate result because they have sufficient expertise of the selecting process in Zimbabwe.

	Frequency	Percent	Valid Percent	Cumulative Percent
Using a System	2	10	10	10
Doing it the manual way	18	90	90	100
Total	20	100	100	

Table 4. 2 Results of using manual way or system in recruiting

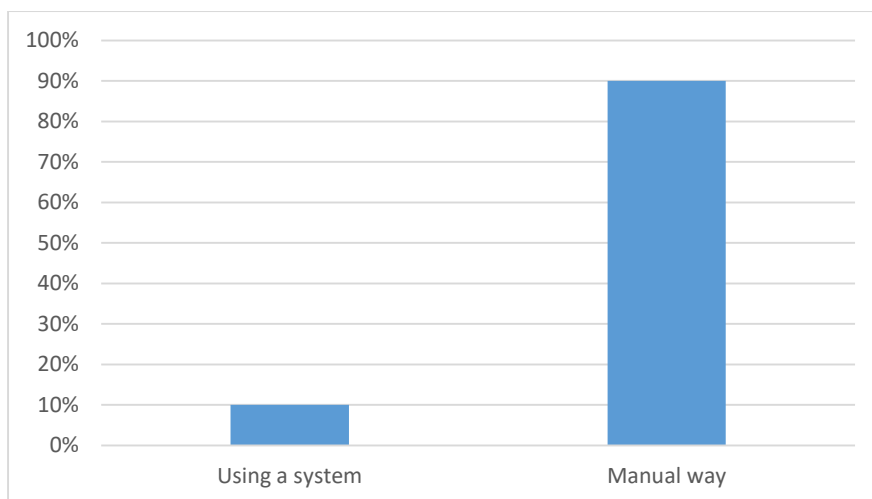


Figure 4. 14 results of using manual or using a system during recruiting

Question 2: Do you believe that a web based job selection through cv analysis will be useful in selecting best candidates?

Each participant offered a response to this question. This investigation was crucial since it reveals whether or not the system is working effectively.

	Frequency	Percent	Valid Percent	Cumulative Percent
Agree	4	10	10	10
Strongly Agree	16	80	80	100
Total	20	100	100	

Table 4. 3 Showing results if the system will be useful

The results from the table and fig indicate that participants responded with confidence because they all agreed that the system functioned excellently and lessened the workload associated with the manual method, with an astonishing 80% strongly agreeing. As this was one of the main goals, to determine whether the approach is practical and efficient in choosing the best applicant from a pool of resumes.

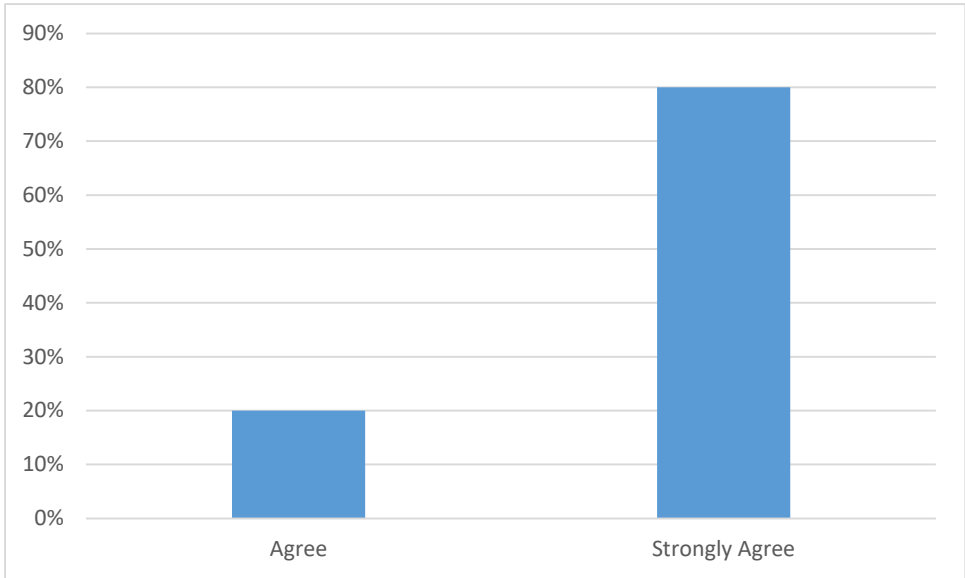


Figure 4. 15 results if the system will be useful

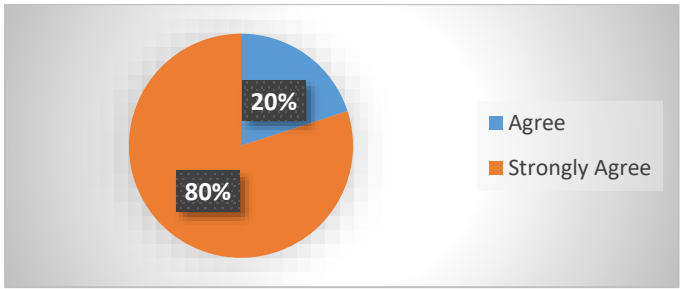


Figure 4. 16 pie chart

Question 3: Is the system accurate in ranking candidates?

	Frequency	Percent	Valid Percent	Percent Cumulative
Yes	20	100	100	100

Table 4. 4 Showing results if the system is accurate in ranking

All respondents agreed that the ranking system was accurate since it produced accurate results if you repeat same CVs. The ranking decisions was based on the cv checking some parameters in the pdf.

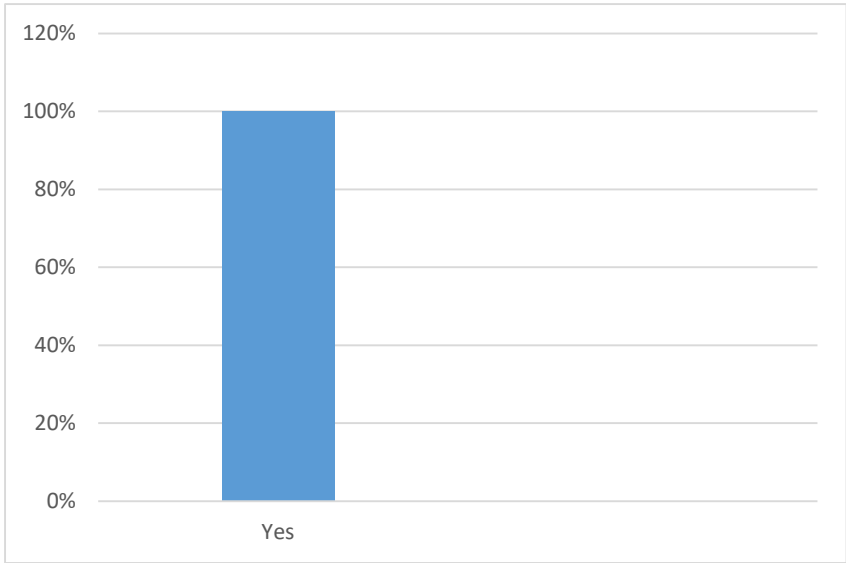


Figure 4. 17 accuracy of the system in ranking

Question 4: How do you rate the system?

The majority of respondents appreciated the system, as seen by the 60% who rated it as great and the 40% who rated it as good. None of them gave it a low score, demonstrating the success of the work. The table below displays the findings.

	Frequency	Percentage	Valid Percent	Cumulative Percent
Good	8	40	40	40
Great	12	60	60	100
Total	20	100	100	

Table 4. 5 System ratings

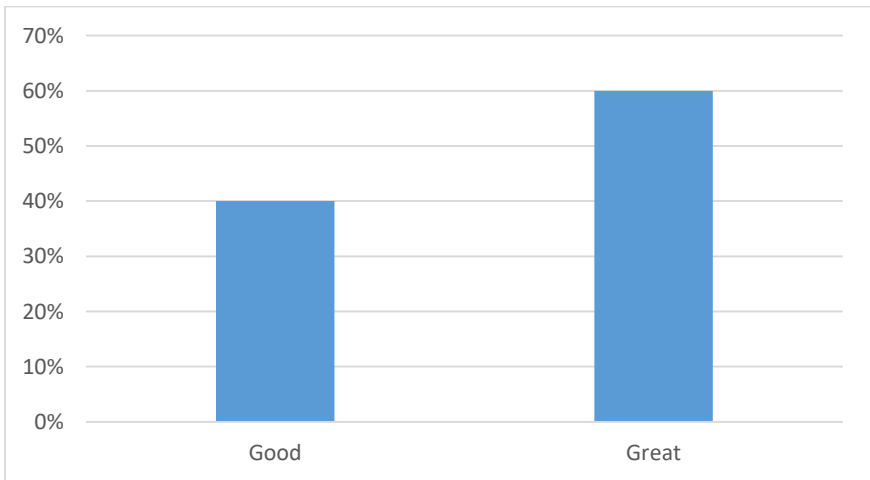


Figure 4. 18 System ratings

Question 5: Do you see the significance of having such a system in the HR Department?

	Frequency	Percent	Valid Percent	Percent Cumulative
Yes	20	100	100	100

Table 4. 6 Will the system be significant

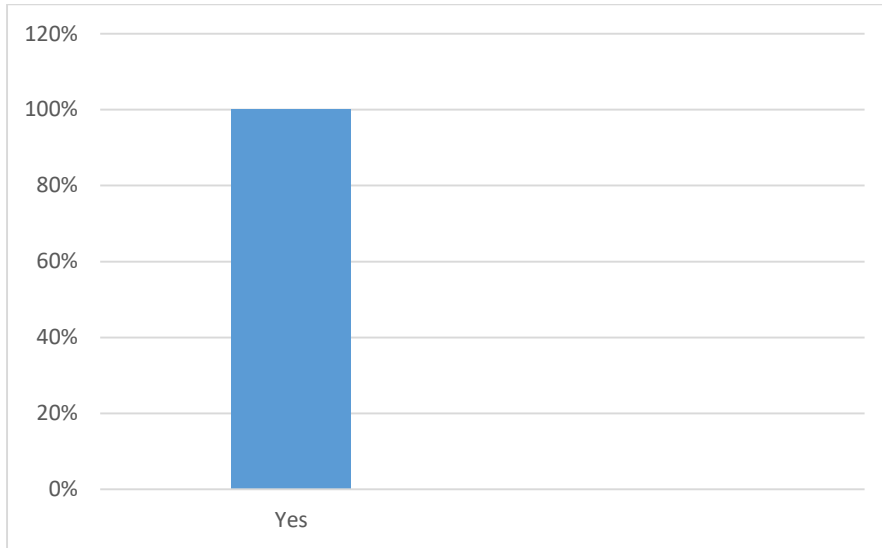


Figure 4. 19 results of the significance

All the respondents agreed with the idea of having a web based through CV analysis application in the HR department to help select the best candidate.

Question 6: Do you apply for jobs online or post jobs online?

	Frequency	Percentage	Valid Percent	Cumulative Percent
Yes, Hr Managers	5	100	100	100
Yes, Job Seekers	15	100	100	100

Table 4. 7 Online recruitment results.

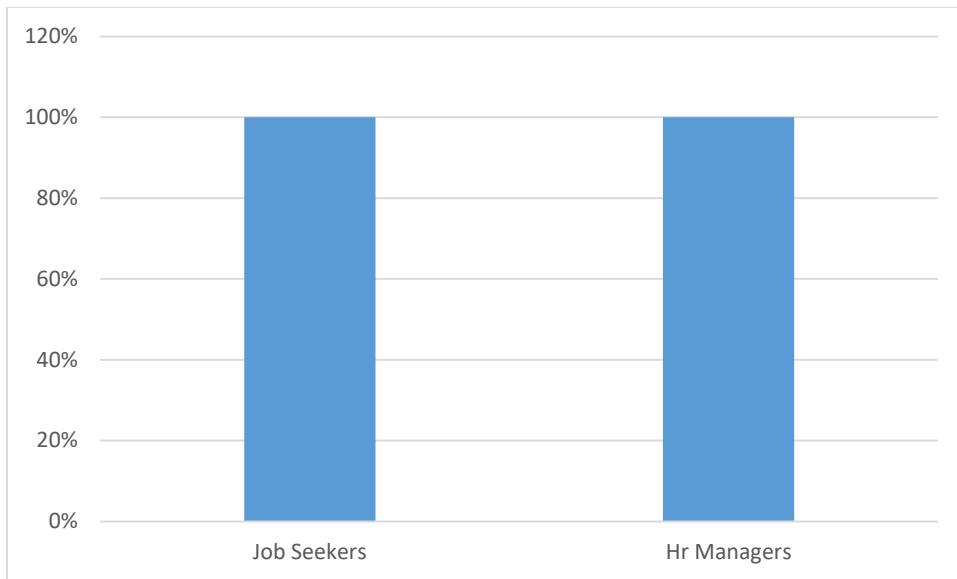


Figure 4. 20 Online results

The results above show that all Hr. Managers post job online and all job seekers look for jobs online. This means that the respondents will welcome the idea of doing the job selection online.

Gender Distribution

The gender of the respondents was one of the factors examined in the demographic profiles of the research participants. The outcomes are shown below.

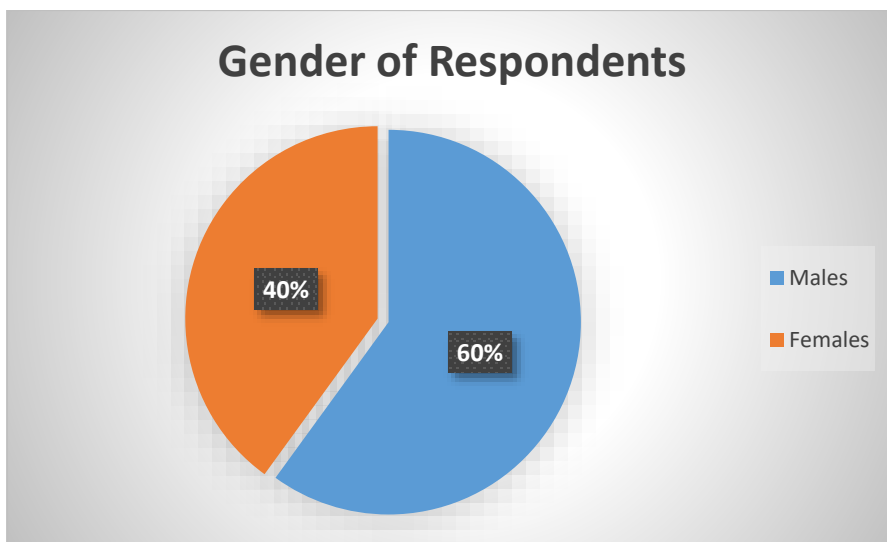


Figure 4. 21 Gender of respondents

According to the above statistical findings, 60% of the sample population was male and 40% was female, indicating that more men than women are looking for work in Zimbabwe. It is interesting to note that the data gathered included opinions from both males and females.

Distribution of Respondents by Category

Figure below illustrates the distribution of research respondents' results per category.

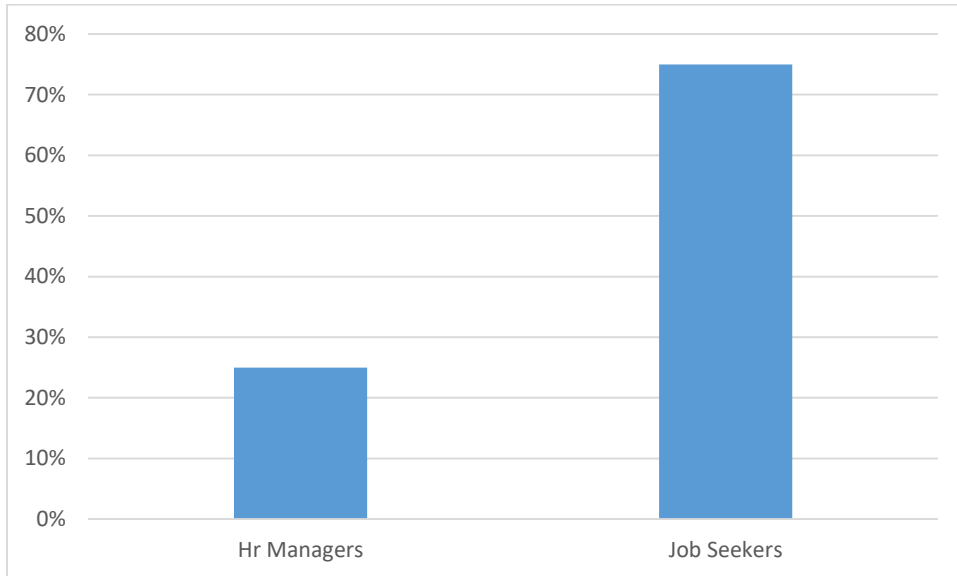


Figure 4. 22 distribution by category

HR managers, and job searchers were among the respondents who took part in the initial data gathering operation, according to Figure above. The majority of respondents 75% were job seekers and 25% were HR managers, according to the results as presented. The HR managers and job searchers made up a larger portion of the population because they are the ones most impacted by the recruitment process. HR managers complained about a pile of CVs, while job seekers complained that their CVs were ignored and they both agreed that the system was useful in solving both solutions.

4.4 Analysis of results

The system is useful to HR departments for efficiently choosing the best candidate from a pool of CVs, according to the statistical analysis of the distributed questionnaires. I have developed a system in agreement with (Nguwi, 2022) who agreed with former Singapore prime Minister who stated that “if you want a country or business to succeed you must have a system that enables the best man and most suitable to go into the job that needs them”. Results show that all job seekers look for jobs online and companies post jobs online which is in agreement with Karaoglu who conducted a research in 2020 on the prevalence of online job search activities and found out that more people have looked for jobs online (72%). Results show that

respondents agree that the system will be helpful in selecting the best candidate for a job which is in agreement with Hafeez and Farooq who conducted a research in 2017 on the effectiveness of online recruitment. They found out that online recruitment attracts more job seekers and the best candidates. In conclusion, the web-based application for job selection through cv analysis was successful since it was creative and achieved the goals for successfully selecting candidates and ranking candidates.

4.5 Chapter Summary

As it emerged from the research, the system's important information and data have been presented in a rich, pictorial manner using graphs, tables, and diagrams. The outcomes show that the system was operating as expected and that it complied with the project's objectives, achieving its goals. The research summary, conclusions, and suggestions will be discussed in the following chapter. The summary emphasizes the primary objectives of the study, conclusions are the study's results, and recommendations are ideas for resolving the problems found.

CHAPTER 5

Conclusion and Recommendations

5.1 Introduction

The author focused on presentation and analyses of collected results from the research on the previous chapter. This chapter focuses on recommendations, conclusions and future work of a web based selection through cv analysis application. This chapter also examines the difficulties the researcher encountered when putting the research system under consideration into practice.

5.2 Aims and Objectives Realization

The main aim of this study was to develop a web based application that select job candidates based on cv analysis using NLP and be able to rank candidates based on their cv score. The aim was partially achieved. The objectives set by the researcher were also accomplished. The first one, was to develop a web based application that selects the best candidate for a job was achieved in chapter four when tests were done. Followed by produce ranking decisions that would have relatively higher consistency than those of human experts and rank candidates based on their skills, qualifications and education. The selection of candidates bases on cv analysis will be more accurate and much faster. The response time of the system saved time of going through thousands of CVs by hand.

5.3 Conclusion

The time it takes to analyze thousands of applications and choose the top candidates from a pool of applicants can be significantly reduced by using a branch of AI called natural language processing. The technology will assist the HR department in choosing the best applicant for a job. The organization will then benefit from skilled labor as a result. Numerous resumes don't need to be sorted through by the Hr. Manager. The algorithm demonstrated reasonable accuracy and time savings in choosing the top applicants from a vast pool of resumes with this simplified version of CV analysis.

5.4 Recommendations for future work

The system is now operating smoothly, but the system developer should continue to test its functionality to keep up with the evolving needs. If making changes to the system requires

applying patches, do so carefully documented. The following are improvements that will soon be made to the web-based application for job selection using CV analysis:

- Include an online aptitude test
- Include a personality test

5.5 Challenges Faced

The researcher encountered some difficulties while doing the research, particularly during the system's deployment phase. Due to a variety of factors, some participants did not trust the system. For instance, some participants did not trust me with their resumes due to privacy concerns. The researcher was also given little time to conclude the job, which prevented the system from being as polished as the researcher had planned.

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Appendix

I am **Allan S Kamuruko**, studying towards a Bachelor of Science Honors Degree in Information Technology with the Bindura University of Science Education (BUSE). I am currently conducting a research entitled “*A web based job selection through CV analysis application using Natural Language Processing*” The purpose of this letter, therefore, is to kindly request you to respond to the attached questionnaire. The information you give will be treated confidentially and at no time will your name be referred to directly. The information given will only be used for academic research purpose.

Questions

1) **Do you apply for jobs online?**

Yes

No

2) **Are companies using a system in analyzing CVs during recruiting? or They are doing it the manual way?**

Using manual way

Using a system

3) **Do you believe that a web based job selection through cv analysis will be useful in selecting best candidates?**

Agree

Strongly Agree

No

4) **Is the system accurate in ranking candidates?**

Yes

No

5) How do you rate the system?

Bad

Good

Great

6) Do you see the significance of having such a system in the HR Department?

No

Yes