A Lightweight Agile Development Implementation of Enterprise Resource Networking and Collaboration

Joe Essien

Veritas University, Faculty of Natural Science, Abuja, Nigeria,
joessien@veritas.edu.ng

Abstract: Changing the way people work is difficult. The habits and culture of systems development teams are typically ingrained in the way they conceive and approach software solutions. Agile development is a software development process that leverages on adaptive planning, rapid response to change in requirements, early delivery and continuous product improvement. The purpose of agile development is to minimize project failure by collaborating and harnessing bilateral interactions with users. However, agile projects come with a set of challenges and problems different from those faced by projects that follow traditional methodologies. For organizations and projects, where experience can be used to plan a course of action with a good degree of certainty for a positive outcome, a traditional methodology may be more appropriate than an agile methodology. Agile methodologies are effective when the product details cannot be defined or agreed in advance with realistic degree of accuracy. In that case, the situation calls for a collaborative environment between the user and the developer. This paper presents an implementation of the agile methodology in a complex and dynamic environment of human resource management. A tripartite case study of an online recruitment involving governmental job pooling center, organizations seeking for applicants and the job applicants is used to demonstrate the effectiveness of the Agile methodology. The importance of this particular case under study is that it goes far beyond an employer or recruiter running a job recruitment portal. This case involves government collaboration in a way that can enable the provision of a supportive environment that create solutions to unemployment, stimulates economic growth and manpower development using accurate and reliable statistics obtained from this type of project. Unemployment can induce precarious social ills such as crime, corruption and underdevelopment prevalent in many societies. The lightweight approach adopted in this work defines its own processes for realizing the core principles for agile methods. The outcome exemplifies an effective client-centric approach to feature – driven development and knowledge sharing thus fostering the principles of high-quality development, testing and collaboration within the enterprises.

Keywords: Agile Methodology, Enterprise Resource, Feature- Driven Development, Lightweight methodologies, E-Recruitment

1. Background to the Study

Online recruitment also known as E-recruitment (electronic recruitment) is defined as the screening and selection of job applicants for employment via the internet or intranet. E-recruitment portal is an internet-based recruitment management system used for controlling and organizing recruitment processes and procedures in corporate institutions and business firms [1]. E-recruitment systems have become important means of helping organizations establish a brand identity, attract talented workers, and retain valuable employees compared to traditional recruitment method. The revolution of computerization and automation of human resource implies the advancement of recruitment using the internet as application and screening of candidates can now be done by various programming methods. This ensures that all candidates get fair considerations during application and screening. However, in many implementations of E-Recruitment, there has been no effective collaboration between the public and private sector in terms of information sharing on areas such as youth employment, need for capacity building, programmes that strengthen development of talents, and outsourcing of talents skilled in both academic and technical grounds to the private sectors in order to reduce the rate of unemployment. A case in consideration is a portal for harmonizing information sharing between governmental agency particularly responsible for youth's development with other private and public sectors. Terms of reference include skill acquisition and employment to facilitate collaborative programmes that create recruitment links between enterprises, industries and talented youths. The E-Recruitment process makes provision for a pool of candidates who are potentially qualified for varieties of jobs and provides information needed by an enterprise to make prudent decisions in terms of selections to fill up the vacancies.

Many countries regardless of their status as developed, developing or underdeveloped face the same type of problems when it comes to unemployment of their citizens. There is generally lack of harmonization and coordination in the operations of various governmental and non-governmental programmes aimed at youth development. Also, recruitment agencies are confronted with many difficulties when it comes to filling the most suitable candidates for job vacancies as they are restricted and limited most times to the data repository they maintain or call for applications when there are openings. Recruitment agencies are therefore forced to select from stringent and skewed requirements as there is no collaboration with a networked centralized pool of database from where multiple comparisons for best choices can be made. Poor decision on recruitment made can have serious adverse effects on performance of a company and indeed the economy of a country. This study aims to bring the public and private sector together (in terms of youth employment), by harmonizing governmental and non-governmental capacity building and development programmes (for the youths) by

adopting a flexible, agile lightweight development methodology. By leveraging the agile method, development of the system experiences a lightweight process that supports a focus on the rapid delivery of business value. This helps the enterprise to significantly reduce the overall risk associated with development process and ensure that business value is maximized. The approach also fosters continuous alignment of deliverables with desired business needs, makes it easy to adapt to changing requirements throughout the project. Budget constraint play very minimal role towards success using adile approach as agile manifesto states that the team is self-organizing. Reduction of unemployment in any nation adds value to the nation's economy. This research work contributes towards solving unemployment problems through a retrospective tripartite networking and collaboration of information systems for effective decision making.

2. Review of Related Work

Today's E-recruitment implementations are designed to make valuable significant contributions to the enterprise business activity. Recruitment involves the overall process of attracting, short listing, selecting and appointing suitable candidates for jobs (either permanent or temporary) within an organization. Internet-based technologies which support all aspects of recruitment have become widespread throughout many countries though not effectively implemented in some countries. Sourcing approaches often utilized during recruitment is the use of one or more strategies to attract or identify candidates to fill job vacancies. It may involve internal and/or external recruitment advertising, using appropriate media, such as job portals, local or national newspapers, social media, business media, specialist recruitment media, professional publications, window advertisements, job centres, or in a variety of ways via the internet. Many major corporations recognize the need for diversity in hiring to compete successfully in a global economy. Online recruitment is advantageous as all exercises linked to it are quick and transparent with a lot of evidence-based transactions provided in a database [2], [9]. Recruiters are usually confronted with the burden of ensuring quick and transparent selection of candidates at various times of the year especially during periods when they need to resolve an emergency. In the past, it was very difficult to get a pool of potentially skilled candidates for a job selection with paper-based applications, as recruiting establishments had to attend to day-to-day running of business operations while handling recruitment issues [3]. The revolution of online recruitment has brought about situations whereby candidates can apply for jobs even before there are job openings, when job openings are created by recruiting establishments, eligible candidates are then selected from a pool of applications [4]. Online recruitments also make provisions for online tests and screenings which are created at the requests of the recruiting establishments. Screenings consider various factors which include age, sex, location, nationality etc., which are used to fast-track the recruitment process while also ensuring quality and efficiency [5]. With screening, candidates obtain jobs without being stressed of physically being engaged in the process, and the recruiting establishment gets successful candidates in a quick timeframe without being burdened with organizing the recruitment process. Both the individual seeking the job and the recruiting establishment are therefore fulfilled with this type of arrangement.

In the field of software development, many research studies on online recruitment systems have been undertaken. According to Ha [6], online recruitment system increases the efficiency and consistency involved in the process of recruitment, while reducing the efforts and resources used to find qualified applicants. Tsai et al. [7] in their study affirmed this hypothesis and stated that that online recruitment builds strong communication systems which allow communication between candidates and recruiters to be reviewed and evaluated. In the study of Smith et al.,[8] The authors argued that small companies considered it less expensive to use the internet for job advertisement compared to the print media, as the internet was more effective in targeting prospective employees than newspapers and other print mediums. Studies on the use of technologies in screening and selection processes for job candidates across the nations, observed that most organizations patronized screening and recruitment tools based on technology, for the discovery of new assessment strategies which would standardize systems, improve efficiency and therefore expand the pool of applicants [9], [10], [17]. Many researchers have explored the effectiveness of job portals to determine the factors and elements which could help increase the users' satisfaction on the use of job portals. The studies affirmed that there is a high level of user satisfaction with the presence of a chat facility, help desk/call center and online test features on job portals and this significantly reduced the costs involved in job application, and a technological strategy for improving screening activities in recruiting firms [10]. The authors also noted that, job search on the internet can significantly bring about improvements in search outcomes in terms of job quality and satisfaction. Thus it can be said that online recruitment can transform the traditional style of recruitment into a hiring process which is collaborative and independent of time and space.

Be that as it may, the developments of E-Recruitment systems have come with challenges. Organizations often adopt online systems because they believe e-recruiting is more likely than traditional recruitment sources to uncover individuals with unique talents and skills [8]. More so, recruitment strategies differ when the organization has the need to hire different levels of staff. Organizations would use different approaches depending on the job level and the amount of specialized skills and qualifications required for the position. It is extremely important to find the right fit even if the recruiter spends few

months to find the right person and the organization will be more precise in the interviews and in each step of the recruitment cycle. These constraints and many others such as ensuring that the candidates meet company goals and characteristic, ability to examine the relationship between recruitment system and technological development pose challenges to E-Recruitment development. Other issues include security and confidentiality, particularly with testing and selection online [11]. Thus E-recruitment is not considered as a process itself, but more as a web-based assistance that must be integrated into recruiting and selecting methods and collaborative with other external services. A high integration level of e-recruiting is achieved when parts of the online recruitment process are automated by a corporate information system [15]. Furthermore, with the implementation of e-recruitment come certain risks. Indeed, the design and implementation process should never be over as company policies are not static. It requires constant enhancement and upgrade to allow extensive collaboration with other databases and tools [12]. For this reason, the Lightweight Agile Feature-Driven Development (FDD) is preferred for E-Recruitment. Agile models provided a lighter way of software development with the intention to overcome the limitations of traditional software development models. Drawbacks of traditional models include less user interaction, long development duration, high cost, no adaptability and most importantly no response to frequently changing user requirements [17],[18]. Agile methodologies shift the focus from process to people and value those factors which were neglected in traditional models [19]. FDD as a process oriented and client-centric agile process model works by focusing on the design and building aspects of software development process [20], [13] and allows a well-known pattern known as Entry-Task-Verification-eXit (ETVX) consisting of five phases [23] to be applied. The phases include: i) Develop an Overall Model, ii) Build a Features List, iii) Plan by Feature, iv) Design by Feature and v) Build by Feature. Each phase further consists of different series of activities 13], [14]. Like other agile process models, it also follows iterative and incremental approach for software development. FDD develops the software according to client valued features [15] by using eight best practices such as: domain object modeling, development by feature, individual class ownership, feature teams, inspection, configuration management, regular builds and progress reporting [11], [14].

3. Enterprise Collaboration and Networks

Several methods are known for collaboration between business enterprises and partners of services. On a basic level, an individual partner might identify a business enterprise through advertisement or word of mouth, and then directly contact the business enterprise or the business enterprise's portal. Once contact is made, negotiations take place which may result in a consummated business transaction. Particularly for large scale transactions, the process usually is more complicated. Instead of searching business enterprise by business enterprise to find a desired set of skills, a partner may wish to narrow the universe of potential skills according to certain criteria such as price, references or location. This permits the partner to avoid spending time looking for business enterprises or listings which are of only tangential interest or no interest at all, and instead to focus on the universe of skills which most suits the partner's needs.

From the business enterprise's perspective, it is desirable to narrow contacts with potential business enterprises to those more likely to result in a consummated transaction. Perhaps most importantly, it is in the partner's interest to evaluate the financial position of prospective business enterprises to minimize financial risk and to avoid added time and expense. Frequently, the partner may desire to preserve anonymity throughout part or all of the interactive process. Further, it is often desired by partner to obtain a list of potential business enterprises that can each be evaluated in terms of the likelihood that they will engage the business enterprise's skills before they are contacted [11].

In recent times, advances in data storage and retrieval methods and communications methods have permitted more sophisticated approaches to performing at least the initial step of matching business enterprises to partners and graduates [16]. For example, many web portals now utilize a network of terminals linked to a host computer which provides a database of listed skill sets. The portal can formulate a list of skill sets in which the partner may be interested based on criteria provided by the partner, such as price, location, size or type. The partner can then view the skills and, if interested, can contact the business enterprise, or more usually, the business enterprise's portal in order to initiate negotiations. Advances in communications and multimedia applications have been applied to improve the quality of the information conveyed to the potential partner about skills being offered for sale. More recently, interactive systems have been proposed through which the prospective partner can assess skills advertised via social media portals. Even more recently, the global networks have been used to advertise particular pieces of skills to potential business enterprises. Such uses are primarily limited to situations in which a business enterprise advertises a particular set of skills by posting a listing on an "electronic bulletin board" which may be read by potential applicants. The potential customer can then contact the business enterprise or the business enterprise's portal by telephone or by electronic mail.

While some databases created by portals or brokers are available, access is usually limited [21]. Typically, many systems require the payment of a fee in order to gain authority to utilize the database. Many others available on the Internet are limited in terms of the features and services provided [22].While greatly improving the accessibility of business enterprises to information concerning skills being offered for service, these prior methods and

systems suffer from many disadvantages and drawbacks. Moreover, many of the systems according to the prior practice fail to offer interrelated skills being offered as service. A partner must therefore expend a great deal of time and effort to sort through each skill set to find one which is of potential interest. Even where the prior method provides a sorting function, such as with the local bulletin databases, they generally are not directly available to the partner, but instead must be accessed through a portal. Again, this adds to the partner's costs, and provides a disincentive to engagement, thus adversely impacting the business enterprise. Furthermore, the prior art systems described above often fail to adequately screen potential business enterprises. Financial screening can permit the business enterprise to increase the chances of a successful consummated collaboration.

4. Features Specification Abstraction

Feature-Driven Development (FDD) is a client-centric, architecture-centric, and pragmatic software process. As the name implies, features are an important aspect of FDD. A feature is a small, client-valued function expressed in the form <action><result><object>. For example, "Save CV in database", "Search for Job in Database", and "Apply for work in an Establishment". Features are the primary source of requirements and the primary input into the planning efforts. FDD is a model-driven short-iteration process that consists of five basic activities. For accurate state reporting and keeping track of the software development project, milestones that mark the progress made on each feature are defined. This section gives a high level overview of the activities proposed for the E-Recruitment System. In the Figure 1, the meta-process model for these activities is displayed. During the first two sequential activities, an overall model shape is established. The final three activities are iterated for each feature.

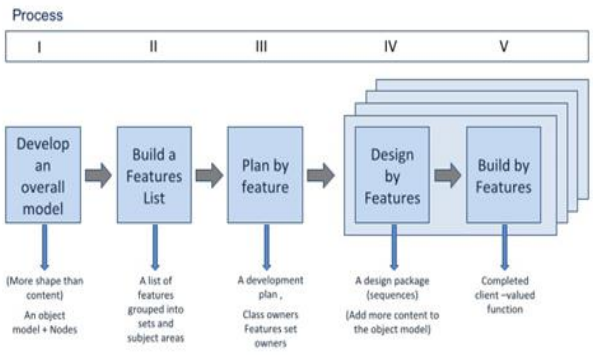

Figure 1: FDD Process Life Cycle

In the first phase, the overall model that represents the high level-object model is developed. In this phase, the goal is to identify and understand the fundamentals of the domain that the system will address. The second phase is concerned with building the features list of the system and grouping them into related sets and subject areas. These first two phases for the case of the E-Recruitment is presented in a mind map shown in Figure 2.

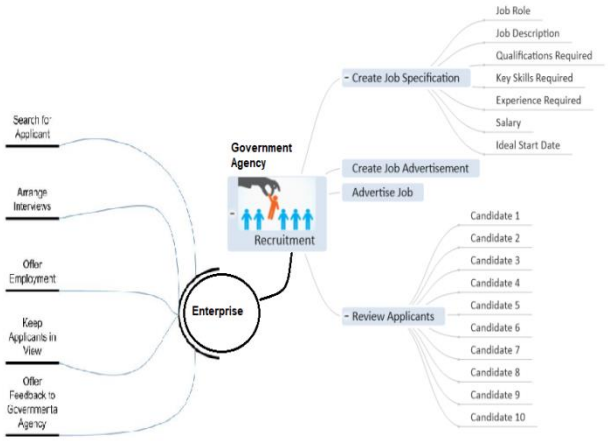

Figure 2: Mind map of the E-Recruitment System

The third phase is involved with planning the development based on the features. At this stage the class and class owners are identified. The majority of the effort on an FDD project is carried out in the fourth and fifth phases namely Design by Feature and Build by Feature. These two activities include tasks such as detailed modeling, programming, testing, and packaging of the system.

The aim of this the E-Recruitment System is to apply a lightweight agile development methodology from the point of view of both service producers and requesters and review the range of futures that are available to the clients through the design and implementation of a specified web-based portal that would provide an interactive platform for government agency, enterprises and job seekers to form alliances. The features would include;

i. Design of an information system on available jobs and capacity building and developmental program;
ii. Design of a statistics module on current and previous job employments and records;
iii. Design of database for storing records of applicants and enterprises;
iv. Design of a module for application for jobs and skill acquisition programmes and;
v. Design a module for outsourcing of jobs to recruiting establishments and selection of potential qualified and skilled candidates by recruiting establishments.

Thus the solution provides a platform that networks stakeholders for effective collaboration and formation of alliance conglomeration. Thus the major contribution achieved by the work is a management information system for harmonizing recruitment activities and capacity building and development programmes to reduce unemployment in communities.

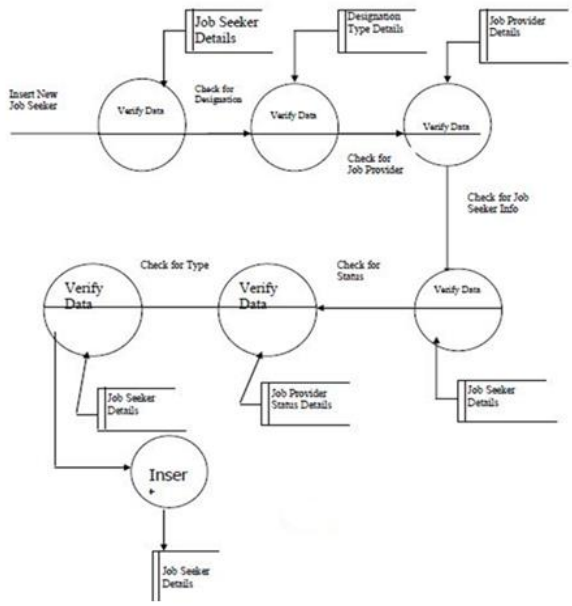

Figure 3: DFD for New Recruitment Creation

The data flow diagram (DFD) in Figure 3 shows graphical representation and analysis of movement of data through a system. Based on the DFD other class objects deployed in the system are developed. The DFD also depicts the logical association of artefacts for which the physical data is modelled.

5. Lightweight System Implementation

The Home page gives an introduction to the E-Recruitment portal and introduces the government agency used in this study, the Federal Ministry of Youths and Sports (FMYS). The portal is designed to be hosted by FMYS and sign up options exist for job applicants, recruiting organizations and officials of the FMYS.

5.1 Login, Profiling and Sign up Pages

The signup page is the registration hub of the job E-Recruitment portal. It requires the user to enter detailed information on username, password and email address which the user would like to use for registration. The role field requires the user to select one of three options: Job applicant, FMYS, Recruiting organization user roles, as the role he/she would be playing in the portal.

Figure 4: Assess Page of the E-Recruitment System

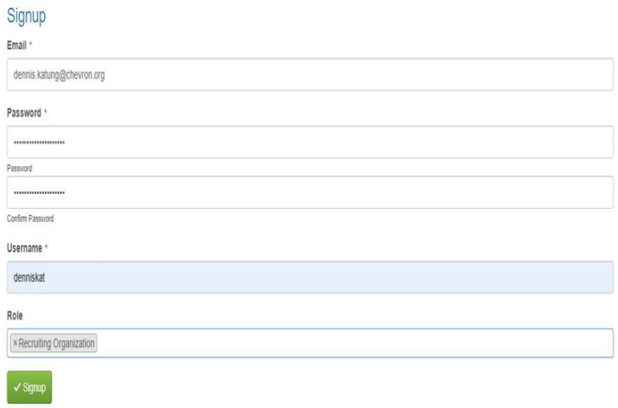

Figure 5: Sign Up Profiling Recruiting Organizations

Figure 6: Sign Up Profiling for Applicants

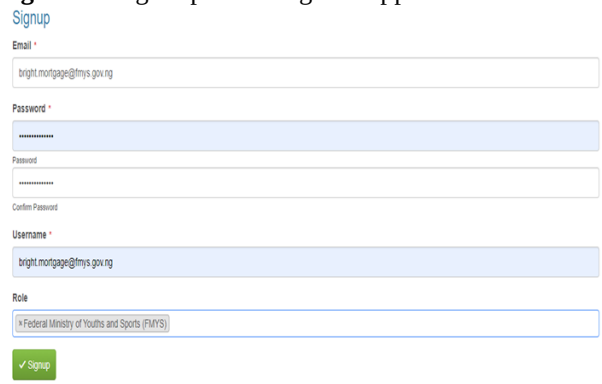

Figure 7: Sign Up Profile for Government Agency

The introductory page is shown in figure 4. This page links into a profiling page which allows the recruiting organisation, the government agency and the job applicant to create a profile to the E-Recruitment system. This is shown in Figure 5, Figure 6 and Figure 7. This page requires the user to enter email address and password for authentication to create the user account. In an online recruitment process, the applicant is required to send a detailed synopsis of his/her background, skills, academic qualifications and experience (otherwise known as curriculum vitae) via internet-based applications or website owned by the recruiting establishment. The applicant's curriculum vitae is examined and screened by automated processes put in place by the recruiting establishment. This is shown in Figure 8.

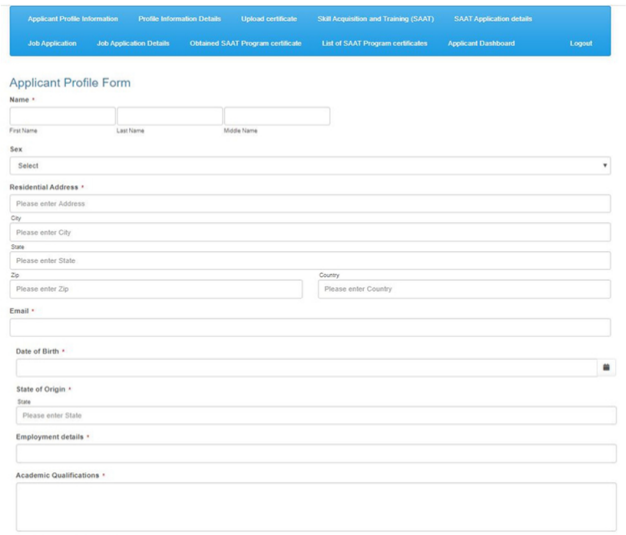

Figure 8: Applicants Profile Form

Similarly, the government agency and the Recruiting organization also provide detailed description of their organization. This is shown in Figure 9 and Figure 10.

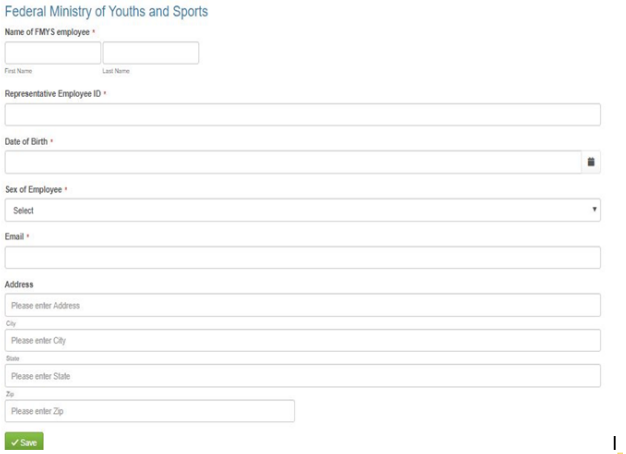

Figure 9: Government Agency Profile Form

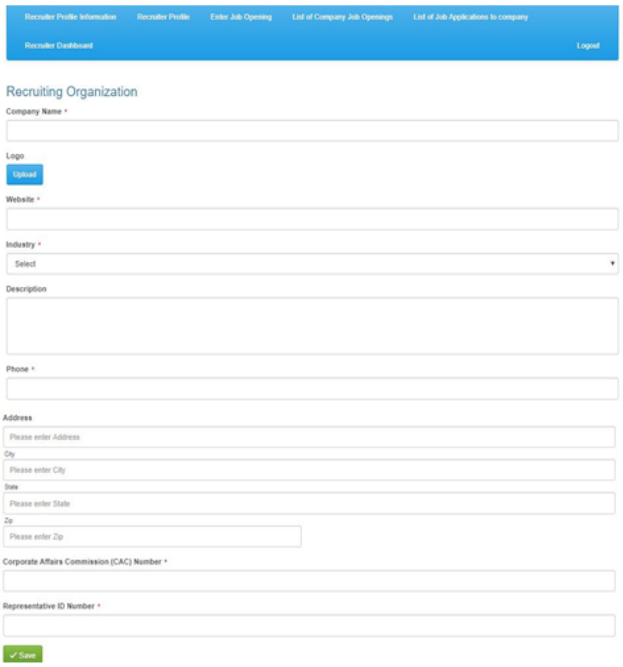

Figure 10: Recruiting Organisation Profile Form

After the representative of the recruiting organization and the applicants provide all information as in Figures 8 to 10, the details of all fields filled by the employee and the government agency are previewed on the job portal as shown in Figure 11 and Figure 12.

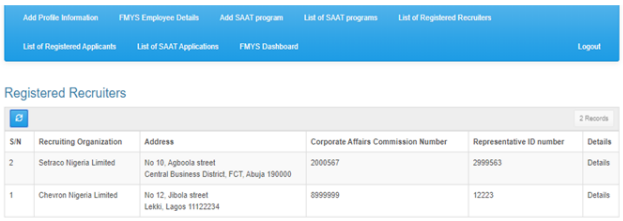

Figure 11: List of Registered Recruiters.

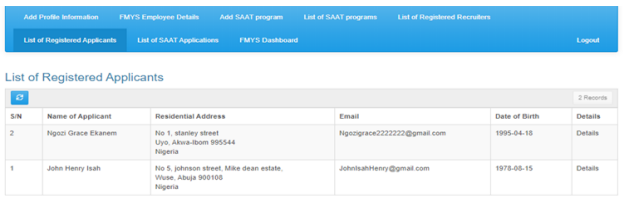

Figure 12: List of Registered Applicants.

5.2 Uploading Job Opening

Figure 13 displays a filled form with details of Chevron Nigeria Limited, a recruiting organization in the oil and gas industry used in this study. The filled form and table displays the company name, company logo, company website, company description, Address, CAC number and identity number of the company representative ID.

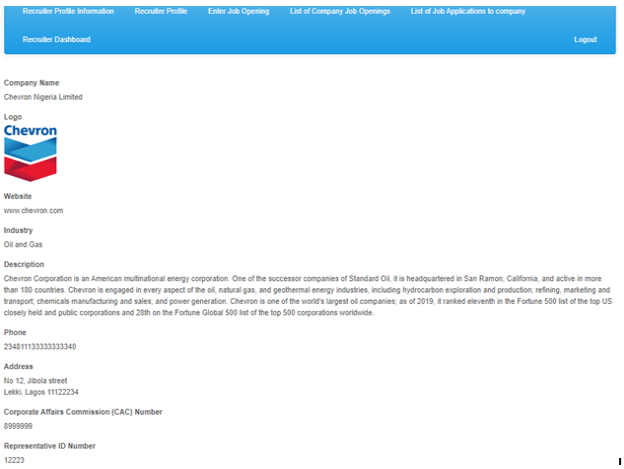

Figure 13: Details of Recruiting Organization

Job openings are entered on the job portal from the recruiting organization account, by filling the form in Figure 14 to add job openings to the E-Recruitment portal.

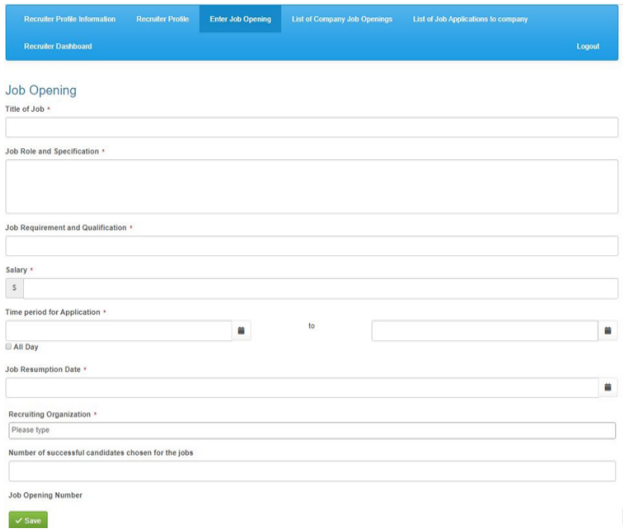

Figure 14: Adding Job Opening

The organization can see its own list of job openings by reviewing the data table on list of company job openings in Figure 15. By clicking the details link on the data table, the Recruiting Organization is directed to a page where the details of the job is previewed, as displayed in Figure 16.

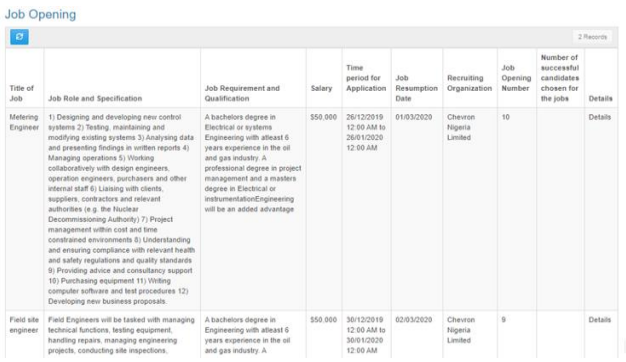

Figure 15: List of company job openings

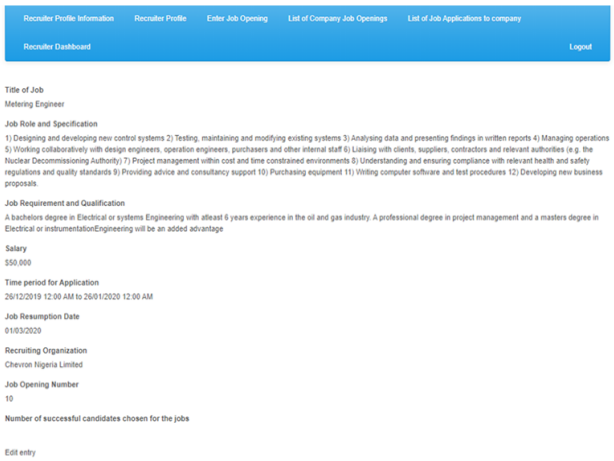

Figure 16: Details of Job Opening

5.3 Uploading of CV and Applying for Job

This is the feature which defines the process where job applicants can apply for job openings already entered by the recruiting organizations in to the system, as displayed in Figure 15. First, the applicant can add more details of his work experience, qualifications and can also upload his CV. Figure 17 shows how an applicant uploads all credentials (academic and professional certificates) he/she obtained and wishes to make available. The certificates are updated on the data table as the applicant uploads them to the E-Recruitment Portal. On the job portal, recruiters can have access to the certificates by clicking on the profile details of the applicant who has applied to a job opening owned by a recruiter.

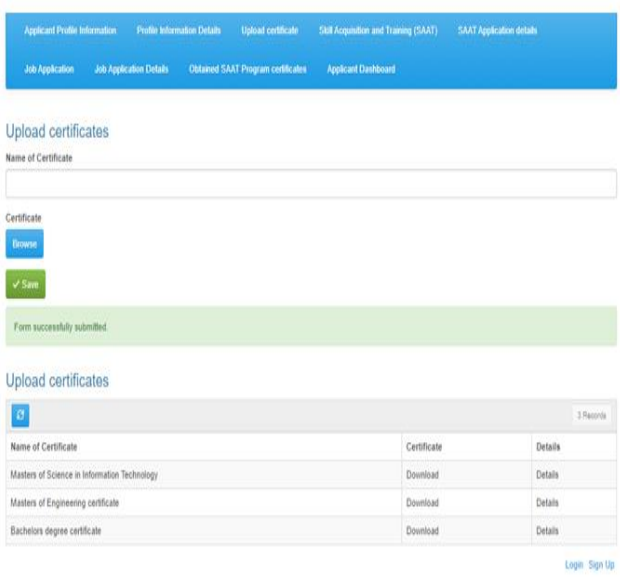

Figure 17: Uploading of CV and Certificates

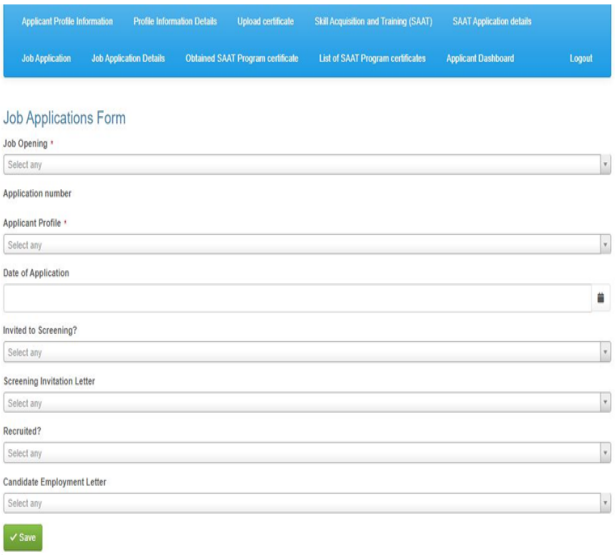

Figure 18: Job Application Page

A job applicant applies for a job by simply filling the form in Figure 18. The candidate applies for any job available on the job portal by selecting a particular job opening from a dropdown of jobs displayed on the "Job opening" field on the form in Figure 18. The "Applicant profile", "Date of application" "Application Number" and "Name of Organization" fields are automatically generated by the system, while the fields on "Invited to Screening?", "Screening invitation Letter","Recruited?", and "Candidate EmploymentLetter" are filled by the Recruiting organization that owns the job opening, during the process of selecting candidates during and after the screening and recruitment processes. As the job applicant applies for jobs, the applications get updated on the dashboard data table shown in figure 19. The data table provides the job applicant a list of all jobs which the applicant has applied for, and also allows the applicant follow up on the application and the evaluation of his or her performance during recruitment process.

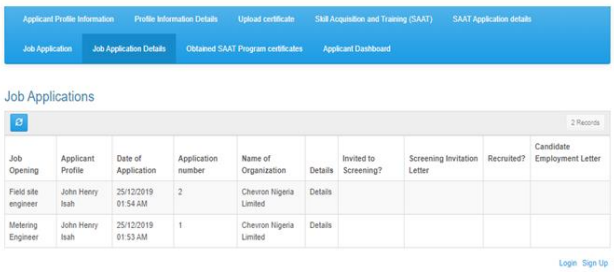

Figure 19: Job Application Dashboard

5.4 Providing Updates on Job Selections

The data table which previews the job applications are auto generated by the job applicant as displayed in Figure 19 from the Job applicant user account. This data can also be previewed by the recruiting organization from its user account. Using the form displayed in Figure 20 the recruiting organization can update the progress of job applications made to the organization. To update the progress of the application, the recruiting organization selects from available dropdowns, the job opening and the applicant profile (name of applicant), and the job application number pops up automatically to confirm that the recruiter is working on the profile of the right applicant. The recruiter can always update the fields on "Invited to Screening?", "Screening invitation Letter", "Recruited?", and "Candidate EmploymentLetter" at any point in time during the recruitment process. As the recruiter updates the fields, they equally get updated on the centalized data table as shown on Figure 20.

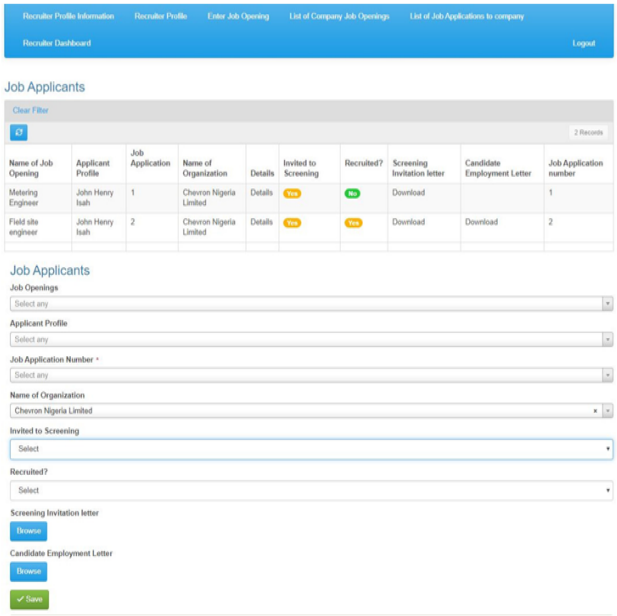

Figure 20: Updating Job Application Progress

With this dashboard, internal analysis on recruitment can be carried out for decision making by the recruiting organization.

The governmental agency has a very critical role to play in this entire paradigm. As this organization has the administrative role over the E- Recruitment system, it can monitor the statistical data generated by both the applicants and recruitment organisations and provide support for agencies who actively participate in providing employment of job seekers. The governmental agency can also organize training to upgrade the skills of applicants who have been actively applying for jobs without success based on authentic statistics obtained from the system. This training referred to as Skills Acquisition and Training (SAAT) is part of the features of this system but not expanded upon due to adherence to strict relevance to this paper.

6. Summary and Conclusion

A lightweight agile methodology was selected for this development based on its suitability for the projects. It has been affirmed that agile methodologies can be modified easily to fit the available team and company culture [24]. Therefore much caution was taken by sticking as close as possible to the formal definition of the methodology and adapting the methodology practices so as to gain the necessary experience for this work. In summary, this study provides an overview on the design and implementation of a portal that connects

individuals searching for jobs, organizations aiming to recruit individuals, and a government agency (FMYS) for the purpose of employment and skill acquisition. Various literature contents on online recruitment have been reviewed to understand how far technology has been adopted in the recruitment processes of organizations and firms around the world. Though results from the literature review shows that recruitment based on the use of the web has definitely triggered a revolution as to how organizations conduct recruitment activities within their organization, there is a need for the government to be as much as possible proactively involved in recruitment and skill acquisition activities either directly or indirectly, as part of unemployment reduction and youth development strategy in the society. This work gave a perfect implementation of the concept of this tripartite collaboration and network. Within Nigeria for example, there are various websites which connect individuals and organization for the purpose of recruitment, but no official government platform exists for obtaining and analyzing data on recruitment and skill acquisition activities. This proposed and designed E-Recruitment portal therefore provided a solution to this problem by connecting the government, recruiting organization and prospective candidates targeting employment and the system can be used officially for the purpose of data collection, data analysis and information sharing. The portal is designed using web programming technologies HTML, CSS and Javascript; with database design implemented with MySQL. This E-Recruitment portal has the capability of becoming a very successful tool for reducing unemployment in the society as the analysis of data obtained can be used for government planning and policy. The job portal provides user accounts for the applicants, recruiting organization and the FMYS with features for job application, skill acquisition training application, monitoring, updating and evaluation of recruitment processes using the FDD Agile development approach. This therefore provides an effective means of applying for jobs and skill acquisition training, and also an efficient means of monitoring and evaluation of recruitment processes.

7. Area for Further Research

It is obvious, that the revolution of technology is now a very important tool for management processes of human resource units, in order to meet up with their daily responsibilities and operations. Online recruitment is very quick and viable, thereby making it very popular in many nations and amongst recruiters. The concept of online recruitment is now advancing amongst a large amount of the global population as part of the internet revolution. For this project, an area for further research could be extension of accessibility to systems of this sort to mobile platforms such that even individuals seeking employment but lack ownership of computer systems can use their electronic devices such as phones to access the services if they wish to hunt for jobs. This will extend the use of the system far beyond the confines of one governmental agency into a reliable means of ascertain statistical information not only on employment but also on average age of applicants, locations, job preferences and indices for national economic growth assessment.

References

[1] Mansourvar, Marjan, and Norizan Binti Mohd Yasin. "Development of a job web portal to improve education quality." *International Journal of Computer Theory and Engineering* 6.1 (2014): 43.

[2] Thompson, Lori Foster, Phillip W. Braddy, and Karl L. Wuensch. "E-recruitment and the benefits of organizational web appeal." *Computers in Human Behavior* 24.5 (2008): 2384-2398.

[3] Taylor, Jacquelyn Y. "Recruitment of three generations of African American women into genetics research." *Journal of Transcultural Nursing* 20.2 (2009): 219-226.

[4] Galanaki, Eleanna. "The decision to recruit online: A descriptive study." *Career development international* 7.4 (2002): 243-251.

[5] Prouska, Rea, et al. "Employee participation and representation in Central and Eastern Europe." *Economic and Industrial Democracy* (2019): 0143831X19887805.

[6] Saradha, H., and Harold Andrew Patrick. "Employee engagement in relation to organizational citizenship behavior in information technology organizations." *Journal of Marketing and Management* 2.2 (2011): 74-90.

[7] Tsai, Wei- Chi, and Irene Wen- Fen Yang. "Does image matter to different job applicants? The influences of corporate image and applicant individual differences on organizational attractiveness." *International Journal of Selection and Assessment* 18.1 (2010): 48-63.

[8] Smith, Alan D., and William T. Rupp. "Managerial challenges of e- recruiting: extending the life cycle of new economy employees." *Online Information Review* (2004).

[9] Chapman, Derek S., and Jane Webster. "The use of technologies in the recruiting, screening, and selection processes for job candidates." *International journal of selection and assessment* 11.2- 3 (2003): 113-120.

[10] Kar, A., & Bhattacharya, S. (2009). E-recruitment and customer satisfaction: An empirical study in and around Kolkata. *IUP Journal of Management Research*, *8*(2), 34.

[11] Kerrin, Máire, and Polly Kettley. *E-recruitment: Is it Delivering?*. Institute for Employment Studies, 2003.

[12] Kim, Soonhee, and Jennifer G. O'Connor. "Assessing electronic recruitment implementation in state governments: Issues and challenges." *Public Personnel Management* 38.1 (2009): 47-66.

[13] S. Goyal, "Major Seminar On Feature Driven Development," p. 22, 2007.

[14] B. Boehm, "A Survey of Agile Development Methodologies," Laurie Williams, pp. 209–227, 2007.

[15] P. Coad, J. D. Luca, and E. Lefebvre, "Java Modeling In Color With UML," in Java Modeling In Color With UML: Enterprise Components and Process, no. c, 1999, pp. 1–12.

[16] Reichheld, Frederick F., and Phil Schefter. "E-loyalty: your secret weapon on the web." *Harvard business review* 78.4 (2000): 105-113.

[17] G. Rasool, S. Aftab, S. Hussain, and D. Streitferdt, "eXRUP: A Hybrid Software Development Model for Small to Medium Scale Projects," Journal of Software Engineering and Applications, vol. 6, no. 9, pp. 446–457, 2013.

[18] F. Anwer, S. Aftab, U. Waheed, and S. S. Muhammad, "Agile Software Development Models TDD , FDD , DSDM , and Crystal Methods : A Survey," International Journal of Multidisciplinary Sciences and Engineering, vol.8, no. 2, pp. 1–10, 2017.

[19] F. Anwer, S. Aftab, S. S. M. Shah, and U. Waheed,"Comparative Analysis of Two Popular Agile Process Models: Extreme Programming and Scrum," International Journal of Computer Science and Telecommunications Journal, vol. 8, no. 2, pp. 1–7, 2017.

[20] [11] P. Abrahamsson, O. Salo, J. Ronkainen, and J. Warsta, "Agile software development methods: Review and analysis," VTT Publications, no. 478. pp. 3–107, 2002.

[21] Santos, Jessica. "E- service quality: a model of virtual service quality dimensions." *Managing Service Quality: An International Journal* (2003).

[22] Palmer, Jonathan W. "Web site usability, design, and performance metrics." *Information systems research* 13.2 (2002): 151-167.

[23] S. R. Palmer and M. Felsing, A Practical Guide to Feature Driven Development. 2002.

[24] Boehm, Barry, and Richard Turner. *Balancing agility and discipline: A guide for the perplexed*. Addison-Wesley Professional, 2003.