

AUTOMATION PSYCHOLOGICAL ASSESSMENTS WITH CLOUD COMPUTING

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ABSTRACT: This paper deals with the automation of psychological assessments to help to select the right candidate for the organization during the recruitment process on a human resources consulting firm. The solution was developed with Kanban Method and cloud computing, such as Amazon Web Services (AWS), where it was integrated and launched with other services to improve security and operativity. Experiments were divided into functionalities: (1) an interface for mobile phones and (2) notifying recruiter by SMS and Email when candidate finalize the tests. The results show improved recruiter response time to analyze test results and prepare psychological reports in two and a half months. The recruiter's performance increased by up to 5% in person-hours.

KEYWORDS: Psychological assessments, automation, cloud computing, e-recruitment process.

I. INTRODUCTION

Human resources consulting firms and other industries around the world have been interested in the advancement of technology to be more comfortable in every activity and to reduce the cost of hiring during the recruitment process. One alternative adopted has been e-recruitment based on web pages recruitment systems and mobile applications to improve all processes to provide the best suitable candidate for the organization. This hard work needs online e-recruitment platforms, but it is not enough. Recruiters need to search candidates, evaluate with projective and psychometric tests, and interviews to assess the psychological profile of candidates to decide and to hire new employees. Human Resource Management has been using technology since the 1960s with mainframe computer systems and keeps using technology. Still, nowadays they use Enterprise Resource Planning (ERP) or platforms specialized in recruitment, selection, training, compensation, performance management and planning for job applicants and employees, including managers and business partners [1].

The relevance of apply technology to facilitate work for recruiters is significant much in this time of pandemic when economies keep the recruiting process. The most optimistic estimates after the outbreak of COVID-19 predicted that the growth rate of the world economy would decrease to 1.0% or less [2]. According to [3] only in Lima, Peru, 2,3 million people are unemployed, but [4] affirm labor market concerned human health, education, essential public services, and technology will increase.

For this reason, it is important to continue applying technological developments to make possible improvements to the recruitment and selection processes, specifically in psychological evaluations that give accurate results according to the area to which a candidate is applying. As well as facilitating access and availability to these recruitment systems to recruiters and candidates. This research highlights results obtained in the automation of psychological assessments to help during the recruitment process on a human resources consulting firm using the benefits of cloud computing services such as AWS.

II. Related Work

Researches implemented psychological assessments based on web pages to be resolved by candidates. One research [5] implemented a web page expert system in the selection process, reducing the qualification time of psychological assessments and offering reliable results. Another research [6] implemented a web page system to take psychological tests online, and results were shown in a selection report. Another thesis [7] automate psychometric tests with a non-immersive virtual reality system based on web pages deployment on Heroku to evaluate candidates and savings more than 40% of person-hours per recruitment process.

III. THEORY

3.1. E-recruitment

Online recruitment or e-recruitment includes practices and activities with the main purpose of identifying and selecting potential employees carried out on the internet, making it more accessible, especially where long distances are involved.

3.2. Cloud Computing and Recruitment process

Cloud computing is a technology that provides remote access to software, store files, and process data through the Internet, being the alternative to using the personal computer or local server [8].

3.3. PaaS

Platform as a Service (PaaS) is the intermediate layer where developers and IT managers are offered the necessary tools to develop and distribute web applications, without the need to download and install additional software [9], such as AWS, Heroku, Google App Engine, Windows Azure and others.

3.4. Kanban Method

Kanban Method is an agile software development framework where work items are visually represented on a Kanban Board, allowing team members to see the status of each part or column at any time. These columns correspond to work item states ("Do", "Doing," and "Done" are such states). "Doing" column limits the work in progress for each person. Kanban is characterized by the principle of "start with what you do now," such is mentioned in [10].

3.5. Continuous Integration

Continuous Integration keeps the developer's changes validated by running automated tests to check the integrity and then integrate their changes into the main branch [11].

3.6. Continuous Delivery

Continuous Delivery automates deployments at any time and offers new changes to your customers quickly. Deployments can be at any point in time without affecting customers in production [11].

IV. Our Approach

We developed automation of psychological assessments to help during the recruitment process on a human resources consulting firm, was used cloud computing, such as AWS and GitHub, to deploy the solution. The first step was to identify which functionalities are most important and to evaluate which services are best to use. Second, to migrate from Heroku to AWS, meanwhile testing each functionality and ensuring the quality of the software. Finally, it was developed new two new functionalities: (1) an interface for mobile and (2) to be notified by SMS and Email to recruiter when candidate finalize the tests. The development of the project was carried out using the Kanban Method with Work In Progress (WIP) equal to one, and it was applied to test and deploy weekly changes to ensure quality.

The software was deployed on Amazon Lightsail with 2 GB of RAM, a Virtual Private Network, and it was enabled to be a Virtual Private Cloud with Application Load Balancer and Route53. The database was migrated to PostgreSQL 11 Micro Database on Amazon Lightsail. The mobile interface was programmed to React.

The second new functionality was developed using Amazon API Gateway, Lambda Functions, Amazon Simple Notification Service (SNS), and Amazon CloudWatch to tracklogs, and we integrated it with Route53. In the flow of the automation of psychological assessments, we included a call to Lambda Function programming in Java 8 and configured telephone number and email of the recruiter on SNS.

Both functionalities were tested with three psychological assessments in a small group of people. **Figure 1** shows the architecture of the solution deployed in the production environment on AWS.

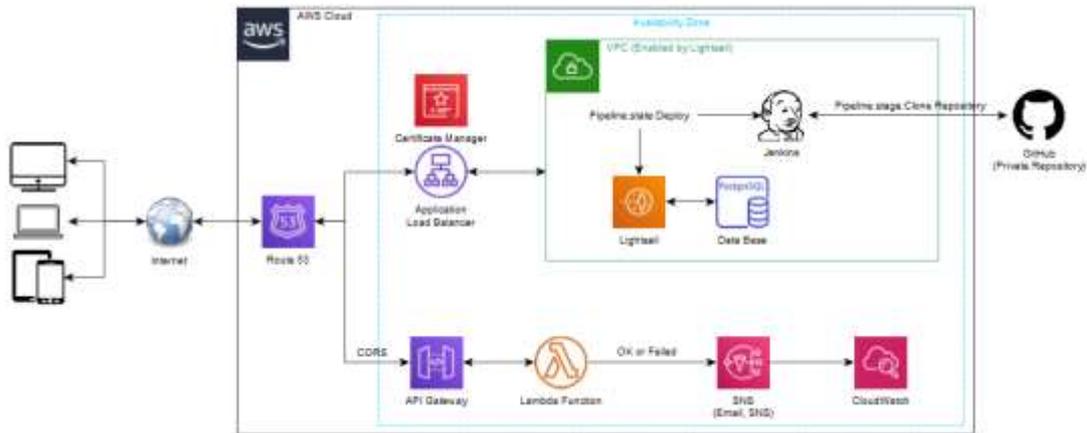


Figure 1. The architecture of the solution

V. Experimentation and Results

For the experiment, the population was about more than sixty candidates in two and a half months. With the following characteristics: (a) adults with mean between 27 and 35 years old, (b) Peruvians living in the city of Lima, and (c) applying for positions of medium operational. The psychological tests taken were BarOn, GATB, and DISC. The psychological report generated by the software was accompanied by a psychologist who was worth interpreting the results.

After the first experiment, the candidate's feedback was positive for mobile than for the original web page. Regarding notification by email and SMS, the performance of recruiters increased by up to 5% person-hours per month, on average, 3 hours throughout January 2020 and middle March 2020. **Table 1** shows a comparison between person-hours without, and with the solution, numbers of candidates were equal for both comparative experiments. Each psychological report represents around three hours per candidate.

Table 1. Average person-hours comparative with experiments of writing the psychological report.

Period	Total candidates per month (without/with solution)	Average person-hours per month without solution (Hours)	Average person-hours per month with the solution (Hours)	Difference
January 2020	11 / 11	34.0	31.5	2.5
February 2020	14 / 14	43.5	39.5	4.0
March 2020	7 / 7	22.0	19.5	2.5

VI. CONCLUSIONS AND FUTURE WORK

The main contributions of this work are a reduction of person-hours worked on the psychological evaluation process on a human resources consulting firm. This proposal reduces the time spent on schedule an appointment and reduces the cost of hiring, after notifying to the recruiter that candidate finalizes the assessments.

Along with this research, we identify challenging issues, such as the migration to automation help, but to complete the psychological evaluation process is necessary for an expert to decide and to ensure the candidate is telling the truth.

To handle the difficulties mentioned above, we suggest exploring how to use artificial intelligence to be implemented in recruitment [12] [13] or job interviews to identify expressions of the candidate's face and got an automation interview identifying, for example, micro-expressions using a database of pictures labeled with multiple face gestures, even to interpret body language responses monitored by webcam, and trained with an unsupervised algorithm such as K-means Clustering.

This research, shortly, will contribute to the recognition and elimination of prejudices by the personnel evaluating candidates, using evidence-based artificial intelligence, creating competitive advantages, and generating improvements in the talent acquisition functions through the digital transformation of these same.

The present proposal will allow us to configure and personalize the required skills of the candidates, as well as provide suggested profiles for a sought job position; this will be achieved through algorithms of pattern recognition via video and voice. These patterns will be saved and continually updated, generating new and better profiles based on new knowledge and quality indicators.

This research will allow us to compare the skills evaluated before hiring and the expertise demonstrated after hiring by monitoring the daily work of the staff employed during their trial period, finding opportunities for improvement, constant training, and decision-making regarding continuity labor.

This research involves the intention to quantify skills and competencies by observing the candidate's behavior while performing written and oral evaluations using video, the voice of artificial intelligence-based software hosted in cloud computing.

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VIII. References

- [1] D. L. Stone and J. H. Dulebohn, "Emerging issues in theory and research on electronic, human resource management (eHRM)," *Hum. Resour. Manag. Rev.*, vol. 23, no. 1, pp. 1–5, 2013, doi: 10.1016/j.hrmr.2012.06.001.
- [2] Naciones Unidas, "América Latina y el Caribe ante la pandemia del COVID-19 Efectos económicos y sociales," *Inf. Espec. Covid-19*, no. 1, pp. 1–15, 2020, [Online]. Available: https://repositorio.cepal.org/bitstream/handle/11362/45337/S2000264_es.pdf?sequence=4&isAllowed=y.
- [3] P. Villar and L. Chávez, "Casi la mitad de empleos en Lima se perdieron y algunos puestos jamás regresarán tras la pandemia," *El Comercio*, Lima, Jun. 16, 2020.
- [4] C. Lugo Silva, "Transformación digital: de ideal a esencial," *TELOS Fundación Telefónica*, Jun. 2020.
- [5] S. R. Mendoza and J. N. Cáceres, "Sistema experto para la selección de postulantes en puestos de una agencia bancaria usando la metodología CommonKads," *Universidad Nacional Mayor de San Marcos*, 2016.
- [6] N. Reyes, "Diseño e implementación de un sistema para la selección y reclutamiento de personal basado en gestión por competencias," *Universidad Estatal Península de Santa Elena*, 2014.
- [7] F. Cerna, "Sistema WebVR para el proceso de evaluación psicológica en una consultora de recursos humanos en Lima 2019," *Universidad Tecnológica del Perú*, 2019.
- [8] Salesforce.com, "What Is Cloud Computing?," *Salesforce*, 2020. <https://www.salesforce.com/products/platform/best-practices/cloud-computing/> (accessed Jun. 25, 2020).
- [9] J. Curto and J. Conesa, *Introducción al Business Intelligence*. Barcelona, Spain: El Ciervo 96, S.A., 2010.
- [10] B. Mike, *Kanban from the Inside*. Sequim, Washington: Blue Hole Press, 2014.
- [11] S. Pittet, "Continuous integration vs. continuous delivery vs. continuous deployment," *Atlassian*. <https://www.atlassian.com/continuous-delivery/principles/continuous-integration-vs-delivery-vs-deployment> (accessed Jun. 25, 2020).
- [12] A. Bongard, "Automating Talent Acquisition: Smart Recruitment, Predictive Hiring Algorithms, and the Data-driven Nature of Artificial Intelligence," *Psychosociological Issues Hum. Resour. Manag.*, vol. 7, no. 2, p. 19, 2019, doi: 10.22381/pihrm7120193.

- [13] H. Rodney, K. Valaskova, and P. Durana, "The Artificial Intelligence Recruitment Process: How Technological Advancements Have Reshaped Job Application and Selection Practices," *Psychosociological Issues Hum. Resour. Manag.*, vol. 7, no. 2, p. 25, 2019, doi: 10.22381/pihrm7120194.