Business Process Automation and Re-engineering for Enhancing Recruitment and Selection Process: Case study in Refining & Petrochemical Company

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Abstract: *The changes in business environments have led to increasing organizations' interest in improving their processes to enhance performance and attain competitive advantage. Automation of traditional business processes management makes the corporations more innovative and adaptive to change approaches. Business Process Automation (BPA) leads organizations to re-engineer their processes to achieve their success goal from all departments. Recruitment and selection is a major sector in any organization. The process of finding and matching people for the right specific job requires time and effort from organization management to optimize its effectiveness and production. This paper addresses the implementation of a business process re-engineering using the Bizagi platform. It presents the automation of the recruitment and selection processes of Petro Rabigh company to enhance the time and reduce cost.*

Keywords: Business process re-engineering, Bizagi, hiring management, recruitment, automation

1. Introduction

What worked yesterday may not work today or tomorrow. World is changing fast all the time in all parts of life: education, healthcare, government and all business areas.The business environment is rapidly changing which may lead to the need of improving processes continuously to enhance the performance of the organizationsand increase their efficiencies. Smart organizations know that, so they concern with their strategies, structures, environment, processes, and technologies to succeed in the business. They are required to apply the new advanced technologies in order to facilitate their work and business processes at all levels. Business processes are a combination of activities that aim to achieve organizational goals[1].

The change of information systems and applications is essential in any organization to support evolving business processes[2]. Therefore, there are one of the most popular change management approaches called Business Process Re-engineering (BPR) which can provide solutions to corporations[3]. BPR creates dramatic performance improvements such as reducing cost, increasing quality, enhance services, and speed operations[4]. To create effective BPR procedures, companies have concentrated on automating their business process by using technology to make the management of processes more efficient[5]. The automation of business processes can be done by different kinds of software.

This paper aims to use the Bizagi platform to model and automate business processes in a recruitment and selection area in Petro Rabigh company in order to reduce process time and costs by eliminating unnecessary activities. Due to the importance of recruitment and selection department, the success of the organization is directly related to the performance of individuals who responsible for that business. Thus, conscious efforts must be put into human resource planning[6].

The overall structure of this study is organized as follows: section 2 presents a literature review including BPR, automation, and recruitment and selection process; section 3 illustrates our methodology followed by section 4 that examines the current recruitment process model. From sections 5 to 7, it covers the re-engineering of the process model, provides monitoring and optimization after improvements and process automation. Finally, the conclusion is outlined.

2. Literature Review

2.1 Business Process Re-engineering

Business processes term has different definitions, but most researchers suggest that it refers to the group of related activities within an organization that creates valuable output by adding procedural values using organization resources to achieve a concrete goal[7]. It's essential to understand the business processes and optimized well, particularly before integrating an enterprise to make the Enterprise Resource Planning (ERP) system works successfully[8]. Continuous improvement of these business processes is highly needed because the organization will always face new and unpredictable business challenges; therefore, management tools such as BPR should be implemented to attain a competitive advantage.

The main reason behind the emergence of BPR is the dramatic changes in the business environment that require re-engineering the process workflows effectively. In the early 1990s, the BPR phenomenon has been significant attention in literature by authors such as Davenport and Short[7], Hammer[9], Hammer and Champy[4], and Harrington[10]. The concept of BPR was evolved after some companies in US changing their processes and benefit from advanced technology to improve its performance. According to[11], BPR mainly focus on examining the state of business processes and then re-engineering it to eliminate inefficiencies in activities in order to improve efficiency.

Over the last decades, the meaning of BPR was represented as a managerial practice to attain advancement in business processes.

BPR is concerned to make significant changing in the roots of the processes[12]. However, change is a primary aspect of BPR and is meaning change in operations, people's jobs, culture, and organization structure[13]. The change requires top-management support to communicate to its employees why the change is necessary and its impact on their performance, which will be reflected in the organization's performance[13, 14]. In this paper[15], management support was a critical factor that led to the success of BPR, which is agreed by 95% of Chinese executives. In addition, organizations must also create a new culture by translating the change policies into daily operations. Therefore, delivering employees with proper IT training will help organizations resist any coming changes[16]. Furthermore, breaking down the business objectives into smaller achievable processes in re-engineering business processes is an efficient way to achieve the required results. There are several software tools available to facilitate the re-engineering of business processes greatly. These tools have different unique features that allow business processes to be modelled, simulated, and analyzed.

Studies show a list of objectives in BPRsuch as increase productivity[17], shortening product development cycles[18], increase customer satisfaction[19], cost reductions[20], streamlining operations[21], beat crises situation[22], and that finally help the organization become leaders in their domain. Another study [23] also mentioned that the goal of re-engineering the business process is to give the organization a more competitive advantage where enhance the time, resource, and service.Wherefore, BPM goals cover all the aspects of business needs. For instance, adoption of BPR in a few observed organizations such as Caterpillar, Inc enabled them to cost savings over five years from BPR initiatives[24]. Moreover, several organizations have reported significant benefits after implementing BPR successfully[25, 26]. In contrast, it's difficult to generalize the success rate since BPR implementation doesn't necessarily achieve desired goals, as mentioned by[4], who said 50-70% of BPR initiatives in some USA enterprises are failed. Thus, determining factors that led to failure in BPR implementation is very critical.

2.2 Business Process Automation

Business Process Automation (BPA) can be done by utilizing information communication technology. These technologies are facilitating the execution of recurring business processes efficiently, where manual effort can be replaced. BPA delivers an efficient change in the work performing method through streamlined processes, accelerated information flow, paperless transactions, and among others, which that make it one of BPR's primary activities[27]. Accordingly, this helps organizations minimize costs and increase productivity.

2.3 Recruitment and selection processes

For many decades, placing the right people in the right positions was a responsibility referred to the human resources (HR) department. HR mainly has master individuals who are empowered to gauge the skills and expected abilities from others to perform certain activities as well as recruitment and selection, compensation, and training. Therefore, HR considered as one of the most significant resources to ensure the survival of the organization.

Recruitment and selection processes can create an initial transformation sequence for business processes in order to improve all tasks within the company through continuous improvement of business processes that are mainly reflected in increasing the performance, efficiency, and competitive advantage of the organization. Re-engineering is one of the powerful management techniques to improve business processes [28]. For that, these processes can't be accomplished without involving and determine the most notable types of processes that are taken into account for the development of recruitment and selection in any organization from the beginning. Besides this, it is important to pointed out some previous researches related to the implementation of re-engineering and recruitment processes to clarify the most essential elements of production which contributed to the achievement of organizational goals[29].

According to[30], stated that the recruitment process in the public service does detect bottlenecks and errors in their business processes. The study claims that the users unsatisfied with the whole recruitment procedure since they had some difficulties in tracking their files, slowness response, the concerned authority is not aware of completing the process, and the corruption that occurs in the selection process. All of these are considered inefficient in the business processes and waste user's time. For that, the authors proposed re-engineering possible aspects of processes to be automated and more enhanced by discovering all processes using a specific algorithm to traces the observed behavior in event logs. The results showed 527 application files were succeeded out of 1496 from discovery event logs. So, an optimization process has been approved and applied in public service to various ministries to meet the user's requirements and achieved business goals. As well as eliminating the level of corruption in processing and users no longer need to go by themselves to follow up their files.

Over and above that, since reducing both time and costs are essential to achieve organizational goals. This study [31]selected Private Limited Company (Pvt Ltd) to perfectly re-engineering its recruitment process with emphasis that processes in other departments don't affect directly. The study initiated the main procedures of selection, planning, and recruitment and execution processes of BPR that were illustrated from the manager's interview. Moreover, obstacles in the recruitment process were taken into consideration. As well as, the outdated procedures that consuming more time, costly and it has proven ineffective needs to be re-engineered and changed in the existing recruitment process. The study concludes that Pvt Ltd seeking to expand their business in various countries. Due to this long-term goal, the suggested re-engineering model will minimize the cost and increased efficiency in a facilitated way to associated and integrated them later.

On the other hand, [32]highlighted the weaknesses of the efficiency information services provided by information institutions for the recruitment process. This study conducted an analytical descriptive method to reduce the cost of services provided, authorize the institution's employees to access and monitor processes, solve problems, fast response, and combine similar processes to reduce overlap and redundancy. For that, the role of HR came to re-engineering the information services due to making it more effective and efficient. The result confirmed that there is a clear deficiency in the level of information services, including the lack of manpower, the percentage of specialists in the same field reached 10% only which led to the failure of the institution's ability to adapt to changes and to remain competitive. In addition, the performance was improved to 67% by re-engineering these processes.

In the light of re-engineering, organizations need responsiveness to the enhancing and flexibility in changing their business process because it's one of the main reasons that lead to the loss and collapse of organizations more than their employees themselves. Subsequently, organizations that do not adapt to changes might disappear over time. A number of dimensions relating to aspects of recruitment and selection processes were derived from the literature, such as reduce costs, time that is not adding value to the process, unnecessary steps within the work processes whereas the increasing effectiveness and efficiency. In addition to record the flows of work processes in logs files that allow easier insight into the whole picture of the processes.Furthermore, reduce manpower, hierarchical levels in the organization, and waiting time within a particular business process can improve different work processes in large, medium, and small organizations[33].

After a comprehensive analysis of the literature, we concluded that BPR utilized significant support to make decisions about the changes occurring within the company. Lack of works that have been done on the automation of BPR to limit additional unnecessary steps and simultaneously concerned about processes that could be costly and consuming more time. Thus, this paper aims to improve recruitment and selection process by using management tools of BPR.

3. Methodology

To examine and understand the recruitment and selection process of an organization, the case study will be conducted on Petro Rabigh Company. Petro Rabigh is a Rabigh Refining & Petrochemical company located in Saudi Arabia that produces refined hydrocarbon and petrochemicals. The data collection was done based on the general observation and an interview with an employee from the HR department. In order to re-engineer their current business process, the qualitative method is used to recognize this process and therefore determined the drawbacks of it with impacts on the organization then try to propose a possible optimization for their processes.

4. Current Recruitment Process Model (As-is)

This section provides the Business Process Model (BPM) of the current recruitment and selection process in Petro Rabigh company as shown in Figure 1. This modeling illustrates an accurate and entire procedure of recruitment and selection. The current process of recruitment and selection was modeled by Bizagi modeler.The Bizagi modeler fundamentally can simulate the whole process by using workflow diagrams in effective manner [34].

The recruitment process begins from the recruiter division which needs a professional employee to hire. The recruiter submits recruitment requisition to hiring management to review it and then creates the job description document. This document mainly provides relevant information about the position includes the responsibilities, general tasks, and functions. Based on the job description, the hiring management search for a suitable candidate to fill the vacancy.

After that, screening and evaluates possible candidates for a vacancy by sending the initial list to the recruiter to review it and then select the short candidate's list. In the next step, hiring management schedules an interview and informs the candidate with the necessary information. Then, they establish an interview committee from both departments to conducts the interview and evaluates the candidate by fill out the evaluation sheet. The result of evaluation sheet helps to select the appropriate candidate and then creates a job offer to send for a candidate to review it. There are two possible outcomes. The reject offer will lead to select another candidate. Otherwise, the candidate should submit relevant documents like medical examination and the degree certificate to check whether it is complete or not. The process will go to select another candidate when the documents are not completed. If it's complete, the hiring management will approve the candidate and there will be a sub-process, as shown in Figure 2. The nationality of the candidate will be checked either Saudi or non to perform different procedures. In the next stage, after making a contract there are two situations. The fresh graduate will gain a training program for three months and if he is an employee, it must submit resignation within a maximum period of two months. In the end, the hiring management executed procedures direct the work.

Based on the previous scenario, a company act as a container for a full business process that contains:
1) Recruiter: The department who submits recruitment requisition.
2) Hiring management: It mainly responsible for all procedures and approves hiring.

Both represent tasks and roles inside the company. While the candidate acts as an external process participant which is outside of the company boundaries.
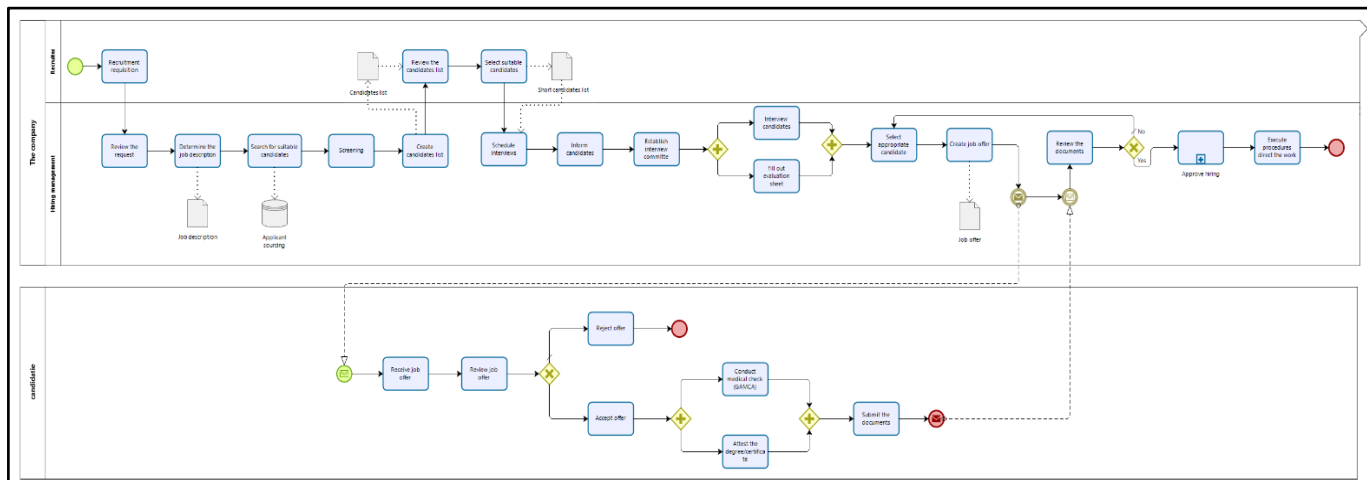
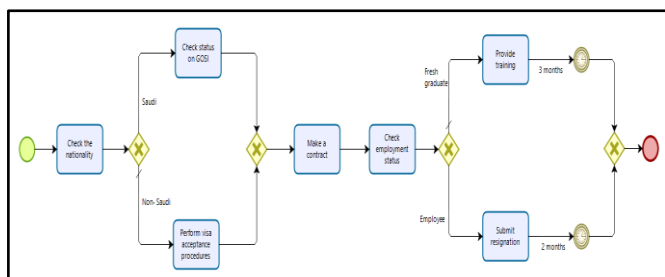**Figure 1:** As-is recruitment process model

Figure 2: Sub-process of approve hiring

A limitation of using BPM in Bizagi modeler is that it lacks knowledge of time, resources, and priority for each activity[35]. Therefore, determine the activity first, check the validity, and then start the execution and automation process by other Bizagi platforms.

5. Re-engineering Recruitment Process Model (To-be)

The BPRis generally aimed at improving the performance of the business process. After the process is understood and described as it is, the objectives of the process of BPRare determined to solve performance problems and take advantage of the possible improvement opportunities. Improvement processes always start from making a study of the current situation and then work on implementing the proposed improvements by developing new process scenarios, monitoring them and continuing to improve them. BPR mainly focuses on examining the state of business processes and then re-engineering it to eliminate inefficiencies in activities in order to improve efficiency[11].

The Devil's Quadrangle framework focus on time, cost, flexibility, and quality.This framework also helps in identifying available directions for improvement in BPR, where itseeks to reduce execution time and costs as well as improve process quality and flexibility[36]. Wherefore can use it to identify objectives from potential improvement procedures for each process.

In this recruitment and selection business process, time and cost are critical factors in implementing the process. In the recruitment and selectionBPRfirst, to raise the processes'

speed the unnecessary activities were excluded that could be incorporated into other activities this also let to decrease the cost. Activities of review the request by hiring management, review the candidates' list by recruiter and review the job offer by the candidate have been excluded. All of these activities can be carried out in one process in the activities that follow them as shown in Figure 3. This can improve the quality of work and reduce dispersion. Moreover, activities of conduct the medical check and attest the degree/certificate that required from a candidate were excluded because the activity of submitting the documents can do their jobs. This greatly reduces the processing time and improves its flexibility. In addition to excluding two check activities in the hiring approval sub-process and relying on an exclusive gateway to check conditions to direct flow to one correct path (see Figure 4). This re-engineering helps improve the quality of the process and reduce the time spent on these activities.

Second, two activities were merged into one activity to reduce transportation time, increase employee commitment and non-fragmentation of work. Activities of the search for suitable candidates and screening merged into one activity called the search for suitable candidates.

Third, a new sub-process has been created that contains four activities that have been moved from the main process to simplify it and reduce complexity, helping to easier understand the process flow as well as improve process quality and flexibility. Figure 5 presents the sub-process which called make interview that contains activities related to the procedures of candidates' interviews which are schedule interviews, inform candidates, establish an interview committee and interview candidates.

Fourth, reordered the activities which are schedule interviews, inform candidates, establish an interview committee. This also called "Resequencing" and it means put activities in a suitable place that will be improving set-up times. The new sequence is to establish an interview committee, schedule interviews, and inform candidates.
The re-engineeringof this business process has been by eliminating unnecessary activities, merge two activities in one activity and create sub-process. These steps of the re-engineering will enhance time, cost and quality of recruitment and selection business process. The top

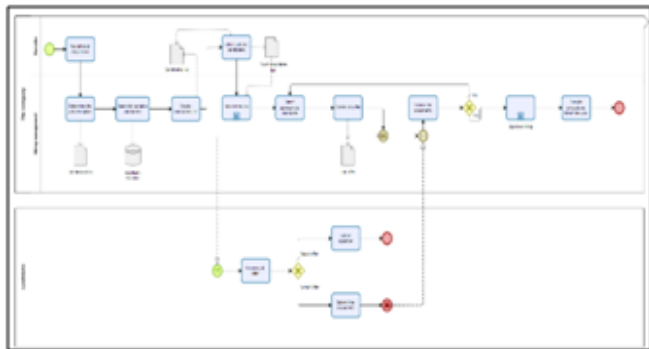management has to play an important role in re-engineering.

Figure 3: To-be recruitment process model

6. Monitoring and Optimization Recruitment Process Model

This section helps organizations to better understand their business processes by using simulation. Business processes simulation is frequently used to evaluate the impact that happened in as-is and to-be models on the performance of a process. Thus, simulation has the ability to foresee in a tangible and comprehensible manner of the possible decisions before making it in the real world. On the whole, it facilitates decision-making that managers could be taken through analyzing and developing different scenarios of each activity.

With the significant importance of simulation, the proposed model has simulated by using Bizagi simulation. Bizagi simulation enables managers to compare and distinguish which changes were made through the What-if Analysis scenario. Moreover, the advantage of using the Bizagi simulation is to identify and assess all processes based on four steps include process validation, time, resource, and calendar analysis. These four steps have been included in the process model to clarify exactly what actions should be evaluated to run the processes smoothly and accurately.
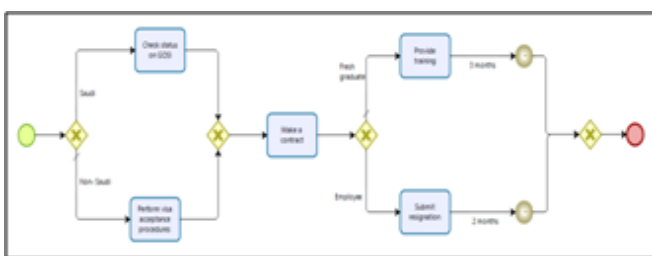

Figure 4: To-be sub-process of approve hiring

1) Validation process: Validations have been used to describe the missing tasks, gateways and error messages that occurred in each process independently[37].
   - The number tokens: To get reliable outcomes, the number of token instances have been defined as 1000 according to Bizagi recommendations.
   - The gateway conditions: In the process model, every branch has different probabilities during the execution time. In this project validation, the hiring management has a right 50% to select another appropriate candidate if the submitted documents not completed or did not meet the job requirements.
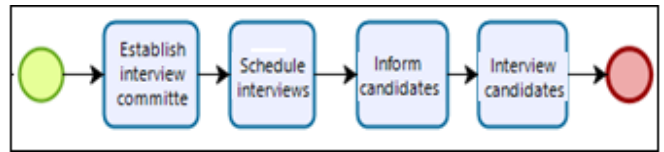

Figure 5: New sub-process make interviews

2) Time analysis: The importance of time analysis is examining how long each task takes to be executed and how it can be improved. To avoid wasting time must ensure that each task takes only the time required to be executed. Therefore, figure 6 displays some tasks in the recruitment and selection process and how long does each task takes to implement. in addition to displaying minimum, average, maximum, and total time. For example, in the task of select an appropriate candidate the average time is an hour, and the total time is 52 days and 2hours. Few tasks take days to implement such as the search for a suitable candidate. The other tasks take hours to have been done and there are tasks that take less than 1 hour.

Figure 6: Simulation results of time analysis

3) Resources analysis: In the validation of this project only human resources were examined, including 30 employees from the recruiter department, 15 from the hiring management division, and 5 candidates. Most tasks do not require more than two employees to implement them, but in the process of interview candidates, the number of employees reaches up to four.
4) Calendar: Availability of resources directly affects time such as weekends, breaks, and shifts. These time factors will manipulate and change the performance of the wholeprocess. Consequently,to get an accurate performance the work time in the process has been assigned to one shift, 8 hours, and 2 days off on weekends.

6.1 Comparison of As-is Processes and To-be Processes

The results of the time analysis of business processes have been used to monitor the efficiency of the process after the re-engineering, where there is a significant difference before and after implementing BPR in terms of time. The main benefit that has been noticed of re-engineering the recruitmentprocess model was minimizing the processing time within the organization and eliminating the delay. The time decreased by 39% and this leads to an improvement in the recruitment process.Table 1 shows the difference between task times in each process before and after BPR in detail.

On the other hand, the resources of the company Improved after re-engineeringprocesses that led to also reduced total cost. Figure 7 shows the hiring management department was reduced the total cost from 4166 to 2140 and that demonstrates cutting the human effort. In general, the total cost for the recruitment and selection model reduced by more than 32% from before the re-engineering.
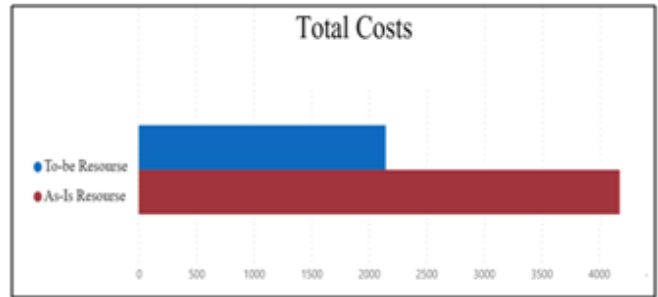

Figure 7: Total cost of hiring management department

Table 1: Comparison of time between as-is and To-be

Process	Department	Task	As-is Time	To-be Time
Recruitment and selection process	Recruiter	Recruitment requisition	20	20
		Review candidates list	3 days	-
		Select suitable candidates	20	20
	Hiring management	Review the request	3 days	-
		Determine the job description	10	10
		Search for a suitable candidate	5 days	5 days
		Screening	1 day	-
		Create candidates list	10	10
		Schedule interviews	15	15
		Inform candidates	10	10
		Establish interview committee	30	30
		Interview candidates	2 days	2 days
		Fill out evaluation sheet	2 days	-
		Select appropriate candidates	1 h	1 h
		Create job offer	1 h	1 h
		Review the documents	1 h	1 h
		Execute procedures direct the work	30	30
Candidate decision process	Candidate	Receive job offer	3 days	3 days
		Review job offer	1 days	-
		Reject offer	30	30
		Accept offer	1 day	-
		Conduct the medical check (GAMCA)	1 day	-
		Attest the degree /certificate	2 h	-
		Submit the documents	1 day	1 day
Approve hiring process	Hiring management	Check the nationality of the candidate	15	-
		Check status on GOSI if the candidate is Saudi	15	15
		Request visa issuance if the candidate is non- Saudi	7 days	7 days
		Make a contract for the candidate	1 h	1 h
		Check employment status	15	-
		Provide training for 3 months if the candidate is fresh graduate	30	30
		Submit resignation for 2 months if the candidate is employee	30	30
		Total time	30 days 640 minute	18 days 490 minute
		Total minutes	43840	26410
		Reducing time	39.7%	

7. Automation Recruitment Process Model

BPA plays a big role in increasing business efficiency. It helps to eliminate unnecessary processes and facilitate communication between employees across different departments. In addition, it contributes to reducing the costs needed to implement processes.

Automation is the last step in the recruitment process re-engineering, it helps to improve the outcomes of the recruitment process and time of response. The recruitment process was automated by the Bizagi studio. It is a platform that helps organizations to convert their processes into a digital way.

Figure 8 shows the "recruitment requisition" form which is filling out by the recruiter. In this form, the recruiter fills the request information, and it contains the request ID, request date, requester name, and department. The recruiter alsodetermines job details and it contains job type, joblocation, no of openings, career level, gender, age, nationality, education, degree title, required experience, work permit, and required travel.

The hiring management department receives the request information and the job details to review and determine the job description. The job description form contains a job description, responsibilities, salary, bonus, and other benefits. This form allows the uploading file of the job descriptionas shown in Figure 9.

Figure 8: Recruitment requisition form

Figure 9: Job description form

Figure 10 represents the "execute procedures direct the work" form, the hiring management department responsible to fill this form. This form displays the request information and hiring management department adding the employee name and ID, and date of direct the work, thus completing the recruitment process.

The form was created for every task in the recruitment process. But only three basic forms of the process were displayed.

Figure 10: Execute procedures direct the work form

8. Conclusion

This paper analyzes the current recruitment and selection process in Petro Rabigh company. Besides, it identifies the improvement that can be adopted on these processes through the Bizagi Platform. The outcomes of this paper indicate the benefits of the re-engineering improvement of the recruitment process model, such as increase the speed of processing and reduce the cost throughexcluding unnecessary activities. Also, reduce transportation time, and increase employee commitment via merging multiple activities into one activity. In addition, to simplify, reduce complexity, and improve the quality and flexibility of the model, a new sub-process has been created called make an interview that contains activities related to the procedures of candidates' interviews.

Along with that, the improvement in the resources in the hiring management department of the company reduced the total cost from 4166 to 2140 which lead to minimizing the human effort. In general, after re-engineering, time and recourses reduced by 39% and 32% respectively, which demonstrates the improvement of the performance and efficiency of the process model.

9. Acknowledgment

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