Decision Making and Service Oriented Architecture for Recruitment Process.
Using the New Standard Decision Model and Notation (DMN)

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Abstract—**Various models and methods are used to support the design process of SOA (Service Oriented Architecture), but still after many years of practice, there are a lot of questions and unsolved problems that cause the failure of SOA development projects. One of the reasons is that rapid changes in the business environment make it necessary to introduce the decision design, which should be efectively supported by SOA. Indeed, it is a big challenge to create a system that help the human resource development in industry to make their work easier without missing an opportunity to get a best employee. The objective of this study is to develop a decision making and Service Oriented Architecture for employee recruitment using analytic hierarchy process. This study explored the relationship between SOA and decision making during the recruitment process. To achieve our goal, we use the new method SOA^{+d} to develop the SOA architecture. Also we provide the decision using the new standard Decision Model and Notation (DMN). The novelty of the proposed approach is in the a) the formal definition of a complete set of proposed services b) the uses of standards language and notation in each dimension of approach c) the specification of the mappings rules to identify a set of services. We illustrate the proposed approach with a real case study of the Recruitment and Selection in SAAD DAHLAB University.**

Keywords–SOA; SOA^{+d}; DMN; SoaML, AHP.

I. INTRODUCTION

While organizations are trying to become more agile to better respond the market changes, and in the midst of rapidly globalizing competition, they are also facing new challenges. It is primarily a question of ensuring the decisional aspect of the information system by adopting the services oriented architecture (SOA) like a support architecture.

Also,the Human Resources Area needs to carry out different activities in order to find a person with the skills, abilities, experience and knowledge to fill a vacancy. This process is usually time-consuming whereby a lot of manual work is required and it is necessary to coordinate many people in the different stages of the process. The Recruitment and Selection process covers:

- Requesting a person with certain skills and abilities to fill a vacancy.
- Advertising the vacancy internal and external.
- Scheduling psych technical test, interviews, medical exams, etc.
- Collecting result of test and interviews.

- Updating the candidate list.

The decision environment consists of what a basic interview necessitates. The interviewer is the major decision-maker who chooses the right candidate for the vacancy. Decision period depends mainly on the corporate needs. The immediacy of the need of an employee, the time needed to fulfill the procedural requirements of the recruitment process together with the time that the interviews take (this may change depending on the number of the candidates) are the major factors that shape the decision period [1].

Additionally, in order to enable a vendor independent formalization of decision designs with a common understanding and tool support, the *Object Management Group* (OMG) decided to work on a standardized meta-model and a profile that enables the modeling of decision making and their elements [2]. The result of this effort is the Decision model notation *Decision Model and Notation* (DMN), which is currently released in version 1.0. Today, DMN gains increasing tool support, even IBM decided to integrate the DMN in their proprietary IBM Blueworks [3]. Therefore, the proposed architecture uses this new standard for modeling the decision view, and present the principal contribution of our work in decision field.

To develop a Service Oriented Architecture for the recuitement process, we must use the new approach SOA^{+d} [4] which integrates a decision aspect in SOA.

The SOA^{+d} approach comprises four phases [4] (a) Analysis phase: it contains three activities, each activity presents a view of SOA^{+d} and supported by standard modeling that reinforces key view. Therefore, the UML standard is used to analyse IS level. We use the BPMN standard for the business analysis, and we use the new DMN standard to specify decision view. (b) Identify and categorize services: in this phase, the applicable mapping rules for service identification based on the use case, BPMN and DMN are defined. (c) The service design phase,, in which a set of service designs has to be designed and modeled using the standard *Service oriented architecture Modeling Language* (SoaML). d) The realization services phase present the realization services using existing tools.

A. Problem statement

Given the conventional technique of interviewing for a vacancy in a company, the need of a more systematic approach is obvious. There are some criteria to be met while the decision is made. The recruitment decision should be based on:

- A consistent set of satisfaction of the requirements
- A clear and objective decision making environment
- A well defined and documented list of the requirements expected to be met by the candidates.

The main goal of our research is to design a new SOA to support the decision making in the recuitement process. In order to solve the main problem and develop a research plan of action, the following sub-problems were identified:

- What recruitment and selection strategies are suggested in the literature?
- To what extent does old methods utilise the recruitment and selection of strategies suggested in the literature?
- How the competent are sales managers in using the suggested recruitment and selection tools?

The recruiting process is typically intended to realize the following among other objectives:

- To provide an equal opportunity for potential candidates to apply for vacancies.
- To systematically collect information about each applicants ability to meet the requirements of positions.
- To attract highly qualified individuals.
- To select candidates who will be successful in performing the tasks and meeting the responsibilities of the position.
- To emphasize active recruitment of traditionally underrepresented groups, i.e. individuals with disabilities, minority group members and women in order to resolve historical recruitment imbalances.

B. Paper Organization

In Section II, the DMN notation (Section II-A) and Analytical Hierarchical Process (Section II-B) are presented. These concepts are used in our work for defining the new architecture. In Section III, we illustrate the different phases of SOA^{+d} approach. Section IV presentes the development of the case study by using the New standard DMN and SOA^{+d} in Recuitement process. Finally, we conclude the paper by proposing some future works (Section V).

II. BACKGROUND

In order to ensure comprehension, the following terms, related to this study, are briefly defined.

A. Decision Model and Notation

The OMG has recently standardized the DMN, which enables the abstract formalization of decision designs [5]. The goal of DMN is to standardise notations (and associated metamodel) for decision modelling. DMN will provide constructs spanning both decision requirements and decision logic modeling.

The decision requirements level consists of a Decision Requirements Graph (DRG) depicted in one or more Decision Requirements Diagrams (DRDs). A DRG models is a domain of decision making, that shows the most important elements involved in it and the dependencies between them [5]. The elements modeled are decisions, areas of business knowledge, and the input data.

Decision logic level : The components of the decision requirements level of a decision model may be described, as they are above, using only business concepts. This level of description is often sufficient for business analysis of a domain of decision-making, to identify the business decisions involved, their interrelationships, the areas of business knowledge and data required by them, and the sources of the business knowledge [5]. Below are the reasons of using a DMN:

- DMN creates a standardized bridge for the gap between the business decision design and decision implementation [5].
- DMN, as an IT specification, is a confirmation that there is demand for a new kind of software product aimed at decision modeling and management.
- Common notation that is readily understandable by all business users, from the business analysts needing to create initial decision requirements and then more detailed decision models, to the technical developers responsible for automating the decisions in processes, and finally, to the business people who will manage and monitor those decisions.

B. Analytical Hierarchical Process

AHP is a method for ranking decision alternatives and selecting the best one when the decision maker has multiple criteria [6]. It answers the question, Which one?. With AHP, the decision maker selects the alternative that best meets his or her decision criteria developing a numerical score to rank each decision alternative based on how well each alternative meets them.

The application of the AHP to the complex problem usually involves four major steps:

- **Step 1** : Break down the complex problem into a number of small constituent elements and then structure the elements in a hierarchical form.
- **Step 2**: Make a series of pair wise comparisons among the elements according to a ratio scale.
- **Step 3** : Use the eigenvalue method in order to estimate the relative weights of the elements.
- **Step 4** : Aggregate these relative weights and synthesize them for the final measurement of given decision alternatives.

III. SOA^{+D} APPROACH

SOA^{+d} method based on SoaML and DMN will be used. In the literature, several authors proposed approach of the *Service Oriented Architecture* (SOA) services [7]–[15]. According to the followed vision, each one proposes a set of steps. SOA^{+d} proposes a new approach for the development of the SOA. It considers three views that must be analyzed in

order to develop SOA. The Business and Information vision are inspired from the works of [9] [11] [13] [14] [16] [17]. SOA^{+d} method contribution consists on the proposal of the third vision which is: Decision.

SOA^{+d} follows a downward approach to discover the services. SOA^{+d} articulate around four phases: Analysis, Identification and categorize service, Services modeling and Realization pahse.

A. Phase 1: The analysis

includes three steps: information system analysis, business analysis and decision analysis steps [4].

B. Phase 2: Identify and categorize services

Is based on the cartographies already worked out to identify the services (business, information and decision services) [18]. As we already underlined, we identify three service types: services which exist on the business level, information system and decision services.

C. Phase 3: Services Modeling

In this step the services must be modeled with formalism. We adopt a specification at the base of the SoaML language [19] which offers a high level of abstraction, then it is necessary to refine the services to make them specific to a given platform.

D. Phase 4: The realization

Proposes to develop the services and to deploy them to be called upon. The technical choice (data base management system, development environment, application server, processes business Management system, etc.) must be done in this phase.

IV. RECRUITMENT AND SELECTION

This research is based on the process of Recruitment and Selection of SAAD DAHLAB University, located in the north region of Algeria. The recuitment process covers:

- Requesting a person with certain skills and abilities to fill a vacancy.
- Advertising the vacancy internal and external.
- Scheduling psych technical test, interviews, medical exams, etc.
- Collecting results of tests and interviews.
- Updating the candidates list.

A. Phase 1: The analysis phase

The Recruitment process begins when a Personnel Requisition is made. If the job description does not exist, it is created by a Human Resources Analyst. If the person who made the request does not have the level of authority, the process continues to approve request task.

The Recruitment process includes two sub processes :

- **Job Vacancy Advertisement Sub process** : The Human Resources area must arrange and place the advertisements in an appropriate medium. The advertisements can be placed internal or externally; the

proposed architecture gives the flexibility to choose between them.

- **The selection process** : evaluates possible candidates for a vacancy; the sub process includes test and interview scheduling, enter their results and select the person.

Figure 1 shows the Recruitment business process with the BPMN (Business Process Management Notation) language.
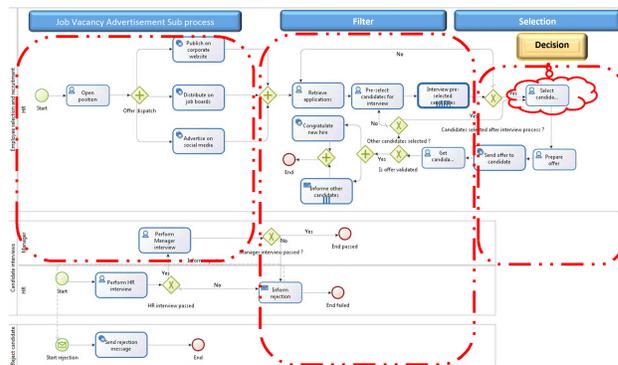
Figure 1. The Recruitment and Selection Process BPMN

B. Phase 2: Identify and categorize services

After the use of the analysis defined through the phase 1 to the Recruitment process, we found the services of Business, Information and Decision levels; this is shown in Figure 2.

The Business Process entity is Recruitment; it holds information about the personnel requisition such as Job Title, Number of vacancies needed, Area, and other information about the position. The entity is related to the Job Description, Advertisement and Candidates entities. The relationship between Recruitment and Candidates is from one of many; it is necessary to include several candidates in a Selection Process. The main attributes of the Job Description are: Title, Code, Responsibilities, Abilities, Experience and Job Description. The Advertisement entity includes Job Title, Location, Company Description, Contact Details, and Ideal Candidates. The Candidates entity includes Name, Last Name, CV file, Email.

Selecting a candidate is a complex problem involving qualitative and quantitative multi-criteria. The first step in any candidate rating procedure is to find the appropriate criteria to be used for assessing the candidate. To comply with the criteria for candidate selection and their importance, required data were collected.
In order to select the right candidate, the Analytic Hierarchy Process (AHP) [6] approach has been adopted. The AHP is a theory of measurement through pairwise comparisons and relies on the judgements of experts to derive priority scales. Figure 2 shows the services of decision level.
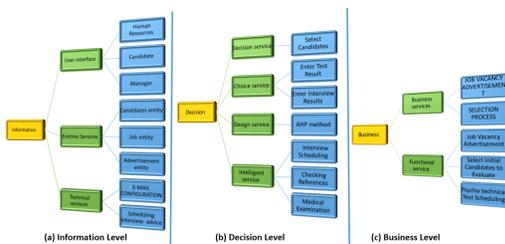
Figure 2. Decision level of Recruitment Process

C. Phase 3: Services Modeling

The mapping from BPMN diagram to SoaML model requires first and foremost a correspondence between the elements of BPMN and SoaML elements. For this, we use the mapping defined in the research work already done [7] [17] [20] and [21].

After performing the transformation rules we obtain the services modeling of Recruitment Process illustrate in Figure 3 and Figure 4.
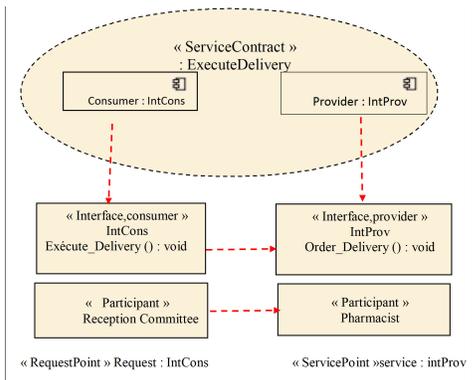
Figure 3. SoaML contratdiagram
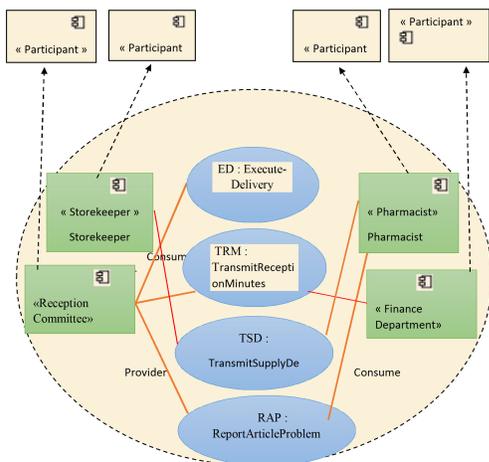
Figure 4. SoaML architecture diagram

D. Phase 4: The realization

Figure 5 summarizes the Services Integration in Recruitment Process.
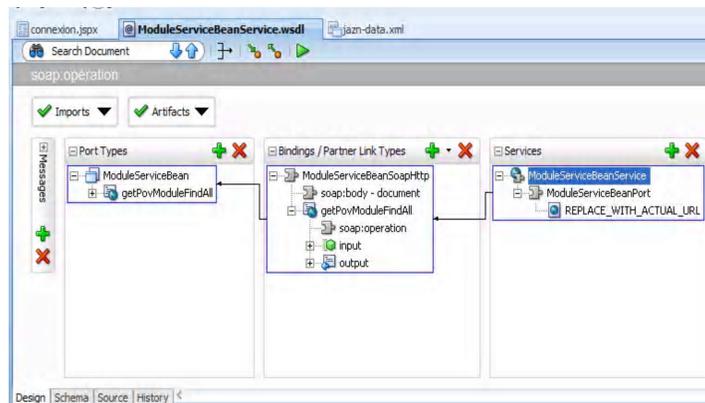
Figure 5. Services Integration

As shows Figure 6, during the Selection Process a Candidate must attend several interviews with different people. For each interview it is necessary to include the results.

Figure 6. Preselection

Afterwards, the person who made the requisition must select the final candidate to fill the vacancy. As shows Figure 7, if the selected candidate accepts a salary offer the sub process ends.

Figure 7. Select the final candidate

V. Conclusion and Future Work

The increasingly globalized world necessitates to choose the best employee for the company, otherwise, both sides have to overcome several losses. This project was prepared with the aim to shed light on Blida University about effective recruitment process.

In this paper, we developed a system that works automatically to find the most suitable candidate for vacancy according to AHP model and using the new standard DMN. The various contributions carried out in our work are summarized as follow:

- **Introduction of the decision aspect into the SOA Services Oriented Architecture** The new approach, that we developed, extended the principles of the SOA on the totality of the company system. It brought new concepts and it restructures the company architecture in a manner that it is nimbler and able to take part in decisions from a request.

- **Proposed solution based on standards languages and notation**: in this paper we have presented a detailed approach using existing modeling languages such as UML, BPMN and SOAML. The proposed approach helps in specification, design and realization of a new type of service to depict the decision components in SOA.

- **A new approach of SOA uses DMN**: SOA architecture, that is developed is the first architecture of SOA that considers the modeling of the decision making aspect by the use of DMN; it extends the principles of the SOA , on the totality of the entrprise system. The decision introduced in SOA^{+d} is defined by the use of DMN. It is worth to note here that the suggested and modelled decision in SOA^{+d} contains more information than SOA approaches proposed in literature. As it was mentioned previously, the decision model that is obtained from the DMN notation is complete and shows how to automate the decision.

In our future work, we envisage the tool developement for proposed architecture to obtain a framework. Moreover, we are working on the implementation of the mapping rules defined within the framework, and more specifically those that allow us to obtain (as automatically as possible) services details from real Computational Independent models. Moreover, since our approach follows an MDE approach for the Service Oriented Development of SOA, we are currently working on the code generation from the models for different Web Services platforms. In the light of all these, we shall be able to complete the integration process between high level SOA and the decision implementation.

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