

WEB BASED SUPPORT SYSTEM FOR INTEGRAL PERFORMANCE APPRAISAL*

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Integral performance appraisal process is used as a key tool for enterprise competitiveness. It considers different indicators to provide evaluation assessments about employees' performance based on the judgment of different groups of reviewers, who socialize with employees. This contribution presents a Web based Support System for Integral Performance Appraisal, so-called WSSIP, which implements an integral performance appraisal model that offers a heterogeneous framework in which reviewers can provide their judgments within different domains (numerical, interval-valued and linguistic), according to the nature of criteria and the background of each reviewer. In this contribution, we show the functionality of WSSIP, conducting a simple case study for an integral performance appraisal process.

1. Introduction

Performance appraisal is a common activity in companies whose aim is to evaluate and analyze employees' capacity to accomplish effectively their work^{1,2}. Currently, integral performance appraisal processes² are based on the opinion of different groups of reviewers who socialize with employees, since they can truly respond to how an employee develops his/her job. Moreover, this process includes the opinion of employee about her/himself. *Integral evaluation* or *360-degree performance appraisal*² overcomes some disadvantages² from traditional evaluation such as lack of objectivity, prejudice or halo errors, etc.

The criteria involved in integral performance appraisal processes may have different nature, quantitative or qualitative, and the provided judgments can be

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vague or uncertain. Therefore, it seems necessary and appropriate to provide a heterogeneous evaluation framework in which the involved criteria can be assessed in different expression domains and the final results expressed by linguistic terms to facilitate their understanding.

In this contribution, we present WSSIPPA, a Web based system that supports integral performance appraisal processes able to manage a heterogeneous evaluation framework, such that reviewers can provide their judgments within different expression domains (numerical, interval-valued and linguistic), according to the nature of the criteria and the background of each reviewer. Furthermore, in order to offer understandable and interpretable results, WSSIPPA presents them by linguistic information. To do so, WSSIPPA implements the integral performance appraisal model proposed in [3] that offers these desirable features. The functionality of WSSIPPA is shown, conducting a simple case study for an integral performance appraisal process in order to illustrate the usefulness and effectiveness of the system.

This contribution is structured as follows: Section 2 reviews the general scheme of the integral performance appraisal model that we develop in WSSIPPA. Section 3 presents the WSSIPPA functionality, carrying out a simple case study for an integral performance appraisal process with a heterogeneous evaluation framework. Finally, in Section 4, conclusions are drawn.

2. A Heterogeneous Integral Performance Appraisal Model

Our proposal in this contribution is to develop in WSSIPPA an integral performance appraisal model to deal with heterogeneous information that provides linguistic results. Such a model was introduced [3] whose general scheme is shown in Figure 1. To manage heterogeneous information, this model utilizes the heterogeneous computing approach presented in [4].

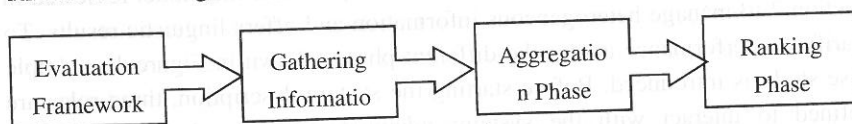


Figure 1: General scheme of the integral performance appraisal model.

a) Evaluation Framework. It fixes the structure of the integral performance appraisal process by defining the main features and terminology of this process in which personnel are evaluated from different points of view. In this case, it defines a heterogeneous context in which reviewers can use different expression domains to assess each criterion.

b) Gathering Information: In this phase, reviewers of the different collectives provide their judgments about the employees, regarding the set of evaluated criteria.

c) Aggregation Phase: The aim of this phase is to compute global values about performance of the set of evaluated employees, regarding to the different criteria and reviewers' collectives. In order to manage the heterogeneous framework, this model follows the approach presented in [4]:

- Choosing a linguistic domain, S_T , to unify the heterogeneous information. This linguistic domain is selected with the aim of keeping as much knowledge as possible. This linguistic domain is a key because evaluation results will be expressed in it.
- Transformation of the information into fuzzy sets in S_T . Each numerical, interval-valued and linguistic judgment is transformed into a fuzzy set on the S_T , by using different transformation functions.
- Transformation of fuzzy sets into linguistic 2-tuples in S_T . In order to simplify the computations and improve the understanding of the results, the fuzzy sets in S_T are transformed into linguistic 2-tuples⁵ in S_T .
- Aggregation step. Here, the linguistic 2-tuple computational model is used to aggregate the unified information to obtain global values about the performance of each evaluated employee.

d) Ranking Phase: Finally, the global values expressed in linguistic 2-tuples are sorted to obtain a ranking of employees.

3. Web Based Support System for Integral Performance Appraisal

In this section, we present WSSIP[‡] that implements the model reviewed in Section 2 to manage heterogeneous information and offers linguistic results. To clarify its performance across the different phases shown in Figure 1, a simple case study is introduced. Before starting the system description, three roles are defined to interact with the system: *administrator*, *appraisers* and *human resources*.

a) Evaluation Framework. *Administrators* define the evaluation framework. In our case study, it includes two employees that will be evaluated by one supervisor, two collaborators, three customers and themselves, according to four criteria. Two criteria are evaluated in a numerical domain and the other two

[‡] The system is hosted at the following URL: <http://serezade.ujaen.es:8080/mspev2>

criteria are evaluated in a linguistic domain with five labels. Obviously, all reviewers do not evaluate all the criteria because some of them do not have sufficient knowledge. Therefore, each evaluator assesses the corresponding criteria with his/her knowledge.

First, the set of criteria and their expression domains are defined in a survey (see Figure 2 and 3), which is associated with an integral performance appraisal process for a set of evaluated employees. The system automatically selects the set of reviewers, who socialize with each employee (see Figure 4). Finally, the system allows manually add or remove any reviewer of the set.

Figure 2: Definition of an indicator

Figure 3: Definition of a survey

b) Gathering Information. The judgments about the employees are provided by *appraisers*. When a user with this role is logged in the system, it shows surveys that he/she should complete. Each survey gathers information from an evaluated employee, according to the criteria defined in the evaluation framework (see Figure 5).

In order to ensure an organization, an *administrator* may impose a deadline for the gathering of the information; when the deadline ends; the reviewers cannot complete or modify their associated surveys.


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INTEGRAL PERFORMANCE APPRAISAL
 EVALUATED EMPLOYEE: employee01

List of reviewers for the employee: employee01

ID	NAME	TYPE
Sup01	supervisor01	Supervisor
col01	collaborator01	Collaborators
col02	collaborator02	Collaborators
cus01	customer01	Customers
cus02	customer02	Customers
cus03	customer03	Customers
emp01	employee01	Evaluated

Figure 4: Set of reviewers


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INTEGRAL PERFORMANCE APPRAISAL
 EVALUATED EMPLOYEE: employee01
 REVIEWER: supervisor01

Level of sales: 10,800 evaluation01

Productivity: 110

Customer service

☐ None ☒ Low ☐ Medium ☐ High ☐ Perfect

Personal Image


☐ None ☒ Low ☐ Medium ☐ High ☐ Perfect

Save

Figure 5: Gathering of the information

c) Aggregation Phase. In this phase, the system computes a collective assessment for each evaluated employee. These assessments will be used in the next phase to obtain a ranking. The system carries out automatically the transformations to unify the heterogeneous information^{3,4} in a linguistic domain and then, it shows a set of aggregation operators (maximum, minimum, arithmetic mean and median) to select one of them in order to compute the collective assessment for each employee. This selection is conducted by the *human resources* user. WSSIPPA allows multiple resolutions, using different aggregation operators. Despite different options, in our case study, the arithmetic mean operator is selected to aggregate the unified information in a linguistic domain (see Figure 6). The obtained results expressed in linguistic 2-tuples are the following: (*High*, -0.2) for the first employee and (*Medium*, 0.2) for the second employee. We can check that these results are close to human natural language in order to be understandable and interpretable by multiple members of the company.

d) Ranking Phase. When the global values of the set of evaluated employees are computed, WSSIPPA sorts these values in order to show a ranking of employees to the *human resources* users. In our case study, the employee with the first ranking position corresponds to the first employee with a global values of (*High*, -0.2) (see Figure 7).


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AGGREGATION PHASE

CHOOSE THE AGGREGATION OPERATOR

☐ ARITHMETIC MEAN
☐ MEDIAN
☐ MAX
☐ MIN

ID	Evaluation Name	View
1	INTEGRAL PERFORMANCE APPRAISAL: Evaluation 01	<input type="button" value="View"/>

Figure 6: Selection of the aggregation operator


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RANKING PHASE

INTEGRAL PERFORMANCE APPRAISAL

evaluation01

RANKING	NAME	GLOBAL VALUE
1	Employee01	(High: 0.2)
2	Employee02	(Medium: 0.2)

Figure 7: Ranking phase

4. Concluding Remarks

Performance appraisal is a process to determine efficiency and effectiveness of employees. In this contribution, we have presented WSSIPA, a Web based system that supports integral performance appraisal processes with a heterogeneous evaluation framework that provides linguistic results. In this framework, reviewers can provide their judgments within different domains (numerical, interval-valued and linguistic). The linguistic results are close to human natural language in order to be understandable and interpretable by multiple members of the company. The developed system offers companies a software tool for integral performance appraisal processes in an automatic, easy, fast and distributed way.

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