Gest. Prod., São Carlos, v. 25, n. 1, p. 16-29, 2018
http://dx.doi.org/10.1590/0104-530X2417-16

ISSN 0104-530X (Print)
ISSN 1806-9649 (Online)

Competence-based selection of IT professionals in a Higher Education Institution: a proposal based on a Multicriteria Decision Support Model

Seleção de profissionais de TI por competências em uma instituição do ensino superior: uma proposta baseada em um modelo multicritério de apoio à decisão

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Abstract: The main objective of this study was to develop and implement a decision support model in the competence-based selection process of Technology Information Professionals in a Higher Education Institution. To do that, we used the Multicriteria Decision Analysis and adopted an action research strategy based on the understanding of the selection process and analysis of the competences for the Programmer and Support Analyst positions, having as basis the evaluators perception of the profile, and the results of the candidates in the stages of the selection process. Thus, a multicriteria model (*SMARTER*) was developed to structure the competence profile of the positions, enabling comparisons among candidates of the selection process, producing closer results to the desired candidate. The study becomes relevant by the applicability of the created model, which allowed a faster and simpler selection process and still met the required profile. The model was presented and approved by the participants of the research, who also are the evaluators. The generated results allowed the multicriteria model to contribute to the decision support of the evaluators in the selection process of IT professionals, being well rated by the decision-makers, providing a more reliable selection process evaluation for them.

Keywords: Competence-based selection; Decision support; Multicriteria models; IT professionals.

Resumo: *O trabalho teve como objetivo desenvolver e implantar um modelo de apoio à decisão no processo de seleção por competências de profissionais de Tecnologia da Informação em uma instituição do ensino superior. Para isso, foi adotada estratégia de pesquisa-ação e utilizado o método de análise de decisão multicritério (MCDA), a partir da compreensão do processo seletivo e análise das competências para os cargos de Programador e Analista de Suporte, utilizando-se como base a percepção dos avaliadores com relação ao perfil e os resultados dos candidatos nas etapas do processo de seleção. Com isso, desenvolveu-se um modelo multicritério (SMARTER) para estruturar o perfil de competências dos cargos, possibilitando comparações entre os candidatos do processo de seleção, gerando assim resultados mais próximos à estrutura de preferências com relação ao perfil de candidato almejado, estudo relevante pela aplicabilidade do modelo criado, que proporcionou um processo de seleção mais rápido, com uma avaliação mais simplificada, e atendendo ao perfil de cargo requerido. O modelo foi apresentado e aprovado pelos participantes da pesquisa, que são os avaliadores. Os resultados gerados fizeram com que o modelo multicritério contribuísse no apoio à decisão dos avaliadores no processo de seleção dos profissionais de TI, sendo bem avaliado pelos decisores e tornando a avaliação do processo de seleção mais confiável para eles.*

Palavras-chave: *Seleção por competências; Apoio à decisão; Modelo multicritério; Profissionais de TI.*

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Received Mar. 15, 2015 - Accepted Dec. 1, 2016

Financial support: None.

1 Introduction

The actions of selecting people and forwarding them to the area of the organization in which they are required represents a process capable of aggregating value to the organization as well as enabling a more adequate use of the professional and their performance in the role (Souza et al., 2011). The selection of people in companies represents an important process within the area of people management and results in the choice of professionals who help meet the recurrent demands of the business of these companies. This importance grows increasingly, at a time when attracting talents and selecting suitable professionals represents an essential part to the organizational strategy (Souto, 2012).

A competence-oriented management model helps the organization discern the ideal results to achieve and, through this understanding, identify in professionals, the necessary competences to what has been proposed (Nobre, 2005). The adoption of the strategy of selecting people based on competences has been growing for over a decade, as selecting competent professionals facilitates the achievement of organizational objectives, such as productivity increase or decrease of operational expenses (Abreu & Carvalho-Freitas, 2009; Berto, 2014).

In view of the increasingly strategic importance in creating and providing infrastructure and IT applications in public and private organizations, there is a high demand for trained professionals in this field in Brazil (Barcelos & Rapkiewicz, 2004). The need for these professionals in the country is increasing due to the shortage of skilled labor in the area (Softex, 2012), and managerial efforts to keep IT professionals in organizations have been intensified (Luftman & Kempaiah, 2008). In this sense, an effective selection process seeks perpetuity and the development of said professional. Inefficient selection processes, as well as poorly defined evaluation criteria, may lead to inappropriate choices of candidates, which may compromise the performance of such candidates in the organization. The adoption of Multicriteria decision support can contribute, in this context, once it has advantages in decision-making processes, which involve several variables and functions as the basis for the decision-maker when there is no consolidated perception among several actors involved in the decision-making progress (Noronha, 1998). The model seeks to assist in the systematization of information and definitions of existing preferences, clarifying what should be considered in the decision at the time of the evaluation and enabling comparison of the existing alternatives (Gomes et al., 2006).

In this context, the *SMARTER* multicriteria model is applicable in situations of multiple alternatives and criteria (Lopes & Almeida, 2008). This causes the preference structure of the decision-makers to be considered in the decision-making process, thus allowing a more aligned choice to the context and competences sought by them. Therefore, the use of a multicriteria model brings new perspectives to the competence-based selection process of IT professionals. Considering that there are no studies that show the development and application of the multicriteria method in the selection of people.

For this, the research aimed to optimize the competence-based process at the Superintendency of Informatics (SINFO), UFRN, organizational unit responsible for coordinating and executing management, development and implementation of information technology activities in the institution.

Thus, the objective of this work is to develop and implement a decision support model in the competence-based selection process for the SINFO Senior Programmer and Support Analyst positions. For this, the action research strategy was used to understand the selection process, develop the multicriteria decision support tool, as well as evaluate it with the decision-makers.

In this context, the article was divided into seven sections, including the introductory part. Sections two, three and four address competence, competence in professionals and competence-based selections. Section five discusses the methodological procedures adopted in this research. The section six emphasizes the results reached since the construction of the tool until it's application by decision-makers and their evaluation of the model. Finally, section seven presents the final considerations, recommendations and prospects for future research.

1.1 Concept of competence

The concept of competence has been built since the 20th century. According to Dutra (2010), the first proposition in a structured manner was made by David McClelland, in 1973, and with it, the vision of organizations, having this perception of competence, as well as its possibility to be measured, contributed to the understanding of the work from the assessment of what is done.

Within the competence concept, two views may be pointed: the American and European (Dutra et al., 1998). In American thought, Boyatzis (1982) defines competence as the ability which the person can bring to the work situation, this vision is due to the fact that it had some influence from McClelland on the behavior as a function of the interaction between the person and the environment. On the other hand, the European perspective on the notion of competences focuses on identification of profiles which are the basis for training and certification of competences programs (Steffen, 1999).

There are two points in common regarding the concept of competence, which are the changes in work processes, which provide production flow and more efficient communication, and competitiveness factors facing the market (Rodrigues, 2006). In general, competence is considered a significant factor to measure job performance. The concept of competence is associated to a well-executed job, which in turn, to define it, it is necessary to evaluate the results, this being the main component to know the employee performance (Carvalho et al., 2008).

Competency is a set of knowledge, competences and attitudes which justify a specific professional performance (Fleury, 2002). Knowledge and competences can be acquired or developed, however the attitudes involve desires, beliefs and values which are the product of a whole life story, being hardly shaped according to the interest of an organization (Carvalho et al., 2008).

In addition to representing a set of knowledge, skills and attitudes required for the execution of activities, competence is understood as the expression of the performance of the person in a given context, through adopted behaviors at work and accomplishments the person may have (Brandão & Borges-Andrade, 2007).

The competences involve differentiating skilled personnel who could contribute more significantly to the organization. According to Dutra (2010), people value added because of their competence contributes to the organization on effective competitive advantages.

Competences can be classified as technical and behavioral, the first reflects the knowledge and resourcefulness in techniques the individual needs to know to perform their activities and the behavioral reflects the competitive advantage of the professional in ways and behaviors compatible with the tasks of the assignments to be performed, or, in other words, strongly linked to attitudes (Rabaglio, 2004; Leme, 2005).

1.2 Competences in IT professionals

The processes of change in the world economy and the increasing globalization, shaping new scenarios for organizations, led to a greater dependence on human expertise to ensure their competitive success in organizations (Sandberg, 1993; Arthur, 1996). The IT field, currently, is considered a strategic resource for gaining competitive advantage (Chun & Mooney, 2009). In this way, Information Technology becomes a strategic differentiator, which entitles the IT professional to assume competences which empower them to this new reality (Correia & Joia, 2014).

In this context, the proper management of IT professionals has become a key factor of competitiveness, from the point of view of business support (Bassellier & Benbasat, 2004; Schambach & Blanton, 2002).

It is possible to state that one of the biggest challenges associated with the constant use of IT resources is in the identification and development of competences in professionals of the area so that they develop activities properly and aligned with the expectations of their organization (Correia & Joia, 2014).

According to Campos (2010), this professional finds himself in a situation in which the formation of a set of competences works as a way of adapting and surviving in an increasingly more dynamic work market. In this case, a set of technical and behavioral competences, usually present in IT professionals, is illustrated in Figure 1.

1.3 Competence-based selection process

To represent an important step within the organization, the selection process of people has gained greater prominence when it comes to competence in the organizations. According to Mazon and Trevizan (2000), the selection, when well executed, provides the organization with an increase of productivity, return on investments, as well as contributing with the company to achieving its goals.

The competence-based selection process represents an efficient approach to the selection of professionals, in addition to providing satisfaction to selected candidates. This way, it is necessary to look for methods and tools which facilitate, optimize and enhance the selection process through competences (Abreu & Carvalho-Freitas, 2009).

The main goal of the competence-based selection is the creation of a competence profile for each position within the organization, which is created by a mapping competences (Rabaglio, 2004). In this process, it is not always possible to find the right candidate for the

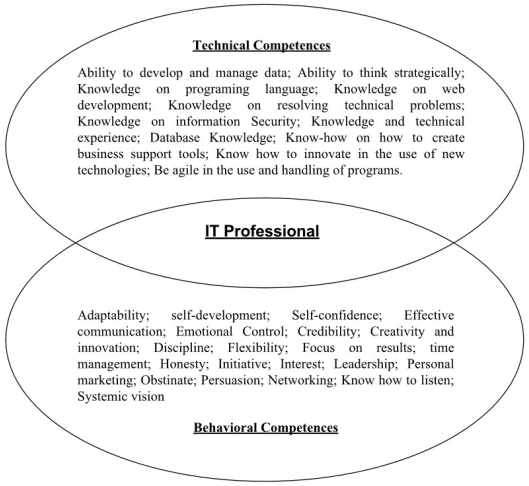

Figure 1. Competences Profile of IT Professionals. Source: Campos (2010) and Brasil (2010), adapted.

duties proposed for the position. When facing this limitation, the candidate closest to what was expected is selected, adapting him to the position which will be performed (Bronover & Doval, 2014).

Carvalho et al. (2008) emphasize the final decision of the manager regarding the competence-based selection process, in which the techniques used in the process provide benefits when requiring support for decision-making, identifying basic characteristics on the candidate for later comparison to the desired competence profile. However, the interview is more emphasized, especially the one in private, due to its significance in a selection process based on selection by competence. The advantage in the implementation of this type of process is to provide a selection of people on the basis of observation of essential competences to the position (Souza et al., 2014).

2 Research methodology

This research is characterized as applied, as it seeks to develop knowledge through practical intervention in an organizational unit, specifically focused on solving the pointed problem (Vergara, 2005), in addition to characterizing itself as of exploratory nature, needing to be acquainted with the problem.

The research uses a quantitative approach, as it has measurable information (opinions or data) which, using mathematical techniques and resources for the construction of information and ideas (Oliveira 1999).

The adopted strategy is action research, as it highlights the reality of the observed problems regarding the selection process, through actions of intervention. Hence, it is possible achieve dynamism in the study of the problems, decisions, actions which take place between the parties involved in the process of solving the problem (Thiollent, 2003). Based on the stages of the action research, according to Thiollent (2009), this research occurs according to the methodological steps shown in the Table 1.

The information and data were obtained in three moments: through meetings to understand the needs in the selection process with the participation of managers and coordinators involved via individual semi-structured interviews with evaluators from the selection process of the positions in person and finally by applying a questionnaire, through a data collection tool on the internet with closed questions in order to determine the degree of importance of 09 different selection criteria for the process determined in the previous step.

Moreover, the focus of the research was in the selection of the Systems Programmer and Support Analyst positions, as they are the ones who go through the SINFO selection process more often. Six interviews were conducted, all of them recorded: two interviews were 60 minutes long each; one interview was 49 minutes; one was 44; 1 was 30; and the last one was 28 minutes long. The transcription of the information had 2 pages each interview. The data collection time was 2 weeks, from September 4 to 15 2014. As for the questionnaire, the registration of the data was performed by the virtual tool itself, allowing visualization and analysis on it.

This research elaborated and adopted the intervention tool based on the SMARTER method. The MCDA methodology is characterized by its flexibility, which

Table 1. Methodological steps of the research.

Phases	Definitions	Research steps
Exploratory	Researchers and members of the Organization in the investigated situation detect problems, actors, capabilities and possible actions;	• Understanding of the problem in the selection process through discussions with the superintendent, boards and coordination.
In-depth research	The situation is researched through discussed data collection instruments and progressively interpreted by participants;	• Understanding and analysis of the selection process of the senior programmer and analyst positions; • Identification of the selection criteria; • Analysis and handling of the data for formation of competence profiles.
Action	Implementation of actions; includes the choice of the best alternative solutions and the assembly of the new procedures. Alterations in procedures can be already implemented starting possible changes;	• Development of multicriteria decision support model in the selection process; • Guidelines of the selection process in the usage of the tool; • Implementation of the model in the selection process.
Evaluation	Responsible for the feedback and possible redirection of the actions.	• Evaluation of the applicability of the model in the process with the decision-makers; • Understanding of the importance of the tool in decision-making.

Source: Thiollent (2009), adapted.

contributes to the construction of the model with the decision-makers and their visions regarding the problematic, considering the participation of all these is necessary for an efficient discussion and a better understanding of the decision-making context (Pereira, 2001).

The main advantage of the method is the ability to simplify a decision involving the multiple attribute assessment of alternatives, by using constants from predefined scales through a methodology called ROC (Ranking Ordered Centroid) which facilitates the attainment of the values functions (Lopes & Almeida, 2008).

The Borda method is used as a way of aggregating structures of individual preferences for group decisions. The aggregation of values in the method is done by the sum of the points each alternative obtained for each criterion, with the goal of uniting the individual assessments of the decision-makers in the selection process (Almeida, 2013). In the end, the alternative to reach the highest number of points obtained in the evaluations of the decision-makers is the considered one.

The SMARTER model was developed based on the suggested methodology in Almeida (2013), Mello et al. (2014), Gomes et al. (2011) and Belo (2008), according to the following 9 steps as shown in Figure 2. The first step represents the definition of the objective the multicriteria model will handle and the decision-makers who will use the tool. The next step reflects the criteria to be considered to make the decision, usually defined by decision-makers. The third step is the definition of the set of alternatives which will be analyzed by decision-makers. The fourth step is the construction of arrays of consequences to be used in the model, which incorporate the performance the alternative will have on a certain criterion. The fifth step deals with the review and elimination of any criterion which does not have significant influence on the performance of any alternatives. The sixth step is the construction of evaluation arrays, where the assessments of the decision-makers on each alternative related to the criteria set in the second step shall be entered. The seventh step is constituted by the ordering of the criterion in order of importance, following the *Swing* procedure. The eighth step sets a weight to each criterion, which is obtained by using the *Ordered Ranking Centroid* method, which sets the weight of a criterion relating it to all the others. The last step makes the calculation of the weight of each criterion on the evaluation of the alternatives, given individually by each decision-maker. The product of these calculations will represent the optimal value, or the value function, of the alternatives. Soon after that, the aggregation of these values is made using the Borda method.

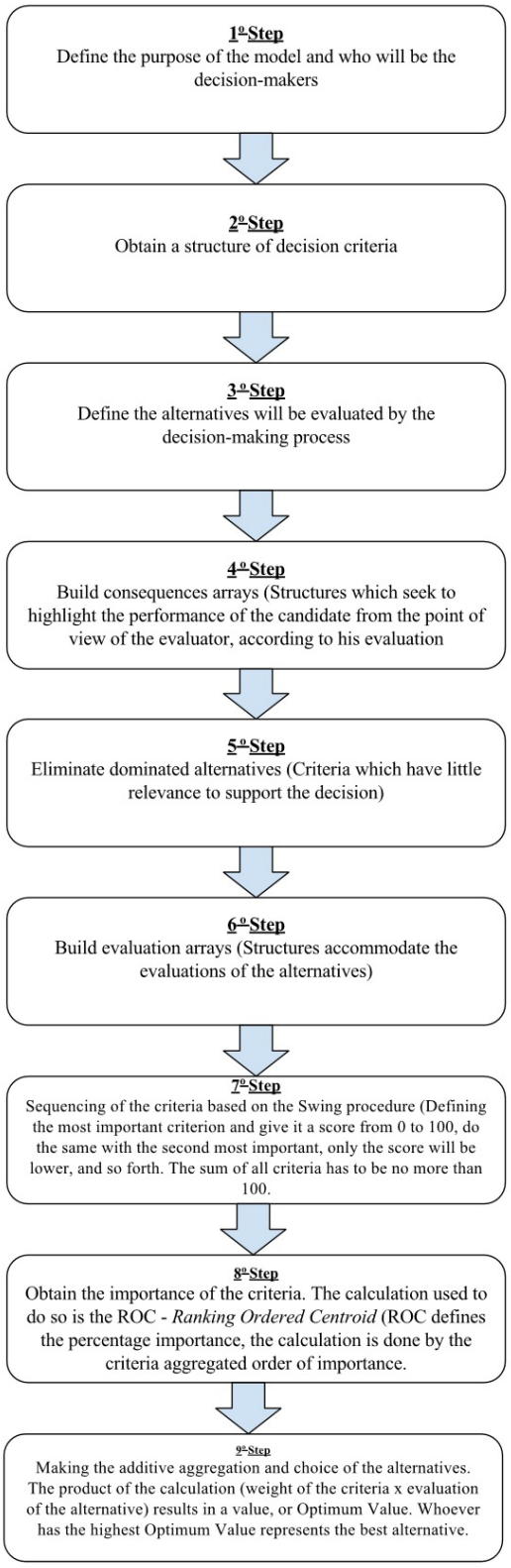

Figure 2. Steps to build the SMARTER multicriteria model. Source: Created by the author (2014).

2.1 Application of the model in the SINFO/UFRN selection process

This section presents results of the development and application of the decision support model, based on the 4 stages of the action research presented in the next topics.

2.1.1 Exploratory phase

SINFO did not have a formalized IT professional selection process, being the assessment of the candidates based on the experience and empirical knowledge of the evaluators. Thus, the evaluation adopted by decision-makers does not follow any specific criterion.

In general, SINFO adopts two stages in the selection process: a written exam, addressing technical knowledge to sort and eliminate candidates in the process, the classified go then, to the next stage where they go through an individual interview, to have their technical skills and behavior identified and evaluated through discussions among the evaluators.

Therefore, three assessment dimensions of the SINFO selection process could be investigated: the score obtained in the written test; the assessment of technical competences; and evaluation of behavioral competences.

2.1.2 In-depth research phase

In accordance to the process of building the SMARTER method described, a discussion with the coordinators needs to happen to define the purpose of the creation of decision support model, which was to improve and standardize the selection of candidates in the selection process. After that, the decision-makers of the selection process were identified, which led to a set of 08 people, among coordinators and managers, of whom 05 belonged to the Systems Directory and 03 belonged to the Networks and Infrastructure Directory.

Henceforth, 09 criteria were chosen to be evaluated and the positions to be used. The criteria were defined and chosen by the decision-makers yet in the stage of the data collection, based on the of IT professionals competences defined by Campos (2010), agreeing with the Brazilian Classification of Operations - CBO (Brasil, 2010). To facilitate the use of the multicriteria model, as well as the possible changes the model may suffer in the future, the number remained in 09 criteria, as shown in Figure 3.

According to the steps of the SINFO selection process, applicants who passed the first phase and went to the interview, are the ones who will be evaluated by the decision support model. So, the selected candidates in phase two represented the alternatives to be evaluated in the model.

Regarding the arrays of consequences, in accordance with the *SMARTER* model, the Programmer and Support Analyst positions had 09 criteria developed specifically for each role.

As well as the array structure of consequences, two assessment arrays were built for each position, once the number of arrays depends on the number of the evaluators conducting the interviews and, in this research, each position had two evaluators. The evaluation was based on an interval scale of 05 options (0; 1; 2; 3; 4), represented respectively by "not assessed", "competence non-existent", "low competence", "reasonable competence", "high competence". It is worth noting that each evaluation has a specific weight (0,00; 0,25; 0,50; 0,75; 1,00), being equivalent to the scale presented.

The set of 09 criteria of the positions was placed in order of importance, based on the "*Swing Weights*" procedure, from the perception of evaluator of each position, as shown in Table 2. In this step, information was collected and discussed along with the evaluators to decide which criterion was more important, making

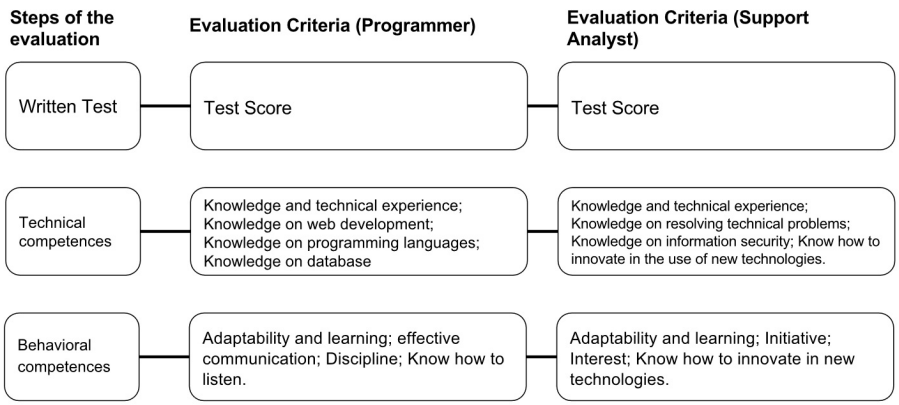

Figure 3. Evaluation criteria used in multicriteria decision support model. Source: Data from the research (2014).

the relation between the 09 criteria involved, and distributing 100 points among 09 criteria according to their importance.

After the ordering of the criteria in order of importance, the *ROC* was calculated to obtain their scale. As a way of showing the calculation, the Table 3 shows that the criterion which obtained the highest score receives the Scale constant k_1, while the criterion which obtains the second highest, receives k_2, and so on, so that $k_1 > k_2 > k_3 \ldots k_n > 0$.

Thus, for each position, a structure of constants of scale was developed based on the calculation of the *ROC*, in the perception of each evaluator, which represents how the evaluator evaluates the contender in certain criteria, as shown in Table 4. It should be noted that the information of the position of programmer is shown to demonstrate how it was obtained.

With the definition of the constants of scale and the assessments, the data is processed in the arrays of consequences, to generate the value functions of each alternative. These values represented by the sum of the optimal values reached in each criterion determine the evaluation of the candidate in general, in the perception of the evaluator.

The optimal values are established for each candidate in the selection process and on the individual perception of each evaluator. Then, using the Borda method, in which the optimal values receive a specific score, according to Table 5. So, the candidates are scored by each evaluator according to their performance, enabling the aggregation of all the points a candidate could have obtained, in other words, the points from each evaluator of a particular candidate are summed, resulting in a general evaluation of the evaluation team on said candidate.

Even if an evaluator determines a different score then another evaluator, each score set for a candidate is summed, so all the evaluations from different evaluators of that candidate are united. The optimal values of the candidates generate a classification from highest to lowest, the best ranked receives the highest score as the worst gets the lowest score. The candidate who has the highest score is the closest to the profile desired by the evaluators.

2.1.3 Action phase

With the goal of guiding the conduct of the interviews, brief meetings were held to clarify the objectives of the interview, the way interview should be conducted, the aspects that should be further explored, how the model would contribute to the decision-making process and the classification of the candidates, as well as in the elucidation of any doubts. Such measures are part of the action phase in the action research, as there is the need of objectification and dissemination of information along with knowledge, where the participatory researcher commitment contributes as a way of awareness of the researcher (Thiollent, 2009).

During the interview, there was the observation of the performance of the evaluators in conversation with the candidates, using a guide of questions developed by the researcher along with the evaluators, with the objective of facilitating the progress of the interview keeping the focus on the general purpose of the evaluation.

Regarding the interviews of the candidates to the programmer post, two evaluators, named here as "Evaluator 1" and "Evaluator 2" and 5 candidates participated. During this stage, the evaluators adapted

Table 3. Application of the *ROC* calculus.

Order	Calculus	$(w_1 \geq w_2 \geq w_3 \geq .. \geq w_n)$
1º	w_1	(1+1/2+1/3+1/4+...1/n)/n
2º	w_2	(0+1/2+1/3+1/4+...1/n)/n
3º	w_3	(0+0+1/3+1/4+...1/n)/n
4º	w_4	(0+0+0+1/4+...1/n)/n

Fonte: Belo (2008), adapted.

Table 2. *Swing* application by the Evaluators of the Systems Directory.

Programmer selection process criteria	Evaluator 01	Evaluator 02	Evaluator 03	Evaluator 04	Evaluator 05
Adaptability and learning	05	12	05	05	15
Effective communication	05	12	05	15	10
Knowledge and technical experience	10	12	10	20	13
Knowledge on web development	10	10.4	15	10	11
Knowledge on programming languages	10	12	15	10	11
Knowledge on database	10	8.8	05	10	07
Discipline	05	12	05	10	14
Written Test	40	10.4	35	15	11
Knowing how to listen	05	10.4	05	05	08
Total	100	100	100	100	100

Source: Data from the research (2014).

Table 4. Definition of the constants of scale of the Programmer criteria.

Criterion	Evaluator 01	Evaluator 02	Evaluator 03	Evaluator 04	Evaluator 05
Adaptability and learning	0.0625	0.01642	0.0820	0.01897	0.02245
Effective communication	0.0625	0.01642	0.0820	0.01897	0.0408
Knowledge and technical experience	0.01875	0.01642	0.01803	0.0862	0.02245
Knowledge on web development	0.01875	0.0746	0.01803	0.01897	0.01020
Knowledge on programming languages	0.01875	0.01642	0.01803	0.01897	0.01020
Knowledge on database	0.01875	0.0299	0.0820	0.0345	0.0408
Discipline	0.0625	0.01642	0.0820	0.0824	0.02245
Knowing how to listen	0.0625	0.0746	0.01803	0.0862	0.0408

Source: Data from the research (2014).

Table 5. Score model of the Borda Method.

Optimal Values (Ov) of the candidates in decreasing order	Borda Method Score
Ov 1	10
Ov 2	09
Ov 3	08
Ov 4	07
Ov 5	06

Source: Created by the author (2014).

themselves well to the parameters of the conduct of the interviews, like the objective sought and predefined questions.

The evaluation arrays, together with the assessments of the candidates, are in Tables 6 and 7. They were analyzed in a comparative manner, since, after all the interviews, there was comparison of desired profiles by each evaluator. The evaluations were measured using a scale of 0 to 4, which in turn, are represented by different constants of scale between 0.00 and 1.00, as determined by multicriteria model. After the evaluations made by each evaluator, the values have been entered in the multicriteria model developed in the Excel tool to generate the rating. Considering that the tool evaluates, scores and ranks, from the individual perceptions of the evaluators, the first results achieved the ideal classification, as the evaluators agreed with the classification given by the tool, highlighting the candidates who were closer to the profile desired by the evaluators. In this sense, there was no need to reassess the candidates to perform the evaluations on the multicriteria tool one more time.

The achieved results to the Programmer position through the multicriteria model developed in the Excel tool can be followed afterwards, when each candidate receives an optimal value for each competence, which at the end, when summed, becomes the final optimal value of that candidate in the perception of the evaluator, in Tables 8 and 9, which are presented in the arrays of consequences.

With the optimal values defined, the tool performs the score using the Borda method, as showed in Tables 10 and 11, and finally, it constitutes a final classification, summing the score obtained by each candidate. In this case, the points of each candidate from evaluator 1 were added with the points from evaluator 2, generating a unified score. As it can be seen in Table 12, candidate 1 tied with candidate 4, however, the tool considers the highest grade in the written test as a tiebreaker criterion.

As for interviewing candidates for the Support Analyst position, an evaluator called "Evaluator 3" was used and the evaluations were designed according to the model created for the position, as shown in Table 13, in which the evaluation array is demonstrated.

Since the number of candidates interviewed for the Support Analyst position reduced the complexity of the decision if compared to a situation with more candidates, such fact was pointed and considered by the evaluator after the interviews. However, the obtained results with the use of multicriteria model contributed to confirm his considerations relating to the candidates he interviewed and evaluated, according to Table 14. Therefore, the initial results, scoring and ranking, in the Tables 15 and 16, obtained by use of the tool, were effective and eventually confirmed by the evaluator. In this case, there was no unification of more than one assessment, as only one evaluator conducted the interviews.

2.1.4 The use of the tool in the other positions of SINFO

To expand the possibilities of usage of the tool, the multicriteria model was applied in other positions which were still in process of selection, given the interest of other areas to adopt the created tool. With the action research, change trigger actions are permitted, as said by Thiollent (2009), for it is not confined to describe

Table 6. Evaluator 1 evaluation array.

Criterion	Candidate 01	Candidate 02	Candidate 03	Candidate 04	Candidate 05
Knowledge and technical experience	0.5	0.5	0.75	0.75	0.0
Knowledge on web development	0.75	0.5	0.75	0.5	0.0
Knowledge on programming languages	0.75	0.5	0.75	0.75	0.0
Know how to listen	0.75	0.25	0.75	0.5	0.0
Knowledge on database	0.5	0.5	0.5	0.75	0.0
Adaptability and learning	0.25	0.25	0.5	0.75	0.0
Discipline	0.75	0.25	0.75	0.5	0.0
Effective Communication	0.25	0.25	0.5	0.75	0.0

Source: Created by the author (2014).

Table 7. Evaluator 2 evaluation array.

Criterion	Candidate 01	Candidate 02	Candidate 03	Candidate 04	Candidate 05
Adaptability and learning	0.75	0.5	0.75	0.75	0.0
Discipline	0.75	0.25	0.75	0.5	0.0
Knowledge and technical experience	0.75	0.5	0.75	0.75	0.0
Knowledge on web development	0.5	0.5	0.75	0.75	0.0
Knowledge on programming languages	0.75	0.5	0.75	0.75	0.0
Effective Communication	0.5	0.75	0.5	0.75	0.0
Know how to listen	0.5	0.25	0.75	0.5	0.0
Knowledge on database	0.5	0.75	0.5	0.5	0.0

Source: Created by the author (2014).

Table 8. Evaluator 1 consequence array.

Criterion	Candidate 01	Candidate 02	Candidate 03	Candidate 04	Candidate 05
Knowledge and technical experience	0.090	0.090	0.135	0.135	0.000
Knowledge on web development	0.135	0.090	0.135	0.090	0.000
Knowledge on programming languages	0.135	0.090	0.135	0.135	0.000
Know how to listen	0.135	0.045	0.135	0.090	0.000
Knowledge on database	0.041	0.041	0.041	0.061	0.000
Adaptability and learning	0.020	0.020	0.041	0.061	0.000
Discipline	0.061	0.020	0.061	0.041	0.000
Effective Communication	0.008	0.008	0.016	0.025	0.000
SUM	0.627	0.406	0.701	0.639	0.000

Source: Created by the author (2014).

Table 9. Consequence array of Evaluator 2.

Criterion	Candidate 01	Candidate 02	Candidate 03	Candidate 04	Candidate 05
Adaptability and learning	0.168	0.112	0.168	0.168	0.000
Discipline	0.168	0.056	0.168	0.112	0.000
Knowledge and technical experience	0.168	0.112	0.168	0.168	0.000
Knowledge on web development	0.051	0.051	0.077	0.077	0.000
Knowledge on programming languages	0.077	0.051	0.077	0.077	0.000
Effective Communication	0.020	0.031	0.020	0.031	0.000
Know how to listen	0.020	0.010	0.031	0.020	0.000
Knowledge on database	0.020	0.031	0.020	0.020	0.000
SUM	0.694	0.454	0.730	0.673	0.000

Source: Created by the author (2014).

Table 10. Application of the Borda method for Evaluator 1.

Candidates	Optimal values (Ov)	Borda method score
Candidate 3	0.701	10
Candidate 4	0.639	9
Candidate 1	0.627	8
Candidate 2	0.406	7
Candidate 5	0.000	6

Source: Created by the author (2014).

Table 11. Application of the Borda method for Evaluator 2.

Candidates	Optimal values (Ov)	Borda method score
Candidate 3	0.730	10
Candidate 1	0.694	9
Candidate 4	0.673	8
Candidate 2	0.454	7
Candidate 5	0.000	6

Source: Created by the author (2014).

only one situation, aspect of participatory research the author defines as "diagnosticion".

As the model was developed based on the competence profile the decision-makers established for the Programmer and Support Analyst positions, the criteria assessments would not have the same weight of importance to the different positions. Having said that, the multicriteria model did not have the same performance as it had with the main positions of the research. However, its adoption made the understanding possible for the researcher and the researched, as well as the applications of the tool in the other areas of the organization.

One of the findings about the model is that it facilitates the objectification of the professional profile desired to be achieved, the evaluator feels safer and their assessment becomes deeper. During the interviews, the evaluator reviews the evaluations of the candidate who has just been interviewed and

Table 12. Score and final classification of the candidates.

Candidates	Evaluator 1 Score	Evaluator 2 Score	Total Score	Test Score (Tiebreaker)	Final Classification
Candidate 3	10	10	20	7.6	1º
Candidate 1	8	9	17	9.5	2º
Candidate 4	9	8	17	7.2	3º
Candidate 2	7	7	14	9.4	4º
Candidate 5	6	6	12	6.4	5º

Source: Created by the author (2014).

Table 13. Evaluator 3 evaluation array.

Criterion	Candidate 01	Candidate 02
Adaptability and learning	1	0.75
Knowledge in solving technical problems	1	1
Initiative	1	0.75
Interest	1	0.75
Know how to innovate in new technologies	0.75	0.5
Knowledge on information security	0.5	0.5
Knowledge and technical experience	1	1
Self-confidence	1	0.5

Source: Created by the author (2014).

Table 14. Evaluator 3 consequences array.

Criterion	Candidate 01	Candidate 02
Adaptability and learning	0.324	0.243
Knowledge in solving technical problems	0.192	0.192
Initiative	0.126	0.094
Interest	0.126	0.094
Know how to innovate in new technologies	0.061	0.041
Knowledge on information security	0.041	0.041
Knowledge and technical experience	0.048	0.048
Self-confidence	0.022	0.011
SUM	0.939	0.764

Source: Created by the author (2014).

compares it with the previous, this action enables the ratings are the most reliable, having as parameter the perception of the evaluator.

The results of ranking of candidates through the decision support model could be used to the advantage of the evaluators of the other positions, once they guided the choice of the decision-makers for the higher-ranking candidate and thus, identified the most qualified candidate.

2.1.5 Evaluation phase

The evaluation of the model is evidenced by the perception of the participants of the research, since the results of the action research become organizational results when the changes are introduced in the organization itself, and in a diffuse way, in the culture itself (Thiollent, 2009).

During the implementation of actions, discussions with members of the organization and suggested proposals for improvement, contributed in the materialization of changes during a period of the application of the research.

The meetings held before the interviews provided a better use of them, which increased the given contribution by the model to facilitate the decision. In the decision-making process, the decision-making which has multiple criteria and decision-makers can become complex for having to involve sometimes inaccurate or incomplete information (Gomes & Moreira, 1998). With the use of the decision support model, even the decision-makers inserted in a multiple variables reality during the research, it was possible to find appropriate and significant results for the team of decision-makers in the selection process.

Another finding was that the tool was developed so that assessments can be redone whenever the evaluator feels he did not do a good one, allowing him to generate various classifications, like various scenarios, giving it views in different perspectives of the best choice.

One of the comments made by the decision-makers was the use of strategic thinking during the evaluation, when the multicriteria model conditioned their actions to a single goal set by *SMARTER*. The approval of the multicriteria model as a tool for decision support for the SINFO evaluators showed that working with action strategies is acceptable and efficient.

With the guidance for the choice of decisions, the evaluators noticed how much the process can be optimized, putting aside subjective and empirical arguments related to the assessment of the candidates. So, this way, it can be said that there was a structuring of complex situations, in which the decision problem within these situations has become better resolved.

Another point that could be evaluated was to identify opportunities for improvement and perpetuity of the multicriteria model to the selection process, the good performance in generating information that contributes to the decision-making process, which made the possibilities for implementation better viewed in the organization by the evaluators.

In General, as shown in Table 17, the ease in the use of the tool, fast and accurate results, and the flexibility in handling the data in the tool, proposed good perspectives as to the application of the model to the positions at SINFO.

Table 15. Application of the Borda method for Evaluator 1.

Candidates	Optimal values (Ov)	Borda method score
Candidate 1	0.939	10
Candidate 2	0.764	9

Source: Created by the author (2014).

Table 16. Score and final classification of the candidates.

Candidates	Total Score	Test Score (Tiebreaker)	Final Classification
Candidate 1	10	6.5	1º
Candidate 2	9	6	2º

Source: Created by the author (2014).

Table 17. Benefits of the adoption of the multicriteria model.

Areas	Description of the benefit
Adaptability	Capacity to redo evaluations and shape decision-making scenarios; flexibility to fit changes in the organization, with no loss of utility.
Efficiency	More strategic process; structuring of stages; definition of goal.
Quickness	Reduction of complexity in the decision-making process; optimization of the decision, without subjective and empirical discussion.

Source: Created by the author (2014).

3 Conclusion

This research aimed to develop a multicriteria decision support model to be used as a tool by the evaluators who work in the selection process of the Senior Programmer and Support Analyst positions at SINFO, in view of the importance of the process for the IT organizational unit.

In this sense, the model could show an ideal profile of the position, in accordance with the views of each evaluator, becoming then a reference to be used in evaluating and providing a choice of candidates who are closest to such profile. As it is a selection process, the model allows multiple candidates to be assessed accurately and at once, resulting at the end of all the evaluations, in the classification of the candidates by the score achieved during the process and adjusted by the Borda method in the multicriteria decision support model.

Furthermore, it was verified by the evaluators that when assessments are fulfilled, multiple competences are observed, however, they are complementary and help analyze the core competencies, which directly influence the evaluation. As the objective to be achieved, the model then highlighted these core competencies, and put them in order of importance, being then defined as evaluation criteria in the developed model, perfecting the process of evaluation and selection of the candidates.

For the construction of the model, Excel 2010 worksheets and their applications enable the realization of future changes, if necessary, regarding incorporation of new evaluators and new evaluation criteria. It is worth pointing, as future perspective of the work developed at SINFO, that the model may go through adaptations to include new positions, with a differentiated profile than the ones already listed.

Perceptions of some evaluators regarding the tool, had them conclude that it may be have more improvements, making it more incorporated into the processes of organization which involve other decision-making processes.

Facing the achieved results in the research, it was found that the tool could be developed within the parameters and features of multicriteria SMARTER model, with the purpose of collecting information on the competence profiles of more than one professional, as well as processes them to generate information about the best qualified alternative among the others. The fact that the decision support tool became feasible in use during the selection process of the position, generating information for decision-making, being just fed by the evaluations of the decision-makers in the selection process, within the 09 evaluation criteria, which refer to the competences that the position must have and what candidates in process have, showed how much it is applicable in cases of evaluation and selection of people in the organization.

In addition, the results showed the relevance of the research for the organization, given the new vision created on how to select IT professionals, considering the importance of these professionals in the market.

In this context, the contribution of this work to future research will serve to improve the perspectives of operation of this tool, not restricting itself only to IT professionals, but professionals of any market areas by increasingly fostering efficient competence-based selection processes in organizations. In a managerial vision, decision-making process, being one of the main situations of the decision-maker in the organization, is best used to their advantage when using tools which support the choice. People selection, being a decision-making process, with the support of the developed tool, becomes effective in the organizational reality, and brings, therefore, more qualified professionals for the company.

Some limitations of the research should be identified in relation to the number of criteria which could be extended when compared to the IT competences, but for cognitive reasons previously listed, it is complex for the decision-makers to visualize and list a structure of preferences for the decision-makers.

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