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A Novel Fuzzy Scoring Approach of Behavioural Interviews in Personnel Selection

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Abstract: *The need for a behavioural interview scoring strategy is a critical element in order to ensure an optimal organizational human capital. Behavioural interview based on storytelling approach is a technique through which career seekers are required to provide clear details of how they have handled such workloads in the past. The whole literature assumes the existence of strong correlations between the score received on the selection interview and subsequent job performance, so in this paper we intend to highlight the relationship between these two assessments as well as the modelling using fuzzy logic of a CAR alternative system for scoring the selection interview. The results demonstrated that there is a very significant association between the classic interview score and work performance ($r=0.894$ to $p<0.01$). Furthermore, there is also a significant correlation coefficient of $r=0.925$ at a $p<0.01$, between the fuzzy CAR score and job performance, thus the validity and the optimization of the procedure are fully proven.*

Keywords: *Personnel selection; Fuzzy Scoring; behavioural interview; storytelling.*

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1. Behavioural interviews based on storytelling approach in personnel selection

The interviews tend to be one of the most common forms of workforce selection within organizations around the world (Ryan et al., 1999; Wilk & Cappelli, 2003). Behavioral interview method is preferred by direct supervisors (Lievens, Highhouse & De Corte, 2005). Moreover, candidates perceive the interview as a selection method more accurate than other selection procedures (Hausknecht, Day & Thomas, 2004; Lievens, De Corte & Brysse, 2003; Topor, Colarelli & Han, 2007) having already accustomed to the fact that the interview represents a part of the selection process (Huffcutt et al., 2001)

The research has found that structured interviews clearly have a much higher predictive power over unstructured or semi-structured interviews (Cortina et al., 2000). Meta-analysis developed by Huffcut et al. (2001) identifies seven latent dimensions assessed throughout the interview: knowledge and skills, cognitive ability, social skills, personality, interests and preferences, matching with job and physical skills, practically most of the individual attributes currently studied by researchers, attributes that can differentiate between job candidates. The research developed by Jansen et al. (2013) adds to the literature describing why the selection strategies focused on the consistency of behavioral reasoning (behavioral interviews) are reliable predictors of subsequent work results. Based on interaction theory, the researchers note that the true variance performance in the selection interview and at work is clarified by interpersonal discrepancies in evaluating the situational demands.

The need for a behavioral interview scoring strategy is a critical element (Taylor & Small, 2012). Scores of situational and behavioral interviews meant to test teamwork associated when it was used a detailed behavioral anchored scale guide (Klehe & Latham, 2006). Both situational and behavioral interviews predict equally GPA score obtained by the candidates, when there were given clear scoring instructions (Klehe & Latham, 2005). Moreover, in telephone interviews when the recruiter utilized behavioral anchored rating scales in assessing both types of behavioral and situational interview, there was demonstrated the criterion validity relative to the rating given by the direct supervisor (there was not found a moderating effect of recruiters previous experience) (Day & Carroll, 2003; Gibb & Taylor, 2003). Finally, Höner Wright and Sablynski (2007) found that the ratings method structuring, utilizing behaviorally grounded evaluation for each query, improved the procedure's fidelity. Based on those results, the

usage of rating guides tends to be helpful to the selection interview's quality and effectiveness.

Behavioral interview based on storytelling approach is a technique by which job applicants are asked to provide clear examples of how they have accomplished certain workloads in the past which involve certain skills in certain circumstances. The logic behind this is the behavioral consistency principle, in other terms, the nature of a human does not alter profoundly during his life. The way certain tasks have been performed in the past is a good indicator of how certain tasks will likely be performed in the future in similar situations.

Behavioral assessments are structured into key capabilities. Basic skills are those key skills, crucial to be carried out in an extremely satisfactory occupier of the post, usually contained in the organizational competency framework.

For a particular job, the structure of basic skills will obviously depend on the job responsibilities and tasks described in the job description. The recruiter will pose questions in the behavioural interview regarding whether applicants have accomplished certain roles in the past, are generally interested in candidates' views on whether they respond to a given circumstance, and there are often "follow-up" questions to provide a better and more comprehensive description of previous career success. Behavioral questions would almost always begin with "Tell me about a moment when ..."; "Give me an illustration of ...;" "Describe a scenario where ..."

Behavioral responses will be positive scored following the CAR principle (Challenge/Action/Result), namely to describe/ narrate specific circumstances of the situation, to describe the action taken in handling the situation and to describes the result of the action. There will be also appreciated prompt, short and succinct answers. Thus, in general, the types of questions require applicants to describe/narrate a problem or a situation, the actions they have undertaken to manage the problem and results of situation, allowing recruiter to quickly assess mental patterns of a candidate in the management of certain situations.

If recruiters feel that there are areas which have failed to address, they could help in guiding candidate response. For example, in answering the question "Describe a moment when you worked under pressure" in the case which the candidate is focused on how to deal with the practical aspects of the problem but failed to specify how did he manage to approach stress during and after the event, the recruiters may prompt with another question such as "How did you adapt to stress? ". This fact will provide an opportunity to present a complete picture of his behavior. This prompting

strategy may be affected by the subjectivity of recruiter. If the recruiter sympathize a candidate, he may be tempted to prompt the candidate.

2. Fuzzy CAR model for scoring behavioural interviews

One of the main assumptions of this paper is that the recruitment and selection process of staff represents the main way to ensure a performing human capital within organizations. In order to demonstrate the effectiveness of behavioral interview as a method of selection for technical personnel, there it was analyzed the relationship between the interview score and subsequent job performance of 51 employees within a multinational automotive company in Arad county. Both behavioral interview selection and method for evaluating of individual performance are standardized techniques within the studied company; both tools regard the assessment of those skills considered fundamental at organizational level.

The whole literature assumes the existence of strong correlations between the score received on the selection interview and subsequent job performance, so in this paper we intend to highlight the relationship between these two assessments as well as the modeling using fuzzy logic of a CAR alternative system for scoring the selection interview. Fuzzy logic represents the most widely accepted technique for approaching uncertainty, given the strong subjectivity which characterizes the assessment of professional competence.

There was extracted from the organization archive data of 51 employees participating in this research: interview score and individual professional performance assessment score. Regarding the description of the sample, 29 people are masculine and 22 people are feminine. Employees are aged between 25 and 39 years. Regarding previous work experience, there was a variation between 1 and 13 years of previous professional experience.

The two instruments used described briefly below are: behavioral interview and job performance evaluation sheet.

Hiring procedure requires that candidates who have passed the screening CV stage, to be invited for an interview at the company. The recruiter will consider a summary of the inter-view that will be completed immediately after the finalization of the interview (the approximate length of interview: 30 minutes). According to the following general parameters, the recruiter awarded each applicant a rating between 1 and 5, where 1 means very low level, 2 stands for low level, 3stands for average level, 4 stands for high level and 5 for very high: Education, Experience, Overall skills, General appearance and Managerial skills (for management). For calculating the final

score obtained in the selection interview there will be calculated the mean of subscores of each 4/5 of general criteria. Media resulted (1 to 5) represents the total score from the interview sheet, where 1 represents very low skills, 2 equals low skills, 3 equals average skills, 4 equals increased abilities, and 5 very high skills.

Assessing job performance represents a standardized procedure at the organizational level, being carried out at the end of each year. Depending on the score obtained on the annual performance evaluation, decision makers determine promotion and salary raise.

The direct supervisor assigned each subordinate a score be-tween 1 and 5, where 1 represents a very low proficiency level, 2 equals low level, 3 equals average level, 4 equals increased level, and 5 equals very high level on 11 performance criteria:

1. specific knowledge in the workplace,
2. work quantity/quality,
3. communication,
4. interpersonal skills,
5. organizational thinking,
6. decision making and judgment,
7. client satisfaction,
8. collaboration skills,
9. changeable adaptability,
10. human resource management (for staff carrying out management) and
11. performance against objectives (only for managerial positions).

For calculating the total score obtained by the employee, there will be calculating the average of subscores for each of the 9/11 general criteria. The average obtained (1 to 5) represents the total score of the evaluation of professional performance, where 1 stands for very low performance, 2 stands for poor performance, 3 stands for average performance, 4 stands for increased performance, and 5 for very high performance.

The idea of this fuzzy model is to calculate the final inter-view score by CAR type responses provided by each candidate, as detached from their behavioral answers (storytelling approach). A simplified procedure is conducted for granting final interview score by establishing decision rules based on the interdependence of these CAR type responses rather than calculating the average of the 16/20 criteria scores. This research aims is to verify whether this new fuzzy model for calculating the final interview scores represents a valid procedure reported to post-employment job performance.

Fuzzy Logic Controllers (FLC) realizes the fuzzy reasoning, which derives from the control theory, based on open-loop controlled process mathematical models. The FLC has been effectively applied in most of the practical problems. We have used the fuzzy controller Sugeno with singletons (crisp values) instead of fuzzy sets for the output variable.

Our fuzzy controller for scoring interview responses consists of three inputs (CAR):

- Challenge, with two linguistic labels: Bad and Good;
- Action, with three linguistic labels: Bad, Medium and Good;
- Result, with three linguistic labels: Bad, Medium and Good;

and one output with 18 singletons. The values chosen for the singletons are linearly distributed between 1 and 5, but this even distribution may be subsequently optimized.

Starting form this simple structure of assigning scores we can design 3 x 3 x 2 = 18 control rules that will create the de-sired input-output function (a control surface).

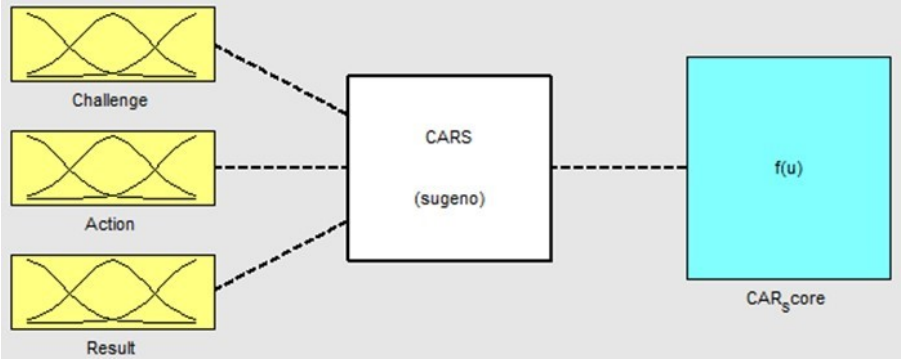

Figure 1. The main window of the CARS application

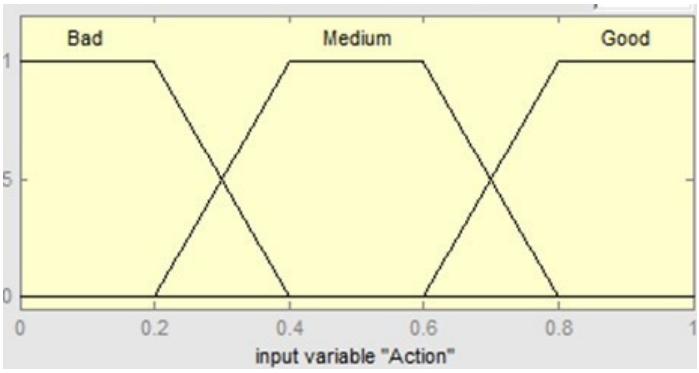

Figure 2. Action input variable with three fuzzy labels (Bad, Medium, Good)

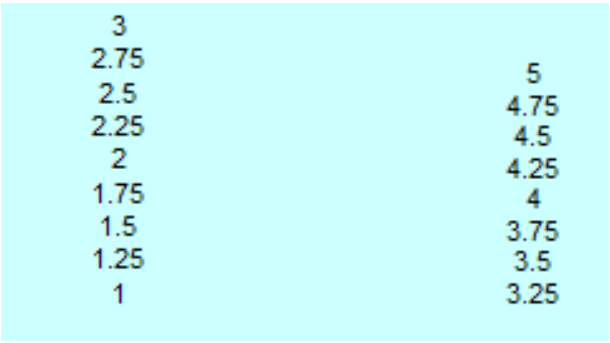

Figure 3. The output variable CAR Score with 18 singletons

1. If (Challenge is Bad) and (Action is Bad) and (Result is Bad) then (CAR_Score is 1) (1)
2. If (Challenge is Good) and (Action is Bad) and (Result is Bad) then (CAR_Score is 1) (1)
3. If (Challenge is Bad) and (Action is Bad) and (Result is Medium) then (CAR_Score is 1.25) (1)
4. If (Challenge is Bad) and (Action is Bad) and (Result is Good) then (CAR_Score is 1.5) (1)
5. If (Challenge is Good) and (Action is Bad) and (Result is Medium) then (CAR_Score is 1.75) (1)
6. If (Challenge is Good) and (Action is Bad) and (Result is Good) then (CAR_Score is 2) (1)
7. If (Challenge is Bad) and (Action is Medium) and (Result is Bad) then (CAR_Score is 2.25) (1)
8. If (Challenge is Bad) and (Action is Medium) and (Result is Medium) then (CAR_Score is 2.5) (1)
9. If (Challenge is Bad) and (Action is Medium) and (Result is Good) then (CAR_Score is 2.75) (1)
10. If (Challenge is Good) and (Action is Medium) and (Result is Bad) then (CAR_Score is 3) (1)
11. If (Challenge is Good) and (Action is Medium) and (Result is Medium) then (CAR_Score is 3.25) (1)
12. If (Challenge is Good) and (Action is Medium) and (Result is Good) then (CAR_Score is 3.5) (1)
13. If (Challenge is Bad) and (Action is Good) and (Result is Bad) then (CAR_Score is 3.75) (1)
14. If (Challenge is Bad) and (Action is Good) and (Result is Medium) then (CAR_Score is 4) (1)
15. If (Challenge is Bad) and (Action is Good) and (Result is Good) then (CAR_Score is 4.25) (1)
16. If (Challenge is Good) and (Action is Good) and (Result is Bad) then (CAR_Score is 4.5) (1)
17. If (Challenge is Good) and (Action is Good) and (Result is Medium) then (CAR_Score is 4.75) (1)
18. If (Challenge is Good) and (Action is Good) and (Result is Good) then (CAR_Score is 5) (1)

Figure 4. The rule base

3. Results and discussion

In order to test whether this novel system performs more efficient, the Fuzzy Inference System (FIS) interface in Matlab is used as implementation software environment. FIS offers two visual tools to facilitate the results analysis, In Figure 5 is depicted the View Surface panel and in Figure 6 is depicted the View Rules panel.

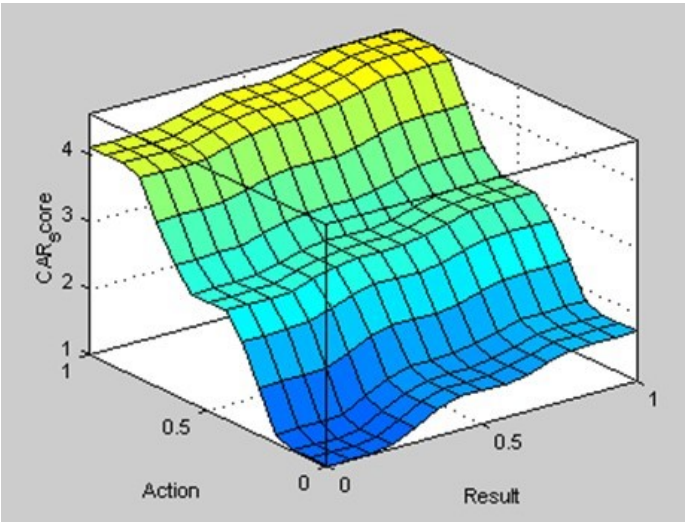

Figure 5. A CAR Score control surface (for Challenge = 0.5)

Control surfaces are loci of the outputs variables when the input data can be represented by all values.

In Figure 4, the areas colored in blue depict candidate's lower scores and yellow colored areas are associated with high scores.

Figure 5 illustrates the dynamic representation of the rule base.

Figure 6 showed that the activation thresholds of each linguistic term and of each rule can be tracked, including the final outcome (3.76 in this case). The key benefit of this form of fuzzy expert models is the complete clarity which can be conveniently clarified by the inferential rules. It creates prerequisites for more changes and modifications which are highly effective.

Figure 6. The dynamic representation of the rule base

To test the robustness of the fuzzy algorithm for calculating the final interview score, the Pearson correlation coefficients between classic interview score (mean M=2.941, standard deviation SD=0.778), fuzzy CAR score (M=2.99; SD=0.779) and subsequent job performance (M=3.020, SD=0.786) are to be calculated. To establish if the correlation coefficient is significantly different from zero, the t-test is used. Thus, there is verification of an association between the two variables.

4. Conclusions

The results demonstrated that there is a very significant association between the classic interview score and work performance ($r=0.894$ to $p<0.01$), thus demonstrating construct validity. Here the construct refers to specific professional competencies needed to effectively perform job related tasks, that have been investigated and tested in both interview and performance assessment. Furthermore, there is also a significant correlation coefficient of $r=0.925$ at a $p<0.01$, between the fuzzy CAR score and job performance, thus the validity and the optimization of the procedure are fully proven.

From the above results it is resulting that this CAR fuzzy algorithm represents an innovative and highly practical method of scoring behavioral

interviews, based on storytelling CAR approach. It can be applied very easy for immediately implementation by human resources specialists.

In this analysis a CAR fuzzy model for employee evaluation behavioral interview was delineated and introduced with an illustration. A simple alternative to the conventional approach of rating behavioral interviews may be the proposed method. Using current evidence, the suggested program was tested. This is suggested that the procedure proposed to verify workforce selection using behavioral interviewing based on storytelling methodology was used to produce optimum outcomes. The proposed employee selection framework has the following advantages:

- Decision makers should split down the question of compound job selection into a clear, more rational evaluation of the variables. The fuzzy system is based on CAR type responses, which commonly occur in any candidate's job interview narrative story.

- During the workforce selection process, the model will reduce both time and costs.

- In a future investigation, it will be interesting to test the influence of different membership functions on the overall results.

References

Cortina, J. M., Goldstein, N. B., Payne, S. C., Davison, H. K. & Gilliland, S. W. (2000). The incremental validity of interview scores over and above g and conscientiousness scores. *Personnel Psychology*, *53*, 325−351. http://dx.doi.org/10.1111/j.1744-6570.2000.tb00204.x

Day, A. L. & Carroll, S. A. (2003). Situational and patterned behavior description interviews: A comparison of their validity, correlates, and perceived fairness. *Human Performance*, *16*, 25−47. http://dx.doi.org/10.1207/S15327043HUP1601_2

Gibb, J. L. & Taylor, P. J. (2003). Past experience versus situational employment: Interview questions in a New Zealand social service agency. *Asia Pacific Journal of Human Resources*, *41*, 371−383. https://doi.org/10.1177/1038411103041003008

Hausknecht, J. P., Day, D. V. & Thomas, S. C. (2004). Applicant reactions to selection procedures: An updated model and meta-analysis. *Personnel Psychology*, *57*, 639-683. https://doi.org/10.1111/j.1744-6570.2004.00003.x

Honer, J., Wright, C. W. & Sablynski, C. J. (2007). Puzzle interviews: What are they and what do they measure? *Applied H.R.M. Research*, *11*, 79−96.

Huffcutt, A. I., Conway, J. M., Roth, P. L. & Stone, N. J. (2001). Identification and meta-analytic assessment of psychological constructs measured in

employment interviews. *Journal of Applied Psychology*, *86*, 897−913. http://dx.doi.org/10.1037//0021-9010.86.5.897

Jansen, A., Melchers, K. G., Lievens, F., Kleinmann, M., Brändli, M., Fraefel, L. & König, C. J. (2013). Situation assessment as an ignored factor in the behavioral consistency paradigm underlying the validity of personnel selection procedures. *Journal of Applied Psychology*, *98*(2), 326-341. http://dx.doi.org/10.1037/a0031257

Klehe, U. & Latham, G. (2005). The predictive and incremental validity of the situational and patterned behavior description interviews for team playing behavior. *International Journal of Selection and Assessment*, *13*, 108−115. http://dx.doi.org/10.1111/j.0965-075X.2005.00305.x

Klehe, U. & Latham, G. (2006). What would you do – really or ideally? Constructs underlying the behavior description interview and the situational interview in predicting typical versus maximum performance. *Human Performance*, *19*, 357−382. https://doi.org/10.1207/s15327043hup1904_3

Lievens, F., De Corte, W. & Brysse, K. (2003). Applicant perceptions of selection procedures: The role of selection information, belief in tests, and comparative anxiety. *International Journal of Selection and Assessment*, *11*, 67−77. http://dx.doi.org/10.1111/1468-2389.00227

Lievens, F., Highhouse, S. & De Corte, W. (2005). The importance of traits and abilities in supervisors' hirability decisions as a function of method of assessment. *Journal of Occupational and Organizational Psychology*, *78*, 453−470. http://dx.doi.org/10.1348/096317905X26093

Ryan, A. M., McFarland, L. Baron, H. & Page, R. (1999). An international look at selection practices: Nation and culture as explanations for variability in practice. *Personnel Psychology*, *52*, 359-391. https://doi.org/10.1111/j.1744-6570.1999.tb00165.x

Taylor, P. J. & Small, B. (2012). Asking applicants what they would do versus what they did do: A meta-analytic comparison of situational and past behavior employment interview questions. *Journal of Occupational and Organizational Psychology*, *75*, 277−294. http://dx.doi.org/10.1348/096317902320369712

Topor, D. J., Colarelli, S. M. & Han, K. (2007). Influences of traits and assessment methods on human resource practitioners' evaluations of job applicants. *Journal of Business and Psychology*, *21*, 361−376. http://dx.doi.org/10.1007/s10869-006-9033-6

Wilk, S. L. & Cappelli, P. (2003). Understanding the determinants of employer use of selection methods. *Personnel Psychology*, *56*, 103-124. https://doi.org/10.1111/j.1744-6570.2003.tb00145.x