

Predicting Selling Behaviour Profiling Using Soft Computing Agents

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ABSTRACT: Salesperson recruitment is a critical task for most organizations. Existing approaches for salesperson recruitment primarily rely on interviews. Some organizations also include personality testing based on psychometric techniques. The high turnover of salesperson in the industry suggests limited success of these procedures. Additionally, existing approaches lack benchmarking methods and do not adapt well to cultural changes across different industries and countries. In this paper we describe an Adaptive Salesperson Recruitment System (ASRS) based on intelligent soft computing agents for predicting selling behaviour category. The ASRS has the ability to benchmark as well as learn selling behaviour patterns in different types of industries and countries.

Keywords : recruitment, behaviour profiling, salesperson, intelligence, soft computing, fuzzy-k-means

1. INTRODUCTION

Recruiting the right person is critical to the organization's success. Organizations enter the employment market place to look for qualified salespersons that suit their needs. On the other hand, salespersons as candidates look for jobs that meet their expectations. According to the Bureau of Labour Statistics in the United States, there were 13,900,000 individuals employed in sales and marketing jobs in 1997 and by 2005, this is projected to increase by eighteen percent (Vinchur, Schippmann, Switzer III, & Roth, 1998). Statistics show improper recruitment of salespersons leads to job dissatisfaction, substandard performance and high turnover. Therefore, some organizations consider themselves fortunate if they retain fifty percent new salespersons for two to three years (Futrell & Parasuraman, 1984). On the other hand, improper recruitment techniques can exceed \$100,000 per salesperson (Churchill, Ford, & Walker, 1997) as expenses for recruitment, training, lost sales and managerial time devotion. Therefore, sales managers have the ultimate responsibility for effective recruitment of their staff. Good salespersons obviously represent an important opportunity to gain a competitive advantage. An important aspect of salesperson recruitment is to determine the selling behaviour of the salesperson in a salesperson-customer interaction situation. Thus, the selling behaviour is primarily influenced by the selling behaviour category of the salesperson (which is also the focus of this paper).

Most existing approaches of salesperson's recruitment rely on interviewing processes. Selling behaviour, product knowledge, ability and attitudes of the sales candidate are tested by the management in a face-to-face interview. The interview process has some limitations due to the time constraints and subjectivity (e.g.: mood of the interviewer) for selecting the candidates. Some organizations use psychometric techniques (Murphy & De Shon, 2000) for evaluating behaviour profiling and behaviour categorization of a sales candidate. The limitations in psychometric techniques primarily relate to the indirect nature of questions and their lack of understanding by the candidate.

Further, these interview processes and psychometric techniques largely do not employ benchmarking methods. That is, 'what is the definition of a good salesperson for a particular organization?' Similarly, most of the selection tests and techniques prepared for the recruitment are applied in western countries, but, it cannot be predicted if similar behaviour profiling would be applicable in other non-western countries. However, research shows that cultural differences of power distance and individualism vary in different countries (Hofstede, 1983) and it affects selling attitudes and selling performance of the salesperson. In other words, a salesperson's behaviour in different countries and industries may vary based on their cultural understanding. Thus, the selling behavioural categorization needs to be learnt and adapted to these cultural changes.

In this paper we describe ASRS, which is based on integration of selling a behaviour model of psychology literature and an intelligent soft computing fuzzy-k-means technique. ASRS predicts the selling behaviour category of a sales candidate and also benchmarks the candidate profile against an existing best salesperson selling behaviour profile in an organization.

The paper is organized as follows. Section two describes the existing methods and the cultural relativity of management in salesperson recruitment. Section three outlines the selling behaviour model. Section four outlines the fuzzy-k-means soft computing technique to introduce the granularity

in the behaviour category. Section five analyses the selling behaviour profile of the sales candidate and section six describes the adaptive soft computing agent model for predicting selling behaviour profiling. Section seven outlines implementation results. Section eight concludes the paper.

2. Background

2.1 Existing Methods

Statistics show the most widely used tool for selecting a candidate is the interviewing process (Kristof-Brown, Barrick, & Franke, 2002). Eighty five to ninety percent of organizations (Bell, 1992) rely on this mode as their main strategy of recruitment. It is a complex social interaction between candidate and interviewer (Fox & Spector, 2000). Unfortunately, the interview process is unreliable and has many limitations. Social psychology research shows that attitudes similarity may lead to interpersonal attraction (Fox & Spector, 2000). Keenan (1977) shows interviewers prefer candidates whom they like personally and perceive to be similar to them. Another study found that there is a significant effect on performance rating and biasing for interviewer behaviour (Cardy & Dobbins, 1986). Arvey & Campion (1982) point out non-verbal communication such as eye contact, head moving, posture, smiling and speech fluency, body orientation and voice modulation influence rating of candidates in the interview. Further, the interview is primarily based on information provided in the resume of the candidate. It does not include information, for example, about the selling behaviour capabilities of the candidate. Also, the success of this approach is limited by subjectively and mood of the interviewer and time constraints in which the decision is made. The time constraint of an interview does not facilitate complete evaluation of the sales candidate.

Meantime, some organizations employ psychometric techniques and they are used to aid the interview process. Psychometric techniques are more useful in recruiting when very little is known about a candidate. Aptitude tests or cognitive tests or intelligence tests and personality tests are commonly used in selecting the candidates. These techniques have some limitations (Hoyt, 2000) also. The techniques do not yield an absolute score. The performances on these tests are typically relative

(Murphy & De Shon, 2000; Sunderland, 2001) and scores have significance according to some reference. Further, indirect questions are used in psychometric techniques for evaluation. These questions are not well understood by the candidates and are not popular with them.

2.2 The Cultural Relativity Of Management

The definition of culture is broad. Hofstede (2001) states, that the culture is a collective mental program. It is a framework for understanding differences among cultural groups in organizations and societies. Hofstede's (1983) research titled 'Differences in people's work related values among 50 countries' describes the behavioural profile of the individuals in 'individualisms' vs 'power distance'. He found that high power distance coexists with low individualism and low power distance coexists with high individualism. Therefore, based on his research we identify the performance of salespersons having low power distance/high individualisms show a higher need for autonomy, and high power distance/low individualisms need more supervision. In the next section we describe selling behaviour model used in designing ASRS.

3. SELLING BEHAVIOURAL MODEL

This model has been used based upon interactions with senior managers in the sales and human resources arena in the consumer and manufacturing industries in Australia. In this scenario one way of determining behaviour¹ knowledge qualitatively is to observe the sales managers (chosen as domain experts) at work and discuss in detail with them how they identify the varying personal needs of the salespersons and customers and deal effectively with them. In other words, this would involve grouping similarities in selling behaviours of salespersons into different categories.

Much work has been done in modelling salespersons and customer behaviours (Sujan, Sujan, & Bettman, 1989; Szymanski, 1988; Weitz, Sujan, & Sujan, 1986). The behavioural model developed by Buzzotte, Lefton & Sherberg (1981) has been used for building predicting selling behaviour profiling.

¹ The word behavior is implied to mean selling and/or buying behavior as is applicable and is in context of inter-personal behavior

Another similar study done by Anderson (1991, p33) developed a social style matrix frame (Rich & Smith, 2000) for combining the assertiveness and responsiveness scales to establish four distinct classifications of social style. However, the behavioural model (Khosla & Dillon, 1993) used here has two dimensions namely, 'Warm -Hostile and Submissive-Dominant'.

Warmth is regard for others. A warm person is optimistic and willing to place confidence in others. Hostility is lack of regard for others, the attitude that other people matter less than oneself. A hostile person rarely trusts others. Submission is the disposition to let others take the lead in personal encounters. It includes traits like dependence, unassertiveness, and passiveness. Dominance is the drive to take control in face-to-face situations. It includes a cluster of traits like initiative, forcefulness, and independence. The two dimensions Submissive-Dominant and Warm-Hostile give rise to four broad groups of salespersons and customers, i.e., Dominant-Hostile (DH), Submissive-Hostile (SH), Submissive-Warm (SW), and Dominant-Warm (DW). Some of the typical salesperson and customer characteristics that emerge from this behavioural model are shown in Figure 1.

The four categories shown in figure 1 are extreme caricatures. Since most salespersons in practice will not belong totally to any one category, fuzzy granulation has been introduced. That is, we have extended the modelling in figure 1 by introducing fuzzy categories like ‘High, Med, and Low’ in each category as shown in figure 2. The linguistic variables High, Med, Low also represent selling behaviour intensity in a particular category.

4. FUZZY-K-MEANS BEHAVIOURAL CLUSTERING TECHNIQUES

Lofti A Zedeh (Mamdani, Sichanie, & Pitt, 2000) defined the term ‘Soft Computing’ to describe collection of methodologies. The principle aim of soft computing is to exploit the tolerance for imprecision, uncertainty and noise in data to achieve traceability, robustness and low solution cost (Mamdani, Sichanie, & Pitt, 2000). Soft computing allows decision-making in environments, which involve incomplete, uncertain and vague information and ambiguities. Fuzzy-k-means is an iterative soft computing technique that aims to separate N objects into K clusters i.e., minimizing the intra-group dispersion of points. It was initially introduced by Bezdek (1992). That is, the four categories SH, SW, DH, and DW are refined using linguistic variables like high, medium and low. So, we have twelve clusters (SH (high, medium and low), SW (high, medium and low), and three each for the other two categories) as shown in figure 2 instead of the original four as shown in figure 1. Qualitatively, the linguistic variables provide information on the intensity (or extent (or degree of membership) to which a candidate’s behaviour belongs to a fuzzy category within each category). More detail on the algorithm can be found in Bezdek (1992).

5. ANALYSIS OF THE SELLING BEHAVIOUR PROFILE

In order to analyse the selling behaviour based on the model shown in figure 2, 17 areas (*selling as a profession, assertiveness, decisiveness, prospecting, product, customers, competition, success and failure, boss, peers, rules and regulations, expenses and reports, training, job satisfaction, view about people, relationship with non-selling departments, general attitudes*) have been identified for evaluation of a sales candidate. At least four questions related to each area (a total of 76 questions) have been designed.

A sample set of four questions related to the area of competition shown in figure 3. Each question relates to one of the four behavioural categories. A total of 76 questions have been designed. In order to quantify the varying degree of importance attached to the different areas of selling and buying behaviour by the domain experts (eg: Sales Managers), weights have been assigned to them on a scale of 1 to 10.

1. In sales, the law of the jungle prevails. It's either you or the competitor. You relish defeating your competitors, and fight them hard, using every available weapon.	Behavioural Category: DH
2. The best chance to outwork and outsell competitors is by keeping abreast of competitive activity and having sound product knowledge of your product.	Behavioural Category: DW
3. You may not be aggressive otherwise, but when it comes to competition you are just the opposite. You spend a good deal of your time explaining to the customer why he should not buy from the competitor.	Behavioural Category: SH
4. You do not believe in being aggressive towards your competitors. Competitors are people like you and there is room for everybody.	Behavioural Category: SW

Figure 3: Questions Related to The Competition Area

After determining the different areas and their weights, attributes related to each of these areas with respect to different behavioural categories have been determined. A typical selling behaviour categorization heuristic used to determine the selling behavioural categorization is shown in Figure 4.

5. ADAPTIVE SOFT COMPUTING AGENT MODEL FOR PREDICTING SELLING BEHAVIOUR PROFILING

This section describes the modelling of an alternative adaptive soft computing agent model used for prediction of the selling behaviour category of a sales candidate. Figure 5 shows e-sales recruitment

model and its components. The selling behaviour agent has been further decomposed into an ES (expert system) profiling control agent and clustering control agent. In this section, we describe aspects related to fuzzy-k-means behaviour predicting agent. Fuzzy-k-means clustering technique for predicting the selling behaviour category of a sales candidate is used for clustering and predicting.

The predictive model is based on the need to develop an incremental learning model of selling behaviour categorization and as an alternative to the expert system model. Table 1 shows some of the selling behaviour patterns used as training data set for developing fuzzy-k-means clustering and prediction models. This training data set shows pruned scores (ie. raw scores minus contradictory answers) in four selling behaviour categories.

The pruned score have been derived from heuristics used by an expert system model developed earlier (Khosla & Dillon, 1993).

Table 2 shows the categories predicted by the fuzzy-k-means model on unseen selling behavioural patterns.

PN	CAT	SH(High)	SW (High)	SH (Med)	SH(Low)	DH(High)	SW(Low)	DH (Med)	SW (Med)	DH(Low)
35	SH(Med)	0.00233	0.00003	0.57807	0.00008	0.00002	0.00005	0.39250	0.00029	0.02663
36	SH(Med)	0.00022	0.00000	0.98138	0.00000	0.00000	0.00000	0.01772	0.00001	0.00067
37	DH (Low)	0.00046	0.00005	0.00940	0.00006	0.0054	0.00039	0.23939	0.00029	0.74450
38	SW (Low)	0.00001	0.02870	0.00005	0.02692	0.0000	0.00212	0.0002	0.94189	0.00003
39	DH (Low)	0.00007	0.00001	0.00056	0.00001	0.0024	0.00005	0.00403	0.00006	0.99278
40	SH(Low)	0.00000	0.01246	0.00000	0.98366	0.00000	0.00003	0.00001	0.00384	0.00000
41	DH(High)	0.00002	0.00003	0.00009	0.00002	0.9980	0.00026	0.00041	0.00008	0.00104
42	SH(Med)	0.00033	0.00000	0.99874	0.00000	0.0000	0.00000	0.00087	0.00000	0.00005
43	SH (Med)	0.00352	0.00000	0.99435	0.00001	0.0000	0.00001	0.00192	0.00002	0.00017
44	SH(Low)	0.00000	0.00049	0.00001	0.99870	0.0000	0.00001	0.00001	0.00078	0.00000
45	DH(Med)	0.00301	0.00010	0.17098	0.00030	0.0000	0.00020	0.71591	0.00105	0.10838
46	SH(High)	0.99753	0.00000	0.00241	0.00000	0.0000	0.00000	0.00003	0.00000	0.00003
47	SH(Med)	0.00145	0.00001	0.94115	0.00002	0.0000	0.00002	0.05418	0.00006	0.00311
48	SH(Low)	0.00000	0.01621	0.00001	0.90083	0.0000	0.00017	0.00004	0.08272	0.00001
49	SH (Low)	0.00000	0.02146	0.00001	0.97030	0.0000	0.00010	0.00002	0.00811	0.00000
50	SH(Med)	0.04955	0.00002	0.92734	0.00006	0.0000	0.00004	0.01210	0.00010	0.01074

Table 2: Predicted Selling Behaviour Categories for Candidates 35 to 50 Using fuzzy-k-means Clustering

The prediction is based on fuzzy categories related to SH, SW and DH categories only. Thus, only fuzzy categories are shown. For example, unseen Pattern Number (PN) 35 in table 2 shows that candidate has 57.8% membership in the Submissive-Hostile (SH(Med)) and 39.5% membership in Dominant-Hostile (DH(Med)) fuzzy category.

7. RESULTS

Figures 6 and 7 show the results of interpretation of the sales candidate behaviour category and benchmarking tasks.

The pie chart represents the overall distribution of four category scores. That is, the upper right hand corner of figure 6 shows the area wise breakup of a candidate's selling behaviour as related to the Dominant Hostile (DH) category with medium intensity. Figure 7 shows a comparison of the candidate's profile (one with a low dominant hostile score) with the benchmark profile (one with a

high dominant hostile score) of a particular organization. The HR and sales managers are particularly interested in the orientation of the two profiles. They are less interested in the magnitude of difference between the two profiles (which if required can be deciphered from the Y coordinate dimension of the comparison of the profile graph).

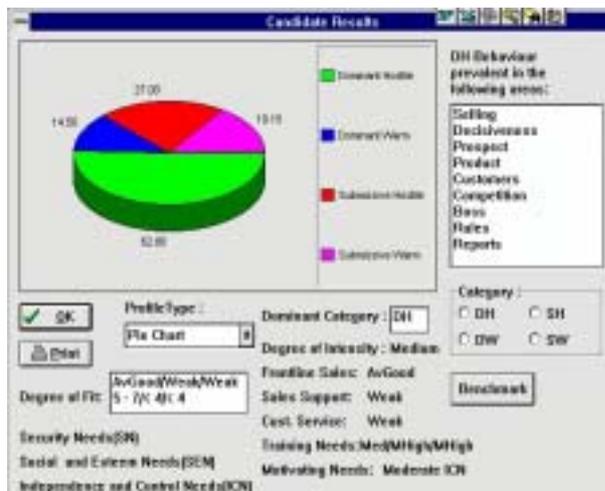


Figure 6: Candidate Result Screen (courtesy of Intelligent Software Systems, Melbourne, Australia)

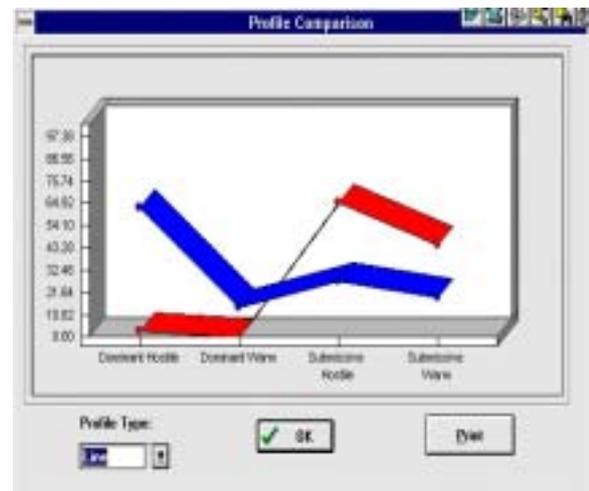


Figure 7: Benchmarking of a Candidate's Behaviour Profile (courtesy of Intelligent Software Systems, Melbourne, Australia)

8. CONCLUSION

In this paper we have described an Adaptive Sales Recruitment System (ASRS) for predicting selling behaviour categories of salesperson used on previously learnt behavioural patterns-ASRS candidates used for benchmarking of salespersons. Further, we describe ASRS, which is based on integration of a selling behaviour model from psychology literature and an intelligent soft computing fuzzy-k-means technique.

We have outlined in the paper an intelligent soft computing model for selling behaviour categorization and benchmarking of a sales candidate. It may be noted that benchmarking is primarily facilitated by a computerized behaviour profiling system. Benchmarking is difficult to achieve in the interview process. Predicting selling behaviour profiling has been exhaustively field tested on more than 500

sales candidates with 85% accuracy. An earlier version (only expert system) of the system is has been used in industry for the last 5 years.

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