

Recruitment Filtering With Personality-Job Fit Model

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Abstract

Many job applications on the web [3-4, 7-8, 10, 12] provide only simple boolean comparing using only basic requirement information (i.e., degree, age) for searching and matching jobs to candidates. The net effect: too many 'hits'.

[13] showed that personality is an important factor for hiring process and satisfaction of employers and employees. In designing better filters for searching and matching a job application on the web, we considered this factor with general job requirement and then combined it to our matching process. We have tested our model by using data obtained from applicants who applied for jobs with a company in Thailand. The results show that we are able to give a better match than achieved using basic qualifications only.

1. Introduction

World Wide Web (WWW) has been essential and been used in every aspect of society and economy such as advertising, production, shipping, planning, billing, accounting, and looking for employment. For employment, the Internet has allowed both employers and employees unlimited both to acquire and access to jobs and opportunities.

1.1 Problem Definition

Job search web site is a good media to be a large career center to search jobs or workers but it is

not the best one in particular in the results' searching. Since, employment information from anywhere can be put into it, there will be problems such as results flooding and reliability.

The number of job listings on the Internet is increasing dramatically. Today, many newspapers include their employment classified ads online, and employers of all types are posting current vacant positions on their company web sites. Many of these sites provide search engines to help to narrow selections.

However, many existing Job search web sites on the Internet are not the best tools to help recruitment to find the satisfied results yet. Since the majority of them support users to find the results by using the Boolean Logic for the searching and matching function that queries from the various criteria - such as any keyword(s), job area, year experience(s), and education level. The results are then shown as a list that will be sorted by date or alphabetically. The problem with these results is that users always get too many listed outputs then they have to view all, and waste a lot of time in finding the best fit for them. How can we help to find better match results and what the criteria should be used?

1.2 What Factors Can Help to Refine the Results?

Normally, there are many factors that have been used to be the general criteria on job matching (such as education, experience, etc.) which are

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basically the general requirements. Thus, the given results from general matching are general too. But there are still many important factors that should be the criteria in order to get the better matched results, for example, personality characteristics, various skills (computer skills), and hobbies.

Research, [13], showed that personality is an important factor for hiring process and satisfaction of employers and employees. Thus, it should be considered in employment process. Employers then get the employees who match not only the basic requirements but also have a suitable personality for the job. Obviously, if both sides are satisfied with the jobs, it will inevitably show up as increased productivity while reducing employee relationships problems, employee turnover, stress, tension, conflicts and overall human resources expenses, and higher profit for employers.

1.3 Proposed Solution

This project aims to suggest the knowledge of the weighting principal on the results with the two main component functions, in the part of the searching and matching function, for the Job Search application on the web by mix the personality character to be the special criteria with the general criteria in order to get the job fit from personal details. We will model a prototype that will include the personality in a job search model. In particular, we will use personality assessments to be added with the general criteria that should become more and more important to employers who wish to put the right people into the right jobs. Employers can select employees based on their individual needs, and job seekers can also be selected based on their personality that is matched with employers' individual needs.

The results will be shown in a different style to the other existing job search web sites which have got too many results. Our results are derived from both querying composed of personality

characteristics and general requirements criteria and will display the weighted results as a percentage sorted in descending order. So the most matched result will be a percentage at the top of the list and the rest follow. Therefore, we believe that making use of this idea will help users to get a better matched result and then it will be more convenient for the users to view. It will be easy for the user to find the most suitable and also they can save time from the weighted results.

However, using the job search on the web is one resource supplementary channel to help employers to get only the filter results level but it cannot substitute all recruitment processes. Usually, employers' final selection and decision is based on the result of an interview. The interview can help employers to verify qualifications and to evaluate how the person will "fit" into the organization. Our project, therefore, will aim to help screening the pool of applicants to find those who are qualified to be interviewed but not to replace the whole process.

2. Background

The Internet opens up a whole new world of opportunities in particular in the job market. An Internet job search is a channel in which anyone uses the Internet as one of many sources of employment information. It does not replace traditional job search strategies, only enhances them. [11]

So, there is no doubt that the Internet has caused a fundamental change in the employment process. The Internet is a great source of information on the job market or is a virtual gold mine of employment resources that will only get better in the future.

2.1 Existing Job Search Tools on the Web

From many reviews on popular Job search web sites in the cyberspace such as jobsdb.com [8], myjobsearch.com [3], jobpilot.co.th [7], fedworld.gov [12], telecomcareers.net [4], and jobsearch.monster.com [10]. We found that these

web sites have at least eight main functions in common, including:

- *Registration*: Register the user by inputting details of either job seekers or company profile.
- *Login*: This function is used to verify members only.
- *Resume/Profile*: Members have to enter their personal data in the prepared form. Also, they can edit their profiles anytime they want.
- *Personal Job List*: User member can view the history data from this function. For job seekers, this function keeps the data from past job applications.
- *Job Post*: Employer members can post their job openings and their requirements in the prepared form.
- *Jobs/Candidates Match*: It is available to a member who has already registered. The system only sends the latest and most updated matching information to the members automatically via e-mail.
- *Jobs/Candidates Search*: It is available immediately for members who want to search for any jobs or employees. They have to choose a keyword from the list then the system will search the corresponding criteria from the database server.
- *Quick Search*: It is available immediately for anyone who interest to find any jobs or employees. Users choose a keyword from the list then the system searches the corresponding criteria from the database server.

Also, we found that their searching is based on the principles of Boolean logic. In other words, they only allow users to formulate a more precise query by using the logical relationship (such as and, or, not) among search terms.

2.2 What Factors are Used on a Hiring Decision?

Traditionally, the acronym KSA or KSAO has been taken as the shorthand for attributes of the individual related to job performance. Originally, the acronym that appeared was KSA - meaning

Knowledge, Skills, and Aptitudes. Over the years, and depending on the source, the acronym has evolved to take on different meanings. The "K" and "S" always stood for Knowledge and Skills. The "A" and "O" components have varied. "A" has stood for abilities (which are synonymous with skills), attributes, or aptitudes. "O" usually represents "other characteristics" and usually appears when "A" represents ability. [10]

All above factors, KSAO, are related to job performance and also can determine workers' happiness and success in a job. Furthermore, reference site [11], it shows that people advance farther in their career, are far more productive, and enjoy lives more fully when they are working in a job and environment that supports their personality and values.

2.3 Job Performance on Personality

Prior to the late 1980's, it was generally assumed that the link between personality and job performance was tenuous at best. Research [10] findings were inconsistent. In the last decade there have been a series of advances which unequivocally demonstrate that personality, as assessed through standardized instruments, has a predictive relationship with job performance approaching, and in some cases exceeding, that of cognitive ability. The greatest single advance in personality research has been the emergence and broad acceptance of the Five Factor model of personality, commonly referred to as the "Big Five" [12].(see Table 1)

The Big Five are bipolar dimensions of personality that have been found to form the taxonomic (and factorial) core of personality models and also capture lay-persons' descriptions of personality.

Table 1 The Big Five Taxonomy of Personality

Big Five Factor	Alternate Name	Sample Associated Trait Description - Positive Pole	Sample Associated Trait Description - Negative Pole
<i>Extroversion</i> ¹	Surgency, Assertiveness	Sociable, Gregarious, Assertive, Talkative, Active, Ambitious, Expressive, Enthusiastic, Outgoing	Quit, Reserved, Shy, Retiring, Taciturn, Inhibited
<i>Conscientiousness</i>	Conformity, Dependability	Careful, Thorough, Responsible, Planful, Persevering, Diligent, Achievement Oriented, Efficient, Self-discipline,	Inconsistent, Impulsive, Undisciplined, Unreliable
<i>Emotional Stability</i>	Neuroticism ²	Calm, Relaxed, Self-Confident, Steady, Easy-going	Anxious, Depressed, Worried, Insecure, Vulnerable, Tense, Angry, High-strung
<i>Agreeableness</i>	Likeability, Friendliness	Courteous, Flexible, Cooperative, Tolerant, Caring, Trusting, Kind, Supportive, Altruistic, Sympathetic, Modest	Self-Centered, Self-Aggrandizing, Spiteful, Hostile, Indifferent, Coarse, Cold, Mean-spirited
<i>Openness to Experience</i>	Culture, Intellectance, Inquiring Intellect	Imaginative, Creative, Curious, Cultured, Sharp-witted, Broad-minded, Inventive, Insightful, Complex	Simple, Concrete, Narrow, Imitative, Unimaginative

1 The extroversion-intraversion poles of the Big Five are similar to Myers Briggs'.

2 Neuroticism has a negative connotation and is the original term used in the Big Five - the scales can be interpreted by either their positive or negative values.

Usually when talking about someone's personality, we are talking about what makes that person different from other people, perhaps even unique. This aspect of personality is called individual differences. From [1], it is the central issue. These theories often spend considerable attention on things like types and traits and tests with which can

categorize or compare people: Some people are neurotic, others are not; some people are more introverted, others more extroverted; and so on.

However, personality theorists are just as interested in the *commonalities* among people. What, for example, do a neurotic person and a healthy person have in common? Or what is the common structure in people that expresses themselves as introversion in some and extroversion in others?

The predictive utility of personality assessment is enhanced when job type and personality constructs are matched. This is to say, different jobs demand different personality profiles.

3. The New System Requirements

This project proposes a prototype that works as a job search engine on the web. We outline a clear purpose and requirements of the model with the improvement goals for a new system. It provides two possible solutions to the problems addressed above, which are:

- Prioritizing the results format by sorting them as a percentage in descending order derived mainly from considering users' requirements and qualifications.
- Adding an importance factor to the common criteria in order to get a better filtering quality.

There are two main reasons for bringing the personality characteristics as criteria besides the basic criteria. The first, the personality characteristics are an important factor usually used to decide in the hiring process. Secondly, the personality factor can help to narrow an applicant pool down to the precisely qualified to improve the filtering results.

Therefore, making use of this concept will probably help users to get a better screen of the searching and matching processes from above technique. It should be more convenient for the users' view and easy to find the most suitable from the percentage sorted list.

4. The New System Design

To generate better filtering for searching or matching results, two more additional functions over the existing work process has been added, *Personality Self-Assessment for Job Seekers* and *Personality-Job Specification for Employers* (see Figure 1). The other functions remain the same.

The project prototype is different from the current system, in particular the results format of the display. Figure 2 shows the flow chart of filtering concept of this project.

These results have to be filtered by two processes. The first, Boolean Logic is still used to query the general criteria, the same as in the current system. Then, the mapping technique is used on the results from the previous process. This last technique will compare the personality characteristics of each result with the specified requirements of searcher then compute them as a percentage. The percentage of each one will be sorted in descending order so that the most suitable results will be a percentage at the top of the list and the rest follow.

4.1 Site Design

Our site was divided into three main parts (see Figure 2 called: *Job Seekers*, *Employers*, and *Quick Search*). Each part is constructed to serve a specific purpose. Job Seekers is created to support job search process for job seekers member only. Quick Search is used for anyone who wants to search candidates and jobs quickly without registering. Employers are created to serve any company member which allows them all the functions for finding candidates.

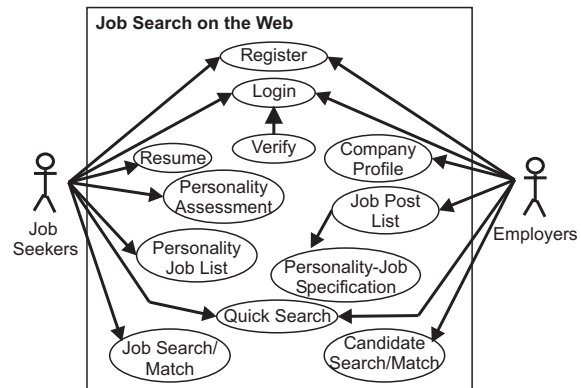


Figure 1 Use Case Diagram of Job Search on the Web of the New System

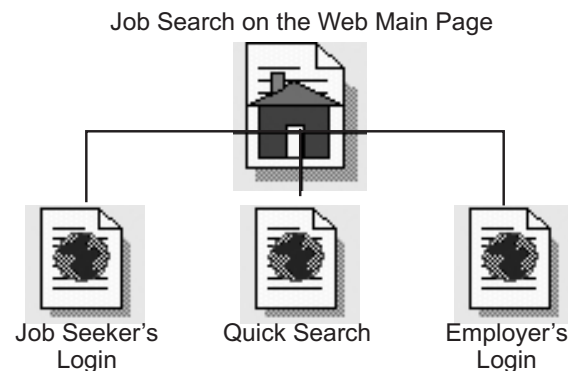


Figure 2 Site-map of Job Search on the Web Main Page

4.1.1 Job Seekers part is provided for job seekers to search any jobs from the job openings which are posted by employers who are the member. There are six functions in this part.

- *Job Seeker Registration*: This function is for a new job seeker who has not registered as a member yet.
- *Job Seeker Login*: It is used to authenticate a job seeker member. Job seekers have to enter their email address and password the same as registered.
- *My Resume*: Job seeker member has to enter their personal information in details in the prepared form.
- *Personality Assessment*: This part is the most important factor of this project. It composes of many questions about personality assessment. Job seekers have to evaluate themselves about their personality characteristics in each question.

- *Personal Job List*: Job seeker members can see the history of jobs which they have already applied for.

- *Jobs Search/Match*: This function is the main core of our model. It provides for job seeker member who want to search any job openings which match their personal data and personality specifics and requirements.

4.1.2 Employers part defines four functions for any employers to post their job openings and to find candidates:

- *Employer Registration*: This function is for new companies who have not registered as a member.

- *Employer Login*: It is a security system for employer members. Employers have to enter the same email address and password as registered.

- *Company Profile*: The employer members have to enter information about their company.

- *Job Post List*: The employer members can post their job openings in the prepared form which has two parts. The first part is the general job opening details such as the job category, title, and other general qualifications. The other part is about the personality related to the job, the employer can specify the personality that they want from the prepared questions on this form.

- *Candidates Search/Match*: This function is the most important for the candidates search process. It is provided for employer members to search for any candidates that match their requirements and personality specifications for each job.

4.1.3 Quick Search part has two main services opening for both member or nonmember seekers and employers.

- *Jobs Search*: It is created for any job seekers to quickly search for jobs without logging in to the system.

- *Candidates Search*: It is built to serve any employers to search any candidates quickly without login.

4.2 Personality Assessment Form Design

The most important factor is personality characteristics which are added to the general criteria.

Generated output is displayed as the percentage and is sorted in a descending order. These results are derived from the data in the prepared form. The method for evaluating "Job Match" is a designed assessment instrument that measures the essential job-related personality characteristics particular to the specific job. "Job Match Patterns" is the personality assessment form. In our system, the Job Match Patterns are composed of three profiles [13]: Thinking Style, Occupational Interests, and Behavioral Traits. Table 2 to Table 4 are the three patterns that are designed for this purpose. These profiles will be inserted in the Personality Self-Assessment function of the Job Seekers area in the web page. The candidates have to specify their personality which they assess themselves from the prepared questions.

Table 2 Profile for Thinking Style

Scale Name (Scale Description)	1	2	3	4	5
1) Learning Index (An index of expected learning, reasoning and problem solving potential.)					
2) Verbal Skill (A measure of verbal skill through vocabulary.)					
3) Verbal Reasoning (Using words as a basis in reasoning and problem solving.)					
4) Attentive (A measure of listening skills and concentration of the mental powers)					
5) Numerical Ability (A measure of numeric calculation ability.)					
6) Numeric Reasoning (Using numbers as a basis in reasoning and problem solving.)					

Note: Scale score numbers 1 to 5 are represented as the score. Score 1 is the lowest value and score 5 is the highest value.

Table 3 Profile for Occupational Interest

Scale Name (Scale Description)	1	2	3	4	5
1) Enterprising (Indicated interest in occupations where they use persuasiveness and enjoy presenting plans.)					
2) Financial/Administrative (Indicated interest in occupations that work with financial data, business systems, administrative procedures, etc.)					
3) People Service (Indicated interest in occupations that help people and they are concerned with the welfare of others.)					
4) Technical (Indicated interest in occupations that center on scientific and technical activities, research and intellectual skills.)					
5) Mechanical (Indicated interest in occupations that work with tools, equipment and machinery.)					
6) Creative (Indicated interest in occupational where they are imaginative, original and aesthetic.)					

These Job Match Patterns are important because they allow employers to specify the personality that match the individual attributes of people with the qualities important to succeed in specific jobs.

The personality assessments form used to improve the screening process which can be embedded in this prototype in order to measure personality characteristics related to the job. Then, when the applicants fill in the prepared form, this form can be used later for assessing their general qualification as well as their personality. Employers have to input their requirements specifying the general requirements and personality that fit the job also.

Table 4 Profile for Personality Traits

Scale Name (Scale Description)	1	2	3	4	5
1) Energy Level (Tendency to display endurance and capacity for a fast pace.)					
2) Assertiveness (Tendency to take charge of people and situations. Leads more than follows.)					
3) Sociability (Tendency to be outgoing, people-oriented and participate with others.)					
4) Manageability (Tendency to follow policies, accept external controls and supervision and work within the rules.)					
5) Attitude (Tendency to have a positive attitude regarding people and outcomes.)					
6) Decisiveness (Uses available information to make decisions quickly.)					
7) Accommodating (Tendency to be friendly, cooperative, agreeable. To be a team person.)					
8) Independence (Tendency to be self-reliant, self-directed, to take independent action and make own decisions.)					
9) Objective Judgement (The ability to think clearly and be objective in decision-making.)					

5. Experiment Results

We have tested the model by using real data to check how satisfied it is. The real data was derived from 300 distributed questionnaires including: 250 job seekers and 50 companies. But we got back only 57 papers from one company including: 52 candidates and 5 job titles.

Figure 3 shows all applicants who have applied for this job. These records were sorted as an ascending order by alphabet names. Note that this list will not help employer to find the best suitable for their job.

Personality JobFit

October 10, 2001 Home Logout

We found 28 applicant(s)

No.	Applicant Name	Sex	Age	Education	Monthly Salary	Year(s) Experience	Job Location
1	JobSeeker76_LSNName76	Female	26	Degree	12000฿	0	Bangkok
2	JobSeeker77_LSNName77	Male	28	Master	15000฿	1	Bangkok
3	JobSeeker78_LSNName78	Male	27	Master	15000฿	3	Bangkok
4	JobSeeker79_LSNName79	Female	33	Degree	15000฿	10	Bangkok
5	JobSeeker80_LSNName80	Female	27	Degree	12000฿	4	Bangkok
6	JobSeeker81_LSNName81	Female	27	Degree	17000฿	0	Bangkok
7	JobSeeker82_LSNName82	Female	27	Degree	12000฿	3	Bangkok
8	JobSeeker83_LSNName83	Female	27	Degree	12000฿	5	Bangkok
9	JobSeeker84_LSNName84	Female	27	Degree	12000฿	5	Bangkok
10	JobSeeker85_LSNName85	Male	27	Degree	17000฿	1	Bangkok
11	JobSeeker86_LSNName86	Female	27	Degree	12000฿	2	Bangkok
12	JobSeeker87_LSNName87	Female	27	Degree	12000฿	4	Bangkok
13	JobSeeker88_LSNName88	Female	27	Degree	12000฿	2	Bangkok
14	JobSeeker89_LSNName89	Female	27	Degree	12000฿	2	Bangkok
15	JobSeeker90_LSNName90	Female	27	Degree	12000฿	2	Bangkok
16	JobSeeker91_LSNName91	Female	27	Degree	12000฿	2	Bangkok
17	JobSeeker92_LSNName92	Female	27	Degree	12000฿	2	Bangkok
18	JobSeeker93_LSNName93	Female	27	Degree	12000฿	2	Bangkok
19	JobSeeker94_LSNName94	Female	27	Degree	12000฿	2	Bangkok
20	JobSeeker95_LSNName95	Female	27	Degree	12000฿	2	Bangkok
21	JobSeeker96_LSNName96	Female	27	Degree	12000฿	2	Bangkok
22	JobSeeker97_LSNName97	Female	27	Degree	12000฿	2	Bangkok
23	JobSeeker98_LSNName98	Female	27	Degree	12000฿	2	Bangkok
24	JobSeeker99_LSNName99	Female	27	Degree	12000฿	2	Bangkok
25	JobSeeker100_LSNName100	Female	27	Degree	12000฿	2	Bangkok

Figure 3 View all applicants sorted by name

Personality JobFit

Monday October 10, 2001 Home Logout About

Matching on Personality Characteristic Specification

Sorting by personality matching

We found 28 applicant(s)

No.	Fit	Applicant Name	Sex	Age	Education	Monthly Salary	Year(s) Experience	Job Location
1	85%	JobSeeker78_LSNName78	Male	27	Master	15000฿	3	Bangkok
2	83%	JobSeeker67_LSNName67	Female	22	Degree	15000฿	1	Bangkok
3	81%	JobSeeker77_LSNName77	Male	28	Master	15000฿	1	Bangkok
4	81%	JobSeeker69_LSNName69	Female	22	Degree	8000฿	0	Bangkok
5	81%	JobSeeker63_LSNName63	Male	23	Degree	8000฿	0	Bangkok
6	80%	JobSeeker83_LSNName83	Female	26	Degree	19000฿	0	Bangkok
7	80%	JobSeeker84_LSNName84	Male	27	Degree	12000฿	0	Bangkok
8	74%	JobSeeker17_LSNName17	Female	27	Degree	25000฿	6	Bangkok
9	74%	JobSeeker18_LSNName18	Female	29	Degree	25000฿	6	Bangkok
10	74%	JobSeeker19_LSNName19	Female	27	Degree	12000฿	4	Bangkok
11	72%	JobSeeker10_LSNName10	Male	35	Degree	45000฿	13	Bangkok
12	72%	JobSeeker98_LSNName98	Female	23	Degree	12000฿	1	Bangkok
13	71%	JobSeeker99_LSNName99	Female	23	Degree	12000฿	1	Bangkok
14	70%	JobSeeker102_LSNName102	Male	30	Degree	25000฿	6	Bangkok
15	67%	JobSeeker101_LSNName101	Male	29	Degree	20000฿	5	Bangkok
16	60%	JobSeeker100_LSNName100	Male	27	Degree	17000฿	3	Bangkok

Figure 4 View all applicants who were sorted by matching on personality characteristic

From the problem above, our model try to help employer to get more convenient than the previous method by using the mapping technique on the personality characteristic criteria from both sides, employers and applicants, in order to get the percentage. Then, the percentage results are sorted in a descending order. Hence, this method can help employer to find the better screen from matching on personality criteria (see Figure 4).

If employer would like to refine the results they can easily both choose any general qualification criteria and match on personality trait (see Figure 5).

Therefore, the use of matching on both factors, general qualification and personality characteristic,

can help user to get better qualify results than use only general criteria.

Personality JobFit

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CANDIDATE SEARCH EMPLOYER

Sex: Male Female Any

Age: 27 - 35 years

Education: Degree

Faculty: Any

Major: Management

Monthly Salary: 15000 - 30000 baht

Year Experience: 3 year(s)

Matching on Personality Characteristic Specification

Search Back

We found 7 applicant(s)

No.	Fit	Applicant Name	Sex	Age	Education	Monthly Salary	Year(s) Experience	Job Location
1	82%	JobSeeker122_LSNName122	Male	29	Degree	15000฿	7	Bangkok
2	76%	JobSeeker115_LSNName115	Male	35	Master	18500฿	12	Bangkok
3	76%	JobSeeker121_LSNName121	Male	29	Degree	15000฿	7	Bangkok
4	70%	JobSeeker127_LSNName127	Female	31	Degree	30000฿	8	Bangkok
5	67%	JobSeeker123_LSNName123	Male	32	Degree	27000฿	10	Bangkok
6	66%	JobSeeker119_LSNName119	Female	27	Degree	15000฿	5	Bangkok
7	62%	JobSeeker126_LSNName126	Female	32	Degree	25000฿	7	Bangkok

Figure 5 View the filtered applicants on both general qualifications and personality criteria

6. Conclusions

The personality-job fit model measures essential data an employer needs, to make hiring better. This model employs matching between the Job seekers' personality and the Employers' specifics, the system predicts job suitability and accurately matches the job seekers with the work they do. It is used to help employers find employees who "fit" their needs.

To compute result as a percentage, it matches on the personality traits criteria specified in the form called "Job Match Patterns" by user members. So, the final results is weighted by a percentage value which is sorted in descending order, the best match is of the top of the list and the rest follows.

A different style of the output format from the existing systems has been used. We aim to help users to find the better matched results from the filtering of the 2 steps mentioned above, and also, to represent the output format as a user friendly style

and hope that the results lead to job satisfaction and career success.

7. Further Development

Our prototype uses only some of the methods available for evaluating recruitment. It can be scaled into a more effective system. For instance, other personality assessment patterns may be used to filter preferences, needs and styles. Further, various search engine techniques [6] may be applied to get results more efficiently.

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