A SYSTEM AND METHOD FOR RECOMMENDING RELEVANT JOB VACANCIES OR JOB APPLICANTS

FIELD OF INVENTION

The present invention relates to a method for recommending relevant job vacancies, job applicants and its system thereof, more particularly, a method which includes classifying job vacancies and job applicants into a plurality of predetermined classification levels.

BACKGROUND OF THE INVENTION

The challenge of matching suitable candidates with job openings available at a given time is ever-present. An applicant may find it extremely difficult to locate a truly suitable position for themselves from among a large number that are being advertised. It is also becoming more common for employers to leave positions vacant rather than fill them with candidates who are not best-qualified, or who may require extensive initial training. When an employer seeks to hire an experienced employee, the pool of talent, within which a search is conducted, is often limited to individuals who have already worked in a particular job within a particular industry. Although it may be meritorious that a prospective employee has current or prior experience in a particular job within a particular industry, individuals with experience in other jobs within other

industries may possess the particular skills that an employer requires for a particular job. yet there exists no efficient means for identifying such individuals who possess the precise skills sought out by the employer. In recent years, the number of technology companies attempting to solve issues in the recruiting process has grown tremendously. The proliferation of web-based technologies includes a wide range of applicant tracking systems, data extraction methods, new search technologies, and processes to match the appropriate job seekers with open positions. Applicant tracking systems collect job description and job seeker (resume) information, but they do not have precise matching between the required elements of the job specification and the skills and experience of the job seeker.

Many technologies have been implemented to improve on the system for recommending relevant job vacancies. For example, a United States patent with publication no. US8117024B2 discloses a system and method for automatically processing candidate resumes and job specifications expressed in natural language into a normalized form using frequency analysis. A database of elements is provided in which each element with a corresponding set of synonymous words or phrases. Candidate resumes and job specifications are received in electronic form and expressed in natural language. The candidate resumes and job specifications are analysed to extract elements expressed in candidate resumes and job specifications. The extracted elements are compared to the database, wherein the most frequent element or synonym for each extracted element is identified and used as a common form for the extracted

element. A set of candidate resumes is then matched with a corresponding job specification by comparing the set of elements expressed in common form for the resumes with the set of elements expressed in common form for the job specification.

Besides that, a Chinese patent with publication no. CN103294816B discloses a method and system for recommending positions for a job seeker which includes steps of obtaining information of the job seeker which includes job hunting requirements, generating a test paper with corresponding testing questions based on information gathered from the resume of the job seeker. The answer results of the test paper is combined to evaluate position competence of the job seeker for the job hunting requirements, and the position information is matched with the position competence which is taken from a position database to generate a position recommending scheme, such that the position recommending scheme is recommended to the job seeker.

Another technology as disclosed in a United States patent with publication no. US20140358810A1 which recites a computer-based method, and computer system, for matching candidates with job openings. The system includes a method of providing a candidate with a score for a particular job opening, whereby the score is derived from a comparison of features in the candidates resume with job features in a description of the job opening, as well as use of external data gathered from other sources and based on information contained in the candidate’s resume and/or in the description of the job opening.

Lastly, yet another United States patent with publication no. US8660871B2 discloses a system and method for recruiting and employment services, wherein background information associated with talent-capability attributes is received from talent/applicant. Job description information is received from employers. Prospective matches are identified between employers and talent, and employers and talent are given an opportunity to consent to exchange of talent contact information.

The aforementioned prior arts describe the many configurations of systems for recommending relevant job vacancies and job applicants. The drawbacks of the prior arts include not being able to classify relevant job vacancies and job applicants based on keywords searches with reference to Standard Occupation Classification (SOC) at desirable accuracy such as SOC level 4, not being able to overcome unspecified skill demand due to insufficient capacity in including all skill requirements in either an applicant resume and/or job description but are essential for a job application. Additionally, the problem of one word may have multiple meanings or multiple words may have the same meaning. Besides that, most job matching/analysis do not incorporate salary, proper skill analysis to differentiate between soft skills, common skills, or specific skills based on industry specialization, or labour mobility analysis for users occupations switching.

SUMMARY OF INVENTION

An object of the present invention is to establish an occupation classification database with one or more dimensions which include industry-specialization, job position, and skill specialization. It is also an object of the present invention to provide specific, common and soft skill analysis at a predetermined classification level. It is a further object of the present invention to provide a labour mobility analysis between occupations for occupation matching to counter for unspecified skill demand and identify skills that were not listed in an applicant's resume or in the job vacancies. Besides that, it is also an object of the present invention to provide an appropriate salary estimation for worker or job valuation. Further, it is an object of the present invention to recommend relevant job vacancies and job applicants that are impartial and unaffected by background bias.

In an aspect of the present invention, there is provided a computer-implemented method for recommending relevant job vacancies and job applicants, comprising the steps of establishing a occupation classification database according to a plurality of predetermined classification levels that are each related to at least one parameter by a classification module; matching input related to job application of an applicant with the parameters of the occupation classification database by a job matching module; and generating the recommended job vacancies and job applicants which correspond to the parameters that matched with the input of the applicant by a job vacancies and job applicants generating module; wherein the classification levels are configured to be at

least one dimensional, with each dimension corresponding to a parameter that includes any one or a combination of job position, skill specialization and industry-specialization.

Preferably, the computer-implemented method further comprising the step of constructing a predetermined occupation classification list, and classifying unspecified data from the occupation classification database with reference to the predetermined occupation classification list through any one or a combination of machine learning, deep learning and Neuro-linguistic programming upon detecting keywords from the job vacancies and job applicants .

Preferably, the specialization includes industry-specialization, job position, skill specialization, or a combination thereof.

Preferably, the computer-implemented method further comprising the steps of providing an education linkage to the skill specialization, wherein the education linkage includes education subjects relevant to each skill specialization; conducting an education-skill analysis through comparing the input of the applicant being education subjects studied by the applicant with the education subjects relevant to the skill specialization by an education-skill analysis module; and generating the recommended job vacancies and job applicants based on the education-skill analysis by the job vacancies and job applicants generating module.

Preferably, the education linkage is included to the occupation classification list with the education subject being one of the parameters.

Preferably, the computer-implemented method further comprising the steps of conducting a labour mobility analysis, upon matching input of applicant with the parameters of the occupation classification list, by a labour mobility analysis module; and generating the recommended job vacancies or job applicants based on the labour mobility analysis by the job vacancies and job applicants generating module.

Preferably, the labour mobility analysis is conducted by the step of estimating similarity in skill specialization between expected skill derived from a current or past occupation of the applicant, and required skill of the job.

Preferably, the computer-implemented method further comprising the steps of conducting a salary comparison by comparing an expected salary of the applicant with an offered salary of the job vacancies by a salary analysis module; and generating the recommended job vacancies and job applicants based on the salary comparison by the job vacancies and job applicants generation module.

Preferably, the expected salary of either or both the applicant and the job vacancies is estimated using a Mincer Earnings function based on variables including any one or a

combination of human capital, firm factor, hiring difficulties, and occupation trend.

Preferably, the occupation trend is based on the occupation classification list with parameters being industry-specialization, job position, and skill specialization that match with the input of the applicant.

In another aspect of the present invention, there is provided a computer-implemented system for recommending relevant job vacancies and job applicants , the system comprising an input module for receiving information about job vacancies advertised on an online platform, input related to a job application from an applicant, or a combination thereof; a classification module for establishing an occupation classification database according to a plurality of predetermined classification lists with levels that are each related to at least one parameter; a job matching module for matching input related to a job application of an applicant with the parameters of the occupation classification list; and a job vacancies and job applicants generating module for generating the recommended job vacancies and job applicants which correspond to the parameters that matched with the input of the applicant and job vacancies; wherein the classification levels are configured to be at least one dimensional, with each dimension corresponding to a parameter that includes any one or a combination of industry-specialization, job position and skill specialization.

Preferably, the job vacancies and job applicants module is incorporated with engines

configured to conduct any one or a combination of machine learning, deep learning and Neuro-linguistic programming for constructing a predetermined occupation classification list, and classifying unspecified data from the occupation classification database (90) with reference to the predetermined occupation classification list.

Preferably, the specialization includes industry-specialization, job position, skill specialization, or a combination thereof.

Preferably, the system further comprising an education-skill analysis module for conducting an education-skill analysis through comparing the input of the applicant being education subjects studied by the applicant with the education subjects relevant to the skill specialization, wherein the relevant education subjects are linked to each skill specialization through an education linkage.

Preferably, the education linkage is included to the occupation classification database with the education subject being one of the parameters.

Preferably, the system further comprising a labour mobility analysis module for conducting a labour mobility analysis upon matching input of applicant with the parameters of the classification database.

Preferably, the job vacancies and job applicants module further comprising a salary

analysis module for conducting a salary comparison by comparing an expected salary of the applicant with an offered salary of the job vacancies through a Mincer Earnings function based on a plurality of variables if either or both the expected salary of the applicant and the offered salary of the job vacancies is not stated.

Preferably, the variables include any one or a combination of human capital, firm factor, hiring difficulties, and occupation trend.

Preferably, the occupation trend is based on the occupation classification database with parameters being the industry-specialization, job position and skill specialization that match with the input of the applicant.

One skilled in the art will readily appreciate that the present invention is well adapted to carry out the objects and obtain the ends and advantages mentioned, as well as those inherent therein. The embodiment described herein is not intended as limitations on the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

For the purpose of facilitating an understanding of the invention, there is illustrated in the accompanying drawing the preferred embodiments from an inspection of which when considered in connection with the following description, the invention, its

construction and operation and many of its advantages would be readily understood and appreciated.

FIG. 1 is a block diagram illustrating a preferred embodiment of a system for recommending relevant job vacancies and job applicants .

FIG. 2 is an exemplary embodiment of a block diagram illustrating a Standard Occupation Classification (SOC) structure for a Lead Data Engineer.

FIG. 3 is an exemplary embodiment of a block diagram illustrating the Standard Occupation Classification (SOC) structure for a Data Engineer.

FIG. 4 is a flow chart illustrating a preferred embodiment of a method for recommending relevant job vacancies and job applicants based on the above-mentioned system.

FIG. 5 is a flow chart illustrating a preferred embodiment for an education-skill analysis performed by an education-skill analysis module.

FIG. 6 is a flow chart illustrating a preferred embodiment for a labour mobility analysis performed by a labour mobility analysis module.

FIG. 7 is a flow chart illustrating a preferred embodiment for a salary analysis performed by a salary analysis module.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, the invention shall be described according to the preferred embodiments of the present invention and by referring to the accompanying description and drawings. However, it is to be understood that limiting the description to the preferred embodiments of the invention is merely to facilitate discussion of the present invention and it is envisioned that those skilled in the art may devise various modifications without departing from the scope of the appended claim.

It will be understood that each block of the flowchart illustrations and/or block diagrams, and combinations of blocks in the flow chart illustrations and/or block diagrams, and combinations of blocks in the flow chart illustrations and/or block diagrams, can be implemented by computer program instructions. These computer program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, that execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

These computer program instructions may also be stored in a computer-readable memory that can direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer readable memory produce an article of manufacture including instructions means that implement the function/act specified in the flowchart and/or block diagram block or blocks.

The computer program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a series of operational steps to be performed on the computer or other programmable apparatus to produce a computer implemented process such that the instructions that execute on the computer or other programmable apparatus provide steps for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

The invention will now be described in greater detail, by way of example with reference to the drawings.

FIG. 1 is a block diagram illustrating a system for recommending relevant job vacancies and job applicants to an applicant and hiring person respectively. The computer-implemented system comprising an input module **20** for receiving information about job vacancies advertised on an online platform **10**, input related to a job application from an applicant, or a combination thereof. The system may be

accessible by a computing device which may include a smart device, a smartphone, a personal computer or the likes, in which the computing device may be capable of transmitting and receiving information through wired or wirelessly over a communication network, wherein the communication network may be a wireless network connection established via a wireless protocol cloud such as a Long-Term Evolution (LTE) cloud, Code Division Multiple Access (CDMA) and its derivatives, Enhanced Data Rates for SGM Evolution (EDGE), 3G protocol, High Speed Packet Access (HSPA), 4G protocol, 5G protocol and the likes, in accordance with the advancement of wireless technology with time.

Preferably, the job vacancies may be displayed or searched for on the online platform **10**, which may include websites or a mobile application containing a plurality of webpages which may be accessed by the computing device. In a particular embodiment, an interface of the online platform **10** may include a general search engine service which is designed to allow applicants to search for relevant job vacancies based on keywords that have been input into the system. The search results may be presented in a list of electronic results of the recommended relevant job vacancies on the online platform **10**, in which the applicant may then select one of the electronic results from the list, and subsequently being redirected to the webpage corresponding to said job vacancies.

In a particular embodiment, the system may communicate with an occupation

classification database **90** which stores information pertaining to occupation classifications for each job vacancies and job applicants in the online platform **10**. For this preferred embodiment, the occupation classification is preferably based on a Standard Occupation Classification (SOC) of a predetermined country as set forth by said country's government authority. Preferably, the occupation classification database **90** may communicate with a server **100** for managing the online platform **10** through executing operations of modules including but not limited to a classification module **30**, an education-skill analysis module **40**, a labour mobility analysis module **50**, a salary analysis module **60**, a job matching module **70**, and a job vacancies and and job applicants generating module **80**. Preferably, the plurality of modules communicates with one another to form an interconnected communication network.

In a preferred embodiment, the classification module **30** may be configured to establish an occupation classification database **90** according to a plurality of predetermined classification lists with levels that are each related to at least one parameter, preferably from levels 1 to 5. The current SOC structure is only one-dimensional with 5 groups, denoted as level 1 to level 5, which may cause mix ups between industry-specialization and job position. Particularly, the groups may be categorized into major groups, sub-major groups, minor groups, unit groups, and occupations, each corresponding to respective classification levels in the SOC structure as shown in the table below:

Table 1: Current structure of Standard Occupation Classification (SOC)

Standard Occupation Classification Structure	
Level 1	Major Group
Level 2	Sub-major Group
Level 3	Minor Group
Level 4	Unit Group
Level 5	Occupation

In an exemplary embodiment as illustrated in **FIG. 3**, a "Lead Data Engineer" **203** position is classified under class 13302 "Software and Application Manager" **202** in the current SOC structure which is a part of class 1 "Legislators, Senior Officers and Managers" **201**, whereby "Software and Application" is the industry-specialization, and "Manager" is the job position. However, a "Data Engineer" **206** as illustrated in **FIG. 3** is classified under class 2521 "Database Designers and Administrators" **205**, which is under class 2 "Professionals" **204**. Under such a one-dimensional design in the current SOC structure, there is no linkage between the "Lead Data Engineer" **203** and the regular "Data Engineer" **206**.

Table 2: Modified Standard Occupation Classification (SOC) Structure

Modified SOC Structure		
Dimension 1 – Specialization Level	Dimension 2 – Position Level	Dimension 3 – Skill Composition

Specialization Level 1	Industry	Position 1	Manager	Specific Skills	Common Skill
Specialization Level 2	Field	Position 2	Professional	Specific Process and Function	Common Process
Specialization Level 3	Sub-field	Position 3	Associate Professional	Specific Tool	Common Tool
Specialization Level 4	Generic Occupation	Position 4	Worker		
Specialization Level 5	Specific Occupation	Position 5	Labour		

In order to mitigate the missing linkage between the two occupations as mentioned above, the classification module **30** may be configured to establish the occupation classification database **90** according to a plurality of predetermined classification list with levels which are at least one dimensional. Preferably, the occupation classification list may have three dimensions as illustrated in **Table 2**, in which each of the dimensions correspond to the parameter that includes any one or a combination of job position, skill specialization and industry specialization. The classification module **30** may also update the occupation classification database **90** by firstly constructing the predetermined occupation classification list, then classifying unspecified data

obtained from the occupation classification database **90** with reference to the predetermined occupation classification list through any one or a combination of machine learning, deep learning, and Neuro-linguistic programming upon detecting keywords from the job vacancies and job applicants , such that the occupation classification and job matching may be performed by text matching, keywords extraction and comparison or the likes.

Table 3: Occupation Matrix for Specialization Level 5

Occupation Matrix		Level 4
		Generic Occupation
Position 1	Manager	Level 5 – Specific Occupation
Position 2	Professional	
Position 3	Associate Professional	
Position 4	Worker	
Position 5	Labour	

Referring to **Table 2** and **Table 3** respectively, specialization level 5 is a cross product of specialization level 4 and job positions from levels 1 to 5. The occupation matrix as shown in **Table 3** may be able to classify each specific occupation based on their respective job positions under a generic occupation label, potentially enhancing the occupation classification list in the current SOC.

Besides that, another problem to solve may be unspecified skill demands that are unlisted in current job vacancies and in job applicants' resumes. Unspecified skill demand happens when essential skills are not stated in a job vacancy and job applicants' resume although it is a required skill due to reasons such as insufficient capacity in including the required skill in said applicant's resume or description of the job vacancies. For example, most professional jobs that are listed in the online platform require proficiency in a particular software application, such as Microsoft Office, as it is a fundamental skill that every job applicant should possess. However, this requirement may not be mentioned in the respective job vacancies and job applicants' resume . Unspecified skill demand is crucial and is a common issue in job matching for applicants. By way of example, a particular occupation may have up to 50 skills requirements, in which when listed on the online platform **10**, the job vacancies for said particular occupation may only list out 10 to 20 skill requirements, but do not make mention of the remainder of skill requirements. Understandably, the applicant's resume may only include less than 10 required skills due to limited space and focuses on achievements, as resumes are more achievement-oriented rather than skill-oriented.

In a preferred embodiment, the education-skill analysis module **40** is configured for providing an education linkage to the skill specialization, wherein the education linkage includes education subject relevant to each skill specialization as identified through the occupation classification list. An education-skill analysis may be conducted by

comparing the input of the applicant being education subjects studied by the applicant with the education subject relevant to the skill specialization. Preferably, the education linkage may be included to the occupation classification list with the education subject being one of the parameters for job matching by the job matching module **70**. Recommended job vacancies and job applicants may then be generated based on the education-skill analysis by the job vacancies and job applicants generating module **80**.

Table 4: Education linkage to specific job scopes

Skill	**Job Scope / Skill Demand**	**Education Module (NUS BSc Computer Science)**
0	Data Storage 1	CS2102 Database Systems, CS3223 Database Systems Implementation, CS4221 Applications Design and Tuning, CS4224 Distributed Databases
1	Data Storage 2	
2	Data Processing 1	
3	Data Processing 2	
4	Data Analysis	BMK 5202 Python Programming for Business Analytics
5	Data Visualization	
6	Data Summary	NA, Business Knowledge
7	Data Science	CS3243 Introduction to Artificial Intelligence, CS3244 Machine Learning, CS5242 Neural Networks and Deep Learning, CS5260 Neural Networks and Deep Learning II

8	NLP Data Science	CS4248 Natural Language Processing, CS5246 Text Mining, CS5241 Speech Processing
9	CV Data Science	CS4243 Computer Vision and Pattern Recognition

By way of example and referring to **Table 4**, an NUS graduate with a degree in Computer Science applying for data engineer vacancies at an entry level. Typical job vacancies will list our relevant specific skills according to standards set in the online platform database. With no formal experience for a fresh graduate, the applicant may only rely on either their education or academic background which may not contain keywords related to relevant experience or skill. With the education-skill linkage being used as a parameter for job matching by the job matching module **70**, the applicant may have acquired the skills needed for the job vacancies if the applicant has undergone either one of the education modules shown in the table above. Preferably, the recommended job vacancies and job applicants may then be generated based on the education-skill analysis by the job vacancies and job applicants generating module **80** thereafter.

In a preferred embodiment, the system comprises the labour mobility analysis module **50** for conducting a labour mobility analysis upon matching input of applicant with the parameters of the occupation classification database **90**. The labour mobility analysis module **50** functions as a way for applicants to bridge their skills and occupation of

choice when searching for a new job and is important for either applicants who are switching jobs, for cross-sector hiring, for companies to retain their workers, or for applicants who want to upgrade their personal skills. For example, the applicant was previously an electrical engineer and may be looking into becoming an electrical sales engineer. On the surface, the two occupations are different in terms of job scope and responsibilities. Nevertheless, there may be underlying skills or requirements that overlap between the two respective occupations, in which the applicant may possess. Preferably, the labour mobility analysis may then be conducted to estimate similarities in skill specialization between an expected skill derived from a current or past occupation of the applicant, as well as a required skill of the job. The estimation may be based off a formula such as follows:

Labour mobility between 2 occupations = Overlap specific skill / Total specific skill

Conditional to similarity in industry-specialization

Wherein, for example, a doctor has a specific skill such as medical knowledge on terms and equipment used in the medical industry, and several unspecified or soft skills which can be translated over to a sales position such as customer relations, support, communications or the likes. However, a person in sales do not have said set of specific skills in order to be translated over to the doctor position.

Table 5: Labour mobility based on specific skill similarities between different

occupations

Labour mobility	Specific Skill Similarity
Very high	>80%
High	60% - 80%
Low	40% - 60%
Very low	<40%

Table 6: Labour mobility analysis of a sales engineer and an electrical engineer

Occupation 1 (to)	Occupation 2 (from)	Labour Mobility	Specific Skill Similarity
Sales Engineer	Electrical Engineer	Very low	Less than 40%
Electrical Engineer	Sales Engineer	High	60% - 80%
Electrical Engineer	Electrical Engineer	Very high	More than 80%

Table 5 illustrates an example of labour mobility grades based on a percentage range in specific skill similarities which may be used as a benchmark or standard when conducting the labour mobility analysis. Based on the exemplary table as shown in **Table 6** respectively, the labour mobility from the sales engineer to the electrical engineer is very low. For example, one of the preferred skills for the sales engineer as listed in a job vacancy is negotiation with clients and customers. However, the

negotiation skill is not listed in the applicant's resume although the applicant may have this skill already. By only using text matching based on comparisons between the two occupations, a mismatch may occur. However, using the labour mobility analysis as shown above, a match may be found as this skill is classified under the sales engineer occupation, which may be translated over from the electrical engineer occupation or vice versa.

In a preferred embodiment, the salary analysis module **60** is configured to conduct a salary comparison by comparing an expected salary of the applicant with an offered salary of the job vacancies. Preferably, a Mincer Earnings function may be employed to either analyse or estimate a suitable salary based on the salary comparison. The Mincer Earnings function is a single-equation model that explains wage income as a function of schooling and experience, and is generally modelled earnings (natural log) as a linear function of education and a quadratic function of potential labour market experience, such as shown in the equation below:

$$\log y = \alpha + \beta_1 S + \beta_1 X + \beta_2 X^2$$

wherein,

α refers to earnings of an individual without education and experience;

β refers to a rate of return for schooling and experience;

S refers to years of schooling/education; and

X refers to years of experience.

Table 7: Modified Mincer Earnings Function

Dependent Variable	**Independent Variables**			**Fixed Effect**
Natural log salary	**Human Capital**	**Firm**	**Hiring Difficulties**	**Occupation Trend**
	Education (year)	Company size	Hiring failure (repeat advertisement)	Occupation classification up to SOC level 5
	Experience (year)	Hiring by firm or recruiter	Nationality restriction	
	Certification	Employment type (contract, permanent, internship)	Application rate	

The **Table 7** above illustrates a modified Mincers Earnings function which may be implemented by the salary analysis module **60** to either or both analyse and estimate the expected salary based on a plurality of variables, which may include any one or a combination of human capital, firm factor, hiring difficulties, and occupation trend. Particularly, human capital may include any one or a combination of years of education,

years of experience, and type of certification achieved. The firm variable may include any one or a combination of company size, hiring type either by firm or by a recruiter, and employment type, which may include contractual employment, permanent employment or internship. In the case of hiring difficulties, hiring failure such as repeated advertisement of a particular job vacancies may be considered as well as nationality restriction and application rate for the job vacancies. Further, the occupation trend may be based on the occupation classification list with parameters being the job position, industry specialization and skill specialization that matches with the input of the applicant. In the event that the salary of the applicant is not stated in their resume, the input gathered from the applicant in combination with the parameters from the occupation classification database **90** and the variables as shown in the **Table 7** above is enough to utilize the Mincer Earnings function to estimate a suitable salary range for the applicant. Likewise, if the applicant has presented an expected salary in their resume but the job vacancies do not do so, the modified Mincer Earnings function may be utilized as well. Subsequently, the expected salary of the applicant and the offered salary of the job vacancies may then be compared and the recommended job vacancies that match the expected salary of the applicant may then be compiled to be generated by the job vacancies and job applicants generating module **80** thereafter and vice versa for the hiring person, whereby said hiring person will be recommended with a number of job applicants that are suitable for the job vacancies as advertised by them.

In another preferred embodiment, the job matching module **70** is configured to match

input related to the job application of the applicant with the parameters of the occupation classification database **90**. Upon matching inputs related to the job application of the applicant with the parameters as mentioned above, including results obtained from the education-skill analysis module **40**, the labour mobility analysis module **50** and the salary analysis module **60**, appropriate job vacancies and job applicants may then be determined and compiled to be transmitted to the job vacancies and job applicants generating module **80** to be generated thereafter. The job vacancies or job applicants that were generated by the job vacancies and job applicants generating module **80** may then be displayed to the applicant in the form of electronic results in the search engine of the online platform **10**, whereby the applicant or hiring person may then select any one of the job vacancies or job applicants to be reviewed thereafter.

In another aspect of the present invention, there is provided a method for recommending relevant job vacancies and job applicants to the applicant and hiring person based on the above-mentioned system. Referring to **FIG. 4**, Step **301** recites the input module **20** receiving inputs from the applicant relating to the job application of the applicant, in which said inputs are used for comparisons with job vacancies on the online platform **10**. At Step **302**, the classification module **30** establishes the occupation classification database **90** with at least one dimension, each dimension corresponding to the parameters which include any one or a combination of job position, skill specialization and industry specialization. At Step **303**, the education skill analysis is conducted by the education skill analysis module **40** to determine suitability of the applicant for the

occupation in the job vacancies based on the applicant's education background instead of working experience. At Step **304**, the labour mobility analysis is conducted by the labour mobility analysis module **50** to estimate similarities in specific skills between the applicant's past or current occupation and the occupation as listed in the job vacancies. At Step **305**, the salary analysis module **60** conducts the salary analysis to provide an estimated salary range regardless whether information of the salary is present in either or both the applicant's resume and the job vacancies. At Step **306**, the input received from the user relating to the job application is compared and matched with parameters of the occupation classification database **90** by the job matching module **70**. Upon matching, the job vacancies and job applicants generating module **80** then generates recommended job vacancies or job applicants based on the matched input at Step **307**, which will be displayed as electronic results of the recommended job vacancies or job applicants on the online platform **10**.

FIG. 5 is a flow chart illustrating the education-skill analysis conducted by the education-skill analysis module **40**. At Step **401**, the inputs of the applicant are compared with education subjects relevant to the skill specialization of a particular job vacancies. At Step **402**, the education linkage to the skill specialization is provided for each responsibilities or job scope for said job vacancies and job applicants . At Step **403**, the education linkage is then included to the occupation classification database **90**

as one of the parameters to be compared and matched with the inputs of the applicant. The job vacancies and job applicants generating module **80** then generates recommended job vacancies and job applicants based on the education-skill analysis thereafter at Step **404**.

FIG. 5 is a flow chart illustrating the labour mobility analysis module **50** conducting the labour mobility analysis by estimating similarities in skill specialization between the expected skill derived from current or past occupation of the applicant, and required skill of the job vacancies at Step **501**. Once the similarities in skill specialization have been estimated and graded, this information is used as a parameter to be compared and matched with the inputs of the applicant, such that recommended job vacancies or job applicants may be generated thereafter by the job vacancies and job applicants generating module **80** at Step **502**.

FIG. 7 is a flow chart illustrating the salary analysis being conducted by the salary analysis module **60**. At Step **601**, the input of the applicant, particularly the expected salary is compared with the offered salary of the job vacancies. At Step **602**, the salary analysis module **60** may check if salary information is present in either or both the applicant's resume and the job vacancies. At Step **603**, the salary analysis module **60** then estimates the salary that matches the applicant's expected salary or offered salary by the job vacancies if either or both applicant's and job vacancies' salary information is unavailable. At Step **604**, the job vacancies and job applicants generating module **80**

generates the recommended job vacancies or job applicants based on the salary estimation thereafter.

The present disclosure includes as contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a degree of particularly, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangements of parts may be resorted to without departing from the scope of the invention.

CLAIMS

1. A computer-implemented method for recommending relevant job vacancies or job applicants, comprising the steps of

establishing an occupation classification list according to a plurality of predetermined classification levels that are each related to at least one parameter by a classification module (30);

matching input related to job application of an applicant with parameters of the job category list by a job matching module (70); and

generating the recommended job vacancies or job applicants which correspond to the parameters that matched with the input of the applicant by a job vacancies and job applicants generating module (80);

wherein the classification levels are configured to be at least one dimensional, with each dimension corresponding to a parameter that includes any one or a combination of industry-specialization, job position and skill specialization.

2. The computer-implemented method according to claim 1, further comprising the steps of constructing a predetermined occupation classification list, and classifying unspecified data from the occupation database (90) with reference to the predetermined occupation classification list through any one or a combination of machine learning, deep learning and Neuro-linguistic programming upon detecting keywords from the job vacancies and job applicants .

3. The computer-implemented method according to claim 1 or 2, wherein the specialization includes industry-specialization, job position and skill specialization. or a combination thereof.

4. The computer-implemented method according to any one of claims 1 to 3, further comprising the steps of

providing an education linkage to the skill specialization, wherein the education linkage includes education subjects relevant to each skill specialization;

conducting an education-skill analysis through comparing the input of the applicant being education subjects studied by the applicant with the education subjects relevant to the skill specialization by an education-skill analysis module (40); and

generating the recommended job vacancies or job applicants based on the education-skill analysis by the job vacancies and job applicants generating module (80).

5. The computer-implemented method according to claim 4, wherein the education linkage is included to the occupation classification database (90) with the education subject being one of the parameters.

6. The computer-implemented method according to any one of the preceding claims, further comprising the steps of

conducting a labour mobility analysis, upon matching input of applicant with the parameters of the job category list, by a labour mobility analysis module (50); and generating the recommended job vacancies or job applicants based on the labour mobility analysis by the job vacancies and job applicants generating module (80).

7. The computer-implemented method according to claim 4, wherein the labour mobility analysis is conducted by the step of

estimating similarity in skill specialization between expected skill derived from a current or past occupation of the applicant, and required skill of the job.

8. The computer-implemented method according to any one of the preceding claims, further comprising the steps of

conducting a salary comparison by comparing an expected salary of the applicant with an offered salary of the job vacancies by a salary analysis module (60); and generating the recommended job vacancies or job applicants based on the salary comparison by the job vacancies and job applicants generating module (80).

9. The computer-implemented method according to claim 8, wherein the expected salary of either or both the applicant and the job vacancies is estimated using a Mincer Earnings function based on variables including any one or a combination of human capital, firm factor, hiring difficulties, and occupation trend.

10. The computer-implemented method according to claim 9, wherein the occupation trend is based on the occupation classification database with parameters being the industry-specialization, job position and skill specialization that match with the input of the applicant.

11. A computer-implemented system for recommending relevant job vacancies or job applicants, the system comprising

an input module (20) for receiving information about job vacancies advertised on an online platform (10), input related to a job application from an applicant, or a combination thereof;

a classification module (30) for establishing an occupation classification database (90) according to a plurality of predetermined classification lists with levels that are each related to at least one parameter;

a job matching module (70) for matching input related to a job application of an applicant with the parameters of the job category list; and

a job vacancies and job applicants generating module (80) for generating the recommended job vacancies or job applicants which correspond to the parameters that matched with the input of the applicant;

wherein the classification levels are configured to be at least one dimensional, with each dimension corresponding to a parameter that includes any one or a combination of industry-specialization, job position and skill specialization.

12. The computer-implemented system according to claim 11, wherein the job vacancies and job applicants module (80) is incorporated with engines configured to conduct any one or a combination of machine learning, deep learning and Neuro-linguistic programming for constructing a predetermined occupation classification list, and classifying unspecified data from the occupation classification database (90) with reference to the predetermined occupation classification list.

13. The computer-implemented system according to claim 11 or 12, wherein the specialization includes industry specialization, job position, skill specialization, or a combination thereof.

14. The computer-implemented system according to any one of claims 11 to 13, further comprising an education-skill analysis module (40) for conducting an education-skill analysis through comparing the input of the applicant being education subjects studied by the applicant with the education subjects relevant to the skill specialization, wherein the relevant education subjects are linked to each skill specialization through an education linkage.

15. The computer implemented system according to claim 14, wherein the education linkage is included to the occupation classification database (90) with the education subject being one of the parameters.

16. The computer-implemented system according to any one of claims 11 to 15, further comprising a labour mobility analysis module (50) for conducting a labour mobility analysis upon matching input of applicant with the parameters of the job category list.

17. The computer-implemented system according to any one of claims 12 to 16, further comprising a salary analysis module (60) for conducting a salary comparison by comparing an expected salary of the applicant with an offered salary of the job vacancies through a Mincer Earnings function based on a plurality of variables if either or both the expected salary of the applicant and the offered salary of the job vacancies is not stated.

18. The computer-implemented system according to claim 17, wherein the variables include any one or a combination of human capital, firm factor, hiring difficulties, and occupation trend.

19. The computer-implemented system according to claim 18, wherein the occupation trend is based on the occupation classification list with parameters being the industry-specialization, job position and skill specialization. that match with the input of the applicant.