CASCIO COMMONS
Center for the Advanced Study of Communities and Information

[Call for Papers] ICDIM 2014: The 9th International Conference on Digital Information Management
Posted by jcoh on 31 March 2014, 12:00 pm

ICDIM 2014
9th International Conference on Digital Information Management
Pibulsongkram Rajabhat University, Phitsanulok, Thailand
September 29-October 01, 2014

Sep 29, 2014 – Oct 1, 2014
Pibulsongkram Rajabhat University, Phitsanulok, Thailand
Submission Deadline: Jul 5, 2014
Notification Due: Aug 5, 2014
Final Version Due: Sep 15, 2014

http://www.icdim.org

Call for Papers

The ICDIM intends to bridge the gap between different areas of digital information management, science and technology. This forum will address a large number of themes and issues. The conference will feature original research and industrial papers on the theory, design and implementation of digital information systems, as well as demonstrations, tutorials, workshops and industrial presentations.

The topics in ICDIM 2014 include but are not confined to the following areas.

Information Retrieval
Data Grids, Data and Information Quality
Temporal and Spatial Databases
Data Warehouses and Data Mining

Web Mining including Web Intelligence and Web 3.0
E-Learning, eCommerce, e-Business and e-Government
Natural Language Processing
XML and other extensible languages
Web Metrics and its applications
Enterprise Computing
Semantic Web, Ontologies and Rules
Human-Computer Interaction
Artificial Intelligence and Decision Support Systems
Knowledge Management
Ubiquitous Systems
Peer to Peer Data Management
Interoperability
Mobile Data Management
Data Exchange issues and Supply Chain
Data Life Cycle in Products and Processes
Case Studies on Data Management, Monitoring and Analysis
Security and Access Control
Information Content Security
Mobile, Ad Hoc and Sensor Network Security
Distributed information systems
Information visualization
Web services
Quality of Service Issues
Multimedia and Interactive Multimedia
Image Analysis and Image Processing
Video Search and Video Mining
All the accepted papers of ICDIM 2014 will appear in the proceedings published by IEEE.

All paper of ICDIM 2014 will be fully indexed by IEEE Xplore.

All the ICDIM 2014 papers will be indexed by DBLP.

Modified version of the selected papers will appear in the special issues of the following peer reviewed journals.

1. Journal of Digital Information Management (JDIM)
2. International Journal of Web Applications (IJWA)
3. International Journal of Information Technology and Web Engineering (IJITWE)
4. International Journal of Emerging Sciences (IJES)

SUBMISSIONS AT http://www.icdim.org/submission.html

Filed under Call for Papers | Permalink

* The Center for the Advanced Study of Communities and Information (CASCi)
ICT Career Analysis using Association Rule

Patsakorn Singto
Faculty of Information Technology
King Mongkut’s University of Technology North Bangkok
Bangkok, Thailand
patsakorn.s@mutr.ac.th

Anirach Mingkhwan
Faculty of Industrial and Technology Management
King Mongkut’s University of Technology North Bangkok
Pichinburi, Thailand
anirach@ieee.org

Abstract—Since technologies have been developing rapidly, new devices and systems will be created and provided faster and more efficiently. The demand for ICT careers in ICT industries is very high and the industries also require these people highly. Professionals in ICT careers should have technical expertise in computer systems, hardware and networks, and they should have exceptional problem solving and analysis. Knowledge and skills concerning with ICT careers are continually changing without certain. As a result, it is difficult to make the decision for improving skills. The purpose of this paper was to present algorithm for selecting the proper ICT skills for ICT careers. The uncertain and diverse ICT skills are decision-making problems, which can be solved by using the theory of association rule method. This method focuses on defining ICT skills. The ICT skills are one part of the group of career based on the standard of ISCO-08. The results demonstrate the appropriate skills for each ICT career. Therefore, ICT professionals are able to improve their knowledge by training skills properly for their careers.

Keywords—Association rule; ICT career; ICT competency

I. INTRODUCTION

Nowadays, supply and demand for careers concerning with ICT in labour markets are both provided in government sector and private sector, both national and international. ICT careers and professionals provide information sources widely in order in order to serve for educational institutions, students and other people to seek jobs. Job portals are the online career center service (OCCS) provided for announcing job positions from many companies such as CareerBuilder, HotJobs, Monster, JobsDB. However, OCCS, which is for the labour market, has not been well informed with sufficient quality of statistical information on the ICT career structure. A large number of careers in OCCS and various sources and organizations cause a problem which is an inconsistency of competent description among organizations. Some competence or skills are required by project activities [1].

There are factors on the growth of ICT careers; (1) the fastest growth of organization and (2) the increasing on evolution of computer hardware and software system. It is necessary for ICT workers or other people who are related to ICT careers to improve knowledge and skills continually in order to be able exist in inconstant environment. This paper focuses on probability value of professional knowledge in ICT careers and correlation of ICT careers for the purpose of more accurate and reliable results. In this paper, firstly, undesirable and incomplete data was considered and screened out by using pre-processing of the database. Secondly, ICT careers were analyzed by using association rule mining considering the correlation between ICT careers and technical skills. Thirdly, the support values were compared among the relationship of ICT career groups. Finally, the results of this research, in the expectation, will be able to reflect on the competencies of ICT careers currently, and will be useful for educational institutions, students, and job seeker.

We organize this paper as follows; Section 2 shows information on ICT career in ISCO-08 for cluster and competency of ICT career. Section 3 illustrates model on ICT career analysis. Section 4 illustrates method for using ICT career information. Section 5 shows an example on ICT career Section 6 gives the conclusion and future work.

II. RELATED WORKS

In this section, we explain a background ICT career and data mining the task of finding frequent pattern in large database is very important and has been studied in large scale.

A. Competence of ICT Career

The competence is set of components knowledge, skills, and attitudes (KSA). The human resource management focuses on skills and behaviors that an individual needs to be effective in a particular work area. Many organizations adopt Competence Management systems (CMS), which is system supportive of knowledge intensive organizations that are embracing a core competence. CMS has been used the principle of balanced competence descriptions to define the balance formal and informal indicators of competence in competence descriptions. While formal descriptions of competence refer to documented knowledge and skills acquired such as earning a degree, attending training course, informal descriptions of competence refer to on-the-job experiences, interests, personal characteristics, and behaviors [1-2].

B. Careers in Information and Communications Technology

ICT careers information are also used in a wide range of research topic such as matching job seekers with job vacancies, educational planning, and so on. The rapid changes that have taken place in information and communications technologies, and the influence of these changes on the occupation structure of the labour market. Therefore, International Standard Classification of Occupations 2008 (ISCO-08) was adopted by International Labour Organization (ILO) which are to promote rights at work, encourage decent employment opportunities, enhance social protection and strengthen dialogue on work-related issues [2-3].
The ISCO-08 is a four-level hierarchically structured classification that allows all jobs in the world to be classified into 436 unit groups, based on their similarity in terms of the skill level. Career skill level involve the performance include of Level 1 a simple and manual tasks, Level 2 an operating machinery and electronic equipment, Level 3 a complex technical and practical tasks, and Level 4 a require complex problem-solving and decision-making base on a factual knowledge in a specialized field [4].

![Fig 1 ICT Career Level of ISCO-08](image)

Fig 1 shows ICT careers major groups contains 3 level the following information.

A) Level 4 Information and Communications Technology Services Managers plan, direct and coordinate the acquisition, development, maintenance and use of computer, such as Data processing manager, Application development manager, Information technology manager, and so on.

B) Level 3 Information and Communications Technology Professionals plan, design, write, test, provide and improve information technology systems, develop, maintain and support database, include of minor group are software and applications technology professionals, such as System Analysts, Software Developers and so on, and database and network professionals, such as Database Designer and Administrators, System Administrators and so on.

C) Level 2 Information and Communications Technology Operations and User Support Technicians provide support for the day-to-day running of communications systems computer systems and networks such as ICT Operations Technicians, ICT User Support Technicians, Computer Network and System Technicians and so on.

C. Association Rules

Association rules data mining is finding inherent regularities in data and valuable knowledge which is implicit in huge database. Frequent pattern mining method based on minimum support threshold such as Apriori algorithm [5].

III. MODEL

Based on the literature reviewed in the previous section, we present the process of ICT analysis as shown in Fig 2. The process has been divided into three steps. The first step is data preprocessing. In this step, we are collected from ICT job portal websites and dimension reduction of human resource requirements is achieved by words segmentation for English Language of Rapid Miner Studio 6.0. The second step is construction competency ICT career relational which represented by obtain a weight standard relationships of ICT Skill Ontology and ICT Career Ontology to the improved Apriori algorithm with a weight parameter each item in a data description. The third step is construction ICT competency relationship which used by cosine similarity. The propose of this paper is analyze in relational between ICT careers and competency and between ICT careers and ICT career.

![Fig 2. Flow diagram of the process of ICT analysis](image)

IV. METHOD

The method is shown and the descriptions of its 4 steps are followed:

A. Data Collection

To collect data, we used a web crawler to visit ICT career group of web job portals and extract a careers name and technical skill. The extracted features and label were placed in a database by used Rapid Miner v.6.0. Database was collected in June, 2014 which includes totally 560 data records in the table of careers.

B. Data Pre-Processing

To obtain higher quality of result, we filtered out the necessary data and then converted the data and dimension reduction for data pre-processing.

We were filtered out the columns related to ICT skill used by chi-square technical. Some data like null value or stop word were filtered out to get a precise analyzed result.

C. Competency ICT Career Relationship Process

The process is constructed the practice of Apriori algorithm and defined a weight parameter with each items. We are created itemsets by competency of human resource
requirement data transaction which is queried in ICT ontology database with SPARQL. It is search semantic type which enables to find from hierarchical representation to reply the most appropriate result, such as parent-child relation, sibling’s relation [6-7]. We do not discuss how a semantic search in this paper because it is very complex to each itemsets. Below relation of competency ICT career in ICT career group by Apriori in pseudo code [4].

Apriori (T,e)
  L1 = {frequent itemsets}
  k = 2
  while L (k-1) ≠ ∅
    Ck = candidates generated (Lk-1 x Lk-1) and eliminating any k-1 size itemset that is not frequent
    for each T in database do
      Ct = Subset(Ck, t)
      for each c in Ct
        count[c] = count[c] + (1 * weight)
      Lk = candidates in Ck, while count[c] ≥ e
      k = k + 1
  return

D. ICT Careers relationship process

ICT careers were divided into a three group by ISCO-08 which ICT careers under the same group are a similar. The rapid changes that have taken place in information and ICT, competency ICT careers changes of the labour market. Therefore, ICT careers relationship was changed a both quantity and relation.

We apply cosine similarity to measure of similarity between two ICT careers in vectors form of an inner product space that measures the cosine of angle between them, similarity between items a and b, denoted by sim(a, b) is given by

\[
sim(a, b) = \cos \theta = \frac{\frac{a \cdot b}{\|a\| \|b\|}} = \frac{\sum_{i=1}^{n} a_i x b_i}{\sqrt{\sum_{i=1}^{n} a_i^2} \sqrt{\sum_{i=1}^{n} b_i^2}}
\]

where \(\frac{\frac{a \cdot b}{\|a\| \|b\|}}\) are a weight vector between two competency ICT career, \(\|a\|, \|b\|\) are the norm of a both vector, the resulting similarity ranges from 0 to 1, to 1 meaning exactly the same, with 0 indicating independence or dissimilarity.

V. IMPLEMENTATION AND RESULT

ICT careers existing in job web portals are online human resource requirement of ICT industry which is not convenience for ICT careers analyze. This research analyzes the relations between ICT skills and ICT careers, which used ICT careers received 560 records filtered data and ICT ontology structure to define itemsets.

The algorithm let minimum support minsup equal 0.1. Comparing with the minimum support can remove the infrequent itemset which has support less than minimum support. Relations of skills to ICT careers compares number of events containing 1 itemset because evidence explanation.

This example is representing the relational between ICT careers and technical skill that the following result as Fig 3. We show the ICT career as Software Developer and Web Developer which have related with ICT skill together. ICT skills instance of as MS SQL, MySQL and ASP.Net skills are the mostly needed to a Software Developer then C#.Net and VB.Net skills come after it. Web Developer must have MS SQL, C#.Net and Oracle ICT skill respectively. That means with these three skills on hand, people who knowledge ICT career can obtain higher opportunity of being employed and search people instead of vacancy.

Fig 3. Weighted Association ICT Careers Result

The result shows in Table I which illustrates relational quantity between ICT skills groups and ICT career in percentage form. Relational database management system (RDBMS) is a database management system that is based on the relational model. Database systems skill group in use are System Analyst, Software Developer and Web Developer. Network Engineer is not found programming language, database system and software development skill group.

Table I. Relation between ICT skill Group and ICT Career
We used weight ICT skills each of ICT career to similar measure which used formula 1 for calculate. Table II summarizes ICT Careers similarity for example 5 career minor group. For example, System Analyst is similar to Software Developer, Web Developer which human resource uses these careers substitutable for vacancy. Network Engineer is dissimilarity to System Analyst, Software Developer and Web Developer. Show that ICT skills of Network Engineer had a difference from System Analyst, Software Developer and Web Developer.

Table II. ICT Career Similarity

<table>
<thead>
<tr>
<th>ICT Career Similarity</th>
<th>ICT Manager</th>
<th>System Analyst</th>
<th>Software Developer</th>
<th>Web Developer</th>
<th>Network Engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT Manager</td>
<td>0</td>
<td>0.022</td>
<td>0.024</td>
<td>0.024</td>
<td>0.000</td>
</tr>
<tr>
<td>System Analyst</td>
<td>0.022</td>
<td>0</td>
<td>0.131</td>
<td>0.158</td>
<td>0.000</td>
</tr>
<tr>
<td>Software Developer</td>
<td>0.024</td>
<td>0.131</td>
<td>0</td>
<td>0.099</td>
<td>0.000</td>
</tr>
<tr>
<td>Web Developer</td>
<td>0.024</td>
<td>0.158</td>
<td>0.099</td>
<td>0</td>
<td>0.000</td>
</tr>
<tr>
<td>Network Engineer</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

VI. CONCLUSIONS

In this paper, algorithm of association rule was used and the data were analyzed by considering the correlation among ICT careers in database of human resources. The most required basic ICT skills for Software Developer are ASP.Net and MS-SQL. Thus, it will be necessary for students or job seekers to have the proper skills.

As the result above, educational institutions or students can manage their courses in studying more efficiently. Moreover, the students will be able to prepare for their future in the appropriate, accurate and competitive ways; especially their skills should match the demand of labour market. Moreover, the human resources industries in ICT can find the applicants instead of vacant positions.

For further research, to study and discover about work experience in ICT careers and to compare for analyzing the trends of ICT industries from human resources should be considered.

REFERENCES
