Weaving the New Web: Designing a Web 2.0 Solution to 'Catch' Job candidates

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2010-4

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Email: bailei528@hotmail.com
Enschede, the Netherlands, April, 2010

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Abstract

The electronic technologies have been embedded in current HRM, which is known as E-HRM. The E-recruitment is one of the most important applications of E-HRM. By using Internet and other computer-based technologies, there are many recruitment approaches could be used by organizations, such as using corporate website and commercial job boards to announce job opening. Organizations earn many benefits from current Internet recruiting approaches. However, within current Internet recruiting approaches, employers are in a passive position. They have to wait to be connected by applicants, and then make selection basing on existing applicant pool. As a result, the outcome of Internet recruitment by using existing approaches is becoming lack of satisfaction. Therefore, we would like to propose a solution in this thesis that could overcome this recruitment problem. In this design, employers could take initiatives on recruiting talented candidates from Web 2.0 applications. And both active job seekers and passive job seekers could be located by employers.

Key word: Web 2.0; Internet recruiting; active job seekers; passive job seekers; social networking sites

Acknowledgments

This thesis would not have been possible without the support of many people. I would like to express gratitude to my supervisor Dr. Tanya Bondarouk, who was abundantly helpful and offered invaluable assistance, support and guidance. Deepest gratitude is also due to my second supervisor Dr. Martijn van Velzen, without his knowledge and brilliant recommendations this study would not have been successful.

I offer my regards and blessings to all of those who supported me in any respect during the completion of the thesis. Special thanks to Anna Nehles, whose encouragement and support helps me get over this study. I also like to thank my friends in Business Administration program, Wang Xiaoyan, Weng Vivian, Wang xiaocheng, and Li Qianqin.

Lastly, I wish to express my love and gratitude to my beloved families; for their understanding & endless love, through the duration of my studies.

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1. Introduction

The electronic technologies have been embedded in current HRM with different purposes. The E-recruitment would be one of the most important parts of applications within EHRM. In this chapter, the problems of current E-recruitment are illustrated, and our research objectives for this thesis are given.

1.1. Defined E-recruitment

The recruitment is one of the most important areas of human resource management, and plays a critical role in enhancing organizational survival and success (Singh & Finn, 2003; Giraed & Fallery, 2009). A high standard inflow process could be the premise for smoothly running through flow and outflow processes of HRM. As a filtering mechanism in the selection process, it mainly deals with locating and attracting qualified job candidates to fill job vacancies (Sign & Finn, 2003). While the terms recruitment and selection are frequently used together, they constitute different stages in the overall process of employee resourcing. The selection focuses on variable methods on identifying the most suitable person for the organization. And the recruitment is about locating potential suitable person for the selection phase.

Nowadays, making use of electronic technologies in recruitment is becoming more and more common among the organizations. The E-HRM (electronic human resource management) would be the application that uses technology to support the HRM. When the technology is embedded in function of recruitment, it will be called as called e-recruitment.

There are several definitions of E-recruitment. For example, Giraed and Fallery (2009) refer e-recruitment as “the use of any technology to attract, select or manage the recruitment process”. Meanwhile, dictionary of HRM defines E-recruitment as the recruitment of employees on the Internet (Heery & Noon, 2001). It appears some differences between two definitions in literature. Giraed and Fallery (2009) states that electronic recruitment is about using all kind of technology including Internet, while the dictionary of HRM only mentioned Internet technology. Despite the differences in terms, both definitions are reasonable and acceptable. The Internet technology is one core technology related to e-recruitment. In actual e-recruitment, Internet could not function independently, which normally needs supporting of other technologies. For instance, the Internet technology may help employers on attracting candidates from job market, but seems not capable of deciding which potential candidates are suitable for organizations. Sometimes, for selection, employers need to perform other functions, such as online testing. In online test, the Internet technology has been combined with computer-based testing to get tasks done. In general, we consider the e-recruitment as the process of recruitment by using Internet and other computer based technology in this thesis.

Puck & Paul (2009) describe the E-recruitment as one of the most important applications in the E-commerce area. One of the noticeable advantages of E-recruitment is that the traditional paper-based reception of applications could be entirely replaced by using computer-based technology (Holm, 2009). In practice, applicants fill out electronic forms and give their personal information and employment history as well as what type of employment they are seeking through the online systems. Meanwhile, the companies process the information with advaned technology. The recruiters don't need to manually process all incoming applications anymore. Within computer-based technology, the applications are processed automatically, and even including automotive response to some candidates. Beside, more experts could participate in the recruitment process without technique barriers. An information platform on recruitment could be created by computer-based technology, and it will be a communication channel between members of recruiting board. Moreover, the E-recruitment activities will be not only limited internally using computer-based technologies. The external partners and customers could get involved within the e-recruitment as well. However, the e-recruitment systems is still "at this stage mainly used for tacking, forting, and categorizing applicants, as well as informing them whether they are of any interest for the organization or not"(Holm, 2009, p.55). From this point of view, the current e-recruitment system is at least able to benefit organizations on administrating the applicants' information.

1.2. Existing E-recruitment approaches

1.2.1. Two types of E-recruitment

- Internal E-recruitment

The internal E-recruitment means that the organizations use their own online systems to publish the job vacancies and receive resumes (Mohamed et al., 2001). Nowadays, it is common that online recruiting is embedded within organizational websites (Cronin et al., 2006). The positive side of internal e-recruitment is the convenience. As long as the organizations have corporate website, information about job opening could be published on the website immediately. The negative side of internal e-recruitment is that there is no precognition on result of recruitment, since the amount of received resumes depends largely on visiting rate of corporate websites. The job advertisements would be seen by a large number of people only when there are enough numbers of visits to the corporate website, and part of these people may be the potential candidates who would send resumes to the organizations. Therefore, the e-recruitment approach on using corporate website is preferred to be utilized by well known organizations, because their web pages have high visiting rate and easy to be located by applicants (Mohamed et al., 2001; Puck & Paul, 2009). Another reason whether or not employers use corporate website for recruiting purposes depends on companies' competitors (Ettinger et al., 2009). To be competitive on recruitment, a candidate has to perform better or at least equal performance comparing with their competitors. Besides, the result of internal e-recruitment depends on the extent that target job seekers have adopted this method. If target job seekers don't check the corporate website on looking for job positions, organizations may not able to recruit them through internal

e-recruitment approach.

- External E-recruitment

The external e-recruitment includes advertising vacancies on the Internet by using specialized recruitment sites to dedicate the job openings. These sites function mainly as the databases managing job vacancies (Mohamed et al., 2001). Depending on the type of job, the commercial sites could classify as general job boards, specialized niche job sites and etc (Ettinger et al., 2009). There are quite a number of such specialized recruitment sites. For instance, www.monster.com is a commercial e-recruitment site with national coverage without any specialized employment field. For the specialized niche job sites, it may have focus on specific industry or city, or on minority or women candidates (Mohamed et al., 2001). http://itjobs.com.au/ is a dynamic new website dedicated to IT recruitment. http://job120.com.cn/ is a Chinese commercial site for job vacancies within medical and public health industry. http://www.ethnicjobsite.co.uk/ is a site created for challenge on unequal employment opportunities for ethnic minority groups in UK.

The recruitment sites are only one approach of the external e-recruitment. The chat rooms and newsgroups on networks, and personnel placement services are used as external e-recruitment (Ettinger et al., 2009). For instance, some HR managers create online chat rooms, and potential candidates could communicate with formal employees, so potential candidates could have direct understanding about the company on culture, environment and other aspects before they work in the organizations, and create a strong sense of belonging and connection with the team. Sometimes, organizations may not assign the recruitment tasks to their own staffs. Instead, they set contracts with professional intermediaries, who will charge the responsibility on recruitment. The intermediaries provide services on personnel placement, so that the organizations could select potential employees from candidate pool they provided. If intermediaries use computer-based technology on recruitment, it would also be a case of external e-recruitment application.

1.2.2. Strategic choices in internet recruitment approaches

The recruitment and organizational strategy must be aligned so as to realize optimal results, and the technology in recruitment is used to complement and reinforce overall strategy (Singh & Finn, 2003). Therefore, the managers should be aware that the adopted E-recruitment approaches in practice should be consistent with the general organizational strategies as well as the purpose of the recruitment. Depending on the organizational capabilities and the financial strategy, the managers and recruiters can decide whether using outside assistance to develop online recruitment (Cronin et al., 2006). For instance, when the intent is on cost reduction, they may choose more economic approach, such as only use internet corporate website for posting job openings. When the objective is to improve the performance, multiple choices on recruitment approaches is more likely to occur.

The size of firm is one important factor for recruitment activities (Barber et al. 1999). And managers may make their choices on which type of E-recruitment approaches they are going to

use in recruitment. Commercial job boards should benefit small and medium sized companies, which usually encounter low level traffic visits to their homepages (Puck & Paul, 2009). It will be much easier and cheaper to use commercial recruitment website on advertising job opening. Meanwhile, since large firms typically have more job vacancies than small firms and therefore hire larger numbers of candidates, the large companies can benefit from careful and customized development of their own system, whereas smaller companies and those who do less hiring may benefit more from buying commercial applicants (Mohamed et al., 2001). However, Smith and Rupp (2004) present different opinion that post employment opportunities on company's website is extremely cost-effective for small to medium-sized companies. More important, attracting traffic to the website will be extra positive consequence on using internal approach, and are able to benefit for other purposes, such as company popularity (Smith & Rupp, 2004, p. 68). The problem is, for small and medium-sized companies, the low traffic of websites may induce the results of recruitment becoming not as good as expected. Cost is still one of the main obstacles preventing small companies from designing and maintaining their own websites (Hausdorf and Duncan, 2004). And it is not worthy that they invest an amount of money on building corporate website whereas not many people utilize website on job applications or even look through the site. Therefore, small and medium sized companies could use corporate website as complementary approach on recruiting, and expect more resumes from professional job boards. Meanwhile, for larger firms, internal corporate website and external online recruiting are both effective on attracting candidates. The corporate website contains much more information about the organization than in commercial job board, which helps applicants have better understanding about the corporate, and they may evaluate whether they fit with the organization from multiple perspective, such as the organization culture (Mohamed et al., 2001). However, according to Hausdorf and Duncan's research finding (2004), the differences in recruitment activities between small and large firms are reduced within the use of Internet in recruiting. The approaches that firms use to advertise for job positions are regardless of their size. In fact, for the use of corporate sites, the small firms that had websites used these sites to the same extent as large firms.

1.2.3. Weakness of exiting E-recruitment approaches

In general, the current e-recruitment applications are mainly internal and external approaches. In practice, it is very much depending on existing organizational systems and culture. The organizations could make use of either internal e-recruitment approach or external one during the recruitment practices, and of course they may use hybrid approaches for recruitment. As mentioned earlier, each approach has its specific effects on recruitment and different effects on result of e-recruitment. Therefore, the result of e-recruitment will depend largely on the way an organization making use of these approaches.

The current e-recruitment approaches limit the outcome of recruitment. In internal e-recruitment approach, the organizations are only waiting to be connected by applicants, but not chasing the target persons. It is same when using commercial job boards within external e-recruitment approach. Organizations will be communicated by job seekers when the job advertisements have been seen by them. Organizations are being too passive during these two situations. It may be

argued that using chat rooms and intermediaries are not passive applications because organizations take initiatives on making connections with potential candidates. We have to say it is true, but these initiative actions are not going to alter the situation that organizations are being at weak side of recruitment.

The success level of chat rooms is depending on whether target potential employees are participators of the online communications, and whether they would make positive decision on applying the job vacancies by using this approach. Therefore, organizations don't have many influences on the effect of chat rooms application, because users (potential candidates) are in charge of outcomes, and organizations could only accept the result.

As the application on using intermediaries, convenient and efficient is the reason that organization using this approach. However, organizations are in a passive position on this E-recruitment approach, because their selections have to base on the intermediaries' recruiting outcomes. Organizations could only select candidates within the provided applicant pool defined by intermediaries. Therefore, the result of recruitment is depending on the quality of e-recruiting service intermediaries. For instance, if Intermediaries do not keep the applicants profiles up-to-date, serious circumstances might be caused consequently.

In summary, the organizations are not in an active position within the personnel selection and recruitment, no matter which combinations of E-recruitment approaches are used for the actual recruitment. The organizations could be active on choosing methods on doing E-recruitment, but they are in a passive position on receiving the outcome of E-recruitment produced by chosen methods.

1.3. The E-recruitment' outcome

As mentioned, the organizations are only able to passively accept the outcome of the chosen E-recruitment approaches. Therefore, there are some complaints about the outcomes of E-recruitment. The average quality of candidates is much lower than employers' expectation (Chapman & Webster, 2003). With low quality on candidate pool, the employers could only choose a comparative suitable employee within it, but these persons may not be satisfactory for the job positions. Moreover, the current employee selection in terms of resumes, interviews, job applications, and many other forms do not reflect "typical" behaviors, as a certain element of self-representation included is presenting the "maximal" work performance (Kluemper & Rosen, 2009). In turn, the managers are not able to acquire the accurate description of potential candidates with current E-recruitment approaches. The managers need to recruit the potential employees with high "potential fit" level, and then they are able to retain people longer within the organization (Singh & Finn, 2003).

1.4. Internet recruiting

We have introduced two types of E-recruitment in the previous sections. Internal and external approaches mainly rely on Internet for recruitment, such as using corporate website and commercial sites, but some approaches may not, such as supported intermediaries. The Internet recruiting is only the act of scouring the Internet to locate both actively-searching job seekers and also individuals who are content in their current position (these are called "passive candidates").

In accordance with this classification, there are two orders of recruiting as well. Posting vacancy advertisements on the Internet to initiate applicant response, and companies wait until being contacted, are also known as pull recruiting (Mohamed et al., 2001). Pull recruiting mainly attract the individuals who are in high activity-level are very anxious on finding jobs. This group of people is more likely to send their resumes to companies, build their online profiles, and take whatever needed to get an opportunity. And the existing E-recruitment approaches with Internet have no difficulty on recruiting active job seekers.

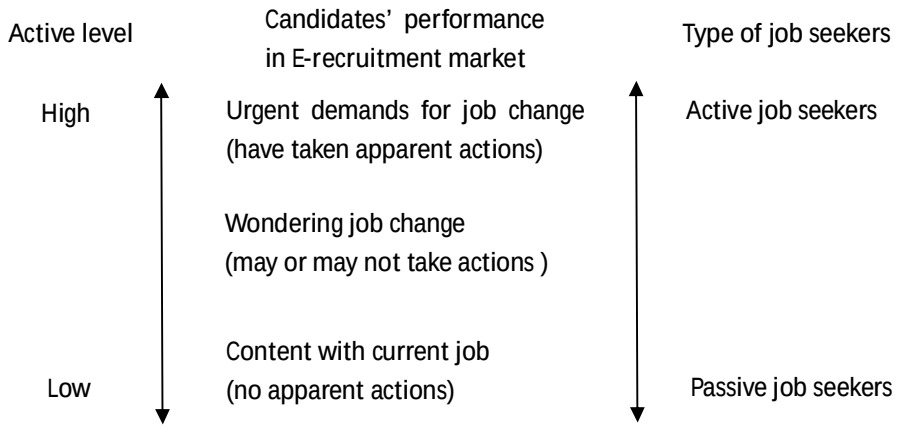

Figure 1. The different performance of job seekers in E-recruitment market

The other recruiting order is called the push recruiting, where organization takes the initiative and contacts individual. It involves searching and contacting potential applicants on the Internet who may or may not have been looking for employment (Mohamed et al., 2001), so called the passive job seekers. As shown in Figure 1, the individuals could be in the situation that "wondering job change" but may not start yet, or still satisfied with their current job. The individuals in both situations have lower level activities on job seeking than individuals who recruited from pull recruiting. The group of individuals who are "wondering job change" may take some actions on seeking jobs but not completely put into it. For instance, they may only create their online profiles with information required for job vacancies, but they don't actually contact with companies. There is a situation that individuals who are content with current job don't take actions on employment searching, and they are in a low active level on job seeking. These individuals are not easy to be identified by current Internet recruiting because they may not have any online profiles or updating information.

We have demonstrated that current E-recruitment approaches are very passive on locating the potential candidates for organizations. The main reason is that current approaches are only able to locate the actively-searching job seekers, and individuals who have high active performance on seeking jobs. Only when individuals have already post their resumes online or send applications to organizations, they are able to be located by current e-recruitment approaches. When they are not visible on HR market, it is very difficult to locate them by organizations.

The Internet recruiting is a type of E-recruitment that largely relies on Internet technologies. It can be seen as such that the Internet recruiting is a cluster of e-recruitment approaches which using Internet as the primary channel to identify and select potential candidates for organizations. Nowadays, Internet recruiting is developing very fast because more and more companies and applicants are becoming “clients” of it (Chapman & Webster, 2003).

Internet has so many advantages that more and more people use internet to recruit employees. First of all, Internet is a low cost application and has worldwide accessibility, which means internet recruitment could be used by a huge amount people at anytime and anywhere, and also the cost of Internet recruiting could be acceptable as well. Besides these, Internet recruiting advances on response time and range of applicants as well (Puck & Paul, 2009; Rao, 2009). Thirdly, range of applicants is been abroad by internet (Puck & Paul, 2009; Rao, 2009; Smith & Rupp, 2004). Recruiters could benefit from Internet recruiting by tapping a huge talent beyond their own national boundaries with cognitive diversity from every company (Puck & Paul, 2009). Fourthly, some Internet related technologies are able provide very sufficient supplementary information about recruitment. For instance, employers would recognize number of people who may be interested in online posted jobs through number of visits to the websites, clicks on published job ads, page impression, and etc (Ettinger et al., 2009). However, internet also has some disadvantages. Recruiting may not be as smooth development as we assumed. According to Singh & Finn (2003), succeed job applicant from internet is only 20%. Not to mention with security concerns and fear of losing resumes in cyberspace, still 35% large corporation required applicants to fax or mail their resumes (Mohamed et al., 2001, p.517).

1.5. Status quo and outcome of Internet recruiting

Looking backwards to 2001, already 90% of large US companies recruited via the Internet (Capelli, 2001). This proportion among Fortune companies is even higher. According to Lee (2005), the recruiters from 96 of the Fortune 100 companies are customers of at least one external e-recruiting service. However, smaller companies may not use and invest on Internet recruiting as much as larger companies (Singh & Finn, 2003). Nevertheless, Internet recruiting is becoming a very favorable tool by recruiters. Bartram (2000) did a survey over 1000 organizations about the used status of Internet recruiting, and found out that up to 20% of their workforce is a direct result of Internet recruiting, more than 80% companies had career sites on their homepage and about 35% of the companies with more than 10,000 employees had at least one dedicated Internet recruiter. Earlier research also confirmed the situation that more and more companies

are users of Internet recruiting, because the numbers of jobs found were clearly grater in the internet-based conditions than in the traditional search condition (Van Rooy et al., 2003).

There are several reasons behind the fact that Internet recruiting is being accepted by more and more organizations. One is that more people are looking for jobs through internet. Until 2004, there have been about 18 million applicants posting their resumes on internet portals such as Monster.com for finding jobs (Smith & Rupp, 2004). Meanwhile, the college student is a group who extremely welcome internet recruiting. According to SBC internet services (cited in CyberAtlas, 1999d), even 10 years ago, 82% of college students in the US who are due to graduate 1999 summer will use the Internet to search for job openings, and 66% of them will use e-mail to send their applications, and through an online job service as well. The same survey also found that 75% of 1999 graduates will use the internet to research a specific job or career and 79% will use it to research prospective employers.

In general, Internet recruiting has been widespread among organizations and applicants. During the Internet recruitment, organizations already have some basic knowledge and usage experiences on computer-based and Internet related technologies. Meanwhile, it will be no problems on locating enough number of individuals from the Internet. However, reaching a consistent set of quality candidates online is a goal that is being realized by most organizational users (Bartram, 2000). However, low quality of candidates is the most apparent disadvantages of Internet recruiting currently and possibly will slow down the development of E-recruitment. Moreover, current Internet recruiting approaches land employers in a passive position on locating the candidates. Nevertheless, the usage of Internet recruiting is still growing. In order to improve the situation of Internet recruiting, we would like to launch an Internet technology, which could work on the difficulties.

1.6. Useful Internet related technology

Using the Web 2.0 is a current tendency on Internet recruiting development. O'Reilly (2005) presents Web 2.0 as a new generation in the development of the World Wide Web, superseding the predominantly publishing model of many web-based information applications and services. With Web 2.0, the use of the Web can be characterized as the decentralization of website content, which is generated from the 'bottom-up', with many users being contributors and producers of information, as well as the traditional consumers. Web 2.0 tries to tap the power of humans and look at social collaboration in electronically by associated with web applications that facilitate interactive information sharing, interoperability, user-centered design, and collaboration on the World Wide Web. Therefore, Web 2.0 could be considered as a platform for the evolution of social network, and some Web 2.0 concepts have been developed on creating and sustaining online social network and utilizing people collective strengths (Kaplan & Haenlein, 2010; Dasgupta & Dasgupta, 2009):

- Blogs: Blogs provide an online social network for users to express their thoughts, and help in generation and discussion of topics.

- Social networking sites (such as Facebook): social networking sites are text- based online spaces formed by a group of individuals to share their thoughts, ideas and have a variety of tools to promote social networking.
- Content communities (such as video-sharing sites): facilities helps users to send their media files and related content online in order to make other people within network see and contribute on it.
- Collaborative projects (such as Wikipedia): a Wiki is a website that allows the easy creation and editing of any number of interlinked web pages on a particular subject via a web browser. Wikis allow users to share content.

Individuals contribute on providing an ideal platform that helps Social Networks to grow (Dasgupta & Dasgupta, 2009). They usually use Web 2.0 concepts and create social networks from the reason that they have a set of common interests and activities, or are interested in exploring the interests and activities of others, such as, performance of tastes (favorite music, books, film, etc) (Kluemper & Rosen, 2010).

A magic of Web 2.0 technologies is its ability to create new relationships between collaborators (employers and applicants) and information (Giraed & Fallery, 2009; Dasgupta & Dasgupta, 2009). The employers and applicants are connected with close relationships within the online social communities. And it enables recruiters to see the applicant from a different perspective (Giraed & Fallery, 2009). The information uploaded by applicants within Web 2.0 applications is accessible for employers. To some extent, applicants' writing skills, job experiences, or a variety of knowledge, skills, and abilities would be contained. And this information could be used on assessment of personality, intelligence, and a global measure of performance (Kluemper & Rosen, 2009). For instance, if candidates show a positive life attitude within their blogs' text, there is big chance that they will be serious for their job. From their friend circle or information about private life, it can also tell the information about their personality.

Therefore, employers are able to locate the potential employees from Web 2.0 applications by making use of this information, and evaluate the quality of identified individuals. All the employers need to do is to summarize useful information from Web 2.0 applications. In sum, the Web 2.0 is a very important Internet technology that let employers become active on recruitment, and be able to enhance the quality of applicant pool.

1.7. Research rationale

There are many E-recruitment approaches which organizations can use to locate the qualified employees, while most individuals who located by current approaches are active job seekers. We have to admit that some candidates who provided by intermediaries may not be active job seekers, and was located by intermediaries manually. Nevertheless, current approaches could not help on locating the candidates who don't actively look for jobs, because in most time, employers are very inactive on employees' selection. They are waiting to be connected by applicants, and only able to make selection basing on offered applicant pool. Neither internal E-recruitment

approaches nor external E-recruitment approaches are providing organizations enough opportunities to take initiatives during the recruitment. Consequence, the result of E-recruitment by using existing approaches is becoming not as good as expected. Employers have common complaints about candidates and Internet recruiting. They don't satisfy with the quality of candidates. Especially, they believe the amount of high quality candidates are not enough, which make them lack of choice on selection. Moreover, they believe the information to be used on individual evaluation is limited, and they would like to have more individuals' information for pre-screening and decision making.

The internet recruiting lay emphasis on the effect how Internet related technologies could support the E-recruitment. And by using Web 2.0 technologies, employers are having a new relationship with potential candidates. Employers could be active on chasing the potential candidates instead of passive waiting. However, current Internet recruiting approaches are not actually making use of this new development on technologies. Therefore, the target of thesis is to design a new Web 2.0 technologies based solutions on catching the job candidates from Internet recruiting. The procedure on proposing this solution will be in five steps. Firstly, we will go through the relevant literature, and seek out what are professionals' expectations for improved Internet recruiting and Web 2.0 technologies. Secondly, we arrange face to face interviews with three experts from companies within different industries, and as I know, they are very representative Internet recruiting users in China. We would like to use the information from the Interviews to enlarge the list of requirements we identified from the professionals in step two, and evaluate these requirements as well. Thirdly, we will propose our suggestions on how Internet recruiting should be improved, especially how Internet related technologies including Web 2.0 technologies could be utilized on supporting on talent catching. Next, we will use an example to demonstrate how our solution works. Finally, we will have a discussion on how our Web 2.0 technology-based solution would contribute theoretically and practically comparing to the current Internet solutions, and give our suggestions on further research.

2. Strengths & weaknesses of existing Internet recruiting

2.1. E-recruitment process

Nowadays, papery medium is still very popular among companies on publishing job opening. Meanwhile, E-recruitment is going to be accepted by more and more company. There is one important reason that these two recruitment approaches could both exist as same time, which is no matter the recruitment with traditional papery medium, or e-recruitment using high technology, the general recruitment process is same. They both include four main phases, which are recruitment preparation, attracting candidates, receiving & processing candidates, and final selection & hiring employees. However, the E-recruitment approaches we talked about here are still the existing passive internal and external approaches. Since we are going to propose the suggestion that employers could take initiatives on recruitment, we will also show the differences between active E-recruitment processes with current passive processes.

(1) Preparation:

The preparation process starts with the discovery of what a company's future personnel requirements will be (Maier et al., 2009). Company may initiate the recruitment by the reason that they are not satisfied with the current business performance, and would like to stimulate the marketing development by introducing new employees. After that, the manager and recruiter could define hiring needs by carefully analyzing and identifying the knowledge, skills, ability, and experience required to effectively performing the job (Singh & Finn, 2003; Holm, 2009). The criteria for new employees are customized in terms of job descriptions. For instance, organizations may set one of obligatory prerequisite for a marketing manager is at least five years marketing experience. It is wise that recruiters are thoughtful and careful during the preparation phase. Otherwise, company will recruit the wrong type of numbers of people by reason of ineffective plans (Singh & Finn, 2003). This would be the situation for existing E-recruitment approaches. When the target of recruitment is to identify the passive applicants within Web 2.0 applications, some additional preparations on defining criteria will be needed. In the Web 2.0 applications, users may use different expressions on describing same issues. For instance, to describe the skills level, both "skilled" and "practiced" could be used by applicants. If recruiters use the inappropriate or unfamiliar phrases on searching the candidates from Web 2.0 applications, the result will be very different. Therefore, the result of push recruiting will be partial depending on the preparation of key words used on searching. In the later chapter, there will be more explanation on key words.

(2) Attraction (Bartram, 2000; Holm, 2009):

In the current E-recruitment approaches, the main purpose of attraction is to draw people into a large applicant pool (Bartram, 2000). Companies publish their need for new personnel including the skills that the new personnel must have on job advertisement (Maier et al., 2009). Active job-seekers can search through an online database and submit their applications directly (Maier et al., 2009). Within circumstance of Internet recruiting, organizations have more channels on distributing information about recruitment beyond the traditional papery one. The typical Internet approaches would be using internal and external E-recruitment approaches mentioned in chapter one. In the push Internet recruiting, even organizations taking the initiatives on locating the potential candidates, the purpose of this process is still to identify more people into an applicant pool. In this thesis, we are going to utilize the Web 2.0 applications to develop the push recruiting. With our solution, Web 2.0 applications could help organizations attract an expanding applicant pool only with high quality candidates.

The key of "attraction" is to make sure that the job advertisements would reach the target candidates. It is important for the recruiters to pay attention to choosing the appropriate approach for specific recruitments. As mentioned earlier, based on the factors of business type, company size and etc., the recruiters should have different strategies on choosing E-recruitment approaches for attracting high quality applicants. However, there is no such problem in push recruiting approach. The organizations are not going to wait for being contacted by candidate. Instead, they will actively search for the candidate from the Web 2.0 applications.

(3) Receiving & Processing (Bartram, 2000; Holm, 2009; Maier et al., 2009; Singh & Finn, 2003):
No matter whether an organization passively receive resumes from applicants or aggressively searching them from Internet, processing of their information would always be necessary. In the processing procedure, the first step is to evaluate the applications and do initial interviews (Maier et al., 2009), so that the application numbers would be cut down by filtering out those who fail to meet key criteria (Bartram, 2000). With short-listing candidates, the meeting, testing and interviewing with candidates will be hold (Holm, 2009). For an effective recruitment, organizations should end up processing and selecting with people who are the best on the market (Singh & Finn, 2003). Therefore, it is better to acquire the relatively comprehensive understanding of candidates as reference for making final selection. As we mentioned before, organizations complaint that they don't have enough information to make their selection decision, one of important purposes of our solution is to collect more information for profiling the candidates.

(4) Final selection and hiring (Bartram, 2000; Maier et al., 2009; Holm, 2009):
Wit h more detailed selecting criteria, a company could make final decision from the remaining candidates (Bartram, 2000). In order to make sure the recruitment process reaches a conclusion that is satisfactory for both parties, the organization may need to negotiate a contract with the chosen candidate. (Maier et al., 2009; Holm, 2009).

2.2. Advantages and disadvantages of Internet recruiting

2.2.1. Advantages

1. Larger applicant pool (Chapman & Webster, 2003; Ettinger et al, 2009; Mohamed et al., 2001Singh & Finn, 2003; Wolters, 2006;) and better quality of responses (Ettinger et al, 2009; Wolters, 2006):

An expanding applicant pool means that employers could reach a wider range of applicants from a larger geographical area (Chapman & Webster, 2003). With a larger pool of possible candidates, employers could select from a wider room than before, which is a partial reason that staffing quality has been improved (Ettinger et al, 2009). Another reason is, more precise job ad descriptions could be published on Internet websites compared to newspapers (Ettinger et al, 2009). Applicants could get a straightforward comprehension for certain open positions, and send their resumes to exactly ones that they are competent for.

An expanded applicant pool has effect on reducing adverse impact for protected groups. Some technology-based tools are able to make HR staff process more information than before (Chapman & Webster, 2003). The direct outcome would be an increasing overall number of applicants. According to the survey data from Chapman & Webster (2003), using internet related technologies on recruitment did not appear to be having a detrimental effect on the number of minority applicants applying for jobs. Actually, HR manager hire more minority applicants as a result of adopting an online application procedure. With an increasing overall number of applicants, a higher number of minority applicants who met companies' cutoffs and are able to fill more positions. Therefore, there is higher numbers of minority applicants, such as women or minority races, who are recruited by company. However, Stone and his colleagues (2006) argued that situation is not as optimistic as we thought, because individual differences always have influence on acceptance and use of e-recruiting systems. For instance, women are less likely to use web-based recruiting systems than are men, so it is less likely that they will be hired than men. Moreover, e-recruiting is less likely to be used by older, less well-educated, or members of ethnic minority groups than those who are young, highly educated, white job candidates.

2. Increased amount of relevant information (Stone et al., 2006)

In traditional recruitment using newspaper, very limited amount of information could be presented. The web-based advertisements contain much more amount of information, usually including the job vacancies, job descriptions, the organization's culture as well as its "brand identity", and the inducements (e.g., pay, fringe benefits, learning opportunities, promotion prospects). The applicants don't need to search relevant information by themselves, because the eHR-based recruiting systems reach a much wider set of prospects than traditional recruiting systems (Stone et al., 2006). Besides, the e-recruitment will provide more opportunities for job applicants on having virtual previews of organizations. Some companies (e.g. Cisco Systems, T-Mobile) give job applicants the opportunities to "make friends in the organization". Applicants may feel like working in company already, and could gather considerable information about the benefits and challenges of working for the organization. This relevant information could help

applicants on making their decision on whether apply and accept job position.

3. Recruitment time reduction (Singh & Finn, 2003; Wolters, 2006; Ettinger et al, 2009; Mohamed et al, 2001):

The Internet recruiting system, acting as virtual labor market intermediaries, are often connected to external online job and CV databases available on 24/7 basis (Holm, 2009). Under this circumstance, there is no need for middlemen anymore (Singh & Finn, 2003). Once vacant positions posted online, it could be filled as quickly as possible (Jansen et al., 2009; Puck & Paul, 2009). Within recruitment system, there is function named Smart agents, which are searching tools using a number of selection criteria (Wolters, 2006), and the time for locating potential applicants gets less than before. Moreover, comparing with traditional assessment approach by using paper and pencil, online technology could make testing efficient and convenient by reason that the online assessment is ease in scheduling and tracking, and have faster knowledge of assessment results (Cronin et al., 2006; Crespin and Austin, 2002). According to Cober et al., (2000), recruitment using Internet has afforded organizations the opportunity to reduce the recruitment and selection cycle time by up to 25%.

4. Cost saving (Chapman & Webster, 2003; Singh & Finn, 2003; Puck & Paul, 2009; Ettinger et al., 2009; Wolters, 2006; Pfieffelmann et al., 2010):

One of the biggest cost saving is on advertisement. Harris and Dewar (2001) estimated that the average cost per hire using traditional advertising is $3,295 versus $ 377 using Internet advertising. Companies have reported savings of 95% when changing from traditional to online recruiting sources (Pfieffelmann et al., 2010). Besides, more and more employers are apt to use automating processes for improving the efficiency of the hiring system (Chapman & Webster, 2003). Because it is less period and less mistakes, organization would save time and human resource on doing it comparing to manual operation. In a long term perspective, automation by using machine is much cost effective than using people manually on same specific functions. Computer does better on automatic screening and filtering of applications (Wolters, 2006). Further, to some extent, online assessment saves cost as well, such as reduction on printing and shipping costs (Crespin and Austin, 2002).

5. Equal opportunities (Van Rooy et al., 2003)

Job advertisements have equal opportunities to be known by the potential application in Internet environment. With well-designed search engines, applicants have same opportunities on be aware of the job openings, and on finding the job positions that fit their requirements. It has same situation with their online resumes. With similar content, applicants' profiles have same opportunities to be seen by organizations.

6. More specified search result from Internet recruiting (Van Rooy et al., 2003)

In traditional way of recruitment, most operations are based on the print material. The job opening is announced on paper media. The resumes send to employers are all in papery version. It is not difficult to image how thorny to find the exact and specified results are. However, with the help of Internet, the situation is becoming completely different. The time and expense spend on manual filters could be alleviated through internet-based technologies. In Internet recruiting,

online job vacancies and digital resumes will be scanned by Key Word Search. With different setting on Key Word, both employers and applicants are able to have the most precise outcomes they need.

7. Improving people' capacity (Singh & Finn, 2003)

"As IT becomes institutionalized in recruiting, the knowledge, skills, and ability levels of recruiting staff will become more oriented to technical expertise, rather than administrative" (Singh & Finn, 2003, p.399). The point of high capability is to stimulate development of Internet recruitment. Recruiting staff is the group of people knows most about the recruitment. If they could consider the problems from both technical and administrative perspectives, it will let them see a big picture and propose an overall solution. Moreover, with wide applications of Internet, recruiting staff and other HR staffs are not the only group of people has responsibility on recruitment and HR functions. Other stakeholders are responsive to recruiting and have power to access to HR data as well. By sharing HR information among organizational members, HR is becoming an embedded function within organizational processes, but an independent function. For this purpose, HR staff should be trained for this requirement as well.

2.2.2. Disadvantages and limitations

1. Disadvantages of Internet recruitment

Lack of information completeness (Jansen et al., 2009) is one of main reasons that applicants may fail on applying jobs. By using electronic recruiting, neither the company nor the job applicant can generate sufficient valid information (Puck & Paul, 2009). For instance, applicants won't know whether all the offers are there, or if they are missing something (Jansen et al., 2009). Another example of lack of information richness is applicants also cannot know what the company is about and the people who work there from an Internet site (Jansen et al., 2009). Sometimes, it appears bad or wrong matches between job and applicant, because sometimes job descriptions might not be understood correctly by applicants (Jansen et al., 2009). For the applicants who use commercial websites like Monster.com would have this problem. It is possible that during the interview, applicants could find out the job position or the organization is not like they thought. In general, the negative effect of Internet recruitment is lack of explanation information from applicants' side. There is also negative consequence in employers' side. The sourcing for recruiters to collect candidates' information is very limited in current Internet recruiting. If recruiters are passively receiving the resumes from candidates, the best they could know about candidates is information within their resumes. If recruiters search candidates from commercial websites, the information in online resume is also only they could look through. Therefore, we may have this requirement:

- *Requirement: Improved Internet recruiting should have multiple information sourcing.*

Cheating is a problem that could not be avoided completely (Chapman & Webster, 2003). Resumes sometimes could not be fully trusted because applicants may not be telling the truth about their ability or background (Mohamed et al., 2001, p.519). To some extent, the applicants

who cheat on resumes or are unqualified could be ruled out by testing for cognitive ability, knowledge, and etc (Chapman & Webster, 2003). However, not all of lies could be identified through the assessment or further in-depth interview. For instance, if company uses online computer-based testing for cognitive ability, knowledge, etc of applicants. When the individual who does test is not really the applicant and is a hired expert. Or copies of answer are shared among applicants. Under this situation, the assessment will be failed on distinguishing the truth and lies. Moreover, using assessment on inspecting flam is such a waste of resources, when resources could be used on other areas, such as chasing for more talents from market. The in-depth interview also cannot ensure the all accurate background of applicant is present, when applicants really know how to demonstrate their advantages. Therefore, the requirement will be:

- *Requirement: In Internet recruiting, it should be function on confirmation of the trustworthiness of resumes.*

E-recruiting is less beneficial on passive job seekers (Cronin et al., 2006; Singh & Finn, 2003), and have negative effect on candidate quality. Since the quality of candidates is not going to be simply improved by expanded applicant pool, it would be very necessary to figure out the way to develop this situation. As we said, HR managers should not be content with the situation on waiting contacted by applicants any more. They have to be more aggressive on recruiting high quality candidates; otherwise, they will lose their competitive on market because their competitors may acquire more talents than they are. The solution for company is that they have to take initiative on locating the qualified candidates as much as they can. In fact, the candidates from received resumes are only a small partial of target people. Most target people are still outside the company. The point on improving human resource quality is to locate these passive seekers. However, if the best possible employees do not post their resumes on job boards; or they already have jobs, they will be less facile by Internet (Cronin et al., 2006). Therefore, unlike the active seekers, this group of people who don't volunteer on job searches is not easy to be located by using common internet recruiting approaches. The way to improve Internet recruiting is to locate passive seekers.

- *Requirement: Identify the passive seekers by using improved Internet recruiting.*

To some extent, a loss of personal touch is one of unintended effects of internet recruiting (Chapman & Webster, 2003). HR traditionally prided itself on emphasizing the human element in organizations. However, Internet recruitment has the potential to de-humanize the selection process. For example, since more and more recruitment activities are operated through the high technologies, recruiters will lose much of the face-to-face or at least phone contact they had with applicants in the past.

- *Requirement: Improved Internet recruiting should keep the channel for recruiters on making personal touch with candidates.*

The Internet recruiting may limit staffing quality by reason that actual behavior, appearance and communication skills of the candidates could not be observed via online recruitment

(Ettinger et al., 2009; Jansen et al., 2009). As we mentioned, only with the incomplete or inappropriate profiles are not enough on judging the qualification of candidates. A real and authentic impression of candidates should get from face-to-face interaction, which is a specific and important element for e-recruiting success (Jansen et al., 2009, p.124). In other words, the internet recruiting is making less desirable applicants are easily screened out, and save more "face time" with the best applicants.

- *Requirement: Improved Internet recruiting should be able to provide supplementary information about candidates beyond the resumes.*

Within Internet recruiting, recruiters may use some subjective criteria to select candidates from Internet and do primary election from an applicant pool. And earlier research demonstrates that different recruiting sources may yield different applicant pools in terms of demographic characteristics of Internet recruiting (McManus & Ferguson, 2003). Consequently, the result of searching is much depending on the Key Word they used. The customization on Key Words is need according to recruiters' expectation on applicants. Moreover, using purely demographic criteria and checks on relevant experience may not be enough for selecting candidates any more (Bartram, 2000). Sometimes, in order to make right decision on qualification judgment, the recruiters and managers need integrated information about candidates. For instance, the good educational background doesn't mean that candidates could be competent for any type of job position. Somehow, their personality may be the determinate issue on deciding whether they are qualified or not for certain job. Recruiters would be very appreciating to have structured information about candidates beyond the information from resumes. Therefore, future of searching employees lies in developing structured evaluations and assessments (Bartram, 2000). The question would be what the substances are important for recruiters to check the quality of candidates.

- *Requirement: Improved Internet recruiting has structured function to identify target individuals, especially on background and qualification judgment.*

Research suggested that e-recruiting helps to attract candidates with high levels of drive, previous achievement and work experience (Jattuso & Sinar, 2003; McManus & Ferguson, 2003). However, other studies indicated that e-recruitment systems are more likely to produce candidates who have unfavorable background and are frequent job hoppers (McManus & Ferguson, 2003). Therefore, e-recruitment system should be able to generate favorable candidates and abandon people with unfavorable background.

- *Requirement: improved Internet recruiting should only produce candidates who have favorable backgrounds in terms of companies' circumstances.*

Using external agencies may cause inconvenience. For instance, compared to own company career sites, the information from external agencies may appear less data ownership/flexibility (Ettinger et al., 2009). Sometimes, extra spend may need for internal ICT development in order to link in-house systems to external providers smoothly (Ettinger et al., 2009).

- *Requirement: improved Internet recruiting should be able to have better data ownership and flexibility.*

2. Negative consequences caused by expanding applicant pool:

Expanding applicant pool could cause significant problems. It is common that "large organizations receive thousands of resumes within days of posting a vacancy on the Internet" (Mohamed et al., 2001). Therefore, they "may not have sufficient staff time to review these resumes" (Mohamed et al., 2001, p.518). On the one hand, recruiters have lack of ability on checking the information validity (Wolters, 2006). They won't know if there is cheating happened (Chapman & Webster, 2003). Even these unqualified applicants could be ruled out by further testing for cognitive ability, knowledge, and etc., it still cannot prevent from beginning and will consume resources. On the other hand, large amount of resumes makes difficulties on reaching certain labor groups (Ettinger et al., 2009). During the period of print media, organization would post the advertisement on newspapers or magazines that are popular among the target group. For instance, organizations will choose "Software Test & Performance" magazine, if position is in IT department. Under this circumstance, received resumes would be mostly from people who read the magazine, such as IT staff. Therefore, the chance on recruiting satisfied employee will be much higher.

- *Requirement: Improved Internet recruiting should have solution on locating the target people accordance with the trouble caused by expanding applicant pool.*

3. Disadvantages of using advanced technology

The high technology is time-consuming and expensive. To support the e-recruitment, companies have to invest on updating DB, personal data collection and testimonials control. Do not mention the much recruiting budget will be typically spent on Internet platforms (Ettinger et al., 2009). If recruiters and managers don't have a strong administrative system, they could lose track of e-resumes (Ettinger et al., 2009; Singh & Finn, 2003). For the online assessment, advanced technology could solve problems on the one hand, and cause new problems as well. With increased system requirements, companies could support distance assessment (Cronin et al., 2006), but expenses on system might be over companies' acceptance. Moreover, if there are subgroup differences in access to the on-line assessment (Cronin et al., 2006), extra training may be needed for technicians on operations.

- *Requirement: It should be low cost and straightforward on using improved internet recruiting.*

Table 1. The requirements identified from literature

Requirement a	Improved Internet recruiting has multiple information sourcing.
Requirement b	The validity of resumes should be able to be checked by improved Internet recruiting approach.
Requirement c	Identify the passive seekers by using improved Internet recruiting.
Requirement d	Improved Internet recruiting should keep the channel for recruiters on making personal touch with candidates.

Requirement e	Improved Internet recruiting should be able to provide supplementary information about candidates beyond the resumes.
Requirement f	Improved Internet recruiting has structured criteria on identifying target individuals, especially on background and qualification judgment.
Requirement g	improved Internet recruiting should only produce candidates who have favorable backgrounds in terms of companies' circumstances
Requirement h	Improved Internet recruiting should be able to have better data ownership and flexibility.
Requirement i	Improved Internet recruiting should have solution on locating the target people accordance with the trouble caused by expanding applicant pool.
Requirement j	It should be low cost and straightforward on using improved internet recruiting.

2.3. Requirements from companies

In this part, we will present the information acquired from the face to face interview with company's HR experts. And the purpose of these interviews is to complete the requirements from literatures on how to improve Internet recruiting to be active.

We randomly selected three companies in completely different business industries, and interviewees are employees who work in company over two years. They all have some experiences on e-recruitment. The main content of interview is: (the interview question is listed within appendix.)

- Interview A

Navinfo is a Chinese company with more than 500 employees. With 13 years experience on navigation business, Navinfo is able to producing navigable map and dynamic traffic information service provider in China.

Dr. Yuguo Wang is executive manager of Navinfo in last 8 years, and he accepted our interview request. He told me that Navinfo is a user of Internet recruiting, and they have published their job vacancies on company homepage for many years. And Dr. Wang said, the traditional recruitment approach was their main way for hiring new employees, such as campus recruitment. However, situation was changed until last few years. It is becoming considerable number of digital applications from Internet is send to company instead of papery ones. Therefore, they change the way of receiving the resumes, and only accept digital resumes currently.

Figure 2. Corporate homepage of Navinfo

As Figure 3 shown, it is the description of one job vacancy that is posting on corporate sites, which is named "Marketing Manager". There are other 33 job vacancies currently on the corporate site that could be applied by sending resumes.

Figure 3. Details of a job vacancy in Navinfo

Dr. Yuguo Wang said the most obvious change caused by using Internet recruiting is that his HR staffs have much less workload than before. Since everything is in digital, HR staffs are spending

less time on screening the resumes and making selections.

However, he also has a problem with internet recruiting. Dr. Wang said in his company, some job positions have really high turnover numbers, and it is very normal in Chinese navigation industry. When employees quit the job without any advanced notice, projects will have to be stopped because there is no replacement. Publish the vacancies on corporate website normally cannot solve the problem because it takes time for recruiting procedure. Therefore, he really hopes there is the way to deal with this situation that HR staff could accelerate the speed of recruitment, and be prepared for any emergent situation of employees' selection.

- Interview B

PCCW Limited (Pacific Century CyberWorks) is the holding company of HKT Group Holdings Limited (HKT), Hong Kong's premier telecommunications provider and a world-class player in Information and Communications Technologies. PCCW also holds a majority interest in Pacific Century Premium Developments Limited, and overseas investments including the wholly-owned UK Broadband Limited.

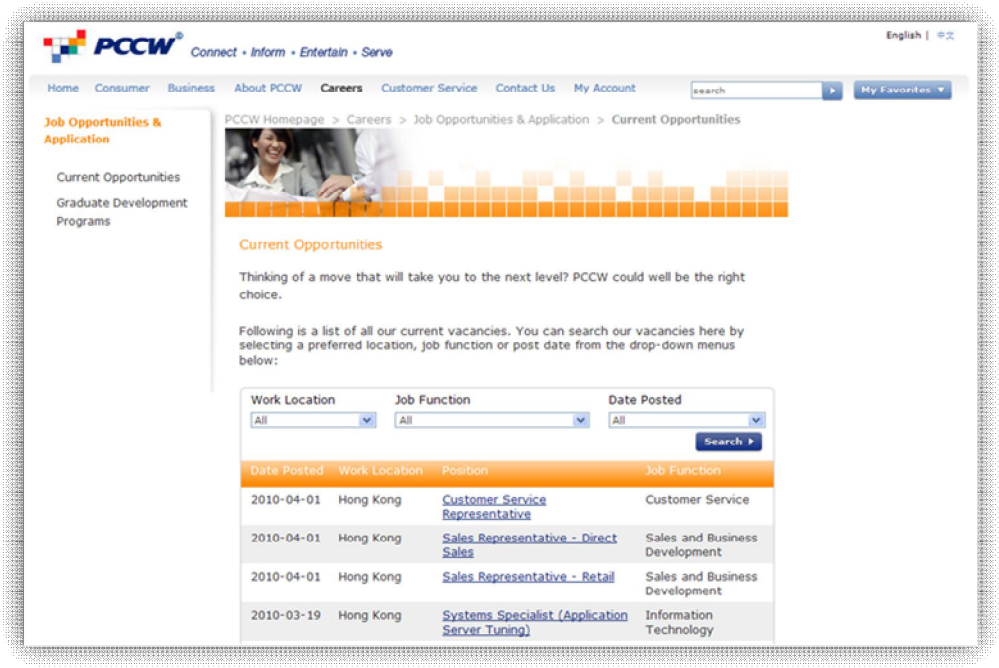

Figure 4. Current job opportunities in PCCW corporate site

Di Wu is a project manager in PCCW Technology (Beijing) Limited. He said, the HR department in his company is only responsible for local low-level and middle-level employees' recruiting and selecting issues. Meanwhile, high level positions within PCCW Technology (Beijing) Limited, such as line manager is normally assigned by Hong Kong. In PCCW, there is over 90% of employees are recruited through Internet, which includes using both corporate website and commercial job boards. Mr. Wu estimated that PCCW will continue on using Internet as main sourcing of recruitment.

Figure 5. PCCW using commercial job boards for job advertisement (http://jobs.chinahr.com/html/2009-12/18/22200100690809000687.htm)

Currently, Mr. Wu is in charge with five employees. All of his team members were identified by Beijing HR department. With a candidates list provided HR recruiters, he may choose employees that he is satisfied with. Mr. Wu thought that average quality of job candidates was increasing. It had more candidates who meet with his criteria. However, it happens that he is not satisfied with any job candidates. If situation of no candidates happened, he could do nothing about it, but only select one candidate who is comparatively suitable with his requirement. He complained that HR staffs sometimes don't really know what kinds of employees he is looking for and could work with, which affect the result of recruitment, and hence the recruitment is in a low efficiency. In sum, his opinion about the recruitment is managers should get involved into recruitment procedure and make contribution on recruitment.

Interview C

The establishment of Beijing Dentsu Advertising Co. LTD. is a joint venture of Dentsu Incorporated from Japan, Chinese International Advertising Co. LTD. and Beijing Dacheng Company in 1994. Dentsu Incorporated is one of the largest advertising agency brands in the world.

Figure 6. Dentsu's homepage

Xiaoning Yang works in Dentsu as a senior recruiter for over 10 years. One of the Dentsu's missions is to chase the most talent advertising workers and hold on to a dominant position among competitors. Therefore, Ms. Yang said Dentsu are using a variety of approaches on "catching" talent from job market. And the usage of Internet does assist her with indentifying individuals who are most favorable for Dentsu, which absolutely improve her work efficiency and quality of candidates.

In Dentsu, most managers in company are Japanese, so the working environment is very much in Japanese style. It is very effective, but employees may feel like in a hierarchical "military camp". Some employees left the company because of pressure. When she is selecting applicants, the compressive capacity is one of important indicators on making decision. She once recruited an applicant who could not stand the pressure caused by Japanese working style, and was fired eventually. Meanwhile, she mentioned that Internet recruiting has been used by company for many years. She normally collects candidates from Internet, such as professional recruiting websites. She said, in order to get a deep understanding about candidates' capacity, especially the compressive capacity, they always arrange some assessment and face to face interview. However, it cost money and is time consuming, moreover, some details may not be implied through test and interview. For instance, once, an applicant had almost perfect performance within test and interview, and fit all criteria of the job vacancy. They were ready to sign contract with him. However, one of her colleague recognized him, said he had drinking issue and was fired by previous company. Xiaoning Yang said she was fortunate that not made the mistake, but she knew it will happen again. She complained that current approaches of Internet recruiting are not able to provide this kind of information, such as personal life. Therefore, Ms. Yang suggested that more channels within Internet recruiting should be created, so recruiters could know more information about the candidates during recruitment or even before the recruitment, such as

their reputation, personality, social life circle, and so on. At the end of interview, Ms. Yang approved the improvement of recruitment caused by Internet, and believed that Internet recruiting will replace the traditional way eventually.

Table 2. Important information from interviews

	Navinfo	PCCW	Dentsu
Use status	mainly use internal corporate website for recruiting;	Using both internal and external Internet recruiting approaches;	Using both internal and external Internet recruiting approaches;
Benefits of online recruiting	his HR staffs have much less workload than before;	Increased average quality of candidates;	Larger number of favorable candidates;
Weaknesses of online recruiting	The operational timeframe is longer than expected;	There is no guarantee that each time of recruitment will have acceptable average quality on candidates;	Lack of knowing candidates information besides the resumes;
Prospects	Navinfo will increase the usage of Internet recruiting;	Internet will be still the main source for recruiting talents;	Internet recruiting will replace the traditional way eventually;
Suggestions (Requirements)	Internet recruitment should be prepared for any emergent recruiting situation.	Managers would like to be involved in recruitment procedure more.	Internet recruiting should have more channels on information collecting.

2.4. The finalized requirements

In this chapter, we explained some detail information about the Internet recruiting by showing the advantages and disadvantages of existing Internet recruiting. With the intention on proposing our solution on improving the push recruiting by using Web 2.0 applications, we summarized some requirements basing on professionals' opinions about the weaknesses of Internet recruiting. These requirements are actually how Internet recruiting supposes to be for chasing the high talent in Web 2.0 environment. Moreover, more suggestions on how to develop the Internet recruiting were collected from three interviews with companies. Their suggestions have contributions on enriching the existing list of requirements (requirement 10 & 11 in table 3). The suggestion from Dentsu on increasing information resourcing chancels confirms the requirement a & b in table 2. As a result, we have a finalized list of requirements.

Table 3. The finalized requirements

Requirement 1	Improved Internet recruiting should have multiple information sourcing for checking resumes validity including applicants' background and reputation

Requirement 2	Identify the passive seekers by using improved Internet recruiting.
Requirement 3	Improved Internet recruiting should keep the channel for recruiters on making personal touch with candidates.
Requirement 4	Improved Internet recruiting should be able to provide supplementary information about candidates beyond the resumes.
Requirement 5	Improved Internet recruiting has structured criteria on identifying target individuals, especially on background and qualification judgment.
Requirement 6	improved Internet recruiting should only produce candidates who have favorable backgrounds in terms of companies' circumstances
Requirement 7	Improved Internet recruiting should be able to have better data ownership and flexibility.
Requirement 8	Improved Internet recruiting should have solution on locating the target people accordance with the trouble caused by expanding applicant pool.
Requirement 9	It should be low cost and straightforward on using improved internet recruiting.
Requirement 10 (from Interview A)	Internet recruitment should be ready for any emergent recruiting situation
Requirement 11 (from Interview B)	From organization's point of view, they would like to be involved in recruitment procedure more.

3. Design a new E-recruitment system

3.1. General idea of solution

The E-recruitment system we proposed is called the Talent tracing and management system. The system could track down the candidates everywhere on the Web from personal Web pages to association sites in order to collect the employees' information by using recruitment sourcing techniques. This system would be very helpful on tracking candidates that companies already have partial information about them from resumes or other sources. In case the companies have totally no information about the candidates, the search still could be carried out from Web 2.0 applications, such as Facebook and LinkedIn (see Figure 7) with relative Key Word (KW). The aim of this approach is to assess and structure information into comprehensive profiles of potential candidates and store the profiles within local DB. The recruiters and managers could later on query this system. Through interface, the users (i.e. recruiters and managers) are able to search, save and look through the candidates' information, and furthermore examine whether and to what extent the candidates potentially fit with company (Singh & Finn, 2003).

The E-recruitment system could use as a web-based prescreening tool to screen the candidates, and only the candidates with valid information could go through to next phase of recruitment. Another purpose is to provide reliable candidates' information for recruiters and managers, and they are able to use it anytime. They may need this information for making the recruiting decision. Therefore, both managers and recruiters are users of the E-recruitment system.

3.2. Function analysis

The function analysis of the proposed system is illustrated in Figure 8. The "received resumes" is one of the main resource information of system. The multiple channels for receiving these resumes are from pull recruitment, such as receiving through organization website or searching from commercial recruiting site. Each main function also compromises a sub-system, which provides different services for Talent tracing and management system. In the first block, the available information within resumes should be cataloged and saved in DB. It is the initial information about talents within the system, and more personnel information will be available from Internet. The design of DB is very important, which decide the overall efficiency of the system. Moreover, the lifecycle of the Talent tracing and management system depends to certain extent on the DB structure, too. DB should not only be designed for current need. With rapid development of Internet, more and more information will be available and useful for system. So a DB without foresight consideration will fail the organizations' needs very soon. Consequently, it requires users of system should have basic knowledge of DB management. Hence, HR managers

may need both administrative and technical ability.

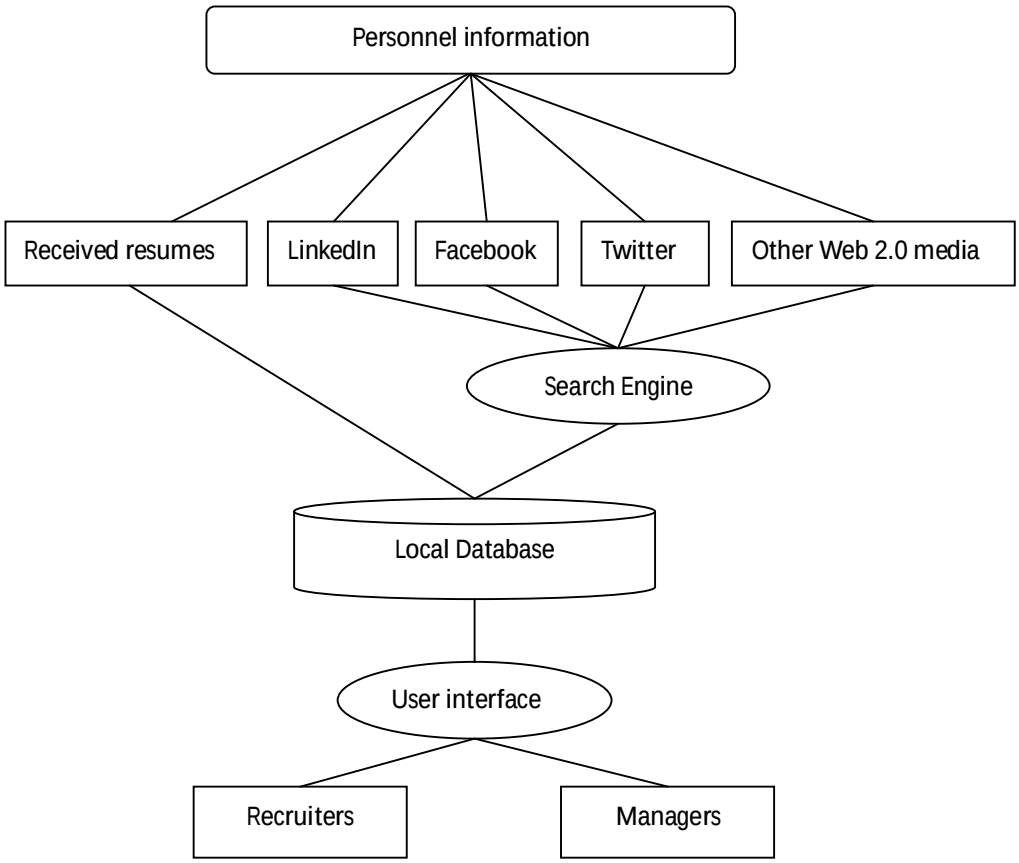

Figure 7. Structure chart of Talent tracing and management system

Based on the criteria provided by managers and recruiters, only a number of candidates from the received resumes will be selected and kept in DB. The system is about to manage personnel who have required capability and skills, so only the talents who are most valuable for organizations will be remained in DB. The recruiters have rich experience on HR recruitment, so they should provide professional opinions on personnel selection. The managers (department managers) know better about what kind of staff they need. Bartram (2000) also suggests that line-managers are involved in determining recruitment criteria 97.4% of the time. Generally, there is no one other people than the recruiters and managers who could be competent on formulating the criteria. It is same reason that recruiters and managers decide the list of KWs will be searched in Internet. They identify the key words according to their personal preference on candidates and received resumes (see Figure 9). The recruiters may not have the technical background for conducting the key words (Mohamed et al., 2001). It will have effects on content of key words if there are incomplete or incorrect understandings on job descriptions. The managers could fix this problem since they know what characteristics of employees are essential for the job vacancies. However, the managers only have local picture about the required employees within own department. The recruiters would see a big picture of recruitment because they cooperate with all departments. Therefore, recruiters and managers could cooperate on making the list of KWs more comprehensiveness and customization because they have different point of view on

recruitment. In short, recruiters and managers are both users and contributors of system.

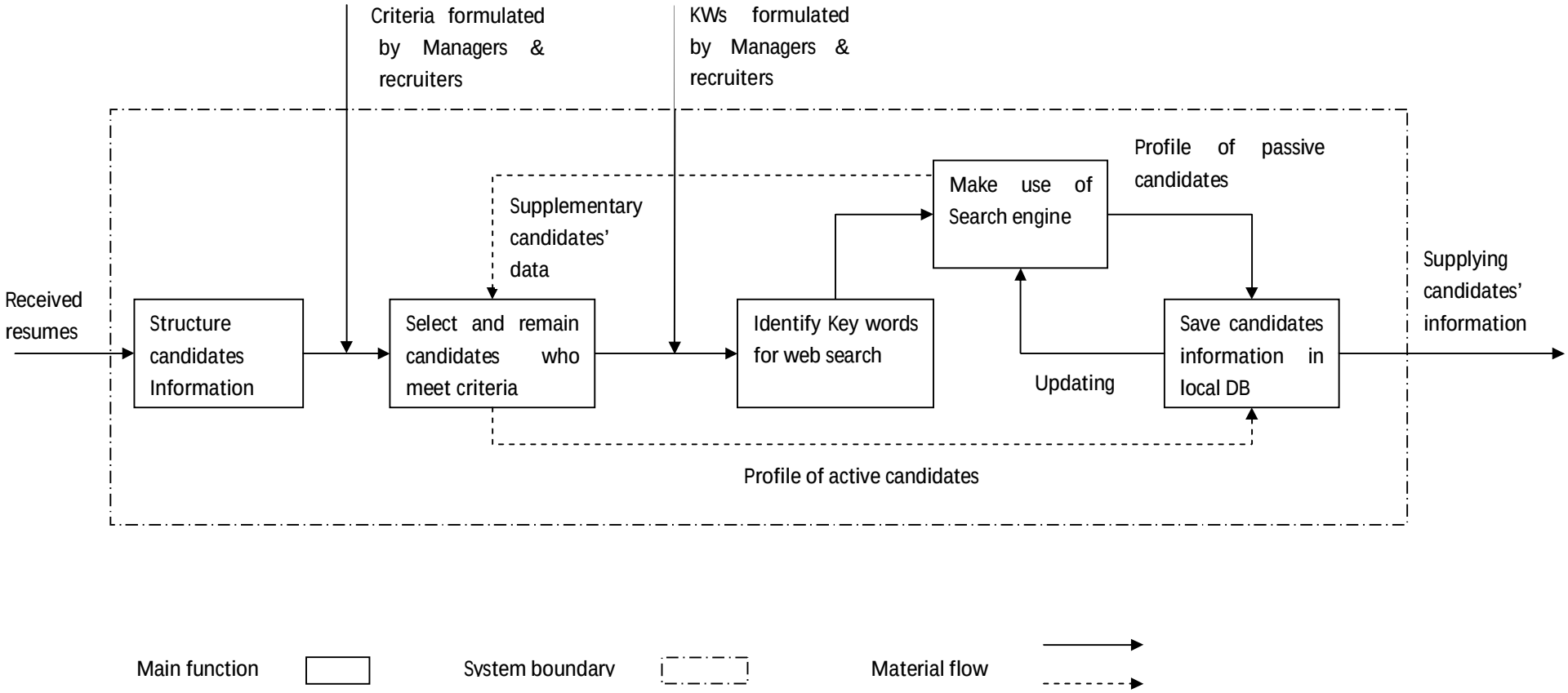

Figure 8. Function analysis of Talent tracing and management system

The next sub-system is to “Identify Key words”. In our case, we describe the key words by two terms, which are “Attributes” and “Values”. “Attribute” is a characteristic of someone or a factor of something. “Value” is a sequence data of “Attribute”. For instance, the “career level” is an example “attribute”, which indicates the skill level of person. Under the “career level”, there could be a sequence “value”, for example ”None of these”, “Entry level”, “Experienced”, “Manager” and so on. Therefore, when line managers and HR staff are identifying the key words, they have to identify both the characteristic and the specific values of this characteristic that they would like to obtain through the Internet.

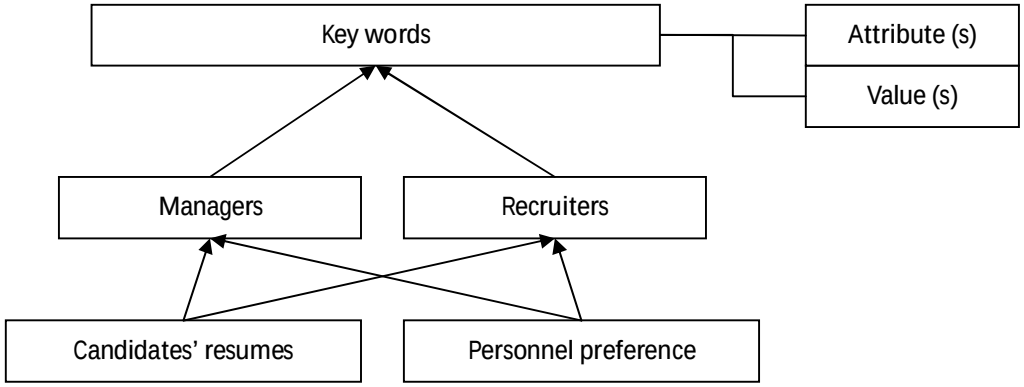

Figure 9. The contents and contributors of Key words

As mentioned earlier, the purposes of our system includes both collecting additional candidates’ information and checking the validity of resumes. Both the managers and recruiters check the candidates’ resumes and decide what extra data they would need from the Internet (see Figure 9). For instance, they are interested in a candidate named Tom Jackson, then “Tom Jackson” would be a value of attribute “Name”. It is possible to search both “Name” and other attributes for getting more explicit data about this person. For instance, value “cum laude” within attribute “Honors & awards” is able to provide the information about how good his performance back to school. It also works when the validity of information has been doubted. When there is no satisfied result within received resumes, the recruiters and managers should identify a series of requirements as key words. For example, there is a marketing manager vacancy in Chinese local office of a Dutch manufactory company. Without any particular interested in anyone, requirements on personnel characteristics could be “language”, “industry”, “education” and “career level”. Under each attribute, it could have one or more values. The example values of “language” could be:”Chinese”, “English” and “Dutch”.

With the identified key words, it is now possible to “make use of search engine” to acquire the candidates’ information. For active candidates with partial information, the acquired information could be used to complete their resumes and create a personnel profile, and then the profile will be saved in local DB. Besides the active candidates, some new candidates, so called passive candidates”, will be located by key words formulated by managers and recruiters. The main purpose of this design is to use push recruiting on locating job candidates who are not active on

job market. They haven't send resumes to company through Internet approaches, but they fit with recruiters and managers' requirement and preferences on candidates. Their information will be organized in profile and saved in local DB as well. One important issue about the system is to keep the personnel profile bringing up to date. Afterward, it could provide updating information for recruitment. So the updated personnel information would be the output of proposed system,

3.3. Supporting techniques and knowledge

3.3.1. KWS

The Key Word Search (KWS) serves as a selection tool, which allows the employers to search the resumes according to some criteria, such as experience or education (Mohamed et al., 2001). Usually, the commercial sites for job advertisement, such as Monster, provide the function of KWS, which allow employers search potential applicants in terms of their preference within the site. By changing the search criteria, users could compare the results of KWS (Mohamed et al., 2001, p.519). Since the employers could select interested candidates from a huge amount of applicants by using KWS, the flooded unqualified applicants caused by internet recruiting would not be the employers' concern any more (Chapman & Webster, 2003).

The organizations define the KWs in terms of recruitment requirements, which imply the focal point that employers concern about the candidates. In other words, KWs are what organizations considered important for evaluating the candidates' quality. If we say that the success of organization depend business strategies, the E-recruitment system would live up to HR managers' initial expectations and needs (Holm, 2009). And the KWs illustrate their expectations and needs.

In our case, both recruiters and managers are able to contribute on defining the KWs. The KWs are going to be used for searching the relevant data through internet to valid and perfect candidates' information. KWs could be name. For instance, with a known name from resumes, it is possible to collect information related with this name through internet. By comparing the different sourcing information, the validity of information within resumes could be checked. Moreover, some new information could be collected for implementing the candidates' profile. KWs also could be characteristics of person when names are unknown, such as job title. Recruiters could search "vehicle engineer" and "Dutch" from internet, and then information about available vehicle engineer from the Netherlands could be searched out.

3.3.2. Search engine

There are two application of search engine in our system, and they are named the web search engine and the local DB search engine. These two search engines have different intentions in system. A web based search engine is a tool designed to search for information on the World

Wide Web. The identified KWs are the basis of search actions. With searched results from Internet, all candidates' information would be saved in local Database. The local DB search engine will be used to search information within the local DB for recruitment. The result of search will depend largely on the requirements for specific recruiting.

3.3.3. Self representation

Within the context of the social network sites, individuals are able to construct an online representation of self, such as their online profiles and resumes. One motivation of individuals using self-presentation is that they could ingratiate and influence others and gain rewards (Schlenker, 1980), because in any type of social interaction people have the desire to control the impressions from other people. Individuals may decide to create a personal webpage to present themselves in cyberspace, and which is consistent with their personal identity (Kaplan & Haenlein, 2009). The quality of online profile decides to what extent others people will like them and are willing to make friends with them. Zinman and Donath (2007) confirm that individuals are willing to connect to interesting people. Most social network sites encourage users to construct accurate self representations, but participants may do it in different levels. Actually, both social and technological forces shape user practices on being authentic or playful within the profiles of social network sites (Boyd & Ellison, 2008). In fact, if the users of social network sites are job seekers and aware that their profiles are being evaluated by potential employers, information provided on profiles is likely in an effort to be viewed more favorably (Kluemper & Rosen, 2009). Moreover, the articulation of friendship links is also one aspect of self-presentation. The identity of profile owners could be defined through the friendship links (boyd & Ellison, 2008).

One challenge of Internet recruiting comes from the fact that the individuals may not tell the truth in their resumes. This also motivates us to use Web 2.0 applications for validating the information within resumes. But a further question may arise that the individuals may also present the similar "unauthentic" information in their online profile as well. We propose two target resolutions for this problem. First, the individuals' information will be collected from more than one social networks site, and the content will be compared between different profiles. The untruth information would be appeared from conflicts. Second, the validation can be also referenced from the online friends. The list of friends could make suggestion about the background of the individuals. For instance, the educational background might be reliable if his university is as same as some his friends. Yet, we have to indicate that individuals could fake the information within online profiles on purpose, and it cannot be recognized with common procedure. Nevertheless, their profile still could be evaluated in further recruitment procedure, such as capability test and in-depth interview.

3.4. Core functions

3.4.1. Identify the key words

The list of KWs decides the quality of result from internet search. According to Mohamed et al. (2001), there are some measurements that could improve quality of KWS. Firstly, it is the use of job analysis information to develop the key word. With careful consideration on what should be involved within job, the recruiters and managers determine the words to look for through Web 2.0. Secondly, use multiple words to search for the same qualification. There are usually more than one term or word to refer to a particular qualification, knowledge or skill. Combination of multiple key words could result in more precise results from Internet search. The last measurement would be the formalization of the KWS process, which include the personnel training as well. Certain documents could be established in organizational policies regarding the determination and use of key words. The documents should include a specific process for KWs selection. For instance, the recruiters and managers work on list of KWs respectively, and then recruiters are responsible on synthesizing various opinions. Meanwhile, the documents should contain information about KWs classification and recommendations on KWs. For instance, some KWs are about personnel capability or skills, and others are about reputations. For each possible KW, it could have some recommendations within documents, such as some adjectives on describing personality. The recommendations could be summarized from previous recruitment, and file as reference for coming recruitment.

We are going to propose the suggestion on classifying the individuals' information that could be acquired from Web 2.0 applications, which are very important data that company may like to know about their candidates. And the key words could be also listed in terms of this classification. There are five classes candidates' information, which are basic information, contact information, personal information, education background and working experience (See Figure 10). Each class has different amount of attributes. These attributes are also the key words that may use during the Web 2.0 search. For each attribute, we illustrate some example items. An inclusive list of candidates' information is provided in appendix A.

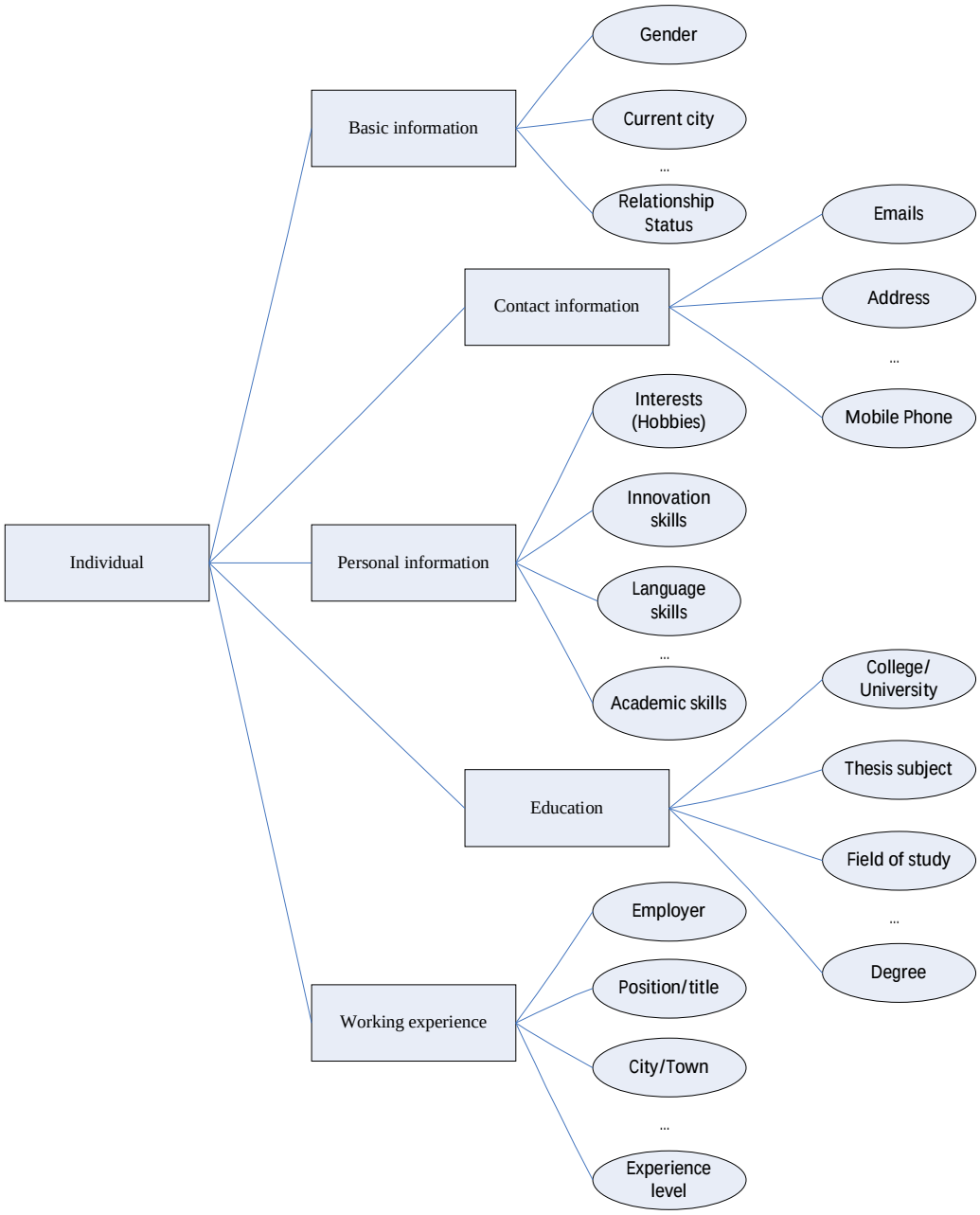

Figure 10. The content of individuals' information

1. Basic information: e.g. Gender (Male; Female); Birthday; Current city.

2. Contact information

The contact information is the information that organization could keep in touch with candidates). The typical examples include Emails; Mobile phone; Land phone; Address; City/Town; Zip code; Website.

3. Personal information

There are many attributes about personal information within the list in appendix. Not all of them

are mandatory to be collected, and it could be adjusted in terms of company specific recruiting requirement. The personal information has a different character with other classes, which is most content personal information could not acquire directly from Web 2.0. The information has to be refined by staffs that collect information from Web 2.0. One important source of personal information would be personal profile in most online social network applications. Users describe themselves with a few sentences in their profile. Other sources may include blogging, twitters and etc. The typical examples include:

- Interests (Hobbies): E.g. Bridge, movie, music, reading;
- Academic knowledge: It is different and much depends on type of organization and job description. E.g. medical knowledge for Doctor, economic knowledge for trader. Company may have multiple tests on evaluating it;
- Languages: capable language, and may have multiple entries. e.g. English; Chinese;
- Employability/career development skills: ability to actively manage work life in a rapidly changing environment and the attitude of being self-employed whether inside or outside an organization.

4. Education background:

The typical example include: Country (the Netherlands, China, etc); College/University; Degree (e.g. Bachelor's degree; Master's degree; Doctorate; Engineer's degree); Field of study (e.g. Business administration; Computer science).

5. Working experience

It could be one or more places that candidates worked, and for each one, the following information should be included: Employer/company name; Position/title; Experience level.

6. Summary

As we mentioned, in actual situation, managers normally make the decision on recruitment according to candidates' educational background and working experience. However, it is not enough in a global economy when more and more people will apply for job position. Sometimes, managers need more information beyond the general things. We believe these five group information would be enough on personal evaluation.

Meanwhile, these five groups of information are grounds for users of systems on deciding the Key words, because it is important data that employers may need to know about the candidates before the selection and hiring. Each group of data has different functions on personal identification. "Education background" and "Working experience" are relatively stiff requirements on people who apply for vacancies. Traditionally, recruiters use "Education background" and "Working experience" to make their primary selection on candidates. For some items, company may have specific and defined criteria. For instance, in "Education background", the requirement on degree could be "Bachelor or higher", and on field of study could be "computer science or related major". In "Working experience", company may have specific requirement for applicant's previous job title, such as "project manager". With these items, they only keep candidates who meet these criteria until next phase of recruitment. However, with the expanding amount of candidates, the current applied criteria are not enough to sustain a good and short list with

qualified candidates, and they need more detailed criteria to select and evaluate the applicants. Therefore, we proposed “Personal information” as a very important group of data within candidates’ information. “Personal information” could help recruiters to estimate the future performance of candidates. Moreover, there will be dissimilar personal requirement for different job positions. For example, the “Negotiation skills” and “Teamwork skill” are very important capacity for a project manager, and it may less important for an IT engineering. As to “Basic information” and “Contact information”, this is very important complementary information.

3.4.2. Collect information by using Web 2.0

Web 2.0 could be used to catch the job candidates by reason that Web 2.0 components have been used extensively among individuals, and people could both use and contribute on the content within Web 2.0. Web 2.0 is used as important channel to disseminate information and make friends. Thus, it opens the possibility that the managers take initiatives on obtaining candidates’ information through Web 2.0 concepts.

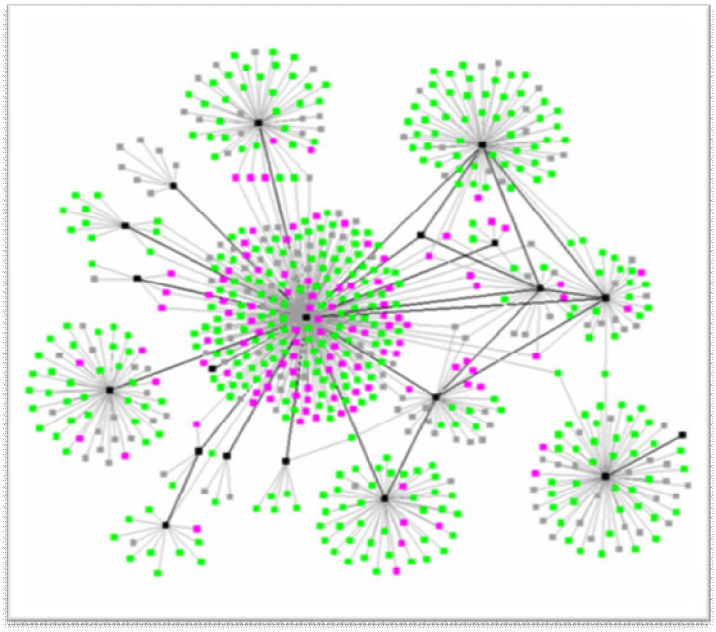

Figure 11. Simple social networks

Meanwhile, the Web 2.0 has advantages on building and sustaining social networks. The social network would be an important approach for us to reaching the possible candidates as many as possible. People formulate group according to their needs and goals. It is different with physical social networks. The type of Social networks built by Web 2.0 would be to some extent in different categories. Without limitation on geographical spread and societal impact, the virtual social networks would be more refining and meaningful. It could exist in various domains, within and outside organizations, within and outside geographical boundaries, within and outside social boundaries and many other areas. When a candidate leads us to a social community, it means we

have reached all persons within this social community. Moreover, anyone with this social community may also in other communities, and we could step into those communities and search for candidates we need (see Figure 11). Therefore, social communities would be the clue for us on tracing the candidates. Moreover, the strategy to fully make use social networks is to take advantage of strong ties in interpersonal ties. The strong ties are normally connections among close friends and family. And connections between people who don't have direct relationship but share some friends are weak ties. In the application of the Internet recruiting, both strong ties and weak ties are important. Strong ties are the connections among the schoolmates, classmates, (former) co-workers and person sharing interests, which are the crucial factors for us to locating passive candidates. Weak ties are important by reason that brings us more individuals into the applicants' pool to be selected.

As mentioned earlier, a social network is usually created by a group of individuals who have a set of common interests and objectives. Web 2.0 is technology that could help building social network electronically. This means that there is a big chance that John's Facebook group has numerous people who are skilled on software engineering as him. The information within group profile and group members' individual information could tell managers more information about whether persons meet requirements for job vacancies. These persons and their information are what we intend to acquire from Web 2.0 applications. So far, persons who are professional software engineers are reserved talents for company. Basing on this candidates list, individuals profile will be structured and saved in local DB. When company has vacancies on software engineers, managers could select one within this list of software engineers. More important, their information could be regular updates because of information in Web 2.0 application updating as well. Hence, company always has relatively newer profiles about potential candidates, and their decision on recruitment would be reliable and legitimate. In general, the approach on searching candidates through Web 2.0 applications absolutely improves both the quantity and quality of possible candidates.

It is clear on how our systems works on locating related candidates and their information by using social networks created by Web 2.0. According to the requirements of recruiters and managers about potential employees, it is able to utilize different social networks to locate them. According to Dasgupta & Dasgupta (2009), there are various types of social networks by Web 2.0. Depending on type of industry that company working on, managers may choose different combination on social networks for doing recruitment. The categories mainly contain:

- Social contact networks: these networks are formed to keep contact with friends and family, and are one of the most popular social networks.

- Education networks: these are social networks dedicated for students where they can have areas to gather study topics, placement related queries and advanced research opportunity. For graduations, these social networks help on keeping touch with classmates or schoolmates.

- Specialist networks: some social networks are specifically designed for specific field workers,

such as doctors, scientists, engineers, members of the corporate industries.

- Networks for fine arts: social networks about fine arts are dedicated to people linked with music, painting and related arts.

- Sporting networks: There are some social networks are dedicated to people of the sporting fraternity and have a gamut of information related to this field.

- Mixed networks: a number of social networks that have a subscription of people from all the above groups and is a heterogeneous social network serving multiple types of social collaboration.

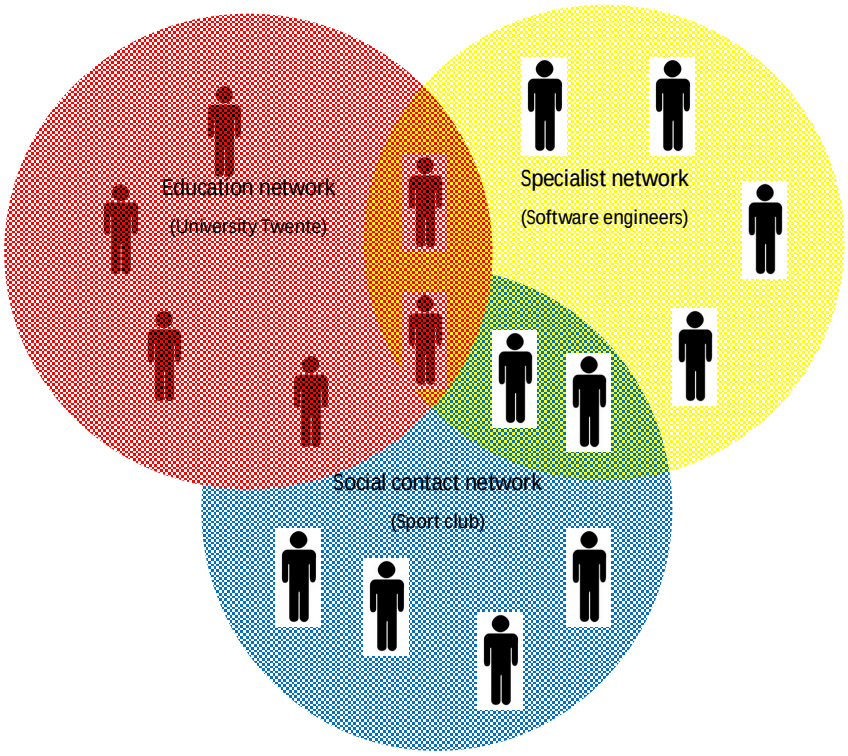

Figure 12. The relationships of social communities in Web 2.0

Figure 12 illustrates the details of structure of social networks. Individuals are nodes that connecting different social communities. And social communities created by Web 2.0 are mechanism on gathering individuals as a group. As we introduced before, reaching one person within a social community means that other persons within it are also accessible. While each social community contains one or more individuals, each individual could be in one or more social communities (figure 12). For people who are in more than one community, managers could use them as guiders to other communities in order to collect more talents and their information.

3.5. Conclusion

The design of the Talent tracing and management system is explained in this chapter. The idea of this system is to help organization locating and managing potential candidates who have high quality by using Web 2.0 concepts. The system we proposed is a public system. The customized system is able to be used by people inside the company, such as line managers and team leaders. In this system, we consider the actions on collecting talents as a long term mission. HR should always be prepared for the coming recruitment. The local talents DB would make companies ready for any emergent recruitment. The companies with frequent recruiting event should reserve those candidates' information, and keep qualified people as HR repertory. Therefore, beyond the responsibility on requirements identification and the Web 2.0 search operation, we suggested that updating the local DB should be treated as regular job for HR. When the recruiters have a regular plan to make candidates' information up to date, the system would be always used as reference on recruitment.

The proposed system could also benefit companies of different size. The large size companies could be satisfied in terms of their diverse demands on employees. Moreover, solution has advantage on producing larger amount applicants, which meet the large size companies' requirement as well. The small size company could benefit from the system by its low cost, since this solution does not require much investment on recruitment. Actually, depending on the actual situation of recruitment, a company may have different arrangements on size of local DB, because the number of candidates reserved in local DB by small size company would be much less than the large companies.

Our system is particularly suitable for global recruitment as well. With the increasing globalization of the economy and labor market (Chapman & Webster, 2003), the E-recruitment is developing more globally than nationally or regionally. For companies wishing to open a subsidiary company abroad, they could make easy information collection about the future labor market in advance. Traditionally, they ask help form the intermediate actors who are professional on labor market. Now, with the help of this system, they may obtain same or even more information than the intermediates, but with much lower cost.

4. Example: one Web 2.0 search

In previous chapter, the idea of Talent tracing and management system has been introduced. In this chapter, the system will be better explained by using an example case.

4.1. Example description for Job vacancy

PHP Web Developer

About the Job
Excellent permanent opportunity for an experienced PHP Web Developer based in Enschede for a large Media client.

Key Skills:
Web development experience using PHP, MySQL, MSSQL Server, XSLT & CSS.
A good knowledge of advanced Object Oriented PHP programming
Ideally experience with the ZEND framework or similar.
Experience with medium to large web development projects

Role:
The focus of this role will be web development work in PHP. The individual will be required to fulfil the following tasks within the department:
Dedicated developer to all client online offerings
Development predominantly on major projects, but from time to time on micro projects and maintenance jobs
Assisting the lead developer/project manager with problem solving, defining projects plans and some analysis

Therefore, the key words in this case would be: Php developer AND Enschede.

4.2. Demo of Web search

Some software applications have been used to present this demo, which are Photoshop, Dreamwaver, PHP and MySQL.

Step 1:

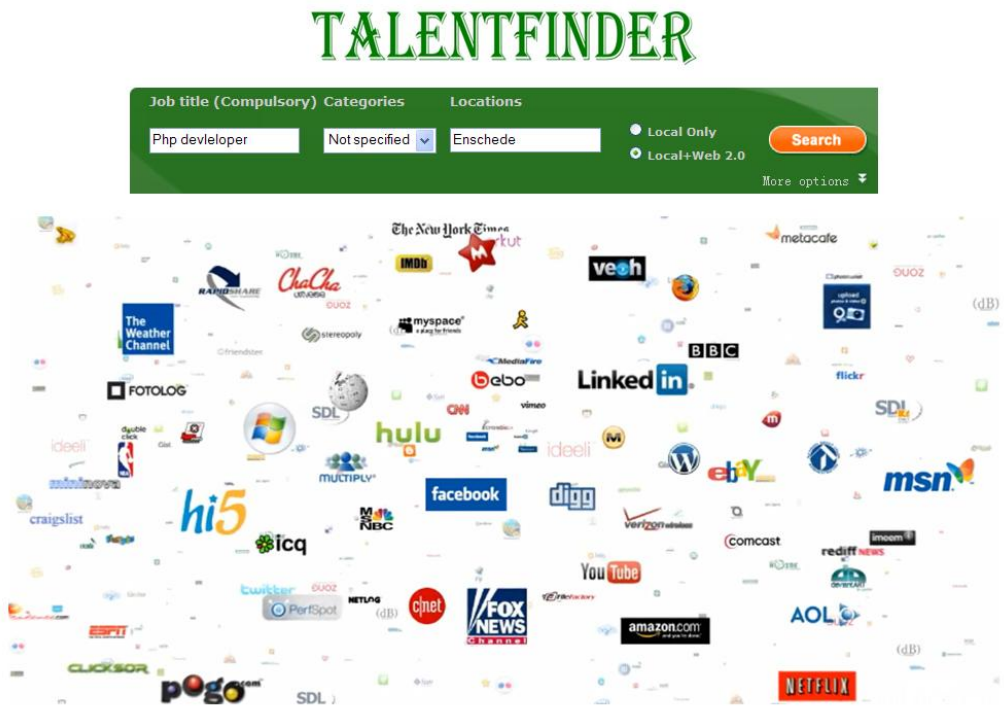

Figure 13. Example front page

Figure 13 shows the possible front page of system function that works on collecting information. The logos on the front page are Web 2.0 media that are expected to provide useful individuals' information. With different setting within web search engine, the target group of Web 2.0 media could be defined. It means that users could have their specific focuses on potential candidates, because the type of users might be diverse in different Web 2.0 media.

As shown in Figure 13, users could give limitations on four aspects. "Job title" is what type of candidates that companies require for. According to Job description, the key word is "PHP developer". "Categories" let users give extra limitation on industry. For instance, a user from bank may like to constrain the category as accounting and financial services. In this case, we choose "not specified". "Location" is which area is ideally for having candidates, which could be not specified as well. In our example, it is "Enschede". The last optional limitation indicates the sourcing of information. Company may already have some candidates' information from receive resumes, and contain it in local DB. Therefore, the system allows users to search only from local DB or both from local DB and Web 2.0. With these constrains, users could press the button "Search" for result.

Step 2A:

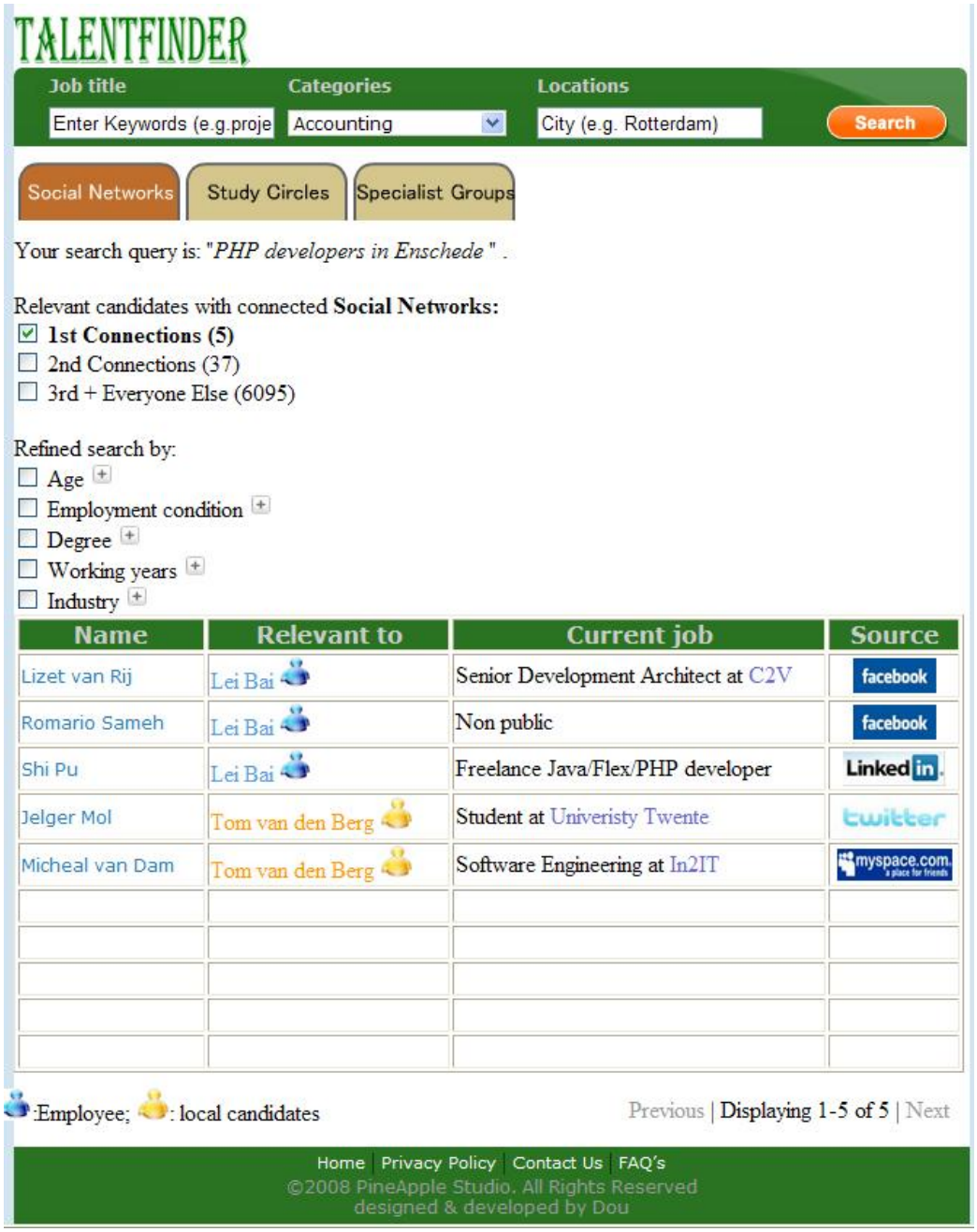

Figure 14. The searching result from "Social Networks"

We have three categories of result, and this page shows the results under the category "Social Networks". The results are persons who are "PHP developers in Enschede" and have directly connected with persons who are employees and reserved candidates in local DB and in Web 2.0 social contact networks. And these five individuals are people who have strong ties with "Lei Bai"

and "Tom van den Berg" in the scope of social connections. If users also would like to know the result of weak ties, it is possible to select "2nd connections" for another 37 candidates, which will present the list of individuals who share friends with "Lei Bai" and "Tom van den Berg". Basing on the result of 2nd connections, users could refine search by using more constrains, such as Degree.

Step 2B:

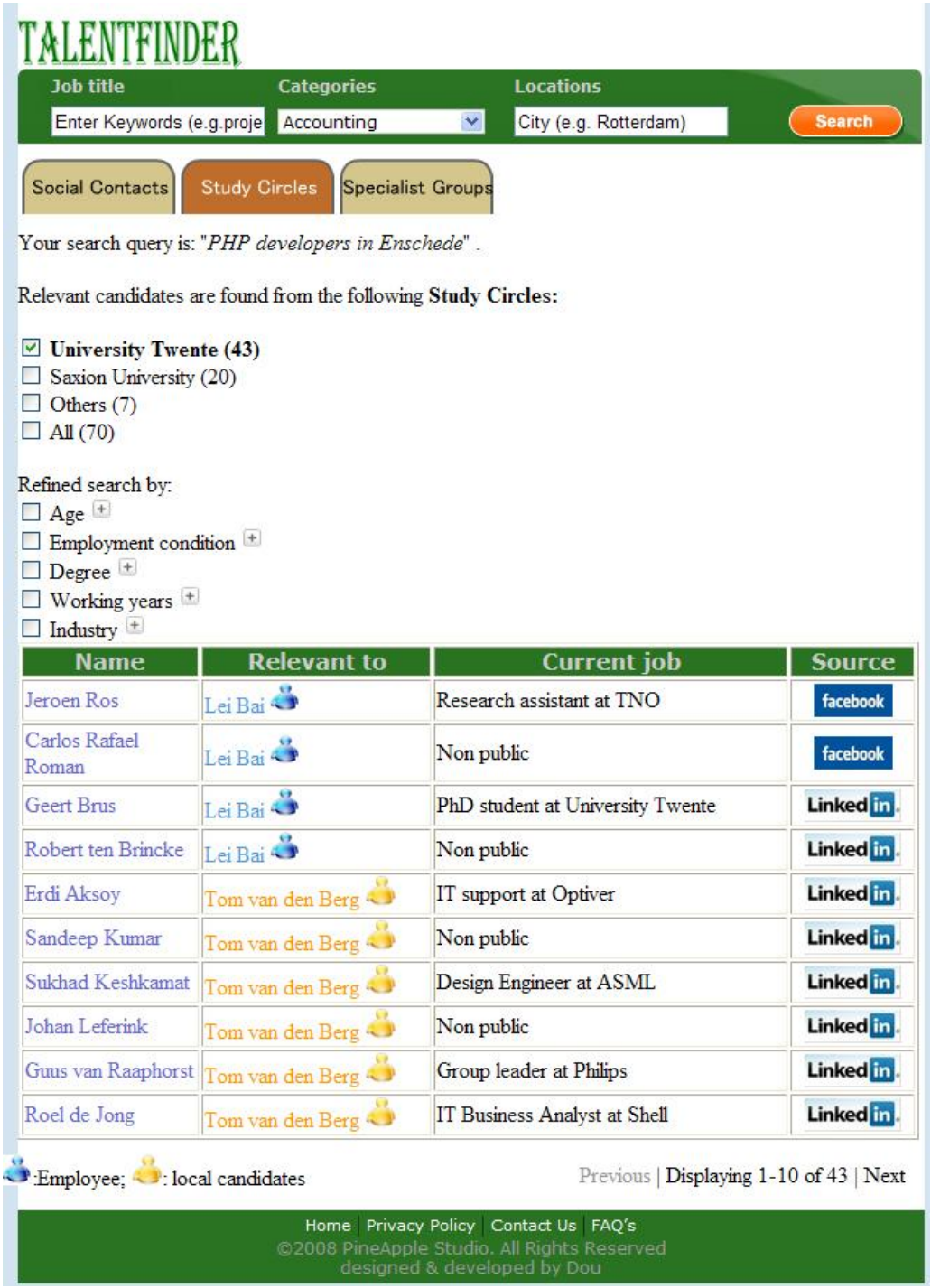

Figure 15. The searching result from "Study Circles"

The result showed in Figure 15 is people who are “PHP developers in Enschede” and share same “Study Circles” with employees and reserved candidates in local DB. Employee “Lei Bai” used to study in University Twente, so persons who relevant to her would also study in same university.

Step 2C:

Figure 16. The searching result from “Specialist Groups”

“Specialist Groups” illustrates online groups related to “PHP developers in Enschede”. Users could entry into these groups to search for more possible candidates.

Step 3:

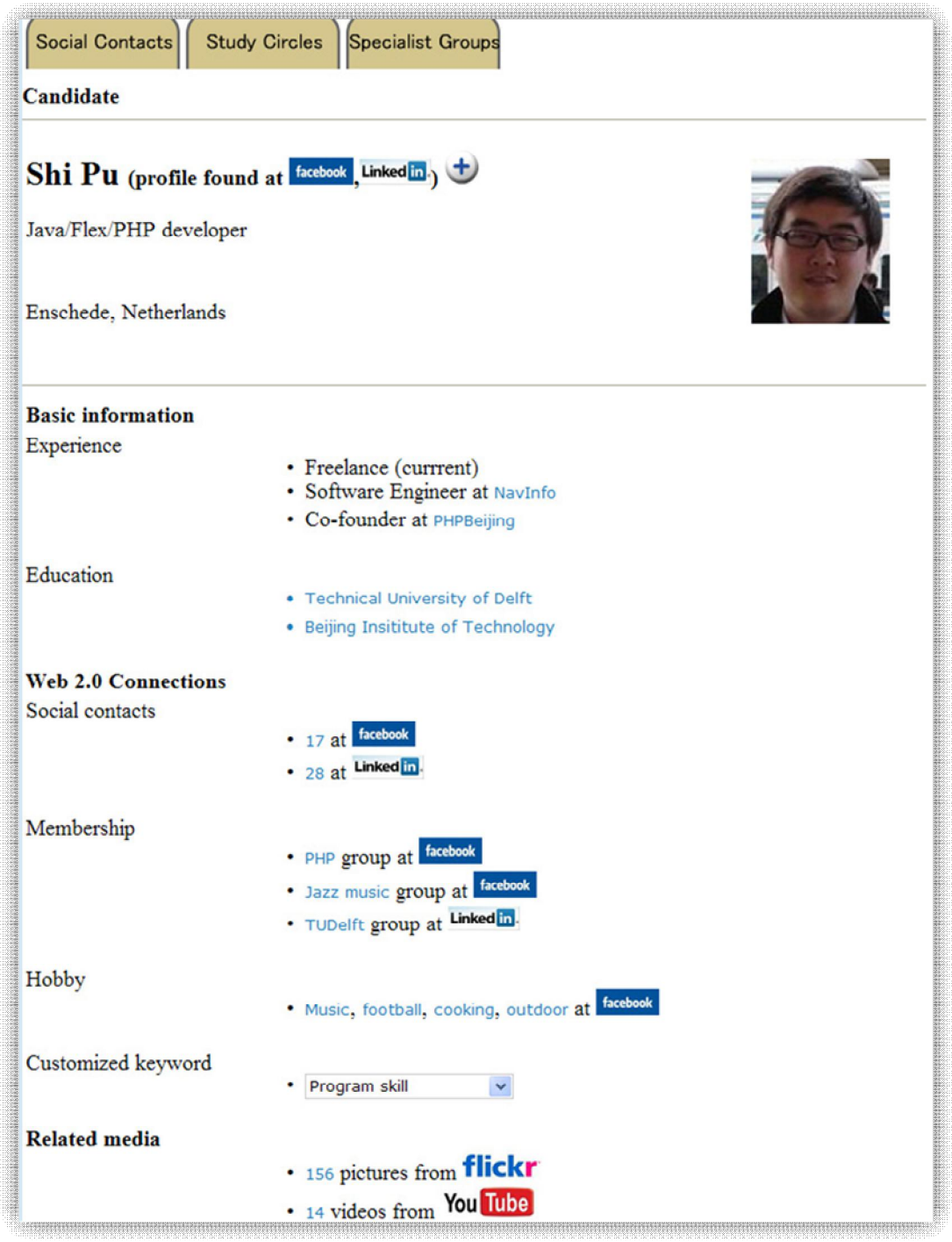

Figure 17. The information of an individual

This Figure 17 shows the page when users select one person from result. Some information about

candidate is included in this page. If users are interested in “Shi Pu”, they are able to save all information into local DB by pressing “plus button”. If users need more information, they can entry into “Shi Pu” Web 2.0 accounts (Facebook, or LinkedIn) to look through more.

5. Discussion

The target of thesis is to utilize Web 2.0 applications during the Internet recruiting with the intention of improving the quality of recruitment by “catching” both active and passive job candidates. The recruitment is more successful and with a high quality, if larger number of candidates indentified by Internet recruiting fit with the firms’ requirements on job vacancies. Therefore, how to create a high-quality applicant pool would be essential to meet the research target.

Within the existing approaches of Internet recruiting, it could create a good value applicant pool. To increase the quality of applicant pool, one straightforward method would be to increase the size of applicant pool and locate further high talent individuals into applicant pool. However, current approaches are not able to bring essential improvements on quality of applicant pool anymore, because the current Internet recruitment approaches are limited to locating only candidates who are very active on job seeking. For talents who are not active on job market, there is no effective searching strategy so far. In other words, the current Internet recruiting approaches has reached its maximal outcome on candidates’ quality. Therefore, our solution would be, on one hand, focusing on increasing the size of applicant pool by identifying individuals who may not be active on job market. For instance, individuals could be still content with current jobs. On the other hand, it is necessary to locate high talent individuals by cognizing and differentiating their ability, and increase the quality of applicant pool eventually.

In traditional recruitment approaches, the personal networking is for long a very important resource (Feldman & Klaas, 2002). For instance, individuals usually need to be recommended for job vacancies by certain people (such as former employees), which means that employers are more welcoming the candidates who are known and have connection with employees. Some recruiting procedures could be skipped by utilizing personal networking for locating candidates, such as background checking. Moreover, there is better assurance on the quality of candidates because the recommender’s reputation has been known. However, the strategy on utilizing personal network hasn’t applied into the scope of Internet recruiting yet. The existing Internet recruiting approaches only provide simple connections between the firms and applicants. By using commercial job site, employers could make easy contact with certain job applicants. Each job applicant may have a useful personal network for employers on locating more valuable potential employees. However, without appropriate channels, employers are not able to utilize their personal network for recruitment. Therefore, one advantage of our solution is to fully make use of the online personal networking created by Web 2.0 applications. Web 2.0 technologies facilitate the development of platform on social community. In Web 2.0 applications, people become relevant (e.g. Facebook) for reasons. They may share same background, have similar hobbies or know each other because they are friend’s friends. So people are connecting to each

other and forming virtual personal networks. The virtual personal networks share same characteristics as real personal networks. For example, individual could be traced by known personal connects with certain people. The strong ties within personal network are very important for employers to locate key potential candidates who have required characteristics. And weak ties are used for reaching individuals in other clusters. With larger amount of candidates, the employers would have better chance to recruit high-quality employees. Therefore, we utilized this characteristic and made use of in proposed solution, which is "Talent tracing and management system". "Tracing" means to pursue the valuable talent within the Internet, specifically, from Web 2.0 applications, and their personal information as well. "Management" means to collect and retain useful talents' information for organizations on recruitment.

Table 4 gives a comparison between the new approach and the existing Internet recruiting approaches. The comparison focuses on the key requirements which we finalized from literature and companies' interviews in Chapter 2.

Table 4. Comparison between proposed solution and existing solutions

Synthesized requirements	Proposed Solution	Existing solutions
Extended sources for extra candidates' information;	Beyond the received resumes, recruiters are able to utilize Web 2.0 applications, such as Facebook, as the extra information sourcing channel. Web 2.0 is a platform for users to sale themselves. Information they uploaded onto Web 2.0 let them have opportunities to be known by other people. And it contained important information for recruitment, such as their personal life and hobbies. Recruiters could refine useful information within it. And information within resumes could be compared with information contained in Web 2.0 applications for validity checking, such as candidate's personal background. However, there is a limitation about this solution, which is users of Web 2.0 may not upload all information onto Internet. Therefore, not all information could be checked. Meanwhile, Web 2.0 applications allow users to have personal contact with each others, such as sending private messages. It is not the same as the personal touch in the traditional approach, such as talking in phone. But the advantage of personal touch in Web 2.0 is candidates will be behavior naturally and truly because they may not know that they are connected by recruiters. And then the recruiters will have the actual performance of candidates.	Current solutions don't have additional sourcing for candidates' information, and only candidates' information within the resumes is available for recruiters. If managers would like to know more about the candidates, they normally organize testing, interviews, and etc.
Pursuing job candidates have not taken actions on job seeking;	Job candidates who don't take actions are called the passive seekers. "Talent tracing and management system" is able to be located them by utilizing Web 2.0 applications. The individuals' information meet up	Only the individuals who take actions on looking for jobs, known as active job seekers, could be located

	companies' requirements could be collected by proposed system.	by current Internet recruiting approaches.
Better competence on candidates' selection and evaluation;	The KWS (Key word search) is an efficient approach on locating and selecting the individuals by using certain criteria. Individuals could be searched from Web 2.0 application by using Key words. The decision on Key words is completely depending on the perception of recruiters and managers. So the advantage of this solution is only individuals who have favorable background will be selected. In chapter 3.4.1, it is the suggestion for candidates' information that should be known by recruiters. Those items could be used as criteria on individual selection and evaluation during the Internet search. In the actual recruitment, recruiters could make adjustments in terms of specific job descriptions. The identification of Key words should base on a job analysis, and results of searching is depending what key words are used.	There is computer-based technology in current Internet recruiting approaches for retrieving employees who match with companies' requirements.
Flexibility;	Recruiters are in charge of acquiring candidates' information from Web 2.0 applications, which will be higher flexibility and much less constraints on content of data. So company will have better data ownership and flexibility. Meanwhile, proposed solution could conserve the potential candidates' information in local DB. Therefore, with sustained information within local DB, companies could be prepared for any staff change.	The data from external agency and commercial website is always lack of ownership and flexibility; current approaches are lack of strategies on dealing with emergent recruiting requirement.
Cost effective;	In proposed solution, the collected data is free, because information within Web 2.0 applications is available for all registered users. And it is very easy to operation "Talent tracing and management system" as long as recruiters know how to use search engines, such as Google. However, it need some cost on system construction including the web search platform, HR database and some supporting functions.	Using corporate site for recruitment is very cost effective, and some cost is necessary if using the commercial job boards on recruitment.
Better involvement for managers;	"Talent tracing and management system" allows employees within the company get involving into the recruitment, and the system could be handled easily by users. Without any professional training, managers who normally have no participation in recruitment are able to use system to recruit potential candidates.	Managers are able to do selection personally within current Internet recruiting approaches, but it may take time for them to be familiar with the recruitment procedure.

Previous researches (Mohamed et al., 2001; Chapman & Webster, 2003) already proved that keyword search is a very important tool on Internet recruiting and could decrease the negative effects caused by flooded resumes. In proposed system, the KWS is a very important embedded technology that ensures the quality of web search's outcomes. The choices of KWs have direct influence on list of individuals located from Web 2.0 applications. In 3.4.1, we explained the principles on identifying high quality KWs, and also structured useful KWs into a list. The list includes both useful KWs for web search and important criteria to evaluate the candidates. Moreover, it is information that may contain within online individuals' profile. However, the list of information is still the empirical result, and some items may not accurate. Therefore, in the future research, some field studies may be necessary, because the items should be completed by recognizing and analyzing actual recruiting cases.

There are millions of users of Web 2.0 applications, containing rich amount of personal information. Recruiters could consider the users of Web 2.0 applications as a huge applicant pool, and they select candidates within it in terms of their specific personnel requirements. The personal information uploaded onto Web 2.0 applications by users could be used by the recruiters on qualification. But there should be differences on the amount of personal information between the job seekers who have different active levels. Both active and passive job seekers are the target groups of individuals that will be identified by our solution from the Web 2.0 application. For active job seekers, recruiters already know partial individual information. So the reason recruiters use system is to collect additional information about job seekers, and then produce an inclusive personal profile. The situation for passive job seekers might be complex. The efficiency of system depends on to what extent individuals use Web 2.0 applications. For instance, people who are content with current job may not use Web 2.0 to create any online profile, so it will be very difficult to locate them and collect their information from Web 2.0 applications. If people don't satisfy with current job and are considering change job, they will have motivations on creating online profile with personal information, and then the system could acquire some useful information. Therefore, a difficulty still exists that passive job seekers are lack of enthusiasm on using Web 2.0 and building online profile. In our thesis, we provide one example to demonstrate how our solution operates. In this case, there is a lot of available target person' information on Web 2.0 and could be used for recruitment, but we don't know whether his is active job seekers or passive job seekers. Therefore, there is no confirmed relationship between job seekers' active level and their available information on Web 2.0. One hypothesis could be made in terms of this relationship. The hypothesis would be the more active the job seekers are, the more individuals' information is available on Web 2.0 (see Figure 18). Further research should be addressed on this topic.

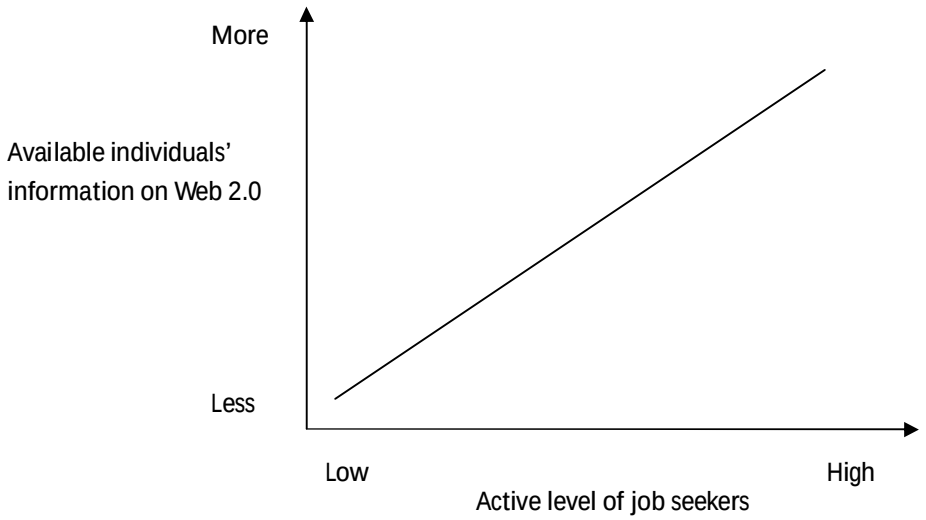

Figure 18. A hypothesis on relationship between active level of job seekers and their available information

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Appendix A

1. Basic information

- Gender (Male; Female);
- Birthday;
- Hometown;
- Current city;
- Relationship Status (e.g. Single; in a relationship; engaged; married.);
- Religious Views (e.g. Christian Buddhism).

2. Contact information

- Emails;
- Mobile phone;
- Land phone;
- Address;
- City/Town;
- Zip code;
- Website.

3. Personal information

- Interests (Hobbies): E.g. Bridge, movie, music, reading;
- Academic knowledge: It is different and much depends on type of organization and job description. E.g. medical knowledge for Doctor, economic knowledge for trader. Company may have multiple tests on evaluating it;
- Languages: capable language, and may have multiple entries. e.g. English; Chinese;
- Cognitive skills: the ability to think creatively and critically. At work, creative thinking is generally expressed through the process of creative problem solving. Organizational strategy is an example of creative thinking;
- Problem solving skills: it is behavioral skills to recognize and define problems, invent and implement solutions, manage risk, and track and evaluate results;
- Functional skills: Basic skills such as writing, reading and numeracy. It is known as communication skills as well.
- Technical skills: research techniques, project management, or IT engineering
- Innovation skills: the types of skills that allow individuals to become innovative in what they do. Ability is summarized from cognitive skills, behavioral skills, functional skills and technical skills.
- Learning capability: ability to learn from training and experiences to avoid misunderstandings and mistakes
- Self-esteem: ability that reflect a person's overall evaluation or appraisal of his or her own worth.
- Motivation/goal setting: ability on identify desire, values, and beliefs that drives employees

to take action.

- Employability/career development skills: ability to actively manage work life in a rapidly changing environment and the attitude of being self-employed whether inside or outside an organization.
- Interpersonal skills: ability to determine appropriate self-behavior, cope with undesirable behavior in others, absorb stress, deal with ambiguity, structure social interaction, share responsibility, and interact more easily with others
- Teamwork skills: skills are critical for improving individual task accomplishment because practical innovations and solutions are reached sooner through cooperative behavior.
- Negotiation skills: skills are critical for the effective functioning of teams as well as for individual acceptance in an organization.
- Leadership skills: ability on influencing another; ability to successfully integrate and maximize available resources within the internal and external environment for the attainment of organizational or societal goals (Ogbonnia, K.S.,2007)

4. Education background

- Country: e.g. the Netherlands; China
- College/University: it may have multiple entries, and also other related information. e.g. University Twente;
- Degree: e.g. Foundation degree; Associate's degree; Bachelor's degree; Master's degree; Doctorate; Engineer's degree
- Field of study: e.g. Business administration; Computer science.
- Dates attended: Class year. e.g. 2008
- Graduation year: e.g. 2010
- Activities and Societies: multiple entries. e.g. sport club.
- Thesis subject: companies may like to how candidates' subject related to company's project.
- Certificates: Honor; Award. e.g. Cum laude.

5. Working experience

- Employer/company name;
- Position/title;
- Description;
- City/Town;
- Time Period;
- Experience level (e.g. Entry level; senior level; associate; executive).

Appendix B

The list of questions during the face to face interview:

Question 1: Does the online recruitment be used in your company? As you know, what type of online recruitment has been used?
Question 2: According to your job description, in which you may need to use the online recruitment?
Question 3: To what extent, do you think the online recruitment could improve your work?
Question 4: From your point of view, what are advantages and weakness of online recruitment in your company?
Question 5: What are your suggestions for the online recruitment operations in your company?
Question 6: Do you think the online recruitment is necessary in your company? Will you company keep using it in the future or not?