Managing recruitment and selection in the digital age: e-HRM and resumes

Elfi Furtmüller*, Celeste Wilderom and Mary Tate

Abstract. Recruiters, in the business of screening job applicants, are increasingly dependent on information systems especially digital resume databases. However, the current literature does not provide a consensus on the requirements for resume content for digital recruiting. This research contributes to the understanding of the different requirements of recruiters for offline and online resumes. We offer an analysis of the relevant literature; interviews with recruiters; and content analysis of the resume fields of 40 e-Recruiting sites. Based on this we identified a number of challenges in categorizing digital resume data and digital matching between resumes and job advertisements. We identify areas for further research on the maintenance and extension of online resume databases and derive recommendations for digital resume design.

Keywords: e-HRM, digital resumes, recruiter requirements, workflows

1. Introduction

In the world before the web good employee selection was seen as the sine qua non of rational business; yet not all employees were selected in systematic or smart ways. Increasingly, careful and efficient selection of employees is seen as a critical task for organizations [21]. Although some selection aspects such
as the employment interview have attracted much research attention [22, 24, 33, 47], the management of requirements for digital resumes has received little academic scrutiny [16]. The literature available on resume preparation, construction, design and content, and e-Recruiting mainly originates from practitioner journals [10, 20, 23] and books [5, 44]. As a result, many of the recommended practices are not based on empirical research. It is no wonder then that there is little agreement about which resume fields are essential for e-Recruiting business processes [12, 31]; usability [11, 13], and general design aspects [8, 14]; we lack knowledge about which resume fields are essential for effective selection procedures.

A further issue is that most available literature on resume design is focused on the United States [18, 39], with scant attention to other cultural contexts [16, 41]. Organizations, recruiters and applicants frequently use different terminology to mean similar things, leading to difficulties in interpreting and matching digital resume fields with the content of job advertisements. In this paper, we discuss knowledge representation challenges in categorizing digital resume profiles. As Glynn and Raffaeili [17] state:

“In order for fields to flourish, there needs to be some level of standardization (or agreed-upon principles) in practices, norms, conventions, or cognitive templates in order to enable communication, comparability—and even competition—among ideas and theories” (p. 6).

Additionally, compared to research into applicants’ perceptions on e-Recruiting [13, 15, 29, 60], there has been limited research on recruiters’ views as to their requirements for resume design [6, 9]. This imbalance is surprising since recruiters constitute the clients who usually pay for using online recruiting services such as Monster, Careerbuilder or Stepstone.

While Information Systems publications have investigated e-Recruiting business processes [12, 31]; architectures [30]; implementation [41]; usability [11, 13], and general design aspects [8, 14]; we lack knowledge of the essential elements a that should be included in a digital resume form. In a recent literature review on e-recruiting, Wolfswinkel et al. [54] argued the main inadequacy of current research is its non-theoretical character. In practice, many different terms are used for the same resume field descriptions across online career sites.

The purpose of this current study is to add to the e-HRM literature and specifically, the study of digital resume management. We used multiple sources of information, including a literature analyses [55], interviews with recruiters and a systematic analysis of the resume fields of the 40 largest Dutch e-recruiting sites to derive the critical fields required by recruiters for digital resumes. We also examine issues related to matching resume data with job advertisement data, and the processes required to maintain a standardised set of digital resume fields. We discuss how digital resume fields and search functions may be complemented to improve the identification of qualified candidates. This requires consistency particularly in the representation of candidates’ biographical data.

The rest of this paper is structured as follows. We first discuss gaps in the literature and present the research methods (literature analyses, interviews and resume field content analyses on recruiting sites). Then, we present the results of the interviews and propose the essential components of digital resumes. We discuss the findings in light of previous literature, derive recommendations for digital resume design, and outline implications for research.

2. Resumes and e-Recruiting

In the academic literature, several reviews have appeared on personnel selection [2, 4, 21, 36]. They emphasize that biographical data in the form of resumes are the most commonly used information in personnel selection. Some researchers even suggest that every selection decision includes an evaluation of biodata [6]. Resumes generally represent a structured, professional profile that showcases an applicant’s strengths, accomplishments, interests, skills, and work-related experiences [39]. The pre-screening of resumes is a key phase in personnel selection processes. Recruiters use resume information to draw conclusions about an applicant’s work-related skills, abilities, motivation, personality, and job fit [6, 8]. The resume is thus a critical tool for evaluating the potential suitability of any given applicant for a particular job, and it determines increasingly often who is invited for additional screening [38, 45].

Recent developments in recruitment practices show that job applicants, as well as professional recruiters and organizations in need of personnel, are increasingly turning to the internet. Recruiters use it to advertise job postings and search applicant pools, while job seekers use it to apply online [7]. In the last decade, e-Recruiting has spread around the globe, and has become a leading e-commerce application. Currently, 40,000 job boards are live 24/7, and all Fortune 100 companies recruit via the internet. The major advantages of e-Recruiting
While most professionals agree that resumes are vital, there is no consensus over resume design requirements and the specific content to be included in resume forms. This lack of consensus on what constitutes appropriate biodata for a resume is problematic. If biodata is seen as including such things as interests, personality, skills, and values, it becomes difficult to distinguish biodata from other measures. In an attempt to clarify matters, Mael [32] provided a taxonomy of biodata items. He stated that the core attribute of biodata is that the items pertain to historical events that may have shaped the person’s behavior and identity (p. 763). This broad definition however does little to inform researchers about specific resume components. Ross and Young [39] conducted a comprehensive review of academic resume design literature, including journals, periodicals, and book publications. Their research revealed eight salient resume categories: (1) career objectives, (2) educational record-college, (3) educational record-high school, (4) related work experience, (5) non-related work experience, (6) personal information, (7) professional and personal involvement, and (8) references. They derived 72 resume content items. This classification provides a starting point for our investigation, although some limitations of their research should be noted [37]. Ross and Young’s resume items have been tested only with recruiters in the recreation and leisure services industry, and it is unclear if these resume items are similarly relevant for all the other industries.

While digital resumes have many advantages, the matching of job candidates to vacancies is still challenging in the absence of some standardization in resume content fields. Initial evaluation of applicants, to filter out those that are unsuitable without screening out good candidates, is still a time-consuming challenge. Inasmuch as the Web makes it easy for job seekers to apply for many jobs in a short time period [29], the consequence is that companies may be inundated with a large number of resumes, many from unqualified applicants [28].

Recruiters encounter different challenges when working with digital (online) compared to print (offline) resumes. Digital resumes can be used in automated processes such as for example, automated storage, searching, pre-selection, comparison and ranking of candidates. Digital resumes may be easily transferable to other systems and it is relatively easy to update their content. Moreover, digital resumes offer the chance to send automatic replies to applicants [31]. In offline or printed resumes, consistent resume design is less of an issue; applicants have the possibility to fully customize their resumes [25]. However, in the initial screening phase recruiters need to invest more time in interpreting print resumes. Also in the task of systematically comparing resumes’ contents [15, 49] recruiters need to spend more time when resumes are not standardized. While (standardized) digital resumes aim to offer more systematic and faster resume screening, achieving this benefit depends on the way resume fields are structured and classified, including the availability of search functions that recruiters desire [16].

Internet research in recent years has offered new knowledge on effective searching: allowing targeted searches on many internet services such as books, hotels or restaurants. Pre-requisites for effective searching in e-Recruiting include the systematization of knowledge on effective searching: allowing targeted search functions that recruiters desire [16].

A good match between a candidate and a job needs to be bilateral as it requires considering both applicant and recruiter preferences [2]. In practice, there is very little standardisation [26]. Digital resume applications are often designed independently, either internally by organisations or by commercial job portal providers. Typically there is limited or no information exchange across the various providers, or between candidates and providers.

This literature analyses of resumes, e-Recruiting practices and pre-selection technology suggests that a more structured and sophisticated understanding of online resume design is needed. Such knowledge could be used to enrich resume form design. We address the following research question: “What are the requirements of digital resume forms from the recruiters’
This main question is broken down into the following three sub-questions:

1. Which fields in digital resume forms are significant from the recruiters’ perspective?
2. How can the fields used in digital resume forms be systematically represented?
3. What workflow process can be used to utilise digital resume fields and search functions to improve recruiters’ identification of prospective staff?

3. Method

The requirements for resume forms were developed using a mixed methods approach; analyzing literature; interviewing recruiters; and content-analysis of the resume fields of 40 e-Recruiting sites [35]. In order to gain a better understanding of these requirements, we also examined the designs of resume forms on leading-edge e-Recruiting sites based on both the literature and our interview data.

3.1. Interviewing recruiters

It has frequently been argued that involving end-users (such as users of e-Recruiting sites, that is, recruiters) in system design is a critical factor in the successful implementation and operation of information systems. IS researchers have claimed that the direct interview remains the best technique for eliciting requirements [1]. In order to interview recruiters from a variety of sectors and industries in the Netherlands we first determined which specific companies were active at two career fairs, the Nobiles career event in Utrecht and the Nationale Carrierebeurs in Amsterdam. Using the contact data on the career fair websites, we emailed 72 organizations (belonging to various branches) and requested 30 minute interviews during the career fair. To encourage participation, we offered to share the results of the study with the organisations that agreed to participate. The interviews were semi-structured and included open-ended questions. Before the career fair, the questions were pilot-tested with one recruiter and an academic who are both actively involved in e-Recruiting research, and the interview protocol was refined. Overall, seventeen recruiters agreed to be interviewed. The sample consisted of twelve females and five males, with ages from 22 to 37 (average 30). Combined, they had between 1 to 15 years of professional experience, with an average of 5 years. Four of these recruiters worked in consulting firms, three in finance organizations, two for IT companies, two for technical companies, and one each in trade, utilities, pharmacy, education, transportation and recruiting. Recruiters were asked which resume fields are important to them and which fields, search options and functions should be added to current online resume forms. The typical interview was on site and took about 25 minutes. In most cases it was not possible to extend the interview longer since job applicants were waiting to talk with the recruiters. While a tape recorder was taken to the interviews, the noisy career-fair environment led the interviewer to take comprehensive field notes during and after each interview.

3.2. Data analyses of e-Recruiting websites

In order to get a comprehensive overview of resume forms currently used in practice, we analyzed the 40 largest e-Recruiting sites in the Netherlands. We selected these largest sites since they attract a wide variety of different applicant groups, and therefore should collectively represent best practice in resume design. We began by familiarizing ourselves with all the sites by visiting them and carefully reading and comparing the different resume fields used across the sites. We used the classification system from Ross and Young [39] as a starting point. Two coders then wrote down and coded independently every resume category including fields, field type and input options. Emerging differences in categorization were discussed between the two coders, and new codes were added to supplement the Ross and Young framework where required. After the initial development of the resume coding categories, the fields from all recruiting sites were categorized and a resume knowledge representation framework was formulated. To control how many websites we needed to analyze to reach code saturation for the resume fields, we documented the progression of resume field identification after each website. Code saturation was reached after analyzing 14 e-Recruiting sites. In total, 114 resume fields were identified within the studied 40 recruiting sites, all of which have been used in at least one website. Of these attributes, 78 fields (68%) were identified within the first two websites. An additional 36 attributes were identified in the next twelve websites. After the fourteenth website, no new fields were discovered (see Fig. 1). By achieving code saturation for the resume fields in our study, we believe our findings apply to the full range of resume design practices in contemporary Dutch e-Recruiting websites.
4. Results

In what follows we will describe first the resume requirements emerging from the interviews with recruiters. Then, we will present the results of the e-Recruiting website analyses and the relevant components of digital resumes. This analysis is integrated into a knowledge representation framework [57] of data requirements for digital resumes. This will facilitate the next stage of development of a digital resume design ontology. However, in this paper we have stopped short of specification of a detailed ontology, as this is a technical process with (likely) a different readership, and different theoretical foundations.

Next we will discuss requirements for recruiting workflows: to improve matching between resumes and job advertisements. Finally we suggest areas for future research into the maintenance and extension of resume knowledge representation frameworks.

4.1. Recruiters’ preference

The interviews with recruiters were useful to gain insight into their usage of e-Recruiting sites, and their perspectives on important resume and search fields. Over a third of the interviewed recruiters identified applicants’ education and years of professional work experience as highly important resume criteria. Further, they frequently requested information on extra activities, ambitions, desired job, personality, hobbies and interests, phone number, and personal information. Approximately 25% of the recruiters were dissatisfied with the current e-Recruiting websites, and felt that rather than there being missing data, there was too much unnecessary data:

“There are too many fields in a resume. I only want to know their name, phone number, education and work experience” and “I see no need for additions because then it would be even less manageable and would take more administrative time”.

Another recruiter argued:

“I only want to get to know about their past work experiences: related to the prospective job: not paper filling!” It was emphasized to us that resumes should be easily readable.

However, some of the recruiters we interviewed did identify additional data requirements. One recruiter wanted to know the reason why an applicant had left the previous job while another demanded knowledge tests:

“Before an applicant gets invited for a job interview, he has to do an analytical and mathematical test online, however first we always look through their resumes”.

Three recruiters requested the inclusion of phone numbers so that they could talk to a potential applicant immediately, before another employer made contact. Two recruiters found the highest education level very important. Another wanted to know how quickly an applicant had finished their formal educational trajectory.

Recruiters differed to some extent in terms of the criteria they required for searching and filtering online resumes. The most frequently requested search filter (by almost 70% of recruiters) was years of professional work experience. More than half of the interviewees preferred to search for job titles (or synonyms of that job title) when filtering applicant databases.

“Sometimes a job title has multiple meanings, like an architect can design buildings or computer software”.

One-third of the recruiters preferred to search for applicants who lived close to the company location. Also, a third of the recruiters stated they usually searched for education level, e.g., highest degree obtained. Some recruiters noted that they liked to search for industry or branch type. Three of the 17 recruiters explained that they wanted as many suitable applicants as possible, and would then manually check all the resume forms of the pre-filtered applicants. Six recruiters felt that determining what resume design and search criteria are important largely depends on the vacancy. In this context, two IT recruiters noted additional criteria such as specific expertise or years of experience with a specific programming language would be useful.

Two recruiters searched for applicants with a certain career level. One recruiter suggested they always filter out applicants who are not actively seeking a job. Another recruiter requested the ability to filter out applicants who do not want to travel. One recruiter wanted to search for those applicants who had indicated a desired
salary level that was similar to the level offered by the hiring organization.

4.2. Website analysis

Three researchers carefully reviewed resume field options of the 40 largest Dutch e-Recruiting sites (for a complete listing of these sites: see Appendix A). We compared the resume fields used in these sites with what we found in the resume design literature and with the interview results. While the recruiting sites in the study shared many features in their resume fields and subfields, they also differed in several areas, and in the labeling and extensiveness of fields they used. For instance, some sites include a field only for the most recent professional experience while others provided the option to fill in multiple previous positions. Similarly, educational levels, skills, job titles and demographic data were clustered in various ways across the studied websites. Not all systems include all relevant fields suggested in the literature. Importantly, we found that many resume forms used variations of unstructured textboxes, checkboxes or select boxes for capturing data. This meant that although required fields might be present, they would not be easily searchable using criteria relevant for recruiters, due to their unstructured format.

4.3. Digital resume design

Based on the literature analyses, the integration of insights from the interviews with recruiters and the e-recruiting website analysis, we derived the relevant content for digital resumes. Compared to previous literature, two new resume categories have been added: career status and desired job; other salient resume fields are personal and contact information, education, work experience, extra activities, skills and references. In this section, we present a justification for each category based on literature, interviews, or website analysis. In some cases, we returned to previous research, in an effort to further explicate our findings. This allows us to contextualize our study and to note where our findings diverge from those of previous researchers.

4.3.1. Personal and contact information

The inclusion of personal information, such as age, gender, ethnicity, marital status and a photograph is generally included at the discretion of the applicant [39]. In the research literature few employers have indicated that personal information is desirable in resumes. Hutchinson and Brefka [23] found that inclusion of personal information was typically considered unimportant, and some respondents pointed out that such information would be “struck out” for legal reasons. Holley et al. [20] found that more than half of the applicants for Director of Personnel positions provided marital status, and many chose to include their age and number of children. They suggest prospective employers are barred from requesting certain types of information, and thus some may prefer not receiving such information for fear of discrimination claims. Personal information is usually supplied by job applicants in order to enhance their chances of obtaining an interview [34] despite the fact that such information has also been found to create discriminatory evaluations in pre-selection decisions [19]. Some applicants falsely believe that they are required to provide personal information in their resumes, unaware perhaps that anti-discrimination legislation in many countries makes it illegal for employers to base hiring decisions on such information. Essential information in each resume, according to Ross and Young [39], is an applicant’s telephone number. This was confirmed by our interviews; three recruiters requested the inclusion of phone numbers so that they could immediately talk to a potential applicant. The region where a candidate lives (during the time of the job application) is seen as important, while specific address, fax and social security number are not important. Further, age, birth date and place, gender, marital status, number of dependents, military experience, photograph and ethnicity were rated as not important by Ross and Young. Monsterboard.nl, the largest Dutch e-recruiting site belonging to the largest US-based e-Recruiting firm, does not require applicants to fill in personal information such as gender or birth date, but all the other Dutch e-recruiting sites we analyzed require applicants’ gender and birth date. Stepstone.nl, a Norwegian site, even demands information about nationality. A Dutch public-sector site, ‘werkenbijde-overheid.nl,’ asks for marital status. Similarly, one of our interviewed recruiters stated: “As a recruiter, you want to know everything you can about any potential applicant.” Yet, most resume forms let the applicant choose to show or hide personal and contact information from potential employers. In case of a fully anonymous resume (a resume without personal and contact information) recruiters can get in contact with applicants by anonymous mail. Also, the applicant can choose not to include their resume information in resume databases. In such cases, applicants can manually send in online resumes when responding to a job.
advertisement. ‘Nuwerk.nl’ gives the option to explicitly include or exclude selected companies from seeing the resume profile. In this way, applicants can be confident their current employer cannot find them in a pool of job seekers. We conclude that since employers are prohibited from selecting employees based on gender, birth date, nationality or marital status, online resume forms should ideally not even ask for this personal information.

4.3.2. Education

A significant number of researchers [3, 5, 9, 25] agree with our interviewed recruiters that educational experience is an essential component of a good resume. A recruiter may use this section to match particular job requirements with the educational accomplishments of applicants. Applicants’ competencies may be further judged on the basis of the reputation of schools attended (e.g., a prestigious private school versus a regional or state university) and the field of study. Moreover, it may be possible to infer the degree of motivation of the applicant from the duration of their program of study. Degrees received and the dates they were awarded should be included under the education section in reverse chronological order. The most suitable education to be included in resumes should be either university/college or high school level. Crosby [10] suggests that high school educational information should be included for applicants who apply for internships or student projects, and by recent graduates. However, Hutchinsons and Brefkla [23] argue there is little value in listing high school information unless it is the applicant’s sole educational experience or directly related to the open position. Researchers have frequently suggested the inclusion of grade point average (GPA). This might be due to recruiters’ beliefs that a GPA reflects in part on the candidate’s intelligence, motivation, and other abilities needed on the job [40]. For experienced professionals, recruiters place more emphasis on relevant previous work experience [23]. Ross and Young differentiate between college experience and high school experience. Overall, college experience, field of study, internship experience, major area of study, type of degree earned and date of graduation were all rated as very important. The name of college/university attended, honors and awards, participation in campus organizations, GPA in major, GPA overall, list of college courses taken, transcripts, participation in athletics and class rank were rated as somewhat important. In contrast to college and university history, name of high school attended, and other information from the applicant’s high school record, such as participation in athletics and GPA were rated as not important [40].

4.3.3. Work experience

In the work experience section, job titles, major duties and responsibilities of the jobs listed by the applicant can be compared with the requirements of the job to which a candidate applies [46]. Ross and Young [39] found the following parameters very important: job responsibilities, dates of employment, position title, achievements and accomplishments, reason for leaving, name of employer, name of supervisor, part-time or full-time status, location of employer and salary. Similarly, Cole et al. [9] found that hiring managers find information provided by job candidates about individual job achievements, holding a supervisory position, full-time work experience, and internship experience to be significant. Although some researchers [10] recommend to include full- and part-time job information, and non-related work experience in resumes, Ryan [44] suggested the inclusion only of work experience that is meaningful and directly relevant to the position sought. In organizations where work is accomplished by networks of project-based teams, and by people who can adjust to more flexible assignments, the tradition of clearly defined jobs with position titles that convey meaning outside particular work groups and companies is rapidly eroding. Hence, it is important to have descriptions and titles for job openings that will be understood by employers. In our recruiting website analyses, we found some sites only require applicants to fill-in their most recent or current work experience. This finding corresponds with our interview results. Four recruiters mentioned that resumes should be easily readable and not be overloaded with information. If a site enables the filling-in of multiple experiences, then the most recent or relevant work experience that is related to the desired job should be clearly indicated. Then the applicant’s prior responsibilities and achievements should be identified.

Moreover, based on the literature, recruiting websites should include a checkbox so applicants can see if a job is full-time or part-time. Both literature and our interviews underline the high importance placed on job titles. Current recruiting websites force recruiters to fill in several different but synonymous different job titles since parts of many job titles very often apply to similar work (software engineer, software developer, programmer).
Also, many job titles (like architect) can have multiple cross-domain meanings, e.g., a building architect or a software architect. It is therefore very important that job titles are clearly defined [16] and recruiting sites should take synonyms into account. We recommended that professional or occupational associations should be more engaged in standardizing and categorizing job titles.

4.3.4. Extra activity
Cole et al. [9], Brown and Campion [6] as well as the recruiters involved in this study consider extracurricular activities the third most important section of the resume. These activities include memberships in professional societies, holding elected offices, voluntary community activities [39] and engagement in university or social clubs. The number and type of activities (i.e., professional vs. social) and the number of leadership positions held influence their picture of an applicant’s leadership capabilities, interpersonal skills, and motivational qualities. Given that most entry-level applicants’ prior work experience is either limited or non-existent [9], recruiters are likely to focus more on an applicant’s academic qualifications and extracurricular activities. Ross and Young [39] label this category “personal and professional involvement”, and find it should include, in order of importance: certifications, professional organizations, community involvement, professional presentations delivered, professional conferences attended, and professional publications. All of these resume content items were seen as very important by our interviewees. Hobbies are considered only somewhat important in Ross and Young’s study while four of our 17 recruiters considered hobbies highly important.

The resume design literature suggests an applicant’s prior positions held in association with extracurricular activities to be very important for inclusion in resume forms. Collecting information about these extracurricular activities could be more structured in online resumes, for example by enabling applicants to fill in each experience separately, as they do in the education and work experience sections. For each experience the specific date (for a publication or presentation) or period (for community involvement and memberships) should be stated.

4.3.5. Skills
The online resume forms of the 40 Dutch recruiting sites require applicants to fill in only a fairly standard set of generic skills. For instance, in regard to computer skills, only working knowledge of Microsoft Office elements such as Word, Excel or Powerpoint are specifically listed in the online resume forms. These skill lists should be extended in order to more comprehensively reflect an applicant’s computer skills. For instance, programs like AutoCAD, Photoshop, or Sketchup or other industry specific software and programming languages should be included.

An indication of level of experience (beginner, intermediate, advanced, expert) would strengthen the usefulness of the skills section. Two of the IT recruiters we interviewed stated that information on applicants’ detailed programming languages and experience level is needed. Skills databases need to be integrated with human resource information systems in order to systematically match language skills, software skills, business skills, law skills, project management skills, etc. with a given vacancy.

4.3.6. References in resume forms
Ross and Young [39] identified references from previous employers as very important. They saw references from teachers; reference letters attached and references available on request as somewhat important, while references from relatives were not seen as important. As an alternative to including references in the resume, Besson [5] suggested a separate list of references should be sent to the prospective employer only when the candidate becomes a finalist for the position. In our website analyses, only one of the 40 websites asked applicants for references, and none of the interviewed recruiters expressed the need for references1 on the initial application.

4.3.7. Career status
We found that recruiters want to be able to filter on a range of criteria such as whether applicants are currently available to start a job and are eligible to work in the country; years of experience, education level; career level; current or last job title(s) and employer. These issues are covered by the field career status. It can be used as a search filter. Updated information on the current career status of registered applicants is important so that recruiters who use digital resume pools can first invest their screening time in candidates that are currently available. When recruiters use resume databases

---

1 This might be a Dutch bias since the Netherlands lacks a culture of making and conveying and using reference letters in HRM-type matters, unlike most Anglo-Saxon countries where those letters do play a role.
to first filter for the best-fitting applicants for their advertised jobs, several routine challenges arise. It is often the case that the applicant has by this time found a job elsewhere, or found the company or job description unattractive; and consequently does not respond to the recruiter’s invitation for an interview. Naturally, applicants are more likely to apply to job advertisements when they know the job description and the hiring company [30]. This implies applicants need to take a proactive role, and decide for themselves if they want to be regarded as a candidate by specific hiring organizations [48].

4.3.8. Desired job
The resume field desired job is important for recruiters who use digital resumes, as they need to know how likely it is that a specific applicant will take a specific job in a specific organization. Some of our interviewees noted they stopped using resume pools due to lack of applicant responsiveness and because they were not convinced that applicants actually desired to work for their organization if they only appeared as latent job seekers and did not apply directly for a specific advertised job. Ross and Young [39] showed that specific information on an applicant’s career objectives is very important. They suggest including in resumes a brief but specific objective statement, identifying the type of position the candidate is seeking. This could be either job focused or career focused. However, our interview results and the website analysis show that this is not likely to satisfy recruiters’ needs. Recruiters need more detailed information about applicants when using resume databases. Yet, applicants do not always directly apply to recruiters’ specific job advertisements; when recruiters use resume pools they assume the proactive role in searching for suitable candidates. In this case they desired an extra resume category, which we labeled “desired job” indicating the fit between the candidate’s aspirations and the advertised job. Selection research not only concentrates on person-job fit; but other fit constructs such as an individual’s compatibility with his or her organization, work group, and supervisors [27, 43]. In our proposed “desired job” category, the applicant should at least fill-in the date when he or she is available to start a new job, preferred job title(s), job status, industries, companies, salary, and hours per week he or she wants to work. Also, location is important: some recruiters mention wanting to be given information on the work commuting distance from the applicant’s home address, or eventual need for relocation, in order to judge the feasibility of hiring the candidate. If a website also offers international jobs, the desired salary should take currency issues when relevant into account (for example, by allowing site users to select the required currency from a list).

5. Synthesis
The following Fig. 2 triangulates our findings from literature, interviews, and content analysis of e-recruiting websites. Our use of multiple, independent data-gathering techniques give us considerable confidence in the robustness and completeness of our framework.

6. Challenges and limitations of intelligent matching
We now illustrate the challenges encountered in effective matching of resume and job ad content. Figure 3 below shows data from a typical applicant profile and job ad. The classification of various attributes (i.e., education, languages, skills, etc.) should enable intelligent matching. However building up an ontology for applicant and job ad descriptions is complex. The example shows that the description in the job ad requires a candidate who speaks at least one Eastern European language; the applicant profile lists Romanian under languages indicating a fit with the job ad. The skills ontology therefore needs to be build up the way that languages are classified, e.g., in Eastern European languages (or Slavic), Germanic, Roman, and Indic language families. Classifications of the Japanese family, for example, range from one language (a language isolate) to nearly twenty. A major current problem is that applicants tend to fill in concrete details in resumes (specific school attended, concrete field of study) whereas e-recruiting systems structure data according to broad categories for skills, education level and type.

As most search is keyword based (also not considering homonyms, i.e., bank = financial institution, bank = an applicant’s name), matching results between applicant and job profile remain unreliable.

In order to allow matching systems to improve recruiters’ work routines, classification difficulties need to be addressed. Continuing our illustration, the job ad excerpt requires skills in object-oriented programming language, the applicant filled in the online resume that
### Personal and Contact Information
- Title
- First Name
- Middle Name
- Last Name
- Street
- House Number
- Postal Code
- City
- Country
- Telephone Number
- Mobile Number
- Email Address
- Alternate Email Address
- Contact Preference
- (Home/mobile/phone/email)

### Personality

### Career Status
- Career Status (actively looking for a job, has a job but open to new opportunities, not available)
- Resume (date created)
- Resume (date updated)
- Eligibility To Work In Country
- Current Or Last Job Title
- Current Or Last Employer
- Current Or Last Industry
- Years Of Professional Work Experience

### Desired Job
- Description Desired Job
- Minimum Salary
- Currency
- Industry
- Business Area
- Job Titles You Want
- Job Status
  - (fulltime, part-time, per-diem)
- Job Type
  - (employee, temporary, internship, seasonal, volunteer)
- Start Availability: Date
- End Availability: Date
- Company Type
  - (public/private/nonprofit)
- Companies Where You Want To Work
- Companies Where You Don’t Want To Work
- Fringe Benefits
- Minimum Company Size
- Maximum Company Size
- Max Days Per Month Away From Home
- Desired Locations
  - (Country, City)

### Education
- Education Level
  - (high school/bachelor/master/PhD)
- Field Of Study
- Start Date
- (Expected) End Date
- Diploma
- Institution Name
- Country

### Skills
- Certificate (description)
- Institution Name
- Start Date
- End Date
- Country
- Skill level
  - (beginner, intermediate, advanced, expert)
- Computer Skills
- Industry Related Skills
- Business Skills
- Social Skills
- Technical Skills
- Languages
- Other Skills: Textbox
- Drivers Licences

### Work Experience
- Job Title
- Industry
- Business Area
- Company Name
- Country
- City
- Start Date
- End Date
- Current Position
- Achievements And Accomplishments
- Supervisory Positions
- Internship Experience
- References

### Extra Activity
- Memberships
- Organisation Name
- Start Date
- End Date
- Country
- Extra Activities
- Volunteering
- Honors And Awards
- Professional Presentations
- Professional Publications
- Hobbits And Interests

---

Fig. 2. Resume design framework.
1. No matching possible if classification Electrics is similar to Electrical Engineering is missing.
2. No matching possible if classification Romanian is Eastern European language is missing.
3. No matching possible if classification Java and C++ are object-oriented programming languages is missing.
4. No matching possible if classification CATIA and AutoCAD are CAD skills is missing.

Fig. 3. Excerpt for an applicant profile and a job ad.

Fig. 4. Example classification of IT skills.

he had skills in Java. Here also the IT skill ontology would need to know that Java belongs to the object-oriented programming languages so that this candidate is identified by the recruiters’ search query.

Another example (Fig. 4) on classifying IT skills shows C++ as a subset of both programming languages and object-oriented languages, so that applicants with C++ skills would be returned by searches on either category.

7. Developing workflows and maintaining resume content data

Enacting useful applications of online resumes by recruiters requires more than just a knowledge representation framework. The framework must be sophisticated and able to support a network of inter-related classifications [58]. A process is required for structuring and classifying unstructured job and applicant data in
conformance with the knowledge engineering frame-  
work [56]. Finally, since any classification system will  
be incomplete, a workflow is required enhancing the  
framework as part of its ongoing use. Most current  
e-Recruiting systems, however, have no automated cat-  
egorization, and no easy ability to add new knowledge,  
and therefore search queries can lead to dissatisfy-  
ing results. Manual classification is prevalent which  
requires HR assistants to classify job advertisements  
into job category, branch, type of employment and  
region. More sophisticated classifications into detailed  
education type or job-related experience and skills have  
not been accomplished by most systems yet.

A further challenge is the maintenance of the knowl-  
edge representation framework in response to new jobs  
and other categories. Although our research into the  
required fields for digital resume design was compre-  
hensive and drew on data from multiple sources, it is  
inevitable that new fields, or new categories for exist-  
ning fields, will continue to emerge. New courses and  
degrees, and new technologies and programming lan-  
guages need to be able to be incorporated into the  
framework.

The framework must be adaptive and extensible. In  
principle, the following workflow process is required  
to maintain the framework. If applicants suggest new  
terms that the system does not know these should be put  
into a separate group. The different context suggestions  
should be socialised by subject matter experts using  
collaborative processes involving users and developers.  
The disputed terms can then be incorporated into the  
existing framework, or used as a basis for extensions to  
the framework. A categorization processes for unknown  
terms that enables them to be added to the struc-  
tured content system is essential for the success of any  
e-Recruiting field framework.

8. Discussion

When applicants send print resumes to an organiza-  
tion, usually recruiters assume that the applicants are  
eager and willing to take the advertised job [12, 36].  
With digital resumes this is often not the case. It is easy  
for applicants to send their resumes to many different  
organizations with little effort and cost.

In particular when recruiters use digital resume  
pools, several challenges arise. Recruiters may  
get frustrated if they have identified a seemingly  
perfect candidate but potential candidates with active-  
appearing resumes appear nonresponsive due to  
changed circumstances in their career status. Several  
of our interviewed recruiters noted that resume pro-  
files get easily out-dated. Recruiters had experienced  
many ‘hits’ which suggested suitable candidates, only  
to find that while initially a profile seemed suitable for  
an advertised job, due to changes in the applicants’  
career experiences and interests they were no longer  
an effective match.

Previous research suggests that registered users of  
e-recruiting services are not long-term active users.  
Usually, job seekers tend to look through the pub-  
lished job ads, fill in resume forms and apply to the  
e-listed jobs. As soon as they have found a new job, there  
is very little reason to return to a career site again. And  
it is difficult to design the technical features of online  
services and simultaneously lead new social practices  
for ongoing communications [51].

Due to the exchange-based nature of recruiting ser-  
ces, large numbers of e-recruiting initiatives fail [15].  
Many providers try to solve this dilemma by accumu-  
lating masses of resumes, (i.e., registered applicant  
profiles) so that simply more suitable profiles for the  
same job advertisements appear to be available. The  
problem of outmoded profiles is, however, not solved  
this way [49]. Many of the applicants have already  
found a job or their contact data has changed. There-  
fore, a major design challenge is to implement features  
to motivate applicants to keep their profiles up-to-date.  
Some research suggests additional features to encour-  
age stickiness and return visits; such as enhancing the  
playfulness of the site, or implementing skill competi-  
tions and the ability for applicants to rank themselves  
compared to other registered applicants on the site [14].  
Effective management of online resume data could also  
facilitate regular prompting of applicants to confirm if  
their details are correct and if they are still job-hunting.

When recruiters receive print resumes, after an initial  
screening they reply with a rejection or an invitation  
to submit more documents for additional screening or  
an invitation for an interview or further testing. In the  
offline context, the applicant is usually removed from  
the pool of applications after their application has been  
considered, although some organizations keep resumes  
stored for later possible job interviews.

In the digital context, resumes can be stored lifelong.  
In order to get a systematic overview of the available  
candidates, one needs to build in a ‘career state’ entry:  
to flag the willingness of a person to interview at some  
point (e.g., available on a specified date, currently not  
available, or latent job seeker, that is, open for job  
offers however currently in a job). By paying more
attention to practice-oriented resume design, recruiters’ time investments would decrease considerably. Similarly, automated rejection mails to unsuitable resume profiles can enable efficient communication. Finally, system designers are challenged to create private information space into the applicant profile base (for applicants; friends of applicants and for HR recruiters).

We expect future e-recruiting services to include social network functionalities among registered users: In order to build trust as well as ward off the fear that personalized resume data will be misused.

9. Contribution to research and practice

This study’s analysis of the relevant literature; interviews with recruiters; and content-analysis of the resume fields of 40 e-Recruiting sites contributes to the understanding of varying requirements of offline and online resumes. Second, we shed light on some of the challenges of online matching of resume data to job requirements, and maintaining a structured framework for resume data.

We suggest processes for structuring and matching job and applicant data, and discuss approaches for maintaining and extending the framework. Third, this study has resulted in a number of design recommendations. Fields that could result in claims of discrimination, for example, age, gender and marital status should be excluded from digital resume databases [19, 39]. Furthermore, the equivalency of job titles is complex and requires ongoing input from professional and occupational associations to ensure consistent classification.

Information about extracurricular activities needs to be more structured, and more similar to job information. Skills classifications need to be integrated from a number of disciplines, including language, software and business.

We propose two new resume fields specifically relevant for effectively working with digital resume databases: career status and desired job. We recommend using fewer open text-field options in online resume forms and instead a focus on “select” fields which can be classified for matching job ads and resume profiles. Needless to say, textboxes do not support structured searching or automated pre-selection and filtering of candidates. Still, textboxes have been found useful for screening after an initial assessment (i.e., first screening of the hard facts required for a job) has taken place. In order to lower the time spent in pre-selection processes, various phases in the selection process need to be integrated as discussed earlier in the literature [18].

Our interviews suggested that in a first level selection, recruiters usually do not require all resume content data; there is no need for most of the unstructured information in textboxes or specific street address of an applicant. Basic initial information which is required includes eligibility to work in the country, availability, education level, skills and years of work experience. If these first-level selection criteria are assessed positively, a second level selection should take place (showing specific resume details of applicants, that is, textboxes where applicants express their talents in writing, which also allows recruiters to assess their level of writing fluency). This second-phase may need to include more unstructured written information. Alternatively, upon the initial pre-selection round a phone interview or other selection techniques may take place.

A major challenge in resume design is to establish a standardized vocabulary for resume fields. Our study clearly revealed that the currently used online resume forms use many different synonyms for the same resume field. For instance, some portals ask applicants to fill in their earliest possible starting date, others the earliest beginning date or job enter date – terms which obviously relate to the same construct. And some information services request applicants to fill in an exact day of the month whereas others require filling in ‘start month’ and year.

This research provides a springboard for semantic web applications that will enable the implementation of intelligent, adaptable and extensible e-Recruiting portals and applications. This has great potential to bring productivity gains in this specific aspect of the e-HRM industry.

10. Implications for future research

The challenge remains to classify resume information across sectors, countries, languages and laws affecting the job search and hiring process. Clearly, both research and practice would benefit from a more unified or standardized language for digital resume forms. However, this knowledge source is complex to develop, and would require various syntheses from areas as broad as Linguistics, Human Resources, Computer Science, Information Systems, and even Psychology. To date, there appears little knowledge sharing across organizations and research disciplines when it comes to e-Recruiting portal design [54]. Researchers
from technical disciplines (Information Systems, Computer Science) and social sciences (Human Resource Management, Psychology) have worked independently from each other. Fortunately, in the past decade, scholars have started to undertake joint interdisciplinary efforts to understand the phenomenon and its multilevel implications within and across organizations; leading to several special issues on e-HRM between 2004 and 2010 (e.g., The International Journal of Human Resource Management, 2009).

Clearly, more technical research is needed in the e-HRM domain to develop an adaptive e-recruiting ontology that can learn new skills such as applicants’ various computer or language skills. In order to enable effective matching, comprehensive skill ontologies need to be agreed upon within the recruiting sector. Research suggests that better taxonomies would produce better selection decisions [16, 52].

As educational programs and skills change over time, skill ontologies for resume fields would need to allow learning from new users who fill in new skills which the system did not know before. Yet, different users will likely interpret skill levels differently. Therefore skill tests may need to be included when filling in resume forms. This would provide a more objective comparison of resume content data. An intelligent resume screening system could aid in the recommendation of applicants to recruiters [53]. Also workflows for using, maintaining, and enhancing resume databases need to be developed in order to enhance recruiters’ effectiveness in using such systems.

This study is not without limitations. Quantitative research involving a larger sample of recruiters would be helpful for identifying essential and nice-to-have resume categories in a more comprehensive way. Furthermore, our suggested resume content fields may need revision depending on emerging novel job classifications and industry types in a growing universe of e-Recruiting services. We focused exclusively on analyzing Dutch e-Recruiting sites and interviews with Dutch recruiters. Resume preferences and resume fields may be categorized differently in other cultures outside the Netherlands.

11. Conclusion

This paper addresses and synthesizes requirements of online resume forms into a knowledge framework. We conducted interviews with 17 full-time recruiters, and content analyzed the resume forms of the 40 largest Dutch e-Recruiting sites which provided insights into best practice in content items used in resume forms. These current practices were compared with extant resume design literature and concepts emerging from

---

### Appendix A

#### Largest e-Recruiting websites in the Netherlands


<table>
<thead>
<tr>
<th>#</th>
<th>url</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><a href="http://www.monsterbord.nl/">http://www.monsterbord.nl/</a></td>
</tr>
<tr>
<td>2</td>
<td><a href="http://www.nationalevacaturebank.nl/">http://www.nationalevacaturebank.nl/</a></td>
</tr>
<tr>
<td>3</td>
<td><a href="http://www.intermediair.nl/">http://www.intermediair.nl/</a></td>
</tr>
<tr>
<td>4</td>
<td><a href="http://www.totaljobs.nl">http://www.totaljobs.nl</a></td>
</tr>
<tr>
<td>5</td>
<td><a href="http://www.jobingmail.nl/">http://www.jobingmail.nl/</a></td>
</tr>
<tr>
<td>6</td>
<td><a href="http://www.volkskrantbanen.nl/">http://www.volkskrantbanen.nl/</a></td>
</tr>
<tr>
<td>7</td>
<td><a href="http://www.uitzendbureau.nl.nl/">http://www.uitzendbureau.nl.nl/</a></td>
</tr>
<tr>
<td>8</td>
<td><a href="http://www.jobrack.nl">http://www.jobrack.nl</a></td>
</tr>
<tr>
<td>9</td>
<td><a href="http://www.jobrapido.nl">http://www.jobrapido.nl</a></td>
</tr>
<tr>
<td>10</td>
<td><a href="http://www.jobwisdom.nl">http://www.jobwisdom.nl</a></td>
</tr>
<tr>
<td>11</td>
<td><a href="http://www.randstad.nl">http://www.randstad.nl</a></td>
</tr>
<tr>
<td>12</td>
<td><a href="http://www.uitzendbureau.nl.nl/">http://www.uitzendbureau.nl.nl/</a></td>
</tr>
<tr>
<td>13</td>
<td><a href="http://www%E5%9D%9A%E6%9E%9Cfruitant.nl/">http://www坚果fruitant.nl/</a></td>
</tr>
<tr>
<td>14</td>
<td><a href="http://www.stepstone.nl">http://www.stepstone.nl</a></td>
</tr>
<tr>
<td>15</td>
<td><a href="http://www.uitzendbureau.nl.nl/">http://www.uitzendbureau.nl.nl/</a></td>
</tr>
<tr>
<td>16</td>
<td><a href="http://vacature.overzicht.nl/">http://vacature.overzicht.nl/</a></td>
</tr>
<tr>
<td>17</td>
<td><a href="http://www.werk.nl">http://www.werk.nl</a></td>
</tr>
<tr>
<td>18</td>
<td><a href="http://www.werk.nl">http://www.werk.nl</a></td>
</tr>
<tr>
<td>19</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>20</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>21</td>
<td><a href="http://www.jaba.nl">http://www.jaba.nl</a></td>
</tr>
<tr>
<td>22</td>
<td><a href="http://www.adolco.nl">http://www.adolco.nl</a></td>
</tr>
<tr>
<td>23</td>
<td><a href="http://www.stepstone.nl">http://www.stepstone.nl</a></td>
</tr>
<tr>
<td>24</td>
<td><a href="http://www.uitzendbureau.nl.nl/">http://www.uitzendbureau.nl.nl/</a></td>
</tr>
<tr>
<td>25</td>
<td><a href="http://www.werk.nl">http://www.werk.nl</a></td>
</tr>
<tr>
<td>26</td>
<td><a href="http://www.volkskrantbanen.nl/">http://www.volkskrantbanen.nl/</a></td>
</tr>
<tr>
<td>27</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>28</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>29</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>30</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>31</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>32</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>33</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>34</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>35</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>36</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>37</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>38</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>39</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
<tr>
<td>40</td>
<td><a href="http://www.nuwerk.nl">http://www.nuwerk.nl</a></td>
</tr>
</tbody>
</table>
interviewing recruiters about their everyday professional experience. This research is useful for managers and designers of online resume forms, recruiters, applicants and academicians engaged in e-Recruiting research. We synthesized and explained the content of the most sought after digital resume fields by recruiters. Career status, desired job, education, work experience, extracurricular activities, skills, personal information and contact information. This research provides two new resume fields beyond what is found in the existing academic literature: career status and desired job. Both of these categories provide useful information for recruiters using resume databases for searching and matching. “Current career status” makes it virtually effortless to quickly sort out applicants that are not suitable for the open position, and “desired job” gives the recruiter information as to whether an applicant would be actually interested in an offered job. Further, we have represented the fields in a structured way that will enable design and development. Despite the popularity of e-HRM [18, 41], the full potential of online recruiting is not being realized due to ongoing difficulties in matching and searching on resume fields. Filtering resumes and identifying suitable applicants, let-alone suitable applicants that are actually interested in the position, remains the same labour intensive, hit-or-miss process that it was in pre-digital times. In this study, we identified some of the reasons why this is the case, and proposed some solutions. The knowledge representation framework and the insights gleaned from this exploratory study may aid in improved design that will enable recruiters to harness the business potential of the online resume databases in the future.

References


Article by E. Furtmüller et al.: e-HRM and digital resumes

258


