Using Conjoint Analysis to Determine the Requirements of Different Users for Designing Online Solution Tools: Job Matching Platform

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Abstract Online systems first emerged as recruiting tools in the mid-1990s have grown rapidly and became a widely adopted medium by both employers and job seekers. However, despite their success, they have important drawbacks. These tools are mostly designed for matching corporate positions to certain elite employees rather than covering disadvantaged groups, SMEs and NGOs. Key features of present systems are determined by a "core team" of experts according to the aggregate requirements of an average target user. Designing an inclusive recruitment system requires a rigorous conceptualization phase where all stakeholders actively participate within a multidisciplinary approach with the collaboration of engineers with social. In this paper, we embraced a user-centered approach to determine the relative importance of different online recruitment tool features for diverse users and conducted conjoint analysis to determine the needs, requirements and expectations of different stakeholders, male–female job seekers and job providers from SME or MNEs, We performed requirement-based segmentation on the output from the conjoint analysis to isolate homogeneous user segments. The results demonstrated that there are significant differences between the groups and suggest that conjoint analysis can provide systematic input for process modeling to customize online tools according to the requirements of different stakeholders.

Keywords Conjoint analysis • New product development • System design • Product preference

1 Introduction

Online systems have first emerged as a recruiting tool in the mid-1990s and have been baptized by the popular management press as a 'recruiting revolution' (Boydell 2002). Since then, their use has grown rapidly and they became a widely adopted medium by both employers and job seekers. However, despite their

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success, they have important drawbacks, which implicitly keep at bay certain types of organizations and individuals. These tools are mostly designed for matching corporate positions to certain elite employees and have been found unsuitable for some disadvantaged groups and SMEs and NGOs. Key features of present online recruitment systems are determined by a "core team" of experts according to the aggregate requirements of an average target user. These features generally neglect the requirements of specific groups. Designing an inclusive recruitment system ensuring diversity should be able to manage changing and conflicting requirements. This requires a rigorous conceptualization phase where all stakeholders actively participate for developing a shared vision of the system components. This phase must entail a multidisciplinary approach whereby technical innovators become responsive to the societal needs and societal actors become co-responsible for the innovation process with their constructive inputs. Hence, collaboration of engineers with social researchers who would translate the voice of the societal actors to the design process becomes essential for an inclusive product development process. In this paper, we embraced a user-centered approach to determine the relative importance of different online recruitment tool features for diverse users and conducted conjoint analysis, which is a quantitative market research technique to determine the needs, requirements and expectations of different stakeholders from an inclusive online recruitment platform.

This paper is organized as follows: A literature review covering talent management, development of online recruitment platforms, and implicit exclusion of diversity in online platforms, and integrated product and process innovation for designing an agile and inclusive online recruitment tool has been done. Research methodology to determine the relative importance of diverse product features for different stakeholders including sampling, instruments and procedures has been explained. Finally, study outcomes with the conclusion have been presented.

2 Literature

2.1 Talent Management and Development of Online Recruitment Tools

A firms' competitive advantage is directly tied to the recruitment and management of the talents who make up its human capital pool (Cheese et al. 2008). A talent pool insufficient to fill strategic positions may seriously impede the growth of an organization (Ready and Conger 2007). Recently, talent management has started to emerge as a new discipline to complement classical HRM tools for creating a high potential talent pool and allocating high performing employees to fill strategic positions (Becker and Huselid 1998; Mellahi and Collings 2010). Talent management (TM) can be defined as a systematic, strategic and technology based approach to human resource management (HRM) (Lewis and Heckman 2006). It may be

distinguished from classical HRM practices as it exploits high technological tools such as software and databases and a system approach for maintaining functions such as recruiting, selection, development and career and succession management (Lewis and Heckman 2006).

Recruitment can be regarded as one of the fundamental elements of talent management. It 'includes those practices and activities carried out by the organization with the primary purpose of identifying and attracting potential employees' (Breaugh 2000). Compared to classical HRM, TM focuses on the attraction of talents than their selection. Searching for and selecting new talents can be a time-consuming and potentially conflict-ridden activity, particularly when talent candidates are scarce, currently working in other companies, and when the suitability of the candidate for the available position is difficult to evaluate (Klehe 2012). 'War for talent' (Lievens et al. 2002) led the companies to fill the gap by employing third party agents who are paid by the client when they recruit appropriate employees for the offered positions. These agents, namely headhunters, handle the complexity in recruitment in an efficient manner as they have their own industry specific databases; hence have access to a larger talent pool (Klehe 2012).

Besides many advantages of headhunters, some disadvantages repel firms to use them for their talent recruitment purposes. First, they are not cost effective; costs can exceed the benefits as they sometimes may charge about 50 % of the annual salary for senior-level positions. Second, there are some malpractice allegations for them such as misrepresenting the qualities of some candidates. Third, the potential for unethical methods exist such as stealing successful talents from their current employers (Parry and Tyson 2008). Consequently, matching talents with high quality jobs still remains a problem. For example, according to the Chartered Institute of Personnel and Development (CIPD) (2007) 84 % of organizations in the UK experienced recruitment difficulties, and still in need of choosing appropriate ways to access qualified talents (cited in Parry and Tyson 2008).

Since their introduction in mid-1990s, online recruitment tools have provided high technological solutions to complement the inefficiencies of the existing recruitment methods (Parry and Wilson 2009). They have grown rapidly since then and become one of the fundamental talent management tools. For instance, studies show that US online recruitment sources contain 110 million jobs and 20 million unique resumes and revenues top $2.6 billion in 2007. All Fortune 100 Companies use some form of e-recruiting methods and 94 % of Global 500 companies use their websites for recruitment, as compared to just 29 % in 1998 (Maurer and Liu 2007). In a similar manner, in the UK 64 % of employers prefer online job boards and 42 % declared that they used up to five different job boards simultaneously (jobs.ac.uk 2013).

In the literature, research has shown that companies and job seekers preferred online recruitment to the traditional HR techniques because of their many advantages. First of all functional properties such as cost effectiveness, better access to talents, proper targeting in any specific area or industry, fast response and turnaround times, and ease of use make these tools attractive to the users (Galanaki 2002; Thompson et al. 2008; Zusman and Landis 2002). In addition, intangible

communicative properties such as interactivity and usability, ability of presenting more information regarding the corporate values, enhanced corporate image for attracting talents, and active search and application opportunities have been reported (Cober et al. 2004; Lievens et al. 2002). These findings in the literature are also supported by a comprehensive survey conducted by CIPD (2006) which found that 71 % of the respondents used e-recruitment to reduce recruiting costs, 60 % to broaden the selection pool and 47 % to improve the time to hire (Parry and Tyson 2008).

However, despite their many advantages, online recruitment tools are far from being at a mature stage for a flawless functioning. When they had first emerged in the 1990s, the major difficulty was the insufficiency of the technology to track and manage the large number of resumes and applicants (Parry and Tyson 2008). This still remains a problem. A longitudinal study conducted by Parry and Tyson (2008) have found that huge number of applications, including many unsuitable ones such as from people who had no permission to work in the country was among the most frequently declared problems. According to a survey conducted by IRS Employment Review (2005), 74 % of organizations received inappropriate responses to their job postings. On the side of the applicants, potential negative impacts include low or no response to job applications, user unfriendliness and poor design of the websites (Parry and Tyson 2008). Problems concerning both sides include risk of considering only efficiency and cost containment rather than goal of hiring; cheating; and invasion of privacy (Maurer and Liu 2007; Stone et al. 2013).

2.2 Online Recruitment and Implicit Exclusion

Online recruitment tools have also raised discrimination concerns because of their bias towards certain groups and inability to maintain diversity in talent recruitment and management (Maurer and Liu 2007; Stone et al. 2013). These tools are found to fail to be inclusive towards members of some disadvantaged groups and SMEs (Mellahi and Collings 2010). These failures contain issues such as over-emphasis on individual performance; glorification of the recruitment of the "star players" outside the company; discrimination by excluding less able employees from career development opportunities; and neglecting the cultural issues. Moreover, these tools have been found to be user-unfriendly for the SMEs and non-profit organizations because of the issues such as difficulty in driving traffic to their web sites and inability to investing in the promotion of intangible properties such as the corporate image. These organizations find it hard to attract talents since the cognitive cost of conducting a comprehensive assessment of job offer attributes is much higher than having some heuristic clues about the general image of the company. Hence, companies and organizations that could not afford investing in image building might remain invisible to the talents on online recruitment platforms (McDonnell et al. 2010).

These concerns have important drawbacks in terms of talent recruitment and management. Besides social exclusion issues, uniformity of the talent pool can seriously impede creativity and innovation in an organization. Generation of new ideas, new services, and new products require teamwork of individuals with different backgrounds and a diverse set of experiences and perspectives (Maznevski and Distefano 2000). Dissimilar mind-sets lead to the out-of-the box voices encouraging the breadth and depth of innovative and creative thinking (Bourne and Ozbilgin 2008). Today's dynamic business environment requires managing shifting relationships and connections and adapting to the complexity. Neglecting diversity can lead to management failures as the organizations may fail to adapt to the complexity on an effective basis and to develop a sufficient talent pipeline to fill strategic positions in an uncertain business environment (Brewster et al. 2005; Cheese et al. 2008).

Insufficiently diverse talent pools; unmanageable high volume of applications by the unsuitable candidates; difficulties in online and offline process reconciliation; technical problems and litigation issues can be summarized as the major drawbacks of online recruitment platforms. One of the main reasons for these drawbacks can be summarized as the "one size fits all", top down approach applied in the design phase where these platforms are planned as rigid models with predefined product boundaries (Palmer and Kaplan 2007). Consequently, present platforms have been biased to target large corporations willing to hire highly talented employees who can help them meet their short run (e.g., productivity) performance goals rather than the formation of a diverse talent pool (Maurer and Liu 2007). To make these platforms more efficient and effective for handling diverse stakeholder needs and requirements, an innovative tool with more flexible, open and interactive properties is needed.

2.3 Integrated Product and Process Innovation for Designing an Agile and Inclusive Online Recruitment Tool

Innovation can be defined as finding better solutions that meet emerging requirements by creating applicable new ideas and their exploitation for commercial product development. Besides new product development, innovation also includes the development of new processes for improving production and delivery methods by applying new techniques, equipment and/or software (Pankowska 2012). Online recruitment platforms can be accepted both as a product as they consist a bundle of tangible and intangible attributes such as features, functions, benefits, and uses and also as a process since they consist a set of structured, measurable activities designed to deliver a specific output (job matching) within a specific time-frame (Davenport 1993). Hence, development of an innovative online recruitment platform meeting the specific requirements of disadvantaged groups entails an integrated effort. Such a platform needs to improve and renovate the product features in

line with the inclusion of diverse talent groups and offering advanced features for personalized matchmaking. It also needs to reform the rigid bureaucratic and formal processes, which might cause implicit discrimination to maintain the task of matching right people to the right positions.

Conventionally, new product development is a top-down engineering activity involving a "core team" of experts who design the product according to predefined key specifications fitting to the aggregate requirements of an average target user. However, focusing only on the aggregate requirements and identifying the product according to modifiable rigid definitions may carry the risks of exclusion of some user groups and cannot handle the complexities in an uncertain environment (Bhattacharya et al. 1998). Product definition should be an open process which follows a rigorous conceptualization phase involving testing different ideas, analyzing the needs and requirements of different user groups, and understanding the community ecosystem. Products with unclear or incorrect concepts cause high costs and/or failure at later stages of the development process (Floren and Frishmmar 2012). The conceptualization phase takes the product as a system rather than an entity and targets to design an open system architecture identifying a dynamic model of the structure, behavior and different views of the product.

For the complex systems integrating process and product innovations and composed of a structured collection of software modules, stakeholders, data structures and interfaces, any mismatch between the requirement analysis and system architecture can lead to fatal failures (Wood and Jones 1995). For designing such systems, rigorous requirement analyzes involving different stakeholders and user groups should identify the objectives and enable to develop flexible, large-scale, efficient and effective products for the end user. Such requirement analyzes should not be based only on the identification of the needs of an average customer but should engage a wide range of stakeholders, groups or individuals who can affect or is affected by the achievement of the product or the process (van Riel et al. 2013). Stakeholders should voice their concerns in terms of determining the desirable and undesirable features of products, being affected from the externalities of a product and monitoring the company's actions (Orlitzky et al. 2003; Wood and Jones 1995). Managing legitimate concerns of multiple stakeholders as a part of corporate social performance is an essential element of integrative innovation process (Hauser et al. 1993; Mahajan and Wind 1988; Talke and Hultink 2010). Detecting as early in the process as possible different and sometimes conflicting demands is crucial for filtering ideas that are likely to be failures (Goldenberg et al. 2001). EU science in society initiatives emphasizes the role of engaging the stakeholders into the innovation process. Responsible- Research-and-Innovation as defined by the EU is a comprehensive approach aiming to involve all the affected stakeholders at an early stage. This is crucial for obtaining the tacit knowledge of different users on the consequences of the outcomes of an innovation and the range of different options for effectively evaluating both outcomes and options. Then, these considerations may be used as functional requirements for designing and development of new products and services (EU Commission 2013).

Designing an online recruitment platform according to Responsible Research and Innovation principles requires an integrated approach involving both product and process dimensions. As a product, its design should include normative anchor points such as being user friendly for disadvantaged groups, diversity concerned, flexible and reconciliation of different stakeholder needs and expectations. As a process, it must allow to be managed in a more responsive, adaptive and integrated manner. Since integrating these dimensions involves both technological and societal issues, a multidisciplinary approach whereby technical innovators become responsive to the societal needs and societal actors become co-responsible for the innovation process by a constructive input is needed. Hence, collaboration of engineers with social researchers who would translate the voice of the societal actors to the design process becomes essential for an inclusive innovation (Von Schomberg 2013).

There are three fundamental social research designs for involving stakeholders into the system development process: user-centered; participatory and user-driven (Friedrich 2013). In the user-centered design process, system designers focus on the product such as an object, communication, space, interface, or service looking for ways to ensure that it meets the requirements of the potential user groups. The social scientist/researcher serves as the mediator between the user and the system designer. The researcher collects primary data or uses secondary sources to learn about the needs of the user; interprets this information, often in the form of system architecture criteria. Then, the designer interprets these criteria, typically through concept sketches or scenarios. In the participatory and user driven innovation methodologies, stakeholders express themselves and actively participate to the development process or even co-create the process by generating knowledge (Sanders 2003). In this paper, we embraced a user-centered design to determine the relative importance of diverse product features for different stakeholders and conducted conjoint analysis, which is a quantitative market research technique to determine the needs, requirements and expectations of different stakeholders from an inclusive online recruitment platform.

3 Method

Conjoint analysis is a widely used technique to quantify the users' preferences among competing products or services and can also be used to build in users' preferences to new product development (Gustafsson et al. 2007; Green and Srinivasan 1989, 1990). Conjoint analysis is also applied to study process development issues such as environmental valuation, health care management, and supply chain management to name a few (Farber and Griner 2000; Ryan and Hughes 1997). There are also some studies concerning the conjoint adoption of different innovation processes (Rotaris 2003) and job choice as an integrated system (Krishnamurthi 1988; Montgomery and Barbara 2011; Cattin and Wittink

1989). However, conjoint research concerning development of online recruitment platforms remains a gap in the literature. This paper aims to fill in this gap.

Conjoint research designs provide the respondents with a set of profiles and ask them to rank or rate their preferences between these sets designed according to different characteristics (attributes and their levels). These empirical preferences are then processed in such a way to generate quantified partial utilities for each level of each attribute. Utilities in this sense means the values assigned by the users for certain trade-offs and making preferences among multi-attribute objects. In its usual form, these utilities are estimated according to a regression model, which takes the respondents' preferences as the dependent variable and dummy variables for levels of features as the independent variables. Ultimately, this allows understanding the relative importance of each characteristic for different users. Briefly, conjoint analysis decomposes overall assessment into implicit utilities for characteristics of a product and identifies: (a) the weight of each feature during a choice decision, (b) the composition of the feature during the decision, and (c) determines the partial utilities for the each level of each feature. This analysis may be conducted for all respondents or for selected market segments.

3.1 Sample

For our purposes, we surveyed a group of potential user segments to be involved during a recruitment process. For the sampling design, we applied quota sampling, where each user segment is profiled according to two strata, namely gender and size of the company ($n = 40$). We recruited female job-seeker respondents through "yenidenbiz",[1] a social enterprise for supporting women who have interrupted their carriers and wish to return to job market. We recruited male job-seeker respondents through our connections, mainly PhD students. Both groups represent highly qualified individuals since our research concerns talent recruitment. We have also contacted the HR departments of different organizations for selecting the respondents representing the talent managers of Multi-National Enterprises (MNE) and Small and Medium Sized Enterprises (SME).

3.2 Instruments

For the conjoint design we started with the determination of the dimensions of an online recruitment tool, which might be relevant to the potential users. From the existing literature (Parry and Wilson 2009) for a comprehensive list of factors, we determined eight basic factors considered as important as a feature of an online

[1] http://www.yenidenbiz.com

recruitment platform (their levels in parentheses): Industry Coverage (just big MNEs, includes industry specific, includes SMEs); online interview (yes, no); online tests (yes, no); Referencing Feature (yes, no); Visual appearance (basic, standard, attractive); depersonalized CV (yes, no); pool size (low, medium, high); information about company (simple, standard, includes corporate values). We have especially included depersonalized CV since such procedures are assumed to directly focus on qualifications rather than the potentially discriminating but irrelevant properties such as gender, origin, religion etc. The main idea of depersonalized application procedures is to protect applicants from prejudice based implicit or explicit discrimination during application procedures (Bourgeault et al. 2013).

3.3 Procedures

Using the list of eight features and their levels as the starting point, we generated a fractional factorial design with 27 different profiles of online recruitment platforms since it isn't necessary and would be cumbersome for the respondents to use all combination of feature levels required by the full factorial design. We used "Generate Orthogonal Design" feature in the SPSS software as it generates profiles that permit the statistical testing of several factors without testing every combination of factor levels. We generated a separate card for each product profile by exporting the generated profiles to PowerPoint, where each table (product profile) is placed on a separate slide. Then we presented each respondent with these slides each representing a set of alternative product profiles and asked them to rank order them from most to the least preferred. The respondents were promised their personal utility estimates as an incentive to execute the task in a rigorous manner. The task was salient to them since they were in the process of job search and/or responsible for HR functions. We then used the collected data for estimating the parameters of the conjoint model reflecting the profile preferences as a dependent variable and levels of the attributes that characterize them as independent variables. We used conjoint.sps syntax in SPSS for these estimations.

4 Findings

4.1 Utility Scores

Table 1 shows the utility (part-worth) scores for each potential user group and their standard errors for each factor level. Higher utility values indicate greater preference. Size of the talent pool seems to be the most significant factor related to the preferences of both male and female job-seekers, while depersonalized application

Table 1 Utility scores for different groups

		Male		Female		MNE		SME	
		Utility estimate	Std. error	Utility estimate	Std. error	Utility estimate	Std. error	Utility estimate	Std. error
Indcov	Just big MNEs	1.573	1.267	1.383	1.280	3.391	0.355	−7.207	1.212
	Includes industry specific	−0.530	1.267	−0.540	1.280	−0.451	0.355	2.859	1.212
	Includes SMEs	−1.043	1.248	−0.843	1.261	−2.940	0.350	4.348	1.194
Int	No	−0.044	0.950	−0.151	0.960	−0.606	0.266	0.130	0.909
	Yes	0.044	0.950	0.151	0.960	0.606	0.266	−0.130	0.909
Test	No	−1.069	0.950	−1.030	0.960	−.495	0.266	−0.895	0.909
	yes	1.069	0.950	1.030	0.960	0.495	0.266	0.895	0.909
Ref	No	1.374	0.936	0.994	0.946	−0.138	0.262	0.156	0.896
	yes	−1.374	0.936	−0.994	0.946	0.138	0.262	−0.156	0.896
Visual	Basic	1.086	1.334	1.298	1.348	−1.375	0.374	0.118	1.276
	Standard	−2.110	1.192	−2.208	1.204	−0.031	0.334	0.089	1.140
	Appearance	1.024	1.248	0.910	1.261	1.406	0.350	−0.208	1.194
Deper	No	−1.553	0.950	−1.817	0.960	0.005	0.266	0.355	0.909
	Yes	1.553	0.950	1.817	0.960	−0.005	0.266	−0.355	0.909
Pool	Low	−7.091	1.186	−6.954	1.198	−7.721	0.332	−4.600	1.135
	Medium	1.659	1.137	1.591	1.149	2.364	0.319	1.053	1.088
	High	5.432	1.258	5.363	1.271	5.357	0.352	3.547	1.204
Compinfo	Simple	1.053	1.334	1.199	1.348	0.551	0.374	−0.248	1.276
	Standard	0.457	1.192	0.434	1.204	−0.438	0.334	1.334	1.140
	Includes corporate values	−1.510	1.248	−1.633	1.261	−0.113	0.350	−1.085	1.194

is significant only for women. This is in line with our hypothesis that disadvantaged groups would prefer depersonalized procedures for recruitment. While MNEs value the features such as online interviews and tests, these are not relevant for the SMEs. This can be due to the fact that SMEs do not already have a testing background and have a preference for more face-to-face interactions during the job interviews. As expected, both MNEs and SMEs are biased towards an online platform covering their sectors. Size of the talent pool is important for both groups. While visual attractiveness of the website is important for the MNEs, this is irrelevant for the SMEs. Other features are equally insignificant for both groups.

4.2 Relative Importance

The range of the utility values (highest to lowest) for each factor provides a measure of how important the factor was to overall preference. Factors with greater utility ranges play a more significant role than those with smaller ranges.

The relative importance of the size of the talent pool is largest for all groups, except SMEs who consider the coverage of the SMEs as relatively most important. Another point to consider is the relative low influence of the depersonalized applications for the employer groups and higher influence for the job-seeker groups, especially for women (Table 2). We can say that according to the job seekers, including depersonalized application procedures to an online platform would be an element that would respond their requirements.

Table 2 Relative importance of the features for different groups

	Male	Female	MNE	SME
	Importance values	Importance values	Importance values	Importance values
Indcov	9.906	8.330	23.093	43.051
Int	0.874	1.669	4.368	2.784
Test	7.166	6.843	4.495	6.612
Ref	9.182	6.664	2.144	1.368
Visual	11.291	12.131	10.524	3.235
Deper	9.797	12.203	1.981	3.125
Pool	42.133	41.611	47.637	30.313
Compinfo	9.651	10.548	5.757	9.512

5 Conclusion

In this paper, we presented how conjoint analysis can be used to determine different stakeholder expectations from an online recruitment platform. The results suggest that while some expectations of some groups overlap, some others may not coincide and even be conflicting. These results may provide some interesting insights for the system engineers for building personalized, user-centered designs. A flexible and customizable online recruitment platform should be able to reconcile these conflicting requirements through an intelligent system. This requires designing the system architecture with the active participation of all the stakeholders to ensure the development of a shared vision of the system processes. Hence, the findings provided by our analyses needs to be complemented by the participatory and user driven innovation methodologies where stakeholders express themselves and actively participate to the development process or even co-create the system-components. Qualitative research techniques which can provide more in depth data about the participants such as interviews, participant observations or focus groups can help us to understand multiple, and often conflicting, interpretive positions. Future research needs to take this into account and system designers can use the provided information to design more intelligent, flexible and customizable system architectures. Fuzzy data obtained from qualitative research can be built into the system by applying intelligent system techniques such as fuzzy sets, Multi Criteria Decision Making (MCDM), semantic approaches, Machine learning and Mathematical optimization.

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