What Web Analysts Can Do for Human-Computer Interaction?

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Abstract. Fostered by the emergence of web technologies and of new streams like ubiquitous computing, social media or mobile technologies, a lot of attention has been directed to the field of Web Analytics in order to learn about technology usage behavior of end-users, such as customers or employees of enterprises. Going beyond the scope of online marketing and business intelligence, Web Analysts can be of relevance for typical Human-Computer Interaction (HCI) activities, i.e. designing user interfaces for new business software or evaluating the usability of an existing solution. Thus, this paper aims at elaborating the usefulness of Web Analytics for the HCI domain. Therefore, we conducted an empirical study in order to gather working tasks and professional competencies of Web Analysts by analyzing international job advertisements. Consequently, we draw conclusions on how Web Analysts can support HCI activities with regard to this task and competence profile. It shows that Web Analysts can be of use in HCI practice, i.e. within the usability engineering life-cycle, in HCI research, e.g. for typical design science approaches, and whenever users interact with web-based software applications.

Keywords: E-Commerce, Web Analytics, Job Advertisement Analysis, Working Tasks, Professional Competencies, Regional Variation, Quantitative Content Analysis, Benefits for HCI.

1 Introduction

In recent years, Web Analytics has gained attention due to the necessity to measure the success of web-based business models as well as the integration of internet applications in business processes and functions (e.g., online marketing, social media marketing). Although Web Analytics is, especially in companies of German-speaking countries, still in infancy, its importance will increase due to the growing amount of web data in the next years [1], [2]. Some authors have already concluded that Web

Analytics has risen to being a strategic tool for the management of organizations [3]. Besides, it can be also considered a valuable instrument for supporting user interface designers and improving the usability of software systems [4].

Against this background, this paper examines the occupational field of Web Analytics experts – in further consequence referred as ‘Web Analysts’ – in order to draw conclusions on its benefits for Human-Computer Interaction (HCI) research and practice. It seems that this profession is not accurately defined and accompanied by a lot of uncertainties about working tasks, required professional competencies, and the organizational assignment [5]. Consequently, we conducted an empirical study in order to characterize this profession adequately and on the basis of topical data, precisely of international job advertisements. Hereby, we address the following research questions: How is the profession of a Web Analyst characterized? To which departments are Web Analysts normally assigned to? What are their working tasks and professional competencies in companies? After drafting a task and competence profile of this profession we explain how Web Analysts could be supportive for HCI.

The rest of the paper is structured as follows. The next section gives a brief overview of Web Analytics and HCI, including possible overlaps between these two fields and possible strategies to analyze a professional field. Then, the following two sections report about an empirical study which was necessary to create an authentic profile of working tasks and professional competencies of Web Analysts. In Section 5 we depict possible scenarios in which Web Analysts could be supportive for HCI practice and research. Finally, the paper is concluded, and an outlook on future work is given.

2 Web Analytics and Its Application for HCI Practice

2.1 Web Analytics

Web Analytics can be understood as the “*measurement, collection, analysis and reporting of internet data for the purposes of understanding and optimizing Web usage*”, i.e. to optimize websites and web-based marketing initiatives [6]. Going beyond this definition it consists of two parts. On the one hand, Analytics is defined as the “*practice of supporting decision-making through number crunching*”, i.e. by applying Business Intelligence techniques and tools (e.g., scorecards or dashboards) in order to support specific stakeholders in their decision-making process [7]. On the other hand, the focus of this discipline is set to web technologies and applications, thus restricting the stakeholder groups that interact with web applications and, additionally, have decision-making power.

Technically, Web Analytics use different techniques to collect, store and analyze data. The most common data collecting methods are log-file analysis that exploits log-files of web servers and page tagging which is based on pixel that sends user interaction data to a tracking server. Typical activities of Web Analytics comprise tracking and measurement of users’ online activities, data analysis, statistical evaluation, or analysis of web traffic and click-streams. The application areas comprise the evaluation and improvement of the usability of websites, analysis of usage behavior and characteristics of web users, analysis of online and offline marketing activities or

analysis of web-based business processes etc. Amongst others, indicators include (but are not limited to) number of hits, page views, events, visits, (unique) visitors and page impressions or measures like the visit duration, click paths, and so on. However, and with respect to HCI, the original objective of Web Analytics was to improve the usability of websites [8].

2.2 Human-Computer Interaction

HCI deals with the design and study of interactions between people (i.e., users) and computers and can be considered as the intersection between computer science, behavioral science (psychology), user interface design and any field of study in which computer software is developed [9]. Accordingly, HCI addresses human-related aspects of user interfaces (UI), like information processing of human brains, language and communication or ergonomics of hardware, as well as computer-related issues of software, like dialogue techniques, interface metaphors, input/output devices and graphic designs. The overall goal is to provide a UI design that fits the needs of humans. Therefore, the development includes different design approaches, implementation techniques and tools but also methods to evaluate user interfaces.

Consequently, HCI focuses on two important application areas. On the one hand, it addresses the design and implementation of user interfaces for software applications. Hereby, literature suggests following certain mantras, applying well-established methodologies or methods, and making use of professional tools and UI elements [10]. On the other hand, HCI also deals with the evaluation of user interfaces and interactions in order to learn about the usage behavior of end-users and to improve the usability of a software application. While the traditional Usability Engineering Process builds upon methods for exploratory, formative and summative evaluation of user interfaces [10], predictive evaluation aims at estimating how good the usability of an application will be. In all of these areas Web Analytics is considered to be useful, as it provides indicators and graphics generated from real-world data on technology usage. Selected experiences from literature are summarized in the following.

2.3 The Application of Web Analytics in the Context of HCI

Interactions between Web Analytics and HCI research can be observed in both directions. On the one hand, HCI techniques are often applied to design and improve user interfaces of Web Analytics software or support analysts in their everyday tasks, e.g. through contemporary information visualization techniques [11]. The more interesting approaches reported in literature comprise the application of Web Analytics techniques to examine or enhance the usability of web applications.

Amongst others, Hasan et al. [12] report about making use of Google Analytics to evaluate the usability of e-commerce sites and identify UI problems, i.e. even for specific stakeholder groups. This research suggests that specific web metrics, like the percentage of time spent, visits of the percentage of click depth visits, allow a quick evaluation of features such as the navigation, the internal search, the information architecture, the content and design of the site, the customer service and even the

efficiency of the purchasing process. Similar experiences on the usefulness of Web Analytics for analyzing and improving user interactions with websites are documented in other areas, like library services [13].

All in all, we consider Web Analytics as an important tool to analyze the usability, the content, the layout and design, the navigation, as well as the availability and system quality of websites. Yet, given the range of tasks and required competencies of Web Analysts, this discipline can even have more benefits for HCI, as we will explain later. However, in the first place, we have to characterize the profession of Web Analysts, which is being achieved through the empirical study summarized in the upcoming sections.

3 Research Design and Dataset

In order to get a topical, close-to-market picture of Web Analysts, we decided to conduct an occupational analysis [14], i.e. a specialized type of job analysis that aims at focusing on how a specific profession is employed across multiple organizations or even across a whole industry. Precisely we collected data on the profession and analyzed it according to different characteristics. Similar experiences have been reported over the last decades. For instance, Grob and Lange [15] describe an approach to analyze printed job advertisements (job ads) in order to characterize the occupational field of Business Informatics.

Table 1. Distribution of job ads by online job portal

Online job portal	Number of job ads	Percentage
Monster.co.uk	57	25,56%
LinkedIn.com	38	17,04%
Stepstone.de	28	12,55%
Monster.de	23	10,31%
Monster.com	22	9,86%
totaljobs.co.uk	12	5,38%
LinkedIn.co.uk	9	3,98%
xing.de	9	3,98%
Jobsearch.co.uk	7	3,13%
LinkedIn.de	5	2,42%
Karriere.at	4	1,79%
derStandard.at	2	0,9%
Stellenanzeigen.de	2	0,9%
indeed.com	2	0,9%
backinjob.de	1	0,45%
careesma.at	1	0,45%
xing.com	1	0,45%
Overall	223	100%

For this research study we collected international 223 online job advertisements between July 2012 and November 2012 and applied the method of Quantitative Content Analysis¹ along 130 variables (28.990 characteristics) to describe Web Analysts and develop a comprehensive task and professional competency profile of this profession. Moreover we conducted multivariate analysis method, e.g. regression analysis to identify correlations between different variables by using SPSS and Excel. In order to get a holistic view on this profession we consider job advertisements in the German-speaking countries (i.e., Germany, Austria and the Switzerland) and compared them to the characteristics and job requirements of Web Analysts in the UK and the US. During the data collection it has been turned out that job advertisements in printed magazines and printed newspapers are hardly verifiably. Therefore, the present research study focuses on country-specific and user-highest online job portals and online social network portals (Xing; LinkedIn). Table 1 shows the distribution of job ads for Web Analysts depending on the different online portals.

We used the following search words to retrieve the job ads: ‘Internet Analyst’, ‘e-Business Analyst’, ‘eBusiness Analyst’, ‘e-Commerce Analyst’, ‘eCommerce Analyst’, ‘Web Analyst’, ‘Webanalyst’, ‘Web Analyse’, ‘Webanalyse’, ‘Web Analytics’, ‘Web Controller’, ‘Web Controlling’ and ‘Web Insights’. In order to obtain meaningful research results and to get deeper insight into the profession of Web Analysts, the present research study includes job advertisements from Austria, Germany, Great Britain, United States and Switzerland. We analyzed 84 (37.67%) job ads from Great Britain, 67 (30.04%) from the United States, 64 (28.07%) from Germany, 6 (2.69%) from Austria and 2 (0.9%) from Switzerland. We sorted out identical job advertisements, which were published in different online portals to ensure the accuracy of the research results. About two-thirds (65.47%) of the job advertisements were directly published by the company and about a third (34.53%) of the job ads were published by recruitment agencies.

4 Job Profile of Web Analysts

In the following the profession of Web Analysts is characterized through the results of the empirical study we conducted on the basis of the job ads.

4.1 General Description

The job title ‘Web Analyst’ is widely used in German-speaking (47.83%) and English-speaking countries (49.09%); almost the half of all analyzed job ads was found under this term. Moreover, the title ‘Web Analytics Manager’ is also common in German-speaking countries (28.43%) and English-speaking countries (26.09%). Besides, job titles such as ‘Online Insight Analyst’ (3.18%) or ‘E-Commerce Analyst’ (2.27%) are hardly used in both language areas. In Germany, Austria and Switzerland this profession is sometimes called ‘Web Controller’ (8.70%).

¹ Raw data and results of the analysis can be requested by the authors.

The non-food consumer goods industry has the highest demand for Web Analysts (23.94% in German-speaking countries and 20.59% in English-speaking countries). Furthermore the industry sectors 'IT/Software/Telecommunication', 'Media/Internet' and 'Advertising/Marketing/PR' have a rather high demand for this profession, while the healthcare industry, 'Electrical/Electronics', social economy organizations, the 'Printing/Paper' industry and the educational sector have started to recognize the importance of Web Analytics but have a lower demand for dedicated specialists.

Especially the industries 'New Media/Internet', 'Telecommunications and Consulting' if in German-speaking countries sought Web Analysts. 13.97% of the English-speaking companies and 2.82% German-speaking companies which are looking for Web Analysts can be associated with the 'Advertising/Marketing/PR' industry. Respectively 11.76% of English-speaking companies are working in the field of IT, software or media (film/radio/publishing).

By comparing the job ads of English-and German-speaking countries we identified intercultural differences concerning the operational assignment of Web Analytics in companies. The majority of English-speaking companies (38.46%) have already established a Web Analytics department in the company, while in German-speaking countries only 14.29% companies have such a department and it is more common to integrate this business function into the e-Business department. In addition, it is verifiable, that in English-speaking countries Web Analytics is still a part of the marketing department (34.42%). Finally, 2 out of 54 German-speaking companies have assigned Web Analytics to the controlling department while no English-speaking company considers Web Analytics as part of controlling.

A research study by Zumstein et al. [5] has revealed different research results related to organizational assignment of Web Analytics within enterprises in German-speaking countries. Only a few companies (1%) in the Germany, Austria and Switzerland have established an independent Web Analytics department within the company. The majority of German-speaking companies (48%) have integrated Web Analytics in the marketing department, another 17% of them in the Business Intelligence department and 15% in the IT department.

Salary is an essential part of a job. Only 56 of 223 job ads contained information about salary of a Web Analyst. The salary band shows a wide range in Austria, Germany, Great Britain, the United States and Switzerland. The mean value of the salary is EUR 3,222.09 per month. Hereby the lower boundary was EUR 1,655 per month while the upper boundary for a management position was 7,179 EUR per month. In the German-speaking countries the average salary was 2,346.67 EUR ($n = 3$) and in the English-speaking countries 3,377.30 EUR ($n = 53$). A multiple correlation analysis showed a high correlation between the salary and the required working experience (Pearson correlation coefficient $r = 0.81$ with only $n = 5$ samples and the significance value $p = 0.0931$) and a good albeit not significant correlation between the salary and the required university degree ($r=0.36$, $n=19$, $p = 0.1334$).

4.2 Professional Competencies

The majority of companies (62.33%) expect working experience in the field of Web Analytics. The required working experience lies between of 2.5 to 5 years and corresponds with a mean of 3.17 years. We identified no significant correlations between

the language region and work experience. 61.88% of companies require a university degree in technical, economic or scientific numerical studies. In English-speaking countries (60%) and in the German-speaking countries (46.67%) technical or numerical studies are preferred by companies. Overall the required university degree indicates high requirements for working as a Web Analyst.

Profound knowledge about web technologies is required by 29.15% of the companies. This comparatively low percentage indicates that companies do not necessarily expect that Web Analysts make technical changes, while the majority of the companies a basic understanding of the structure and design of websites. About one fifth of the analyzed job ads in both language areas explicitly mention knowledge about HTML (19.73%) and JavaScript (18.39%). Knowledge about CSS, XML, jQuery and PHP is only sporadically requested in both language regions.

Experience with dedicated Web Analytics software is a basic requirement for Web Analysts. Currently there exists a variety of Web Analytics software products [7]. About three quarters (76.23%) of the companies expect experience with at least one Web Analytics software solution. There exist intercultural differences between German- and English speaking countries. 54.26% of English-speaking companies and 30.56% of German-speaking companies expect expertise in using Adobe Omniture. Google Analytic is free of charge and is regarded as important Web Analytics software for companies, especially for novices. Therefore 53.64% English-speaking companies and 29.17% of German-speaking companies expect experiences with Google Analytics. Hence we assumed that in the English-speaking countries experiences with Google Analytics is a fundamental prerequisite for Web Analysts.

The research studies by Zumstein et al. [5] gives evidence for a dominance of Google Analytics in German-speaking countries. This finding can be interpreted differently. On the one hand, Google Analytics is a free of charge and user-friendly Web Analytics software solution. On the other hand, it can be assumed that many companies still have little experience with Web Analytics, and thus Google Analytics regarded as a good software solution for novices. Furthermore, Coremetrics (US/UK: 24.50%; Austria/Germany/Switzerland: 4.17%) and Webtrends (UK/US: 21.19%; Austria/Germany/Switzerland: 5.56%) are used occasionally in companies. Other software solutions, e.g. Webtrekk, etracker, econda are preferably used in the German-speaking companies only.

We did not identify a dependency between the experience with Web Analytics software solutions and salary. Nevertheless conclusions can be drawn concerning correlations between the following variables: Experience with Web Analytics software is well correlated with Omniture ($r = 0.48$, $n = 223$, $p < 0.001$) and Google Analytics ($r = 0.43$, $n = 223$, $p < 0.001$) - there are hardly any differences in the both two language areas. Moreover, good correlations can be identified for the combined mentioning of econda and etracker ($r = 0.5$, $n = 223$, $p < 0.001$), Omniture and Google Analytics ($r = 0.32$, $n = 223$, $p < 0.001$), Omniture and Coremetrics ($r = 0.27$, $n = 223$, $p < 0.001$) as well as Omniture and Webtrends ($r = 0.26$, $n = 223$, $p < 0.001$). Omniture and Google Analytics seem to be the state-of-the-art in the everyday practice of Web Analysts.

4.3 Working Tasks

The Web Analytics process is the basis for the analysis of working tasks [7]. The working tasks can be categorized according to the four process steps, namely (a) planning, (b) analysis, (c) reporting and (d) optimization of web sites.

Hereby, analysis (84.30%) and reporting (85.20%) activities are the most frequently listed working tasks of Web Analysts in both language areas. About half of the companies listed planning (54.26%) and optimization (56.95%) activities as important tasks of Web Analysts. Especially German-speaking companies (75%), in comparison to the English-speaking companies (44.37%), consider planning as an important responsibility of Web Analysts. The optimization activities (56.95%) are, compared to the other categories, of less relevance. Moreover, the working tasks in the four categories differ in terms of the importance which we measured through their occurrences in the job ads. We identified a strong correlation between analysis and reporting tasks ($r = 0.42$, $n = 223$, $p < 0.001$), while correlations between analysis and optimization tasks ($r = 0.31$, $n = 223$, $p < 0.001$) as well as planning and 'other' activities ($r = 0.31$, $n = 223$, $p \leq 0.001$) are moderate.

The development of analysis concepts (53.52% in German-speaking countries vs. 31.13% in English-speaking countries) and the definition of key performance indicators (22.54% vs. 25.17%) are the most frequently mentioned **planning activities of Web Analysts**. In German-speaking countries the development of reporting concepts is listed significantly more often than in English-speaking countries (38.03% vs. 8.61%). Therefore, it can be indicated that Web Analytics is in German-speaking countries still in infancy, as this activity is specific for novices of Analytics. Only 5.83% of all companies explicitly mentioned the development of conversation rates as a working task of Web Analysts.

Analysis activities are the second-most frequently listed working tasks of Web Analysts (84.30%). Especially, analysis of visitor behaviour is considered to be very important in the job ads (50.70% in German-speaking countries vs. 65.56% in English-speaking countries). Furthermore, analysis of conversation rates (32.39% vs. 35.10%) and statistical testing (33.80% vs. 32.45%) are of relevance for job applicants. Monitoring of key performance indicators (26.76% vs. 34.44%) and analysis of marketing activities (23.94% vs. 30.46%) are also required in this task category.

Reporting activities are the working tasks that appear frequently in the job ads (85.2%). Hereby, the preparation of reports (70.85%) and the deduction of recommendations to act (58.74%) are mentioned very often compared to other activities. The preparation of dashboards seems to be more important in the English-speaking countries than in German-speaking countries (32.45% vs. 15.49%). This difference, as already explained, can be considered as an indicator for development stage of Web Analytics in German-speaking countries.

Optimization activities are less demanded compared to other categories (56.95%) although this category includes various important tasks of Web Analysts. This indicates the efficient use of financial resources and the increased need of coordination between the different online marketing channels. The optimization of conversation rates (23.94% in German-speaking countries vs. 35.76% in English-speaking

countries) is the most notable optimization activity in this category. The optimization of the online marketing activities (21.97%) and the optimization of the website (18.83%) are less important, while search engine optimization (12.56%) and the control of the online budget (5.83%) are hardly mentioned in the job ads in both language areas.

Besides, there were also **other activities** listed in job ads which cannot be assigned to one of the Web Analytics process steps. In German and English-speaking countries the Web Analyst has a central communication role (48.83%) within the company, which indicates that companies are aware of interdisciplinary role and importance of Web Analysts. Moreover, data quality assurance plays a crucial role. Almost 30% of analyzed job ads listed data quality assurance (29.60%) as an important working task of Web Analysts. The implementation of Web Analytics software is also mentioned in many job ads (26.91%). Customer support and customer service (16.14%) as well as management activities (16.14%) are less expected tasks of Web Analysts.

5 Relevance and Implications for Human-Computer Interaction

Based on this job profile of Web Analysts the benefits of such experts for Human-Computer Interaction are elaborated along two dimensions. From a **practical perspective**, the usefulness of Web Analytics for usability engineers is examined according to their typically field of activities. With respect to literature [16] Web Analysts can be useful within the scope of formative and summative evaluation, i.e. if a user interface mock-up, a web-based prototype or a full-featured web application is available. Here, the expertise of Web Analysts for planning evaluation studies, analyzing results and creating reports seems to be particular benefits.

An analysis concept in combination with performance indicators might exhibit usability problems that cannot be identified through traditional usability engineering methods, like a heuristic evaluation of thinking aloud tests. According to the authors' opinion an Analytics approach should be even more sustainable for designing and evaluating user interfaces of software solutions, as they provide a framework and (domain-specific) indicators for HCI-relevant factors and enable repeated measurement of the performance. Concerning optimization concepts the qualifications of Web Analysts seems to be not that relevant – thus HCI has to rely on methods provided by software engineering and usability engineering.

From the **scientific perspective**, Web Analytics can be applied multi-disciplinary fields that include Human-Computer Interaction as a method to develop software systems or examine interactions of humans with computers. In this context, Web Analysts can be also useful due to their competencies concerning reporting and their social competencies. Amongst others, possible research areas in which Web Analysts can be supportive for HCI comprise e-commerce [17], online and social media marketing [18] and any other applied discipline that involves interactions between humans and computers. Similarly to HCI practice, Web Analysts can support scientists through different activities of the four process steps, e.g. in designing a research

initiative, determining and measuring performance indicators, evaluating (web-based) prototypes and proposing improvements for both the research methodology and prototypic software solution.

In both application areas Web Analytics is useful concerning **technology and hand-on skills** if HCI research includes user interactions with web-based tools and platforms. Hereby, scientists would benefit from various competencies of Web Analysts, like handling and analyzing data-sets, calculating (performance) indicators from data, planning data-driven research and design science activities [19].

6 Conclusions and Future Work

Taking into consideration the increasing importance of technology and digitalization in our society, this paper argues for the necessity of Web Analytics and professionals who fulfill the job requirements for this field. We have conducted a preliminary empirical study in order to characterize the profession of a Web Analyst on the basis of a data-set of international job advertisements. Hereby we identified various problematic issues, such as the unclear definition of the job title, the non-uniform integration of Web Analysts in companies or regional differences in the competency and task profiles of this profession.

On the other hand, we see clear advantages for companies and HCI-related activities if Web Analysts can be involved. Most notably, the job profile we elaborated on the basis of our job advertisement analysis indicates that professional Web Analysts can be beneficial in planning HCI activities and measuring their performance. Moreover, they can be supportive within initiatives that deal with or aim at developing web-based software tools, in particular in design science approaches which are very common in applied science. Overall, Web Analytics is considered to be relevant for HCI, as it aims at understanding usage behavior of web users and, thus, can lead to valuable results for HCI designers, evaluators and researchers.

In order to validate our findings, it would be necessary to note down the improvements of HCI activities suggested by Web Analysts or to compare the performance of HCI procedures that involve a dedicated Web Analytics expert to those that are conducted by regular HCI experts (i.e., single and double specialists [10]). It is worth mentioning that for the latter case – comparative studies about Analytics-enhanced HCI – Web Analysts can be beneficial for defining and measuring performance indicators of activities and processes. Moreover, we would like to argue for the involvement of Web Analysts in the context of (web-based) digital ecosystems due to the data-driven and dynamic nature of such systems. Finally, and as part of future work, we see a clear need for developing methods and metrics for Analytics-enhanced HCI.

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