

Analyzing 5 years of EC-TEL proceedings

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Analyzing 5 years of EC-TEL proceedings

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Abstract. Over the past five years, EC-TEL has established itself as a major conference on learning with and through technology. Nearly 600 researchers have contributed about 230 full and short papers on various topics in the domain of Technology Enhanced Learning. In this paper we analyze the contributions of five years of EC-TEL and identify prolific authors, successful co-author-networks and most cited publications. The analysis reveals a very fragmented EC-TEL community that is strongly influenced by a relatively small set of authors.

Keywords: research 2.0, bibliometrics, awareness, visualization

1 Introduction

Scholarly practice focuses on the improvement of the society and therefore conducts research on pressing problems. The daily work process of researchers can be roughly distinguished into reviewing and reflecting new publications, preparing experiments, and publishing the results and the data on scientific conferences or in international journals. Over centuries researchers have gathered around recent publications that served as boundary objects between different communities of practice and reciprocally influenced each other's work. With today's unmanageable amount of published work it becomes increasingly difficult to monitor one's own research domain and to find relevant publications that concur with one's own interests and research projects. In the past years research has explored collaboration of scientists by means of co-authorships of publications. In the TEL community, such endeavors were undertaken for example in [2,5,7]. We argue that structured analyses of scientific publications and visualizations synthesizing the results can help all interested stakeholders in the scientific process to be more aware about content and connections and thus may serve as decision support.

The EC-TEL started as a European conference on Technology Enhanced Learning in 2006. The aim of the founders was to provide a unique forum for

research related to Technology Enhanced Learning in Europe and world-wide [6]. The topics of the conference are dealing with e-learning, knowledge management, and workplace learning. With an acceptance rate of about 20% EC-TEL has established itself as one of the main conferences in the domain of Technology Enhanced and E-Learning.

In this paper we present a bibliometric and scientometric analysis of the published full and short papers of the 5 years of EC-TEL. The remainder of the paper is structured as follows: In Section 2 we present the research question that guided our work. In Section 3 we discuss how the data was obtained and processed. In Section 4 we present the results of our analyses and thereafter in Section 5 we report some limitations of the conducted study. Finally in Section 6, we discuss implications and opportunities for future research and draw some requirements for a future scientific event management system.

2 Research question

The analyses in this article are carried out in order to understand how the EC-TEL conference series can be described using bibliometric and scientometric measures. Moreover, we aim at raising awareness about peculiarities in the analyzed data with the goal to show the fissured EC-TEL community. The overall research question of this paper can thus be stated as “*Which awareness support functions can be derived from the analysis of the EC-TEL publications to improve the support of conference organizers and attendees?*”

3 Data collection and processing

The papers analyzed in this study have been collected from the Digital Library of Springer [10]. All full and short papers of the 5 years of EC-TEL were downloaded in PDF format and used for the following analyses. Poster papers, invited papers and keynote abstracts have not been considered in the study. Altogether we analyzed 229 papers from 574 unique authors. On average there were 46 papers in each year of the conference with 148 unique authors per year. Each year the authors referenced 751 unique publications in their accepted papers.

3.1 Processing and analysis preparation

The extraction and cleaning of bibliographic data was one of the most complex and time-consuming steps in the processing of the data. First, we used an open source command-line tool called *pdftotext* which is available for many Linux distributions [3]. *Pdftotext* allows to extract the plaintext from PDF files, which is the prerequisite for the analysis in the next step: the analysis using *ParsCit* [1]. *ParsCit* extracts metadata about the given publication itself and about the contained references. As the output of *ParsCit* is not always correct and some metadata might be extracted wrongly, a manual cleaning of the metadata was

required in order to provide high quality input for the analysis. After extracting and cleaning the metadata we needed to persistently store it in a database which provided access to this data for the next analysis step. For the research presented here, we used the model of Artefact-Actor-Networks (AANs; [8]) as data storage and data access framework. The latest reference implementation of AANs is described in [9]. Finally, we used the visualization component of the AAN which provides files in the GEXF file format. The graph export served as input for the visual analysis using Gephi [4]. With Gephi we created visual representations of networks that emerged from the published papers and their content-based analysis.

4 Analyses

In this section we report about the results of the paper analyses conducted. All EC-TEL authors whose names are used within this publication have agreed on their appellation.

4.1 Authorship analysis

We started our analysis with the exploration of the authors of EC-TEL. Therefore, we counted the number of papers that had been published by each individual author between 2006 and 2010 and analyzed the distribution of publications over individual authors. The analysis shows that 77.4% (444 authors) of all authors have published only one paper in EC-TEL between 2006 and 2010. It is very rare to find authors with more than 3 papers (less than 5% (24 authors) of all authors). The 13 authors that contributed 5 or more papers to the conference (2.3% of all authors) account for 56 unique papers (24.5% of all papers). From an individual point of view, Pierre Dillenbourg contributed 4 papers to the 2008 edition of EC-TEL and thus accounted for 7.7% of all papers in this year. The 9 authors that published 6 or more papers in EC-TEL are: 1) Ralf Steinmetz (Germany, 8), 2) Christoph Rensing (Germany, 8), 3) Marcus Specht (Netherlands, 7), 4) Rob Koper (Netherlands, 6), 5) Erik Duval (Belgium, 6), 6) Pierre Dillenbourg (Switzerland, 6), 7) Stefanie Lindstaedt (Austria, 6), 8) Jelena Jovanović (Serbia, 6) and 9) Dragan Gašević (Canada, 6).

4.2 Co-authorship analysis

Scientific publications always contain information about the authors who contributed to the publication. The smallest *co-authorship* relation consists of two authors who contributed to one paper. By analyzing co-authorship information on a larger corpus of scientific publications, it is possible to identify groups of persons who work closely together. Figure 1 visualizes the overall co-authorship network of the EC-TEL conference series.

From the set of 229 papers, 11 papers (4.8%) were created by a single author and thus not taken into consideration for the co-authorship analysis. More

4.3 Citation analysis

Within the EC-TEL corpus we find 3.919 references of which 3.401 are unique. On average, each published paper has 17 references with only 1 reference as minimum and 70 references as maximum. The most cited paper that has been published within EC-TEL is on *MACE*, received 3 citations has been published by Stefaner et al. in 2007 [11]. In total, 43 papers from the first 4 years of EC-TEL have received 52 references. The five most cited authors within the EC-TEL corpus are Erik Duval (87 citations), Peter Brusilovsky (70), Rob Koper (54), Alexandra Cristea (44), and Wolfgang Nejdl (39).

5 Limitations

The results presented in this paper are limited to the publication activities within the EC-TEL conference and do not claim a general validity for the whole TEL community. The explorative data analysis in our research was based on a relatively small set of publications and did not take into consideration poster publications or invited publications from EC-TEL 2006 - 2010. Despite the fact that EC-TEL is a young and relatively small conference, it represents an important section of the whole TEL domain.

6 Conclusions and further research opportunities

In this paper we analyzed 229 papers from 574 authors that have been published in the EC-TEL conference between 2006 and 2010 and presented the results of this exploratory study. The analysis shows a very fragmented community that is dominated by some prolific authors, who account for a large percentage of all publications. This observation underscores the need formulated by the STELLAR Network of Excellence to “*overcome this fragmentation and reach a real multi- and trans-disciplinary approach that TEL research needs*” [12]. This conclusion is further strengthened by other results of ours, which show that authors with five or more publications in EC-TEL 2006 - 2010 (2.3% of the authors) account for 24.5% of all papers. Moreover, the co-authorship analysis shows that the community of EC-TEL authors is not strongly coherent; the analysis shows 103 weakly connected clusters and an overall density of only 0.007.

Future conference management systems could should pick up the analyses presented here in order to provide conference organizers and attendees with easy-to-understand data and visualizations of the connections between papers and authors of a conference. The information that can be extracted from scientific papers and their metadata (e.g. co-citation or bibliographic coupling of papers) can be used to make authors aware of and recommend fellow researchers that they might not yet know but that would be worth cooperating with.

For future research it would be interesting to create a representative paper corpus of the whole TEL field to gain an authentic overview of the TEL

community. With such an overview, evidence could be found for the impact of the community activities of the STELLAR Network of Excellence as well as for the international visibility of European TEL by the analysis of large corpora of citations.

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