WER Overview: Retrospective, Trends and Relevance

Joselaine Valaski, Wilian Stancke, Sheila Reinehr, Andreia Malucelli

Pontifícia Universidade Católica do Paraná, Programa de Pós-Graduação em Informática (PPGIa),
Escola Politécnica,
Curitiba, Brazil, 80.215-901
joselaine.valaski@pucpr.br, stancke@ieee.org, sheila.reinehr@pucpr.br, malu@ppgia.pucpr.br

Abstract

This work refers to the review of 258 papers published in the WER throughout 15 editions. This review´s goal was to identify the most active research groups within this workshop, the most debated topics and the trends in the Requirements Engineering area. Furthermore, the aim of this review was to analyze the relevance of WER. It was made identifying where WER papers have been cited. The results showed that Brazil, Argentina and Spain hold the most active groups. The requirements modeling is one of the most discussed topics in this event. Moreover, the results pointed out the international conference as one type of publication that more referenced WER papers, and the Requirements Engineering as one of the journals that more referenced WER papers.

Keywords: Retrospective, Trends, Influences, WER, Requirement Engineering.

1 Introduction

The requirements identification is an extremely important activity, since it is the basis for the planning, development follow up and acceptance of the software project results [1]. In order to support these results, Requirements Engineering provides appropriate mechanisms to understand the client´s needs, analyzing necessities, checking feasibilities, negotiating a reasonable solution, specifying a solution without ambiguities, validating a specification and managing the needs as they are transformed into a system [2].

Some of the main activities related to Requirements Engineering are as follows: elicitation, analysis, specification, validation and requirements management [3]. These activities main goal is to support understanding and to formalize the client´s main needs in a way that it decreases the problems throughout the software development.

However, despite the advances in the Requirements Engineering area, as software become much more complex and bigger, new problems emerge and new solutions are proposed [4]. Thus, it is important to follow the evolution of the topics related to this area. Some mappings and systematic reviews have been performed in order to provide a better idea of what has been produced in this area. These works have offered a better vision for specific topics from the Requirements Engineering area, such as elicitation techniques [5] [6], specification techniques [7] and requirements writing standards [8].

However, it is also important to consider providing a broad vision of the main discussed topics among research groups, as well as identifying these groups. This information may bring several benefits to the scientific area, such as the identification of new information sources, establishment of new partnerships and the orientation of researches toward more relevant topics at a given time. The scientific works are a quite important source to find this information. The Requirements Engineering area has several means of publishing these works, such as specialized journals and international events.

In this context, this work aims to identify some of this information and as an initial source of research, the Workshop on Requirements Engineering (WER) was chosen. The WER is a workshop that has been taking place since 1998 with the goal of consolidating the Iberoamerican Requirements Engineering research community. The event has predominantly happened in Argentina and Brazil. However, in the last few years, other countries from South and North America and Europe have hosted this event as seen in Table 1.

Throughout 15 editions of the WER, 258 papers have been published. The published topics discuss issues involving the main activities of Requirements Engineering. The WER is considered a mature and consolidated event in

the Requirements Engineering area and for this reason was considered a feasible source to obtain relevant answers in this area.

Table 1**:** Host cities of WER

Year	Country/City
1998	Brazil/Maringá
1999	Argentina/Buenos Aires
2000	Brazil/Rio de Janeiro
2001	Argentina/Buenos Aires
2002	Spain/Valência
2003	Brazil/Piracicaba
2004	Argentina/Tandil
2005	Portugal/Porto
2006	Brazil/Rio de Janeiro
2007	Canada/Toronto
2008	Spain/Barcelona
2009	Chile/Valparaiso
2010	Ecuador/Cuenca
2011	Brazil/Rio de Janeiro
2012	Argentina/Buenos Aires
2013	Uruguay/Montevideo

Section 2 describes the method used in this research, followed by Section 3, which details and discusses the results. Finally Section 4 presents the final considerations of this work.

2 Method

This section describes the method used in this research, including the questions and the steps performed in order to make the extractions and classification of the analyzed papers.

2.1 Development of the research questions

With the goal of identifying the most active countries and institutions at the WER, as well as the most discussed topics, the trends in Requirements Engineering and the relevance of the WER event, the following questions have been made:

1. What are the main countries that published in WER?
2. What are the main institutions that published in WER?
3. What are the main topics discussed in WER?
4. Which institutions have been discussed the main topics?
5. Which topics have been discussed for the main institutions?
6. What are the trends in Requirements Engineering?
7. Where have WER papers been more referenced?
8. What are the conferences that have most referenced WER papers?
9. What are the journals that have most referenced WER papers?

2.2 Extraction of information

In order to answer the previous questions, each one of the 258 papers has been analyzed with the goal of extracting the following information: institutions involved in research, home country of the institution and main discussed topics. The access to the papers was made through the website http://wer.inf.puc-rio.br.

The institution identification and home country was manually made in each one of the papers. More than one institution could have been related to the paper through their researchers, including the ones from different countries.

In order to define the topics to be classified, first was analyzed the classification used in the previous WER´s editions. However, it was noted that in back 1998, 2000, 2002, 2006, 2007 and 2012, no classification was proposed by the event. Moreover, it was also noted that the topics had a variation in their nomenclature throughout the years, as well as the unification of topics, as it can be seen in Table 2. Considering these limitations, it has been decided to propose a classification based on the classifications already made unifying or subdividing determined topics. The result of this new classification is presented in Table 3.

After the topics classification definition, two students (one master and one doctoral) read the papers with the goal of identifying the main discussed topics. It was defined that the paper should be related to at least one topic presented in Table 3 but new topics not listed in Table 3 could be included and related. The reading and identification of the topics was performed in an independent way between the students. For some of the papers, the reading of the abstracts was enough in order to identify their topics. In other cases, the papers had to be read thoroughly. After the individual classification was performed, the students made together the consolidation of issues where there was divergence of classification.

Table 2: Topics of the WER

Year	Topics						
1999	Multidisc. approach and Education	Analysis	Modeling and Represent. Requirem.	Negotiation and Requirem. elicitation	Process e Management Requirem.		
2001	Requirements elicitation	Requirements modeling	Process and req. management	Quality Requirements	Non-functional requirements	Requirements reuse	
2003	Requirements elicitation	Specification and Requirements modeling	Requirements management and Experimental studies	Process, model, methods and tools	Quality requirements and Quality Assessment		
2004	Requirements elicitation	Experimental studies	Requirements management	Modeling and Specification	Process, Methods and Tools	Quality requirements	Requirements for agent-oriented paradigm
2005	Cognitive approaches and Reuse	Agents and objectives	Analysis and Modeling	Aspects and Composition	Requirements elicitation	Process	Quality and Metrics
2008	Analysis	Elicitation /Empirical Studies	Elicitation /Methodologies and Tools	Modeling	Process and Quality	Reuse and Traceability	
2009	Early requirements	Requirements elicitation and Management	Requirements specification and Management	Later Requirements and architecture	Traceability and Product Lines		
2010	Requirements elicitation	Req.specification and Modeling	Req. management and Traceability	Business process mod. and P. Families			
2011	Aligning req. with business objectives and process	Early requirements	Late requirements	Non-functional requirements	Reuse of requirements	Models transformation	

Table 3: Proposed topics for classification

Requirements Engineering topics
Cognitive approaches, educational and knowledge management
Requirements analysis and Requirements negotiating
Requirements elicitation
Requirements specification
Tools
Requirements management
Measurement/Metrics
Requirements modeling
Process/Method
Quality requirements
Requirements traceability
Non-functional requirements
Agent-oriented paradigm
Reuse
Requirements Validation

In order to identify where the WER papers have been most referenced, 21 of the most cited papers up to July 2013 have been selected. The list of 21 papers, on Table 4, was obtained on the website that hosts WER publications (http://wer.inf.puc-rio.br). A search was performed for each one of the 21 papers using the website http://scholar.google.com.br in order to obtain corresponding citations. For each citation, the type of publication was identified, according to the categories defined on Table 5. The conferences have also been classified as international and regional.

Table 4: WER most cited papers

Rank.	Year	Paper	Num. Cit.
1	1999	A Requirements Elicitation Approach Based in Templates and Patterns	74
2	2007	Requirements for Tools for Ambiguity Identification and Measurement in Natural Language Requirements Specifications	45
3	2000	From Early Requirements Modeled by the i* Technique to Later Requirements Modeled in Precise UML	37
4	2000	Formal and Informal Aspects of Requirements Tracing	36
5	2002	Capturing Web Application Requirements through Goal-Oriented Analysis	27
6	2002	Supporting Cooperative Requirements Engineering with an Automated Tool	27
7	2001	A Non-Functional Approach for COTS Components Trading	24
8	2001	Requirements Elicitation Using a Combination of Prototypes and Scenarios	22
9	2007	Business Process Monitoring and Alignment: An Approach Based on the User Requirements Notation and Business Intelligence Tools	21
10	2002	Uma Proposta para Melhorar o Rastreamento de Requisitos	21
11	2000	Desenvolvendo Use Cases a partir de Modelagem Organizacional	19
12	2008	Study of Elicitation Techniques Adequacy	17
13	2003	Uma Taxonomia Facetada para Técnicas de Elicitação de Requisitos	17
14	2002	Using Quality Models for Assessing COTS Selection	17
15	2003	New Mechanism for the Integration of Organizational Requirements and Object Oriented Modeling.	16
16	2003	Indicadores para a Gerência de Requisitos	16
17	2002	Enhancing Data Warehouse Design with the NFR Framework	15
18	2000	Requirements Engineering for COTS Selection	15
19	2007	Evolving Use Case Maps as a Scenario and Workflow Description Language	15
20	1998	Una Estrategia de Análisis Orientada a Objetos basada en Escenarios: Aplicación en un Caso Real	15
21	2005	A Content Analysis Technique for Inconsistency Detection in Software Requirements Documents	15
			511

Table 5: Type of publication used to classify the papers

Type of publication
Conference (Conference, Workshop, Symposium, Congress, and Jornadas)
Journal
Academic document (These, Dissertation, and Monograph)
Book
Link doesn't work (There is the citation but the link doesn´t work)
No identified (There no enough information to identify)
Outros (Cathedral Publications; Technical Report; Patent and Local Magazine)

As a support to align the names and types of conferences, as well as the identification of the journals, the WebQualis (http://qualis.capes.gov.br/webqualis/principal.seam) portal was used. The WebQualis is a Brazilian portal used to qualify journals and conferences in different knowledge areas. The results obtained after the papers' classification are presented and discussed below.

3 Results and Discussion

The results will be presented and organized according to the research questions presented in Section 2.

3.1 What are the main countries that published in WER?

In all, 20 countries had at least one publication at WER through 121 institutions. In Table 6 it is shown the amount of institutions involved, the number of published papers and the percentage of publications considering the total amount of papers published up to 2012.

Table 6: Numbers of papers per country

Country	Number of institutions	Number of papers	Percentage (of 258 papers)
Brazil	52	208	80.62%
Argentina	14	61	23.64%
Spain	13	60	23.26%
Canada	10	29	11.24%
Mexico	2	7	2.71%
Chile	6	6	2.33%
Portugal	3	5	1.94%
Italy	4	5	1.94%
United Kingdom	4	4	1.55%
Netherlands	1	4	1.55%
Switzerland	1	3	1,16%
Malaysia	1	2	0,78%
Venezuela	1	2	0,78%
Cuba	2	2	0,78%
China	2	2	0,78%
Costa Rica	1	1	0,39%
Ecuador	1	1	0,39%
Finland	1	1	0,39%
Sweden	1	1	0,39%
United States	1	1	0,39%

As it has been pointed out in Table 6, the countries with the most publications at WER are Brazil, Argentina, Spain and Canada. Brazil has had an 80% participation ratio, as far as publication is concerned. Once the identification of the most active countries was done, this was also applied to the institutions (of education or not) with the most publications at WER.

3.2 What are the main institutions that published in WER?

As it has already been mentioned, 121 institutions have had at least one publication at WER. However, due to space limitation, in Table 7 only the institutions that have had at least 10 publications since the beginning of the WER (15 years ago) are presented. In this same table, the home country, amount of published papers and publishing ration for each institution are shown, considering the total of published papers up to 2012. The institutions with the most number of publications, due to logical reasons, are located in the countries pointed out in Table 6. Among the 9 institutions with the most number of publications, 4 of them are located in Brazil, 2 in Argentina, 2 in Spain and 1 in Canada. After the identification of the most active countries and institution, a verification of the most discussed topics and their relation with the research groups was performed.

Table 7: Number of papers per institution

Institution	Country	Number of papers	Percentage (of 258 papers)
Universidade Federal de Pernambuco	Brazil	44	17%
Pontifícia Universidade Católica do Rio de Janeiro	Brazil	35	14%
Universidad Politécnica de Valencia	Spain	24	9%
Universidad Nacional del Centro de la Provincia de Buenos Aires	Argentina	16	6%
Universidad Nacional de La Plata	Argentina	14	5%
Universidade Metodista de Piracicaba	Brazil	12	5%
Universidade Estadual do Rio de Janeiro	Brazil	11	4%
York University	Canada	11	4%
Universitat Politécnica de Catalunya	Spain	10	4%

3.3 What are the main topics discussed in WER?

In Table 8 it is shown for each one of the topics defined in Table 3, the amount of papers that were related to the topic and the corresponding percentage in an array of 258 papers.

As shown in Table 8, the 3 most related topics were: Requirements modeling, Requirements elicitation and Process/Method. In order to have a better idea of the intensity that these topics were discussed throughout the editions, the illustrative graphic in Fig. 1 was used. Through this graphic it is possible to observe that the topic Requirements Elicitation was highlighted up to 2008, with some peaks.

As far as the topic Requirements modeling, since 2009, it started to be the more discussed than the topic Requirements Elicitation. It is important to observe that in general is difficult to separate the both terms, they are much related. Usually the elicitation activity is supported by the modeling activity and vice-versa.

However, the modeling activity in the last years may has been seen as the main activity in this relationship. Process/Method is a topic that has had many peaks and starting on 2009, it presented a significant reduction in the number of published papers. This oscillation may be related to the period of the creation and dissemination of quality maturity models.

Table 8: The most discussed topics in WER

Topic	Number of papers	Percentage (of 258 papers)
Requirements modeling	80	31%
Requirements elicitation	73	28%
Process/Method	41	16%
Requirements management	35	14%
Requirements specification	32	12%
Tools	32	12%
Quality requirements	26	10%
Reuse	25	10%
Non-functional requirements	25	10%
Measurement/Metrics	16	6%
Agent-oriented paradigm	12	5%
Requirements traceability	11	4%
Cognitive approaches, educational and knowledge management	10	4%
Requirements analysis and Requirements negotiating	6	2%
Requirements validation	6	2%

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Requirements elicitation	1	5	7	6	6	8	4	9	3	4	9	2	2	5	2
Requirements modeling	6	1	2	4	7	5	8	8	5	6	5	6	6	7	4
Process/Method	1	2	1	6	1	7	5	5	1	2	6	2	0	0	2

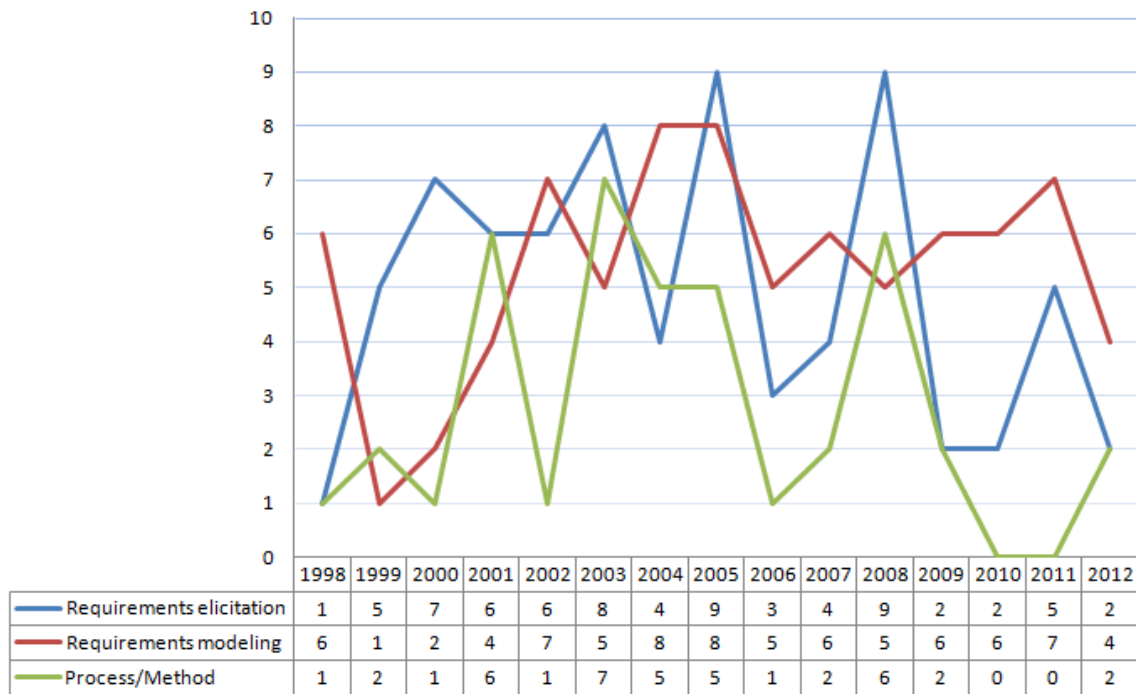**Figure** 1**:** Number of papers related to the topic per year

As it has been previously mentioned, the topic relation was based in Table 3, but the students who made the classification could also identify other topics that they judged relevant in the paper. These other topics are presented in Table 9.

Table 9: Other relevant topics discussed in WER

Topic	Number of papers	Percentage (of 258 papers)
i*	26	10%
Models transformation	22	9%
Oriented goals (GORE)	18	7%
Scenarios	15	6%
Business modeling	15	6%
LEL/LAL	12	5%
Meta model, ontology and taxonomy	11	4%
Natural language	10	4%
Tropos	9	3%
Distributed development	8	3%
Model driven development	8	3%
Patterns	8	3%
Organizational modeling	8	3%
Inspection	7	3%
Product lines	6	2%
Variability	6	2%
Verification	6	2%
NFR Framework	5	2%
Aspects	5	2%
Software transparency	4	2%

These topics can also be understood as subtopics, since each one of them is related to at least one topic from Table 3. Out of these subtopics, the most related ones were: i*, Models transformation and Oriented goals, also known as GORE (Goal Oriented Requirement Engineering).

The i* is an objective oriented approach used to describe not only social and intentional needs in the organizational environment, but also functional and non functional Requirements [9]. These three topics appear in conjunction in many situations, since they are strongly related.

With the mapping of the main topics and institutions, the relation of these topics with the institutions and vice versa has been also performed.

3.4 Which institutions have been discussed the main topics?

According to the 3 highlighted topics in Table 8 and the most related subtopic in Table 9, it was possible to identify which institutions had the most publications related to these topics. In Table 10 it is shown the 3 institutions with the most papers related to the 4 topics selected for evaluation.

The Requirements elicitation topic was the most discussed one by the Pontifícia Universidade Católica do Rio de Janeiro, whereas the Requirements modeling, Process/Method and i* was the most discussed by Universidade Federal de Pernambuco (UFPE). The UFPE appears as one of the 3 most active institutions as far as the 4 topics analyzed are concerned.

The topics that main institutions have been discussing have also been identified. The results are presented as follows.

Table 10: The main topics and related institutions

Topic	Institution	Number of papers
Requirements elicitation	Pontifícia Universidade Católica do Rio de Janeiro	13
	Universidade Federal de Pernambuco	11
	Universidad Nacional de La Plata	8
Requirements modeling	Universidade Federal de Pernambuco	14
	Universidad Politécnica de Valencia	11
	Pontifícia Universidade Católica do Rio de Janeiro	11
Process/Method	Universidade Federal de Pernambuco	10
	Pontifícia Universidade Católica do Rio de Janeiro	6
	York University	4
	Universidade Estadual do Rio de Janeiro	4
i*	Universidade Federal de Pernambuco	12
	Universidade Estadual do Rio de Janeiro	4
	Universitat Politécnica de Catalunya	4

3.5 Which topics have been discussed for the main institutions?

Based on the 5 most active institutions highlighted in Table 7, the most discussed topics by them have been analyzed. Table 11 presents the institutions, the 3 most discussed topics and the amount of papers related to this topic.

Both the Universidade Federal de Pernambuco and the Universidad Politécnica de Valencia have been discussing with more emphasis the Requirements modeling topic, whereas the Pontifícia Universidade Católica do Rio de Janeiro and the Universidad Nacional de La Plata have been discussing the Requirements elicitation topic. The Universidad Nacional del Centro de la Provincia de Buenos Aires has been emphasizing the Scenario subtopic discussion. With the mapping of the most discussed topics at WER, it is observed that some topics were more discussed in the past, whereas other topics gained more importance in the last few years.

Based on this observation, some topics were extracted where these variations are more meaningful. These variations may indicate trends in Requirements Engineering and the results are shown in section 3.6.

Table 11: The main institutions and the related topics

Institution	Topic	Number of papers
Universidade Federal de Pernambuco	Requirements modeling	14
	i*	12
	Requirements elicitation	11
Pontifícia Universidade Católica do Rio de Janeiro	Requirements elicitation	13
	Requirements modeling	11
	Process/Method	6
Universidad Politécnica de Valencia	Requirements modeling	11
	Models transformation	9
	Business modeling	6
	Requirements specification	6
Universidad Nacional del Centro de la Provincia de Buenos Aires	Scenarios	6
	Requirements elicitation	5
	Requirements modeling	5
Universidad Nacional de La Plata	Requirements elicitation	8
	LEL/LAL	7
	Measurement/Metrics	5

3.6 Which are the trends in Requirements Engineering?

According to the variation on the amount of published papers related to the analyzed topics, a trend analysis in the Engineering Requirements area was performed. In order to facilitate the visualization of this analysis, the publications were gathered into triennium groups, coming to a total of 5 groups, according to what is shown in Table 12. Between the second and fourth triennium there has been an increase in the amount of publications, when compared to the first and fifth triennium. It is important to observe this detail so that a correct analysis in the variation of publications can be performed.

Table 12: Numbers of paper published per triennium

Year	Number of papers
1998-2000	37
2001-2003	63
2004-2006	63
2007-2009	55
2010-2012	40

Among the evaluated topics, it has been noted some significant variations. These topics are represented in Table 13. The amount of publications for each triennium and its corresponding percentage of the total amount of published papers are shown on it. This percentage was used to balance the difference in the number of publications that has happed among the trienniums.

Table 13: Number of publications per topic/year

Topic/year	1998/2000	2001/2003	2004/2006	2007/2009	2011/2012
Requirements management	5 (14%)	6 (10%)	12 (19%)	8 (15%)	4 (10%)
i*	2 (5%)	4 (6%)	5 (8%)	7 (13%)	8 (20%)
Measurement/Metrics		4 (6%)	9 (14%)	2 (4%)	1 (3%)
Business modeling		4 (6%)	2 (3%)	4 (7%)	5 (13%)
Oriented-agent paradigm		1 (2%)	8 (13%)	2 (4%)	1 (3%)
Process/Method	4 (11%)	14 (22%)	11 (17%)	10 (18%)	2 (5%)
Quality requirements	1 (3%)	6 (10%)	9 (14%)	5 (9%)	5 (13%)
Software transparency				1 (2%)	3 (8%)

Based on these percentages the graph was created (Fig.2) where it is possible to observe these variations in a clearer manner.

Through Fig. 2 it is possible to observe an increase in the past few years of the following topics: i*, Business modeling and Software transparency. On the other hand, it has been observed a decrease in the number of publication of the following topics: Process/Method, Requirements Management, Measurement/Metrics and Agent-oriented paradigm. The Quality software topic had its pinnacle in the 2004-2006 trienniums, but it still bears certain stability.

The following questions had the objective of identifying the relevance of WER. For that purpose, it has been identified where the papers published on WER have been referenced on.
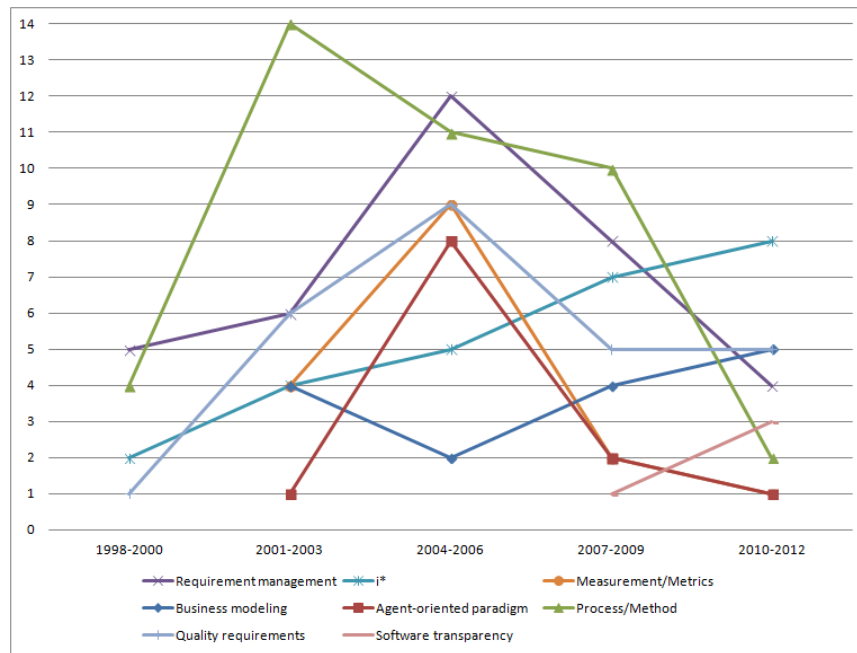
Figure 2**:** Publications' variation of some topics

3.7 Where have the WER papers been most reference?

As previously mentioned, in order to answer this question, 21 of the most referenced papers from WER were selected. In all, 511 references have been identified. However, the duplicated references to a single paper were excluded, resulting in a total of 502 analyzed references.

Two analyses were performed. The first one considered all of the 21 papers and the second one considering the 16 papers written in English language only. This separation was performed due to the observation of different results between papers in English and in other languages. Figure 3 presents the results of these differences.
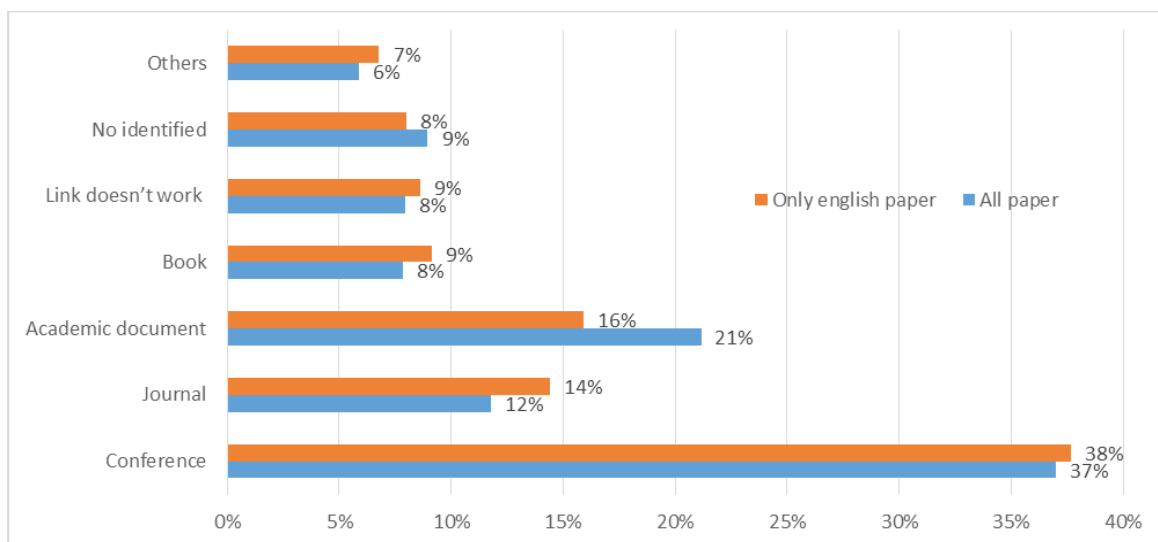

Figure 3: Where WER papers have been most referenced

According to the two analyses presented in Fig. 3, the conferences, the academic documents and the journals are types of publications that possess most references to papers published on WER. However, if only the 16 papers written in English are observed, the average of journal citations increases. In case 21 of the selected papers are observed, not taking into account the language they are written, there is an average increase in the citation of academic documents.

In order to verify if the obtained results may be considered as a standard to others papers published in the WER, the standard deviation was calculated and the result is showed on the Table 14.

Table 14: Standard deviation

	Conference	Journal	Academic document	Book	Link doesn't work	No identified	Others
All paper	11%	7%	11%	5%	4%	5%	5%
Only English paper	8%	5%	7%	5%	4%	4%	5%

The standard deviation is greater for the following publication types: conference and academic document. However, if it is only considered the results of papers written in English, the standard deviation percentage decreases, mainly for conferences, journals and academic document. Even if the standard deviation is considered, it is possible to conclude that a conference is the type of publication that most references papers published on WER.

Considering that, conferences and journals are the types of publications that most spread scientific works, the particular conferences and journals that most reference papers from WER have also been identified.

3.8 What are the conferences that have most referenced WER papers?

Among the 502 analyzed papers, 95 different conferences have been identified. Due to a space constraint, Table 15 only shows the conferences that have had at least two WER papers citations.

Table 15: Conferences that have referenced WER papers

Num.	Conference
36	WER - Requirements Engineering Workshop
9	REFSQ - International Working Conference Requirements Engineering: Foundation for Software Quality
8	WICC - Workshop de Investigadores en Ciencias de la Computación
7	IDEAS - Workshop Iberoamericano de Ingeniería de Requisitos y Ambientes de Software
6	RE - International Requirements Engineering Conference
6	MCETECH - International MCETECH Conference on e-Technologies
4	SBIE - Simpósio Brasileiro de Informática na Educação
4	SBQS - Simpósio Brasileiro de Qualidade de Software
3	Monterey Workshop on Innovations for Requirements Analysis
3	HICSS - Hawaii International Conference on System Sciences
3	Congreso Argentino de Ciencias de la Computación
3	ECBS - International Conference and Workshops on the Engineering of Computer-Based Systems
3	BPM - International Conference on Business Project Management
2	SBES - Software Engineering Brazilian Symposium
2	QUATIC - International Conference on the Quality of Information and Communications Technology
2	SBSI - Simpósio Brasileiro de Sistemas de Informação
2	CIbSE - Congreso Iberoamericano en Software Engineering
2	CAiSE - International Conference on Advanced Information Systems Engineering
2	JISBD - Jornadas de Ingeniería del Software y Bases de Datos
2	ICSEA - International Conference on Software Engineering Advances
2	JIRA - Jornadas de Ingeniería de Requisitos Aplicada

According to the results, it is possible to observe that citations are distributed among several conferences. The main concentration of references has been identified on WER itself (36); the following ones are REFSQ (9), WICC (8) e IDEAS (7), respectively. In order to verify the conferences' coverage, they were classified into international and regional. Fig. 4 presents the results.
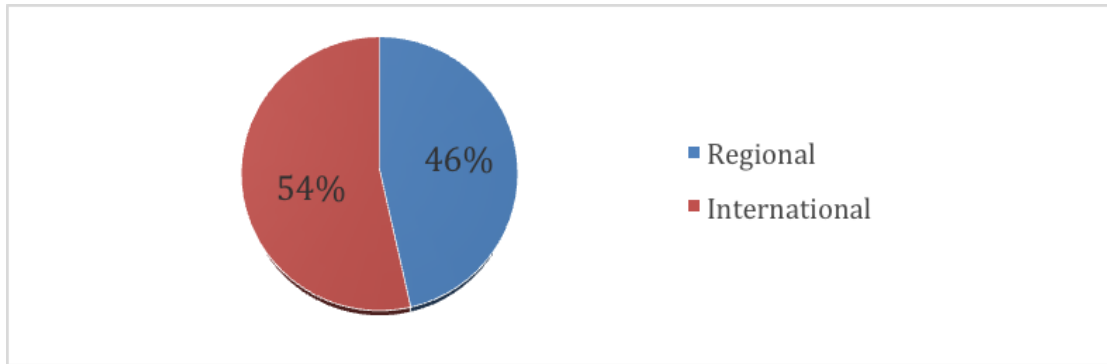
Figure 4: Percentage of publication on international and regional conferences

Most citations (54%) have been made on international conferences. On Fig. 5, it is shown that if the number of citations made on WER (36), which is not considered an international conference, is excluded, the percentage of international conferences citations (66%) increases.
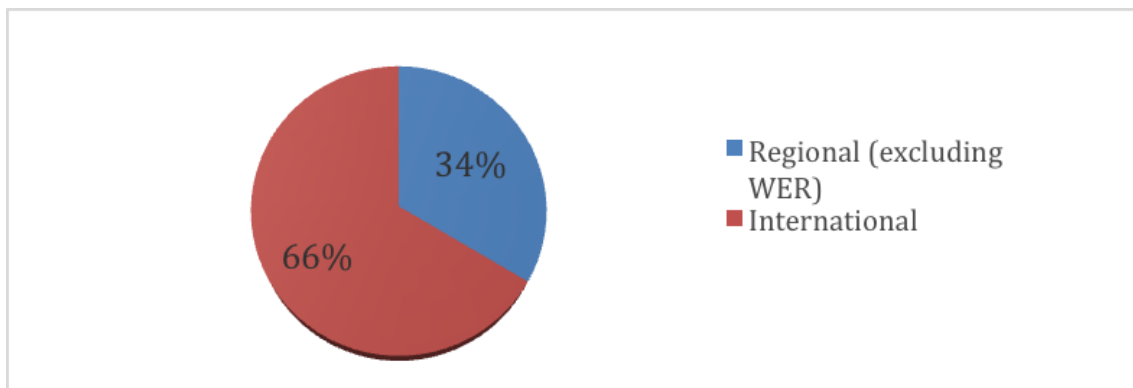

Figure 5: Percentage of publications on international and regional conferences (excluding WER)

The results conclude that although the WER is not considered an international conference, most of the citations made in conferences, are related to international ones. This shows the relevance and influence of the WER event on international research results.

It is important to emphasize that some conferences have changed their names as years past, and this alignment was not done in this research. Thus, it is possible that some results have not been grouped on the same conference.

Next session shows the journals in which the results published on WER have been referenced.

3.9 What are the journals that have most referenced WER papers?

As regards to journals, 41 different occurrences have been identified. Table 6 shows the relation of all identified journals.

As in the conferences, the citations are also distributed among several journals. The greatest concentration of references has been identified on Requirement Engineering Journal (10), followed by Software & Systems Modeling Journal (5) and the Journal of Systems and Software (4).

Table 16: Journals that have referenced WER papers

Num.	Journal´s name
10	Requirements Engineering
5	Software & Systems Modeling
4	Journal of Systems and Software
3	Ingeniare. Revista Chilena de Ingeniería
3	Information and Software Technology
2	International Journal of Web Engineering and Technology
2	Software Quality Journal
2	Journal of Management Information Systems
2	Computer Journal
2	iSys: Revista Brasileira de Sistemas de Informação
2	Journal of Web Engineering
2	Revista de Informática Teórica e Aplicada
2	International Journal of Computer Science Issues
2	Electronic Commerce Research
1	European Journal of Information Systems
1	Information Systems and e-Business Management
1	Information Technology Journal
1	IET Software
1	International Journal of Computer Applications in Technology
1	IEEE Transactions on Software Engineering
1	International Journal of Semantic Computing
1	Environmental Modelling & Software
1	Educational Technology Research and Development
1	Computers in Industry
1	Computer Standards & Interfaces
1	IEEE Transactions on Systems, Man and Cybernetics. Part A. Systems and Humans
1	International Journal of Computer Science and Applications
1	International Journal of Electronic Business
1	International Journal of Engineering Science and Technology
1	International Journal of Information Technology and Computer Science
1	International Journal of Web Application
1	Journal of Computer Science & Technology
1	Journal of Database Management
1	Journal of Information and Organizational Sciences
1	Journal of King Saud University - Computer and Information Sciences
1	Journal of Research and Practice in Information Technology
1	Journal of Universal Computer Science
1	Revista Colombiana de Computación
1	Revista do Programa Brasileiro da Qualidade e Produtividade em Software
1	Software Engineering Notes
1	International Journal of Information Acquisition

4 Conclusion

When studying a research area, it is important to identify the answers to some questions, such as: the most active groups, the most discussed topics, the identified trends and so forth. This information may bring some benefits as the identification of new information sources, establishment of new partnerships, the orientation of researches toward more relevant topics at a given time. We can also mention the relevance of the event in the international scene.

The revision of 258 papers published at WER had the goal of answering these questions as far as this event is concerned. Some of the main obtained results were the identification of Brazil, Spain and Argentina as the home countries of the main institutions that have published at WER so far. The Universidade Federal de Pernambuco located in Brazil, is a reference as the most active in this event. The Requirements elicitation and Requirements modeling topics are the most referenced in the published papers and the Requirements modeling is the most cited in the past few years.

It has been observed an increase in the reference to the following topics: i*, Business modeling and Software transparency.

The majority of references published on WER were made on conferences, journals and academic documents. Among conferences, WER itself is the one that most references the works published. Considering all conferences' publications, the international publications are the ones that most reference works published on WER. As regards to journals, the Requirements Engineering is the one that most references the works published on WER.

This is a preliminary study, since the issues exposed here may be broaden and explored in a deeper fashion in future works. Other analysis may be performed in the database mentioned above, allowing distinct points of view, other than the one presented in this work. A new paper classification may be performed in order to refine the obtained results and it may also amplify the events to be analyzed. A similar but more refined review may be performed, including the main events or journals in the Requirements Engineering area.

In the same event and year where the paper [10] that triggered this work was published, a systematic mapping in the Requirement Engineering Area was published [11] as well, motivated by similar reasons as this research, however, it considered Brazilian Community publications only. These works emphasize the importance of analyzing what has been done in the past in order to decide how to act in the future.

References

[1]   S. T. Fiorini., J. C. S. P. Leite, and C. J. P. Lucena, "Organizando Processos de Requisitos," in *Workshop on Requirements Engineering*, Maringa, Brazil, pp 1-8, 1998

[2]   R.Thayer and M. Dorfman, "System and Software Requirements Engineering," *IEEE Computer Society Press Tutorial*, 718p, 2000

[3]   R. S. Pressman, *Engenharia de Software – Uma Abordagem Profissional,* McGraw-Hill, 2011.

[4]   J. Dominguez, *The Curious Case of the CHAOS Report,* 2009

[5]   A. Davis, O. Dieste, A. Hickey, N. Juristo, and A. M. Moreno, "Effectiveness of Requirements Elicitation Techniques: Empirical Results Derived from a Systematic Review," in *Proceedings of the 14th IEEE International Requirements Engineering Conference*. IEEE Computer Society, 2006

[6]   O. Dieste, N. Juristo, "Systematic Review and Aggregation of Empirical Studies on Elicitation Techniques", *IEEE Transactions on Software Engineering*, IEEE computer Society Digital Library. IEEE Computer Society, 2010

[7]   N. Condori-Fernández, M. Daneva, K. Sikkel, R. Wieringa, O. Dieste, and O. A, Pastor, "A systematic mapping study on empirical evaluation of software requirements specifications techniques", *third International Symposium on Empirical Software Engineering and Measurement,* ESEM 2009, IEEE Computer Society, Florida, USA, pp 502-505, 2009

[8]   R. Cezario, F. Barreto, and V. Benitti, "Padrões de Escrita de Requisitos : um mapeamento sistemático da literatura," in *Workshop on Requirements Engineering*, Rio de Janeiro, Brazil, pp 259-272, 2011

[9]   M. Lucena, C. Silva, E. Santos, F. Alencar, and J. Castro, "Modularizando Modelos i *: uma Abordagem baseada em Transformação de Modelos," in *Workshop on Requirements Engineering*, Valparaiso, Chile, pp 33-44, 2009

[10] J. Valaski, W. Stancke, A. Malucelli, S. Reinehr, "*Retrospective and Trends in Requirements Engineering"* in *Workshop on Requirements Engineering*, Montevideo, Uruguay, pp 135-148, 2013

[11] K. Oliveira, J. Pimentel, E. Santos, D. Dermeval, G. Guedes, C. Souza, M. Soares, J. Castro, F. Alencar, C. Silva, "*25 years of Requirements Engineering in Brazil: a systematic mapping,"*. in *Workshop on Requirements Engineering*, Montevideo, Uruguay, pp 118-134, 2013