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# A META-ANALYSIS OF INFORMATION SYSTEMS RESEARCH DIVERSITY IN PORTUGAL

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## Abstract

*This paper surveys the development of current Information Systems (IS) research in Portugal, giving a broad overview of research activities in this field by analyzing the articles delivered at the Portuguese IS Conference (PISC). Based on such an analysis of all papers published by PISC, the paper presents the findings on key aspects such as keywords, key research topics and most cited articles. We also compare our findings with European and international IS research analyses. With this study, we hope to contribute to the dissemination of IS research knowledge in Portugal and to provide the basis for a broader discussion within the Portuguese IS community.*

**Keywords:** Information systems, IS research, IS diversity, Portugal

## Introduction

In recent years some countries have experienced exponential growth in the adoption and use of Information Systems (IS) to solve some of their socio-economic and political problems. At the same time, research in the IS field in these countries has evolved. This paper focuses on IS research in Portugal. In Portugal there is not the requirement to publish academic articles as in other countries. However, articles are the ordinary means by which researchers share and communicate their research projects and results to with other academics. Although Portuguese IS academics publish and participate in international conferences and journals, there is not the pressure to publish in Portugal as in other countries. The aim of this study is to analyze the diversity of IS research in Portugal by analyzing the articles presented at the only IS academic event held there annually, the Portuguese IS Conference (PISC). According to Vessey et al. (2002, p. 133), “although many studies have addressed various aspects of diversity, there has been no comprehensive evaluation of the diversity of the field”. To the best of our knowledge, this paper represents one of the first efforts to analyze the IS research diversity within Portugal.

Benbasat and Weber (1996) characterized three types of diversity in IS: diversity in the problem addressed, diversity in the theoretical foundations and reference disciplines used to account for IS phenomena, and diversity in methods used to collect, analyze, and interpret data. Therefore, our research issues focus on these issues. We also referred to the two relevant studies made by, first, Galliers and Whitley (2002) on the analysis of research studies published in the European conference on IS, and, secondly, Vessey et al. (2002) on IS research diversity using the articles of top IS journals. This paper is structured as follows: first, we briefly describe PISC and its related sponsor, the Portuguese Association for IS; then, we outline the research methodology; next, we present the findings; and finally, we present the discussion and some implications.

## *The Portuguese IS Conference*

The Portuguese Association for Information Systems (PAIS) is a technical-scientific association formed in 1992 to foster relationships between groups of academic people interested in the IS domain. The main goals of PAIS are:

- To bring together the community interested in IS development and management.
- To stimulate research and share knowledge in the IS domain.
- To establish relationships with other similar research communities/groups, nationally and internationally.

Since 1994, the principal activity of PAIS has been the publication of the journal titled *Sistemas de Informação* (Information Systems). In 2000, it promoted for the first time the Portuguese IS Conference (PISC). The conference participants are mainly from Portugal with regular participation by Spanish and Brazilian researchers. Each year the Portuguese IS community has shown a growing interest and participation in the IS event, and the number of papers submitted and published has increased (see table 1).

**Table 1. Portuguese IS Conference Papers**

	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>Total</b>
Nº. papers submitted	70	55	114	239
Number of papers accepted	54	43	72	169
Acceptance rate	77%	79%	63%	

## Research Approach

This paper reports on all the 169 articles included in the PISC proceedings (the last three years). We address the following questions in this paper:

- What topics do Portuguese IS researchers address?
- What research methods do Portuguese IS researchers use?
- What are the most cited articles?

We also addressed issues such as gender diversity, language used and number of authors. In order to answer these questions, the research was done in the following steps:

- **Development of a database of articles** - we developed a database with the following fields: author, year, title, university, keywords, abstract, number of authors, number of males, number of females, language used.
- **Keyword analysis** - we translated all terms used into Portuguese and then assigned uniform terms for consistency. In 2000 we found eleven articles without keywords. This was the first year of the conference and the format of papers was not yet established. Development of a citations database – we developed a second database with all the references used in all the 169 articles.
- **Articles classification** – to classify the articles, we used the classification systems proposed by Vessey et al. (2001, 2002). This classification system has the following categories: research topics, research approach, research methods, units/level analysis, and discipline. The articles database was extended to include these new components except for research approach, units/level analysis and discipline.

During the development of the databases we encountered some problems such as lack of keywords, errors in the citations, citations in differing formats, and lack of explanation of research methodology used. We started by collecting all the abstracts for coding. Both authors coded the articles individually and then we analyzed both codes. Our background is in IS domain and we were involved in all the Portuguese IS conference events. During the initial coding, we detected that most abstracts did not mention the research method used. Consequently, we searched and analyzed the research methodology sections. Unfortunately, most of the articles did not have such a section. Therefore, we needed to read articles lacking research methodology sections in their entirety. In the articles coding process, we tried to define a single code corresponding to each component of the classification system most representative of the article. However, in some cases there was the need for a second code.

## Findings

The findings are subdivided in two types. The first findings relate to what we define as demographics, representing those aspects that can be subjected to a quantitative treatment, such as number of authors, language used, gender of authors, keywords used and citations. The second findings are the results of the coding process we made for each publication based on the IS classification system.

**Demographics**

There are few surprises when considering the number of authors per paper (see table 2), with two authors per paper being the most common. The total number of papers with one or three authors is the same. The number of papers with four authors is significant but most of these authors are from the same institution. Table 2 also shows the values obtained by Galliers and Whitley (2002, p. 8) for the ECIS conference. Although the number of articles with two authors is about 11% higher in the Portuguese case, we see that the percentages by number of authors are quite similar, with 2 authors being the most common, followed by one author and three authors respectively.

**Table 2. Number of Authors by Article**

Year	1	2	3	4	5	6	7	8	Total
2000	12	27	7	5	2	1	-	-	54
2001	10	22	7	3	-	1	-	-	43
2002	7	40	15	8	1	-	-	1	72
Total	29	89	29	16	3	2	-	1	
Total (%)	17.2	52.7	17.2	9.5	1.8	1.2	-	0.6	
ECIS (%)	26	41	21	7	3	1	-	-	

Table 3 shows that Portuguese is the main language used and English second. There are two main reasons for the use of English. The first is that some articles presented were not written solely for submission to the PISC, or they were research-in-progress studies that were submitted to international conferences or journals. Secondly, some papers were submitted by doctoral students following programs in countries other than Portugal. We also found that in 2002 there were no papers in Spanish. The explanation lies in the fact that in 2002 the Spanish conference on database and information systems was in the same period as PISC.

**Table 3. Articles (%) Published by Language**

Year	Portuguese (n= 54)	Spanish (n= 43)	English (n=72)
2000	66.7	13.0	20.3
2001	76.7	14.0	9.3
2002	86.1	-	13.9

Table 4 shows that the number of women as authors remains similar through the three years, with women representing a third of the total number of authors.

**Table 4. Analysis of Authors by Gender**

Year	Women		Men	
	N	%	n	%
2000	24	33.8	47	66.2
2001	19	32.8	39	67.2
2002	34	34.0	66	66.0
All	77	33.6	152	66.4

Overall, the most cited keyword is Information Systems (IS) followed by Information Technology (IT). Then, the rest of the keywords are related to different types of systems such as Decision Support Systems (DSS), Enterprise Resource Planning (ERP), Geographic Information Systems (GIS); and languages, methods and techniques such as XML, UML, pattern analysis.

**Table 5. Keywords Used**

Count	2000	2001	2002
14		IS	
13			IS
12	IS		IT
8			GIS
7			Knowledge management
6		IT, information society	DSS, ERP
5			IS development
4	Information, DSS, IT		XML, Web, UML, modeling, information management, organizational learning
3	Pattern analysis , IS architectures, organizational knowledge, XMI	Adaptability	Workflow, human resources management, organizational impact of IS, software engineering, e-learning, data warehouse, database, evaluation
2		Virtual environments, database, ecommerce, XML, component, organizational knowledge, data mining, knowledge discovery, ERP, business strategy, case study, information, internet, intranet, IS research, visualization	

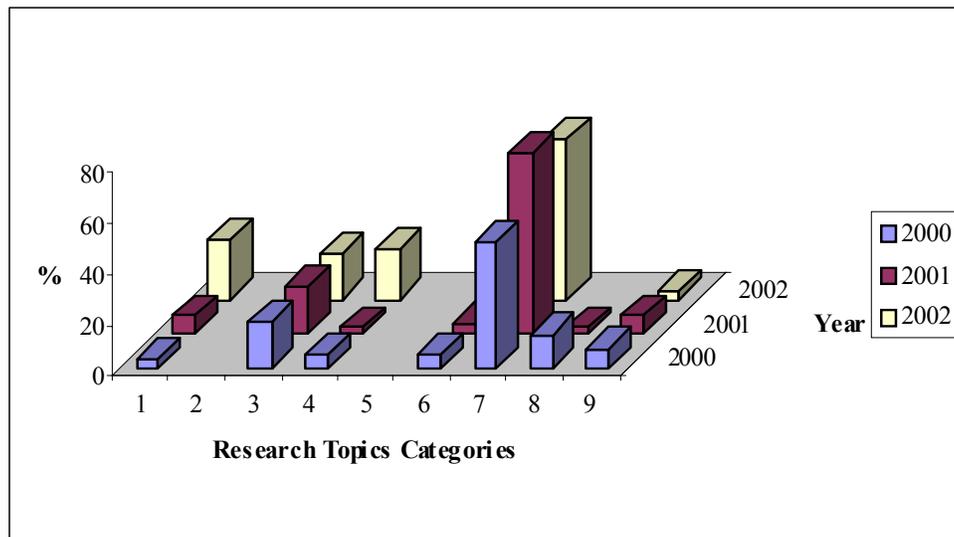
One useful way of determining the characteristics of a research community is to consider its key citations (Galliers and Whitley 2002). In 2000, the most frequently cited papers were concerned with methodology issues, especially qualitative research issues, in particular the grounded theory method. The most frequently cited articles by year are presented in appendix A. In the 2002 conference the most frequently cited references are related to books. It seems that Portuguese IS researchers prefer to use books rather than articles from journals. There is only one reference from a conference proceedings, in this case the European Conference in IS. Due to the business-/ industry-oriented focus of the research issues in the Portuguese conference, it seems natural that the top cited articles are related to business and strategy issues. These findings are similar to those of Galliers and Whitley (2002) in their analysis of the European Conference on IS. Overall, Checkland is the most cited author, because most articles employed the Soft Systems Methodology (SSM) developed by Checkland and his colleagues. SSM is an analysis and problem-solving technique but also a way to think about, visualize and explore problem situations.

**Coding Analysis**

Each publication was coded in accordance with the research topic addressed and the research method used. The detailed findings for research topics addressed by category and sub-category are presented in Appendix B. Table 8 (the summary of research topics categories) and figure 1 show that the main IS research topic category is organizational concepts, followed by problem-solving, systems/software concepts and data/information concepts. There are two categories without articles: computer concepts and problem domain specific concepts, and societal concepts had only one publication in 2001. Within organizational concepts category, the most frequent research topics are the implementation and usage/operation of IT/IS followed by organizational learning/knowledge management topic. In the implementation of IT/IS topic, different systems (e.g. GIS, EIS, DSS, ERP) are proposed and case studies of their implementation explained. IS usage is also quite common as a research topic. An interesting aspect of some of the IT implementations and usage studies is that they are related to the collaboration of different industry sectors, and mainly to small and mid-sized companies. Regarding the knowledge management topic, Sarmiento and Correia (2002) made a survey of knowledge management research in Portugal and they found that there are few articles (16) published in Portuguese journals and PICS.

**Table 8. Research Topics by Year**

	<b>Category</b>	<b>2000 (n= 54)</b>	<b>2001 (n= 43)</b>	<b>2002 (n= 72)</b>
1.0	Problem-solving	3.7	7	23.7
2.0	Computer concepts	-	-	-
3.0	Systems/software concepts	18.5	18.6	18.1
4.0	Data/information concepts	5.6	2.3	19.5
5.0	Problem domain specific concepts	-	-	-
6.0	Systems/software management concepts	5.6	4.6	4.2
7.0	Organizational concepts	50.0	72.1	63.9
8.0	Societal concepts	13.0	2.3	-
9.0	Disciplinary issues	7.4	7.0	2.8



**Figure 1. Research Topics by Year.**

Often, researchers proposed new models and methodologies to solve some problems (15.3% in this category in 2002). However, in most of those articles, we detected a lack of literature review and/or comparison with other models or methodologies on the issue. Probably, this is one reason why the citations are not up to date and few journal articles are ranked as the most cited.

Table 9 shows that the most used research methods are: literature review, concept implementation, and case studies. Along the timeline we see that literature review in the first year was the most important, but as researchers developed their studies, they started to use case studies or concept of implementation to validate their initial research frameworks made through literature review. We expect that next year case study and concept of implementation will remain the most used. There seems to be a growing interest in research methods like action research with some articles discussing the use of action research method and its potential in IS research. In 2002 there was a workshop about qualitative research methods associated to PISC, and there was a considerable interest from researchers in the topic.

**Table 9. Research Methods Used**

	<b>Method</b>	<b>2000</b> (n= 54)	<b>2001</b> (n= 43)	<b>2002</b> (n= 72)
AR	Action Research	1.9	2.3	1.4
CA	Conceptual Analysis	14.8	23.3	9.7
CAM	Conceptual Analysis/Mathematical	-	2.3	4.2
CI	Concept Implementation (Proof of Concept)	18.5	18.6	30.6
CS	Case Study	9.3	20.9	23.6
DA	Data Analysis	-	2.3	
ET	Ethnography	-		
ES	Descriptive/Exploratory Survey	9.3	7.0	5.6
FE	Field Experiment	1.9		
FS	Field Study	-	2.3	
GT	Grounded Theory	5.6		
ID	Instrument Development	-		4.2
LH	Laboratory Experiment (Human Subjects)	-		
LR	Literature Review	33.3	20.9	19.4
LS	Laboratory Experiment (Software)	5.6		
PA	Protocol Analysis	-		
SI	Simulation	-		1.4

## Discussion and Implications

### *Research Topics*

From the viewpoint of research topics, Portuguese IS research is mainly focused on organizational issues which is similar to the research topics in IS research internationally as Vessey et al. (2002) showed. Vessey et al. (2002) showed that organizational concepts topic represents 68.5 % of IS research topics. However, International IS research is considerable diverse within the organizational concepts themselves while in Portugal the organizational topics covered are mainly the implementation and usage/operation of IT/IS and knowledge management issues. The second most relevant topic is problem-solving and especially methods/methodologies. There is a significant number of papers presenting new methods, and frameworks to solve specific problems in the IS domain. We should point out that most of these methods should not be treated as such with some being initial theoretical frameworks for further research or simply guidelines/heuristics rather than methods. We also noticed that most of the researchers do not compare their methods with other methods on the topic or have done an exhaustive literature review. In 2002, data/information topic gained relevance, especially with data mining and data warehouse topics. Finally, we evidenced that systems/software concepts maintains it's the same relevance along the timeline, showing that development of software by applying new methods and techniques is an worry in Portuguese IS research. Most of these software developments are cooperation between Portuguese IS researchers and industry, especially small and midsized companies. From our viewpoint, and regarding Portuguese IS research diversity, there seems to be a lot of opportunities for future IS research topics in Portugal and our findings may help some doctoral students and researchers open new lines of research with Portuguese IS community.

The lack of research on the legal/ethical/cultural/political implications of IS and societal issues is also a point that should deserve some attention from Portuguese IS researchers. This aspect may suggest an IS culture not concerned with social aspects or at least social participation.

### *Research Methods*

The most used research method is literature review followed by concept implementation and case studies. However, the literature review made in most articles is weak, with researchers using only a few articles, in some cases three or four and not providing a general overview of research on the topic. We also found that researchers do not use up-to-date articles and especially articles

from conferences. In the future we intend to analyze which type of research sources are used and accessed by Portuguese IS researchers. Case studies are often used but few articles explain the reason for using the case study method and there is also a lack of explanation on how the case studies were done (the methodological issues). The number of research methods/methodologies citations proves this fact. For Robert Yin's seminal book on the case study research method, we found only three citations in 2001 and four in 2002. Therefore, we think that the methodological issue is an important matter for the improvement of Portuguese IS articles. PhD supervisors should also encourage their students to use new research methods and improve the knowledge of those methods within the Portuguese IS community. We would like to point out the lack of research methodology explanation in most of the articles. Therefore, we encourage future Portuguese conference organizers to define and promote a more rigorous and detailed explanation of this topic on the accepted articles.

### ***Implications***

Based on the literature review we made, we find that IS research activity disseminated in Portuguese academic events is in a premature stage. Also, the IS field in Portugal is not established yet with only one IS journal and a conference in only its fourth year in 2003. The number of articles submitted to the Portuguese IS conference is very small compared with the number of Portuguese IS researchers, including master and doctoral students and PhDs in IS/IT. As Portuguese researchers, we recognize there is a lack of motivation and effort to publish research. We think that IS doctoral supervisors should motivate their students to present their work in conferences, nationally or internationally. This would not only improve the share of knowledge within Portuguese IS researcher community, but also improve the quality of research studies. This study is limited to PICS and its analysis is representative of the IS research in Portugal to the extent that this conference is the only event in Portugal to disseminate IS field. During the last years effort has been made to bring some international IS events to Portugal with some success.

A report from the European Union (European Commission 2002) ranks Portugal in the last position regarding the number of highly cited papers by Portuguese researchers in computing science. The good news is that the average growth of scientific articles is the highest (4.45 in 2001) in the European Union. We also think that issues in the IS field in Portugal go beyond those of research and dissemination. Some Portuguese academics (e.g. Magalhães, 1997) have highlighted the need to promote research in the IS field and develop IS curricula in the universities. Magalhães (1997) mentioned different successful Portuguese IS projects that were not studied or analyzed by Portuguese academics. This topic has a strong correlation to another important one: the scientific literacy in Portuguese society. In a study conducted in 1996/97, Portugal was ranked in the last position among twelve European countries (Rodrigues et al. 2000). Thus, IS Portuguese academics should analyze the impact of the lack of dissemination of their research activity in their own country in terms of educational and industrial perspectives. IS researchers should also analyze the impact of the lack of dissemination within the Portuguese community and analyze to what extent this lack of dissemination may affect the relationship between researchers and companies. With this study, we expect to help in the improvement of IS research knowledge within Portugal and to provide the basis for a broader discussion of within the Portuguese IS community.

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## Appendix A. Most Cited Articles by Year

<b>2000</b>				
<b>Count</b>	<b>First author</b>	<b>Year</b>	<b>Title</b>	<b>Source</b>
4	Glaser B., Strauss A	1967	The discovery of Grounded Theory: strategies for qualitative research	Adline publishing
4	Strauss A., Corbin J.	1990	Basics of Qualitative Research: Grounded Theory Procedures and Techniques	Sage articles
4	Amaral L.	1994	PRAXIS Um Referencial para o Planeamento de Sistemas de Informação	Doctoral thesis
3	Glaser B.	1978	Theoretical sensivity	Sociology Press
3	Porter M., Millar V.	1985	How Information Gives You Competitive Advantage	Harvard Business Review
3	Drucker, P.	1988	The Coming of the New Organization	Harvard Business Review
3	Earl, M.	1989	Management Strategies for Information Technology	Prentice-Hall
3	Hammer M., Champy J.	1990	Reengineering Work: Don't Automate, Obliterate	Harvard Business Review
3	Prahalad C., Hamel, G.	1990	'The core competence of the corporation', , May-June, 79-82	Harvard Business Review
3	Guba E., Lincoln Y.	1994	Competing Paradigms in Qualitative Research in Hanbook of Qualitative Research. Denzin N. and Lincoln y.	SAGE Articles
3	Denzin N., Lincoln, Y.	1994	Handbook of Qualitative Research	Sage articles
3	Yin R.	1994	Case Study Research: Design and Methods	Sage articles
3	Checkland P., Holwell S.,	1998	Information, Systems and Information Systems: making sense of the field	John Wiley & Sons
3	Applegate L., McFarlan F., McKenney J.	1999	Corporate Information Systems Management	McGraw Hill
3	Klein H., Myers M.	1999	A set of principles for conducting and evaluating interpretative field studies in information systems	MIS Quarterly
<b>2001</b>				
<b>Count</b>	<b>First author</b>	<b>Year</b>	<b>Title</b>	<b>Source</b>
4	Checkland P., Scholes J.	1990	Systems Thinking, Systems Practice	John Wiley & Sons
3	Ein-Dor, P., Segev e.	1993	A Classification of Information Systems: Analysis and Interpretation	Information System Research
3	Coplien, J., Schmidt D.	1995	Pattern Languages of Program Design 2	Addison Wesley
3	Tate, J.	1996	Selecting and implementing an accounting system.	M a n a g e m e n t Accounting
3	Ward, J. e Griffiths, P.	1996	Strategic Planning for Information Systems	John Wiley & Sons
3	Morgan, G.	1997	Images of Organization	Sage Articles.
3	Holland C., Light B., Gibson N.	1999	A Critical Success Factors Model for Enterprise Resource Planning Implementation	E u r o p e a n Conference on Information Systems

<b>2002</b>				
<b>Count</b>	<b>First author</b>	<b>Year</b>	<b>Title</b>	<b>Source</b>
6	Checkland P., Scholes J.	1990	Soft Systems Methodology in Action.	John Wiley & Sons.
4	Yin R.	1994	Case Study Research: Design and Methods	Sage articles
4	Checkland, P., Holwell S.	1998	Systems and Information Systems – Making Sense of the Field	John Wiley & Sons
4	Booch, G, Rumbaugh, Jacobson I.	1999	The Unified Modeling Language Guide	Addison-Wiley
3	Senge, P.	1990	The Fifth Discipline – the Art and Practice of the Learning Organization	Doubleday currency
3	Bray, t., Paoli J., Sperberg C., Maler E.	1998	eXtensible Markup Language (XML) 1.0.	www consortium
3	Davenport, T., Prusak, L.	1998	Working knowledge: how organizations manage what they know	Harvard Business School Press