

Quantitative research methods participation in the information sciences papers in Croatia

Dušan Mundar

Faculty of Organization and Informatics
University of Zagreb
Pavlinska 2, 42000 Varaždin, Croatia
dusan.mundjar@foi.hr

Darko Matotek

Faculty of Economics in Osijek
University of Josip Juraj Strossmayer, Osijek
Gajev trg 7, 31000 Osijek
darko.matotek@efos.hr

Marija Jakuš

Faculty of Organization and Informatics
University of Zagreb
Pavlinska 2, 42000 Varaždin, Croatia
marija.jakus@foi.hr

Abstract. *In recent years there has been debate about the appropriate approach for research in the social sciences. It's often stated that the qualitative strategies for research were used to often and quantitative methods are neglected. In this paper is analysed participation of different strategies in research in the social sciences with focus on research in information science and computer sciences. An introduction to research methods used in the social sciences is provided. Classification of the methods into groups by the research objectives and research methodologies are also given. Total of 384 scientific papers were analysed. Observed scientific papers were published in last five years respectively between 2007 and 2011. Publishers of all observed journals are placed in Republic of Croatia.*

Keywords. research methodologies, information science, qualitative methods, quantitative methods.

1 Introduction

This research is analysing participation of different research methods in several scientific papers published in Republic of Croatia. All analysed papers are having focus on information sciences and computer sciences. Set of analysed papers is from four journals publishing in Republic of Croatia. Papers can be retrieved on Hrčak- Portal of scientific journals of Croatia.

Analysed journals are:

1. *Journal of Information and Organizational Sciences (JIOS)*. This is journal published by the Faculty of Organization and Informatics in Varaždin. The journal publishes original scientific papers, preliminary communications, review articles, conference papers and professional papers from the field of information and organizational sciences, as well as relevant contributions from related scientific disciplines. Editorial board consists of 38 members. Eighteen members of editorial board are from Croatia and twenty members of editorial board are from other countries.

2. *Informatologia (INFO)*. This journal is published by the Croatian Communication Association. The journal publishes scientific and professional papers in Social and Humanities sciences, scientific field of information and communication sciences, which are referring to theory, technology and praxis of information and communication, education, communication science, journalism, public relations, media and visual communication, organisation and translation, philosophy, sociology, art sciences and papers from related scientific fields. Editorial board consists of 14 members of which nine members of editorial board are from Croatia and five members of editorial board are from abroad.

3. *Journal of Computing and Information Technology*. It is published by the University Computing Centre of University of Zagreb. The journal presents original scientific and professional papers, as well as review articles and surveys, covering the theory, practice and methodology of computer science and engineering, modelling and simulation, and information systems. Editorial board consists of 21 members. Four

members of editorial board are from Croatia and 17 members of editorial board are from other countries.

4. *International Journal of Engineering Business Management (IJEEM)*. It is published by the InTech, Rijeka. The International Journal of Engineering Business Management is a refereed research journal which aims to promote an integrated and multi-disciplinary approach to engineering, business and management. This Journal is an open access Journal, and it has five scientific boards. Scientific board for Engineering, Technology and Computer Science consists of 35 members. All members are from other countries.

These Journals are selected because they publish scientific papers with focus to informatics and computer sciences. Also, they represent different points of view to informatics and computer sciences - from technical point of view (CIT), organizational (JIOS), communicational (INFO) to managerial point of view (IJEEM).

This paper is organized as follows: after the introduction in the second section are presented scientific methods used in observed papers by division on qualitative and quantitative methods. In the third part of paper is presented technology and methodology of research. Results of the analysis are presented in the following part. At the end of paper are given conclusions about usage of different scientific methods in research papers in observed publications.

2 Theoretical framework

Webster's International Dictionary, [8], defines research as a careful and critical enquiry or examination in seeking facts or principles, diligent investigation in order to ascertain something.

Seeking facts or principles, especially in social sciences, can be endangered by the habit of our mind that it tends to see causation in the association of events. When two events coincide again and again, we come to expect one when we notice the other. We often wrongly treat this 'prediction' as 'causation.' [5] From the perspective of practical usefulness research could be divided into two groups: Pure or Basic Research - acquisition of knowledge irrespective of the fact whether it is of any practical use or not, and Applied research the basic purpose is to put knowledge to practical use. Pure or Basic Research usually has strict rules, which insure correctness of conclusions. Applied research, especially in the social sciences, is often more endangered by making wrong conclusions.

Es van Eeden, [1], points that no definite methodology has resulted from research contributions from aspects of nature that involve people, which were and are being conducted within disciplinary and sometimes interdisciplinary frameworks.

Different methods are used in social science research because problems and research that are conducted in social sciences vary. Some of research methods are:

- Qualitative Method
- Quantitative Method/ Statistical Method
- Field Study Method
- Library Method
- Experimental Method/ Laboratory Method
- Survey Method
- Evolutionary Method/Hierarchical Method
- Comparative Method
- Interview Method
- Case Study Method
- Questionnaire Method
- Sampling Method
- Inter-disciplinary Method
- Scientific Method

Keeping this in view, research methods can be put into the following three groups:

1. In the first group could be included those methods which are concerned with the collection of data. These methods are used where the data already available are not sufficient to arrive at the required solution;

2. The second group consists of those statistical techniques which are used for establishing relationships between the data and the unknowns;

3. The third group consists of those statistical methods which are used to evaluate the accuracy of the results obtained.

From that perspective methods are divided in two major groups:

Qualitative methods

- Methods that are focused on collecting data and information and interpretations of the data. Generally, those methods don't use statistical or other quantitative methods to derive a conclusion. Some of methods in this category are: Field Study Method, Library Method, Survey Method (with descriptive statistics), Interview Method, Case Study method and similar.

Quantitative methods

- Methods that are focused on derivation of conclusion from existing data using proven statistical or general quantitative methods. In the group we encounter different modelling methods for information of business systems. Some special case are UML modelling, programming, functional and

logical modelling, social network analysis, multi-criteria decision making, statistical testing, regression analysis, clustering methods and similar.

According to [1] differences between Qualitative and Quantitative approaches in research practises are stated in Table 1.

Table 1: Differences between Qualitative and Quantitative approaches

Qualitative approaches	Quantitative approaches
<ul style="list-style-type: none"> • Positions him or herself • Collect participant meanings • Focuses on a single concept or phenomenon • Brings personal values to the study • Studies the context or setting of participants • Validates the accuracy of findings • Makes interpretations of the data • Creates an agenda for change for change or reform • Collaborates with the participants 	<ul style="list-style-type: none"> • Tests or verifies theories or explanations • Identifies variables to study • Relates variables in questions or hypotheses • Uses standard of validity and reliability • Observes and measures information numerically • Uses unbiased approaches • Employs statistical procedures

Source: Adapted by authors from Creswell [1]

3 Methodology

In this research are analysed papers from following four journals: Journal of Information and Organizational Sciences (JIOS), Informatologia (INFO), Journal of Computing and Information Technology (CIT) and International Journal of Engineering Business Management (IJEEM).

All published scientific papers in period 2007 – 2011 are analysed. Total number of analysed papers is 384. Professional and other papers are omitted.

In Table 2 are presented papers by journal and year of publication.

Table 2 Analysed papers by journal and year of publication

Journals/ Year	JIOS	INFO	CIT	IJEEM	Total	Relative (%)
2007	24	20	33	0	77	18%
2008	12	24	34	0	70	16%
2009	19	29	31	14	93	21%
2010	18	27	44	13	102	24%
2011	14	30	25	23	92	21%
Total	87	130	167	50	384	100%
Relative (%)	20%	30%	38%	12%	100%	

All of the selected journals are journals listed in the computer sciences and Informatics. Even though, there are other publications in social sciences, some of them are focused on museology (i.e. Museology), archiving (i.e. Arhivski vjesnik), journalism and mass communication (i.e. MEDIALI, Media, Culture and Public Relations) and not primarily on use of information in organizational issues.

Papers from Journal of Computing and Information Technology (CIT) are most frequent (43%, altogether 167) and smallest number of papers is from International Journal of Engineering Business Management (IJEEM) (50%, altogether 50) is the journal was first published in 2009.

All papers in selected Journals are being read to establish used research methods. Research methods are stated accordingly to the methodology section in observed papers. For all published scientific papers are detected research method used to describe or answer research question

Quantitative approach, accordingly to above stated theoretical framework, is every usage of statistical testing (pure descriptive statistics is excluded), functional modelling, different types of system modelling, development of new source, regression models, probabilistic models, multi-criteria decision making, etc.

Qualitative methods, accordingly to above stated theoretical framework, are primarily case study analysis, systematic literature review, descriptive analysis (mean, deviation) of survey data, interview analysis and other descriptive approaches for problem solving.

4 Results of the analysis

In Table 3-Table 6 is shown absolute and relative participation of papers with use qualitative approach and quantitative methods.

Table 3 Papers by research methods (Journal of Information and Organizational Sciences)

Year	Qualitative methods		Quantitative methods		Total
2007	18	75%	6	25%	24
2008	4	33%	8	67%	12
2009	8	42%	11	58%	19
2010	6	33%	12	67%	18
2011	9	64%	5	36%	14
Total	45	52%	42	48%	87

Table4 Papers by research methods (Informatologia)

Year	Qualitative methods		Quantitative methods		Total
2007	16	80%	4	20%	20
2008	19	79%	5	21%	24
2009	18	62%	11	38%	29
2010	17	63%	10	37%	27
2011	15	50%	15	50%	30
Total	85	65%	45	35%	130

Table 5 Papers by research methods (Journal of Computing and Information Technology)

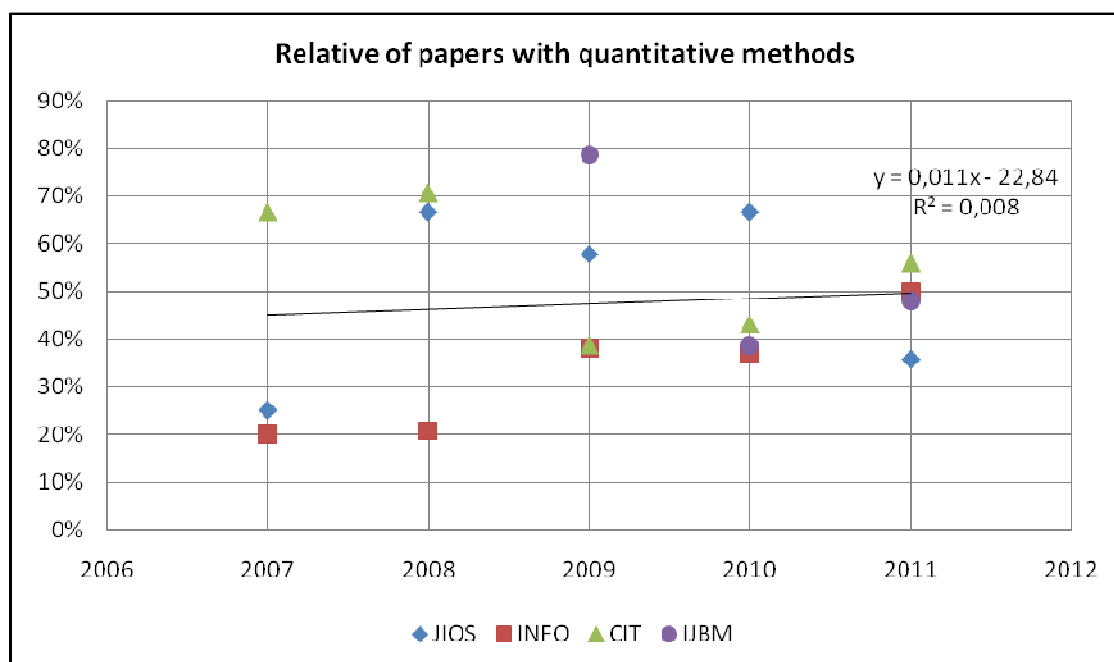
Year	Qualitative methods		Quantitative methods		Total
2007	11	33%	22	67%	33
2008	10	29%	24	71%	34
2009	19	61%	12	39%	31
2010	25	57%	19	43%	44
2011	11	44%	14	56%	25
Total	76	46%	91	54%	167

Table 6 Papers by research methods (International Journal of Engineering Business Management)

Year	Qualitative methods		Quantitative methods		Total
2009	3	21%	11	79%	14
2010	8	62%	5	38%	13
2011	12	52%	11	48%	23
Total	23	46%	27	54%	50

An interesting conclusion arises from research data - that there is similar participation of papers that use quantitative method in three of four observed journals (approx. 50%). Journal Informatologia has the smallest participation of papers with quantitative approach to research problems analysing five year period.

Another interesting appearance is that the proportion of papers with quantitative approach is increasing and dispersion among proportions between journals is getting smaller. In the year 2011 dispersion about the mean of participation is the smallest. Average value of participation of papers with quantitative methods is 47.4% and with standard deviation of 7.4%. For year 2007 those value are: average 37.2%, and standard deviation 20.9%.



Picture 1 Proportion of papers with quantitative methods by journal and year of publication

5 Conclusions

In this research paper is given an analysis of papers from four most influential journals in the information sciences focusing on application of information and computer sciences in Republic of Croatia. This research produced two conclusions. First conclusion is that participation of papers with quantitative methods is approximately 50%, and the proportion is rising from year to year. Second conclusion is that dispersion among participation is getting smaller from year to year.

In future research number of observed Journals should be extended.

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