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Mapping the State of the Art of Scientific Production on Requirements Engineering Research:
A Bibliometric Analysis

Saadah Hassan, Universiti Putra Malaysia, Malaysia
https://orcid.org/0000-0002-9344-8239

Aidi Ahmi, Universiti Utara Malaysia, Malaysia
https://orcid.org/0000-0002-8488-6966

ABSTRACT

Requirements engineering (RE) is gaining acceptance by industries and practitioners as a significant process in systems development. Similarly, the publications on the research related to the RE topic progress. However, there is a lack of study on the progressions of this research based on a bibliographic portfolio. This paper presents the emergence of the RE field and mapping the state of the art of scientific production using a bibliometric survey approach. This study identifies the research trends based on the observations of scientific production over the past two decades. Quantitative and qualitative information in requirements engineering research through various bibliographic attributes are presented, such as the leading journals, top-cited articles, top authors, and top countries. Research trends in RE can be observed based on the number of research themes, and the involvement of various disciplines from RE were not acknowledged until this study was conducted. The results provide evidence and an overview of future directions in this research field.

KEYWORDS

Bibliometric Analysis, Computer Science, Requirements Engineering, Software Engineering, Systems Development

INTRODUCTION

In brief, a requirement is a software capability that must be met or possessed by a system or system component as needed by a user or as stated in a contract, standard, specification, or any other formally imposed documentation (IEEE, 1990). Requirements engineering (RE) is a systematic approach to document the requirements in a good quality manner as well as resolves any identified problem in the requirements as early as possible (Pohl & Rupp, 2015). RE is a sub-discipline of software engineering that starts at the beginning of each software development project. It helps to identify any potential risks in a software development project at the early stage to allow for successful project progress (Pohl & Rupp, 2015).

RE consists of several activities (as shown in Figure 1) that begin with the requirements elicitation, where the elicited requirements are then analysed and modelled. Then the requirements

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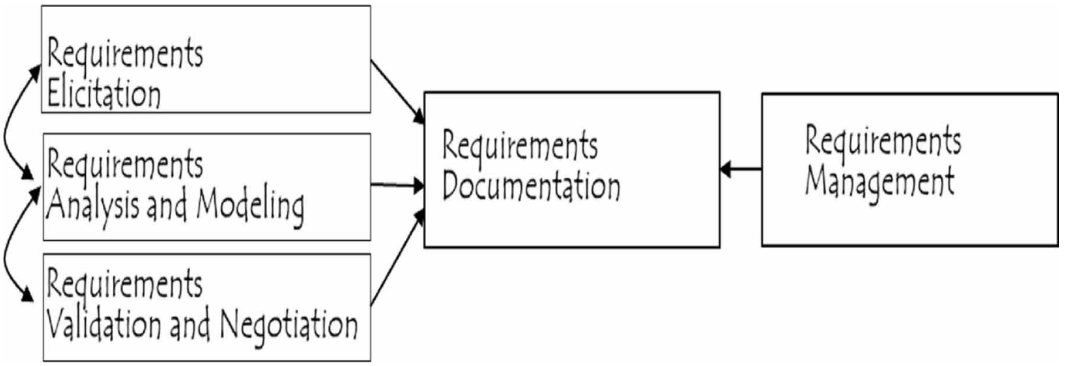
Figure 1. The RE process



need to be validated by the stakeholders where negotiation will take place if there is any conflict exists. Throughout the process, the requirements need to be documented and properly managed to avoid any problems arising after the RE process has been completed. The main output of the process is Software Requirements Specification (SRS) is where the requirements for the software project are documented. The SRS serves as a reference for the subsequent activities in the software development life cycle (i.e., software design, construction, testing, and maintenance). Besides, certain guidelines can be referred to for ensuring the SRS produced is of good quality, for example, the IEEE Std. 830-1998 (IEEE, 1998).

The RE process looks simple but, it is crucial since the key to the success of a software development project depends on its requirements. The RE is increasingly accepted in systems and software engineering practices as a vital process. Wherein the Standish Group (2006) reported that there had been an increase in the number of successful projects proving that RE has been employed in the industry resulted in the systems requirements have been well-addressed. However, discussions on the issues in the RE topic and improvements needed to the RE process are still ongoing. These can be observed from the development in this research field.

Looking at the data from the Scopus database, there are articles on the RE topic published in 1977, and publications on the research related to the RE topic progresses since then. The growing interest in this field infers more research opportunities in the future. Therefore, this study wants to explore further. Some studies have been published in various fields and subject areas that contributed to the RE research. However, mostly the existing studies focus on software engineering (SE) in general (e.g., Glass, Vessey & Ramesh, 2002; Wohlin, 2009) or focus on a specific domain or area of RE (e.g., Iaksch *et al*., 2017; Gupta *et al.,* 2020). Nevertheless, there is a lack of studies that analysed the evolution of the RE using bibliometric analysis. Knowing the main benefit of bibliometric analysis is to observe the impact and characteristics of publications in a specific research area. Hence, this paper has observed the emergence of the RE field and mapping the state of the art of scientific production by using the bibliometric review approach.

The goals of the bibliometric analysis are to document and analyse trends in research within this field for the past two decades. This analysis addressed the following research questions:

RQ1: What are the current trend and impacts of publications on requirements engineering?
RQ2: Which authors, institutions, and countries actively contribute to the publications related to requirements engineering?
RQ3: Which journals actively publish the articles related to requirements engineering?
RQ4: Which articles received higher citations in the requirements engineering domain?
RQ5: What is the knowledge structure of the requirements engineering knowledge base?