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Evaluating and selecting software packages: A review

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ABSTRACT

Evaluating and selecting software packages that meet an organization's requirements is a difficult software engineering process. Selection of a wrong software package can turn out to be costly and adversely affect business processes. The aim of this paper is to provide a basis to improve the process of evaluation and selection of the software packages. This paper reports a systematic review of papers published in journals and conference proceedings. The review investigates methodologies for selecting software packages, software evaluation techniques, software evaluation criteria, and systems that support decision makers in evaluating software packages. The key findings of the review are: (1) analytic hierarchy process has been widely used for evaluation of the software packages, (2) there is lack of a common list of generic software evaluation criteria and its meaning, and (3) there is need to develop a framework comprising of software selection methodology, evaluation technique, evaluation criteria, and system to assist decision makers in software selection.

Contents

1. Introduction . . . 556
2. Research method . . . 556
   2.1. Inclusion criteria . . . 556
   2.2. Search strategy, and search . . . 556
   2.3. Paper selection . . . 556
   2.4. Data extraction . . . 557
3. Results . . . 557
   3.1. Contribution of the literature in the field of evaluation and selection of the software packages (RQ1) . . . 557
   3.2. Software selection methodologies (RQ2) . . . 557
   3.3. Systems/tools for evaluation and selection of software packages (RQ3) . . . 557
   3.4. Software evaluation techniques (RQ4) . . . 559
      3.4.1. Analytic hierarchy process . . . 560
      3.4.2. Feature analysis . . . 560
      3.4.3. Weighted average sum (WAS) . . . 560
      3.4.4. Fuzzy based approach . . . 560
   3.5. Evaluation criteria (RQ5) . . . 560
   3.6. Limitations of the study . . . 560
4. Conclusions . . . 562
Acknowledgements . . . 562
References . . . 562

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1. Introduction

In the past few years there has been increase in the demand for computer software packages. Software firms have produced a variety of packages in response to this demand. Software packages provide a large number of features that are customizable and can be tailored to meet the specific needs of the organizations. Improper selection of a software package may result in wrong strategic decisions with subsequent economic loss to the organization. For example, there are a number of solutions in an ERP market and every solution has different features. As ERP packages cost hundreds of thousands and even millions of dollars, purchasing an ERP solution is a high expenditure activity that consumes a significant portion of companies' capital budgets [69]. Selecting the right solution is an exhausting process for companies [18]. Therefore, selecting a software package that meets the requirements needs a full examination of many conflicting factors and it is a difficult task. This has led researchers to investigate better ways of evaluating and selecting software packages. The purpose of this paper is to review the research work done in the field of evaluating and selecting software packages and provide a basis to improve process of the software selection. Keeping this objective in mind, the scope of review is limited to the literatures that suggest criteria for software selection, methodologies for software selection, software evaluation techniques and systems/tools to assist decision makers in evaluating and selecting software packages. In this paper we address the following research questions:

- RQ1: What is the contribution of the literature in the field of evaluation and selection of the software packages?
- RQ2: What are the methodologies for selecting software packages? This question leads to another sub-question: What are the stages in the software selection methodology?
- RQ3: What are the systems/tools to assist decision makers in evaluating and selecting software packages?
- RQ4: What are the software evaluation techniques?
- RQ5: What are the software evaluation criteria?

Software evaluation can be formulated as multiple criteria decision making (MCDM) problem. MCDM refers to making preference decisions over the available alternatives that are characterized by multiple, usually conflicting, attributes [68,75]. The goal of the MCDM is [41]:

- to help decision makers choose the best alternative of those studied
- to help sort out alternatives that seem good among the set of alternatives studied
- to help rank the alternatives in decreasing order of performance.

In recent years, researchers have focused on models and methods for reusable off-the-shelf software selection [5,13,17,29,31,32,34,36,48,59]. However, there exists other literature that:

- concentrate on evaluation and selection of specific software products such as CASE tools [6,38,53], simulation software [10,19,44–46,66], DSS software [7,55], AHP software [49], knowledge management tools [47,50], data mining software [11], visual programming languages [26], ERP packages [21], CRM packages [12], expert system shells [64], and operations management software [61]
- describe automated systems/tools that assist decision makers in various activities involved in software evaluation and selection [4,17,20,23,39,70]
- describe only criteria for software selection [3,9,54,55,64], and methodology for software selection [2,6,19]
- relate to the evaluation of a single software attribute, quality or some quality sub-attribute, for a software product [15,16].

Stamelos and Tsoukias [62] analyzed the contents of different "problem situations" and suggested a basic classification of software evaluation problem situations: keep or change; make or buy; commercial product evaluation; tender evaluation; software certification; software process evaluation; software system design selection.

The remainder of this paper is organized as follows. Section 2 describes the research method applied in this review. Results are presented in Section 3. The paper is concluded in Section 4.

2. Research method

2.1. Inclusion criteria

The main criterion used for including a paper in our review is that paper should describe research in the field of evaluating and selecting software packages. Only papers that describe: (i) methodology for selecting software packages, and/or (ii) software evaluation criteria, and/or (iii) software evaluation technique, and/or (iv) system/tool to assist decision makers in evaluating software packages, are included in our review. We exclude pure discussion or opinion papers and papers that describe evaluation technique in general and not applied to software evaluation. There were examples of papers describing the same study in more than one journal paper. Fortunately, the number of such cases was small and would not lead to important changes in the outcome of our analysis. Therefore we decided not to exclude any papers for that reason.

2.2. Search strategy, and search

The search strategy for the review is directed towards finding published papers in archival journals, conference proceedings and technical reports from the contents of four electronic databases namely, ACM portal, Elsevier's Science Direct, IEEE Xplore, and Springer-Verlag's Link. The search terms used were "software selection criteria", "software evaluation techniques", "software selection methodologies", "evaluating and selecting software packages", "method for evaluating and selecting software packages", "criteria for evaluating and selecting software packages", "software evaluation criteria", "systems/tools for evaluation and selection of software packages", "knowledge-based systems for software selection", "framework for evaluating and selecting software packages", and "software selection process". Other relevant journals we found while searching the articles on this topic are "information and management", "Information and software technology", and "European journal of operational research". Articles published in proceedings of IEEE on Software Engineering, Springer-Verlag, International conference on COTS-Based software system are also found relevant to this topic. The series of articles on evaluating software engineering methods and tools, part 5 to part 8, ACM SIGSOFT, is one of the major contributions to this topic.

2.3. Paper selection

Our selection process had two parts: (i) an initial selection from the search results, based on reading the abstract of the papers, and (ii) final selection from the initially selected list of papers, based on reading of entire paper. The initial list consists of 130 papers which we found relevant to the topic and potential candidates for inclusion in our review. Initial selection of the paper was done jointly by both the authors on the basis of reading title and abstract of the paper. The first author of the paper then read all 130 papers