Risk avoidance in bidding for software projects based on life cycle management theory

Gang Xie [a,1], Jinlong Zhang [a,2], K.K. Lai [b,c,*]

[a] *School of Management, Huazhong University of Science and Technology, Wuhan 430074, China*
[b] *Department of Management Sciences, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong*
[c] *College of Business Administration, Hunan University, China*

Abstract

This study explores how to integrate software project management risk into bidding risk, and makes use of life cycle management theory to study risk avoidance in bidding for software projects. The stages in the life cycle of software projects and main risk items are introduced. As many types of risk items exist in the bidding, we analyze the possible risk response measures for different risk categories and the measures' corresponding strength. Finally, we describe the basic methodology for dynamic risk avoidance in bidding for software projects based on life cycle management theory and give an example.
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1. Introduction

Software project management is high-risk the world over, and is often regarded as a process that is beyond control. As cost and delivery time frequently run over plan, IT companies often do not achieve their expected profits even when they win their bids [1–3]. Client organizations realize that contractors should be selected not only by offer, but also by taking into account potential risks arising from development, implementation, and other services. Bidders should consider the potential risks arising from their project management ability and the client while they prepare their bids. Therefore, tools for a successful bid include risk analysis before bidding and adopting risk avoidance strategies during the bidding process.

There is some literature on software project bidding and its risk management now [4–8]. Kitchenham et al. present a software project bidding framework that allows users to visualize the risk involved in an offer and to make appropriate bid/no bid decisions [4]. Regner et al. study the choice of a qualified type of software project award procedure, and use the negotiated procedure to support the advantages of an iterative, risk mitigating software process for efficient advertised bidding [5]. Jørgensen and Carelius consider that risk premium overcompensated for the level of uncertainty leads to a higher price in software project bidding [6]. Kitchenham et al. develop an extended evaluation framework and an associated evaluation process to evaluate software bidding model [7], and report two trials of the evaluation framework in software project bidding [8]. However, the investigations are usually limited in a certain segment or stage, for example cost and offer. Current research on risk avoidance countermeasures in bidding lacks an effective approach that adopts proper risk response measures corresponding to specific types of bidding risk yet.

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* Corresponding author. Tel.: +852 27888563; fax: +852 27888560.
  E-mail addresses: xgbill@hotmail.com (G. Xie), jlzhang@mail.hust.edu.cn (J. Zhang), mskklai@cityu.edu.hk (K.K. Lai).
[1] Tel.: +86 27 87557141; fax: +86 27 87556486.
[2] Tel./fax: +86 27 87556486.

Life cycle management (LCM) theory considers the problems in all stages synthetically so that it guarantees a link between the before and after stages and decision-making coherence through the whole life cycle [9]. Chapman considers a formal risk management process (RMP) should be applied at all stages in the project life cycle [10]. Jaafari makes a case for a shift to strategy-based project management, a component of which is real time management of risks, uncertainties and opportunities using a life cycle project management approach. He concludes that risk analysis and management should not be viewed as a separate planning and response operation [11]. Barki et al. develop an integrative contingency model for software project risk management. They assume that the outcome of a software development project is influenced by the fit between the project's risk (risk exposure) and how project risk is managed (risk management profile) [12]. When the software project management risk process is analyzed and forecast systematically before bidding, integration of the later stages of the life cycle into the earlier bidding stages helps to minimize the entire bidding risk effectively, and makes the target coherent in all stages of the project's life cycle. This kind of risk avoidance strategy prevents and reduces project bidding risk to some extent, and allays the probability of the project's failure. This study explores the integration of project management risk into the bidding risk, and presents risk response measures and a dynamic risk avoidance approach to be used in bidding for software projects.

2. Risk in the software project life cycle

Bidders sign contract with clients after winning the bid, and they become contractors. It may be said that software project life cycle starts with the clients' invitation to bid [13]. If bidders win the bid, the software project life cycle can be divided into seven stages, and its flow chart is shown in Fig. 1.

Because decision process of the software project's life cycle is complex, bidders should take their ability to accomplish the software project and the benefits into account before bidding, and make a bid/no bid decision; if they choose to bid, they should then decide what kind of bidding strategy they should adopt. There is a great deal of potential risk involved in each side of a bid, and in all stages of the software project life cycle. By investigating main risk sources in bidding for software projects, we consider that the risk index system consists of five risk categories and 15 risk factors as shown in Fig. 2.

Taking Table 1 as an example, we can see that risk in one stage may be different from that in other stages. In fact, the risk in an early stage will influence that in later stages. For example, demand understanding in the stage *Work out the proposal and submit it* will affect stage *Answer the question* and risk avoidance decisions in later stages. So, we should possibly forecast and analyze the risk in later stages to support risk avoidance decisions in early stages.
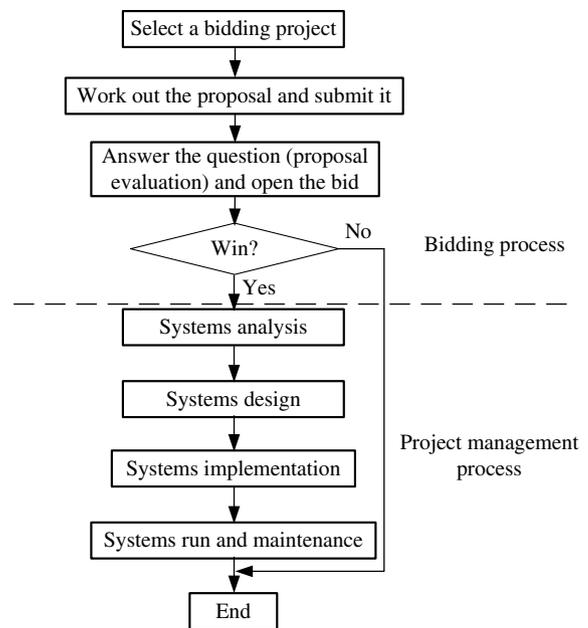

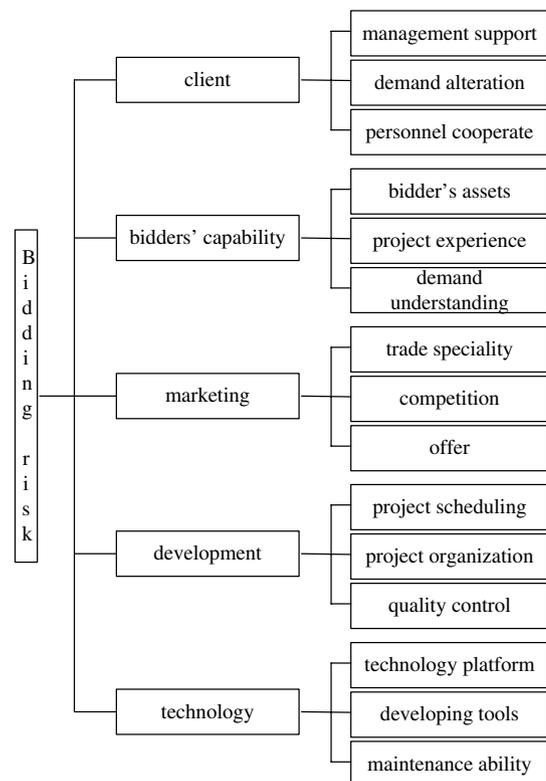
Fig. 1. Software project life cycle flow chart.

Fig. 2. Risk index system.

3. Risk response measures and corresponding strength

Risk avoidance in bidding for software projects is a complex, unstructured and semi-structured decision process. Different kinds of risk correspond to different risk response measures. In general terms, the risk response measures when bidding for software projects are as follows.