

How to Start a Research Project

A research project will take at months to complete. Prior to starting to write a paper, students must go through the proposal stage, during which students will develop their proposal and have it reviewed by his/her research advisor. This means that students need months of planning and background research work before the start of writing a paper.

During the proposal stage, students should discuss their research interests with research department members, identify a research topic, conduct preliminary literature review and develop a project proposal. The proposal should discuss problem statement, objectives, research methodology, research activities, and a time schedule in about 3-5 pages. A sample proposal is attached here for your reference. The length of a research proposal can vary quite a bit. Your supervisor can help you determine the best length for your work.

*Table 1 Sample proposal text-
A Conceptual Framework for Scheduling Constraint Management*

Sample proposal text	Comment
A Conceptual Framework for Scheduling Constraint Management	Provide a brief and meaningful title to your project
<p>1. Introduction</p> <p>Every construction project is unique and has its own operating environment and sets of technical requirements. As a result, the execution of a construction project is subject to numerous constraints that limit the commencement or progression of field operations, which invariably have significant negative impact on overall project performance. By definition, constraints refer to any condition, such as temporal/spatial limitations and safety/quality concerns, which may prevent a project to achieve its goals. Successful execution and control of a construction project relies on effective identification and management of constraints through master planning and short-term look-ahead scheduling. While the master schedule provides a global view of a project and the overall execution strategy, a look-ahead schedule offers a detail account of operational constraints and a detailed plan showing work to be done within a relatively short time window. Ideally, these detailed schedules should reflect actual field conditions and provide field personnel with operation instructions free of constraints and conflicts (Hinze 2008). This look-ahead scheduling and constraint analysis procedure is also a critical component of the last-planner methodology proposed by Ballard (2000). This research project will provide an overview of state-of-art schedule constraint analysis practice during look-ahead scheduling. In addition, it will propose a conceptual framework for managing constraints.</p>	<p>Background or introduction section provides a description of the basic facts and importance of the research area - What is your research area, the motivation of research, and how important is it for the industry practice/knowledge advancement?</p>

2. Problem Statement

The importance of developing a constraint-free and reliable work plan has long been recognized by the industry. However, numerous construction projects are still plagued by delays and cost overruns, which can frequently be traced to ineffective identification and treatment of constraints. First, when a constraint is not properly identified during scheduling, subsequent conflicts in the field are inevitable. Today's projects are becoming more and more technically complex and logistically challenging, which exposes construction operations to even more complex constraints. Second, the traditional scheduling methods, bar charts and Critical Path Method (CPM) which are widely used as a basis for constraint analysis, greatly limit our capability in modeling and resolving constraints during look-ahead scheduling. These methods have long been blamed for their limitations in modeling and communicating constraints, including inability to cope with non-time-related precedence constraints and difficulty to evaluate and communicate inter-dependencies at the field operation level (e.g. Sriprasert and Dawood 2002; Chua and Shen 2001). In summary, there is a need for a better understanding of constraints in construction and a structured approach in identifying and modeling constraints to ensure a constraint-free work plan. More specifically, the following research questions need to be addressed:

1. What are the typical constraints found in various construction projects?
2. How to classify these constrains for easier identification and modeling?
3. What are the current industry practices as well as research advancements in modeling and resolving constraints?
4. How to unify the constraint classification knowledge and various constraint modeling efforts into a framework for total constraint management?

Problem statement provides a clear and concise description of the issues that need to be addressed - What is the specific problem in that research area that you will address (e.g. lack of understanding of a subject, low performance ...)?

3. Objectives

The long-term goal of the research is to develop a formalized constraint management system. Constraint management is defined herein as the process of identifying, classifying, modeling, and resolving constraints. The objective of the current study is to provide a comprehensive review of literatures and industry practices in relation to constraint analysis and outline a conceptual framework for constraint management. Particularly, the study has the following sub-objectives:

1. To provide a comprehensive review of sources and characteristics of constraints typically found in construction projects;
2. To develop a constraint classification method for easier constraint identification and modeling;
3. To review current industry practices and researches in regards to constraint modeling;
4. To outline a conceptual framework for total constraint management.

Objectives provide a list of goals that will be achieved through the proposed research – What are the benefits/impact (e.g. better understanding, improved productivity ...) that will be generated if the research problem is answered?

<p>The result of this study will be valuable to the industry practitioners as well as related software providers in developing better practice and tools for constraint management and look-ahead scheduling.</p>	
<p>4. Preliminary Literature Review</p> <p>A preliminary literature review shows that past studies are primarily focused on understanding and modeling a particular type of constraint, such as technological, contractual, resource, spatial, and information constraints. Limited progress has been made on classifying various constraints according to their characteristics in a comprehensive manner. In terms of modeling and resolving constraints, various approaches have been recommended. For example, many CPM-based methods are applied to deal with time-related constraints; knowledge-based systems were used to automate work plan generation; network-based optimization algorithms were developed to resolve constraints; and databases and visualization techniques, such as 3D, 4D, and Virtual Reality (VR), are used to communicate and visualize constraints. What is missing from the past studies is a comprehensive and structured approach in managing constraints.</p>	<p>Preliminary literature review: provide a summary of previous related research on the research problem and their strength and weakness and a justification of your research - What is known/what have been done by others? And, why your research is still necessary?</p>
<p>5. Methodology</p> <p>The primary research method for this study is literature review and conceptual modeling. Constraint identification and classification through a structured approach is the very first step toward a “zero-constraint” environment. This study will first review various types of constraints in construction and their characteristics. Based on this understanding, a classification method will be developed to categorize constraint factors for the purpose of constraint identification and modeling. In the second stage of this study, existing constraint modeling methods will be identified based on a comprehensive review of current industry practices and academic researches. Finally, once the constraint classification and modeling techniques are identified, a conceptual framework for total constraint management will be outlined. This study will be conducted between September 2010 and May 2011.</p>	<p>Research methodology defines the research methods and logic steps - What to do and how to solve the problem and achieve proposed objectives? Which research methods (e.g. survey, modeling, case study ...) will be used? Attach a project schedule table, if necessary.</p>
<p style="text-align: center;">References</p> <p>Ballard, G. (2000). “Last planner system of production control.” Ph.D. Dissertation. Univ. of Birmingham, Birmingham, UK. Chua, D. and Shen, L. J. (2001). “Constraint modeling and buffer management with integrated production scheduler.” Proceedings of International Conferences on Lean Construction 2001, Singapore. Hinze, J. W. (2008). Construction planning and scheduling, 3rd ed. Pearson, NJ. Sriprasert, E. and Dawood, N (2002). “Requirements identification for 4D constraint-based construction planning and control system.” Proceedings of CIB W78 conference – distributing knowledge in building, Aarhus, Denmark.</p>	<p>All factual material that is not original with you must be accompanied by a reference to its source. Please use ASCE guideline on reference and citation style.</p>