Introduction: This literature search seeks to locate articles to do with better controlling or managing Time, Cost and Quality in projects, particularly in relation to quality systems, alliance contracts, Public Private Partnerships, pre-Qualification and procurement processes. Due to its subject nature, most of the records located are to do with Construction projects.

   Keywords: project leadership; project structure; project objectives.
   **Abstract:** This paper reports on the research conducted in one of the divisions of Europe’s largest IT consultancy. This study aims to investigate (1) the critical elements of managing IT services projects by using Turner’s (Handbook of project-based management) five-functions model to examine the relationships between project definition and scope, project organisation and the triangle of critical project outcomes and (2) if the project leader’s orientation is related to his situation perception of project control. Although the survey has found only partial support for the proposed relationships, it has also identified the importance of personal attributes and contingent experiences on the leader’s perception of project success. More significantly, the evidence that time and quality, rather than time and cost, are the two most critical project objectives reflects the industry shift of concern from being contractors to solution-partners.

   Keywords: buffer; contingency; management reserve; PERT; Monte Carlo; Critical Chain; CCPM.
   **Abstract:** Bias in project performance causes schedule and cost to overrun baseline estimates (your model). Bias is the one-sided tendency of actual schedule or cost to overrun the model. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) and supporting literature recommend estimating the variability for all project time and cost estimates and sizing appropriate schedule or cost buffers (also known as contingency or management reserve) using Monte-Carlo analysis or PERT. This paper describes a number of sources of bias in performance of projects to schedule and cost estimates and provides recommendations to size buffers that ensure your projects come in under your baseline schedule and budget.

   Keywords: industrial projects; contract administration; incentive contract; contractor performance; contract penalty; Saudi Arabia.
   **Abstract:** Project delays and cost overruns are becoming major problems in many projects, especially industrial projects. The present economic situation has forced owners to establish time and cost reduction programs to control expenditure. The main objectives of this study are to study the perception of owners and contractors about incentive/disincentive contracting. A questionnaire was used to gather the required data for the study. This was distributed among owners and contractor companies working in Petro chemical plants, power plants and refineries. The findings of the study support the use of I/D provisions in contracts. In addition, the use of I/D contract provisions ensure that contractors do their utmost to manage and control factors that influence labor productivity, project duration and/or project cost.

   Keywords: project documentation; project stages.
   **Call Number:** ART 264
   **Notes:** Issues of the importance of documentation produced during the three stages of a project, precontract, contract and post-contract are discussed along with suggestions as to how the documentation may be better controlled to assist in the achievement of time, quality and cost parameters.

   Keywords: change management; implementing strategy; quality; cost; time; international projects; partnerships; alliances; stakeholders.
   **Abstract:** The growing emphasis in many low-income countries on community-based infrastructure means that more programmes are being implemented through micro contracts. The advantages of this approach are that it encourages participative negotiation of activities and speedier implementation, the use of local resources, skills and appropriate technology and entrepreneurship in communities. For client organizations, however, large numbers of very small contracts are much harder to monitor, supervise and evaluate. This paper draws upon recent research in India, Pakistan and Sri Lanka to develop a “benchmarking framework” to study the time and cost performance of 162 small-scale contracts for urban infrastructure. The study found that costs were normally very close to target, but project duration generally far exceeded the target. There is only a weak association between the cost and time growth.

**Keywords:** procurement delay; highway projects; infrastructure; material procurement; equipment procurement; construction; developing countries; Nepal.

**Abstract:** Delay in the delivery of materials and equipment to construction sites is often thought of as a contributory cause of cost overruns in construction projects in developing countries. A cursory examination of the environment in which projects are executed in developing countries appears to support this thinking. However, there does not seem to have been much research work conducted that investigates whether this is actually the case and also assesses the cause of these delays and magnitude of their impacts on project costs. This research was aimed at firstly ascertaining the occurrence of material and equipment procurement delays in highway projects in Nepal.


**Keywords:** managing projects; cost; time claims; developing countries; project delays.

**Abstract:** Construction delay has become endemic in Nigeria. It is imperative to create awareness of the extent to which delays can adversely affect project delivery. This paper identifies, by questionnaire evaluates and through empirical method assesses the effects of construction delays. The findings showed that time and cost overruns were frequent effects of delay. Delay had significant effect on completion cost and time of 61 building projects studied. Client-related delay is significant in Nigeria. Acceleration of site pre-contract estimate should assuage the adverse effect of construction delays.


**Keywords:** construction management; construction delays; contractors; surveys.

**Abstract:** Many projects experience extensive delays and thereby exceed initial time and cost estimates. In addition to impairing the economic feasibility of capital projects, extensive delays provide a fertile ground for costly disputes and claims. This paper presents the findings of a survey aimed at identifying the most important causes of delays in construction projects with traditional type contracts from the viewpoint of construction contractors and consultants. Results of the survey indicate that contractors and consultants agreed that owner interface, inadequate contractor experience, financing and payments, labor productivity, slow decision making, un-proper planning and subcontractors are among the top ten most important factors. It is hoped that these findings will guide efforts to improve the performance of the construction industry and will be useful to international engineering and construction firms seeking a share in the Jordanian and the regional markets.


**Keywords:** Time-cost Relationship; Regression Model; Public Sector Projects; Malaysia.

**Abstract:** The time-cost relationship identified in this paper serves as a convenient tool for both project managers and clients to predict the average time required for delivery of a construction project.


**Keywords:** Time-Cost Trade-Off; Fuzzy set; Genetic Algorithms; Construction Scheduling.

**Abstract:** Owing to different resource utilisation, activity duration might need to be adjusted and the project direct cost could also change accordingly. Moreover, activity duration is uncertain due to variations in the outside environment, such as weather, site congestion, productivity level, etc. A new optimal construction time-cost-trade-off method is proposed in this paper, in which the effects of both uncertain activity duration and time-cost trade-off are taken into account. Fuzzy set theory is used to model the uncertainties of activity durations. A searching technique using genetic algorithms (GAs) is adopted to search for the optimal project time-cost trade-off profiles under different risk levels. The method provides an insight into the optimal balance of time and cost under different risk levels defined by decision makers.


**Keywords:** construction industry - Brazil; government contractors; project planning.

**Abstract:** Poor planning and lack of owner involvement in the execution of the planning are critical causes of the delays and cost overruns that characterize the phase of civil works of the public construction projects. However, how public agencies' planning execution affects the time and cost results of the phase of civil works is a question not clarified. In this context, this work discuss the execution of the project planning processes of Cia Paulista de Obras e Servicos, a state owned company of the São Paulo State Government, which managed 398 public construction projects from 1992 to 1999. The approach is on the effect of the planning in the results of the phase of civil works in relation to time and cost. The data were collected through interviews with project managers and inspectors of civil works; through consultation in electronic archives and documents; and through direct researcher's observation in the period from 1995 to 1999. The results achieved point that time and cost are affected by poor work breakdown structures in the description of the project scope; by poor time and cost estimates that disguise the results; by poor procurement documents; by simplified and not integrated scheduling and budgeting; by deficiencies in the organizational planning and communication that delay decisions taking; by a planning of quality focused in the product; and by absence of risk planning.
   Keywords: construction industry - management; cost management; time management; utilities; public sector.
   Abstract: Every Project has a time constraint (a scheduled service date), which should be met satisfying a cost constraint (budgeted funds). Sometimes, there is an incentive in completing the project ahead of schedule. But more often, it is not required. In this case, the most beneficial approach is "Just-in-Time" construction, which provides a significant improvement of Project Cost and Time Management. The main principle of this approach is to meet project time constraints without any unnecessary schedule improvement. To achieve this goal, initial resource allocation should be based on a minimum overtime construction work. During the course of construction, constant project control has to be provided to monitor progress and add resources only when it is required to meet a Project Service date.

Public Service Electric & Gas Company of New Jersey (PSEG) successfully used just-in-time construction on several projects, finishing all of them on time and under budget. The most recent project is "230 kV Circuit Breaker Replacement at Waldwick Switching Station". The need for this project arose when existing breaker failed the tests. Load Dispatcher requested a new breaker to be in service no later than 3 weeks. In the past, similar projects were completed in a shorter time span, but it required a sufficient overtime construction work. This time, decision was made by a Project Team to schedule all work based on a straight time only and monitor the progress every day to define if any resources should be added. As a result, project was done "just-in-time", with overtime worked only 2 last days and cost about 20% less than expenditures of similar project done in the past. Experience shows, that "just-in-time" construction is more suitable for small projects (less than one million dollars), which are less rigid than more complicated projects and allow changes to be implemented in a very short period of time.

   Keywords: cost control; municipal engineering; time management; schedule development.
   Abstract: Record rainfall events during the past three years resulted in the frequent flooding of businesses and homes in portions of the City of Milwaukee. In response, the Milwaukee Metropolitan Sewerage District (MMSD) made a commitment to fast track several flood control projects. Hydraulic analyses of tributary storm and sanitary sewers found that the flooding resulted from sanitary and storm sewer backups. In order to have the projects in place for the following year’s spring rains, the MMSD had to design and construct four separate improvement projects worth $16 million within nine months. This paper presents the project delivery methods considered and ultimately used by the MMSD to meet this extremely aggressive schedule.

MMSD evaluated three different delivery methods to complete the projects within the schedule. Almost all of its work is completed with the traditional design, bid and build mode used in municipal engineering as required by state statute. Using this method, it would have taken an estimated 24 months to complete the projects. Alternatively, the MMSD considered the use of a design/build contract. Such a contract could have met the time frame required for construction. However, a design/build process was considered to have several drawbacks. Among the drawbacks were that other public entities, including the City of Milwaukee and the Wisconsin Department of Natural Resources, would have had difficulty providing their required design review and acceptance without sufficient design detail. In addition, the MMSD desired input on the design process and needed the design to conform to its general technical standards. Finally, the MMSD wanted to stay as close as possible to the intent of state statutes. The solution was to implement a hybrid design and build process that incorporated several innovative contracting mechanisms to meet the aggressive schedule.

First, an engineering consultant was selected to provide overall management and schedule coordination for the flood control projects. Subconsultants were then hired to provide preliminary designs for each project. The preliminary designs focused on key elements needed to obtain preliminary pricing from the contractors, including earthwork, equipment sizing and layout and piping layout. As the preliminary designs were completed, pre-qualified contractors prepared a proposal based on the preliminary designs and were selected based on overall qualifications, their proposed schedule and guaranteed maximum price (GMP). Concurrent with contractor selection, the MMSD identified and purchased additional long lead-time equipment including pumps, a generator, motor control centre, switchgear and sluice gates. Finally, the engineer initiated the environmental and construction permitting process during contractor procurement. In summary, the tasks of final engineering, bidding, equipment ordering and permitting, which are normally carried out sequentially, were done concurrently.

Within three and a half months, the preliminary design, contractor selection and field mobilization phases were completed for each project. Within another five months, the three main projects were substantially complete for the GMP provided by the contractors based on preliminary drawings. The final project was completed within nine months of the start date, and resulted in satisfied constituents and an alternative delivery system proven to save the district time and money.
14. Suhrita S. Deriving the second and third dimensions of the BCWS. Project Management Research at the Turn of the Millennium. Proceedings of PMI Research Conference 2000. 21-24 June 2000; (21-24 June 2000); AIPM. Pennsylvania, USA: Project Management Institute; 2000. Keywords: Research; Conference Proceedings; Modeling; Earned Value; Planned Value; Three-dimensional Models. Call Number: 00PRO1

Abstract: This paper looks into structuring a multidimensional performance management model out of the "Planned Value" and "Earned Value" parameters of time and cost control. All such comparisons between the planned and earned values can be viewed in a three-dimensional perspective - the graphics are generated out of statistically quantified growth patterns in the second and third dimensions.


Abstract: A successful construction project is an integrated effort by people of different qualifications ensuring its completion under the constraints of resources, time and quality. The construction project team consists of three entities: the project owner, the designer, and the construction contractor. Good working practices between the project participants help in ensuring project quality and minimizing disputes between them. The aim of this study is to investigate the working practices pursued by local design offices, for ensuring quality of the project, in the construction project team. The following twenty-three working practices for design offices were identified and the research findings regarding their prevalence are presented in this paper.

1. Roles of the project team members are defined through discussion with the owner and/or owner's representative
2. Working procedures and communication lines are defined through discussion with the owner and/or owner's representative
3. Project cost, schedule, and quality are defined through discussion with the owner and/or owner's representative
4. Contractual requirements and constraints are defined through discussion with the owner and/or owner's representative
5. Project requirements are defined through discussion with the owner and/or owner's representative
6. Methods of testing design correctness are defined through discussion with the owner and/or owner's representative
7. The complete project brief is developed through discussion with the owner and/or owner's representative
8. Space utilization and material appropriateness is defined through discussion with the owner and/or owner's representative
9. Methods for resolving design conflict are defined through discussion with the owner and/or owner's representative
10. Location drawings and physical models are made for review
11. The correctness of the scheme design with regard to the project brief is checked with the owner and/or owner's representative
12. Constructability of the design is checked with the owner and/or owner's representative, and the construction contractor
13. Specification classification is worked out with the owner and/or owner's representative, and the construction contractor
14. Contractual details for construction are worked out with the owner and/or owner's representative, and the construction contractor
15. Requirements for temporary works are worked out with the owner and/or owner's representative, and the construction contractor
16. Degree of accuracy of the drawings and the detail required is established with the owner and/or owner's representative, and the construction contractor
17. Practicality of the design drawings is verified with the owner and/or owner's representative, and the construction contractor
18. Material and workmanship requirements are established with the owner and/or owner's representative, and the construction contractor
19. Appropriate specifications and their details are worked out with the owner and/or owner's representative, and the construction contractor
20. Procedures for communicating design inconsistencies and their correction is established with the owner and/or owner's representative, and the construction contractor
21. There is regular review of the work performed by the construction contractor to help in any possible design changes required by the owner and/or to improve project cost, schedule, and quality
22. An evaluation by the owner regarding the services provided is requested at the end of each project
23. An evaluation by the construction contractor regarding the working relationship is requested at the end of each project.

The findings reveal a higher degree of contact by the design offices with the project participants in the initial stages of the project as compared to the final stages. Cooperation by the design offices is mainly in areas vital for the successful completion of the contract. Designers prefer to remain aloof from the contractors as compared with the owners.
The author has developed and monitored over 10 CPM schedules on projects ranging from $4 mil to $330 mil. This paper will focus on the very unique process of developing the CPM, and then utilizing the CPM for payment and schedule performance monitoring, on a large design/build project. Specific topics to be addressed:

1. General review of the CPM scheduling specifications...the "good, bad, and ugly" of the Atlantic City specifications and suggestions for improvement. General discussion of the overall effectiveness of the contract requirement for a payment CPM on this design/build project. The paper will address whether the CPM scheduling requirement ultimately contributed to the success of the project, both from the Contractor's and Owner's points of view. Outsourcing the CPM service by the Contractor...should this be permitted?

2. The process for developing a payment schedule based solely on concept plans. Issues include selection of the scheduling software, developing the required level of detail, ensuring all payment items are included, the process for getting approval...including early approval of means and methods, resource loading based only on a conceptual understanding of the project, integrating design and construction payment schedules, inclusion of design deliverables and construction stage submittals, inclusion of fabrication and procurement items and stored material payments. Did the process help the Contractor "plan" the project, was the Owner's early involvement helpful...was this a useful tool?

3. Examination of the Contractor's and Owner's "level of sophistication" and whether this affected the usefulness of the CPM management tool.

4. Updating the schedule to insure proper payment. On the Atlantic City project payments ranged up to $9 mil per month and had a great effect of the Contractor's cash flow and ultimately his ability to perform. Other issues include negotiation of payments...percent complete vs. remaining duration, agreement of physical percent complete, effect of payment deductions on perceived schedule performance, "front ending" schedule items, and record keeping requirements for the construction inspection team.

5. Schedule monitoring......recovery plans, etc. Issues to be addressed include the Owner's and Contractor's use of the payment schedule for project management including schedule performance monitoring. Updating to include change orders and changed conditions. Updating during design development. Recover plans and the basis for schedule compression.

6. Conclusion of the overall effectiveness of the CPM tool on design/build projects.

Challenge: Spend $5 billion in 15 months.
The project is a 3000 kilometer heavy wall, high pressure pipeline from northern British Columbia to a liquids processing plant near Chicago, IL. It includes 750 kilometers of gathering system and 37 receipt points, each with a meter station as well as 14 large compressor stations along the mainline. It crosses three provinces, four states and required approval by regulatory and environmental bodies in both United States and Canada.

The managers of this largest single pipeline project in North America faced this challenge, and yes there was a catch; they had to deliver a working pipeline system and liquids extraction plant. This is the story of how an upstart organization took on the majors and developed one of the largest projects ever attempted in North America. Management of this massive project was handled by a very small number of key individuals using sound project management practices.

At the peak of construction, more than 7000 people were directly employed on the project in as many as 75 different locations with expenditures topping $400 million per month. The procurement exercise tied up more than half the pipe production capacity of all big-inch mills in North America for most of a year, including one which devoted its entire capacity for 20 months. The construction effort, likewise, encompassed 75% of the major constructors in Canada and 60% of the constructors in the U.S.

The challenge was to design, build and set up a completely new operating company with staffing of less than 300. And oh, by the way, because of the large dollars involved, the owners wanted the entire $5 billion project finished in the minimum time: a construction period of 15 months with two months added for commissioning.

**Abstract:** Typically, construction contracts are bilateral agreements between a Principal and a Contractor. However, this $45 million (US$22.5 million) construction project in Auckland, New Zealand had a series of construction, leasing and funding related contracts amongst the key stakeholders, mainly due to the cross functional responsibilities and objectives of the stakeholders.

The result was an interesting mix of different types of contracts. This paper looks at the behavior of the different teams and individuals under a complex array of contracts.

In total there were six contracts, as follows:

*A construction contract (for the building structure only) between the landowner (Principal) and the constructor (Guaranteed Maximum Price contract).

*A construction contract between the tenant and the constructor for the Essential Fitout work (HVAC, carpets, ceiling, access flooring etc - approximately 25% of building value) on a cost plus margin arrangement.

*A construction contract for the discretionary fitout (furniture, finishes, fitout of kitchen, internal partitions etc.) between the tenant and the constructor on a cost plus margin.

*An agreement to lease between the land owner and the tenant.

*A guarantee from the tenant to the funder of the base building works that the essential fitout items (without which the project would not be completed) will be completed.

*A quad party agreement between the landowner (Principal), the tenant, the funder and the constructor ensuring that the default of one party was not grounds for termination by the others.

It was agreed by all parties that the Project and Construction Management company, who was the key facilitator of the project, provided Project and Construction Management services for the entire project and act as the constructor.

This paper demonstrates how possible conflict of interest scenarios were overcome by creating individual team structures. Structures who were focussed on their “patch” within the interests of their construction contract.

The overall coordination was provided by one senior Manager of the Project Management organization.

The behavior of the team who were responsible for the GMP contract focussed on costs and scope control aggressively. They were focussed on delivering what was promised for the agreed costs. They achieved significant savings which were shared with the Client.

The teams that were working on a cost plus margin arrangement focussed on looking for value for money solutions. They were looking for “options” all the time, not accepting the traditional solution. The result was innovative design features, converting what would have been a typical building into a “highly intelligent” building.

The senior management of the project management organization focussed their attention on the requirements of the overall project. They were directly accountable to the key stakeholder to deliver the intentions of the various contracts.

Contrary to what could have been accepted as a conflict situation, the result was a focus on win-win solutions for the stakeholders at all times.


Keywords: Project Documentation; Document Control.

**Abstract:** Issues of the importance of documentation produced during the three stages of a project, they being pre-contract, contract and post-contract are discussed along with suggestions as to how the documentation may be better controlled to assist in the achievement of time, quality and cost parameters.


Keywords: PMISA Conference; Proceedings; South Africa; Cato Manor Development Project; Programme Management System; Monitoring; Evaluation.

Call Number: CDROM collection

**Abstract:** The implementation of the Cato Manor Development Project (MDP, and RDP Presidential Lead Project valued at approximately R3,5bn in constant prices, requires a dedicated Programme Management System (PMS) to monitor and evaluate development progress. The primary function of the PMS being to translate the physical and institutional dimensions of the development into a time and cost monitoring and evaluation framework. Furthermore, since the CMDP is located within the Durban Metro Council (DMC, the PMS has to harness and/or re-orientate existing government management systems instead of imposing a completely new PMS. This paper provides an insight into how the PMS was established by the Cato Manor Development Association (CMDA), the organisation tasked with overall programme management of the development of the CMDP.
Keywords: public facilities; government; public administration; case studies.
**Abstract:** The Museum of New Zealand Te Papa Tongarewa Project has been an outstanding success. Against all the predictions and precedents it was completed ahead of time and well under budget. It is a museum which is viewed as revolutionising the very concept of museum and is currently considered as the best museum of its type in the world. It is an emphatic example of what New Zealanders can do when they are united as a group and share a common vision. Along the way the Project had to surmount many challenges. It did so by utilising the very latest of management techniques from all around the world and creating a project culture where world class performance was the aim but always within strict time and cost parameters. This case study reviews the use of quality risk and value management approaches as part of the overall project management.

Keywords: Procurement management - TQC.

23. Mozes EY. **Teams and techniques in schedule compression for mega-projects.** IPMA 96 World Congress on Project Management; 1996; AIPM. IPMA; 1996.
Keywords: large projects; power generation; utilities; project teams.
**Call Number:** CP20
**Abstract:** In a Mega-project of 1100-MW electric power plant, two and a half years before operation started, Company Management urgently required that project schedule be shortened by five months. This paper presents a case-study and a generalized methodology for schedule compression without modern tools. A simple, central time schedule becomes powerful when the detailed schedule of commissioning is integrated into it, and when problem diagnosis and solving are start-up-driven. Since management and departmental motivation are prerequisite but insufficient, advanced techniques should be boldly applied such as Overlapping of phases, Isolation and Absorption of uncertainties, and, most importantly, multidisciplinary Teamwork. Teamwork by people and different organizational units have brought about the required results. Conclusions are drawn from the very good results in quantitative terms of time and cost, as well as in terms of controversial organizational effects, including conflicts between the functional units and the project matrix pushing through the schedule compression.

Keywords: twinning; project delivery methodology.
**Call Number:** TP18
**Abstract:** The focus of this work is on a unique project delivery method developed by the author. The methodology presented in this paper has the potential for providing a sound basis for aligning the objectives of the owner and contractor on the project. The methodology is equally applicable to all types of significant projects. Under this methodology project time and cost are treated as twinned risk management variables, and an innovative contracting system derived based on the probability distribution of these variables. More specifically, the 50% and 90% characteristic values of the project time and cost distributions play a significant part in the determination of the time and cost risk bands and their respectively linked incentive schemes.

To obtain copies of any of the above documents please refer to the AIPM website under IRC - Document Delivery for instructions or contact the IRC Manager on 02-9252 7277 or kevin@aipm.com.au