IPM Prism
A Learning Journal from L&T Institute of Project Management
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KNOWLEDGE @ WORK

From the Editor's Desk

IPM PRISM is a quarterly publication of L&T Institute of Project Management. IPM can be seen as a PRISM that converts the white light of L&T experiences in executing complex domestic & international projects and adopted global best practices into structured programmes for participants to learn the various aspects of project management signified by the colours generated by the PRISM

Please send your valuable suggestions & comments to – **info@lntipm.org**

"Knowledge is the theoretical paradigm, the to do and the why. Skill is the how to do. And desire is the motivation, the want to do. In order to make something a habit in our lives, we have to have all three."

— Stephen R. Covey
(https://www.goodreads.com/work/quotes/6277)

Features

The above quote tells us the significance of Knowledge, Skills and Motivation. It delights us to dedicate this edition of the prism for capturing the multiple dimensions of Knowledge at Work with emphasis on strategic imperatives for knowledge management and outlining the sections of the L&T BOK.

Knowledge emerges during the journey into unchartered areas, in this edition we bring to you two such challenging journeys from the WET IC on first on Mega Lift irrigation project, which made it possible to provide Water to agricultural fields even in Rabi season the second one, showcasing the challenges in execution in working with one of the oldest sewage systems of the world. We appreciate Mr. Kugan Ku and Mr. Sivaramakrishnan for their contributions to the above articles.

The Faculty corner features articles from our IPM faculty, Dr. Hiren Maniar, Prof. Sunil Kumar and Prof K P Reghunath. We thank them for the outstanding articles, which provides knowledge that can be immediately implemented during project execution resulting in Cost, Time and Quality optimization. Dr. Hiren Maniar shows how the projects must device suitable risk management strategy in limiting or offsetting probability of loss from wide fluctuations in the prices of commodities and currencies. Prof. Sunil Kumar, illustrates how Construction defects can turn a project upside down, and, with so many parties working on the job, how it is difficult to identify or manage those defects. Prof. Reghunath demonstrates the challenges and solutions for managing the Linear Projects, highlighting the shortcomings of traditional critical path method and advocating the benefits of the linear scheduling method and the need for linear scheduling software.

Through his Book review on "Critical Chain Project Management" Prof. Reghunath, throws light on the deterministic date paradigm which project managers are stuck with although the duration people put into schedules are uncertain

During this Quarter L&T IPM witnessed the launch of Flagship Programmes, new IC specific programmes and SCDMs. The Program panorama sections captures and brings back those pleasant memories. The world of webinars lists the webinars delivered in the quarter and also provides the steps to access the recordings of the webinar using our knowledge portal.

Look out for the details of the Knowvemeber Drive and the list of upcoming SCDMs to plan your learning ahead.

Happy Learning.

Dean's Desk

V.T. Chandra Sekhar Rao
Dean - L&T IPM

L&T Institute of Project Management is constantly endeavouring to add value to L&T businesses, not only through IPM offering but also through promoting a culture of knowledge sharing and prompting project managers to think ahead to assure better, faster, safer and cheaper project delivery.

We have also taken initiative to create a L&TBOK – L&T Body of Knowledge which can serve as an operating guide to any project manager to take charge of project from proposal hand-over to commissioning. We will start preparing various sections of the L&TBOK and putting it for circulation for comments and potential adoption by various ICs/ BUs. Broad contents of L&TBOK are given elsewhere in this edition of IPM PRISM. We would encourage readers to send their comments to Vandana (vandana.bhargava@lntipm.org) who is supporting the compilation of L&T BOK.

We are also planning to create a case study book of 90 case-studies (called L&T 90), celebrating the 9th decade of delivery excellence by L&T. This is likely to be in 9 volumes dealing with 10 case studies each. We will publish more details of this in the next edition of PRISM.

L&T IPMs involvement for IC specific program delivery is increasing. This year we have done an advanced program for Project Engineering Managers of PT&D, developed and delivered case study based “Cost and Contract Management” module for TI IC. We started AC3A (Advanced Course on Contracts, Claims and Arbitration) course with major participation from Heavy Civil Infra. L&T Geo Structure has won Gold Category award for Best Skill Development initiative for our Planning Engineers Capability Development Programme (PEP-3G3). This program curriculum was conceptualized and developed in partnership with L&T IPM. We are also designing a new set of programs for LTTS tailored to meet their business needs with an intention launch these in November 2019.

With support and guidance of Mr Yogi Sriram, L&T IPM has taken significant strides in Knowledge Management (KM). We now share majority of IPM program content using IPM's KM portal Knowledge@Work. We encourage our readers to register to our knowledge management portal. Please see boxed message related to this.

Link to Register in L&T IPM Knowledge @ Work..... URL : **https://kb.lntipm.org**

L&T IPM promotes “Knowledge Sharing” and another action in this direction is our “Knowvember” initiative with various knowledge events throughout the month of November. We will do this every year with a new knowledge theme each year. This year's theme is “Share and Shine”. Announcements are made in Newsman and E-zine about Knowvember events. “Vyaye Krite Vardhati Vidyadhanam” – means Knowledge is the only wealth which increases by sharing. We encourage all L&T employees to actively participate in L&T IPMs knowledge events and contribute knowledge artefacts.

I attended this year's PMI India's national conference in Hyderabad. It excited me for many reasons. Our Statue of Unity project won “Project of the Year award” under Large Project category. Runner-up also went to L&T (Power) for the Malwa power project. Last year L&T (Hydrocarbon) has bagged the project of the year award under the same category. Vice President Venkaiah Naidu gave a keynote address. He mentioned about India needing 70 lakh new project managers by 2027 and also touched the NITI Ayog's initiative for setting up of a “National Policy Framework for Project and Program Management.”

Overall, there is so much that IPM intends to do for the project management profession. We look forward to support from business leaders, HR leaders and project management professionals in our endeavours to contribute to L&T's pre-eminence and prowess in project delivery.

Happy Reading

Project of The Year – Large category, Runner Up
Project Name: Shree Singaji Thermal Power Project, Stage-II (2X660 MW)
Organization: Larsen & Toubro Limited (L&T Power)

Project of The Year – Large category, Winner
Project Name: Statue of Unity
Organization: Larsen & Toubro Limited (B & F Division)

Deep Dive into Digitalization

Data & Process Aspects of Digital Execution

Contributor: **V.T. Chandra Sekhar Rao** (Dean - L&T IPM)

Construction Industry is in a digital transformation mode with leading players like L&T being torch bearers in the Indian engineering and construction industry. Complex construction projects require that digitalization in select areas of work also need to be structurally well integrated and functionally well interfaced so that overall project delivery is improved. If we do not take enough care that local improvements are synchronous with global objectives of the project or program, the automation that is achieved in select domains does not guarantee the required project performance. While we are making leaps of improvement in select domains, it is essential that we need to look into the following aspects related to Data and Processes:

A) Data related key aspects

1. **Data Authenticity and Accuracy:** The information that is received through various user interfaces, needs to be authentic. This would mean the data can be provided only after user authentication and the data provided by user needs to be prompted for visual or other documentary evidence. "Garbage-in Garbage-out maxim is still valid for any program or system.
2. **Data Portability:** Ensuring that raw data provided by sensors and users is translated to the formats that are faultlessly read by other programs that generate dash-boards on KPIs for the project and do a predictive analytics.
3. **Data Protection:** Unlike the banking applications which are relatively mature with right amount and levels of encryption and data protection, the IOT based systems and IOT enabled construction equipment are more susceptible to attacks and thefts. While designing the systems and modules in these areas data protection needs to be given proper attention.
4. **Project Digital Implementation Plan:** There was a case of data connectivity being absent for 6 months at a major project site, while there was an enough emphasis on digitalization in the company. To avoid such issues, it is necessary to make digital infrastructure implementation to be an essential part of early works at any site, including methods and processes to integrate the offline data as soon as digital infrastructure is achieved or restored.

To realise full benefits of a digitalization program, we need to look into the following processes oriented improvements as well

B) Process related key aspects

1. **Work Process Standardization:** Work processes that are standardized will deliver better when digitalized. While we digitalise, it is necessary that to review how the work processes can be improved, redundant activities can be eliminated and workflows can be simplified.
2. **Advanced work-packaging:** Advanced work-packaging is getting popular in developed economies like US and Canada. It is an advanced level of planning where work breakdown is carried out synchronous between Engineering (Engineering Work packages), Construction (Construction work-packages) and Installation (Field Installation work packages). The material, tools, labour required for any work are made available through detailed planning. It automates work allocations through digital processes.
3. **Centralized visibility of key metrics:** The metrics and data are needed in various degrees and various forms at various levels in the organisation. Information quality, authenticity and contemporaneity are very important to have a clear picture of relative health of various projects in a business. Data breakdown structure should be consistent with data required at various levels for decision making. For example, milestone performance data may be needed at portfolio (BU) level whereas daily progress data will be needed at construction managers level.
4. **Decentralized Decision making:** While visibility is needed at top, the data should enable the decentralized decision making which is a necessity for faster project execution. Centralized decision making often tends to slow down the process and decision quality is often likely to be ineffective due to limited time available with the central decision makers. Governance can however be assured because of visibility of the actual project performance to the executives responsible for the project portfolio.

Digitalization in projects will help us in achieving efficiencies at local work area or work-package level and has the potential to deliver overall project better, faster, safer and cheaper when it is combined with work process optimization and improvement. As we can see in some projects, we do not achieve the timely delivery of projects even when the digital initiatives are taken in projects. They key is to ensure that the other project delivery elements such as work process optimization, effective interface management between and integration across functions achieved at the same time. Tools like VSM (value steam mapping) can achieve the work process optimisation. If we follow the sequence of standardization, optimisation, modularization (to the extent possible) and digitalization, we have the potential to better the performance and profitability in projects.

Pages from Project Success Stories

Megalift irrigation project - Cluster III, Odisha

Contributor: **Mr. KuganKu,** Project Director, WET IC

Compiled by : **Mr. K P Reghunath,** Faculty, L&T IPM

Background

The Government of Odisha had proposed to cover command area of about 2.0 lakh Ha through Mega lift Irrigation Schemes utilizing available surplus water in different river basins. The individual schemes were planned for providing irrigation facilities to rain fed uplands close to the river on either side and also close to the existing reservoir. The mega lift schemes are primarily aimed for supplementation for Kharif water between 20th June and 15th November, depending upon water availability & rainfall.

Scope of Work

174 lift schemes were identified and grouped into 15 Clusters. Schemes under Cluster III is awarded to M/s Larsen & Toubro Ltd, Construction on 18.03.2015. The scope includes execution of 19nos of lift irrigation schemes with intake points on Ong river, Bheden river and Hirakud reservoir. This covers a commanding area between 500 Ha to 2000 Ha in the districts of Bolangir, Bargarh, Jharsuguda and Sambalpur which includes distribution network up to 20 Ha Chak having total planned culturable command area of 24,020 Ha. The project is on "EPC – Turnkey" basis including power system connectivity and operation & maintenance of completed commissioned schemes for five years.

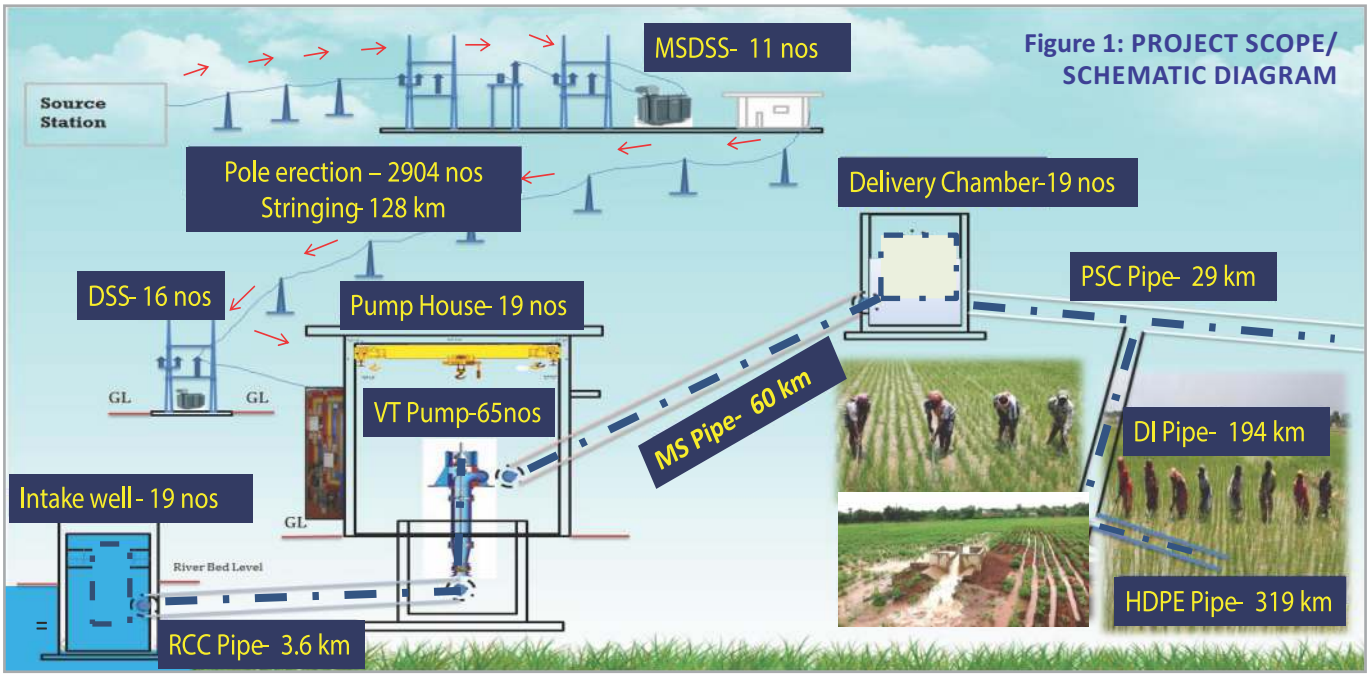


Figure 1: PROJECT SCOPE/ SCHEMATIC DIAGRAM

The project scope includes construction of intake well, pump house, delivery chamber and DSS for each of its 19 schemes and a cumulative of 3.6km RCC pipe laying, 60km MS pipe laying, 29 km PSC pipe laying, 194km DI pipe laying and 319 km HDPE pipe laying to be done for catering water in the fields through 1280nos chalk outlets. Power system connectivity scope which includes construction of 11 nos of MSDSS along with erection of 2904 nos poles and 128 km transmission line stringing.

CHALLENGES FACED

1. The project was widely spread across four districts and each scheme had its unique features for which separate design & execution strategies were implemented
2. Only 5 months of effective working period was available in a year during execution stage of the project.
3. ROW was a major hindrance for executing & commissioning of the schemes which was obtained for a limited time by convincing the local people.
4. The trial run & commissioning activities had to be planned when there was ample water in the river. And at the sametime we had to cater water to the farmers for their irrigation needs.
5. All team members requires minimum knowledge of electrical & mechanical commissioning activities for managing the Mega lift System.
6. The team majorly composed offres her with an average age of 28.

STRATERIES UNDERTAKEN

- **LAND ACQUISITION:**

To address the land acquisition issues on priority basis and early alienation process, the project team continuously interacted with the concerned administrative officials and conducted several reviews with the concerned district collector/sub-collector and other officials regularly.

L&T organized awareness programs in association with District administration at various beneficiary villages, interacted with the farmers and explained them briefly about the project and its benefits in their local language.

- **MICRO PLANNING**

170 activities comprising civil, electrical & mechanical works were listed out & reviewed weekly for all 19 schemes. Zone co-ordinators were made responsible for identification & allocation of resources. The detailed micro-planning ensured that it covered all minute activities during execution stage and the schemes were ready in all aspects during commissioning stage.

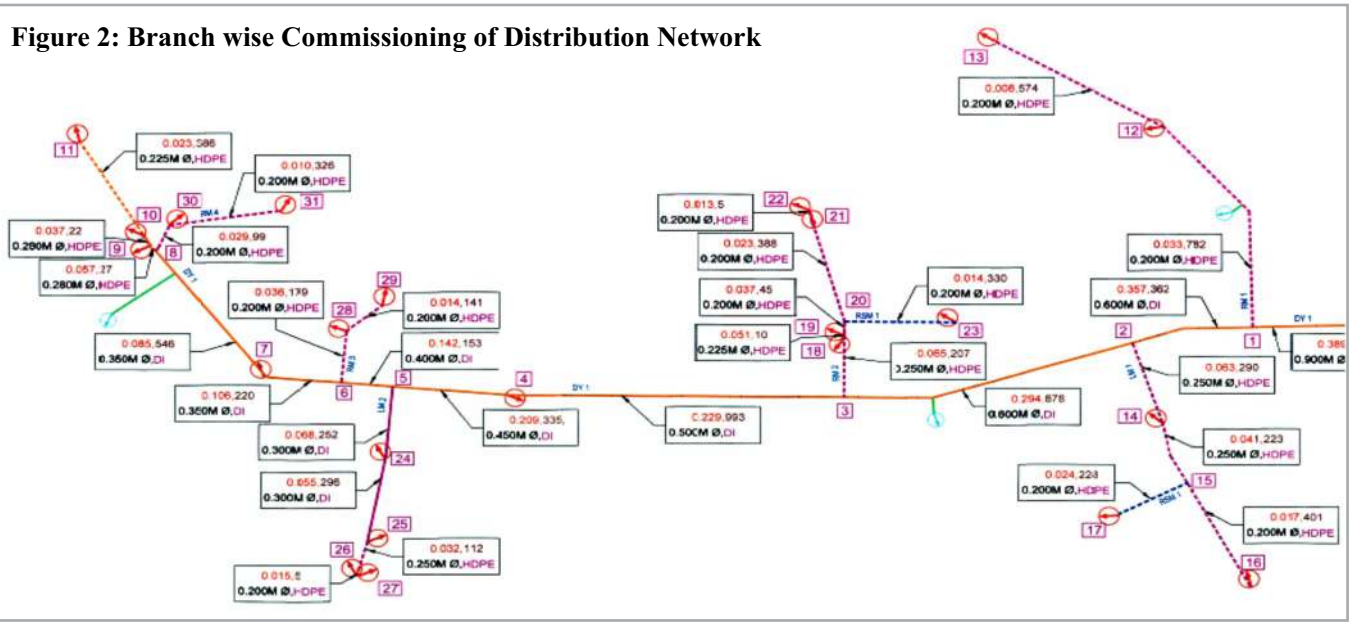
- **COST OPTIMIZATION**

Initially, it was decided to opt out for mobilisation advance and to complete the design and invoice the same to client along with the procurement schedule. In order to complete the design quickly, GIS and Remote Sensing surveying was adopted. This helped us to start early procurement and start site execution within 6months. Billing breakup was prepared in such a way that positive cash flow & negative working capital was maintained throughout the project duration.

- **STAGE WISE COMMISSIONING AND MAINTAINING CHECKLIST**

Checklist for commissioning of all electro-mechanical and electrical activities was prepared and maintained by our engineers which was reviewed on a daily basis. This helped us in checking and running of equipment at their required efficiency. Commissioning of distribution network was done branch wise (refer Figure 2) in a progressive manner. This helped us in closing any minor defects immediately & helped us in achieving commissioning of chalk outlets within minimum time.

Figure 2: Branch wise Commissioning of Distribution Network



- **VERIFICATION AND CERTIFICATION**

Certification from the client was taken simultaneously along with commissioning and handing over formalities was initiated immediately. This certification aided us in getting regular payment from client & smooth handing over to our O&M team.

Results

The Project stands as a testimony for Water can be provided to agricultural fields even in Rabi season by constructing check dams, Distribution network pipes can be laid from chalk outlet towards delivery chamber, ensuring all connections are taken care, Micro-irrigation, Drip irrigation schemes can be planned which can cater water up to 1 Ha Chalk outlet. The successful execution of this project was highly appreciated by the client and in December 2016, L&T was awarded an add-on-scheme (Mahulpaliin Jharsuguda District) of value 25.72 Cr under the District Mineral Fund.

Summary

Effective stakeholder management which includes farmers from the beneficiary villages, administrative officials like district collector/sub-collector, client, micro-planning with checklist, progressive Commissioning of distribution network, technology adoption with GIS, ensuring positive cash flow & negative working capital are the factors that contributed to the success of the project. Good Project management practices leads to boosting our reputation with the client and makes us their preferred partners for the future projects.

Pages from Project Success Stories

Responding with Sensitivity

Contributor: **Mr. K Sivaramakrishnan,** Cluster head - Srilanka, WET IC Complied by: **Mr. K P Reghunath,** Faculty, L&T IPM

This project is implemented by the Ministry of Provincial council supported by Project Management Unit from Colombo Municipal Council and funded by Asian Development Bank. This is a **Brown field Project** whose scope is to upgrade the existing pump stations which shall partly treat the incoming sewer (up to 97% grit removal efficiency) and pumped through rising mains to sea out falls. The expected outcome of the project is improved waste water management performance in greater Colombo. The Project will (i) rehabilitate and upgrade sewerage infrastructure and sanitation in Colombo, (ii) strengthen planning, asset management and operational capacity, and (iii) build capacity for project management and environmental policy compliance. Colombo Municipal Councils (CMC) needs intensive and extensive support for developing an institutional capacity for satisfying its mandate of asset management and delivery of efficient and effective services to the citizens. The expected impact of the project is improved urban environment, public health and quality of life for urban and suburban residents in Colombo. The time line is 30 months plus 6 months commissioning. Time extension granted up to 43 months. 351 Cr + 30 Cr Tax reimbursement, ENAA (Japanese version of FIDIC) Design build contract, All major procurement is from Europe.

Key issues and Challenges

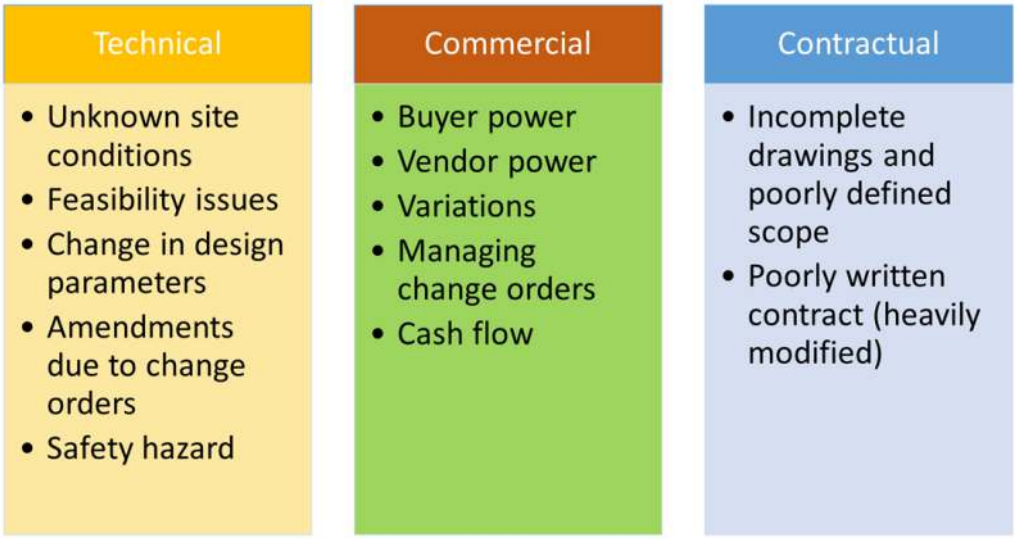


Figure 1: Technical, Commercial and Contractual Challenges in the Project

Figure-1 summarizes the Technical, Commercial and Contractual Challenges in the Project. The pump stations were constructed during British Era between 1906 and 1920 and needs urgent replacement and it is located amidst densely populated area in the capital of the country. Due to various historical reasons, the wastewater assets have not been adequately maintained with the consequence that the operators face severe problems in maintaining the required wastewater collection and disposal services in the Greater Colombo area. Moreover Existing sewerage pumping stations serving the Colombo Catchment areas were corroded due to sea erosion. The sewerage system of Colombo had many technical, institutional, managerial and operational problems.

On rehabilitation the challenge is to rehabilitate (Only M&E) the 100 years old Pump station to cater to the future demand up to 2030. After decomposition of the scope it was observed it that the scope had many 'Unknown unknowns' and Contractual risk involving huge cost. The scope baseline partly covered the above and during execution L&T team started flagging contractually these issues through 'Issue log' and 'Change log'.The client and stakeholders were supporting our findings in principle but denying contractually owing to various associated issues including funding viability, Feasibility issues, Lack of information, Misleading investigation report and poor detailing.

Solutions and Best Practices

To overcome the above challenges and safely maneuver the risks, we have used the following project management concepts like Scope definition, Assumption analysis, verifying and controlling scope, integrated change control and contract administration. We have also practiced a workable 'Monitor and control project work process' to find the changes that we want to make including Beneficial variance.

Based on the above we brought out technically many of the feasibility issues in implementation and anomalies in their consideration for the proposed solutions. We proposed those options through 'Investment appraisal' and 'Life cycle cost' since this was implemented through ADB funding. The customer was notified technically, commercially and contractually by Formal written communication.

The team followed the below best practices that led to a flawless project execution.

Stand-alone engineering services supported with local design team, contractibility review and regular feedback to EDRC, Consultative and collaborative efforts by BU/ SL Cell/ EDRC/ Site to carry out course corrections through EDMS, Operations are implemented through right method statements at site (146 method statements as on date), monitored through CC TV and Digital site walk through, all transports installed with GPS, Operations controlled through RFIs at various stages (2015 RFI as on date). Daily work schedule (DWS) and Daily work return (DWR) practice judiciously followed at sites.

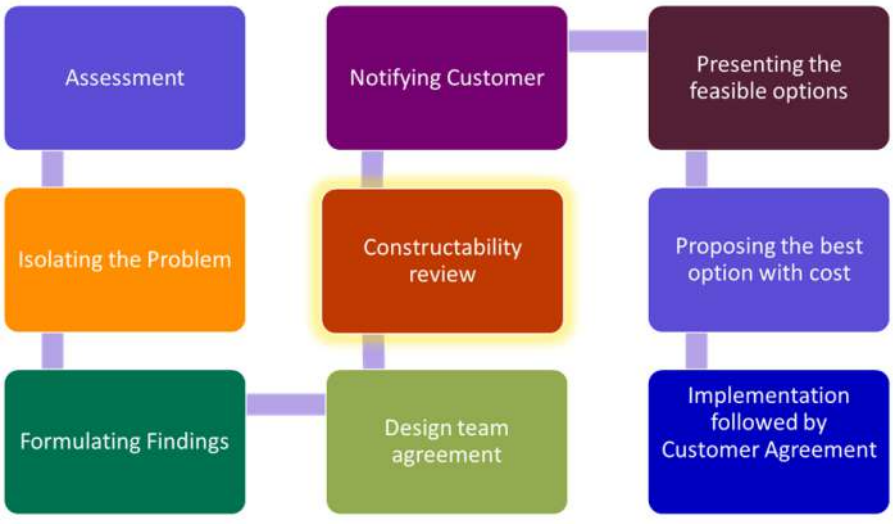


Figure 2: Implementation Sequence

The Results

- De-scoped the risky items through feasibility analysis and Change order
- Raised more than LKR 3 Billion claims and LKR 2.3 Billion variation orders
- Approval so for close to LKR 500 Million claims and LKR 2 Billion variation order
- Formal time extension awarded up to March 2020
- Additional advance received close to LKR 750 Million
- Mechanized the operations to the possible extent
- Implemented safe methods with right gadgets to deal with the hazards in confined area and deep area works and earned incident free safe working hours

Strategic Imperatives for Knowledge Management

Contributor: **Mr. Arun V,** Manager Strategic Initiatives, L&T IPM

Being in international business means that the knowledge now needs to be shared in a distributed environment. The digital age with the technology evolution provides an opportunity to breakdown the silos that exists between the individuals, teams, departments and business units. One of the strategic imperatives to manage knowledge is Accelerated Learning, which is the tactic of using state-of-the-art digital technologies, traditional knowledge-sharing activities, modern learning strategies, social media processes and tools, and cross-discipline knowledge into the broadest view of learning for an organization.

Knowledge Management in International Standards

The recently Published PMBOK 6th Edition by PMI USA, has added Manage Project Knowledge as part of the integration management knowledge area under the execution process group. They have added the Lessons learnt as an input and output for the 24 process across all knowledge areas which proves the importance of Knowledge management in Project-based organisation.

Lessons on Effective and Efficient Techniques includes but not limited to

- Requirements collection techniques
- Improving the accuracy and precision of effort, duration and Cost Estimates
- Controlling scope, including causes of variances and corrective actions.
- Maintaining the Budget, variance Analysis, earned value Analysis, Forecasting and corrective actions that were used to respond to Cost variances.
- Managing resource logistics, scrap, Utilization variance and Corrective actions that are used to respond to resource variance.
- Information on the source of Quality Defects and how they could have been avoided as well as approaches that worked well.

Lessons from Risk Management

Lessons learned during risk management can provide Risks identified from the earlier phases of the project which can be reviewed to determine whether similar risks might recur during the remainder of the project, Effective risks response from the earlier phases of the project can be reviewed to determine if similar responses might be useful during the rest of the project, the information on challenges encountered when implementing risk responses and how they could have been avoided as well as approaches that worked well for implementing risk response will prove to be a vital asset for project management.

Lessons from Procurement Management

Lessons learned during procurement can include information regarding regulations and compliance, data gathering, data analysis, and source selection analysis, technique that were effective in maintaining the scope, schedule and cost of bought items. Where variances occurred, the register will show the corrective actions that were used to respond to variances, and how effective those actions were. In case of claims, information documented to avoid recurrence will be very helpful.

Challenges in Knowledge management in Project-based organisation.

The below table captures the barriers to knowledge management in Project-based organisation like ours

Barriers related to		
Social communication	**Inter-project transfer of documented lessons learned**	**Project manager**
Lack of social communication between projects Sharing of “bad news” is not encouraged Lack of time for social communication Lack of willingness to share project faults caused by individual or group performance	Lack of comprehensive approach to lessons learned to include processes of transfer of lessons learned beyond the project Transfer of lessons learned is fragmented It does not include lessons learned in the project scope and/or budget Lack of a lessonlearned repository Lack of time to produce lessons learned	Lessons learned have a low priority for the project manager Young project managers, from generation Y are overconfident and are reluctant to take advice from others Project managers dislike passing on their expertiseand prefer to control the information (the knowledge) they possess Project managers do not want to criticise processes or people from the organisation

Table 1 - Barriers for Sharing Knowledge

"A better understanding of the social context of project knowledge can serve as a basis for improved prioritization and a more pragmatic approach to problem solving. Organizational disregard for this knowledge can lead to project failures such as those described by in the NASA Challenger and Columbia Shuttle disasters, where the technical root causes were investigated but the underlying causes were poor team communications and lack of organizational learning." Ed Hoffman, Ex- Chief Knowledge Officer – NASA.

The above quote emphasis on the need for capturing the social context in which the projects are operating as an essential component of knowledge management.

Knowledge Services at L&T IPM

Knowledge at Work (K@W) has been designed to overcome the barriers listed in Table -1 and provides many ways of capturing the social context of the project knowledge. Based on Nonaka's SECI model, IPM engages in KM activities for capturing and leveraging its rich tacit knowledge base and encourages and supports the externalization and consequent re-use of this knowledge (the three main people-based activities). Additionally, there are also IT and tool-based KM activities which not only foster the sharing of highly tacit knowledge but also help to make it become explicit and thus easier for sharing and re-use. Figure 1 shows IPM adopted SECI model.

The Project Management conclave is a bi-annual meeting for presenting, exchanging and discussing success stories and best practices. The quarterly magazine prism does the dual activity of capturing and disseminating knowledge by being a platform for employees to share the success stories and the challenges endured during the project execution. The focus of the Knowledge Portal is to create community of Practices (CoPs) at the individuals, departments and organisation level and capture the tacit knowledge of the individuals through discussions and interactions.

CoPs are becoming recognised as being groups within which the sharing of soft knowledge takes place. Virtual Community of Practice is an emerging area which is very relevant for a project-based company like ours. Among the different informal networks, the CoPs are the most interesting from a knowledge management point of view. The factors binding the Members of a CoPare a sense of common purpose, a strong feeling of identity, their own terminology (group specific acronyms and nicknames), being part of an official group. Putting together the subject expert and the team members with the same interests and same need for solutions will add to the organisation common knowledge base, thus reducing its dependency on individuals. CoPs help us to learn about, who knows what and their member lists can serve as "know-who list", expert directory or yellow pages of experts and their areas of expertise. CoPs are different from formal groups as in a formal group, such a team, virtual team or a project group, the legitimation comes from the formal structure of the group whereas in a CoP, the legitimation comes from the social relationships that develop.

L&T IPM, in its endeavour to enable knowledge creates the community of Practice based on the competency required by the employees. The recently added community of practice is on TILOS, linear projects scheduling Tool. This community is using the portal to share the difficulties faced while using the TILOS tool. The community is also well supported by our in house faculty Mr. Reghunath and also the experts from the Tremble who are the creators of this tool. Another important CoP to be mentioned is the PMP community of Practice, which brings together experts, IPM Faculty with PMP certification and the employees who have cleared PMP exam in the past to mentor employees who are preparing for the PMP exam. The other newly added CoP are for the PT&D IC SPEED for the Engineering Department and NUEPC for their planning department which has around 80 members each. The internal trainers from PT&D has been added as experts in the system, thus creating platform setup connecting project personnel across different geographic locations.

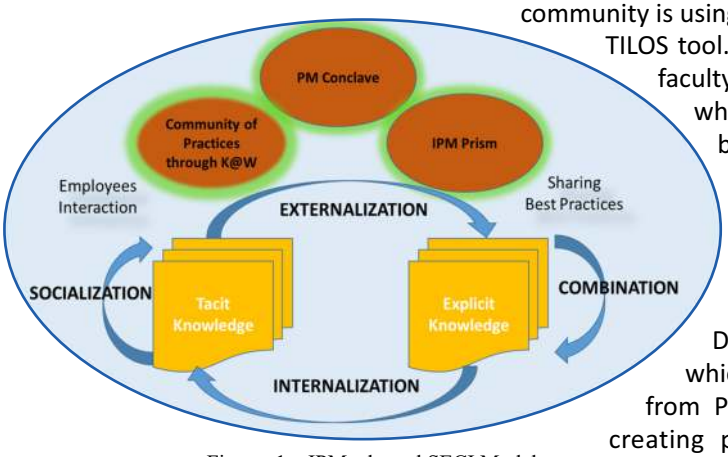


Figure: 1 – IPM adopted SECI Model

Next Steps

A Knowledge management drive called Knowvemeber will launched in the month of November, which will focus on creating an awareness about Project Knowledge management by delivering webinars from thought leaders, running gamified knowledge sharing competitions with leaderboard metrics captured at the community and IC Levels. In the Long run the knowledge portal (K@W) can be used to Measure the effectiveness of the CoP by measuring the following outcomes viz: Extent to which the community has met its initial objectives, the value it created for the organisation, benefits it provided to its members, Member Satisfaction and Level of activity. The K@W 2.0 will have the features enhanced with a improved user interface and inbuilt AI and Machine learning capabilities which will take the searchability, findability, and applicability to greater heights

You can access the Portal through the URL **"https: kb.lntipm.org"**

Reference: Paul Hildreth, Chris Kimble, Peter Wright, (2000) "Communities of practice in the distributed international environment", Journal of Knowledge Management, Vol. 4 Issue: 1, pp.27-38, **https://doi.org/10.1108/13673270010315920** Permanent link to this document.

New Initiatives - L&TBOK

L&T Body of Knowledge (L&T BOK) for Effective Project Delivery

Contributor: **V.T. Chandra Shekhar Rao** (Dean, L&T IPM)

Background

L&T IPM has been delivering project management courses on various knowledge areas through flagship programs and specific competency modules that add value to business. IPM has also been chartered to create L&T Body of Knowledge which can serve as a reference to all our project management and directors for effective project delivery.

The concept is inspired by PMBOK (Project Management Body of Knowledge) published by Project Management Institute, USA, Construction Industry Institute's research on Project Management best practices and some open source information on project management guidelines followed by north American and European multinational companies in Engineering & Construction Industry.

Project Management Knowledge is in "de-centralized form" by the way of SOPs, some lessons learned and some guidelines followed in each ICs. While these are under review or to be updated in respective ICs, but there is a need to integrate the individual SOPs to cover overall project delivery assurance. This can be achieved by having a common structure and flexibility to reference individual SOPs specific to each IC.

Hence the proposal to create a "Guide to L&T Body of Knowledge for Effective Project Delivery," or L&TBOK.

With so many professionals getting promoted to project management roles for the first time and some people graduating to project management roles after performing a specialist role, such a guide or manual like L&T BOK will guide them on how to execute projects effectively. This will also eliminate the chances of projects challenge situations because of the limited understanding by a project manager.

As we propose to involve senior experienced people from each IC to work along with IPM, we will get the benefit of collective wisdom and perspective from International best practices.

Purpose of L&TBOK

- Provide "textbook" to guide Project Manager on **expected** L&T methods of project execution
- Introduce and explain **"Baseline-Approach"** to project execution, and to implement other E-Com expectations and recommendations to improve project execution.
- Embed the Project Management Knowledge areas to the flow of Project Execution EPC project life cycle
- Provide more detailed information on subjects not covered well in the typical PMBOX, particularly Project Finance, Digitization, automation, safety/health/environmental, Contracts and Claims and commissioning/startup

Baseline-Approach

When we talk about baseline, often people limit themselves to baseline schedule and base line costing (ACE). The intent of the L&TBOK is to explain that the Project **Baseline** comprises

- Contract with Client
- Project Scope–Scope of Facilities and Services
- Project Execution Plan
- Project Cost Baseline (See note below)
- Management Level Schedule
- Risk Assessment

(Note: As-sold pricing converted to cost baseline with profit targets blessed by Business heads)

- **"Baseline-Approach" to** project execution
  - Is the way Larsen and Toubro will execute projects and must be a key focus of management?
  - Fundamental points to improving the key goals we should have for every project are:
    1) Are we making money for Larsen and Toubro!
    2) Are we protecting both image and profitability of each project?
    3) Are we improving execution from project to project?

Key Features of proposed L&TBOK

- L&T BOK should contain most of the info that a Project Manager needs regarding a particular topic (80-20 rule–80% standard way of execution and 20% with the particular project context)
- To be jointly developed by IPM and PMOs (Project Management Offices) of L&T ICs involved in EPC execution or similar centralized departments who decide on how IC specific execution is to be planned, executed and controlled.

- Intent was to include only key information of interest to a Project Manager, **not meant to cover all information available on a topic. L&T BOK will provide necessary references to project management knowledge kept in L&T IPM's Knowledge @ Work portal.**
- L&T BOK is a stand-alone document supported by
  – Project Execution Plans and other PM references which are IC specific
  – Reference material from other disciplines (such as supply chain and project control)
  – SOPs are owned by ICs and it covers Listing in L&TBOK extension to XYZ
- **It** provides checklists for each major section to aid in implementing requirements of executing the project the L&T Way.

Structure of L&TBOK

Based on typical EPC delivery, the following structure is recommended by IPM, but can be modified based on the recommendations of a committee to be constituted to create L&TBOK.

L&T BOK content will be organized around **Baseline-Approach** to project execution

Themes and Sections of L&TBOK

A) Project Acquisition
- Section 1 – Proposal Preparation and Contract Negotiations

B) Project Initiation (Proposal Handover and Alignment with Project Team)
- Section 2 – Handover, Project Initiation and Stakeholder Assessment

C) Project Planning (Baseline Definition and Alignment with Project Team)
- Section 3 – Setting-up Project Baseline
- Section 4 – Project Setup, Communication Protocols and Administration
- Section 5 – Project Management Special Issues

D) Project Monitoring and Control- Reporting Against the Baseline / Capturing Deviations from the Baseline
- Section 6 – Project Interface and Integration Management
- Section 7 – Project Cost Monitoring & Control
- Section 8 – Project Schedule Monitoring and Control
- Section 9 – Prime Contract Commercial Execution (includes all aspects like billing, invoicing etc., prime contract communication etc,)
- Section 10 – Change Management (including Claims Management)

E) Executing to the Baseline
- Section 11 – Project Data Management and Digital implementation
- Section 12 – Engineering / Design Management
- Section 13 – Material Management
- Section 14 – Sub-Contract Management
- Section 15 – Construction / Site Management
- Section 16 – Quality Management
- Section 17 – Value Creation (Project Profit Management)
- Section 18 – Safety, Health, Environmental and Security
- Section 19 – Project Risk Management

F) Project Completion
- Section 20 – Final Phases of the Field Work
- Section 21 – Project Close-out and handling DLP phase

Organization of Topics and Sub-sections

Each topic / subsection will be organized as follows

- Description (what is it, why is it important)
- Accountability (who is accountable)
- Key activities, such as
  - What does the PM/ PD have to do?
  - How/When does he/she does it?
  - What do others have to do?
- Special Insights (“heads up”, what to look out for)
- Other sources of information, such as
  - People, websites, IPMK@W etc.
  - References (practices, other documents)

Note: L&T BOK is highly confidential and should be treated as such; must actively protect Larsen and Toubro's intellectual capital. Hence will be given access to people who are authorized at BU level.

Programme Panorama

Snapshots of SCDMs (Specific Competency Development Programmes)

SCDM on Cash flow and Liquidity Management in EPC Projects

Programme Highlights:

Project cash flow play a key role in protecting project profit. Yet often, liquidity aspect are not fully understood and overlooked by project professionals. Any EPC Projects' success – from its long-term profitability to its short-term liquidity – depends on smart, efficient, and creative cash & liquidity management solutions for handling cash inflows and outflows. EPC Projects of all sizes are realizing the importance of cash flow & liquidity management issues and applying sophisticated tools to their cash flow statements.

Total 29 participants attended this programs from different ICs & Business units of L&T. The program was delivered by Dr. Hiren Maniar from core finance faculty of IPM.

SCDM on Cash flow and Liquidity Management in EPC Projects
Held on 30th-31st July 2019 at IPM - Vadodara

SCDM on Cost Management Concept in EPC Projects

Programme Highlights:

This course is designed to provide clear understanding on development and analysis of job costing for EPC project monitoring and control. The emphasis is on different aspects of Cost Management Concepts such as Fundamentals of Project Costing, Project Cost Control process including usage of measurement tools like EVM (Earned Value Management) and reporting tools like JCR (Job Cost Report) etc. The program was specially designed as per the requirement of MMH IC and total 21 participants attended the program which was delivered by IPM Faculty - Dr. Hiren Maniar.

SCDM on Cost Management Concept in EPC Projects
Held on 13th-14th Aug. 2019 at MMH, Kolkatta

SCDM on Sub Contracts Management

Programme Highlights:

The aim of this program is to develop confidence for handling Sub-contractors at Site/Cluster office/Head quarter level. Ability to make future, error free project in planning, sub contract & execution. Capability to improve internal process of business unit related to sub contract. Total 41 participants were attended the program with major participation from PT&D IC. The program was delivered by Prof. Sunil Kumar, Faculty - L&T IPM.

SCDM on Sub Contracts Management
Held on 24th-25th July 2019 at IPM - Chennai

SCDM on Supply Chain & Logistics Management

Programme Highlights:

This programme focuses on the creation of appropriate approaches and special skills needed for effective Supply Chain Management. It also emphasizes the need for integration of various skills with project needs for successful project management. Total 18 participants were attended the program and the program was delivered by Prof. N S Sivaraman of visiting faculty of L&T IPM.

SCDM on Supply Chain & Logistics Management
Held on 8th-9th August 2019 at IPM - Chennai

Preparatory Program on PMP Certification Examination
Held on 26th - 30th August at IPM - Chennai

Preparatory Program on PMP Certification Examination

Programme Highlights:

This is a vital certification program for Project Managers - Internationally acceptable Project Management Professional (PMP) Certification by PMI. In order to achieve PMP® certification, each candidate must satisfy all educational & experiential requirements established by PMI. This PMP® Exam Preparatory course has been conceived for Professionals who wish to pursue for PMP® Certification and making Project Management Associates indispensable for business results.Total 24 participants from various ICs/Business Unites ware attended this program.

IKons of IC – Specific Programmes

Orientation Program on Project Management
Held on 1st - 2nd August at Ahmedabad

WET IC - Orientation Program on Project Management

Programme Highlights:

The main objective of the program is to emphasize the importance of fundamentals of Project Management to the budding engineers. This program covers core contents of Project Management Overview, Framework, Project Life Cycle & Project Constraints Scheduling & Network Techniques, Risk, Quality& Safety Management, PERT - Scheduling accounting for uncertainty, Resource Management & Time Cost Trade off. Total 28 participants from WET IC attended the program which was delivered by Prof. K P Reghunath of IPM Faculty was held at WET Cluster Office at Ahmedabad.

Construction Productivity Program
Held on 22nd - 23rd August at Bengaluru

WET IC - Construction Productivity Program

Programme Highlights:

This program designed as per the requirement of WET IC and contents covered Understanding constructability and productivity, Common mistakes in initial site assessment affecting productivity, Project productivity management & framework, Factors affecting construction productivity, Tools & techniques for enhancing productivity on construction site, Managing time, schedule, procurement, cost and value for productivity etc. Total 21 participants from WET IC were attended the program which was delivered by Prof. Sunil Kumar- Faculty of L&T IPM at cluster office Bengaluru.

Planning for Project Excellence (Batch-2)
Held on 28th - 31st August at IPM - Chennai

WET IC – Planning for Project Excellence (Batch-2)

Programme Highlights:

On successful completion of Batch 1, WET IC wanted us to continue the same program for their remaining planning personnel. This is a three module long duration program spread over 6 months. The main objective of this program is to hone the skills of planning engineers. Special case studies & detailed discussions on their live projects are part of the program.

Total 31 participants from WET IC were attended the program which was delivered by Prof. K. P. Reghunath - Faculty of L&T IPM.

B&F IC - Project Management for Execution Excellence (PMEE) (Batch 9)

Programme Highlights:

The program present the latest in project delivery, planning and monitoring approaches and methodologies, negotiation strategies, and technologies for construction project management with specific examples. It will focus on how to integrate project objectives, owner capabilities, project risks, and technology into a systematic approach to project delivery. The program focuses on measuring the competence of the construction managers in project execution thereby achieving project execution excellences. 25 participants from B&F IC were attended the program.

Project Management for Execution Excellence (PMEE) (Batch 9)
Held on 4th-7th September at IPM - Chennai

WET IC - Construction Productivity Program

Programme Highlights:

This program designed as per the requirement of WET IC and contents covered Understanding constructability and productivity, Common mistakes in initial site assessment affecting productivity, Project productivity management & framework, Factors affecting construction productivity, Tools & techniques for enhancing productivity on construction site, Managing time, schedule, procurement, cost and value for productivity etc. Total 33 participants from WET IC were attended the program which was delivered by Prof. Sunil Kumar- Faculty of L&T IPM at cluster office Ahmedabad

Construction Productivity Program
Held on 18th-19th September at Ahmedabad

PT&D IC - Advanced Special Programme for Excellence in Engineering and Design Management (A-SPEED) (Batch 1)

Programme Highlights:

This is an advanced level of SPEED program conducted earlier & the curriculum has been specially designed to suit the requirements of PT&D Engineering professionals. This 5 day program was delivered jointly by IPM faculty & PTND domain experts. Total 20 participants from PT&D IC were attended the program.

Advanced Special Programme for Excellence in Engineering & Design Management (A-SPEED)
Held on 16th -20th September at IPM - Chennai

Tool based Programme

Tool based SCDM – MS Project

Programme Highlights:

Microsoft Project is a popular and powerful tool for project planning and monitoring. This program provides detailed exposure to various features and aspects of MS Project that can simplify the job of project managers to handle the complexities of managing single and even multiple projects.

Total 16 participants from various ICs/ Business Unites ware attended this program which was delivered by Special tool based IPM Faculty - Mr. K.P. Reghunath.

Tool based SCDM – MS Project
Held on 12th-14th August at IPM - Chennai

Tool based SCDM - Primavera
Held on 24th - 26th July 2019 at IPM - Chennai

Tool based SCDM - Primavera

Programme Highlights:

Primavera is a popular and powerful tool for project planning and monitoring. This 3 day program provides detailed exposure to various features and aspects of Primavera that can simplify the job of project managers to handle the complexities of managing single and even multiple projects. Total 13 participants from various ICs/Business Unites ware attended this program which was delivered by Special tool based IPM Faculty- Mr. K.P. Reghunath.

Flying High with Flagship Programmes

Level 3, Batch 2 : International Project & Program Management (IPPM) (L&T IPM & University of Texas)

International Project & Program Management
Held on 29th - 2nd August 2019 at IPM - Vadodara

Programme Highlights:

The Level-3 International Project and Program Management (IPPM) Programme will Enhance Mega-project competencies to assure superior project, Portfolio and Programme delivery consistent with global standards. The programme was inaugurated in the presence ofMr.Derek Shah EVP & Head - Power Plant Business & Texas University Faculty – Dr. CARLOS CALDAS, P.E. - Professor, William H. Hagerty Fellowship in Engineering. IPPM Programme registered 18 participants this year from various IC/BUs of L&T. Participating ICs are : - B&F IC, Power IC, WET IC, TI IC & SW&C IC. The Programme is of 15 days duration spread over 9 months with contact session of 5 days per quarter.

Level 1, Batch 3 : Postgraduate Certificate of Master's Programme in Business and Project Management (PGC – MPBPM) (L&T IPM & SDA Bocconi)

Master's Program in Business & Project Management
Held on 15th – 19th July 2019 at IPM - Vadodara

Programme Highlights:

The customized Postgraduate Certificate of Master's Programme in Business and Project Management (PGC – MPBPM) has been developed with intent to groom business and project management skill & competencies among the participants which mainly focusing on up-skilling project execution talent along with the latest tools and techniques to handle L&T's complex domestic and international projects. Batch-3 of this collaborative Programme has been launched on 15th July 2019 in association with SDA Bocconi, Milan, Italy, a premier management institute, currently ranked 4th worldwide for custom Programmes, according to The Financial Times Rankings 2018. 264 teaching hours in 7 thematic modules &24 courses, 26 webinars (52 hrs), 5 workshops (40 hrs), individual Capstone project (64 hrs). 3rd Batch of PGC – MPBPM is of 47 participants from various IC/BUs of L&T.

Level-2, Batch-1: Advanced Programme for Excellence in Project Execution (APEPE)

Programme Highlights:

Advance Programme for Excellence in Project Execution (APEPE) is built on international best practices of delivering best in class quality within committed timelines, ensuring fast and consistent performance, using efficient projects, leveraging the benefits of data analytics during execution, taking proactive measures to ensure cost efficiency while assuring customer-centric approach to project delivery. Program is divided into 4 Modules and In between Modules, there will be 12 webinars (i.e. 4 webinars each between Module-1 & 2, 2 & 3 and 3 & 4) to cover advance topics along with review progress and provide guidance on the Action Learning Projects (ALP). Total 18 Participants from various ICs were attended the first module of the program.

Advamced Programme for Excellence in Project Execution (APEPE)
Held on 26th - 30th August 2019 at IPM - Vadodara

Role based Programmes

Batch-5 : Cost Engineering Programme

Programme Highlights:

L&T IPM is running Programme on Cost Engineering with an intent to address issues/ pain points/ challenges faced by L&T projects in the area of cost estimation, planning, budgeting, monitoring and control pertaining to set of complex and inter-related project activities leading to the attainment of a defined goal, subject to specified conditions of cost, schedule, quality and performance. L&T IPM has successfully completed 4 batches of Cost Engineering Programme and trained 87 participants in the field of cost engineering. Main objective of the Programme on Cost Engineering is to apprise participants about the body of knowledge and standards of conduct for the practice of cost engineering, enhancing project management skills & knowledge and prepare participants for the CCP (Certified Cost Professional) exam conducted by AACEi by covering knowledge areas & cost engineering competencies and working through various programme assessment techniques. In the fifth batch, total 47 participants attended the first module of the program from various ICs.

Cost Engineering Programme
Held on 23rd - 28th September 2019 at IPM - Vadodara

We are happy to congratulate L&T GeoStructure for backing the prestigious TISS Leap Vault (Tata Institute of Social Sciences) 2019 HR Golden Award in the Chief Learning Officers Summit.

The Award was receieved by Mr. Binu Jose, Head–HR, L&T GeoStructure from Mr. Uday Singh Mahurkar, Editor of India Today and advisor to PM of India. The award of given for the Planning Engineering Capability building program developed in collaboration with L&T IPM.

Hard Facts on Hedging in Projects

Dr. Hiren Maniar, Faculty, L&T IPM

Every project or business faces risks and the first step in managing risk is making an inventory of the risks that project or business faces throughout life-cycle and getting a measure of the exposure to each risk. Hence, projects must device suitable risk management strategy in limiting or offsetting probability of loss from wide fluctuations in the prices of commodities and currencies which adversely affects project performance and profitability. There are various options available in mitigating price risk in the projects and one of the widely used technique is *"Hedging".*

"Hedging involves taking equal and opposite positions in two different markets (such as cash or physical markets and futures markets) with an intent to protect underlying project assets which enables projects to transfer risks without buying an insurance."

As a first step, projects should list all the risks that impacts performance and profitability, categorizes these risks and measured project's exposure to each one. Next step is to identify which of these risks projects wants to hedge against and which risks needs to be passed to project stakeholders. Here segregation between hedge and non-hedge risks should be done based on potential costs and benefits of hedging exercise. In projects, corporate treasury manages hedging activities. Construction projects usually faces commodities and foreign currency price fluctuation risk and considering the same it is essential for project managers to share commodity and currency exposure inflows and outflows to corporate treasury. Accordingly, hedging decision is taken care by corporate treasury based on inputs from various projects.

Hedging risks has both implicit and explicit costs that can vary depending upon the risk being hedged and the hedging tool used. The hedging benefits include better investment decisions, lower distress costs, tax savings and more informative financial statements. The trade-off seems simple; if the hedging benefits exceed the costs, one should hedge and if the costs exceed the benefits, then hedging is not advisable.

Checklist points before starting hedging activities

- **Unawareness of Financial Risk Exposure:** Project managers often focuses on non-financial risks without considering much on potential financial risks pertaining to commodities and foreign currency price fluctuations. Ideally, project managers should identify commodities and foreign currency price fluctuations risks as given below in table-1 & 2[1].

Table-1: Foreign Exchange (FOREX) Exposure Computation

Sl. No.	Currency Exposure	Exposure Amount			Forex Rate			Hedged Impact (P)	Unhedged Impact (Q)	Total Impact (P+Q)	Remarks
		Total	Hedged (H)	Unhedged (U)	Base (Tender) Rate (A)	Weighted Avg. Hedge Rate (B)	Expected Weighted Avg. Rate for Unhedged portion (C)				
Inflow								[H*(B-A)]	[U*(C-A)]		
1.	USD										
2.	EUR										
3.	.....										
	Total										
Outflow								[H*(A-B)]	[U*(A-C)]		
1.	USD										
2.	EUR										
3.	JPY										
4.	.....										
	Total										

Table-2: Commodity Exposure Computation

Sl. No.	Currency Exposure	Unit of Material (MT/Kg)	Exposure Amount			Commodity Rate			Hedged Impact [H*(B-A)] (P)	Unhedged Impact [U*(C-A)] (Q)	Total Impact (P+Q)	Remarks
			Total	Hedged (H)	Unhedged (U)	Base (Tender) Rate (A)	Weighted Avg. Hedge Rate (B)	Expected Weighted Avg. Rate for Unhedged portion (C)				
1.	Copper											
2.	Steel											
3.	Aluminum											

[1] Source: L&T Corporate Risk Management (CRM)

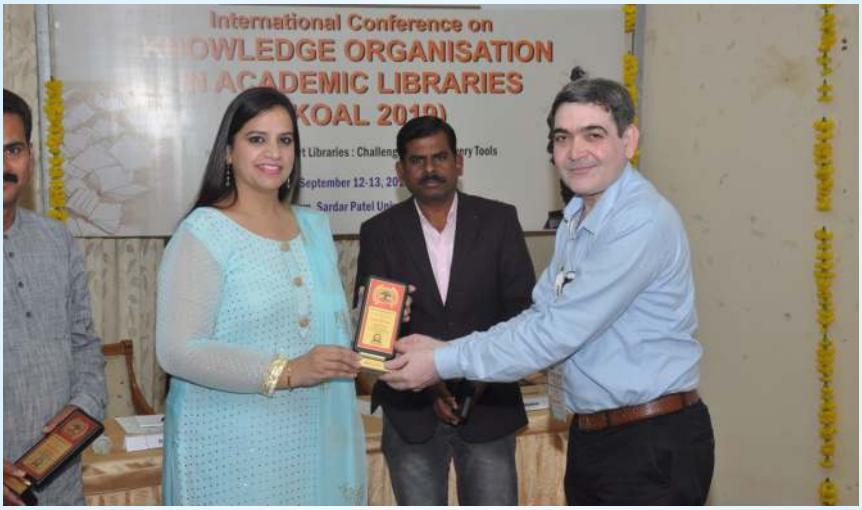
Project manager should compute net exposure for commodities and FOREX and share it with corporate treasury for taking a timely decision of hedging. Corporate treasury initiate hedging position at company level considering overall exposures from other projects or business units.

- **Other Risk Mitigation Options:** Often projects are having escalation clause, rate contracts etc. with various stakeholders to cushion against commodity or foreign currency price volatility. Therefore, in those conditions hedging position is not advisable as it will not add any significant benefits and contrary adds allied costs.
- ***"Ideally combination of financial hedges and other possible nonfinancial options (like pass risk through to a counter party; revising project resource specifications, insurance, judiciously using contingency reserves etc.) should mitigate known and an unknown risk."***
- **Known Market Conditions:** Commodities and foreign currency markets are highly volatile markets but sometimes due to normal market scenarios or predictable events both domestically and internationally volatility remains in a tightrange bound manner. In this scenario, we recommend it to follow wait and watch strategy with strict stop-loss strategy to avoid unnecessary hedging cost with no significant benefits and to provide opportunities to project companies for any downside or upside of commodities and currencies. At the same time, this is a little risky and should be exercised based on expert/professionals advice.

Minimum Awareness Required for Hedging Process:

- Commodity exposure in terms of types, quantity, price escalation, PVC clause admissible, terms & conditions, payment terms etc. to identify unhedged commodity exposure and its possible hedging strategies.
- Currency exposure in terms of type of multi-currency, outflow and inflow exposure and timing, net flow exposure, any currency escalation clause with customers, prevailing and possible currency volatility based on macro and microeconomic environment, cross currency fluctuations for the identification of unhedged currency exposure and possible hedging strategies.
- Project revenue recognition method like project completion, monthly milestone invoicing, pro ratamethod and project specific conditions/commitments to customers.
- Project data requirements like total project amount and currency, start & commissioning date, end date and percentage complete, revenue recognition method and project type (milestone, cost-to-cost, completed).
- Hedging exposure along with decision making for hedging ratios, stop-loss limits for unhedged portion and hedging process monitoring and review frequency.
- To summarize, many project companies use hedging to reduce project risk levels pertaining to commodities and foreign currency fluctuations. These hedging approach can pay off for project companies in situations during volatile commodities and foreign currency markets would otherwise have hurt their performance and profitability, but they also come with a cost. The loss of potential (speculative) extra profit can be balanced by the protection afforded against dramatic and damaging declines in the market.

IPM Faculty/Staff Professional Achievement – Research & Publications



Happy to inform you that our Librarian, Mr. Dharmendra Trivedi has attended & presented the paper on **"The Relationship among Library Service Quality, Customer Satisfaction and Customer Loyalty in Academic Library System"** in International conference on Knowledge Organization in Academic Libraries – I-KOAL 2019. The theme of the conference was on building smart libraries – challenges and discovery tools. The said conference was jointly organised by Library Professional Association (LPA), New Delhi and Sardar Patel University, V V Nagar, Anand (Guj.) and was held on 12-13th September 2019 at Anand. **His paper has been published in conference proceedings with ISBN No.: 978-93-5108-895-0 and received appreciation award from conference authority.**

Due Planning for DLP Period

Mr. Sunil Kumar, Faculty, L&T IPM

Scenario # 1

It was a winter of 2015 Mr Chinmoy Gayen, Chief commissioning Manager of a hydro-electric stage 3 project located in the remote area was on his way to home, happily driving after completing the close out review and lesson learned in Kolkata regional head quarter. He could share, how customer and their ministers were joyous on commissioning of this largest power generating unit in state and had issued taking over and completion certificate along with overall customer satisfaction of 9.5 out of 10.

He didn't imagine even weirdly what could be in the offing for him, when his mobile rang. On the Other side, it was the client project Director from the site. He was furious, blasting at top of his voice, claiming that the control card is malfunctioning, the main inlet valve servomotor does not close fully leading to heavy water leakage and oil from turbine runner is coming in the downstream side of river which has resulted in environment group pressurizing them to shut down the machine.

It shocked Gayen, he had planned the coming week with his family at mangrove forest of Sunderban Delta, also his home town. He could not utter much except," sir, I will reach site by tomorrow". He had a lot to do in the next couple of hours from informing his regional GM and technical GM, locating team members, arranging ticket for morning flight and so on. Despite all odd, He reached site along with a team of 10 crew members with the required tools.

But "that tomorrow" of customer didn't arrive. The load despatch centre didn't agree for machine shut down which was required to carry out rectification citing ongoing national games at Dehradun. It was an order from state Chief Minister Office to ensure uninterrupted powers supply to the national games, though customer kept promising to provide machine in next 2-3 days, the wait was over after one month, after national game was over. They could attend the work which took just three days, for the skilled team.

Scenario #2

"It has come to light that testing of the main canal at an Irrigation Project has been deferred for 17 months by government officials after formally taking over the project from the contractor. The deferral allowed the contractor, to walk away free from any responsibility of repairing construction defect. The canal construction testing was conducted only three weeks ago i.e. 2nd August 2019 although the defect liability period (DLP) for the project had expired in February 2017. During the DLP, the service provider is responsible for all repairs and damage restoration."

Above scenarios are related to defect liability, one from contractor perspective other from owner. Let's look into what is DLP and how it impact projects.

Defects Liability Period (DLP)

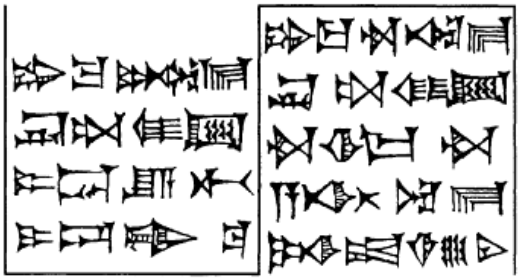
The defects liability period (DLP), also called defects notification period (DNP) under FIDIC, is the period after the construction is completed and accepted (also called practical completion), and where the contractor is responsible for fixing (at their cost) any defects arising in the infrastructure /facility during the DLP/ DNP. It is usually one year (could vary) and is clearly stipulated in the construction as well and the supervision contract.

Defects Liability Periods - as it evolves

A defects liability period is the time specified in the contract during which a contractor is legally required to return to a construction site or build to repairany defects which have appeared in that contractor's work since the date of construction. Usually a defects liability period will start either at practical completion or upon reaching standard completion.

Under typical construction contracts, at completion of the work by the contractor it is customary for a certificate of practical completion to be issued, following which the DLP runs. At the expiry of the DLP, it is customary for a certificate to be issued stating that all defects have been rectified, following which the works are certified as completed under the contract and a final certificate is issued, which discharges the contractor from its obligations and signifies completion of the contract.

"A common misconception is that issuance of the final certificate discharges the contractor in full from liability for all defects in the work. "



Contracts have been around for a long time. We could say one of the first to be the code of Hammurabi. Almost 4,000 years ago, King Hammurabi of Babylon, Mesopotamia, laid out one of the first sets of laws governing construction projects. They are designed to align not only the incentives of constructor but also their responsibility including risk during post occupancy period. It may be rightly considered as a precursor of what we call "detect liability clause" to safeguard client and sponsors.

As one would expect, this dealt with payment to contractors: It reads as follows

"If a builder builds a house for someone and completes it, he shall give him a fee of two shekels in money for each sar of surface"

The code also dealt with responsibility for any defects. Here the position was admirably clear, if ultimately a little harsh:

- If a builder builds a house for a man and does not make its construction meet the requirements and a wall falls in, that builder shall strengthen the wall at his own expense.
- If the son of the owner dies, the son of the builder shall be killed
- If it causes the death of a slave of the owner of the house, he shall give to the owner of the house a slave of equal value.
- If it destroys property, he shall restore whatever it destroyed, and because he did not make the house which he builds firm and it collapsed, he shall rebuild the house which collapsed at his own expense.

The final certificate customarily: • Signifies that it has accepted the works as completed • Discharges the contractor from further liability for defects • Triggers the return to the contractor of all security held by the employer • Precedes the drawing up of final statements of account • Signifies completion of the contract.

However, the final certificate does not fully discharge the contractor from liability for defective works that only become apparent after the issuance of the final certificate.

"While the employer no longer may recall the contractor to site (and the contractor no longer has the right of access to site to remedy defects), as is customarily the case during the DLP, the contractor remains liable to the employer regarding any defects arising. "

The length of any defects liability period is the function of the build, the work a particular contractor carries out and whether it is likely that any inherent defects may take time to become apparent.

Defect Definition and Classification

Ordinarily when the term 'defect' is used in a construction contract it refers to work that has not been performed under the standards and requirements of the particular contract.

it may include: • The quality of any work and the standard of workmanship; • Whether design directives have been followed • Correctness of materials used; • Whether the works have been performed in accordance with contractual specifications and drawings/Technical procedure.

Minimizing Construction Defects and Their Impact

There are proactive measures team members can take to decrease the chance of encountering one.

Review the Contract Terms and Policy Coverage	Implement Quality Control Programs	Act Quickly
With so many people involved on a project, there are a lot of places where blame could land. For all project stakeholders (designers, contractors, subs, and suppliers, etc.), the contract should clearly assign accountability and confirm that everyone is responsible for their own work. Also keep an eye out for provisions concerning responsibilities, liabilities, and any risk-shifting language. A clear understanding of your liability coverage will also help minimize your exposure to defect claims. Plus, it's a good idea to confirm that everyone else on the project has sufficient coverage as well.	Involve all the project participants early on and form some sort of quality assurance group. Everyone is ultimately responsible for avoiding defects, so this should be a collaborative effort. This group should meet regularly, review plans and make occasional site assessments. For site, a solid daily report system should be in place. Conducting daily inspections of the work and materials can help detect issues early on. Furthermore, keeping these well documented and organized can assist you later on when an old project presents a defect claim.	If a defect is discovered, perform a walk-through. Determine what the issue is and present it to the owner, contractor, or management team as soon as possible. Then you can decide how to proceed in the most cost-effective way. Having a quality control program provides an opportunity to repair the defective work prior to completion, which can reduce monetary damages and prevent future litigation.

Conclusion

Construction defects can quickly turn a project upside down, and, with so many parties working on the job, they're not always easy to identify or manage. Everyone involved with a project – from the design team to the construction team – must do their part to avoid defects. Quality control programs, communication, and documentation are an easy, yet effective way to minimize defective work which can help both your bottom line and your reputation.

Some client executive have trained themselves in converting operational issues into construction defect. As a constructor, one has to understand not only nuances of construction but must be good at operational and maintenance issue as well.

A defects liability period gives both a principal and contractor a degree of certainty as to the process that will be followed for making good any defects which may not be apparent at the date of practical completion.

Challenges and Solutions to Manage Linear Projects

Mr. K. P. Reghunath, Faculty, L&T IPM

Linear projects construction planning process can be divided into the following steps:

1. To break down the project into constituent components.
2. To divide realization of these processes between adequate production crews.
3. To define technological connections between crews and activity categories.
4. To decide which production line should dictate the progress pace of the project, due to economic considerations or resource limits.
5. To make an approximate estimate of the resulting construction time and decide how many production units should be employed in parallel.
6. To balance the progress of noncritical production lines with that of the chosen critical one, aiming at achieving working continuity.
7. To check the possibility, within practical limits, of shortening construction time by introduction of planned breaks in continuity or changes in crew size.
8. To analyze the whole process in terms of time and activity durations and produce a plan.

Since the crews and equipment move along the construction right-of-way to perform the work, the unique challenges encountered in planning are to capture issues like location based permits, environmental constraints, location based construction issues and risk elements.

Blind Spots due to Critical Path Method (CPM) in Linear Projects

Conventional scheduling techniques like Critical Path Method (CPM) display their results in bar charts or network diagrams and are unable to show a graphical link between the location where the work is performed (the distance axis) and the time when it is executed (the time axis).

In Linear Scheduling Method, activities are represented by lines with slopes proportional to their production rate. These lines are plotted in X-Y graphs where X (horizontal axis) representing time, while Y (vertical axis) representing work progress (location, distance, floor); or the reverse.

Hence the primary differences between the Linear Scheduling Model (LSM) and the Critical Path Method (CPM) relate to the linear activities present in LSM which models the production rate of an activity as it moves along a path. The location, or direction of travel, is not contained in a CPM activity whereas any point along the line representing linear activity defines the activity in location and time. Conversely, in CPM this same activity only has a start time and an end time.

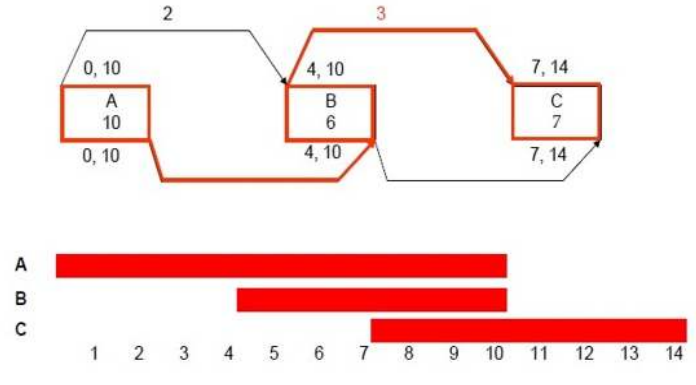
In a project network diagram, critical path is the sequence of activities along the longest continuous path through the network. When the project consists of hundreds of activities, it is important to identify the longest continuous path of activities through the project, since the duration of the project depends on critical path duration and progress on these activities is directly linked to project progress.

On the contrary, linear projects consists of a small number of activities and most of the major activities are not sequential, they progress in unison and are graphically represented on the linear schedule as a group of near parallel lines. Projects with numerous sequential activities like in linear projects, a critical path which identifies the controlling sequence of activities through the project, becomes less meaningful than it is for non-linear projects.

Instead of asking *"what was the sequence of critical activities?" it becomes more relevant to ask "where and when did this activity become critical?"*

When describing several sequential linear activities with CPM, the planner typically attaches a duration to an activity and then creates a start-start relationship with a lag and a finish-finish relationship with or without a lag to the next activity known as combination relationship as shown in Figure1. This is repeated for each activity in the group. If the course of the activity is long, say several kilometres, the only points modelled are the start time and the end time of each activity.

Figure 1: Combination relationship to model linear sequential activities in CPM (using Precedence Diagramming Method, PDM)



Even though CPM can handle interruptible activities, commonly available project management software like Primavera and MS Project don't offer this option. Primavera and MS Project type software assumes activities as contiguous and the scheduling gives the above result (Figure 1), all the three activities are critical throughout.

Instead, the user can make the activities interruptible manually: pause/resume the activity or break down activities to several contiguous activities as given in Figure 2 and Figure 3.

If multiple sequential activities are modelled in conventional CPM/PDM using start-start and finish-finish relationships and equal durations, all the activities in the group will be defined as critical for the entire length of the activity (contiguous activities). In conventional CPM, it cannot have a portion of the activity on the critical path and another portion not on the critical path, an activity is either on the critical path or it is not.

"Hence another problem in using conventional CPM to model linear activities is the ability to identify the controlling activities. If linear activities are, let's say, ten miles long, then if any part of the activity can be considered critical, the entire activity is defined as critical, which contrasts common sense."

Figure 2a: Activity B is interruptible in PDM

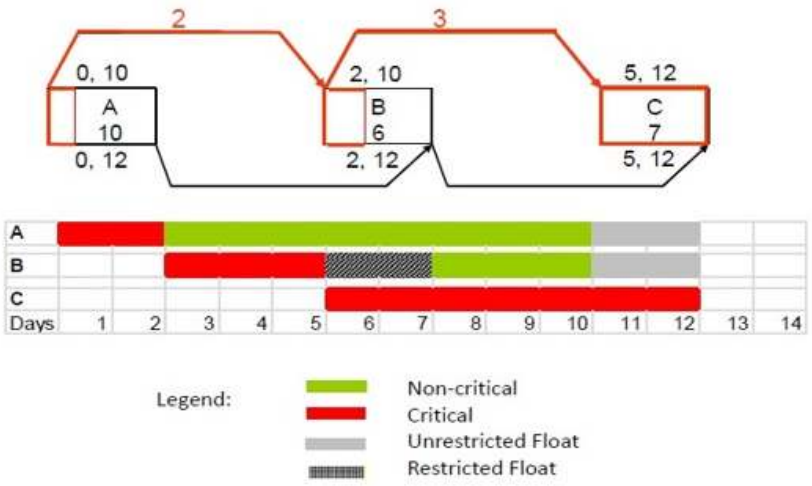
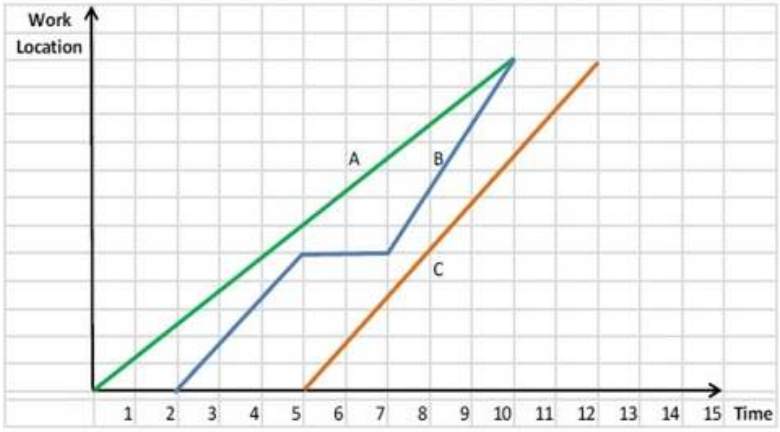


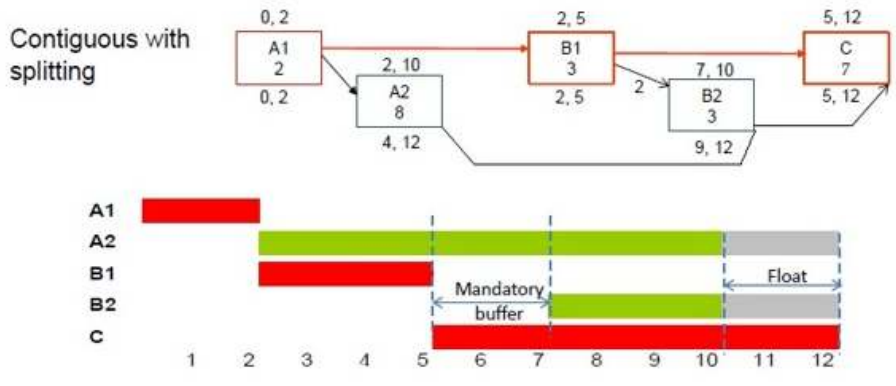
Figure 2b: Activity B is interruptible in LSM



Activity B starts as early as possible but cannot continue at the same production rate as this will violate the FF relationship with activity A

In fact, the controlling activity path described by the Linear Scheduling Model, is specific to only those portions of activities that are actually controlling segments, and that the methodology can be rationally understood in terms of the particular activity production rates and relationships to other activities. In real life, the issue whether it is better to make the activity contiguous or interruptible depends on the nature of the activity and the resource utilization (feasibility and optimization).

Figure 3: The split solution



It is the same LSM solution but treating the 2 portions of activity B (before and after the pause) as 2 separate activities

The split solution to this is given in **Figure 3.** The point of conflict or clash arises due to the higher productivity of successor activity compared to the predecessor activity is difficult to identify and make it visible in CPM. Long duration linear activities in a CPM schedule can be broken into several pieces to resolve this. To model a ten miles long project by breaking into one mile long segments create ten separate activities, and logical relationships must be created between each of these 10 activities and for each 10 activities of all the other linear activities as well. The number of activities and relationships become so numerous that the

schedule's value as a project management tool is severely diminished. The schedules become unmanageable, do not provide adequate information to identify and correct problems that occur somewhere along the mile-long activities. Hence it is difficult to create a CPM schedule that can model linear activities as realistically as the linear scheduling can.

In the linear Scheduling Model activities can have multiple production rates as required. It is very easy to model changes in production rate. For example, if at some point along the course of an activity, the contractor knows that another excavator will become available, the production rate of the activity can easily be modified to accommodate the expected increase in production rate without creating another activity. As the project is constructed, daily activity progress can easily be plotted against the planned progress rate to monitor the activities status. The effects of any reduction in production rate of an activity can be easily shown.

Using CPM, it is difficult to visualize the location of activities with respect to the project and to other activities. Linear scheduling uses the spacial relationships of the project to provide the planner with a visual planning field in which to arrange activities not only logically but also spacially. The spacial aspect of linear scheduling eliminates any planning errors due to the location in which activities are performed.

Conclusion

Linear Scheduling Method (LSM) is a graphical scheduling method which shows location and time at which a certain crew will be working on a given action. It helps to capture the repetitive nature of the activities with fairly high level of details, like easily understandable activity sequencing and clear visibility on activity work progress with the added advantage of lesser time period required for development.

It is important not only that a realistic plan for the project is created but also that the plan can be easily communicated to other parties involved in the construction of the project. The chart produced by the Linear Scheduling Model provides an excellent tool for communicating the project plan to others involved in the project. The Linear Scheduling Method provides a method of visualizing where every activity starts, where it ends, and the path with respect to time and location that it will take. It shows the relationships between activates at any location for an entire project in a single, easy to understand, diagram.

Compared to CPM, the Linear Scheduling Model can realistically determine the controlling activity path and also help to accurately model the production rate characteristics of linear activates. The visual method of planning provided by the LSM facilitates the communication of the project plan to other parties involved in the project. In LSM, as-built production rate information can be easily utilized to track the progress of linear activities on the project and thus providing managers with realistic information for making decisions.

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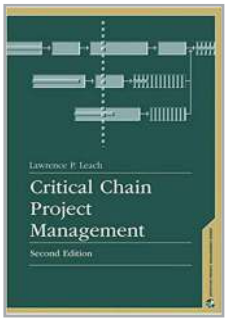
2. Peer, S. (1974). "Network analysis and construction planning." Journal of the Construction Division, ASCE, 100(3), 203-210.
3. Linear scheduling model: the development of a linear scheduling model with micro computer applications for highway construction project control, David John Harmelink, Iowa State University.

IPM Faculty/Staff Professional Achievement – Research & Publications

Glad to inform you that Our Librarian, Mr. Dharmendra Trivedi has published research paper entitled **"Application of Cloud Computing in University Libraries: Case Study of Selected University Libraries in Gujarat"** in international journal **"Library Philosophy and Practice" (LPP),ISSN 1522-022.** Library Philosophy and Practice (LPP) is a Scopus indexed peer-reviewed journal that publishes articles exploring the connection between library practice and the philosophy & theory behind it. **This journal is published by University of Nebraska–Lincoln, USA.**

Look-out in the Library



Title : *Critical Chain Project Management (Second Edition)*
Authors : *Lawrence P. Leach*
Publisher : *Artech House Publishers; Boston - London*

Contributor : ***Mr. K. P. Reghunath,*** *Faculty, L&T IPM*

Review Insights

There is a certain amount of uncertainty in each task. Task durations are often overestimated by team members or task owners. This is typically done to add a safety margin to the task so as to be certain of its completion in the decided duration. In most cases, the tasks should not take the time estimated, which includes the safety margin, and should be completed earlier. If the safety margin assumed is not needed, it is actually wasted. If the task is finished sooner, it may not necessarily mean that the successor task can start earlier as the resources required for the successor task may not be available until their scheduled time. In other words, the saved time cannot be passed on to finish the project early. On the other hand, if there are delays over and above the estimated schedules, these delays will most definitely get passed on, and, in most cases, will exponentially increase the project schedule. Critical Chain addresses the above issues by creating and managing three types of Buffers namely Project Buffer, Feeding Buffer and Resource buffer.

The Critical Chain Method has its roots in one of Dr Goldratt's inventions: the Theory of Constraints (TOC). This project management method comes into force after the initial project schedule is prepared, which includes establishing task dependencies. The evolved critical path is reworked based on the Critical Chain Method. To do so, the methodology assumes constraints related to each task.

The Artech Housebestseller, Critical Chain in Project Management, now build on its second edition packed with fresh, field-tested insights on how to plan, lead and complete projects in half time, all the time. It provides professionals with expanded coverage of critical chain planning, multiple project selection and management, critical chain project networks, OPM3, Agile and Lean techniques related to critical chain project management and effective strategies for bringing about the organisational change required to succeed with the breakthrough method.

The first three chapters provide the background for critical chain project management, so if you are anxious to understand what it will do different for a single project, you can jump to chapter 4. If you are even more anxious to start a single project, you can start with chapter 6 on developing a single project plan. Chapter 7 will guide you in planning multiple projects that share common resources. This chapter provides the context for CCPM, starting by defining the problem and showing some data to assert that CCPM is proving to be an effective solution in a wide range of project types and industries.

In the chapter, developing the (single project) critical chain plan, the author advocates “Good enough as an important idea in developing critical chain project plans. For mathematical reasons, it is impossible to build a precise optimizing algorithm for resource levelling. The procedure to develop the critical chain plan ensures that the plan you build will be “good enough”. This means that the overall length of the schedule will be, within a small part of the length of the project buffer, nearly the shortest or optimum schedule path. Since reality will change many assumptions and we cannot explicitly predict the results of statistical fluctuations, this is good enough.

The CCPM concept is explained with a race car analogy as below

The program completes when the race car completes the race. This a long race, with drivers that switch out. The drivers of the race cars are the resources, moving the overall program along. They are the ones working on the actual equipment. A number of technical limits prohibit having various combination of resources working on the equipment at the same time. For example you cannot weld while spraying-paint, and only so many people can fit into confined spaces. Many resources support the drivers. When the race car comes into the Pit, every resource must have the tools and supplies it needs to optimize the performance of the drivers and move the car along as rapidly as possible.

When you have a unique constraint like a race car, the planning work begins with identifying the critical chain of each project, then working to reduce the overall duration for each project. Next you can pipeline (sequence) the projects to the most constraining resource (drum). Nevertheless you are not done. The next set of tasks to exploit the constraint require actinglike members of the pit crew and prepare detailed plans to maximise effectiveness when the car pulls into the pit.

This cutting edge work offers a full understanding of the CCPM Techniques, tools and theory needed to develop critical chain solutions and apply them to all types of projects. Practitioners get clear instructions on how to build single project critical chain and how to stagger multiple-project environment. The book also presents buffer management techniques for avoiding the pitfalls of committing too much or too little to any specific project and for meeting project time and cost commitments every time. Moreover the book integrates key features of PMBOK (Project Management Body of Knowledge) with critical chain to help professionals' master key project management skills such as scope control and risk management that are not covered in other critical chain books. Over 100 illustrations help clarify this innovative method that has produced well-documented results in a growing variety of project environments.

From the "World of Webinars"

IPM has been conducting its 3P WEBINAR series since October 2017 wherein "Problems, Principles and Practices" (3P) on various specialized topics in Project Management have been deliberated

Webinars delivered during July - September 2019

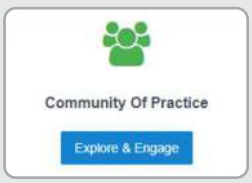
5th July 2019	**Strategies for Effective Sub Contract Management**	**Prof. Sunil Kumar**
Sub Contract management and Contract administration comprises planning, performance monitoring, quality assurance, and other key phases. It poses challenges such as How do you handle a contract modification? What kind of oversight does a subcontractor require? Participants will examine the duties performed by contracting personnel during the administration phase of the acquisition process and improve their knowledge and skills in overseeing contractor performance		
11th July 2019	**Risk Management and Profitability**	**Prof. VTCS Rao**
The purpose of this webinar to enhance the understanding of inter-relation between Risk Management and Profitability, with a focus on reducing unknown unknowns tactically, utilising profit enhancement opportunities and optimising contingency draw down. The webinar also focus on aspects to be taken care during pre-bid stage, while allocating ownership of risks and while working alternate risk mitigation strategies.		
3rd Aug 2019	**Collaborative Planning & Cycle Time Reduction in EPC Projects**	**Mr. Kalyan V**
Webinar will emphasis on understanding the key components of working capital, including cash, inventory, receivables, and payables. The focus will be on financial decision making with regard to working capital issues, to minimize working capital requirements in projects and maximize shareholder.		
21st Aug 2019	**Scheduling, Monitoring and Controlling Linear Projects**	**Prof. KP Reghunath**
Linear Scheduling Method (LSM) is a graphical scheduling method where the project can be displayed as few simple lines, with slope reflecting production. LSM is a suitable method for certain type of construction projects, mainly "linear" projects such as roads and utility works. LSM can also be applied to projects with repetitive activities such as high-rise buildings.		
4th & 5th Sep 2019	**Cost Estimation in EPC Projects**	**Dr. Hiren Maniar**
Webinar addresses the identification, elaboration, planning, and management of efficient Cost Estimation in EPC Projects. The focus will be on highlighting importance of estimating and budgeting aspects for achieving committed project performance during execution stage.		

Steps to view the past webinars of IPM

The links to the past webinars can be accessed through our knowledge portal by following steps

Step 1: Login into the Kb portal using the URL: https://kb.lntipm.org

Step 2: Click on the Community of Practice " Explore & Engage" Option



Step 3: Click on the Join Button of the 3P Webinar CoP

Step 4: Click on the 3P webinar CoP and navigate to the Artefacts tab to access the webinar Links.

IPM – Programme Calendar

Forthcoming Quarterly Programme Details

IC Specific Programmes:

Sr. No	Programme details	Date	Location
1	Defence IC - Driving Execution Excellence in Projects **(Multi Modules)**	18th - 22nd Nov	Coimbatore
2	Power IC - Principles of Project Management	30th Sep - 5th Oct	Rajpura
3	PT&D IC - Project Leadership &Managerial Development Programme (PLMDP with IITM) Batch 7	14th - 18th - 22nd Oct	Chennai
4	LTTS IC - Programme on Project Management for Business Results (PMBR)	25th - 29th Nov	Vadodara
5	PT&D IC - Project Leadership & Managerial Development Programme (PLMDP with IITM) Batch 8	25th Nov, 29th Nov, 3rd Dec	Chennai

Role Based Programmes:

Sr. No	Programme details	Date	Location
1	B5: Module-1 NICMAR EICM - Essentials of Infrastructure and Construction Management (Total 10 Modules - 60 days)	25th - 30th Nov, 2019	Vadodara

Specific Competency Development Module (SCDM):

Sr. No	Programme details	Date	Location
1	PMP Preparatory Course	21st - 25th Oct, 2019	Vadodara
2	Primavera	30th Oct - 1st Nov, 2019	Chennai
3	PMP Preparatory Course	18th - 22nd Nov, 2019	Chennai
4	Commercial strategies for bidding	17th - 18th Dec, 2019	Vadodara

3P Webinars - Problems, Principles and Practices:

Sr. No	Webinars
	OCTOBER TO DECEMBER 2019
1	Project Cost Contingency Management
2	Financial Performance Improvements in EPC Projects
3	Project Stakeholder Management
4	Project Cost Management in EPC projects
5	Project Site, Commissioning and closeout
6	Project Finance Management in EPC Project
7	Project Management Fundamentals
8	Project leadership Dimension
9	Value Engineering
10	Emerging complexities and project management trends

NOTE: For schedule dates of above programmes kindly visit – **www.lntipm.org**

L&T INSTITUTE OF PROJECT MANAGEMENT

Knowvember 2019
Agenda

Week 1 Knowvember

4th Nov
Inauguration
@ IPM Auditorium Vadodara

6th Nov
Lessons from Execution Challenges #1
Shree Singaji Thermal Power Project @ IPM Auditorium Vadodara

Week 2 Knowvember

11th Nov
Webinar on Leveraging Knowledge At Work

12th & 13th Nov
Book Fair
@ IPM Auditorium Vadodara

14th Nov
PM Challenge

Week 3 Knowvember

21st Nov
Panel Discussion : Delivering Dispute Free Projects

22nd Nov
Watch and Win
@ Audi C – TC2 , L&T Construction Campus, Chennai

25th Nov
Webinar on Emerging Trends in Knowledge Management

Week 4 Knowvember

27th Nov
Webinar on Challenges in Organizational Learning in Project based Organization

28th Nov
PM Games

29th Nov
Lessons from Execution Challenges# 2
Statue of Unity

30th Nov
Valedictory with Awards & Rewards Distribution

@ Audi C – TC3, Tower A, L&T Construction Campus, Chennai

Virtual Events

Please send your valuable suggestions & comments to
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