Project Management Knowledge Enhancement Through in House Academy - Larsen &Toubro Experiences

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Contents

1.1 Abstract

This paper describes the development of an innovative project management knowledge enhancement program pioneered by an In house academy of an engineering multinational-Larsen &Toubro (L&T), (www.larsentoubro.com), India.

Project Management (PM) as a discipline is not exactly structured and delivered as a full course in Indian management schools. By and large formal training is restricted to training on use of scheduling tools like MS project, Primavera etc

Consequently for several years, project organizations have been depending on on-the-job learning to enhance PM concepts and also to accomplish project objectives. This naturally leads to avoidable errors and delays in projects.

Being a project driven company, whose eighty percent of the revenue stream comes from projects, it was imperative for L&T to find a solution to this problem on a permanent basis.

Consequent to the above thinking process, L&T decided to establish an academic institution within its fold to develop and deliver project management courses relevant for their projects for all the project personnel of L&T.

Being a highly diversified core engineering project organization, L&T's project management academic needs are very varied and demanding. A program purely based on knowledge framework or process would be inadequate for the varied needs of the different domains and heterogeneous group of L&T.

The necessity of the participants to be engaged in their daily project responsibilities also brought in challenges in terms of program design, pedagogy and course delivery.

Consequently an entity aptly called L&T Institute of Project Management (L&TI'PM) was created, as an in house academy, and has been delivering various courses for L&T project personnel. (www.lntipm.org)

In this paper we describe the process of creation of the academy, pedagogy, and the assessment of the effectiveness of the courses delivered so far.

The paper also looks at the learning's from the experiment and the way forward for similar academies elsewhere.

1.2 Introduction

Larsen & Toubro is a USD 9.8 billion technology, engineering and construction group, with global operations. It is one of the largest and most respected companies in India's private sector.

A strong, customer-focused approach and the constant quest for top-class quality have enabled L&T to attain and sustain leadership in its major lines of business over seven decades.

The company over the past 70 years has grown from a product company into a project company and is considered as the Indian multinational in engineering.

Over 80% of the turnover the corporations comes from projects in the field of Power, petrochemicals, Oils and Gas, Fertilizers, Infrastructure etc.

An effective and efficient project management capability is the core need of this engineering company.

The company realized quite early the need for bringing PM knowledge and skills among its project managers and due to limited avenues available among the management schools it was decided to create an in house academy in 2008.

A nucleus for the campus was created in Baroda with faculty and support staff and the Institute started offering various programs in a full-fledged manner from August 2008 onwards.

1.3 Program Development

L&T as an engineering organization always has given specific focus to training and development. This can be gauged from the fact that in the year 2009 total training man hours of the organization was about 1.97 million. L&T also recruits fresh talent every year from various engineering schools across the length and breadth of the country.

In the year 2009 from about 294 higher educational institutions L&T recruited close to 1163 young engineers. Of the 35,606 employees in various operating divisions of L&T(excluding L&T InfoTech employee strength of 9701) majority of them work in some project and require a formal project management education. And those involved in products also require project management education due to the fact that product life cycle is becoming very short and new product development is a necessity

The projects being managed by L&T project managers' range in value from tens of millions of US dollars to billions of US dollars. They include Greenfield (no previous construction) as well as Brownfield (previously used) sites and many involve new technologies, complex contracting relationships and intricate stakeholder relationships. Projects are located in the upstream businesses and downstream businesses as well as the functions, including information systems. Like other organizations of the same genre L&T recognized that many experienced practitioners are nearing retirement age. This impending loss of experienced staff and associated tacit knowledge, coming at the same time as increasingly challenging projects, had given urgency to the need to develop new project managers and to pass on the tacit knowledge accumulated during the past several years of experience.

1.4 Curriculum design Methodology at L&T IPM.

In a program that incorporates experiential learning, it is necessary to debate and discuss course contents with the project personnel and arrive at what is practically relevant academically feasible and deliverable as a structured course that be certified by employing due assessment techniques.

In order to do this an academic expert from the field of project management held extensive meeting with the practicing managers to arrive at the frame work for the course outline.

In depth focused meetings and discussions were held with various business unit heads and practicing project managers about the course contents, pedagogy and methodology of course delivery.

The methodology of creating the architecture (Table 1) for the courses included, but not limited to:

(a) Group discussions
(b) Subject Matter expert (SME) presentations
(c) Brain storming sessions
(d) Discussions with the existing trainers of different subjects
(e) Opinion leader subject and content survey and finally recommendations on the course structure.
(f) Workshops

Table 1: Methodology of creating the architecture

This process ultimately led to a program design process with a large and detailed list of learning objectives, which are summarized as follows:

- The program designed should focus on the *application* of the project management processes and principles collectively to be classified as L&T body of knowledge and practices.
- It should draw upon the positives of currently available frameworks namely :
- (a) Project Management Institute (PMI) frame work,
- (b) International Project Management Association (IPMA) framework and also other frameworks
- (c) Projects in Controlled Environments (PRINCE2)
- (d) Critical Chain Project Management (CCPM)
- (e)Theory of Constraints (TOC)
- The program should be geared to increase L&T capability to consistently deliver successful capital projects across all the operating divisions.
- The program should cater to all the streams of business disciplines and projects of L&T. The
- Program should provide insights to support success and learning's in challenging multi-regional business environments.
- The program should have contact sessions at specified intervals to:
- (a) Expose the participants to the theoretical concepts
- (b) Exchange of project concepts among heterogeneous group of project managers
- (c) Bring in project problems for classroom discussions and solutions

- (d) To forge the relationship between faculty and practicing project managers for project related
- Case development for knowledge management and archiving
- The discussions also led to classification (Table2) of prospective participants as follows:

1. Those with less than 3 years of experience including fresh Graduate Engineer Trainees (GETS) and lateral recruits with limited experience in projects.
2. Those with more than 3 years of experience but with less than 10 years of experience.
3. Those with 10-20 years of experience
4. Those with more than 20 years of experience.

Table 2: Classification of course contents

The following course delivery challenges (Table3) were also identified:

1. Most of the prospective participants had not gone through any formal structured long duration programs for several long years after their graduation other than limited duration training sessions based on need
2. The target population was typically not available for contact session at a stretch for more than 6 days.
3. They were based in varied locations across the country including remote areas and also overseas.
4. Going through a structured study required several attitudinal changes in the participants.
5. Some form of accreditation/certification from an external body was expected by the participants.

Table 3: Course Delivery Challenges

These constraints necessarily mandated an approach wherein participants go through *contact sessions* at periodic intervals with specific focused take home assignments to be submitted on line or other forms for evaluation.

Distance learning, as a concept, was also evaluated but was kept in abeyance due to

(1) The need for tremendous self motivation needed among project personnel located in difficult project locations with inadequate infrastructure.

(2) The course material developed were for immediate class room delivery and not exactly amenable for an on line learning pedagogy.

(3) Prospective participants' desire to get back to the class room to get the class room learning experience and peer group learning with project managers from different disciplines.

Based on this understanding, emanating out of a detailed study, four levels of courses (L-0, L-1, L-2 and L-3) was developed and linked to a competency matrix as given in figure1.

(a) Course Competency matrix with Levels (Figure:1)

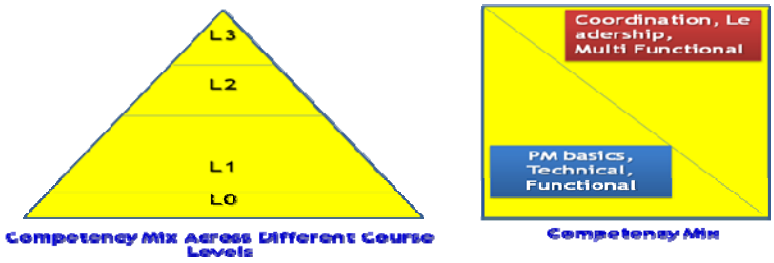

Figure 1: Course Competency Matrix

(b) Course Levels (Figure:2)

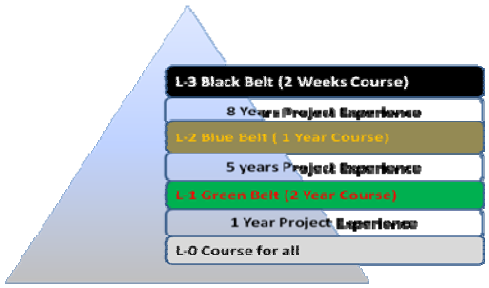

Figure 2: Levels of PM Education at L&T IPM

L-0: Course contents were designed for entry level project personnel with limited or no experience in projects.

L-1: Course contents were designed for project personnel with 3-10 years of experience

L-2: Course contents were designed for project personnel with 11-20 years of experience

L-3: Course contents were designed for project personnel with 21+years of experience.

Course contents for each of the above levels are as given in the following tables.

1.5 Evolution of the courses

Contents and academic needs the contact sessions were also frozen as given in the evolution figure as follows.

L-0: **13 days** of one time contact sessions on entry

L-1: **6 days** of contact every quarter for two years leading to 48 days of contact in two years

L-2: **6 days** contact every quarter for one year leading to 24 days of contact in one year.

L-3: **5 days** contact in two sessions spread over six months leading to 10 days contact in total

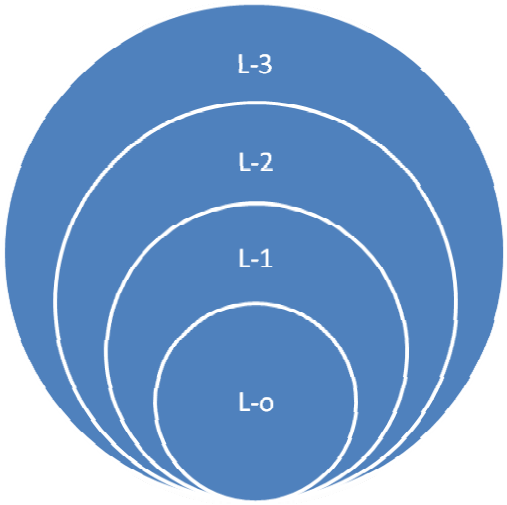

Figure 3: PM course levels -Evolution

1.5.1 L-0 Course contents (Table: 4)

Day	Sessions
1	Introduction to Project Management
2	Planning & Scheduling, Project Network Techniques, Project Procurement, Case Study.
3	Project Feasibility, Working Capital Management, Project Cost Management, Case Study
4	Project Proposal, Pre bid Risk Assessment, Project Bidding & Negotiation , Case Study
5	Project Execution, Case Study on Project Execution, Site Management, Case Study on Site Management.
6	HSE in Project, Project Quality Management, Commercial aspects in Project Management Project Claims & Contract Management
7	Integrated Case Study, Integrated Case Study, Preparation Time, Written Exam
8	SAP for Projects
9	SAP for Projects
10	SAP for Projects
11	Primavera for Projects
12	Primavera for Projects
13	Primavera for Projects

Table 4: L-0 course contents

Module 1	Module 2
Project & Characteristics of Projects Project Life Cycle Program & Projects Project Design Work Break Down Structure	Project Detailed Engineering Proposal Engineering Project Bidding Bid Evaluation Project Negotiation Project Budgeting Estimation Of Cost And Time Project Financial Structuring Project Feasibility Project Appraisal
Module 3	**Module 4**
Network Techniques for Project Management CPM / PERT / PDM Network Techniques for Manufacturing Critical Chain Methods Using MS Project / Primavera for CPM / PERT / PDM Scheduling Using MS Project / Primavera for Project Monitoring and Control Project Resource Management Using MS Project / Primavera for Resource Management Project Risk Management Using ERP in projects	Project Organization Project Responsibility Matrix International Contract Management - FIDIC Claims Management Project Competencies and Assessment Project Leadership, Communication and Soft Skills Arbitration Processes and Procedures Contracts Management Performance Measurement and Appraisal in Projects Cross Cultural Issues In Projects Legal and Commercial Aspects of Project Management Project Team Building Project Conflict Management

Module 5	Module 6
Project Site Management Project Materials Management Quality Management In projects Health, Safety & Environment Issues In Project Management Project Logistics and Supply Chain Management Procurement of Capital Items and Imports Dealing with Government Agencies TQM and Six Sigma in Projects Benchmarking and Maturity Assessment Project Contractor / Sub Contractor Management Lean Project Management	Project Coordination, Erection, Testing & Commissioning Project Hand over and Closure Process 3 D Control and Constructability Post Closure Documentation and Lessons learnt Managing Project Commissioning & Closure in International Projects Real Project Management Under Diverse Circumstances Offshore, International, Multi Location, Extreme Environments
Module 7	**Module 8**
Managing Specific Project Types Chemical / Petrochemical, Ship Building, Airports, Ports, Highways /Expressways, Metro Rail, Real Estate	Project Presentation Integrated Case Study Close Up

Development, Building Construction, Bridges, Offshore Platforms, Manufacturing Plants, Telecom, etc Managing Projects Under PPP Model	

Table 5: L-1 Course contents

L-2 Course contents:

In the case of L-2, in order to take care of the diversity of needs this course after the initial modules of project management concepts branch off into electives for different business domains to take care of the uniqueness of the PM applications in these domains. These electives are in the areas of:

- Infrastructure Project Management
- IT/ITES Project Management
- Heavy Engineering Project Management
- Defense ,space and aerospace project Management
- Marine and shipbuilding project Management
- Project Management for Power plants
- Project Management for Hydrocarbon Industry

Module 1	Module 2
Project Design Structuring Estimation Bidding Procurement	Project Scheduling Monitoring & Control Resource Management
Module 3	**Module 4**
Project Organization Execution and Closure Electives for different domain	Project Quality Environment Health Safety Coordination and Integration

Table 6: L-2 Course contents

L-3 Course contents: Table 7:

This course is conceived at the top of all courses and is specially focused on PM strategy and portfolio management. Also in order to bring in international perspectives the course is divided into three modules with two contact sessions of 5 days each of which one is scheduled outside of the country.

Module 1- INDIA (at L&T IPM) Classroom
Project Strategy, Project Value

Project Execution Project Organization
Engineering and Systems Integration Project Supply Chain Management
Contracts and Procurement Project Performance
Project Dispute and Resolution • Guidelines for L&T case studies preparation • Project strategy • Contracts • Portfolio Management
Module 2- India Inter-session and Online Component – (est. 4 hours a week each case study)
I: L&T case studies preparation and analysis • Project strategy • Contracts • Portfolio Management
II: Readings and Case study discussions – • *Leadership* • *Sustainability* • *Corporate Social Responsibility (CSR)*
Module 3 - USA – Face to Face Classroom
Leadership
Portfolio management Benchmarking and Knowledge Management
Sustainability Site Visit (TBD)IMF / World Bank Projects
Risk Management Site Visit (TBD)
Corporate Social Responsibility (CSR) Close out

Table 7: L-3 Course contents

1.6 Course Equivalence.

Even though an equivalence of the courses delivered at L&IPM is not a mandatory need for the organization, in the long term interest of participants' understanding and project personnel it was decided to compare the current course contents of PMI and IPMA certification courses. Table 8 gives the equivalence that emerged out of the study of comparative course contents and examination.

L&T I'PM	IPMA	PMI
L-0	Level D	CAPM /SP

L-1	**Level C**	**RMP**
L-2	**Level B**	**PMP**
L-3	**Level A**	**PgMP**

Table 8: Course Equivalence

1.7 Course delivery

Courses are delivered exactly like a university with prescribed text books and course materials.

All the participants were given prescribed books of study and access to the rich digital library resource base for their research and study. The library was reasonably well stocked with adequate books & Journals both national and international journals. Participants could also use the linked (with other institutions) library resource of L&T The library subscribed to various Electronic databases like**(A)** Proust – ABI/Inform Complete www.proquest.umi.com **(B)** EBSCO: www.ebscohost.com **(C)** Science Digest www.sciencedirect.com

Contact classes are held various residential learning locations of L&T with faculty drawn from L&T IPM, internal practicing managers, external academies and international universities.

Suitable course feedback mechanisms were built in to get the feedback on course content, delivery and faculty capability. Based on the feedback suitable modifications/changes were carried to make the courses effective.

1.8 Course assessment and grading.

In an industry led academic initiative conventional forms of assessment are not always appropriate especially for project personnel .Hence the assessment model is a combination of application of concepts in the work place and involvement in the educational process.

The current model is under evolution and over a period of time would fully transform into participative evaluation for experiential learning.

The assessment and evaluation model for various levels as practiced now are as follows:

1.9 Level L-0 participants:

Being a short duration course of limited contact classes and the participants profile being fresh engineers, they are evaluated on the basis of the following.

- Class participation in discussions.
- Case study Presentations.
- Short assignments and

- Written test, in the end, of duration 2 hrs covering the entire course content. This written test has since been converted into an online test for immediate results and also for comparative data. All participants are graded. Grading chart is given in **Table 9.**Suitable certificates are .then awarded.

Marks in %	Grade	Points	Quality Comments
>90	O	5	Exceptional
75 - 89	A	4	Good
60 - 74	B	3	Satisfactory
50 - 59	C	2	Average
<49	D	1	Below Par (not an acceptable Grade)

T

Table 9: Grading Chart

1.10 Level-1, Level-2 and L-3 participants:

In the case of L-1 and L-2 Participants since the courses are of longer duration and participants being practicing managers, the following tools of assessment were employed.

- They were continuously evaluated during the contact sessions by way of (1) Quizzes
- (2) Case study presentation and (3) class participation.
- At the end of every module take home assignments pertaining to the subjects of study of that module were given to all the participants.
- They were asked to work on application of the concepts to their work environment and submit a study for evaluation. They were also guided by their immediate superior at the work place along with a guide faculty from L&TI'PM.
- In the subsequent contact session they were expected to briefly present their findings in front of a panel and their presentations were evaluated for (1) relevance (2) depth of study (3) Contribution to the body of knowledge and (4) clarity of thought.
- In last module the following addition assessment tools were employed (1) Formal written test encompassing the entire course contents (2)Viva-Voce of about one hour by an expert panel on a specific knowledge and its application in the project environment area of choice by the participant.
- All the above evaluations were converted into a composite grade as per the grading table given in table 9 and suitable certificates are issued.

1.11 Course effectiveness evaluation

Effectiveness of the courses is to be judged based on the impact of the courses in project managers in project execution and closure.

During the first 18 months of L&TIPM close to 1200 project personnel passed through the portals of the academy and at the end of 18 months it was decided to gauge the effect of the PM education on their work environment.

1.12 Methodology of effectiveness assessment

The database of all the participants was available for a survey on the effectiveness of the course. A comprehensive survey was carried out among the alumni on the effect of the course in their project management capabilities.

The questionnaire specifically focused on the following areas**. (Table 10: Survey Questionnaire)**

1.13 L&T I'PM Survey

Please return the questionnaire, after filling in, to:dean@lntipm.org.

Name:_____ PS No:_____

Course Attended at L&T IPM:_____

1.13.1 Questionnaire

General

1.	Were objectives of the course clear to you?	Yes	No
2.	Were the objectives of the course realized?	Yes	No
3.	Will you recommend this course to your colleague?	Yes	No
4.	The Instructors encouraged interaction and were helpful?	Yes	No

Course Utility & Value in Project

Use ranking scale 1 to 5; 1-Low……..5-High

1. The Course Content met with my expectations
2. The Course/s added value in enhancing my knowledge
3. The Course Exposed me to new knowledge areas & Practices
4. I believe course enables me to carry out my functions in better way
5. The Course offered was complete for which it was offered

Recommendations / Suggestions

1. Please Comment on the strength of the courses and the way it was conducted.
2. Please Comment on the weakness of the courses and the way it was conducted.
3. Please give suggestions / recommendations for betterment of the Program and also suggestion of new courses that L&T IPM can offer.

Table 10: Survey Questionnaire

1.14 PM Course effectiveness Survey results (Figures 4, 5, 6, 7, 8)

The results of the survey are summarized in the following pictograms.

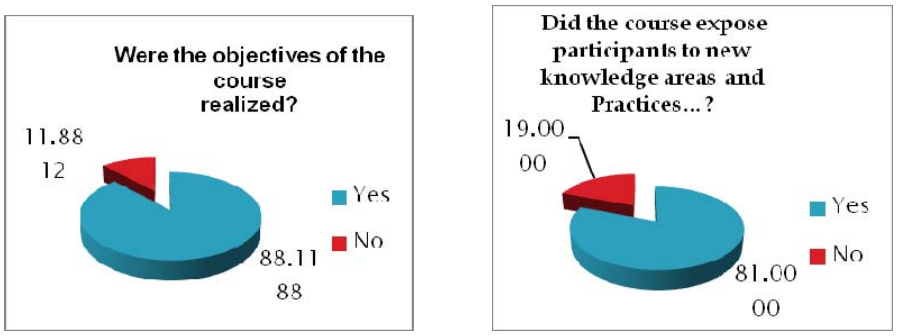

Figure 4 & 5: Course effectiveness survey result

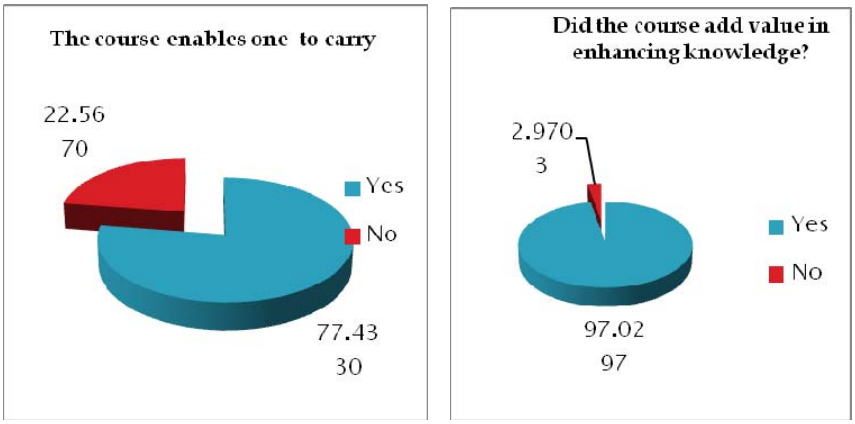

Figure 6 & 7: Course effectiveness survey results

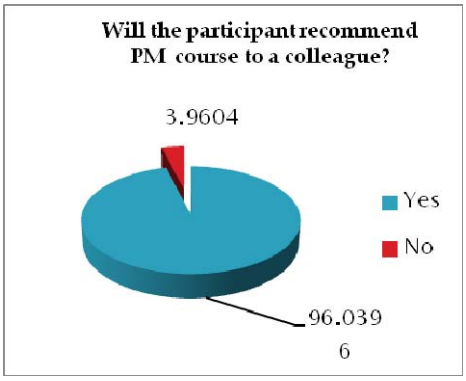

Figure 8: course effectiveness survey results

1.15 Conclusions

Before we arrive at any firm conclusions, the following limitations of the study must be kept in mind.

- The sample size is too small to make it statically significant to analyze and do any correlation studies for effectiveness.
- The survey was carried out just after one and a half years after the participants went through PM education. This period is too short for application of the knowledge and results on long duration projects.
- The ideal way would be to create a control sample of participants who did not go through the program and compare their on-project performance with those of whom that underwent the program.

With the above limitations we can come to the following conclusions

PM education brings in value addition for the project personnel in (1) Understanding the project processes (2) Financial aspects of projects (3) The importance of Time, Scope and Cost in projects.

In summary formal PM education in industry leads to:

- Assess project requirements and develop effective, concise RFPs.
- Match the appropriate resources to the needs of a project based on business goals.
- Adapt and shift planning strategies, staffing models and goal-setting during the lifecycle of a project.
- Identify milestones and recognize when projects are at risk — and manage them to successful completion.
- Provide results and performance reports to executive managers.
- Incorporate international perspectives in global projects.
- Work effectively within diverse organizations to resolve conflicts.
- Maintain ethical standards at all project stages and become successful project leaders
- Creation of knowledge base for future project managers
- Develop a body of knowledge for adding to the repository of the science and art of project management

1.16 Learning and the way forward for similar academies

Experiential learning is the basis of this program. In PM education, this model facilitates the integration of concepts, theories, and practice introduced during the class room sessions, into the participants real project environment .This naturally leads to enhancement of the participants' competence in real project situations.

Educational Research has shown that practitioners can make significant advances in developing their knowledge and capabilities through experiential learning.

The experiences so far at the in-house academy points to the acceptance of the concept of PM education in project based organization. This is more so due to experiential nature of PM education and the need for tweaking the course contents based on the business needs.

Deployment of practicing managers, as faculty, even though beset with its own inherent problems of unavailability at the crucial times, lack of structured teaching experience and the academic rigor. However they bring in currently relevant PM practices into the class room.

The way forward for all those looking at project management education looks to be the creation of academy with a combination of pure academicians and practicing managers. L&TIPM has implemented this model and has been delivering results to a great degree of satisfaction for all the stake holders.

Being an in house academy this model also leads to the ease of creation of PM cases for future study.

Accreditation of courses conducted by such academies by PMI, IPMA et al would foster PM knowledge spread and management among the industry and community.

Creation of an academy like L&T I'PM, however, requires wholehearted commitment of management, finances and intellectual inputs.

Results emanating out of the efforts of similar academies would be enormous in terms of creation of excellent project practitioners, knowledge base leading to establishing PM as a disciplined science of engineering.

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1.18 Author(s) Profile

He is presently leading the one-of-a-kind institution established by Larsen&Toubro (www.larsentoubro.com), for enhancing project management knowledge and skills among project managers of Larsen&Toubro.

Project management knowledge areas of special interest for him are: Project Risk analysis, Pre-bid risk analysis and bidding models.

He, with his impeccable academic credentials and several years of International /national industrial and academic experiences, currently contributes significantly to the evangelism of Project Management concepts in India.

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