Ci3 *India* Consultants' Roundtable

18th October 2016
at IIT Madras

Summary Report

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1. CI3 *INDIA* BACKGROUND

1.1 Background

The last two decades saw the Indian economy grow significantly. Investments of about 1 trillion USD are projected in the infrastructure sector in 2014-2017 (Make in India, 2016). This expansion of India's vast infrastructure presents enormous opportunities, along with challenges. India's population has surpassed 1.2 billion, and continues to grow. It is expected that nearly 590 Million people will live in Indian cities by 2030. This will accelerate growth in housing, commercial, industrial and infrastructure sectors (Make in India, 2016). We need to regenerate urban areas in existing cities and create new, inclusive smart cities to meet demands of both increasing population and migration from rural to urban areas. To manage this growth, considerable efforts are required to boost the capacity of the sector.

Experience in India and other countries, shows that significant and sustainable industry improvements, along with the necessary culture change, must be championed by a core group of enlightened large clients with a long-term vision for value-driven project delivery. Supply chains will only respond when their paymasters' selection and performance criteria require them to improve in desired directions. A critical mass of large clients must act together, in order to initiate new norms and standards, so that major supply chains realize they must change their mind-sets and ways of working (to stay in business), while end-users appreciate that they are receiving better value from such progressive suppliers (rather than seeking apparently 'cheaper' products elsewhere). Large clients spearheading such change will reap more and faster benefits; and with a stronger foundation as well. Therefore, the Construction Industry Improvement Initiative India - Ci3 *India* was conceived to empower this transformation. The ultimate aim of Ci3 *India* is to drive meaningful and sustainable industry improvements by actively involving all the major stakeholders at appropriate stages of this journey.

1.2 Ci3 *India* Objectives

The major objectives of Ci3 *India* are:
(1) To identify current and imminent critical issues in the Construction Industry in India
(2) To compile a Roadmap for industry improvements in strategic high (& wide) impact domains
(3) To launch (a) system improvement initiatives and (b) demonstration projects, in prioritized focus areas within the above strategic domains

2. CI3 *INDIA* OVERVIEW & OVERALL STATUS

2.1 First Regional Roundtable

As a first step towards Ci3 *India*, the inaugural cum first Regional Roundtable of Building Construction Clients was conducted on 14th October 2015 at IIT Madras, Chennai. Ci3 *India* was officially launched to address the above needs by Prof. Bhaskar Ramamurthi, Director, IIT Madras, who provided interesting perspectives on the imperatives and potential for

construction industry upliftment. The aim of the first Regional Roundtable was to explore the first major objective of Ci3 *India* – "to identify current and imminent issues in the Construction Industry in India". Participants at the first Regional Roundtable were Large Building Construction Clients invited from Chennai, Bangalore, Pune and Mumbai. The preliminary broad themes/ domains at this first Regional Roundtable were Project Management, Construction Management and Construction Project Ecosystem.

The welcome address and the launch of Ci3 *India* were followed by the morning plenary session, which included keynote speeches from industry and academia. In the afternoon, three Focus Groups brainstormed in parallel on the above mentioned three different broad themes. The aim of the Focus Group sessions was to identify and develop consensus on current and imminent critical issues identified under each of the three identified themes and suggested sub-themes. Focus Group presentations of 10 minutes each, were followed by a consolidation session. The following were the 16 critical issues identified in the three Focus group sessions at the first Regional Roundtable:

1. Lack of client involvement and competence
2. Lack of trust between stakeholders
3. Shortfalls in proper standards for better project formulation
4. Sub-standard and one-sided contracts
5. Acute shortage of skilled workmen
6. Low productivity
7. Lack of productivity benchmarks and standards
8. Lack of innovation
9. Hindrance to off-site (pre-cast/ pre-fab) construction
10. Inadequate quality
11. Inadequate governance by owners and transparency
12. Lack of proper facilities for workers
13. Improper supply chain management and need to shift to alternate contracting approaches
14. Lack of technology adoption
15. Reluctance to adopt new work practices such as Lean practices
16. Need for better contractor selection system

Focusing on first order prioritization of the emerging issues, this session also yielded an Action Plan with a Way Forward for the Second Regional Roundtable at Mumbai.

2.2 Second Regional Roundtable

In keeping with the imperative to mobilize the national construction industry, it was decided at the outset to hold the second major event of Ci3 *India* in another major regional hub. Thus "Ci3 *India* Developers' Roundtable" (the Second Regional Roundtable) was arranged in Mumbai and held at Hotel Taj Lands End, Bandra, Mumbai on 23 February, 2016. The participants at this roundtable were mostly high level representatives of large construction developers from the Mumbai region.

The focus of the second Regional Roundtable was to disseminate, verify, validate and then to consolidate the current and imminent critical issues in the Indian construction industry which were identified in the three parallel focus group session conducted at the first Regional Roundtable. For this purpose, it was organized in Mumbai, so as to bring on board a set of high caliber construction clients from another important region in India, with potentially fresh insights. Another aim of this Developers' Roundtable was to also develop and disseminate the business case for moving over to holistic cost-efficient and time-efficient construction paradigms, i.e. moving away from the current disparate thrusts for individual stakeholder optimization, towards broader-based, longer-term and well-focused building construction industry eco system value maximization.

The second Regional Roundtable was conducted as one combined focus group, starting off with an overview of the issues identified at the first Regional Roundtable. While these outcomes from the first Regional Roundtable were commented on and endorsed, in general, the degree of emphasis varied on the relative importance/ criticality of each issue. In addition, a few other critical issues were identified, brainstormed and consolidated along with the base set, at this second Regional Roundtable. The additional 'critical' issues were primarily summarized as:

17. Inefficient design process management
18. Uneconomical design codes and operational standards
19. Outdated operational design codes (i.e. to realistically update and rationalize relevant design codes to increase efficiencies, while also targeting quality, safety, and sustainability of construction processes and the built assets).

Therefore, a total of 19 current and imminent critical issues were identified, verified and validated through the two Regional Roundtables.

2.3 Action Items and Action Teams

To address the identified 19 current and imminent critical issues in the Indian construction industry, these issues were rationalized and consolidated into specific Action Items. An Action Team was assigned to work on each Action Item. The Action Teams include industry participants from Chennai and Mumbai Roundtables, academicians, and other invited experts. The seven Action Teams are:

Action Team – 1: Identification and formulation of KPIs
Action Team – 2: Strategies for significantly reducing Construction Project Time-frames & Costs
Action Team – 3: Design processes and Technology adoption
Action Team – 4: Design codes and Standards
Action Team – 5: Human capital (including Labour, Technical, and Managerial, and Skills Development) and Productivity
Action Team – 6: Construction Clients' Charter
Action Team – 7: Institutional Platform

Five of the Seven Action Teams, i.e. Action Teams 1, 2, 3, 5 & 6 had worked on their specific Action Items for about 6 months and produced some valuable outputs. The outputs of the Action Teams were presented as "Action Team Working Papers" at this Consultants' Roundtable.

3. CI3 *INDIA* CONSULTANTS' ROUNDTABLE OBJECTIVES

The main objectives of the Consultants' Roundtable were:

(1) To invite the major Architect, Design and Project Management Consultants to add their valuable perspectives and inputs to Ci3 *India*, before we eventually bring on board the major contractors, so that the industry can move forward together with a unified agenda.

(2) Sharing, discussing and developing the interim outputs of each Action Team with the invited Consultants.

(3) Joint brainstorming and deciding the best ways to finalize, disseminate and action our final outcomes and recommendations.

4. SUMMARIES OF CI3 *INDIA* ACTION TEAMS' WORKING PAPERS AND PRESENTATIONS

The following sub-sections summarize: (i) the Working Papers that were in the hand-out issued to participants, along with (ii) the corresponding presentations made by each Action Team.

4.1 Action Team 1 - Identification and Formulation of Knowledge Performance Indicators (KPI's)

The potential value and indeed imperative for developing and deploying useful KPIs 'appropriately' in an industry improvement initiative such as Ci3 *India,* was conveyed, along with the need to differentiate between KPIs at (a) macro/industry level e.g. overall productivity; (b) 'meso' - organizational level e.g. financial ratios; (c) 'meso' – project performance level e.g. project time and cost performance or accident levels; (d) micro/ activity level e.g. of work norms of specific trades/ activities.

The original objectives of Action Team 1 were recapped as: (1) To identify and develop in stages, a set of useful Key Performance Indicators (KPIs) for the Indian Construction Industry; and (2) to formulate project level KPIs in stages, firstly focusing on building construction clients and initially targeting their use by a 'Benchmarking club' of leading building construction clients. *Note*: It was later proposed to extend these to other industry stakeholders, as well as other (non-building) sub-sectors such as highways.

The Team 1 Actions Flowchart showed how the current working KPI template was carefully developed in stages, with brainstorming, drafts and refinements at and between a series Conference Calls and working sessions. Examples were provided for comparison, of KPIs developed and publicized by the Hong Kong and UK industry. Feedback was again invited (in the relevant columns of the KPIs spreadsheet) on the value and viability of the KPIs listed in the eight A3 page working template. It was noted that (i) 'weighting indicators' to adjust typical values for specific contexts/ conditions and (ii) the typical values themselves, needed

to be developed/derived. The latter may be best derived through the proposed benchmarking club.

4.2 Action Team 2 - Study on Project Time and Cost

The Ci3 *India* Action Team 2 was conceived to identify issues that impact time and cost overruns in construction projects. The objectives of this Action Team are: (1) To identify factors that impact time and cost in projects; (2) To recommend best practices, mitigation measures and appropriate policy recommendations to alleviate factors that impact time and cost; (3) To identify stage wise targets to reduce time and cost in construction projects.

As a first step, to set the context of the study, a kick off concept paper was developed by reviewing literature on time and cost in construction projects. Subsequently the Team members experiences and perspectives on issues impacting time and cost were collected by means of an open ended discussion through a conference call. Also the members suggested that the issues to be studied pertaining to the three project phases viz. – Concept, Planning and Design, Execution. Literature was reviewed and issues specific to the aforementioned phases were identified. 52 issues were verified as relevant by the Team members and it was recommended that the issues should be sent to a broader audience to understand and possibly highlight the issues that have significant impact on time and cost. A questionnaire survey was designed and sent to around 60 people through Ci3 *India* participants. Respondents were asked to rate the impact of the issues in terms of both time and cost. A little more than 50% responded and the Relative Importance Index (RII) was calculated to find the issues that significantly impact time and cost. The identified issues are briefly covered in the working paper.

4.3 Action Team 3 - Design Processes and Technology Adoption

4.3.1 Action Team 3A - Design Processes

The efficiency and effectiveness of the design process contributes significantly to performance of a building construction project. During the initial stages of a project, the influence of design decisions is high, whereas the cost incurred in implementation is low. There are no standards specifying the building design process in India. Hence there are no benchmarks based on which activities in the initial project phases can be planned and monitored. This results in an adverse impact on the downstream phases. The Action Team collected and analysed design process data from different organizations developing building projects.

The analysis revealed that there was significant variability in design durations due to organizational priorities. However, there were no documented standards or benchmarks on the appropriate design duration for various types of projects. In order to develop such benchmarks, it is proposed to standardize milestones and durations associated with the design process. The preliminary work done towards developing a design management standard is reported in the Working paper. This includes the development of standard design workflows and phase durations based on project type. It is anticipated that the availability of a standard will enable better planning and implementation of the design phase.

4.3.2 Action Team 3B - Technology Adoption

The construction industry has generally been a late adopter of technologies that can improve project productivity. There are inherent characteristics of the industry that are identified as reasons for delayed adoption of technology. Anecdotal evidence indicates that most

technology adoption efforts fail, if people, processes & policies are not in place to support the technology platform.

The objectives of this Action Team are to: (1) Discuss and understand the drivers of technology adoption process in the Indian construction industry; (2) Identify issues and barriers in the current technology adoption process and the root causes for the same; (3) Develop strategies for improving the technology adoption process in order to meet project delivery requirements of today and tomorrow as outlined by other action items. Barriers to adopting equipment and IT technologies were identified by the team members by means of a workshop. Recommendations were provided to focus the study on two different parts: (1) to study the barriers for effectively and fully using existing technologies in the industry (e.g. Software for time management i.e. MS Project/ Primavera); and (2) to conduct a survey to understand the industry perceptions on barriers to adopting technology in construction. The survey parameters have been chalked out and it is expected to float the survey in the near future.

For the first part, a pilot study was conducted to identify issues in effective usage of time management software. Project schedules were collected and assessed with the standards and benchmarks. Parameters such as logical ties, leads, lags, floats, and activity durations which are essentially 'mechanics' of a schedule were found to be erroneous. Issues such as lack of skilled planning engineers, clients not mandating good schedules, lack of benchmarks and standardized processes to develop, update and maintain schedules were found to be barriers for effective usage of time management tools.

4.4 Action Team 4 - Design Codes and Standards

This Action Team requires a long term exercise, since each code/ standard has been laboriously compiled after agreement by teams of discipline experts. Also most codes/ standards have been in place for decades but need significant changes that suit recent and emerging design requirements of buildings.

A Team Leader has been identified and few members from those involved with ongoing review of the national building code will be nominated. The primary focus of the Team is to (a) work out a stage-wise strategy, and (b) identify which codes/ standards to target in the first stage.

4.5 Action Team 5 - Human capital (including Labour, Technical, and Managerial, and Skills Development) and Productivity

Action Team 5 was formulated to look at "Human Capital (including Labour, Technical & Managerial, and Skills Development) and Productivity" addressing the issues such as low productivity, acute shortage of skilled workers, lack of proper facilities for workers, need for up-skilling construction professionals, inadequate quality and lack of productivity benchmarks and standards. Based on the discussions with the Action Team members the following agenda was proposed in the Working paper.

a. *Business case for Quasi-Formalization of workforce*
Payment delays and manager-sub-contractor-crewmen inter-personnel dynamics were identified as one of the major reasons for high 'human turnover in the industry resulting in the average age of construction workers being only 28 years. Thus the following initiatives

for 'Quasi-formalization' of workforce were suggested and could be demonstrated in 'Demo-project sites':

      i) Mandatory digital bank account wage- payments for monitoring actual wages to last-mile-sub-contracted workers.

      ii) Provision of 'Site-id' with access control-based attendance to digitally log attendance to be used for time-sheeting of wage/OT calculations.

b. Making construction sector 'aspirational' for workers

The construction industry, unlike the manufacturing industry does not engender the same sense of 'aspiration' from a professional perspective. The following initiatives can be piloted:

i. Uniforms like 'overalls' for all site-workers (to be issued along with helmets, shoes) to ensure a 'factory-like' environment at construction site

ii. Weather-resistant accommodation (using pre-fab materials like Bison boards), along with on-site canteen, entertainment, bus-travel facility (to be provided, if need be on a deductible basis) like in the Middle East.

c. Formally trained and certified workforce to be mandated and measured at least for semi-skilled and skilled jobs to understand impact on productivity over time. Up-skilling of professionals on advanced technologies is also proposed

i. Monitoring of productivity-wages-paid based on skill levels to ensure a premium over minimum wages is paid to semi-skilled/skilled workers for ensuring their retention and also understand RoI in terms of productivity for the same.

ii. Formal training to ensure entry of 'semi-skilled' assistants instead of unskilled helpers.

iii. 'Finishing school' for professionals with up-skilling on latest technologies.

d. Productivity-linked wages as against government-set minimum wages:

The current 'bipolar paradigm' of rate contract vs. wage contract represent two ends of spectrum with rate contract being 100% variable pay, ridden with full performance risk to the sub-contractor but zero risk to the manager, but also leading to minimal loyalty by a sub-contractor who switches if he detects possible loss making, or if he gets a chance to earn more or risk less in a neighboring site, thus creating delays. The other end of the spectrum is the wage contract which has no performance risk for the sub-contractor but transfers complete risk, cost to the manager. A new possibility is a composite metric of productivity linked wages with government-set minimum wages as fixed component and productivity linked-incentive as variable component. For rate contract seekers, the same can be reversed with productivity linked incentive/rate being the substantial component and headcount related incentive as incentive component. Thus a research study is needed for:

1. Designing a productivity-linked-payment system with both fixed and variable components for both rate and wage contract.

2. Usage of technologies like pre-cast to understand their RoI from a scientific perspective in terms of wage-productivity-investment-RoI calculations.

4.6 Action Team 6 - Construction Clients' Charter

The '*purpose*' of the Charter is to obtain a joint commitment of industry leaders and set an example, with a pledge to commit to and practise sound core values and progressive strategies as Construction Clients, that would benefit all construction industry stakeholders including end-users of the constructed products.

The *'Draft Charter with a Framework for development'* was presented with (A) four groups of underpinning *priorities* i.e. (i) overall, (ii) expectations from supply chain, (iii) pledges to supply chain, (iv) pledges to end-users; and (B) a *Charter Structure with indicative Examples* of 'Core Principles & Key Protocols' under six themes – Procurement & Contracting Strategy, Overall Project Implementation & Delivery Strategy, Design Management, Construction Management, Supply Chain Management, Overall Project Monitoring & Control.

The above had been developed in stages by Action Team 6 with a Literature Review and Conference Calls etc., followed by Focus Group Meetings within Sub-Team 6A. *Note*: Sub-Team 6A was formed more recently to focus further on developing this Draft Charter that was initially brainstormed by the whole Team 6 together. Action Sub-Team 6B (set up in parallel with 6A) initiated a framework for a 'Contractor Rating System' - so that signatories to the Clients' Charter could eventually choose to declare that they would only employ Contractors who have achieved a certain 'rating'. This was expected to extend to the rest of the supply chain, including consultants and could eventually loop back to a rating of clients too.

The Construction Clients' Charter is expected to be *pivotal* to the success of Ci3 *India*, since "***all other Action Teams*** *would feed us their own relevant critical inputs* in terms of core principles and best practices in their domains that they believe should be enshrined in the 'Charter'". Explicit top management endorsement by signing this Charter should make implementation much easier.

Appendix III shows the Current Action Teams list.

5. CONSULTANTS BRAINSTORMING SESSION FOR COLLECTIVE BREAK THROUGHS

The following summarizes the key points discussed in the consultants brainstorming session,

- Late 'untimely' decisions

- Lack of 'ownership' of important Client decisions – avoid taking responsibility for decisions e.g. in 'signing-off' on designs. Indeed some project management software facilitates 'ownership', if client must 'press a button' to pass on to next stage, but this should happen even without such software.

- Delayed payments

- Need to upskill' / upgrade competencies of some key personnel of clients including supervisors and even some middle and top management

- Need to upskill consultants too

- Need to inject contractor and operator inputs into designs

- Planning is badly neglected, the emphasis being on scheduling

- Scheduling should include not just the construction phase, but also the planning and design and post-construction phases

- Unrealistic Durations imposed on projects – but this point also triggered a debate on how compressed durations may provoke/ generate 'outside the box' innovations to shorten durations if really needed and feasible.

- Some other industries have standardized design processes & practices – e.g. we can learn lessons from heavy civil infrastructure e.g. design programme milestones such as 'procurement initiation after 30% design'; 'substructure construction after 70% design …

- Documentation process needs to be stronger and workflow driven

- Many Design Codes are seriously out-dated.

- Unnecessarily high partial safety factors and high tolerances to compensate for uncertain workmanship

- Lack of 'performance-based design' and 'service life designs'

- Need to design for maintainability, durability, sustainability and longer design life. Should change emphasis from CAPEX to OPEX

- Industry image needs a significant boost

- Ci3 *India* Clients Charter should help improve image

- Workers need better facilities & other attractions to stay longer in our industry

- Slow to adopt new technology, including modern systems, equipment & tools – worse / slower in non-urban centers

- Slow to develop and deploy sustainable systems & technology

- Inequitable Risk allocation across stakeholders and lifecycle

- Clients should be prepared to pay extra for safety, environmental safeguards and other desired improvements e.g. as in the Qatar Foundation mandatory EHS (Environment, Health & Safety) standards

- Role of Insurance industry and Financiers in incentivizing industry improvements?

- The Construction Owners' Association of Alberta <http://www.coaa.ab.ca/> have developed an industry support programme comparable to some of the Ci3 *India* proposals; and a group of 4 to 5 clients took charge of (and championed) each of the many initiatives. Can Ci3 *India* follow a similar strategy?

- 'Change management' needs emphasis throughout the cycle

- Ci3 *India* should act as a 'change guide' for construction industry. Important to remain and to be seen as independent and neutral to retain respect.

6. ACTION PLAN AND WAY FORWARD

The Ci3 *India* journey was projected, as in attached Fig. 1, from its launch in Oct 2015, along with the first Clients' Roundtable in Chennai, the verification and addition to identified critical industry issues at the Developers' Roundtable in Mumbai in Feb. 2016 and the formation and deployment of Action Teams in March 2016. The time-line running down the

left of Fig. 1 along with the Action 'Activators' progressing down the right side, show the drivers underpinning the development of the Actions and Outcomes that flow from top to bottom in the middle of Fig. 1. It was noted that we had completed 'Phase 1' as planned if not better, being now well-positioned at the bottom of the 2nd box in the middle 'column', with our Working Paper presentations at the two Roundtables on 18th and 19th Oct. 2016. Based on feedback before and also at this Roundtable, the outputs were considered to have exceeded expectations, and are well worth pursuing further. Ci3 *India* had proved itself as an excellent vehicle for revisiting Construction Industry practices and identifying barriers to increasing our performance levels. We should now launch 'Phase 2' for 'Solutions formulation'.

To kick-off Phase 2, the Action Groups have been requested to extend their remit to develop the Working Papers into Draft White Papers by 10 Dec, 2016, so that these may be finalized and consolidated into a Draft Ci3 *India* White Paper in Jan. 2017 and finalized by June 2017.

Based on the very encouraging and snowballing support from industry, it is proposed to implement some of the recommended industry improvements in pilot/ demonstration projects. Wider 'system improvements' could then be launched in stages, starting with a few organizations across a project portfolio and/or a group of organizations together.

'Phase 3' would include spreading the benefits by engaging more industry clients and their principal supply chain members, key Government bodies, and in general disseminating as widely as useful and possible.

Finally, as in Fig. 1, a mechanism is needed for periodic review of implementation and improvements, so that we could continue to position and empower our industry to target the priorities of the day, bearing in mind that we are aiming at moving targets.

It was agreed that we need to eventually extend our methodology and spread the benefits beyond 'buildings' to other sub-sectors of the construction industry including transport (with roads, bridges, airports etc.) and irrigation, water, sewerage & drainage etc.

We briefly discussed possible options for a well-structured institutional platform that would be needed for Ci3 *India* to move forward as above. Funding and human resources would also be needed as in Fig. 2, which was projected to trigger brainstorming as 'one option' for positioning and fueling the way forward. Other options and ideas or suggestions as regards a viable institutional platform, were invited either at, or soon after, this "Consultants' Roundtable", also noting that there would be further group brainstorming on this crucial item at the "Consolidation Roundtable" on the following day, i.e. 19th Oct. 2016.
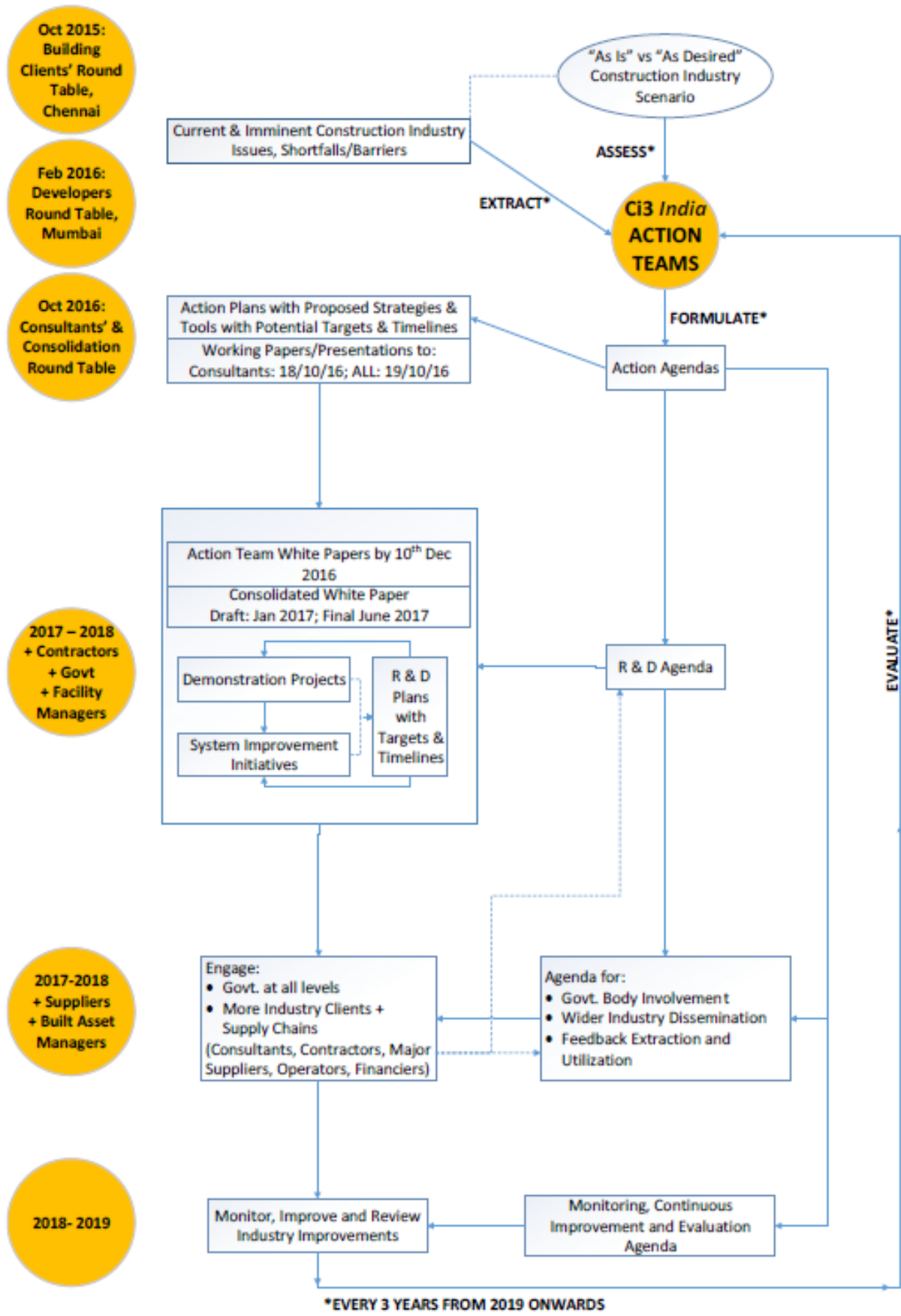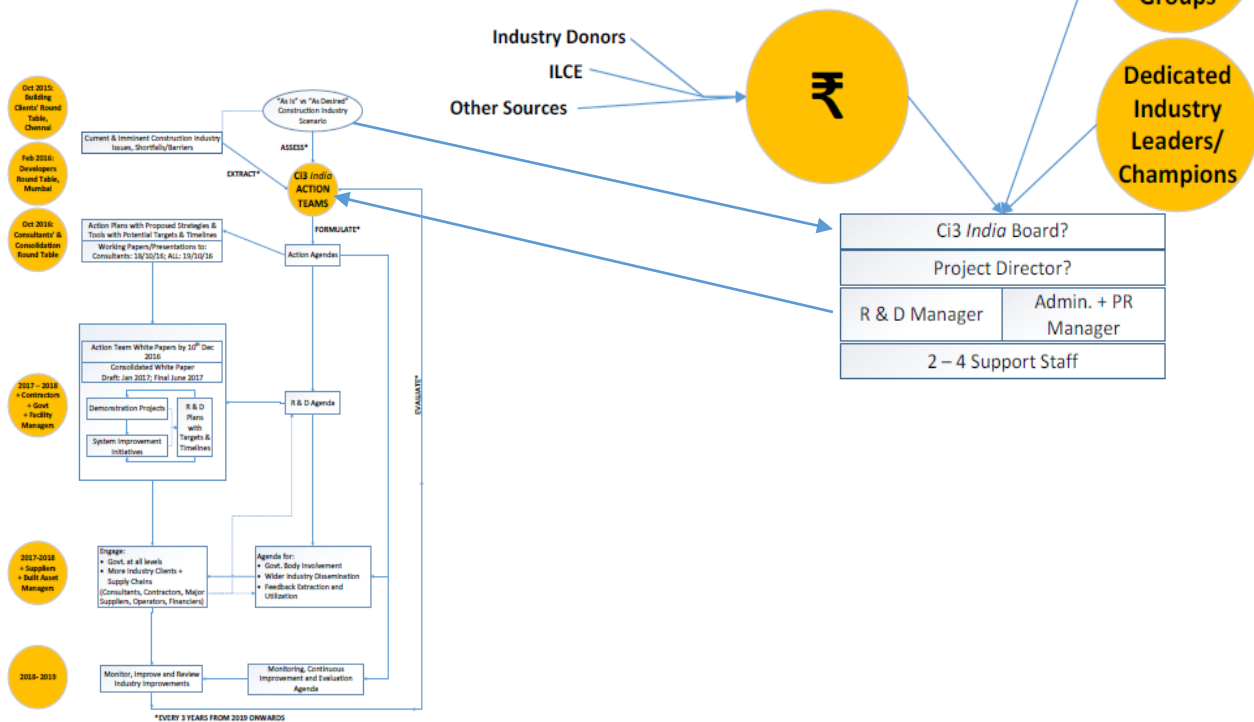
Fig. 1. Ci3 *India* Roadmap

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*ILCE – Institute for Lean Construction Excellence

Fig. 2. Ci3 *India* Roadmap with Funding and Human Resource Inputs – One Option?

7. ACKNOWLEDGEMENTS

8. DISCLAIMER

This summary report was prepared from available information from recordings of discussions, presentations and notes of recorders which were compiled to the best of their ability, given some constraints. The summaries convey interpretations of the main points

from the above by the recorders. They are certainly not exhaustive and may not accurately reflect the specific views or priorities of the speakers, focus groups or whole Roundtable.

9. ORGANIZING COMMITTEE

Prof. Mohan Kumaraswamy, T.N. Subba Rao Brigade Group Adjunct Chair Professor, IIT Madras

Prof. K. N. Satyanarayana, Professor of Civil Engineering, IIT Madras

Prof. Koshy Varghese, Professor of Civil Engineering, IIT Madras

Santhosh Loganathan, PhD Research Scholar, IIT Madras

Purshothaman Srinath, PhD Research Scholar, IIT Madras

with special thanks to:

Dr. Gangadhar Mahesh and Mr. Johan Ninan for rapporteuring the brainstorming sessions

Mr. Mathew Joe and Ms. Vijayalaxmi for helping with diagrams preparation and presentations support

Office Staff, Building Technology and Construction Management division, Dept. of Civil Engineering, IIT Madras

APPENDIX I - Programme

	CONSULTANTS' ROUNDTABLE PROGRAMME	
10.30 – 11.00	Registration and Fellowship	**ALL**
11.00 – 11.15	Welcome Address	**Prof. Koshy Varghese**, Professor of Civil Engineering, IIT Madras
11.15 – 11.30	Ci3 *India* – Overview, Status & Roundtable Objectives	**Prof. Mohan Kumaraswamy,** T.N. Subba Rao Brigade Group Adjunct Chair Professor, IIT Madras
11.30 – 11.50	Action Team: 3 Design Processes & Technology Adoption - Presentation	**Prof. Koshy Varghese, Mr. Mathew Joe, Ms. Vijayalakshmi** and **Mr. S P Srinath,** IIT Madras
11.50 – 12.00	Action Team 1* - Overview	**Prof. Mohan Kumaraswamy**
12.00 – 12.10	Action Team 2* - Overview	**Mr. Kalyan Vaidhiyanathan,** Nadhi Technologies
12.10 – 12.20	Action Team 4* - Overview	**Prof. Mohan Kumaraswamy**
12.20 – 13.00	Joint Brainstorming Session	**ALL** (moderated by: **Prof. Koshy Varghese** and **Prof. Mohan Kumaraswamy)**
13.00 – 14.00	**Lunch**	
14.00 – 14.15	Action Team 5* - Overview	**Mr. Kalyan Chakravarthy, PanIIT** and **Mr. Santhosh Loganathan,** IIT Madras
14.15 – 14.30	Ci3 *India* – Construction Clients' Charter – Overview & Discussion	**Prof. Mohan Kumaraswamy** and **Dr. Ashwin Mahalingam**, IIT Madras
14.30 – 15.30	Ci3 *India* – Way Forward (Consultants' Perspectives, Concerns and Contributions)	**ALL** (moderated by: **Prof. K. N. Satyanarayana, Prof. Koshy Varghese**, **Prof. Mohan Kumaraswamy** IIT Madras)**

*

Action Team 1: Identification and formulation of KPIs

Action Team 2: Strategies for significantly reducing Construction Project Time-frames & Costs

Action Team 4: Design Codes and Standards

Action Team 5: Human capital, Productivity and Skills development

APPENDIX II – ROUNDTABLE PARTICIPANTS

1. Dr. G. S. Venkatasubramani, S. G. Structural Engineers
2. Dr. Gangadhar Mahesh, NIT Surathkal
3. Dr. Harshavardhan Subba Rao, Construma Consultancy
4. Mr. Hari, JLL
5. Mr. Hrishikesh Joshi, TRIL
6. Mr. Kalyan Vaidyanathan, Nadhi Technologies
7. Mr. Kavin Kumar, EPMCR
8. Mr. Mennakshi Sundaram, WTP India
9. Mr. Mithun Raj, Jacobs Engineering
10. Mr. Mohan Ramanathan, Advanced Construction Technologies
11. Mr. N. Rajagopalan, Raj Bharath Engineering Solutions
12. Mr. Nikhil Kanade, SP Realty
13. Mr. P. S. Soma Sundar, FABS
14. Mr. Parthasarathy, TCE
15. Mr. Prakash Patil, TRIL
16. Mr. Ravi H B, Cushman Wakefield
17. Mr. Santhosh Jayarajan, TRIL
18. Mr. Tamil Selvan, TVS EHRL
19. Mr. Thirumanan, Brigade Group
20. Mr. VT Chandrasekara Rao, Shreshta Solutions LLP
21. Prof. Mohan Kumaraswamy, IIT Madras
22. Prof. K N Satyanarayana, IIT Madras
23. Prof. Koshy Varghese, IIT Madras
24. Dr. Ashwin Mahalingam, IIT Madras
25. Dr. Sivakumar Palaniappan, IIT Madras
26. Mr. Santhosh Loganathan, IIT Madras
27. Mr. S P Srinath, IIT Madras
28. Ms. Vijayalaxmi, IIT Madras
29. Mr. Mathew Joe, IIT Madras
30. Mr. Marimuthu, IIT Madras
31. Mr. Johan Ninan, IIT Madras

Appendix III – CURRENT ACTION TEAMS LIST

Team No #	Action Item 'header' #	Team Members from Academia * (Leader/ Co-ordinator highlighted)	Team Members from Industry *	
			From Oct. 2015 & Oct. 2016 Chennai Roundtablers AND nominees	From Feb. 2016 Mumbai Developers' Roundtablers AND nominees
1	Identification and formulation of KPIs	Prof. Mohan Kumaraswamy (IITM) Dr. Gangadhar Mahesh (NIT Surathkal) Dr. Venkata Delhi (IITB) Mr. Santhosh Loganathan (IITM)	Mr. Chandramouli (TVS) Mr Thirumanan, Vice President (Projects) (Brigade) Mr. Tamil Selvan (TVS) Mr. S. Hari (Jones Lang LaSalle)	Mr. Sanjay Ubale (TRIL) Mr. Kekoo Colah (SP) Mr. Kishore Bhatija (K. Raheja Corp.) Mr. Prakash Patil (TRIL) Mr Hari Govind (TRIL) Mr Shabbir Kanchawala (K Raheja Corp.)
2	Strategies for significantly reducing Construction Project Time-frames & Costs	Prof. K N Satyanarayana (IITM) Mr. Srinath (IITM)	Mr Ramamoorthy Venkateswaran (Wipro) Mr. Kalyan Vaidiyanathan (Nadhi Technologies) Mr. E. Tamilselvan (TVS) Mr. B. Parthasarathy (TCE)	Mr. Prakash Patil (TRIL) Mr. Venugopalan Machiraju (SP) Mr. Shabbir Kanchwala (K. Raheja Corp.) Mr. Joshi (TRIL) Mr. Santhosh Jayarajan (TRIL)
3	Design processes and Technology adoption	Prof. Koshy Varghese (IITM) Dr. Gangadhar Mahesh (NIT Surathkal) Mr. Srinath (IITM)	Dr. Harshavardhan Subba Rao (Construma Consultancy) Mr. Hari Hegde (Wipro) Mr. Kalyan Vaidiyanathan (Nadhi Technologies) Mr. Tamil Selvan (TVS) Mr. Mohan Ramanathan (ACT) Mr. B. Parthasarathy (TCE)	Mr. Prakash Patil (TRIL) Mr. Venugopalan Machiraju (SP) Mr. Shabbir Kanchwala (K. Raheja Corp.) Mr. Joshi (TRIL) Mr. Santhosh Jayarajan (TRIL)
4	Design codes and standards	Agreed that this needs a **long term exercise**, since each code/ standard has been laboriously compiled after agreement by teams of discipline experts. Also most codes/ standards have been in place for decades as per many examples discussed at the **Consolidation Roundtable on 19 Oct. 2016.** Mr. Hari Hegde (Wipro) had volunteered to lead this Team and Dr. Harshavardhan Subba Rao (Construma Consultancy), Mr. Sharad Sabnis (TRIL) volunteered to join this Team **We invite you to nominate** any suitable/ well positioned persons e.g. those currently or previously involved with up-dating codes/ standards **who would** (a) work out a **stage-wise** strategy, and (b) identify which codes/ standards to **target in the first stage**.		
5	Human capital, incldg. Labour, Skills Development & Productivity (covers Action Items 5.1-5.4 in the detailed Action Items listing, now 5a, 5b, 5c, 5d)	Prof. K N Satyanarayana (IITM) Dr. Sivakumar Palaniappan (IITM) Mr. Santhosh Loganathan (IITM)	Mr. Mahalingam (TCS) Mr. Chitty Babu (Akshaya Homes) Mr. Kalyan Chakravarthy (PanIIT) Mr. Srinivasan P P (CPWD) Mr. Suresh (PWD-Pondicherry) Mr. Jeevadayalan (PWD-Pondicherry)	Mr. Prakash Patil (TRIL) Dr. Venkata Delhi (IITB) Prof. Cyrus Dordi (IITB) Ms. Anita Rajan (TRIL)
6	Construction Clients' Charter	Prof. Mohan Kumaraswamy (IITM) Dr. Ashwin Mahalingam (IITM) Dr. Gangadhar Mahesh (NIT Surathkal) Dr. Venkata Delhi (IITB) Mr. Santhosh Loganathan (IITM)	Mr. Mahalingam (TCS) Mr. Srimanikandan Ramamoorthy (CTS) Mr. P. Ganesh (CTS)	Mr. Sanjay Ubale (TRIL) Mr. Kekoo Colah (SP) Mr. Kishore Bhatija (K. Raheja Corp.) Mr. Shabbir Kanchwala (K. Raheja Corp.) Mr. Joshi (TRIL) Mr. Santhosh Jayarajan (TRIL)