

Identifying and Addressing Critical Issues in the Indian Construction Industry: Perspectives of Large Building Construction Clients

Santhosh Loganathan¹, *Purushothaman Srinath¹, Mohan Kumaraswamy^{2,3},
Satyanarayana Kalidindi¹ and Koshy Varghese¹

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Abstract: The Indian construction industry faces increasing challenges amidst serious performance shortfalls. Confronting similar issues in past decades, other countries such as the UK, USA, and Singapore commissioned high-powered studies and set up industry development bodies to address their own priorities. Initiatives in other countries are briefly reviewed before outlining the launch of the “Construction Industry Improvement Initiative India” (Ci3 India) that aims to address our own challenges. This paper focuses on identifying and launching a platform to address the current and imminent critical issues in the Indian Construction Industry. Nineteen critical issues were identified, verified, and validated through four focus group sessions at two Regional Roundtables with 54 high calibre large building construction clients, academicians, and other invited experts. The identified issues were consolidated to 10 Action Items. Seven Action Teams were then mobilized to work on the 10 Action Items. Having consolidated a base consensus of clients on the way forward, it was also proposed to develop a “Construction Clients’ Charter” that will set out basic principles, protocols, and targeted good practices by lead clients, who by voluntarily agreeing and implementing these together, could catalyse significant industry improvements.

Keywords: Construction industry development, Critical issues, Ci3 India, Construction Client’s Charter, Indian construction

INTRODUCTION

Construction activity is an integral part of a country’s infrastructure and industrial development. Historically, the Indian construction industry is one of the oldest and the second largest economic sector in the country next to agriculture providing large scale employment. Before independence, construction activity in India was confined to buildings and basic transportation infrastructure. After independence, the need for accelerated industrial, real estate, and infrastructure development laid the foundations for revitalizing architectural, engineering, and construction services. In this respect, the evolution of the Indian construction industry is similar to the general pattern in some other post-colonial economies. While initially driven by the government, private companies have gradually increased their share and contributions to the Indian construction industry. For instance, after independence

¹Department of Civil Engineering, Indian Institute of Technology Madras, INDIA

²T.N. Subba Rao Brigade Group Adjunct Chair Professor, Indian Institute of Technology Madras, INDIA

³Honorary Professor, The University of Hong Kong, HONG KONG

*Corresponding author: psrinath@gmail.com

during the execution of Bhakra Nangal dam, the government realized the increased need for professional competence in the field of construction and established the first professional consultancy company named National Industrial Development Corporation (NIDC) in 1954. Subsequently, a number of specialty companies in design and private construction came into existence.

In the present scenario, an investment of 1 trillion USD is projected in the infrastructure sector in 2014–2017 (Make in India, 2014). 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 (Agarwal, 2013). 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, 2014). The country 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 (DMG Events India, 2015).

To manage this growth, considerable efforts are required to boost the capacity of the sector (Sawhney, Agnihotri and Paul, 2014). In recent times, India has stepped up its development agenda (Laskar and Murty, 2010). For example, a working group of the Planning Commission of India recommended that a trillion US dollars—or almost 10% of India's GDP—be spent on infrastructure by 2017 (Schwab, 2011).

The smart cities initiative of the Indian government is one such initiative to meet these demands. Smart cities focus on the most pressing needs and on the greatest opportunities to improve the quality of life for residents today and in the future (India Smart Cities Challenge, 2016). Similarly, the “housing for all” mission (named as Pradhan Mantri Awaas Yojana-Gramin) by Government of India would be implemented in all rural areas. The mission aims to construct 20 million houses across the length and breadth of the nation within a span of seven years (2015–2022), including 10 million households to be provided assistance for construction of “pucca house” – meaning solid and permanent house, during 2016 to 2019 (Ministry of Housing and Urban Poverty Alleviation, 2015).

As Iyer and Jha (2006) lament, despite the Indian construction industry gaining prominence recently, with the opening up of Indian markets and the proliferation of megaprojects for infrastructure development, the performance of Indian construction projects has not been encouraging. According to the World Economic Forum report of 2013–2014, India ranks 87th in the infrastructure area of the global competitiveness index (Schwab, 2013). A study by the Ministry of Statistics and Program Implementation reveals that of infrastructure projects costing of the order of around 4.45 million dollars, 40% of them get delayed and the delay ranges from 1 to 252 months (www.mospi.nic.in). The Conference of Industry Secretaries report states that except in telecom, the investment during the eleventh five-year plan is expected to fall short of targets in most infrastructure sectors (Ministry of Personnel, Public Grievances and Pensions, 2012).

However, under-performance in the construction industry is not only limited to the Indian context but is also rampant in other countries. The construction industry worldwide faces problems and challenges, particularly in developing and under-developed countries, which need massive structural and cultural shifts from traditional construction practices and systems to contemporary approaches (Kumaraswamy, 2006; Kumaraswamy et al., 2002; Ofori, 2000a). Ofori (1984) argues that the industry

should be "rescued" and enabled to help in the ongoing adjustment of national economies and to develop the capability and resilience to adapt to future changes. De Saram, Rahman and Kumaraswamy (2001) postulated that the construction industries are at the forefront of national development but their contributions are hampered by shortfalls in expected quality, productivity, and safety levels, often accompanied by embarrassing time and cost over-runs, claims, counter-claims, and prolonged disputes on many significant projects. Construction industry visionaries have also highlighted the critical need for improving the performance of the construction industries of developing countries by envisioning linkages between construction industry development, infrastructure development and the broader role of national development (Kumaraswamy, 2006; Kumaraswamy et al., 2002; Ofori, 2006). The importance of taking measures to improve the performance of the construction industry has now been recognized in several countries at various levels of socio-economic development. Dedicated agencies have been formed in many countries to administer the continuous improvement of the industry (Ofori, 2000b).

This paper briefly reviews such improvement initiatives in other countries in the next section, then introduces and outlines the thrusts, methodology, and initial outcomes of the recently launched "Construction Industry Improvement Initiative India" (Ci3 India)¹ that was conceived and designed to identify and address critical challenges in the Indian context. The penultimate section summarizes envisaged future work while interim conclusions are presented in the final section.

LITERATURE OVERVIEW

The construction industry is an important sector of the economy that makes a significant contribution to gross domestic product, capital formation, and employment (Hillebrandt, 2000); and has backward and forward linkage effects with several other sectors (World Bank, 1984). Construction industry development should consider the whole industry (Ofori, 2000a) considering also its national economic objectives. International Council for Research and Innovation in Building and Construction Task Group 29 (CIB TG29) defined construction industry development as "a deliberate and managed process to improve the capacity and effectiveness of the construction industry to meet the national economic demand for building and civil engineering products, and to support sustained national economic and social development objectives".

The construction industry of any country may face many problems and challenges (Ofori, 2000a, 2001). Kumaraswamy (2006) stated that the perennial problems in construction projects have forced the construction industries of developed countries/jurisdictions such as the USA, UK, Canada, Singapore, and Hong Kong to target drastic improvements in this sector. Many countries/ jurisdictions have commissioned high-profile studies leading to high-powered reports, after which some high-level boards, bureau or councils were established to undertake the planning, monitoring, and controlling of industry development (Ofori, 1985). Table 1 highlights a few indicative examples of issues faced by construction industries in the developed economies such as the USA, UK, Canada, Singapore, and Hong Kong and the industry development initiatives launched by such economies to overcome and tackle these issues.

Table 1. Indicative Examples of Construction Industry Issues and Development Bodies in Different Countries/Jurisdictions

Country/ Jurisdiction	Critical Issues Identified	Examples* of National Development Bodies
USA	<ul style="list-style-type: none"> • Declining performance of the construction industry – drop in productivity, e.g. due to, <ul style="list-style-type: none"> (a) diverse and fragmented stakeholders, ranging from owners, users, designers, specialty trade contractors, operators, and regulators (b) segmented processes: planning, finance, design, engineering, procurement, construction, operations etc., leading to adversarial relationships, disputes, and claims • Poor image of the construction industry – as work requiring low technology, physically exhausting, and unsafe • Variation in standards, processes, materials, skills, and technologies • Variation in building codes and regulations propagated by states and localities • Lack of effective performance measures for construction related tasks, projects, and industry as a whole • Lack of industry wide research agenda and inadequate funding for such research • Lack of accurate information about industry • Shortcomings of the management in ensuring standards • Problems involving labour organization • Need for more governmental support <p>(Business Roundtable Report, 1983) (National Research Council, 2009)</p>	<ul style="list-style-type: none"> • Construction Industry Institute (CII): formed in 1983 • Joint initiative by concerned academia and industry leaders • Consortium of more than 130 leading owner, engineering-contractor, and supplier firms from both the public and private arenas <p>(Construction Industry Institute, 2016)</p>
UK	<ul style="list-style-type: none"> • Need to modernize including investment in R&D • Adoption of new technology • Need for innovative contract types and mechanisms • Client dissatisfaction – in terms of quality, safety, time, and cost performance • Inadequate client's role in construction industry development • Inadequate team working • Ineffective dispute resolution mechanisms <p>(Latham, 1994) (Egan, 1998)</p>	<ul style="list-style-type: none"> • Constructing Excellence (CE) and Construction Industry Council (CIC): main national industry development bodies <p>(Construction Industry Council, 2016)</p>

(continued on next page)

Table 1. (continued)

Country/ Jurisdiction	Critical Issues Identified	Examples* of National Development Bodies
Canada	<ul style="list-style-type: none"> • Lack of performance benchmarking • Lack of documentation and dissemination of best practices in the industry • Inefficiencies draining profits – lack of planning and efficient procedures • Competing only on price alone i.e. selecting lowest bid, although estimates are often under quoted leading to low profit margins, inefficiencies, claims, etc. • Cost overruns due to reworks, accidents, change orders, etc. • Declining labour productivity • Limited capability to secure large capital projects • Lack of governmental policies to facilitate industry competitiveness • Worker shortages and skilled labour challenges – rapidly ageing workforce etc. • Reduced demand for new housing 	<ul style="list-style-type: none"> • Canadian Construction Innovation Council (CICC): a not-for-profit national organization devoted to developing the construction industry in Canada through the increased adoption of innovative processes and technologies • The Construction Owners Association of Alberta (COAA), founded in 1973 is a group of owners representing many sectors of the Alberta industrial construction community <p>(Fayek et al., 2008)</p>
(Momaya and Selby, 1998) (Scott, 2016)		
Singapore	<ul style="list-style-type: none"> • High reliance on foreign workers • Low productivity of labour and high rate of labour turnover • Labour intensive construction methods • Lack of documentation and dissemination of best practices • Shortage of specific materials • Absenteeism at worksite 	<ul style="list-style-type: none"> • Construction Industry Development Board (CIDC) was formed in 1984 • In 1999, CIDC and the Building Control division of the Singapore Public Works Department merged into a more powerful and integrated Building and Construction Authority (BCA) <p>(Building and Construction Authority, 1999)</p>
(Lim and Alum, 1995)		

Note: *There are other such proactive national/regional construction industry development bodies, e.g. in Malaysia, South Africa, Hong Kong, etc.

On the other hand, in most of the developing countries, the construction industry has failed to play its expected role as an “engine of growth” by providing the basis for socio-economic development as even some of the rudimentary issues are still not being addressed adequately (World Bank, 1984; Wells, 1986; Ofori, 2006; Ofori, 2015). Researchers have also highlighted that before establishing construction industry development bodies in the developing countries, to overcome their country-specific critical and recurrent issues, it would also be useful to identify the critical issues, review previous and existing measures, and remedial strategies of developed countries. This would inculcate an appreciation of current best practices, which developing countries may also adapt as targets in their development journey where relevant. The researchers also highlight that despite the priorities being different, the

broader industry issues may be approached with better experiential knowledge acquired from such development initiatives, while any relevant specifics may be adjusted to each developing country scenario and as such the key issues studied in some developed countries could also be relevant to other developing countries such as India (Kumaraswamy, 2006; Ofori, 2006, 2015).

Studies have also suggested a need for intervention by construction industry development agencies in developing countries (Ofori, 1994; Wells 1996). In some cases, where a government-funded agency is not established, some type of industry-led organization is often considered desirable (e.g. the UK's Construction Industry Council, Construction Industry Institute, USA, and Hong Kong's Provisional Construction Industry Coordination Board, PCICB) (Ofori, 1994; Fox and Skitmore, 2007) as studies have highlighted institutional support as a significant factor facilitating construction industry development (Fox and Skitmore, 2007).

Similarly, a construction industry development initiative in India named as Ci3 India was conceived to help overcome the critical issues in the Indian construction industry. The present study hence focuses on identifying and addressing the critical issues in the Indian context by the recently developed construction industry development initiative, Ci3 India. The next section provides a brief introduction to Ci3 India.

CONSTRUCTION INDUSTRY IMPROVEMENT INITIATIVE INDIA – CI3 INDIA

The above evidence from the literature overview indicates that significant and sustainable industry improvements could be targeted through an industry development initiative championed by a group of large progressive construction organizations with a long-term vision for value-driven project delivery. They also have a substantial role to play in setting demanding standards and insisting upon improvements (Latham, 1994). Ideally, large public and private clients must formulate joint strategies and act together so that major supply chains realise that they must change their mindsets and ways of working so as to secure future work. Large clients spearheading such a change will reap more and faster benefits, and with a stronger foundation as well. The Ci3 India was thus conceived on the above lines, by researchers from the Indian Institute of Technology (IIT) Madras in conjunction with a group of large building clients, in order to initiate this transformation.

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 (and wide) impact domains.
3. To launch (a) system improvement initiatives and (b) demonstration projects, in prioritized focus areas within the above strategic domains.

Ci3 India was kick-started with an inaugural first Regional Roundtable in Chennai at IIT Madras in October 2015. A second Regional Developers' Roundtable was conducted in Mumbai in February 2016. The participants of the two Regional Roundtable were large building construction clients from Chennai, Bangalore, and Mumbai regions. 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 so it is envisaged that building clients from other regions of the country, from other sectors (i.e. infrastructure and industrial apart from buildings) along with consultants, contractors, and other supply chain members will also be involved at suitable stages.

METHODOLOGY

The present paper focuses on identifying and launching a platform to address the current and imminent critical issues in the Indian construction industry. During the inaugural Regional Roundtable of Ci3 *India* in October 2015, three parallel focus group sessions on three major themes were conducted after the opening plenary sessions. A focus group exercise is essentially a qualitative research approach in which in-depth information is acquired by the researcher based on group-based brainstorming, observations, combined interviews, interactions, and feedback. Furthermore, the focus group method is a cost-effective and quick empirical research approach for obtaining qualitative insights by enhancing the participation of the practising community in eliciting valuable suggestions and feedback (Kontio, Lehtola and Bragge, 2004; Marková, Grossen and Orvig, 2007). Some researchers have used this focus group method in the initial stage of research to generate ideas and hypotheses. Then again, focus groups are used at a later stage of research as a way of verifying and validating the already obtained data and interim findings (Marková, Grossen and Orvig, 2007; Yang et al., 2011). The three focus group sessions were designed to facilitate brainstorming towards developing consensus on current and imminent critical issues identified under each of the three identified themes and suggested sub-themes. The three major themes of the above focus group sessions, at the inaugural Regional Roundtable of Ci3 *India*, were (a) procurement and delivery, (b) productivity, quality, and sustainability, and (c) construction project ecosystem. Each focus group consisted of eight participants and was facilitated by a chairman (moderator) and a designated recorder assisted in noting down the key points discussed and the principal findings emerging from the brainstorming. An approximate rating of the identified issues was invited, in terms of "level of criticality", say on a scale of 1 to 4, from 1 = important, 2 = very important (serious), 3 = critical, to 4 = extremely critical ("life threatening"). Also, an initial causal analysis of the identified issues was requested to ascertain the potential "root causes" of at least the "critical" and "extremely critical" issues. The rating for each issue was arrived based on an aggregated value obtained from individual ratings from the participants of each focus group. Table 2 highlights the profile of focus group participants.

To initially summarize the focus group outputs, either the group Chairman or a chosen rapporteur presented a summary of the respective group outputs. To review and summarize the outputs of all the three focus group sessions in a holistic manner, a feedback and consolidation session was also conducted soon after the above. After the above steps, the authors transcribed and summarized all the three focus group sessions. These summaries were included in the first Regional Roundtable Report to identify the current and imminent critical issues in the Indian construction industry (First Regional Roundtable Report, Construction Industry Institute India, 2016). Next, a second Regional Roundtable cum focus group session was conducted in Mumbai in February 2016 to verify, validate, and consolidate the identified issues.

Table 2. Profile of the Focus Group Participants

Focus Group (FG)	Group Chairman	Designated Recorder/Rapporteur	Focus Group Participants' Profile	No. of Participants	Avg. Years of Experience
FG-1	Researcher 1a	Researcher 1b	CEO's, MD's, and GM's of major client organizations	8	≥20 years
FG-2	Researcher 2a	Researcher 2b	CEO's, MD's, and GM's of major client organizations	8	≥20 years
FG-3	Researcher 3a	Researcher 3b	CEO's, MD's, and GM's of major client organizations	8	≥20 years

FINDINGS AND INITIAL OUTCOMES

The main discussion points and principal findings of the first three parallel focus group session are summarized below. Validation of the identified issues is then outlined.

Outcomes of the First Ci3 India Regional Roundtable

Focus Group-1: Procurement and Delivery – Summary and Principal Findings

The coverage of this group included the following sub-themes: programme packaging, contract types and formats, project team selection, ethics and professionalism, time and cost overruns, payments, stakeholder and relationship management, dispute reduction, and resolution. Key points discussed and outcomes are outlined below.

Programme packaging

The recurring call for project requirements to be detailed as much as possible during the pre-construction phase itself was re-affirmed and reinforced with examples of how it is done in other countries and even by some progressive clients in India. Clients must spend sufficient time to set out the project requirements and specifications in detail, to avoid misperceptions and costly rework during implementation. However, current practice was deplored, where most clients rush through this phase, pushing their consultants and contractors to deliver so fast that they may be compelled to take short-cuts and start site construction with incomplete information. Moreover, there is no time for considering alternative design concepts or technologies, let alone optimize even the selected one. This grave shortfall is confirmed by the observations of Iyer and Jha (2006), who identified owner's inadequate project formulation in the beginning, as one of the critical failure factors contributing to under-performance of Indian construction projects. Studies also indicate that improper planning during bidding stage as one important cause of delay, which is generally overlooked in analysis of construction delays (Doloi et al., 2012; Al-Kharashi and Skitmore, 2009; Bramble and Callahan, 1992). Root causes that were identified, for shortfalls in

developing good programme packaging include insufficient data collection, inexperienced consultants, pressure/distortions by local authorities and different norms in different states of the country, statutory approvals, design management, procurement management, poor selection of contractors, and political motivations from a public sector perspective.

Stakeholder and relationship management

The construction industry involves a large number of stakeholders and hence managing them is quite difficult. It was identified that involvement of the necessary stakeholders at appropriate times, soliciting and respecting their opinions is important, whereas lack of trust between stakeholders is a critical deficiency in stakeholder management in the Indian context. Such findings are also similar to previous findings of Iyer and Jha (2005, 2006) and Doloi et al. (2012) who concluded that lack of commitment of project participants, conflict between them, and their indecisiveness, to be the top three critical factors affecting schedule and cost performance of Indian construction projects. It was deliberated that early involvement all major stakeholders, along with genuine soliciting of their opinions and incorporation of relevant suggestions, can reduce conflicts of interest in the project and promote their "buy-in"/ commitment too. Building trust between the client, contractor, and other stakeholders will also smoothen contractual and stakeholder management. Furthermore, acknowledging the inputs (particularly proactive) contributions achievements of contractors and other stakeholders will also result in better project outcomes. A discussion ensued on contractor rating by the Building and Construction Authority (BCA) of Singapore. It was suggested that India might also benefit from a similar rating system, which may also help promote trust between stakeholders, who know more about their relative "capacities".

Contract types and formats

It was noted that most contract documents were alleged to be substandard and one-sided. Substandard contract documentation is lethal to the construction project in particular, and to the industry in general, as it leads to many conflicts and misinterpretations, in turn triggering costly arbitrations and litigation. Even where the upfront contracts are not deficient to start with, the administration of these contracts must be very professional. Satyanarayana and Iyer (1996) highlighted the significance of effective contract administration, especially in Indian construction projects. Contractors, to stay in business, have under-estimated, whether consciously or otherwise, project time and cost requirements in order to win contracts. Hence, the contractual landscape generally tends to be littered with over-optimistic agreements of cost and time, which may not be practically achievable, resulting in significant overruns of both budget and programme. Following such optimism, the improper planning by contractors during their bidding stage leads to unviable contracts (Satyanarayana and Iyer, 1996). A suggestion was made to design an appropriate rating system to be used during the pre-qualification phase. Clients agree that a fair and clear contract should be drafted with appropriate dispute resolution clauses to avoid time and resources wasted on disputes and claims. It was also emphasized that clients should guard against corruption during bid evaluation on their projects.

Ethics and professionalism

Under this sub-theme, it was discussed and agreed that the construction clients must take special interest to minimize illegal dumping of construction and demolition waste, which affects the local environment and also adversely impacts the quality of life and sustainability. Experts highlighted issues of lack of trust among stakeholders, possibly arising in part from a lack of entry and exit barriers. As reported in an earlier study, skills shortage (in all the levels), lack of professionalism, and other human resource related issues are recurrent problems in the industry (Sawhney, Agnihotri and Paul, 2014). Table 3 highlights the principal findings with ratings (on the 1–4 scale mentioned above) as emerged from focus group session-1.

Table 3. Principal Findings with Ratings as Emerged from Focus Group Session-1

Identified Issues	Rating (On a Scale of 1–4)
Shortfalls in proper standards for better project formulation	4
Lack of client involvement and competence	4
Need for better contractor selection system	4
Lack of trust between stakeholders (possibly because of no entry and exit barriers)	2.5
Substandard and one-sided contracts	2.5

Focus Group-2: Productivity, Quality and Sustainability – Summary and Principal Findings

The coverage of this group included the following sub-themes: designing for life-cycle “value” and built asset management, lean construction, green, off-site, technology and materials innovations, safety and health, environment and society, and benchmarking and KPIs. Key points discussed and outcomes are outlined below,

Productivity benchmarks and standards

The industry is persistently dealing with problems related to productivity, particularly labour productivity. Relevant literature provides evidence that empirical studies using actual field data indicate significantly low labour productivity even in key construction activities (Loganathan and Kalidindi, 2015; Thomas and Sudhakumar, 2013). In addition, other studies have also identified poor labour productivity as a major factor causing delay in Indian construction projects (Doloi et al., 2012). A report of the National Commission on Labour, Government of India (2002) also reported that the industry functions at low productivity because of lack of skills, poor workmanship, and low levels of mechanization and technology adoption.

However, low productivity can be due to inefficiencies of the labour as well as due to mismanagement by contractors. While developers pay labour contractors their agreed rates, which are padded for various inefficiencies, the total cost is ultimately transferred to the customers. This, therefore, highlighted the need for established productivity standards, benchmarks, key performance indicators

and industry norms to monitor the construction process and reduce inefficiencies and time-wastage. In the same vein, a recent Singapore study reported that most contractors there do not have productivity measurement policies, although they did acknowledge its importance (Hwang and Soh, 2013).

The Central Public Works Department (CPWD) of India indices and Delhi Analysis of Rates (DAR) provide standards for productivity and rate analysis for different construction activities. While the CPWD methodology is reliable, it was remarked that the CPWD database is not regularly updated and needs adjustments for different regions of the country, hence, its application in the industry is very low. Therefore, it was suggested that a framework should be developed for productivity benchmarks and standards, also considering increasing mechanization levels in construction sites.

Lack of skilled manpower

A significant discussion strand pertained to the lack of skilled manpower in the Indian construction industry. As reported by earlier studies, many participants felt that lack of skilled labour, lack of skilled operatives, and a low proportion of skilled to semi- and unskilled worker ratio, were critical factors affecting the productivity of construction projects (Thomas and Sudhakumar, 2014; Horner, Talhouni and Thomas, 1989).

The construction industry employs over 29 million workers. However, only 11.4% are skilled workers, and the remaining 88.6% are semi-skilled and unskilled workers (Planning Commission, Government of India, 2010). Planning commission forecasts additional 41 million workforces by 2022. The country has recognized the fact that skilling is an urgent need and begun to put in place the infrastructure, processes, standards, and systems required to raise large skilling factories. National Skill Development Council (NSDC) by the Ministry for Skill Development and Entrepreneurship, Government of India is one such initiative. Specific to construction industry NSDC has developed, Construction Skill Development Council (CSDC). Experts highlighted that however, CSDC, a national level skill development mission was initiated by the ministry, the proportion of skilling that needs to be done for the construction industry is very high. It was remarked that large construction clients should come forward with similar initiatives to fill the gap in skilling.

Increasing in-house workers and developing training wings was suggested by the group. It was remarked that the workers' motivation level is generally low as they hardly receive appreciation for their work. Having workers on board increase their commitment to do a good job as they gain pride and motivation with the company tag. While practiced by certain organizations, practicability at the industry level was questioned. NSDC highlights that only 9.8 million of the total 29 million workers are registered in the country. The need for certification of workers was agreed. However, industry acceptance would probably need clients to mandate a certain proportion of certified workers, which could be increased in stages. This is also essential for the development and welfare of the industry including all stakeholders, in the long run. The Construction Industry Development Council (CIDC) provides some certification courses for workers. The problem of attrition after investing in worker training was also raised as a trained worker might leave the job for a better salary. Therefore, providing a premium for certified workers was suggested, with different premium ratings based on skill levels. The need for governance by owners in this regard was also noted.

Designing for lifecycle value

Lack of an integrated view of the design process was lamented. The absence of user-centric design was also emphasized. Some issues restraining designing for life cycle value in buildings were a lack of competency, lack of awareness, financial implications, and even a feeling of “not needed” as end-users are not directly connected to the designers or developers. Usage of tools such as life cycle analysis and value engineering, along with the mainstream use of project management tools was emphasized.

Off-site construction

Low quality is considered as one of the critical issues in construction. It was remarked that the time and costs wasted on rework and other quality related issues are very significant. Lack of awareness of relevant modern tools and techniques (e.g. clinging to traditional techniques in plastering, lifting, and transporting materials, etc.), improper supervision, inappropriate tools, and equipment were considered to be at the root of quality related issues. It was remarked that quality can be improved by adopting off-site (pre-cast/pre-fab) construction. However, the need for meticulous planning, heavy taxes and excise duty, various transportation permits and other traffic regulations, and storage issues were identified as major barriers to adopting off-site (pre-cast/pre-fab) construction methods.

Health and safety

The industry is reeling with problems related to health and safety of construction workers. An earlier study reported that factors such as illness, injury, lack of basic facilities are identified as the top factors causing absenteeism and turnover of construction workers in Indian construction projects. This study also revealed that the average age of construction worker in India is 26 years with 89% of them are under 35 years of age (Loganathan and Kalidindi, 2016). Hence, it is hypothesized that most of the construction labour discontinue from the job before 40 years of age due to poor welfare and well-being. Serious attention was drawn to improving owners' accountability towards ensuring adherence to minimum wages, improving living and working condition of workers, creating awareness regarding workers' compensation and insurance, streamlining labour laws and regulations to ensure welfare and dignity of workers. Table 4 highlights the principal findings with ratings (on the 1–4 scale mentioned above) as emerged from focus group session-2.

Focus Group-3: Construction Project Eco System – Summary and Principal Findings

The coverage of this group included the following sub-themes: SWOT-type analysis, Up-skilling, Culture-change and optimizing inputs from Trade persons, Engineers & Managers, and Stakeholders & Supply Chains; Computer integrated systems, BIM, ICT tools. Key points discussed and outcomes are outlined below.

Table 4. Principal Findings with Ratings as Emerged from Focus Group Session-2

Identified Issues	Rating (On the Scale of 1-4)
Acute shortage of skilled workmen	4
Lack of proper facilities for workers	4
Low productivity	3
Lack of productivity benchmarks, standards/norms and KPIs	3
Lack of innovation	3
Hindrance to off-site (pre-cast/pre-fab) construction	3
Inadequate quality	3
Inadequate governance by owners and transparency	3

Skill development

While focus group-2 discoursed the lack of skilled labour, focus group-3 discussed that shortfall in skills is observed at all levels in construction, i.e. with managers, site engineers, supervisors, and workers. Experts opined that employee attrition is a discouraging factor for organizations to invest in training and skill development. However, in other industries such as IT and software, the responsibilities of training and skill development is transferred to universities and educational institutions. It was discussed that large construction organizations could also approach the Government for incentives for training construction professionals and workers in the forms of tax benefits etc. High involvement of Government in skill development of professionals will greatly help in skilling the industry as only a limited number of suitable training institutes and trainers are available at present.

It was also emphasized that a practice-based curriculum is needed to cover the different sub-domains of construction. Skilling professionals with updated work practices such as lean construction principles and technologies such as Building Information Modelling (BIM) will help the industry to better manage stakeholders and overcome inefficiencies. With respect to workers, it was highlighted that social initiatives such as village adoption as practiced by some players can minimize labour migration and attrition issues and improve long-term labour-organization relationship.

Supply chain issues

It was pointed out that variations in quality of construction materials are observed. As the industry is highly fragmented, there is great opportunity to sell rejected materials elsewhere, since the facts of rejection are not made public as in other industries such as the automobile industry. Shortage of materials is also observed due to cartelization of materials. There is a need for standards, testing, certification of materials and vendor development. Innovation in alternate materials with sustainability aspects is seen as the need of the hour as many traditional materials such as sand are becoming scarce.

Lack of trust between various stakeholders was also remarked as a critical issue in the supply chain management. Researchers have also highlighted the need for broader selection criteria, optimized construction supply chains, and

smoother inter-organisational transactions (Kumaraswamy, Palaneeswaran and Humphreys, 2000; Palaneeswaran et al., 2003). Researchers have also identified inappropriate procurement and delivery systems and cultural mismatches in supply chains and project teams as critical barriers in construction industry development (Kumaraswamy, 2006). A massive shift from classical and traditional contracting approaches is sorely needed by the adoption of new contracting approaches such as relational and collaborative contracting methods and better stakeholder management practice (Kumaraswamy, 2006; Ugwu et al., 2003a; Rahman and Kumaraswamy, 2002).

Technology adoption

It was agreed that while a higher initial cost is needed for technology adoption, long-term benefits can offset the initial cost. Potential solutions that may be achieved through technology, for example, BIM can help in better stakeholder management and reduce time and cost overruns. However, it was debated that clients must first acknowledge and appreciate the benefits of technology adoption. Clients should strengthen adoption of technologies through contractual incentives and take definitive steps to adopt technologies in their projects at all levels. Clients must also share the results of their demonstration projects (e.g. by case studies) so that they may learn from each other iteratively. Mutual benefits and lessons learned can be exchanged across the whole industry. It was also argued that innovation is much needed to enrich user experience, while attempts to adopt new technologies will be difficult without some fundamental process changes in design and finance management. Table 5 highlights the principal findings with ratings (on the 1–4 scale mentioned above) as emerged from focus group session-3.

Table 5. Principal Findings with Ratings as Emerged from Focus Group Session-3

Identified Issues	Rating (On the Scale of 1–4)
Need for up-skilling construction professionals	3
Improper supply chain management and need to shift to alternate contracting approaches	3
Lack of technology adoption	3
Reluctance to adopt new work practices such as lean practices	3

To summarize, the following are the 16 critical issues identified in the three focus group sessions in 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

Outcomes of the Second Regional Roundtable

As mentioned earlier, the focus group session in 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 calibre construction clients from another important region in India, with potentially fresh insights. A total of 54 participants of the four focus group sessions were top-management industry professionals, academicians, and invited experts with over 20–25 years of experience in construction industry dealing with large construction projects across the country.

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 their criticality. In addition, a few other critical issues were identified, brainstormed, and consolidated along with the base set, in this second Regional Roundtable. The additional "critical" issues were primarily summarized as:

1. Inefficient design process management
2. Uneconomical design codes and operational standards
3. 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, in summary, a total of 19 current and imminent critical issues were identified. Some of the issues identified in the present study are comparable to the findings of the other studies reported in the literature including Sawhney, Agnihotri and Paul (2014). However, some of the "fresh" issues that emerged in the current study include: lack of client involvement and competence, shortfalls in proper standards for better project formulation, lack of productivity benchmarks and standards, inefficient design process management, and lack of innovation. The earlier study by Sawhney, Agnihotri and Paul (2014) identified the grand challenges for the Indian construction industry, adding that the ultimate goal lies in addressing the identified issues and challenges.

In the same spirit, i.e. to address the identified 19 current and imminent critical issues in the Indian construction industry, these issues were rationalized and consolidated as Action Items. An Action Team was assigned to work on each Action Item. The Action Teams include academicians, industry participants from

Chennai and Mumbai Roundtables, and other invited experts. Ten Action Teams were initially formed, but since some items came under a common “umbrella” they were regrouped so that Seven Action Teams could handle these 10 items. Table 6 shows the identified current and imminent critical issues and how they are being addressed as consolidated Action Items by the Action Teams.

Action Items (AIs)

AI-1: Identify and/or formulate a set of KPIs (based on international practices, but adjusted to meet local needs and priorities) for use by a “Benchmarking Club” to facilitate focused and regulated data sharing and continuously improve project level efficiencies vis-à-vis industry averages/norms.

AI-2: Formulate 5-year targets to significantly reduce both average project construction costs and overall project time-frames.

AI-3: Revisit design process management, with a view to upgrading design quality, as well as optimize the “economics” of construction and “life cycle value” of the built assets themselves. Need for awareness of the use and benefits of technology and disseminate the benefits of technology adoption to the industry with demonstration projects, cost-benefit case studies, sharing reports, etc. to target overall efficiency and sustainability.

AI-4: Revisit design codes and strengthen technical inputs (from academia, construction clients, architectural and engineering consultants, and contractors) to provide suggestions to the revisions of such codes so that the code development authorities would realistically update and rationalize relevant design codes to increase efficiencies, while also considering economies, targeting quality, safety, and sustainability of the built assets.

AI-5: Establish the business case for significantly increasing the proportion of direct workers in a construction project i.e. for quasi-formalization of workforce-on-site to minimize attrition, accidents and delays due to “lack of skilled manpower” as most of the migrant construction workers consider construction work as a “part-time”, unskilled profession instead of a skilled, long-term career.

AI-6: Set stage-wise targets for mandating the proportion of trained and certified direct workers in a construction project (e.g. from 30% in 2 years, 50% in 4 years, and so on) during contract finalization stage and closely monitor for compliance. Need to revisit the popular paradigm of construction manpower requirements being “project-based”, from an organizational perspective that aims for an adequate pipeline of projects to move manpower from one project to another within the organization.

AI-7: Improve the overall construction industry image and make it attractive for all talent pools at young-graduate level (entry-level) as well as for career development. Up-skilling construction professionals with advanced technologies, special management programmes. Consider options such as “finishing schools” (“top-up”) for young graduates with different specializations – in Construction Project Management, Structural, Geotechnical, MEP Engineering, etc.

Table 6. Identifying and Addressing the Current and Imminent Critical Issues by Formulating Action Items and Mobilizing Action Teams

Identified Current and Imminent Critical Issues	Brief for “Addressing Identified Critical Issues” – Action Items Summary	Responsibility Assignment – to Action Teams
<ul style="list-style-type: none"> • Lack of productivity benchmarks and standards • Need for better contractor selection system 	<ul style="list-style-type: none"> • Need to formulate updated benchmarks, standards, and performance indicators • Need to design performance-oriented selection criteria 	Action Team-1: Key Performance Indicators (KPIs)
<ul style="list-style-type: none"> • Shortfalls in proper standards for better project formulation • Lack of client involvement and competence • Improper supply chain management • Hindrance to pre-fab/pre-cast • Lack of trust between stakeholders • Reluctance to adopt new work practices such as lean practices 	<ul style="list-style-type: none"> • Formulate five-year target plans to significantly reduce time and cost frames by active client involvement from conceptual stage, adopting new work practices and technologies, and implementing better contracting approaches 	Action Team-2: Strategies for reducing costs and time-frames
<ul style="list-style-type: none"> • Inefficient design process management • Lack of technology adoption • Lack of innovation • Lack of client involvement and competence 	<ul style="list-style-type: none"> • Restructuring existing design management practices • Create awareness about technology by demonstration projects, cost-benefit analysis 	Action Team-3: Design processes and technology adoption
<ul style="list-style-type: none"> • Outdated design codes • Uneconomical design codes and operational standards 	<ul style="list-style-type: none"> • Revisiting design codes and standards 	Action Team-4: Design codes and standards
<ul style="list-style-type: none"> • Low productivity • Acute shortage of skilled workmen • Inadequate quality • Lack of productivity benchmarks and standards • Lack of proper facilities for workers • Need for up-skilling construction professionals 	<ul style="list-style-type: none"> • Business case for training and employing workmen, up-skilling professionals, scientific measurement of skill and productivity, and improving industry image 	Action Team-5: Human capital (including labour, technical and managerial and skills development) and productivity
<ul style="list-style-type: none"> • Sub-standard and one-sided contracts • Inadequate governance by owners and transparency • Improper supply chain management • Reluctance to adopt new work practices such as lean practices 	<ul style="list-style-type: none"> • Instigating alternate contracting approaches in practice, developing an over-arching Charter based on inputs from other Action Teams to capture and propagate best practices 	Action Team-6: Construction Clients' Charter
	<ul style="list-style-type: none"> • Monitoring Action Teams, Enabling and propelling Ci3 India 	Action Team-7: Institutional platform

AI-8: Formulate scientific measures for assessing skill levels, productivity, along with benchmarking and linking of wages to skill-productivity levels rather than to government-fixed, minimum-wages. This may provide a more cost-efficient, viable approach to construction than increasing mechanization purely to reduce manpower needs. Assess the potential benefits of off-site construction (including precast concrete and pre-engineered components) for large projects and project portfolios, where higher skills and a more mature workforce segment can also contribute.

AI-9: Voluntarily subscribe to a “Construction Clients’ Charter” based on which relevant targets would be embedded as necessary conditions in bidding/tendering/vendor selection processes and protocols (e.g. in prequalification/tenderer requirements and selection criteria/ratings).

AI-10: Set up an institutional platform to enable and propel Ci3 *India* activities i.e. in a way to address the identified current and imminent critical issues in the Indian construction industry.

The seven Action Teams tasked with the Action Items (after rationalized grouping) are shown in Table 6. Previous researchers have consolidated some of the generic problems identified through the high-powered studies conducted in the UK, USA, Singapore, Hong Kong, etc. These problems include: unclear and/or unreasonable client expectations; poor procurement strategies that dissociate design from construction expertise and encourage adversarial relationships, purely price-driven selection practices and unfair contract conditions; lack of training, research and development; and multi-layered subcontracting (De Saram et al. 2001). Issues identified in the present study are comparable to those mentioned above, while these issues are still being addressed in many other countries (Sawhney, Agnihotri and Paul, 2014). Therefore, findings from Ci3 *India* should provide useful comparisons to ongoing industry improvement initiatives in other countries, including on the methodological approaches. For example, some countries in South Asia, South America, and Africa in particular, who are yet to set-up effective construction industry development bodies may benefit from a further interchange of common experiences when formulating their own objectives, strategies, and operational mechanisms. This may also lead to joint endeavours for research and development activities across these countries.

ONGOING FUTURE WORK TO ADVANCE Ci3 INDIA

The first major objective of Ci3 *India* is to identify the current and imminent critical issues in the Indian construction industry. This was achieved as above in the first phase of the Ci3 *India* journey, along with the launch of a platform to address these issues. However, one of the current limitations of the present study is that the issues were initially identified by actively engaging only large building construction clients, academicians, and invited experts. Looking further, for Ci3 *India* to work well, construction clients must eventually engage their construction supply chains since both top-down, and bottom-up “buy-in” and commitment will be vital for success. So it is proposed to bring on board design consultants, project management consultants and contractors on stages and eventually to target for example, a

Construction Consultants' Credo and a *Construction Contractors' Code* (i.e., apart from the "Construction Clients' Charter") at appropriate milestones in the *Ci3 India* journey. So the ultimate aim would be for these three interlocking declarations to underpin *Ci3 India*. Such a "common manifesto" could provide the needed confidence to drive demonstration projects and system improvements so that, all groups from all industry sub-sectors could join together, for *Ci3 India* to deliver the desired industry improvements.

CONCLUSION

To recapitulate, the objective of this paper is to identify and set the scene for addressing the current and imminent critical issues in the Indian construction industry. The Construction Industry Improvement Initiative India (*Ci3 India*) was conceived to drive meaningful and sustainable improvements in the industry by actively involving the stakeholders of the industry in the journey, starting with large building construction clients.

Nineteen current and imminent critical issues were identified, verified, and validated through four focus group sessions with 54 high calibre large building construction clients, academicians, and other invited experts. The identified issues were consolidated into 10 Action Items. Seven Action Teams were then mobilized to work on the 10 Action Items. Sawhney, Agnihotri and Paul (2014) in their study recommended formulating a national construction authority, which should be a tripartite body of industry, government, and academia. *Ci3 India* is conceived along the same direction with a focus on addressing the identified critical issues. Stage-wise action plans are being formulated towards developing *Ci3 India* to a high-level national initiative with the inclusion of members and stakeholders from all regions of the country as well as from other construction sub-sectors. Initially, the initiative involved participants from three major regions (Chennai, Bangalore, and Mumbai). However, it is proposed that inclusion of participants from other major regions such as Delhi, Kolkata, and Hyderabad, etc. will be carried at appropriate points. As and when needed, new Action Items may be added, and the working Action Teams will also be expanded appropriately. The issues identified and the envisaged action plans will provide useful comparisons and lessons learned to other countries, particularly developing nations when formulating and fine-tuning their own plans, strategies, and targets. Towards this end, we believe that *Ci3 India* initiative can help transform the Indian construction industry as a whole and improve overall performance for the mutual benefits of all stakeholders, provided a critical mass of representative stakeholders joins whole-heartedly in this journey.

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NOTES

1. While this paper describes the initial stages of the "Construction Industry Improvement Initiative India" – Ci3 India, the eventual outcomes from this successful initiative led to the proposal for an institute named Construction Industry Initiative India (Ci3). More about Ci3, as well as the draft White Papers produced by Action Teams described in this paper can be seen at www.ci3.in.

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