Questionnaire for Industrialized Construction Maturity Evaluation of Building Projects

Dear experts,

Thank you very much for taking the time to participate in this survey. We belong to the researchers of the National Engineering Technology Research Center for Prefabrication Construction in Civil Engineering (NETRC_PCCE) of Tongji University, and we are currently conducting research work on "Maturity Evaluation of Industrial Construction of Construction Projects". There are no "correct" and "wrong" answers to all questions in the questionnaire. Based on your own experience and feelings in the construction industrialization practice, please give you the choice that best reflects the actual situation. The filling process is expected to take you about 20 minutes. Thank you for your participation!

We attach great importance to the strict confidentiality of your personal information and solemnly promise that the questionnaire will only be used for academic research.

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1. Introduction to the evaluation model

The maturity of industrial construction of a construction project refers to the ability level of the project to successfully and reliably implement the project using the technology related to industrial construction under predetermined goals and conditions. This study divides the evaluation indicators into two areas: “Enablers” and “Results”. “Enablers” describe what the project should do to achieve the goal, and “Results” describe the achievement of the project's goals, and **Figure 1** presents the evaluation dimensions that correspond to the following indicators.

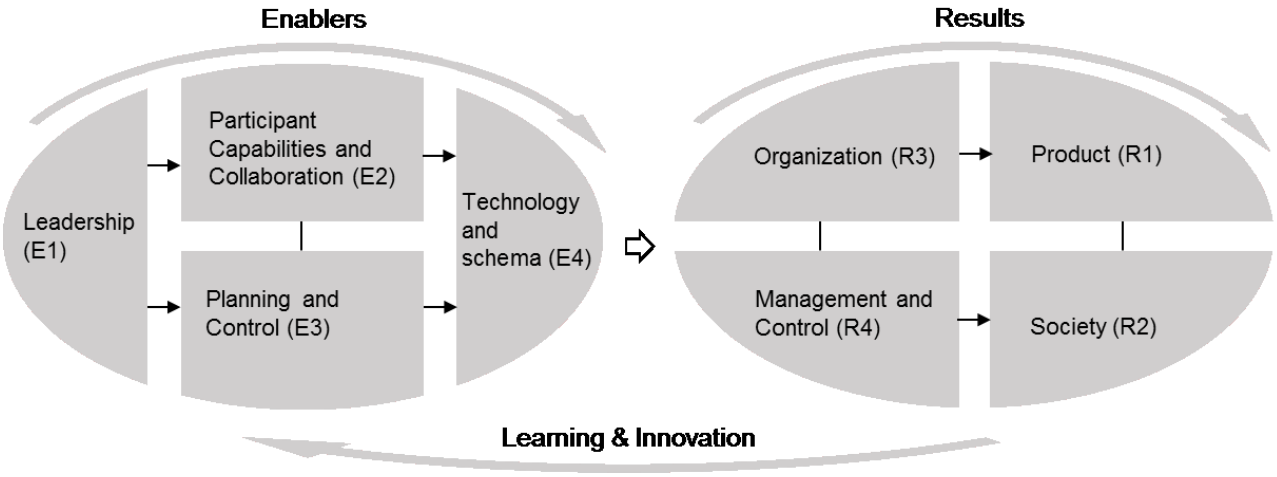

Figure 1. The framework for the evaluation model

2. Basic information about the project

Please fill the blanks of the table that best matches the actual situation of the project you are responsible for and mark the multiple choice questions in the appropriate □ with √.

Project name	
Which party do you belong to:	□ Owner; □ Designer; □ Construction contractor; □ Subcontractor of the construction contractor; □ Consultant/supervisor; □ Component supplier; □ Others:
Project investment situation	Total investment (100 million yuan)： Construction and installation cost (yuan / ㎡): The estimated cost of construction and installation using traditional techniques (yuan/㎡):
Project delivery method	□DBB □DB □EPC □CM-at GC□ Others:
The building area and number of floors	Building area (10,000 m^2): The number of above-ground floors: The number of underground floors:
Project duration	Total duration (Day): start date (y/m/d): completion date (y/m/d):
Prefabricated structural system	□ Prefabricated assembled shear wall structure; □ In-situ structure external slab system; □ Assembled frame external slab system; □ Assembled shear wall system; □ Stacked shear wall; □ Others:
Prefabricated components or parts	Prefabricated components: □ Beam; □ Column; □ Floor slab; □ Floor slab; □ External load-bearing wall panel; □ Internal load-bearing wall panel; □ External wall panel; □ Internal partition wall panel; □ Balcony panel or air-conditioning panel; □ Stairs; □ Daughter wall; □ Other:
	Prefabricated parts: □ Exterior window □ Integrated toilet □ Whole cabinet □ Storage room □ Prefabricated pipe well □ Pipeline system □ Prefabricated flue □ Others:

3. “Enablers” area

Please tick the option on the right side of the table that best matches the actual situation of the project you are responsible for. Here evaluation scores from 1 to 5 stand for "extremely non-conformity", "unconformity", "uncertain", "reluctantly conformity", and "extremely conformity" respectively.

Code	**Indicators**	**Practical analysis elements**	**Your rating**				
			1	**2**	**3**	**4**	**5**
E1.1	Owner’s cognition and attitude	Recognize and facilitate the application of industrial housing technology					
		Recognize and facilitate coordination and communication among all parties involved					

		Establish a work performance system for industrialized construction projects					
E1.2	Contractors' cognition and attitude	Recognize and are willing to change the traditional way of working					
		Establish a work performance system for industrial housing projects					
E2.1	Designer's experience and ability	Has a good reputation and industry qualifications					
		Experience with similar projects					
E2.2	Construction contractor's experience and ability	Has a good reputation and industry qualifications					
		Experience with similar projects					
E2.3	Component supplier's experience and ability	Has a good reputation and industry qualifications					
		Experience with similar projects					
E2.4	Cooperation willingness	Participants established a cooperative relationship based on the contract					
		Participants have long-term cooperation experience and establish strategic partnerships at the enterprise level					
E2.5	Collaboration channels	Use cross-organizational information communication channels, such as BIM, supply chain management platform					
		Cross-organizational personnel collaboration, such as construction personnel stationed in the component plant, component plant personnel stationed on-site, etc.					
E3.1	Goal setting	Set clear and reasonable project goals according to project characteristics					
		Quantify the target and formulate a measurement and control plan					
		Set a new technology application plan, such as new construction and installation process application					
E3.2	Norms and standards	Main standards and norms adopted by the project	□ National Standard □ Industry Standard □ Local Standard				
		Each participant has established and used enterprise standards (please comprehensively consider each participant)					

E3.3	Schedule control	Construction schedule control is standardized, forming a standard operating process and standard management plan					
		Quantify, measure, and track periods of key construction processes, such as recording transportation delay rate and component installation time					
		Continuously seek the optimization plan of construction schedule control					
		Adjustable space is considered and reserved in the schedule					
E3.4	Change control	Change control is standardized, forming standard operating procedures and standard management plans					
		Quantify, measure, and track the key processes of change control, such as recording the location, number of changes, and engineering volume involved					
		Continuously seek optimization solutions for change control					
		The design drawing is sufficiently detailed and conforms to the actual situation of the component factory and the site					
		Owner's needs are determined and maintained in the early stage of the project					
E3.5	Quality control	Quality control is Standardized, forming standard operating procedures and standard management plans					
		Quantify, measure, and track key quality control processes, such as retaining component installation image information, measuring component flatness					
		Continuously seek optimization solutions for quality control					
		Conduct model room testing, identify quality hazards early in the construction phase					
		Prepared for the compression of the construction period, and can guarantee the quality when the construction period is compressed					
E3.6	Cost control	Cost control is standardized, forming standard operating procedures and standard management plans					

		Quantify, measure, and track key cost control processes, such as statistical analysis of the construction site work to reduce inefficient labor					
		Continuously seek optimization solutions for cost control					
		Adopt assembly type special quota					
E4.1	Prefabricated technology system	Compare and analyze multiple prefabricated systems based on project characteristics					
		Identify the key management points and difficulties of the selected technology					
		Comprehensive consideration of room function, available area, price, planning, and other factors					
E4.2	Advance work of IC design	Scheme design, preliminary design consider the later component split					
		Scheme design, preliminary design consider the constraints of later production, transportation, construction, and other links					
E4.3	Design with component confirmation	Component design according to the national standard atlas of components					
		In the case of meeting the prefabrication rate, reduce the appearance of heterosexual components and non-standard components					
E4.4	Detail design and process matching	Relevant parties can provide timely information in the process of deepening the design					
		Result files of the deepening design meet the needs of component automatic production					
E4.5	Component production	Automatic production method based on a digital drive					
		Components such as doors and windows are assembled with the component in advance in the component factory					
E4.6	Component transportation	Carry out simulation or calculation of transportation schemes, such as simulation of vehicle scheduling					
		Implement measures to protect components during transportation					
E4.7	Construction with component assembly	Simulate or test the hoisting and construction plan, such as using BIM software to simulate hoisting					

		There are corresponding solutions to the site space constraints, such as the use of multiple hoisting methods					
E4.8	Industrialized decoration	Apply industrialized interior decoration (if this item is not available, the last two items do not need to be filled)					
		Consider the coordination between the main structure and the interior decoration in the design stage					
		Realize the integration of the whole bathroom, whole kitchen and pipeline system					
E4.9	Operation preparation	Project operational requirements are valued early and prepared during the design phase.					

4. "Results" area

Please tick the option on the right side of the table that best matches the actual situation of the project you are responsible for. Here evaluation scores from 1 to 5 stand for "extremely non-conformity", "unconformity", "uncertain", "reluctantly conformity", and "extremely conformity" respectively.

Code	Indicators	Practical analysis elements	Your rating				
			1	2	3	4	5
R1.1	Prefabrication rate	The average monomer prefabrication rate in the project	□20%-30% □30%-40% □40%-50% □50%-60% □>60%				
R1.2	Practical performance	In the industrial construction projects of the same customer positioning, the room function is better than the average level					
R1.3	Operating and maintenance savings	In the industrial construction projects of the same customer positioning, the use cost (modification, electricity, and water) saved by design and performance is better than the average					
R1.4	Owner's satisfaction	The owner is very satisfied with the project deliverables (only the deliverables are evaluated)					
R2.1	Technological innovation	The project independently developed some patented technologies, which have obvious effects on improving the building construction level and quality and efficiency.					
R2.2	Environmentally friendly	Among the industrialized residential projects with the same customer positioning, the environmental protection benefits of the four-					

		section one-project project are better than the average level					
R2.3	Honors or awards	The project won the honors of Innovative Project, Demonstration Project, Magnolia Award, Luban Award, etc.	□ None □ District level □ City level □ Provincial level □ National level				
R3.1	Participants communication efficiency	Information communication and technical disclosure between project participants are smooth, without information delays and inefficiency. Participants are satisfied with the communication effect					
R3.2	Participants' long-term cooperation willingness	Participants are satisfied with the cooperation method and the distribution of risks and benefits and are willing to cooperate again with other participants of the project					
R4.1	Schedule	Compared with the planned construction period, the project is completed on time or even ahead of schedule					
		Compared with the construction period of similar industrialized houses of the same type, the construction period is less than the average level					
R4.2	Quality	Compared with the planned quality regulations, the project meets quality standards					
		Compared with the quality of similar industrial houses of the same type, the quality level is greater than the average level					
R4.3	Cost	Compared with the planned cost, the project cost is lower					
		Compared with the cost of similar industrialized buildings of the same type, the project cost is largely below average					

Thank you again for your great support for our research!

If you need, you can leave your personal mailbox: _____, and we will send the analysis results to you for review after the data analysis is completed. You can also leave your valuable suggestions for our research here:

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We wish you and your family a very happy life!