COLLA 2023: The Thirteenth International Conference on Advanced Collaborative Networks, Systems and Applications

March 13, 2023 to March 17, 2023 - Barcelona, Spain

COLLABORATIVE WORKS IN CONSTRUCTION PROJECT IN CAMBODIA:

TOWARD A WORKFLOW SCENARIO IDENTIFICATION



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ACADÉMIE DE RECHERCHE ET D'ENSEIGNEMENT SUPÉRIEUR







Kannary KETH is a Ph.D. candidate of ULB and ITC. She strongly believes that BIM will be the future of the construction industry, especially in developing countries.

PRESENTER KANNARY KETH

EDUCATION

2020-Present PhD CANDIDATE INSTITUTE OF TECHNOLOGY OF CAMBODIA (ITC)

UNIVERSITÉ LIBRE DE BRUXELLES (ULB) "Collaboration in BIM for Construction 4.0"

2018-2020 MASTER DEGREE

UNIVERSITY OF LIÈGE "Architectural Engineering-urbanization"

2013-2018 ENGINEERING DEGREE

CAMBODIA (ITC)

"Architectural Engineering"

RELEVANT EXPERIENCE

Oral Presentation

2022: AUN/SEED-Net Collaborative Education Program, Join Graduate Research Seminar in Civil Engineering: "Sustainable Technologies for a Responsible Growth

2022: WP2 Sustainable Building: WP2 3rd Science Workshop

2022: Seminar On Sustainable Development : Sustainable City, Smart City, Cambodia

2022: Séminaire inaugural de l'école doctorale thématique (Architecture, Urbanisme, Ingénierie Architecturale et Urbaine – EDT 62

Poster Presentation

2022: Séminaire inaugural de l'école doctorale thématique (Architecture, Urbanisme, Ingénierie Architecturale et Urbaine – EDT 62









CONTENT

CONTEXT

PROBLEMATIC

RESEARCH QUESTION

METHODOLOGY

RESULT

CONCLUSION

REFERENCE



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CONTEXT

- Developing Country
- Increasing Building Demands [1][2].

The construction in Cambodia [3]



https://www.khmertimeskh.com/501174759/fdi-incambodias-construction-sector-touches-334m/



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CONTEXT

- Economic Growth [4]
 - Construction sector contributed to Economic Growth [5]



https://data.worldbank.org/





PROBLEMATIC

Poor cost performance [6]

Poor schedule performance [6]

Collaboration is essential to the success of construction projects [7]



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RESEARCH QUESTION

Question 1

• What is the interaction between the owners, designers, and contractors in the Cambodian context?

Question 2

• What are the workflow and collaborative processes of the above actors in each phase of the construction projects in Cambodia?

Question 3

• Is BIM perceived by these professionals as an alternative to overcome poor cost and schedule performance in the future?



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METHODOLOGY: COLLABORATION - ELLIS & WAINER, 1994 [8]

• COORDINATION

• COMMUNICATION

Coordination is how the work is structured. The coordinative activities manage the task for actors to perform and the relationship between the actors to complete the tasks.

Communication is about exchanging information and sharing knowledge to ensure that all actors get a common reference. That information can be transmitted in different forms, e.g., verbal, written, or picture.

• CO-PRODUCTION

Co-production is the action related to creating or realizing the project design or building. Those actions can be an action of a single actor or multi actors. This concept also includes the decision-making of problem-solving.



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METHODOLOGY

• PARTICIPANT

- COORDINATION
- COMMUNICATION
- CO-PRODUCTION
- BIM

Presentation project and company: participant described the projects he had been involved in and his company's role in those projects.

Coordination:

- Roles and responsibilities in the project task
- How the work was structured
- Actors' interaction

Communication:

- Communication methods and tools Participants described
- The procedure of sharing understanding, knowledge, and information.

Co-production: we focused on

• The action that actors produced tasks

BIM experience and perspective:

• The question is "Have you ever heard of BIM?" If so, participants explained their experiences and perspective.



METHODOLOGY

• Architecture

• Structure

(MEP)

- Mechanical
- Electrical
- Plumbing



Fourteen Hours



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Face-to-face



COLLA 2023 Participant's role **METHODOLOGY:** PARTICIPANTS • Architecture • Structure (MEP) 9 • Mechanical • Electrical MEP engineer Architect Structural Engineer • Plumbing 14



COLLA 2023

METHODOLOGY: PARTICIPANTS • Architecture • Structure

(MEP)

- Mechanical
- Electrical
- Plumbing



METHODOLOGY: PARTICIPANTS IARIA COLLA 2023 Participant's role Participants' Company 5 Q Designer Contractor Owner Design and Build MEP engineer Architect Structural Engineer 16

IARIA	RESULT :	WORKFLOW
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2023			
VIIO LEGEND	Timeline	→ Flow ◆Approved ◆Rejected	Main-actor Sub-actor Co-production
0	O Owner A Architect S Structure M MEP	Owner Designer Contractor Consultant	Main-actor

RESULT: WORKFLOW

		Timeline	> Flow	Approved	Rejected	Mai	n-actor Sub-actor	-production
ر 	O Ow	ner Architect SStructure	MEP Owner	Designer	Contractor	Consultant Mai	n-actor	
US context	Initial	De	sign	Permitting		BID & Award	Construction	Commissionin & operation
Belgian contex	t PRE	APS	APD	PDU	DCE	MDT	EXE	MSU
Cambodian context	Initial	Conceptual design	Schematic design	Permitting Tender		BID	Construction	Post- Construction

RESULT: WORKFLOW



RESULT: WORKFLOW

		wo	RKFLOW IN CONSTR	RUCTION IN CAM	BODIA			
		Timeline		Approved	Rejected	M	lain-actor Sub-actor	o-production
	O Ow	ner A Architect S Structure	MEP Owner	Designer	Contractor Consu	Iltant M	lain-actor	
US context	Initial	De	esign	Permitting	BID & Av	ward	Construction	Commissioning & operation
Belgian contex	t PRE	APS	APD	PDU	DCE	MDT	EXE	MSU
Cambodian context	Initial	Conceptual design	Schematic design	Permitting Tender	BID		Constructior	Post- Construction
Scenario B The owner has full-package: designer and contractor	he owner has Ill-package: esigner and A S O A S A O S A S A O S A S A O S A S A				S A M	A S M		

RESULT: WORKFLOW



023			<u>WO</u>	RKFLOW IN CONSTR	RUCTION IN CAN	<u>IBODIA</u>			
OLLA 2	LEGEND		Timeline	> Flow	Approved	Rejected	Ma	in-actor Sub-actor	o-production
0		O Ow	vner A Architect S Structure	MEP Owner	Designer	Contractor	Consultant Ma	iin-actor	
	US context	Initial	De	sign	Permitting		BID & Award	Construction	Commissioning & operation
	Belgian contex	(t PRE	APS	APD	PDU	DCE	MDT	EXE	MSU
	Cambodian context	Initial	Conceptual design	Schematic design	Permitting Tender		BID	Construction	Post- Construction
	Scenario C The owner owns full- package of designer	Require- ment	Repeat Repeat	S M Repeat		SS	A S M 3		ASM

RESULT: WORKFLOW

	WORKFLOW IN CONSTRUCTION IN CAMBODIA								
LEGEND	O Ow	→ Timeline	→ Flow MEP Owner	•	•	Consultant	Main-actor Sub-actor Main-actor	o-production	
US context	Initial	De	esign	Permitting	÷	BID & Award	Construction	Commissioning	
Belgian contex	(t PRE	APS	APD	PDU	DCE	MD		MSU	
Cambodian context	Initial	Conceptual design	Schematic design	Permitting Ter	nder	BID	Construction	Post- Construction	
Scenario D The contractor handles both design and build	Require ment		S S A O M M M	ASM			ASS AO M	ASM	

RESULT: WORKFLOW

IARIA

Main-actor Sub-actor Timeline Approved ---> Flow **LEGEND** Co-production O Owner A Architect S Structure M MEP Owner Designer Consultant Contractor Main-actor Commissioning Construction & operation **US** context Initial Design Permitting **BID & Award** Belgian context PRE PDU DCE MDT EXE APS APD MSU Permitting Cambodian Conceptual Schematic Post-Initial BID Construction context design Tender Construction design Architect., structure, and Detail Build method, As-build plan Conceptual Scenario A MEP design schedule, cost,.. design The seperatly 0 S S Α S ---- S Α А A А А А S -- S contract А A -0 Require-0 Μ 0-- S S Μ S 0 between M S S Α S ment А М designer and Μ M М Μ Μ Μ Μ Repeat Repeat contractor Repeat Scenario B Build method, schedule, cost,... S А S Α S А S The owner has 0 0 A full-package: A A Require-S S Μ 0 M Μ designer and ment M Μ Μ contractor Repeat Repeat Repeat Scenario C Α Α Α А А S -- S А S А The owner S S Require-0 0 0--S owns full-A A S S Α -.0 S S S Μ M ment package of Μ М Μ Μ М М Μ Μ Μ designer Repeat Repeat Repeat Scenario D Α А Α SS 0 S .--- S S S The contractor Require: S А A -- 0 - A -0 Ó S handles both ment Μ ΜМ А Μ design and М Μ М Μ build Repeat Repeat

Repeat

WORKFLOW IN CONSTRUCTION IN CAMBODIA

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RESULT: WORKFLOW



RESULT: BIM EXPERIENCES AND PERSPECTIVES





Do you have experience using BIM in project level?





RESULT: WORKFLOW

023 Main-actor OLL Sub-actor Timeline → Flow Rejected Approved **LEGEND** Co-production Ũ O Owner A Architect S Structure M MEP Owner Designer Contractor Consultant Main-actor BID & Award DCE MDT BID Tender Detail drawing: Build method, schedule, cost,... Choosing contractor А А А Α А 0---S S S S S М M M М Μ 3... A S

M

SM

RESULT: BIM EXPERIENCES AND PERSPECTIVES

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"I am interested in BIM. Otherwise, I am concerned about the cost and time of staff training."

COLLA 2023 "I am interested in BIM. Otherwise, I am concerned about the cost and time of staff training."

"I will consider using BIM for my future project if it is the requirement of the project owner."

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"I understand the BIM benefits in construction, but I need more time to learn it."

COLLA 2023

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- "I still must export BIM models to DWG format each time he shared his document with my partner."

COLLA 2023

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"I still must export BIM models to DWG format each time he shares his document with my partner."

"BIM is beneficial, especially, it reduces the waste time of reworks." Otherwise, "we met the difficulty when adopting BIM because we were used to the traditional software, and it is difficult to change."

"There need to be more experts to help us resolve the problem we meet."

CONCLUSION: BIM

- BIM has yet to become familiar in Cambodia.
- It needs to be more motivation, training, and practicality, especially motivation from the government.
- The experts strongly believe that BIM can influence their projects to be more productive. Yet, they are still resistant to change.
- Needs precise management and contract standards aligned with the Cambodian context.
- Increasing human resources, which will be the new actor in the BIM process.
- Further research should focus on analyzing the impact and identifying the potential adoption of BIM in the Cambodian context.



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THANK YOU

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