INFLUENCE OF INTEGRATED TEAMS AND CO-LOCATION TO ACHIEVE THE TARGET COST IN BUILDING PROJECTS

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ABSTRACT

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Construction projects are complex that the **creation of value cannot only be carried out by a company**; for this reason, temporary contracts are created between **construction companies, designers, and owners**. However, these contractual relationships are difficult when the interests and needs of each company are contrasted with those of the project and generate **problems of collaboration between the parties**. The present study describes the **implementation of project integration practice**s such as **co-location and integrated teams** in a building project in Lima, Peru. The ideas proposed resulted in savings for the project. **The study details the ideas by discipline and the achievements obtained**.

AGENDA

- INTRODUCTION
- CASE STUDY
- RESULTS
- DISCUSSION
- CONCLUSIONS

INTRODUCTION

Background

During the last decade, companies and researchers have defended the need for **value creation through collaboration** between organizations (Le Pennec & Raufflet, 2018). However, the way companies are organized to develop a construction project is not ideal because of the well-known problems to achieve collaboration such as: **poor communication, fragmented industry and adverse relationships (Nicolini, Holti, & Smalley, 2001).**

Solutions such as the **location** of the members of a project in collaborative spaces (co-location), can increase collaboration (Kokkonen & Vaagaasar, 2018; Tezel, Aziz, Koskela, & Tzortzopoulos, 2016).

Also the **integration of the teams** and the achievement of collaboration is important to have a successful project that generates value and customer satisfaction (Choi, Yun, Leite, & Mulva, 2019; Lee, Tommelein, & Ballard, 2010; Forgues, Koskela, & Lejeune, 2008)

Target costing is an effective management technique that has been used in manufacturing for decades to achieve cost predictability during new product development. The adoption of this technique promises benefits for the construction industry as it struggles to raise the number of successful outcomes and certainty of project delivery in terms of cost, quality, and time (Zimina, Ballard, & Pasquire, 2012). Kron and Von Der Haar (2016) analyzed the increasing values with target costing pertaining to an optimized cost-benefit-ratio for project development of office buildings.

INTRODUCTION

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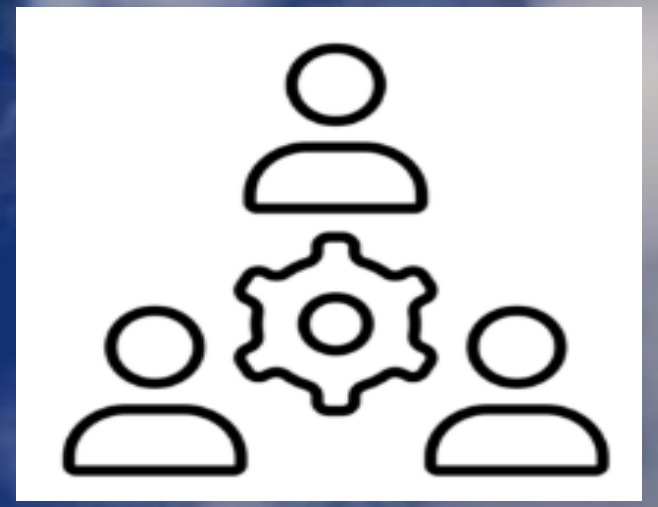
Theoretical Framework

- **Integrated teams:** "A condition in which different organizations with different objectives, needs and cultures merge into a single cohesive and mutually supportive unit" (Baiden et al., 2006) .

- **Co-location:** "The collaborative execution of work by key members of the project team in a single shared physical location" (Fischer, 2017).



CASE STUDY

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PROJECT DESCRIPTION:

Type: Real state building

Location: Lima, Peru.

Owner company: Edifica

Contractor company: Produktiva

Design management: Produktiva

Designers: DLPS, Prisma, Pilotes Terratest, FM Ing.s

Scope: The building has 5 basements, 23 floors, an approximate covered area of 11,673 m2 and an approximate design period of 4 months and construction of 20.5 months.

CASE STUDY

THE METHOD

The model was suggested by a lean consultant.

It begins with a validation study where opportunities for improvement were identified through interviews with key participants in the project (designers, owner, constractor, providers) and set de goals of savings.

Then integrated teams are formed, validate the goals and work co-located to achieve them.

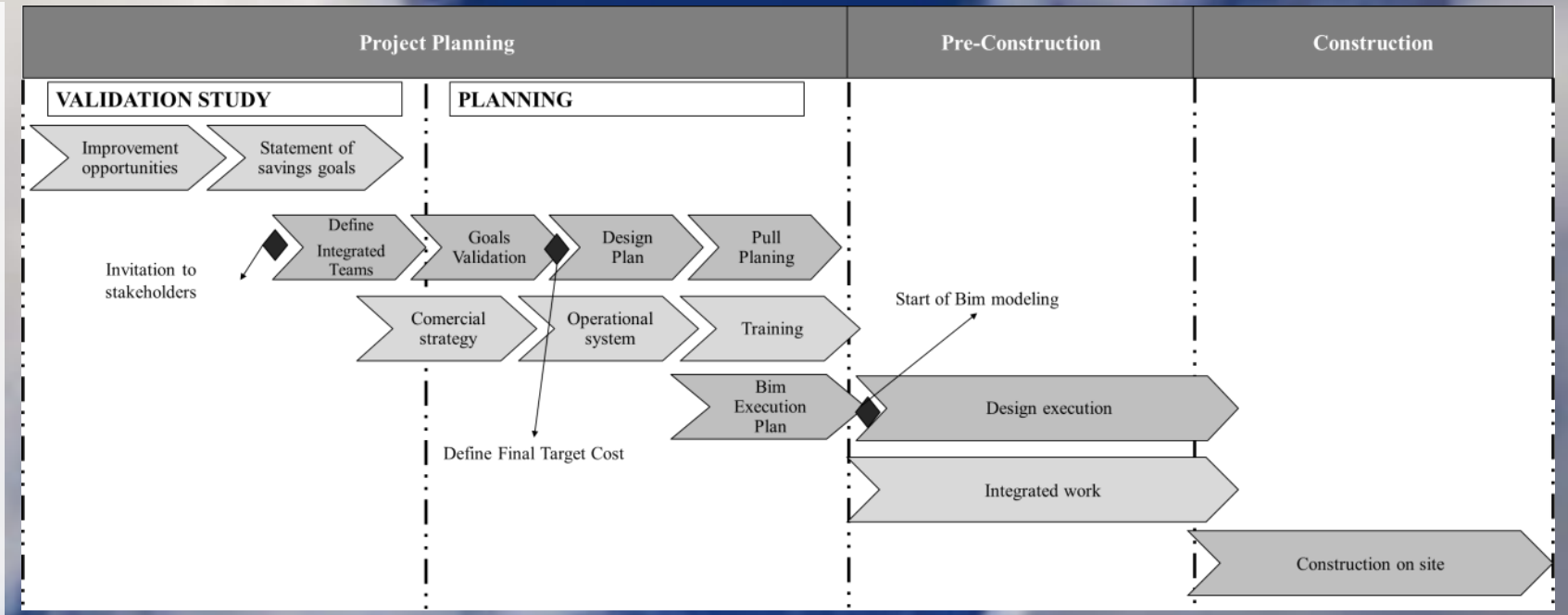

Figure 1 . Implementation model where the use of integrated team is appreciated. The model was developed by a lean consultant. It was based on project integration practices

RESULTS

Table 1. Ideas from interviews with project participants (Part 1/2)

Interviewed	Item	Proposed ideas to improvement opportunities
Structural engineer	1	Thickness reduction of anchored walls with larger plate in punching area, for which it is convenient to define the subcontractor of anchored walls
	2	Identify the basements of the neighbours to consider the true support walls to consider in the project
	3	Use different concrete f´c. If using 350 kg / cm2 and 280 kg / cm2 there would be no problem in the nodes, provided the difference is not greater than 70 kg / cm2
	4	It is cheaper to use more resistant concrete and reduce steel. Costing can be done after pre-sizing.
	6	Recommend using pre-cut steel.
Builder Engineer	19	Basements smaller than five levels are more convenient to use pre-slabs vs post-tensioned slabs.
	20	Study alternative proposals for window systems with other suppliers.
	21	Study optimized design of melamine furniture with Ideoforma Company
	22	Incorporate the pre-cut steel supplier in the design stage

RESULTS

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Table 1. Ideas from interviews with project participants (Part 2/2)

Interviewed	Item	Proposed ideas to improvement opportunities
Electrical Engineer and Sanitary Engineer	6	It is convenient that the boards are located close to the amount
	7	The depth of the boards must be 8.5 to 9.0 cm for which the wall must be 10 cm
	8	The rule indicates that every 3m2 must have an outlet in bedrooms. In Edifica they ask for 2 to 3 outlets per bedroom.
	9	Deposit walls must be cleared in the plans.
	10	Review proposal of points of light and outlets in basements
	11	It is alert to define the need to use outlets in closets.
	12	There are no water pipes in basements
	13	There will only be a grid at the end of each ramp
	14	Check the need for outlets with protectors in basements.
	15	Feasibility indicates that the meters must be located on Dean Valdivia Street.
	16	It is convenient to seek approval in Architecture so that the walls of the light meters can use 1.8 m
	17	Check the load. The standard requires electric cooking and electric hot water.
	18	Only one sinkhole will be used.

RESULTS

Table 3. Design of integrated teams, Savings goals planned and savings achieved in Peruvian soles exchange

Item	Integrated Team	Organization	Savings goals planned	Savings achieved
IE1	Anchored walls	Structural engineer, builder, subcontractor of anchored walls	70,800	83,153
IE2	Slab system	Structural engineer, builder, pre-slabs subcontractor, owner	224,200	358,203
IE3	Vertical elements	Structural Engineer, Builder, Pre-Slab Subcontractor, Pre-cut Steel Supplier	88,500	
IE4	Masonry Walls	Structural engineer, architect, electrical engineer, sanitary engineer, builder, owner.	153,400	147,205
IE5	Electrical outlets	Electrical engineer, structural engineer, builder, owner	59,000	
IE6	Windows and Screens	Architect, builder, owner, windows subcontractor.	212,400	324,872
IE7	Melamine furniture	Architect, builder, owner, melamine furniture subcontractor	224,200	89,029
		TOTAL	1,032,500	1,002,462

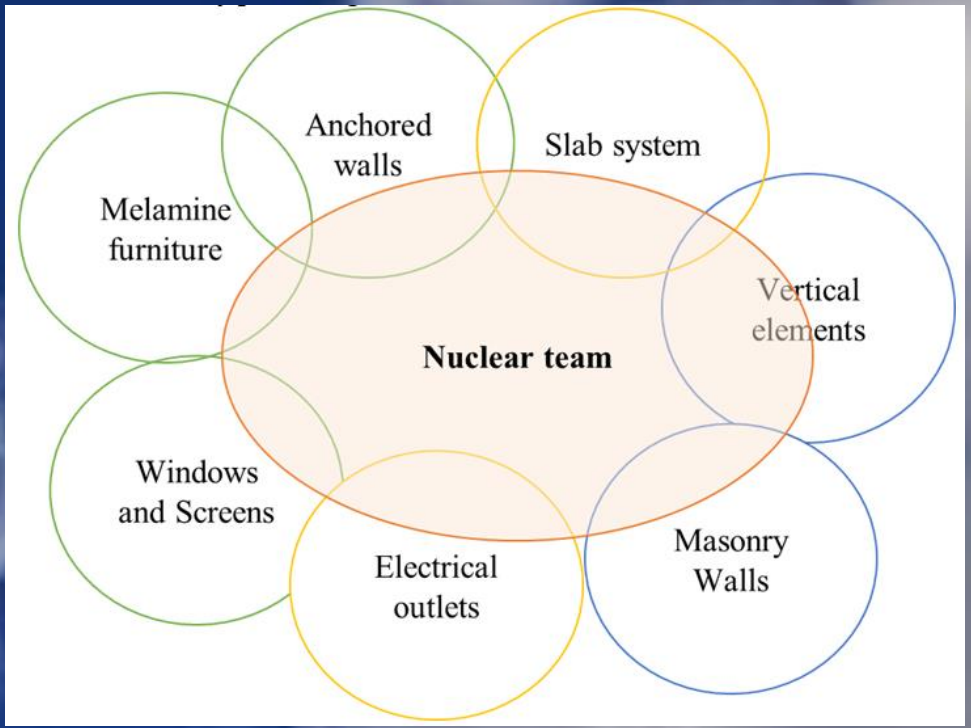

Figure 2. Structure of the integrated teams.

RESULTS

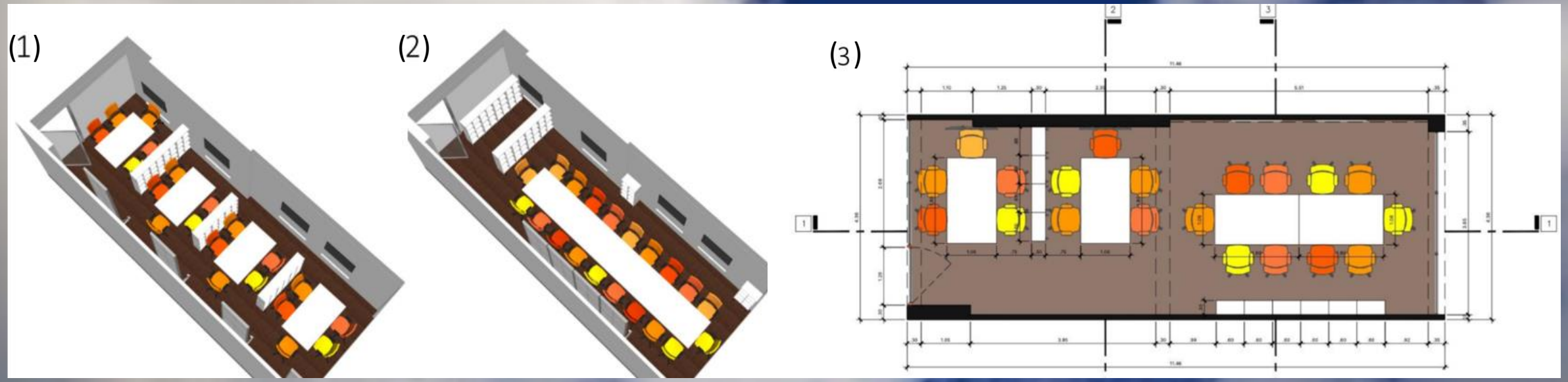

Figure 3 . Big room where the work sessions of the integrated teams were held. In
(1) The division of the room into 4 workstations can be seen. In
(2) You can see the same divided room for a plenary session with all participants.
(3) You can see the distribution plan .
Each environment is equipped with interactive screens to review BIM models and review different alternatives.

RESULTS

Figure 4 . Photos of the work sessions of the integrated teams. The explanation of structure takt planning by the contractor is in the left photo and the Anchored walls integrated team on the right photo.

DISCUSSION

- Integrated team is a tool, which as explained in the case study, plausibly helps to achieve the much desired collaboration between the parties.
- One of the advantages of project integration practices is that the estimation of the cost of the project is carried out from when the design is not very mature until when the design is ready for construction. This allows informed decisions based on cost.
- Visualizing the different design alternatives using BIM models also aided in rapid decision making. This was because the comparison between the amount of resources used in one alternative versus another was made in a matter of minutes. The present investigation on the influence of BIM technology on the way of working in integrated teams has not been studied in depth, but it could be a following investigation

CONCLUSIONS

- The companies had an interesting learning process. Among the points that worked was the process of not judging the ideas of others, having a team moderator that promoted dialogue and exchange of ideas.
- It is important to accompany the design alternatives with an adequate cost estimate for the project.
- The workplace contributes to the collaboration between the parties as it improves communication when the people of the teams face to face. This increases the speed of decision making