# PRODUCTION PLANNING AND CONTROL AS-IMAGINED AND AS-DONE: THE GAP AT THE LOOK-AHEAD LEVEL

Douglas Comassetto Hamerski, Luara Lopes de Araujo Fernandes, Mattheus Souza Porto, Tarcisio Abreu Saurin, Carlos Torres Formoso, Dayana Bastos Costa

INTRODUCTION

- The Last Planner System (LPS) of Production Control is widely acknowledged as fit to tackle the complexity of construction projects

- The removal of constraints is one of the central elements of the system

- Several different types of constraints

- Non-linear relationship between the number of work packages and the number of constraints

- The removal of a primary constraint (e.g. equipment) may trigger the need for removing other upstream constraints (e.g. maintenance of existing equipment
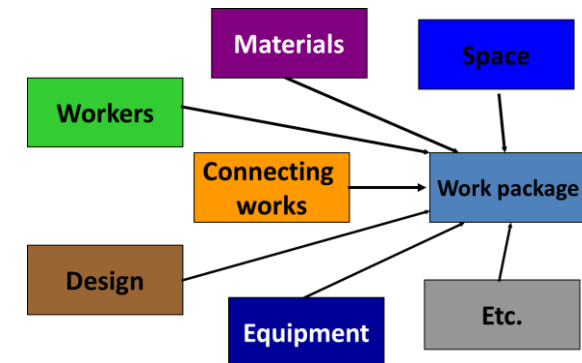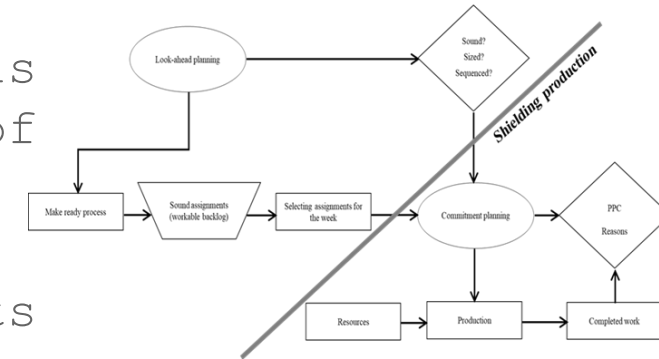
INTRODUCTION

- It is reasonable to expect that the removal of constraints is a complex process itself, likewise other LPS activities

- In this paper, this complexity is investigated in light of the concepts of work-as-imagined and work-as-done

Work-as-imagined (WAI) refers to the various assumptions, explicit or implicit, that people have about how work should be done, being often prescribed in procedures or standards

Work-as-done (WAD) refers to how something is actually done, either in a specific case or routinely

RESEARCH AIMS

To investigate the gap between production planning and control-as-imagined (based on the original version of the LPS) and production planning and control-as-done (based on how it is applied in practice) at the look-ahead level

FRAM

- FRAM is a method to model complex systems

- One of the main roles of FRAM is to model how different functions in socio-technical systems relate to each other (e.g. it allows modelling interactions between managerial and production functions)

- Each function is formed by 6 different aspects (Output, Input, Precondition, Resource, Control and Time) and shows existing interactions between Outputs of upstream functions and the other 5 aspects of downstream functions
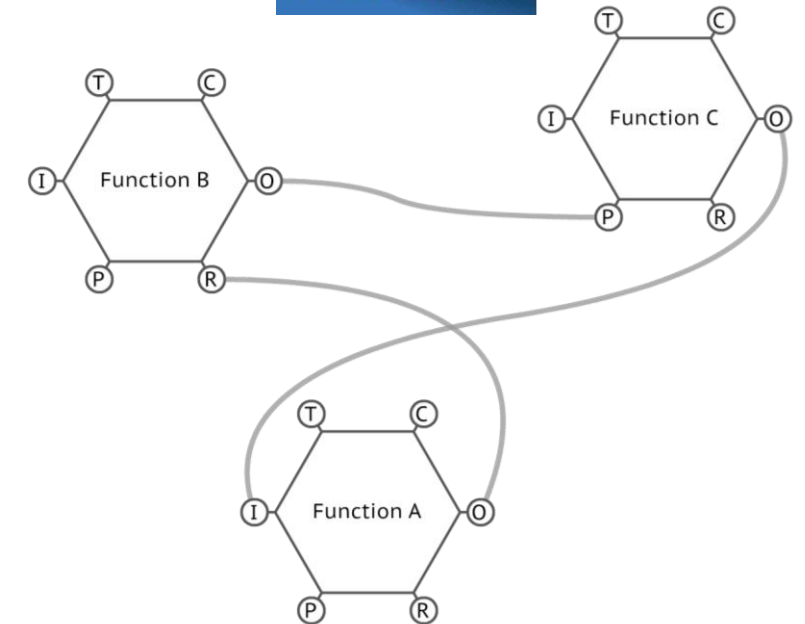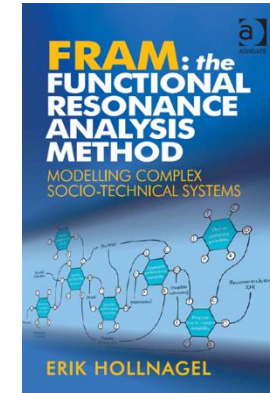
RESEARCH METHOD

- Case study (refurbishment project for a department store in Brazil - fully using LPS)

- Unit of analysis: managerial functions during the process of removing constraints

- FRAM was used to model the functions involved in the removal of constraints, considering two work packages:(i) installation of the fire pipe support system (100% complete); and (ii) mezzanine assembly (delayed)

- Three sources of evidence were used: documents, participant observations, and unstructured interviews

RESULTS

Functional model for the removal of constraints: work package "Mezzanine assembly" (delayed)
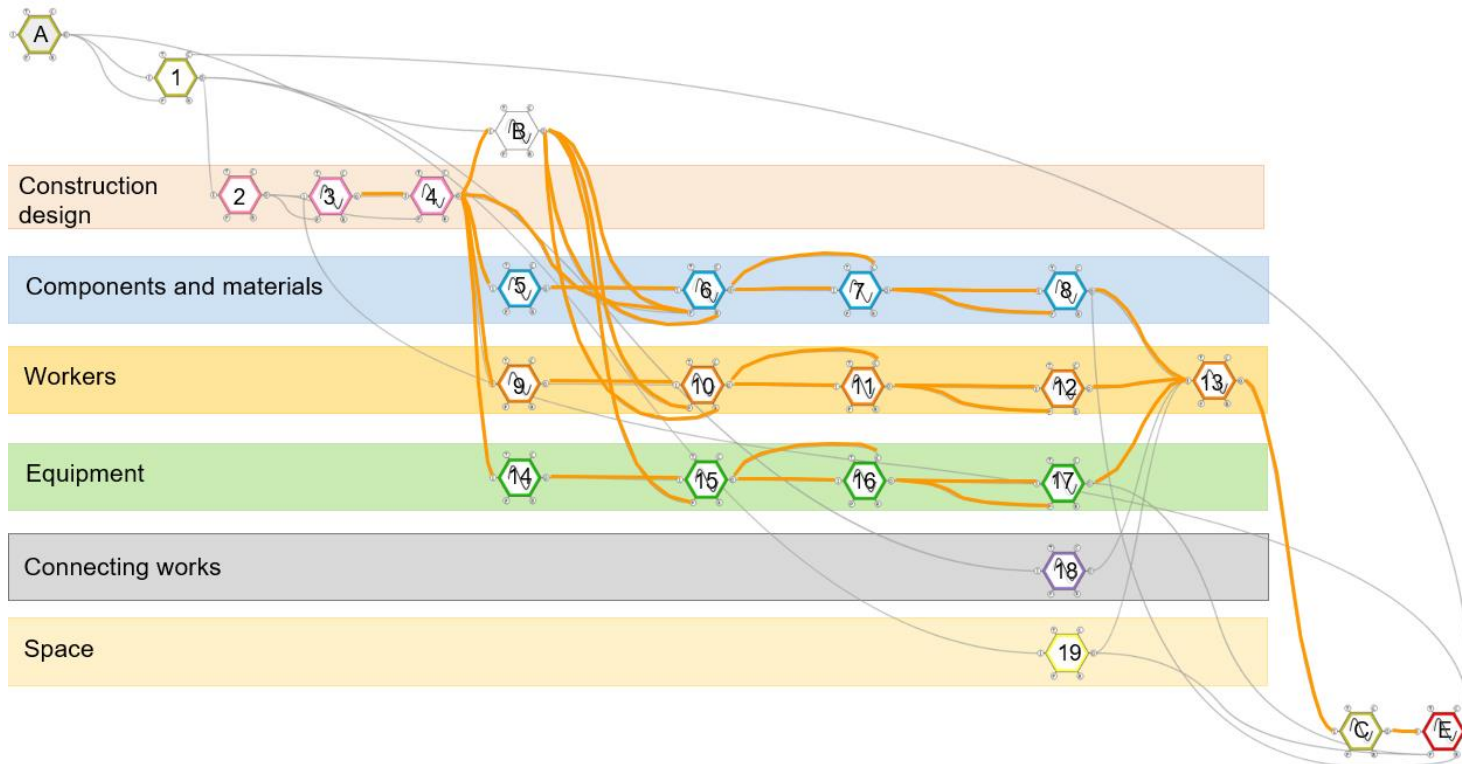
	Function		Function
A	Produce long-term plan	11	Perform induction training
1	Produce look-ahead plan	12	Check workers availability
2	Check construction design availability	13	Conduct a price quote for equipment rental
3	Study construction design	14	Rent equipment and schedule the delivery
4	Check the quantity of materials	15	Check the delivery of equipment
B	Check financial resources availability	16	Check logistics for equipment transportation
5	Conduct a price quote for materials	17	Check the conclusion of previous work packages
6	Purchase materials and schedule the delivery	18	Check space availability
7	Check the delivery of materials	19	Make commitment
8	Check logistics for materials' transportation	C	Produce short-term plan
9	Perform job interviews to compose the work team	D	Installation of the fire pipe support system
10	Hire workers and schedule the start of work on site	E	Mezzanine assembly

Construction design

Components and materials

Workers

Equipment

Connecting works

Space

DISCUSSION

Production planning and control-as-imagined	Production planning and control-as-done
The precondition categories for a construction task are independent on each other	The preconditions categories for a construction task depend on each other
The process of removing the constraints is simple	The process of removing the constraints is complex
There is a formal workable backlog	There is not a formal workable backlog
Constraints are identified by looking for upcoming work packages	Constraints are identified by looking for upcoming groups of work packages
All constraints are formally identified and removed	Some constraints are informally identified and removed – i.e., these constraints are not anticipated and documented in the planning meetings
All constraints are removed before starting the work package	Some constraints are removed while the execution of the work-package is in-progress

CONCLUSIONS

- Differences between what is prescribed by the original version of the LPS and how it was applied in practice in the case study (look-ahead level)

- Hidden activities required for the removal of constraints (took time and effort from managers)

- Further studies are required to:

  - understand if the gaps identified in this study are recurrent on other construction projects and if they reflect fundamental limitations and under specification in the theory of LPS

THANK YOU!

Douglas Comassetto Hamerski – douglas_hamerski@hotmail.com

Luara Lopes de Araujo Fernandes – luara.fernandes@gmail.com

Mattheus Souza Porto – mattheus_porto@hotmail.com

Tarcisio Abreu Saurin – saurin@ufrgs.br

Carlos Torres Formoso – formoso@ufrgs.br

Dayana Bastos Costa – dayanabcosta@ufba.br