Applying FRAM to the construction of concrete frame structures

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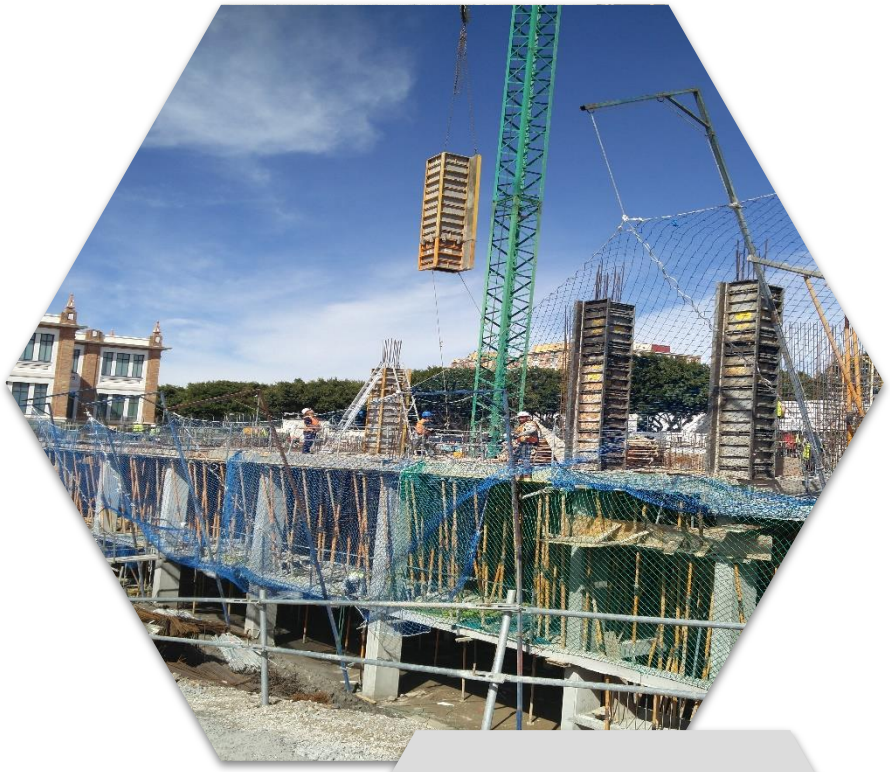
Case study

Construction of an apartment building in Málaga (Spain)



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Data collection

5 Months

15 Visits

30 Interviews

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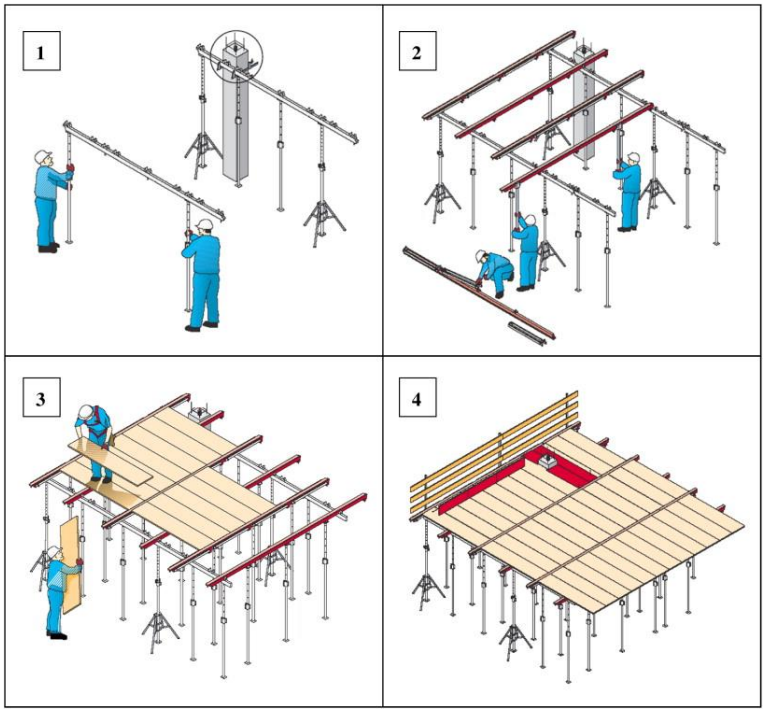
Main Operations

Formwork



Rebar

Concreting

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Other Operations

Safety

Setting out / Check

Tower Crane

Resources

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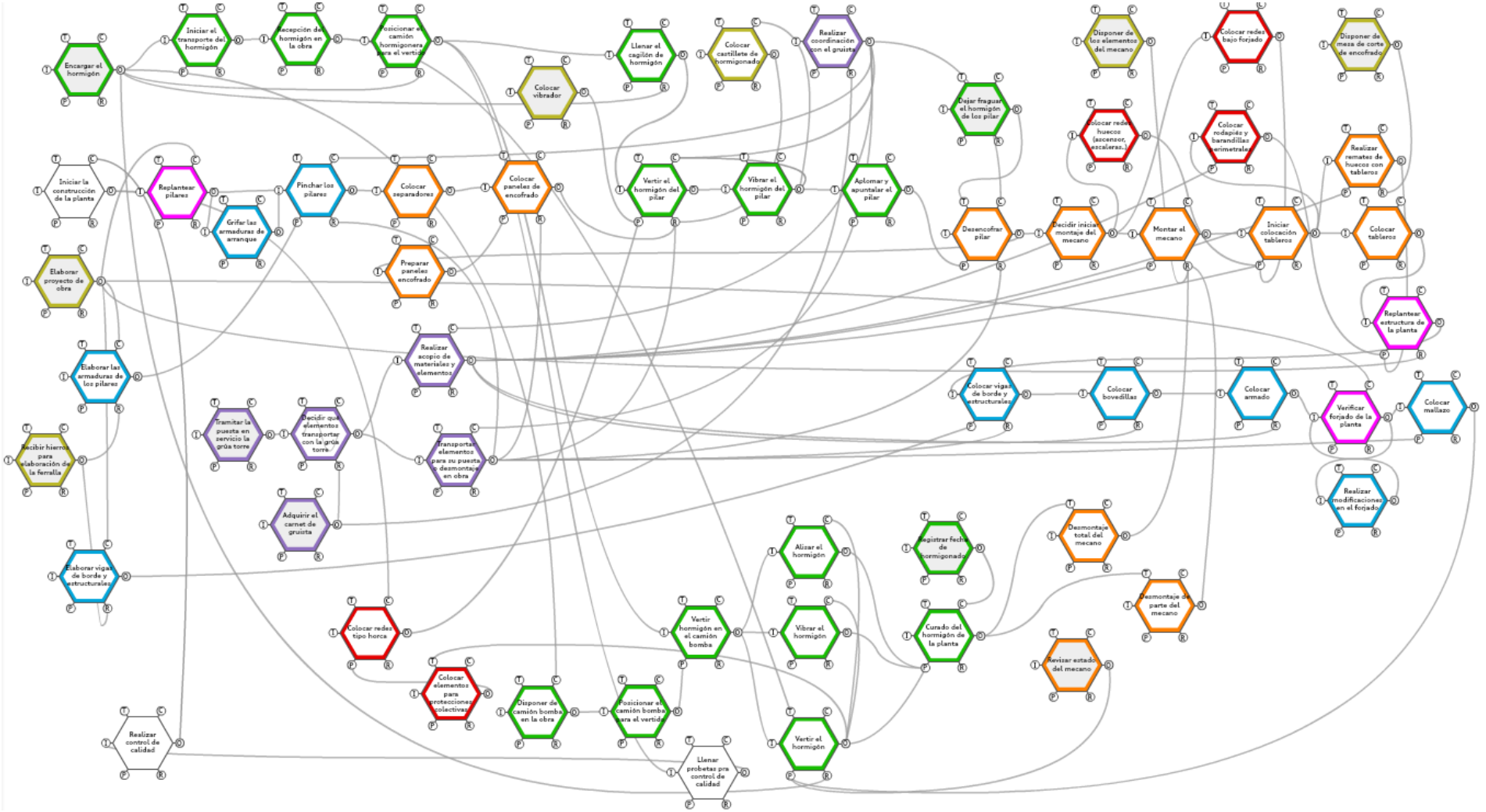
The FRAM model developed



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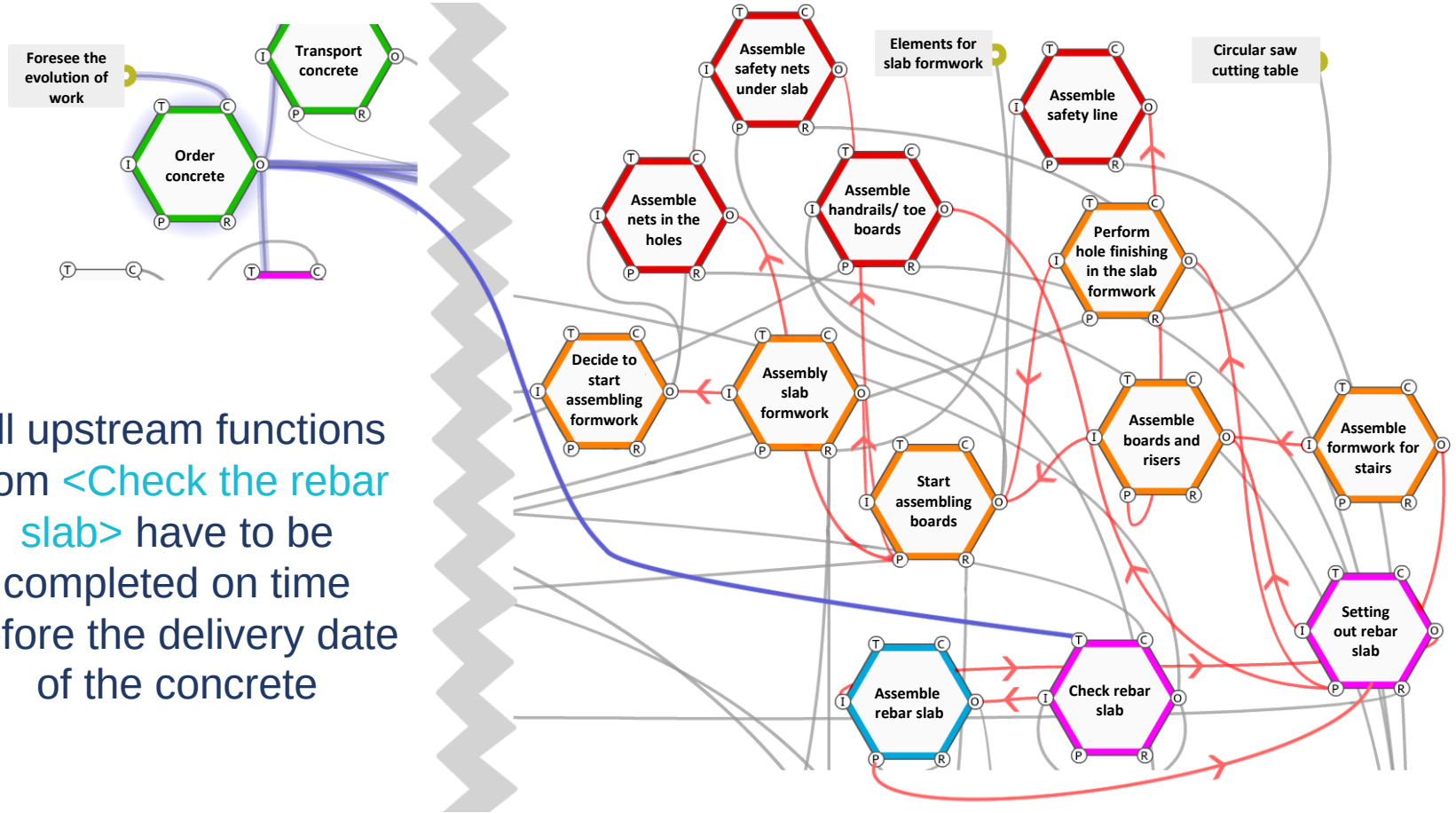
Findings

<Order concrete> appears as a key function. The output from this function is the time aspect for the function <Check the rebar slab>



All upstream functions from <Check the rebar slab> have to be completed on time before the delivery date of the concrete

<Order concrete> increases the potential variability and it spreads to other functions

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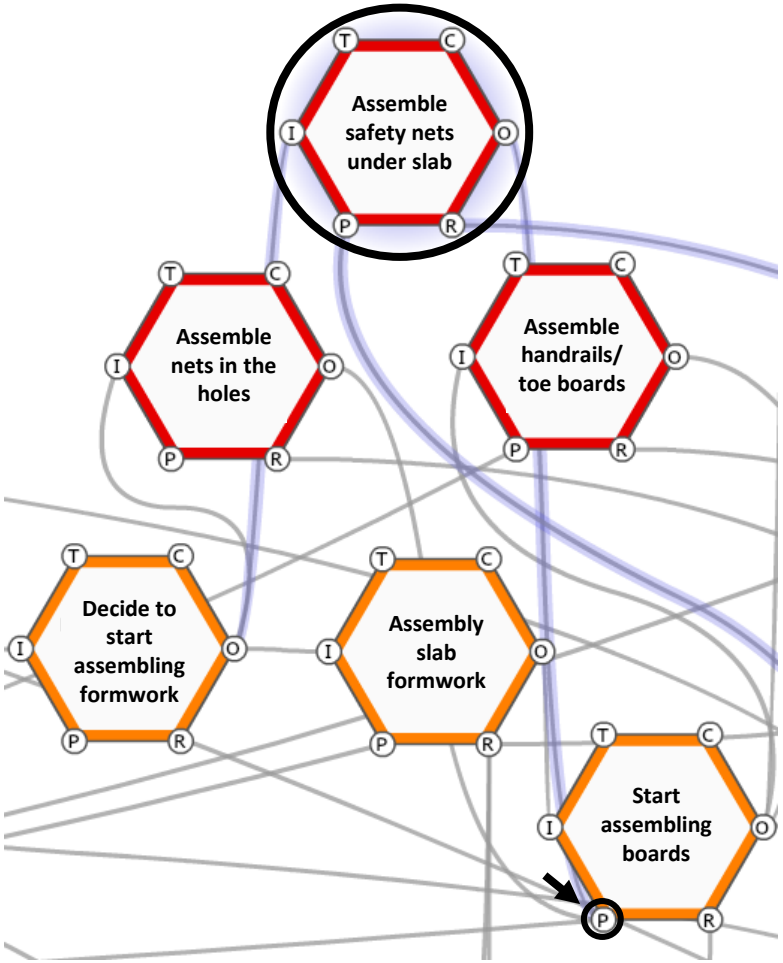
Findings

All the outputs from the functions related to occupational safety and health focus on collective protection safety systems are preconditions of other functions.

Due to time pressure, it is possible that functions start without preconditions are still available.



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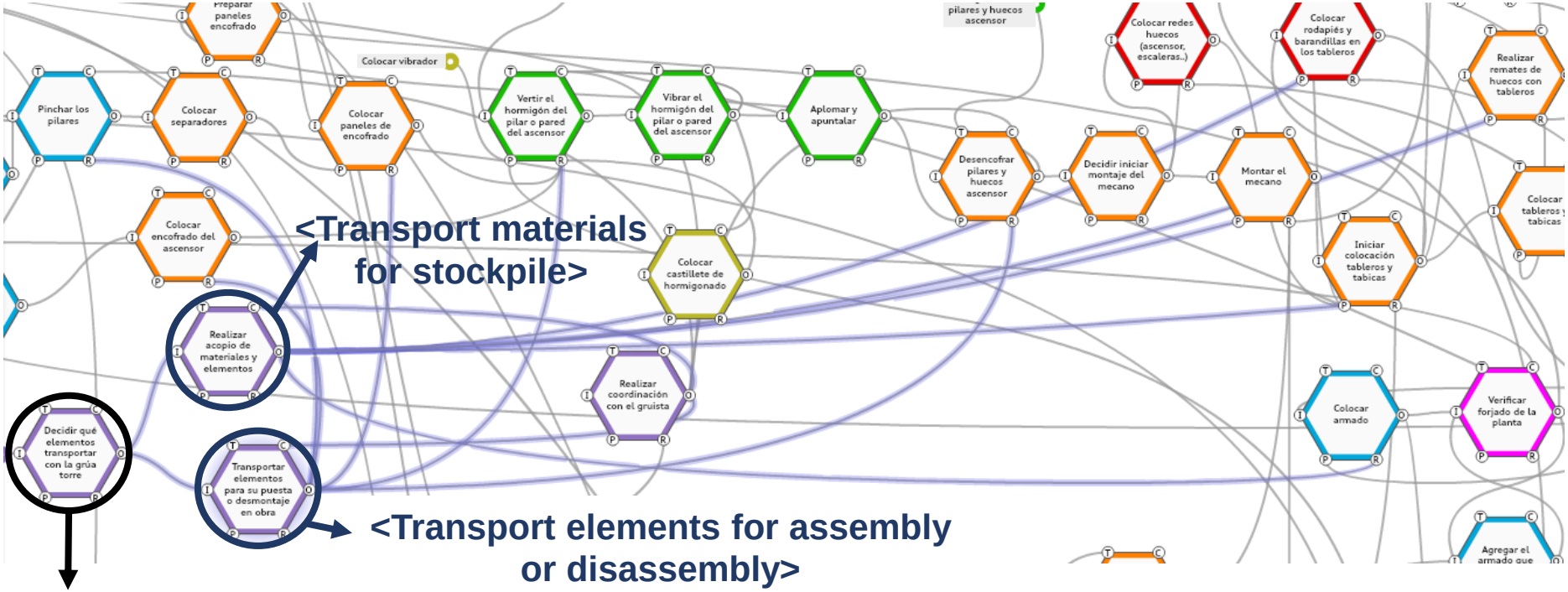
Findings

<Decide what to transport with the crane> is a critical function. The output from this function is a necessary resource to carry out a large number of functions.



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Other points to pay attention to

When we study the "work-as-done" we found that the Construction Phase Health and Safety Plan is never used in the real work.

Most functions are human functions. The resilience skills of the workers are employed to adopt strategies to cope with the variability, but they usually put productivity before safety.

Mainly lagging indicators are used to monitor health and safety performance.

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Future Research Directions

Apply FRAM to investigated accidents in order to improve the functions included in the proposed model

Propose recommendations to make Construction Phase Health and Safety Plan more practical and useful in the daily work

Develop leading indicators to monitor performance in construction tasks

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Thank you very much for your attention