

MAPPING SUCCESS IN COLLABORATIVE ENGINEERING

DESIGN 2018

Chairs: Ian Whitfield, Dorothy Evans and Ross Brisco

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Workshop Team



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Collaborative Design SIG

To support and build the community of collaborative design researchers and initiate a collaborative design research agenda.

Format

9:00	Introduction	Collaborative Design SIG.
9:15	Workshop Context	Overview of challenges in collaborative engineering.
9:30	Activity 1	Ishikawa diagram on collaborative engineering.
10:30	Network Break	
11:00	Activity 2	Causal loop diagram on collaborative engineering.
11:45	Open Discussion	How can we address these challenges through research?
12:15	Close	

What are the benefits of collaborative engineering?

Benefits of collaborative engineering?

- Efficiency improvements
- Elimination of rework
- Improved complexity management
- Automation of parts of the collaborative design process



Benefits of collaborative engineering?

- Rapid creation and articulation of viewpoints
- Faster construction of networks
- Democratisation of the product or service development process
- Discontinuous and open innovation
- Adoption of dynamic capabilities to sustain competitive advantage



Benefits of collaborative engineering?

Organisations have an increased importance to **adapt and advance** collaboration practices in design in order to survive and flourish.



Benefits of collaborative engineering?

Technological advancements have the potential and an expectation to enable **agile collaboration** and new possibilities for innovation.



Benefits of collaborative engineering?

- Rapid creation and articulation of viewpoints
- Faster construction of networks
- Democratisation of the product or service development process
- Discontinuous and open innovation
- Creating new business models and markets
- Adoption of dynamic capabilities to sustain competitive advantage



What are the challenges of collaborative engineering?

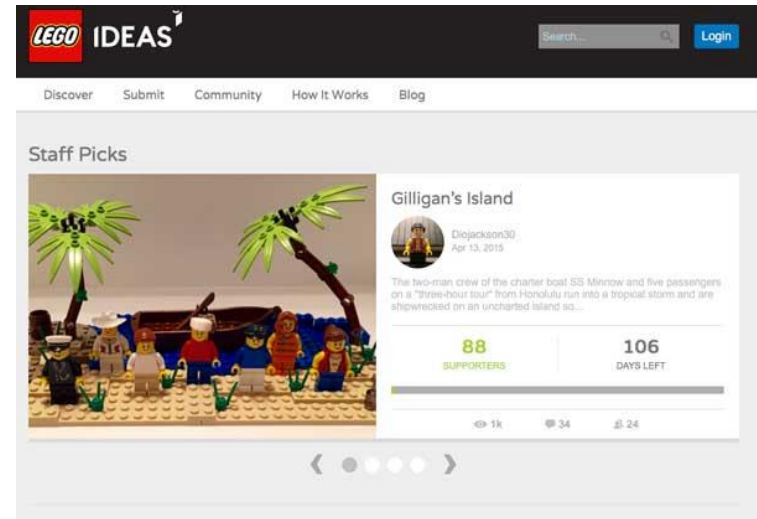
Challenges of collaborative engineering?

The characteristics present **complex and contradictory** challenges to conventional industrial practice and confounds the benefits gained from wide-spread implementation.



Challenges on collaborative engineering?

- Some industrial practices may be ill equipped to replicate these benefits in a collaborative environment
- Collaborative endeavours fail due to obstacles in sharing knowledge
- Difficulty in coordinating stakeholders



Managing collaborative engineering?

- “Constructor error/omission indicated as one of the greatest cost impact sources”.
- “Mandatory government reviews added time to the project due to rework caused by changes”.
- “Poor scope definition disrupts project rhythm, causes rework, increases time and cost, and lowers productivity and morale”.
- “Majority of rework due to limited attention given to design verification and review processes”.
- “Concealed changes creates a backlog of hidden rework”.

Brief Introductions

- Name
- Affiliation
- Background

Please keep to maximum 30 seconds.

Activity 1

What are the challenges of collaborative engineering?

Causes and effect diagram

Cause and effect analysis:

Identify the problem - who is involved, what the problem is, when and where it occurs.

Identify the problem

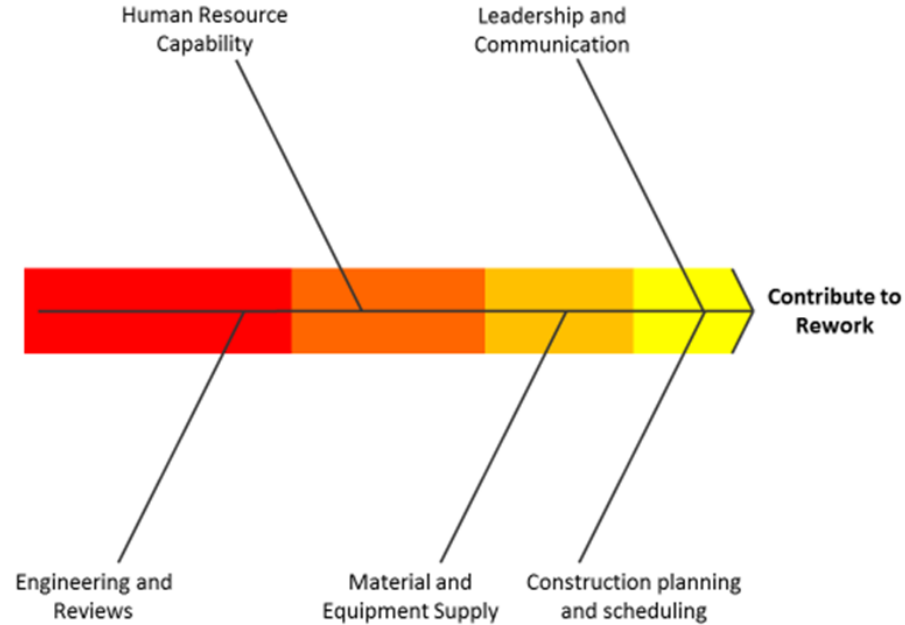


e.g.
Rework
Communication
Coordination
Shared understanding...

Causes and effect diagram for rework

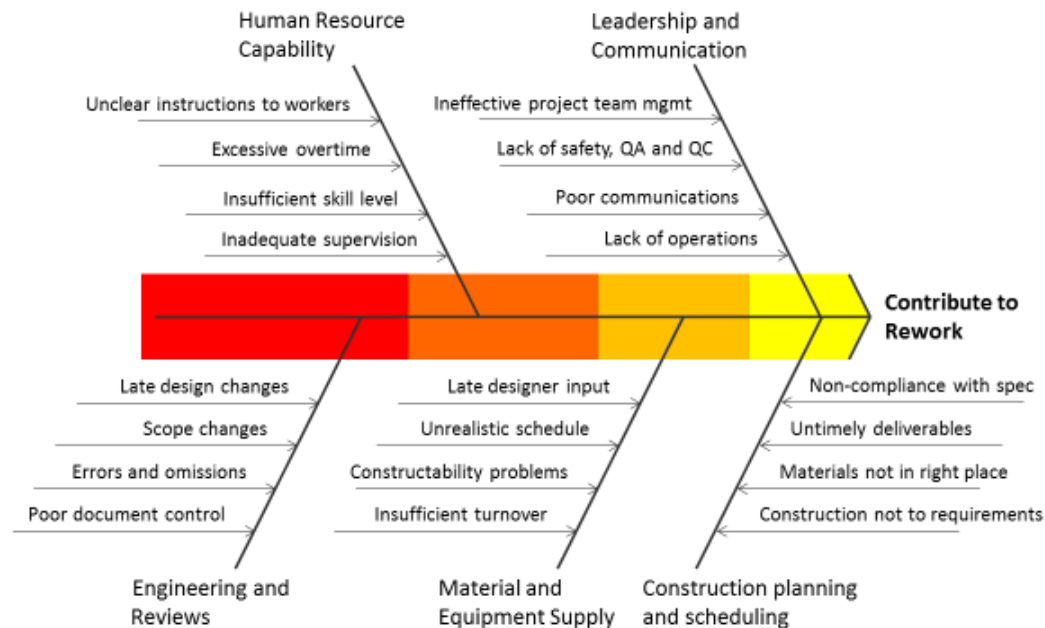
Identify the major factors involved – may be systems, processes, people, external considerations.

Activity 1

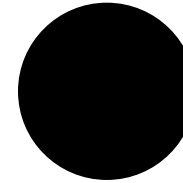
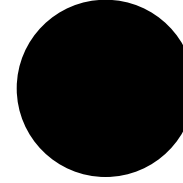
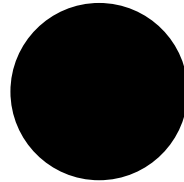
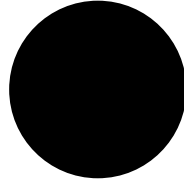


Activity 1

(Common) causes of rework (from construction industry)



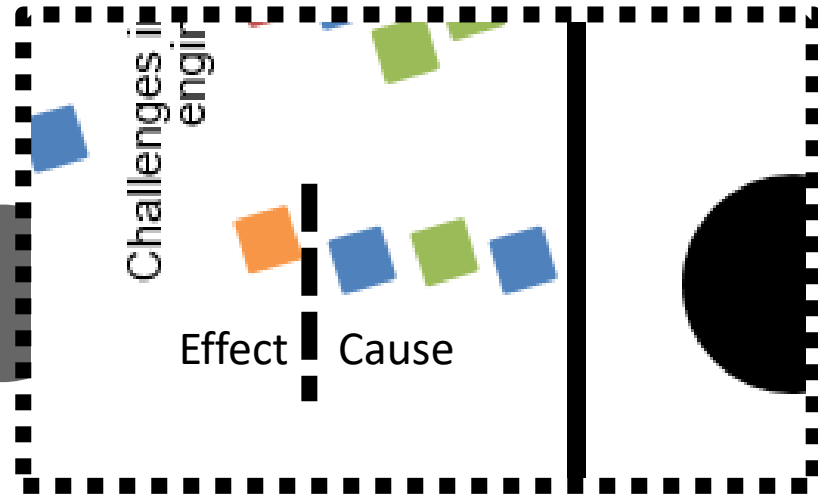
Activity 1





Effect: challenges in collaborative engineering

Cause: contributors of challenges in collaborative engineering



Activity 1

What are the challenges in collaborative engineering?

1. Discuss in your group(s) – 15 minutes.
2. Post-it your challenges – 20 minutes.
3. Share with the group – 10 minutes.

Break

Activity 2

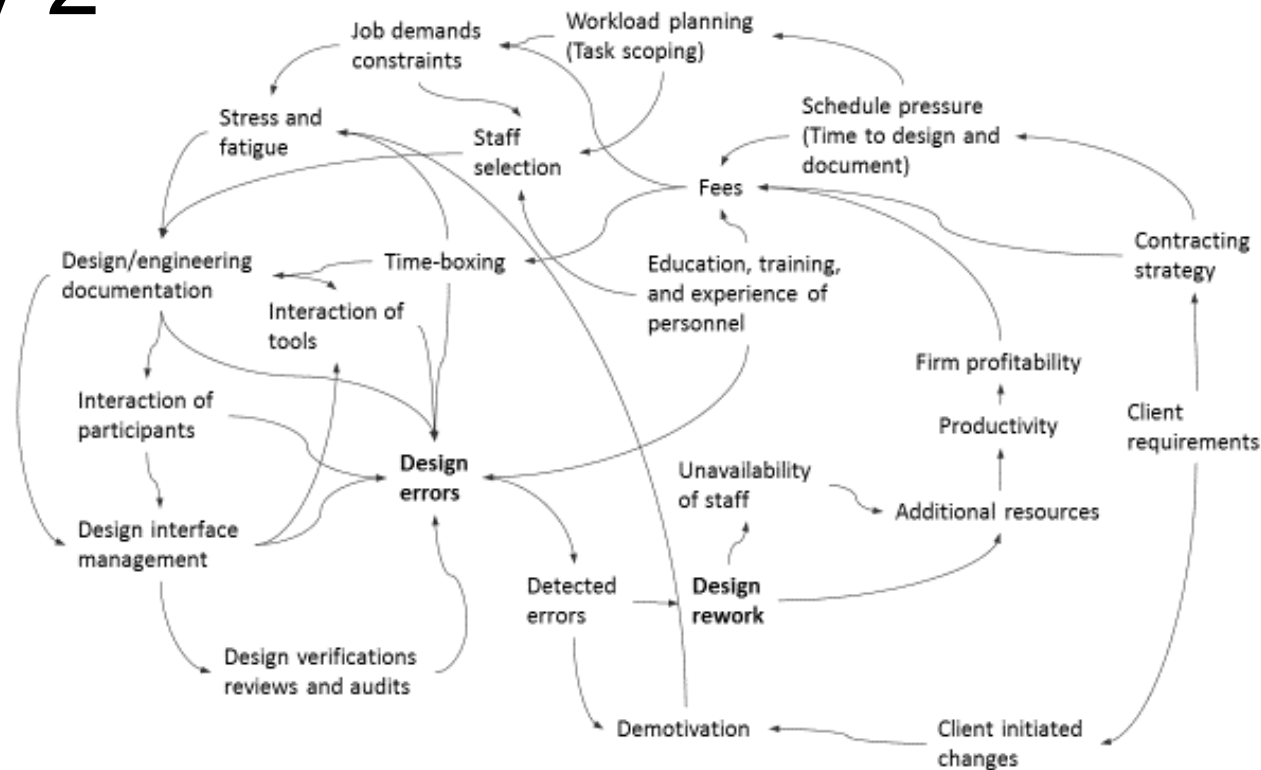
How are the challenges of collaborative engineering linked with the causes?

Can they be mapped?

Connecting causes together

- Ishikawa diagram provides a useful start to understand how causes influence each other.

Activity 2

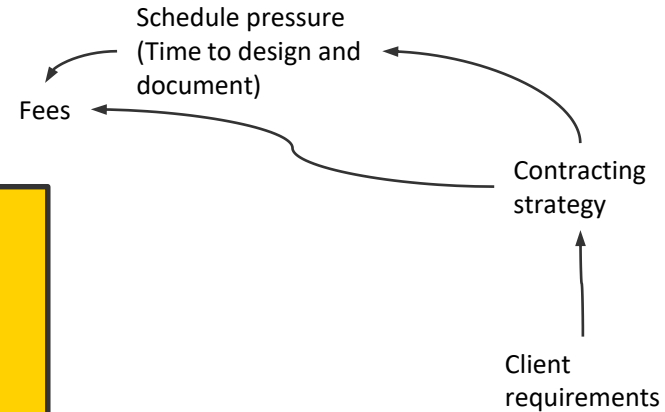


- Understanding client requirements is pivotal to project success.
- Requirements need to be correctly communicated to the design team.
- Relationships with subcontractors need to be correctly managed, and requirements communicated.

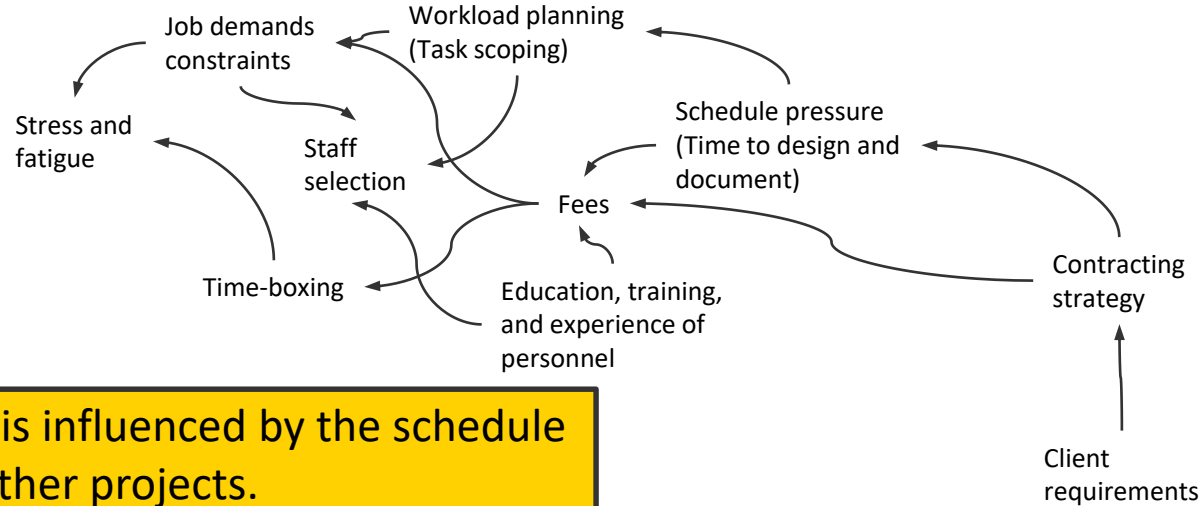
Contracting
strategy



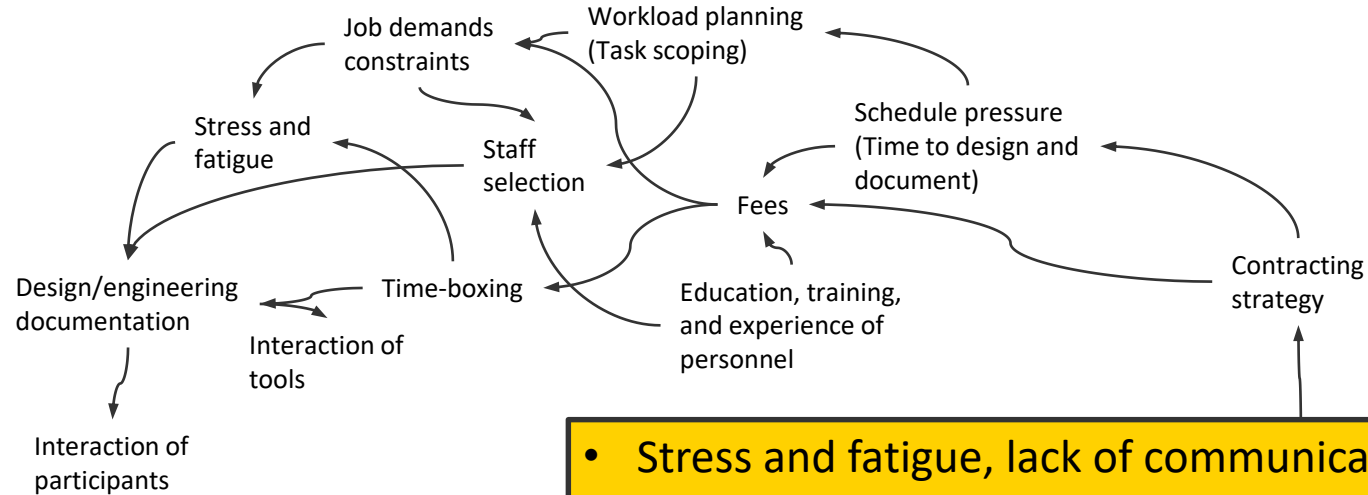
Client
requirements



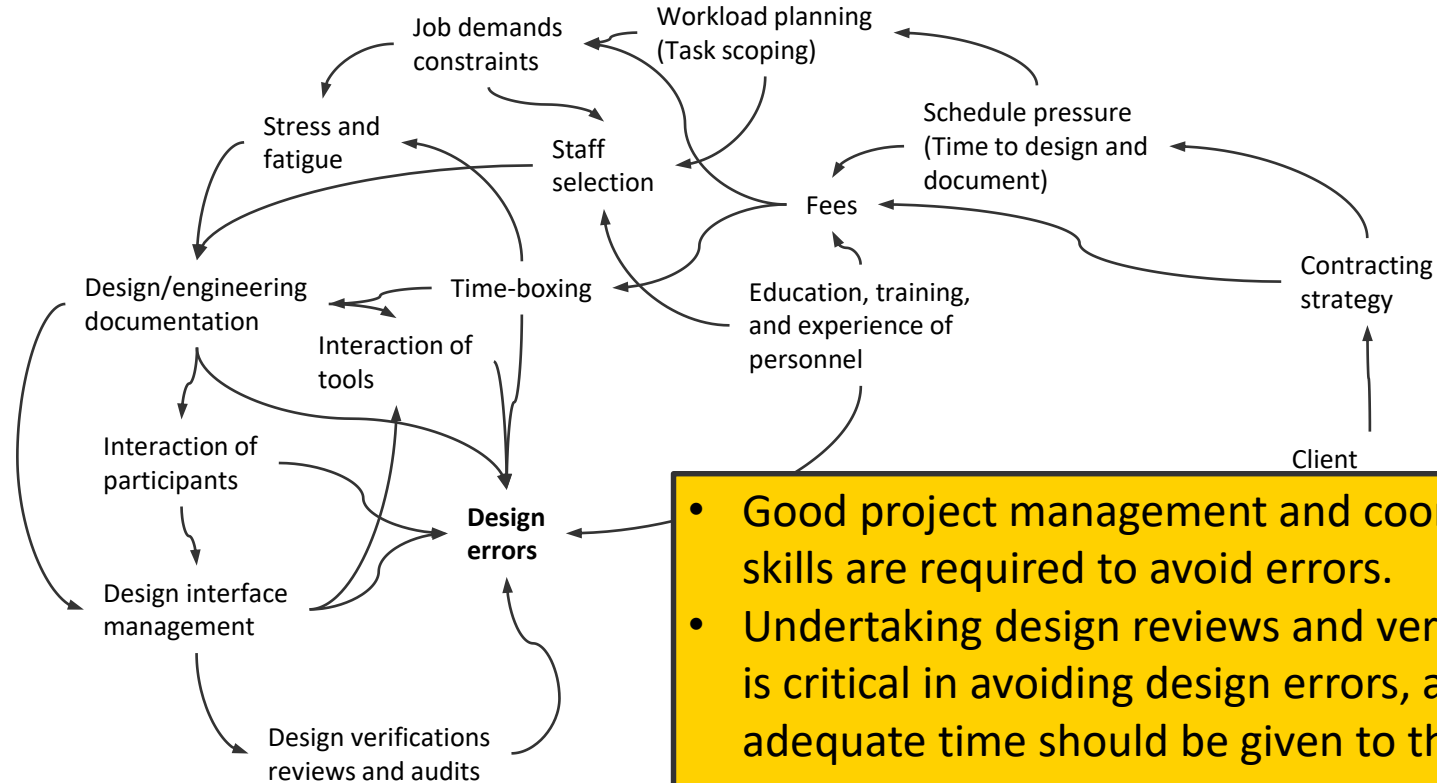
- The aim of achieving a functional design solution is set against the pressure to satisfy the client's needs.
- Schedule constraints and pressure can contribute to incomplete documentation.
- Design fees may be negatively impacted by the choice and relationship with suppliers.



- Workload planning is influenced by the schedule and a portfolio of other projects.
- Low fees would result with fixed and potentially inadequate time for design work.
- It may also result with a reduction in the level of training of staff.
- Increasing demands on staff time leads to errors.

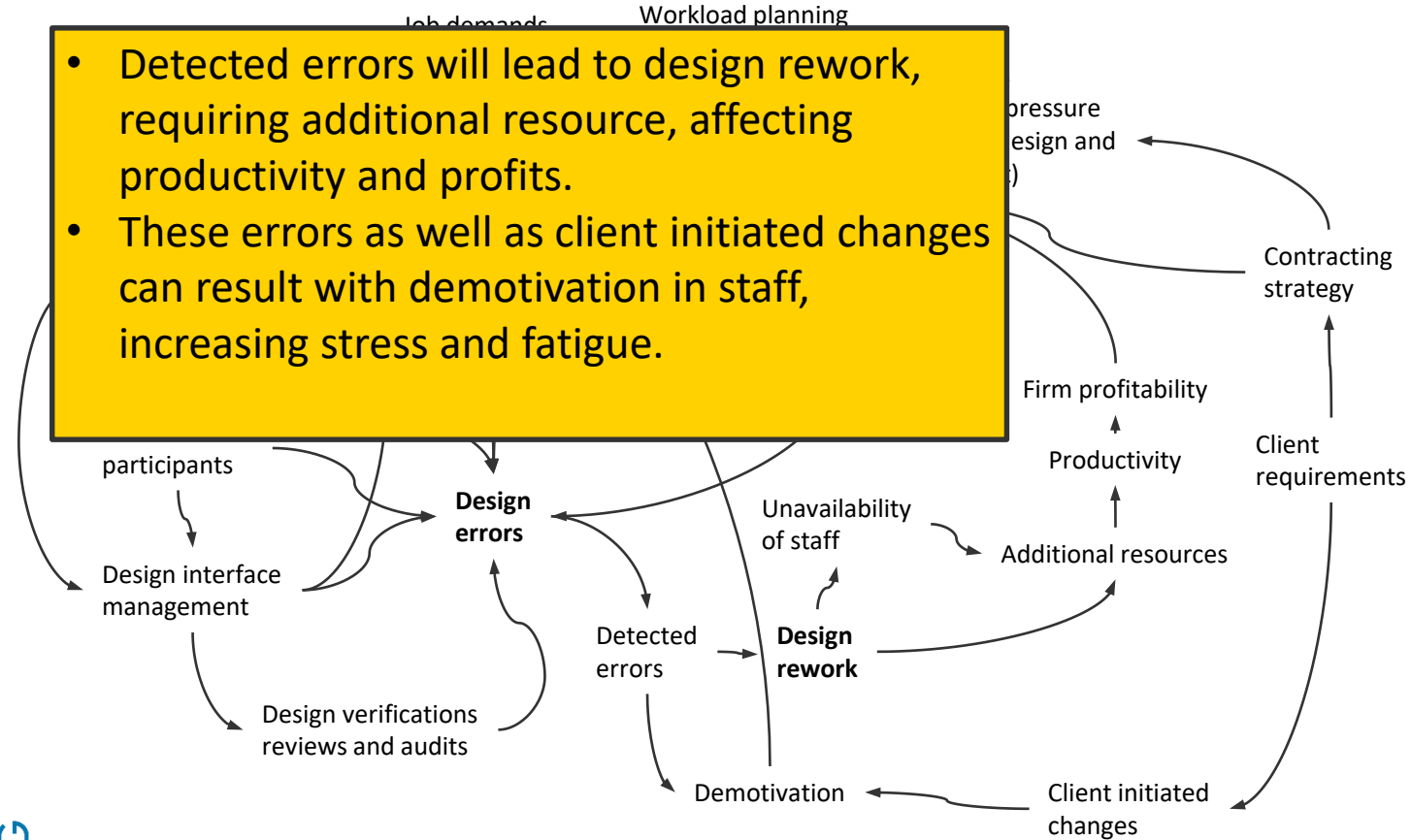


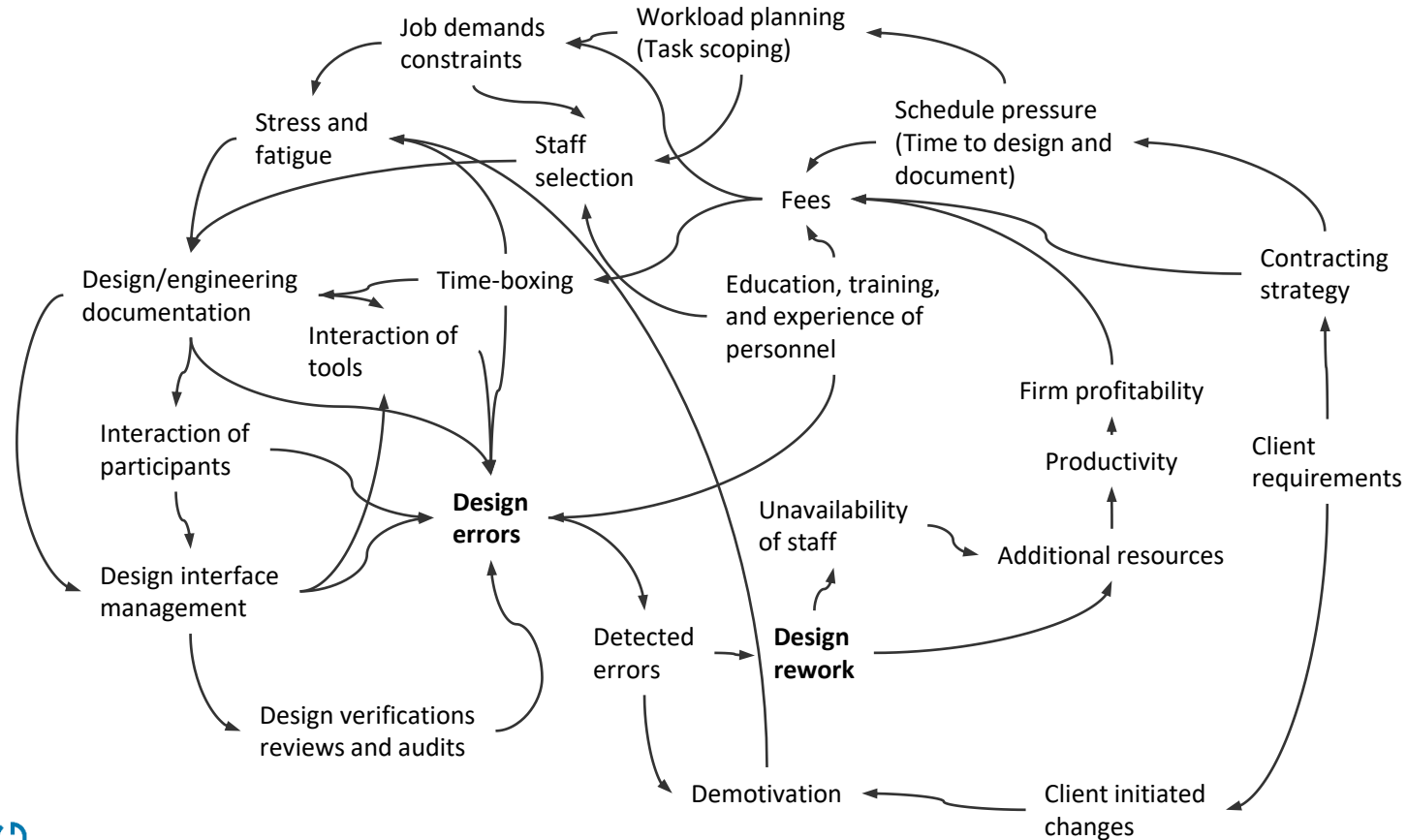
- Stress and fatigue, lack of communication amongst staff, and limited design time can lead to poor and erroneous documentation.
- Poor interaction between participants, and integration between design and analysis tools will result with errors and omissions.



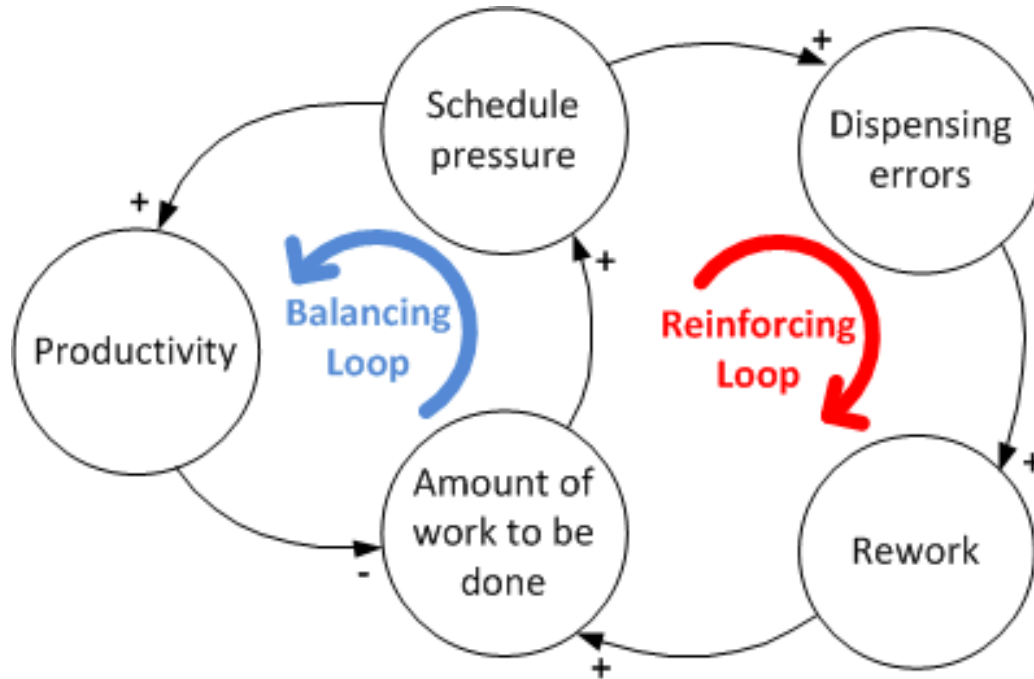
- Good project management and coordination skills are required to avoid errors.
- Undertaking design reviews and verifications is critical in avoiding design errors, and adequate time should be given to this.

- Detected errors will lead to design rework, requiring additional resource, affecting productivity and profits.
- These errors as well as client initiated changes can result with demotivation in staff, increasing stress and fatigue.





Activity 2



Activity 2

Can reinforcing and balancing loops be identified in collaborative engineering challenges?

1. Discuss in your group(s) – 15 minutes.
 2. Draw the loops – 20 minutes.
 3. Share with the group – 10 minutes.

Discussion

How can we address these challenges through research?

Concluding remarks

Thanks for Coming



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