Can You Feel it? Yes We Can!
Human Limitations in Design Theory

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Benefits

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- Reduce design failures
- Improve theory
- Increase income

2 feedback loops limitation

Everyone is limited in their thinking.

No one can understand unaided the behaviour of situations with **two or more feedback loops**

No amount of thinking, intuition, feelings, creativity or collaboration works on situations with **2 or more feedback loops**

Basic design

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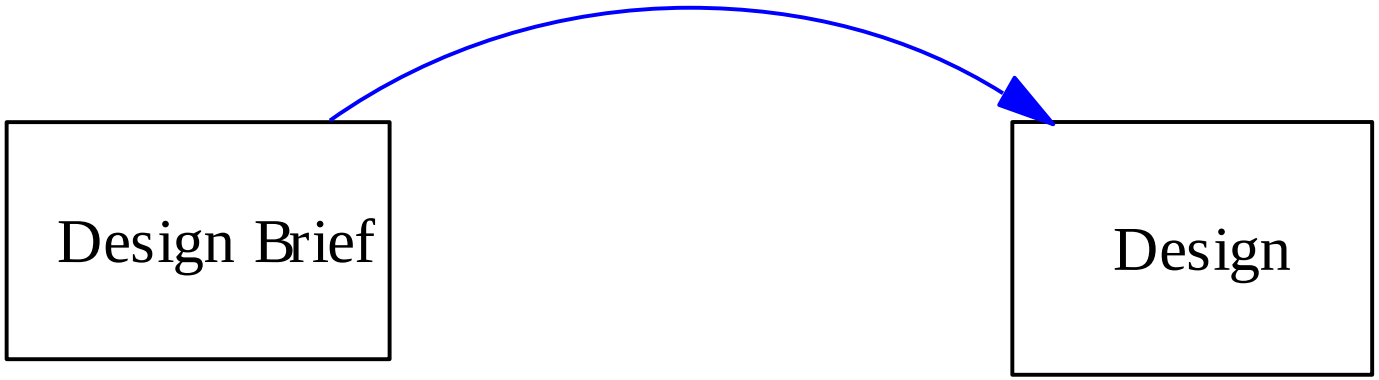
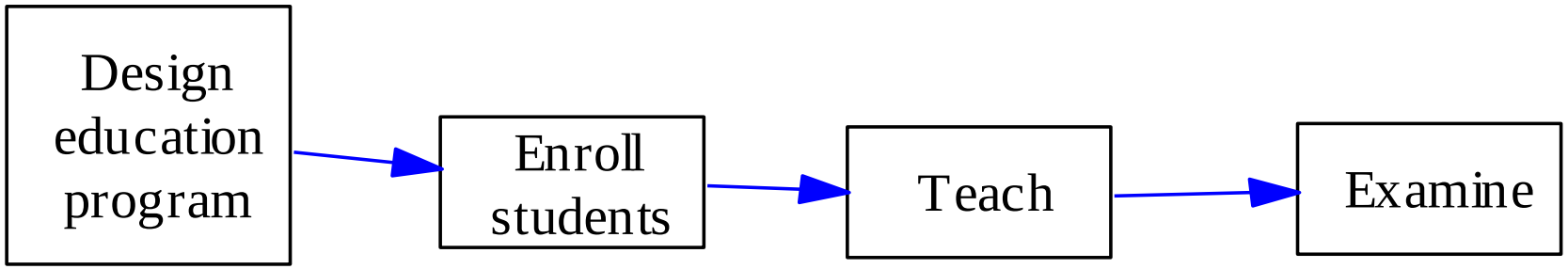
Around half of design has **no** feedback loops

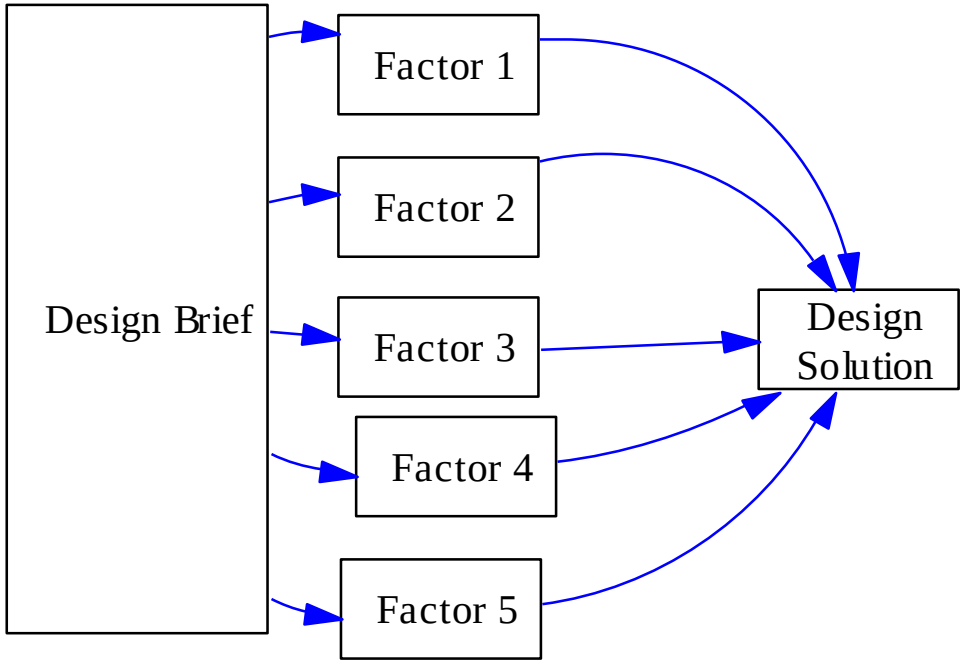


Simple design

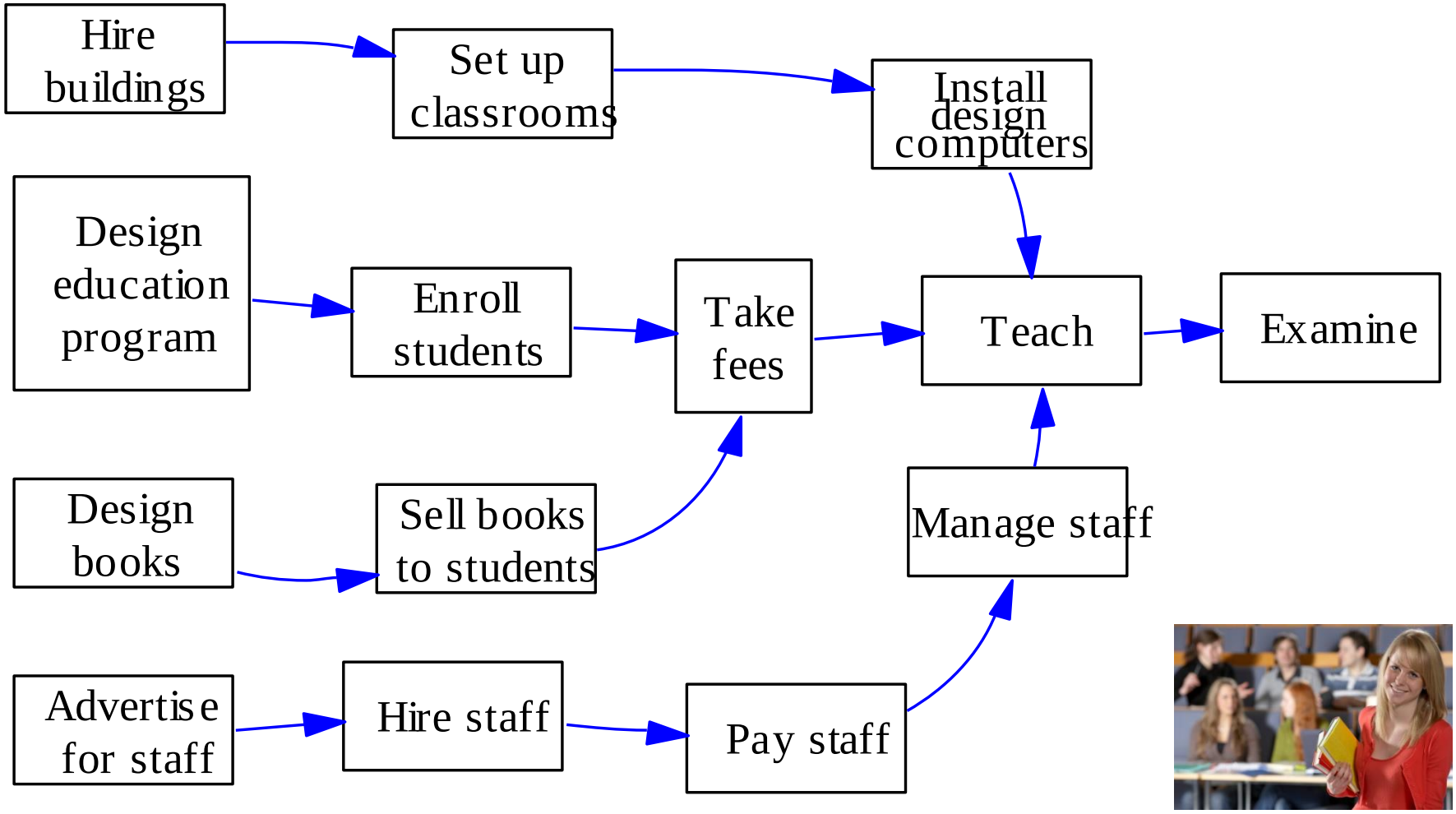


Complicated designs

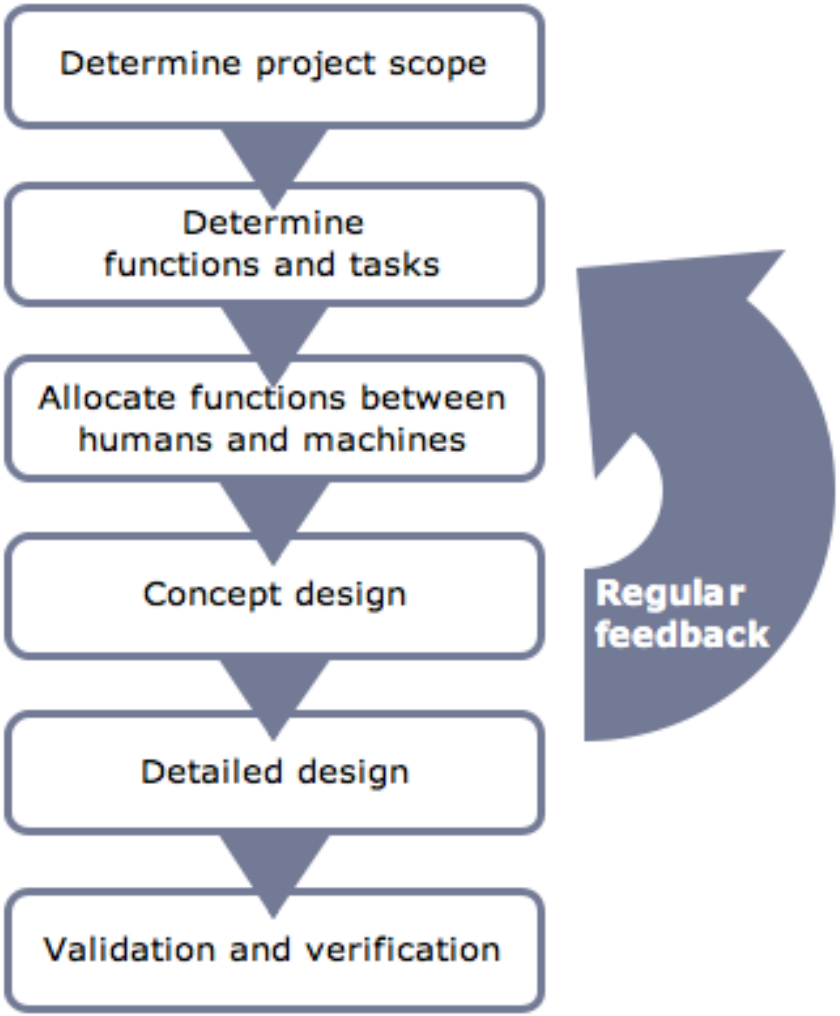
- **Complicated** designs are ***multiple*** simple designs



Complicated design



Feedback loop – single



Feedback loop single

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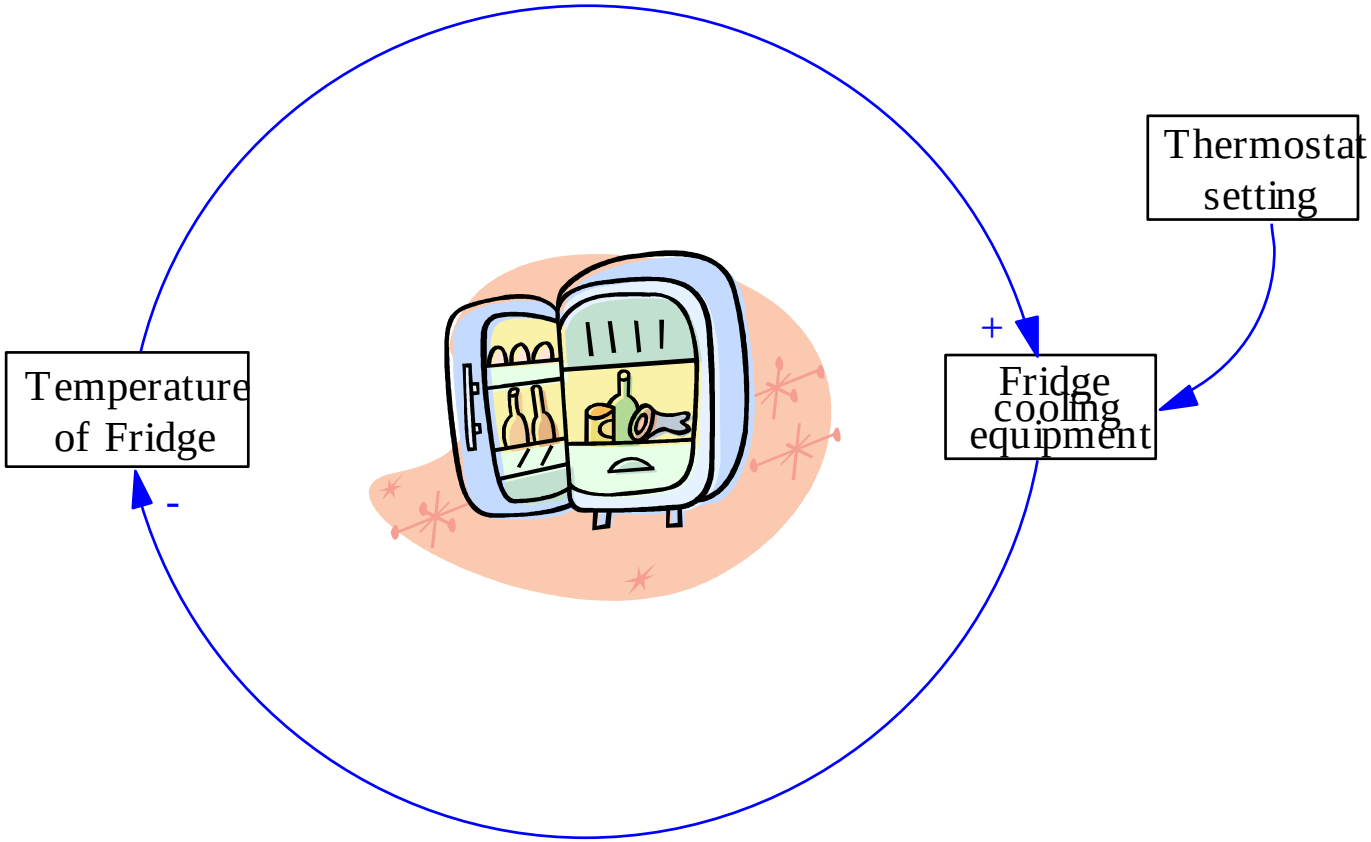
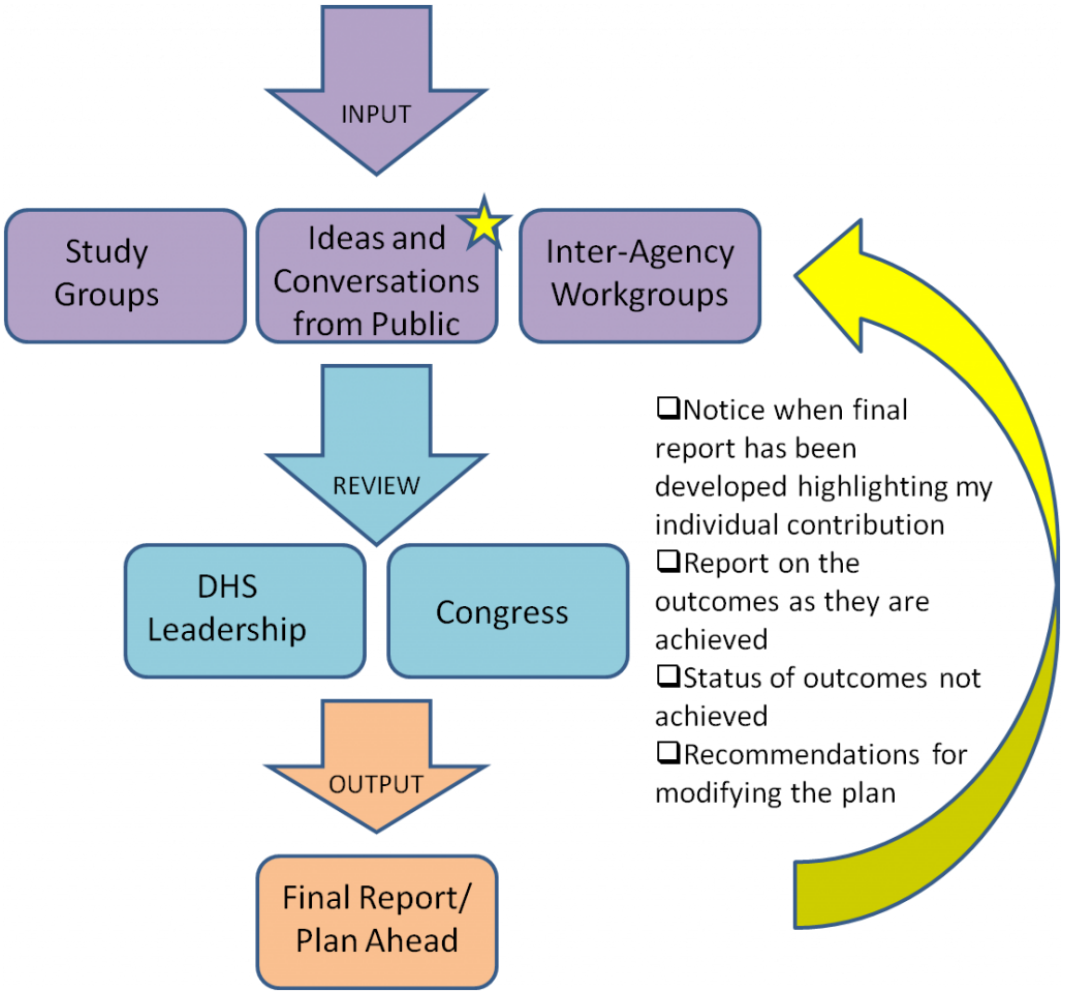
- Simple feedback loop – temperature of fridge



Feedback loop single



Quick test

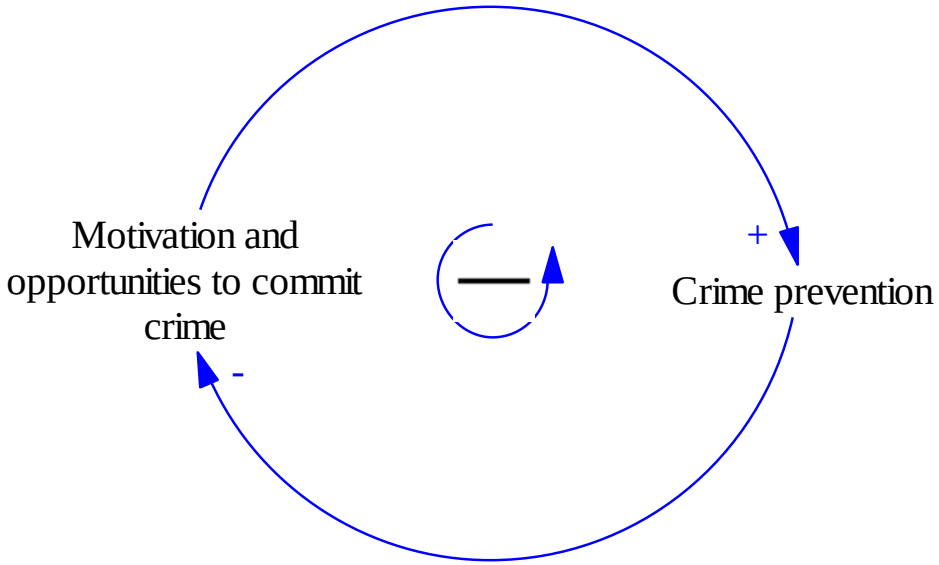
- Johar has $1.10 and buys two items.
- The first item costs $1 more.
- How much was the other item?

Answer

- Most people answer $1 and 10c
- The correct answer is $1.05 and 5c
- This is a simple single feedback loop problem

Simple design – 1 feedback loop

Most Art and Design design methods assume situations comprise at most a *single feedback loop*



Complex design situations

- All design requires the designer to be able to predict the behaviour of the outcome
- Complex design situations are beyond human thinking

'Complicated' and 'complex'

Simple and Complicated

Designs and designed interventions that are **mostly successful**

- Straightforward
- ***No feedback loops*** (or only one)
- Can be ***complicated*** with multiple factors or simple with few factors

Complex designs

Types of designs and design interventions that are **rarely successful** and **often fail**

- Not straightforward
- ***Multiple feedback loops***
- Fail even when not complicated

‘2 feedback loop’ conjecture

Humans **CAN** predict behaviour of even *complicated* situations provided they have

less than 2 feedback loops

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Humans **CANNOT** predict behaviour of *complex* situations with

2 or more feedback loops

Complex design situations

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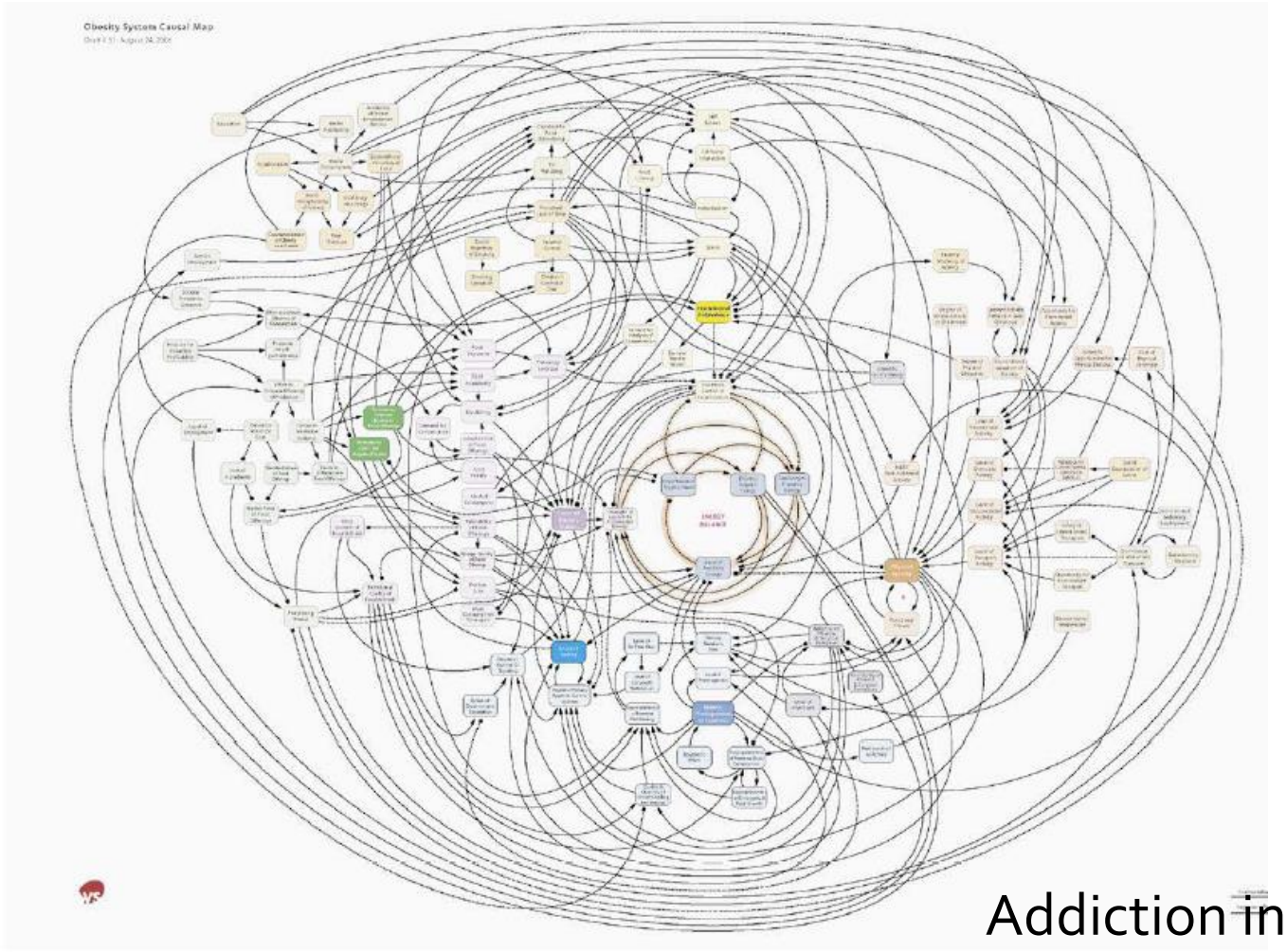


More than
2 feedback loops

Addiction intervention design

Design of obesity reduction: simplified model of multiple interrelated feedback loops http://www.foresight.gov.uk/Obesity/12.pdf

Can you feel it? Yes we can…its an illusion!

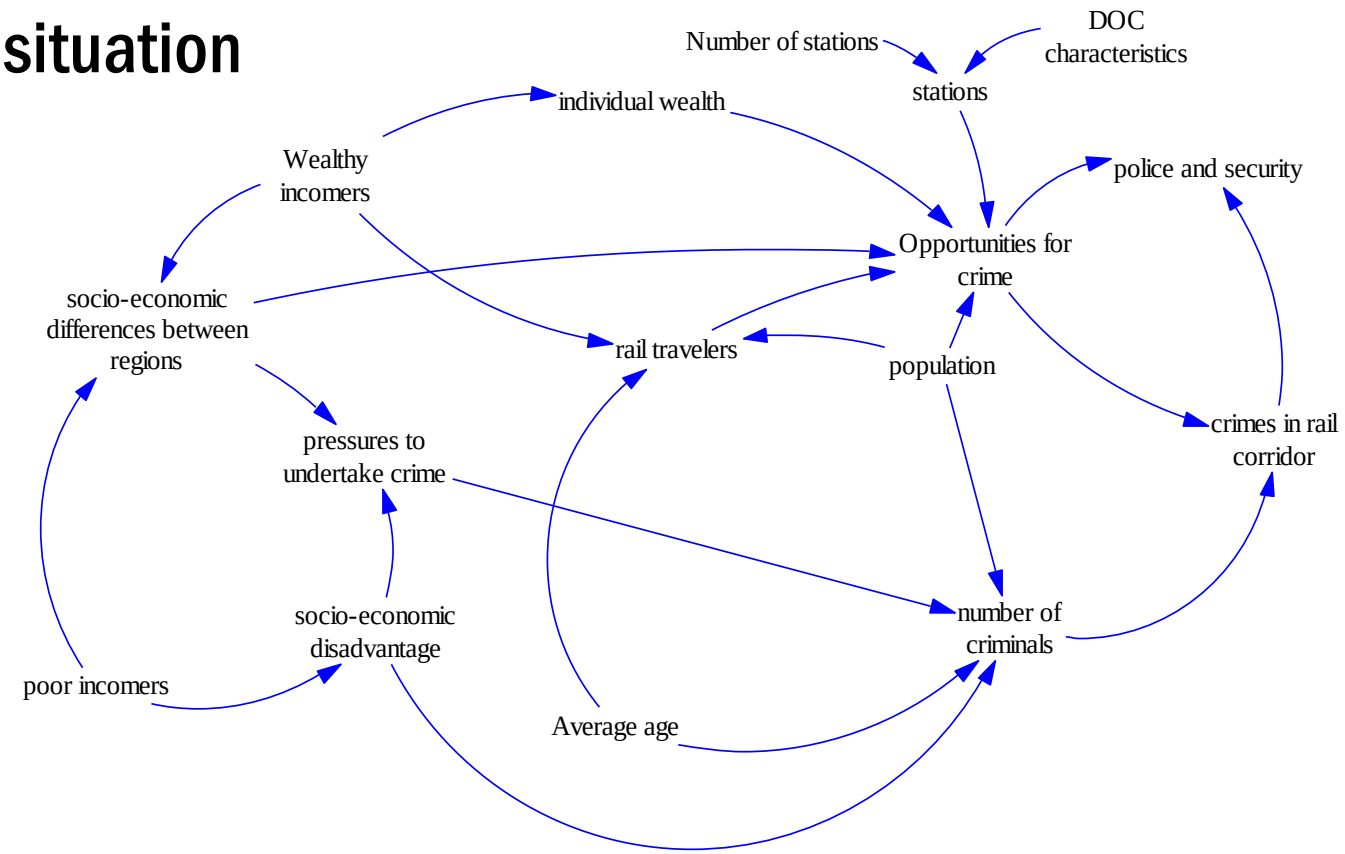
1. Individuals feel that they can use *intuition* to understand **complex** design situations – they cannot
2. Individuals feel *collaboration* or *participatory design* will enable them to identify correct design solutions – they do not
3. Individuals feel they can use *feelings and intuition* to understand complex situations – they give the wrong answers

Solutions for Complex Design

- Create a model of the design situation with all its feedback loops (*causal loop diagram)*
- Convert this to an dynamic predictive model *(system dynamic model)*
- Try out possible designs using the system dynamic model to SEE the outcomes predicted

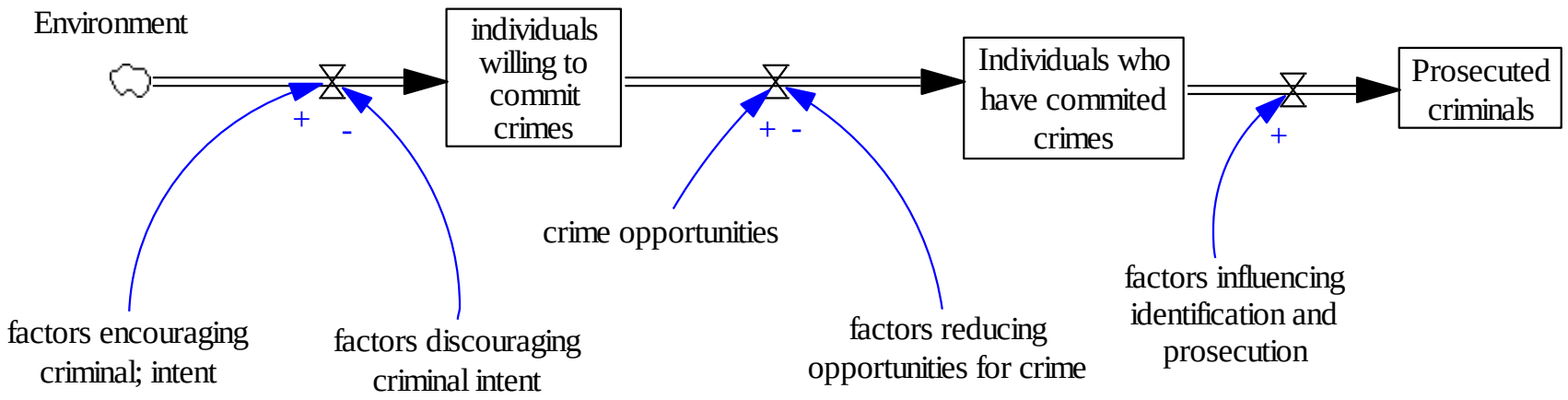
Multi-feedback loop causal diagram of crime changes due to new rail line

- Crime prevention feedback loops in new rail corridor situation



Preliminary model of relationships affecting crime and crime prevention interventions in a rail corridor (unpublished Love, T, Cooper, T, Cozens, P, Morgan, F and Clare, J)

Early stage system dynamic model of suburban/rail related crime



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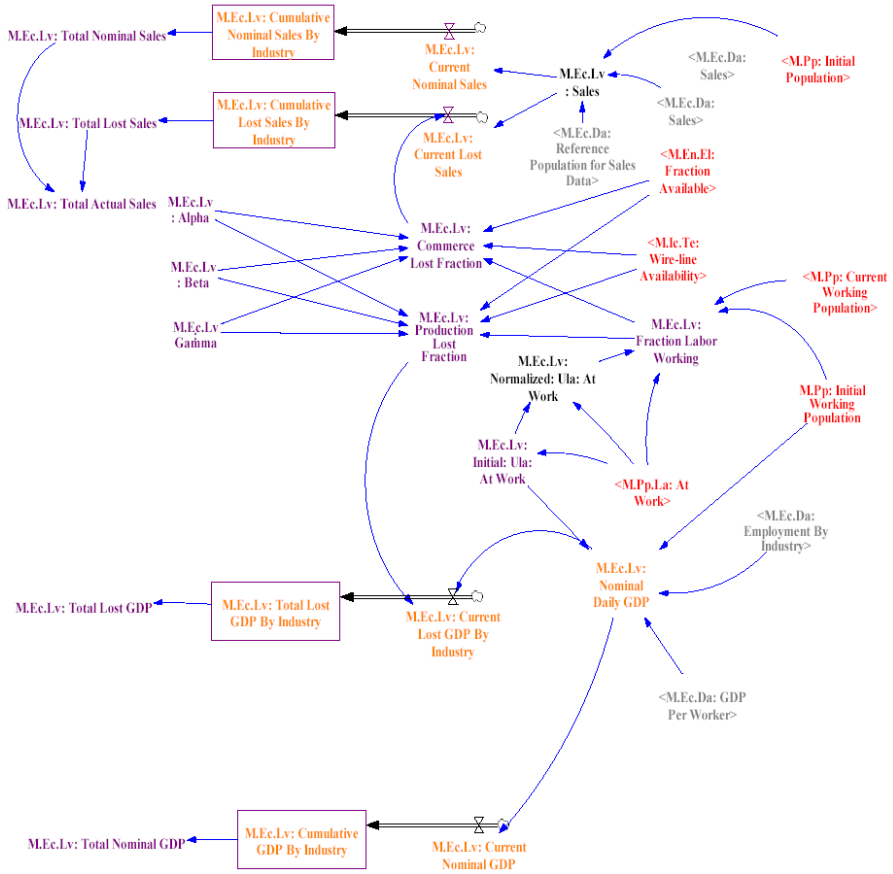
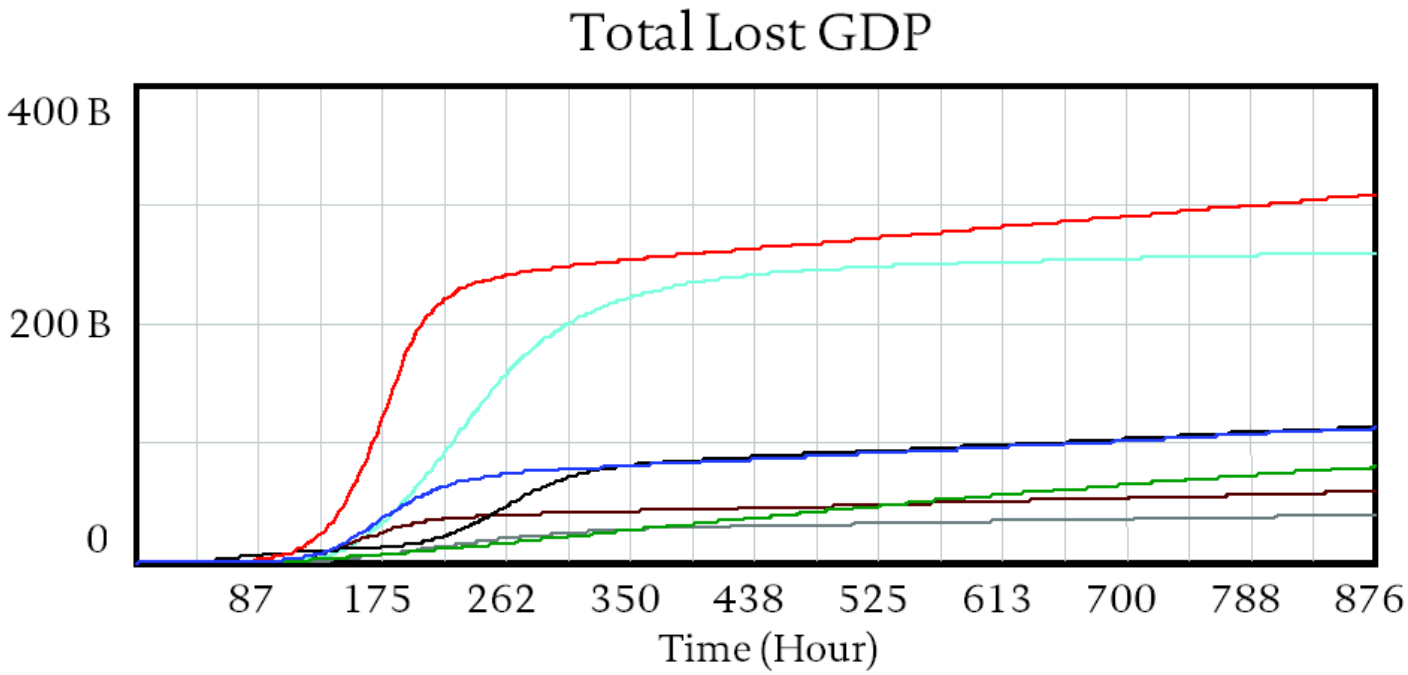
Design of pandemic intervention



Ewers, M. and Dauelsberg, L. (2007) Pandemic influenza mitigation strategies and their economic impacts. In Fielden, K and Sheffield, J. *Systemic Development: Local Solutions in a Global Environment. Proceeding s of 13th ANZSYS Conference.* Auckland: Unitech and ANZSYS.

Example: pandemic intervention



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Participation/Collaboration Workflow for Complex Design

1. Gather information from stakeholders (using participation/collaboration to identify feedback loops.
2. Design causal loop diagram
3. Create predictive system dynamic model of the design and context
4. Designers use the model to SEE design outcomes and this makes up for the human biological limitations in understanding feedback loops

Summary

1. Designers cannot understand situations with 2 or more interlinked feedback loops.
2. Distinguishing line between *complicated* and *complex* design is **2 or more feedback loops**
3. Intuition, feelings, emotions and creativity do not apply to complex design
4. Systems Dynamics tools resolve the problem
5. Need to charge additional design fees for complex design situations .

Questions?