

IN5210
Digitalization as sociotechnical systems design and development

3rd of September 2025

Department of Informatics, University of Oslo
Magnus Li - magl@ifi.uio.no

TODAY

- What is digitalization?
- What is an organization?
- Digitalization as product construction versus sociotechnical systems design
- Some aspects of digitalization as sociotechnical systems design

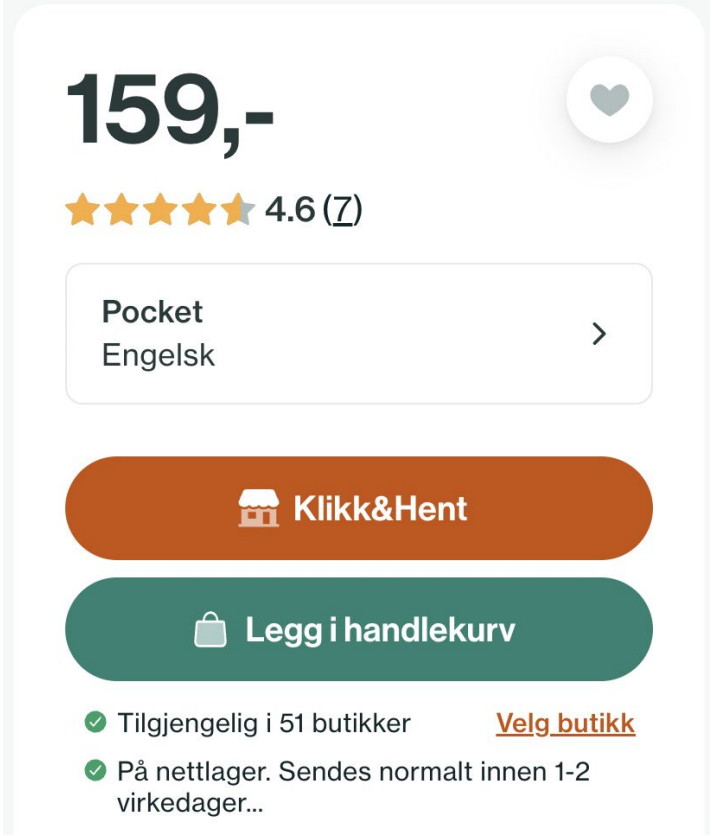
Digitalization - what is it?

Note down some points - 1 min



Digitalization

- Improving organizations by using opportunities in digital technologies



Organization?

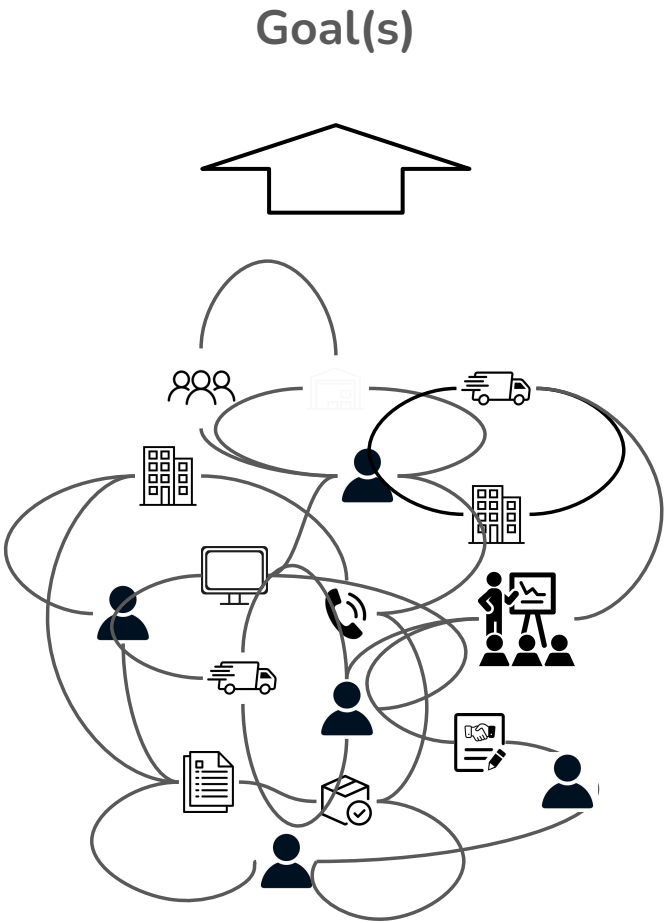
- A group of people working together to achieve a common set of goals





Organization?

- A group of people working together to achieve a common set of goals
- Over time a “system” may emerge, comprising aspects such as
- roles, norms, practices,
- “sub-organizations,”
- technologies,
- standards, rules,

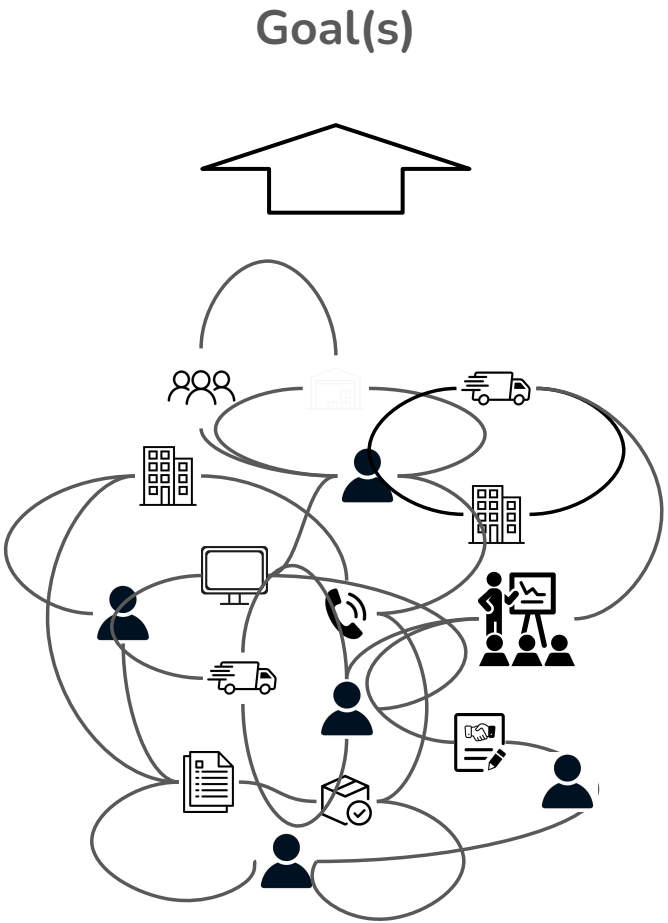


Organization?

Issues can arise

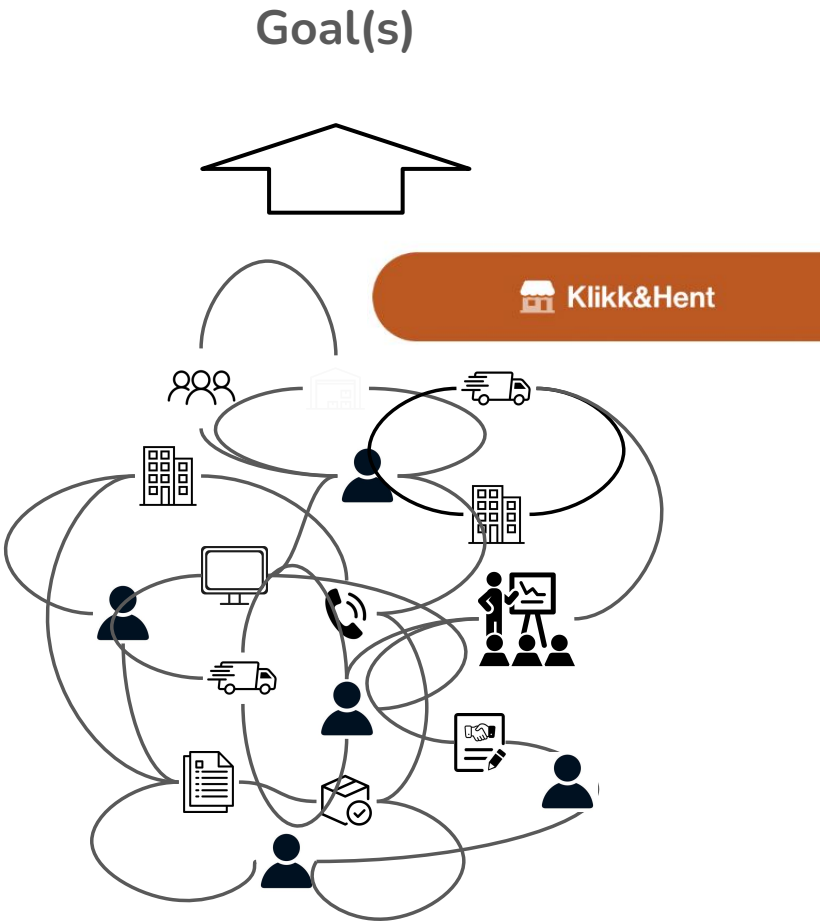
- **Size gives complexity**
- People are part of multiple systems - thus governed by multiple goals (family, career, subdivision, group, union)
- Suboptimization
- Task delegation vs integration

→ Unpredictable behavior!



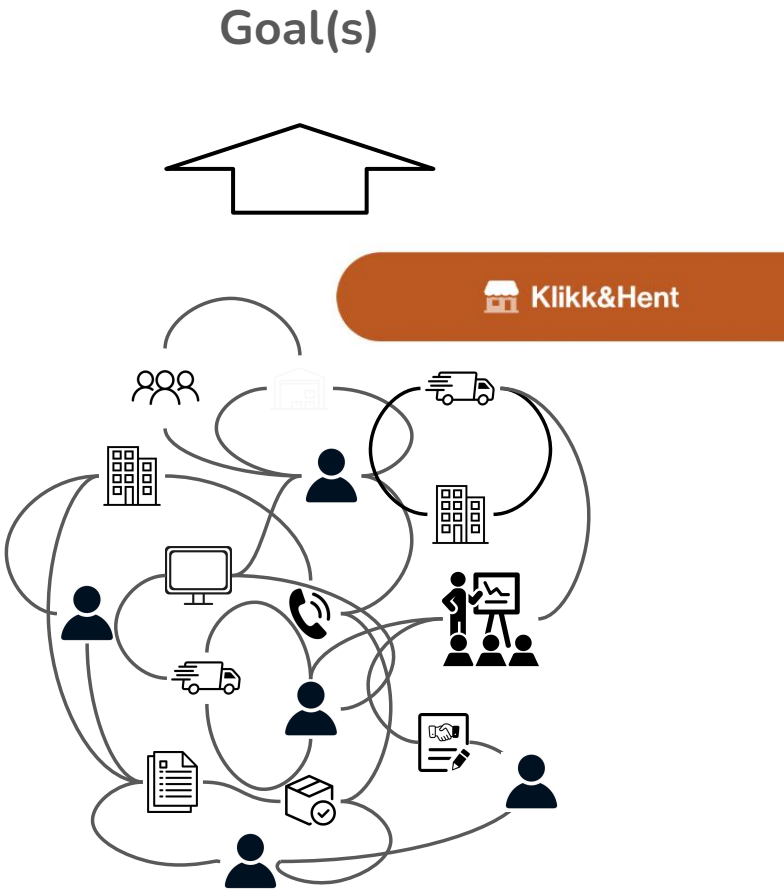
Organization + Digitalization

- **Digitalization** involves making changes in these systems, based on opportunities in digital technology
- The aim is not to have more technology, but to be better at reaching the organizational goals



Digitalization

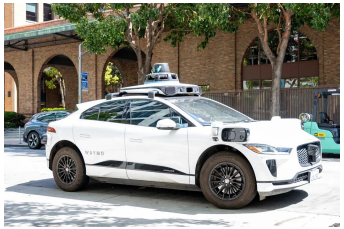
- Technology design ***and*** organizational design
- Design of software *products* and organizations as sociotechnical systems

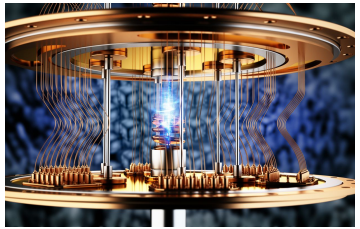


Development of technology









Vs.

Using technology to improve organizations

Ber regjeringen stoppe Helseplattformen: - Hvor lenge skal dette egentlig få pågå?

Bråstopp for nytt datasystem etter å ha brukt 229 mill.

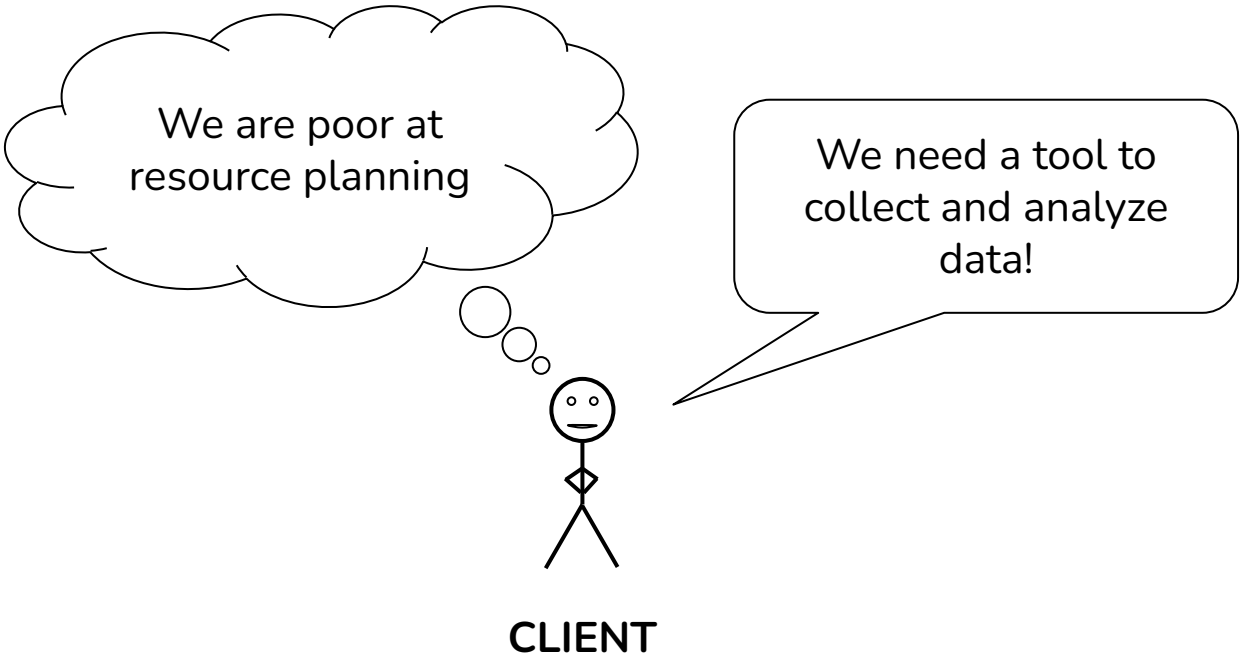
Derfor gikk på NAV på en IT-smell i milliardklassen

Staten styrer mot endå ein it-skandale

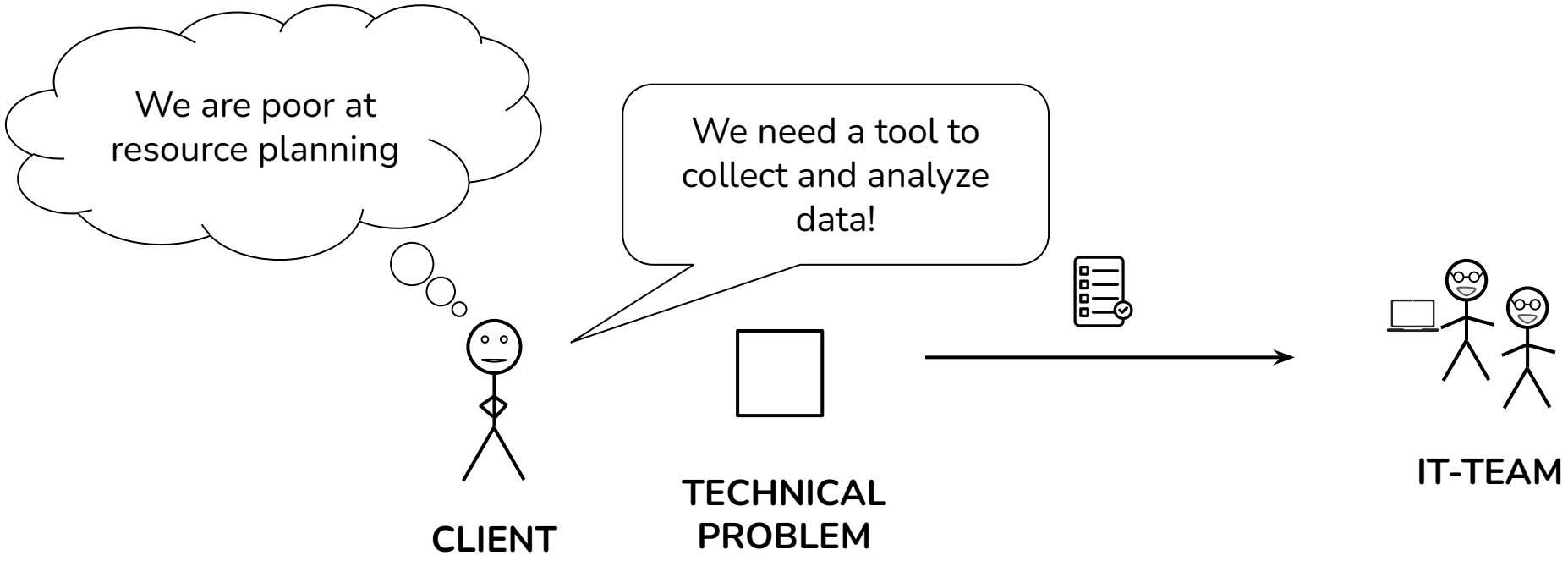
Vend i tide. Det er inga skam å snu.

WHERE DO WE GO WRONG?

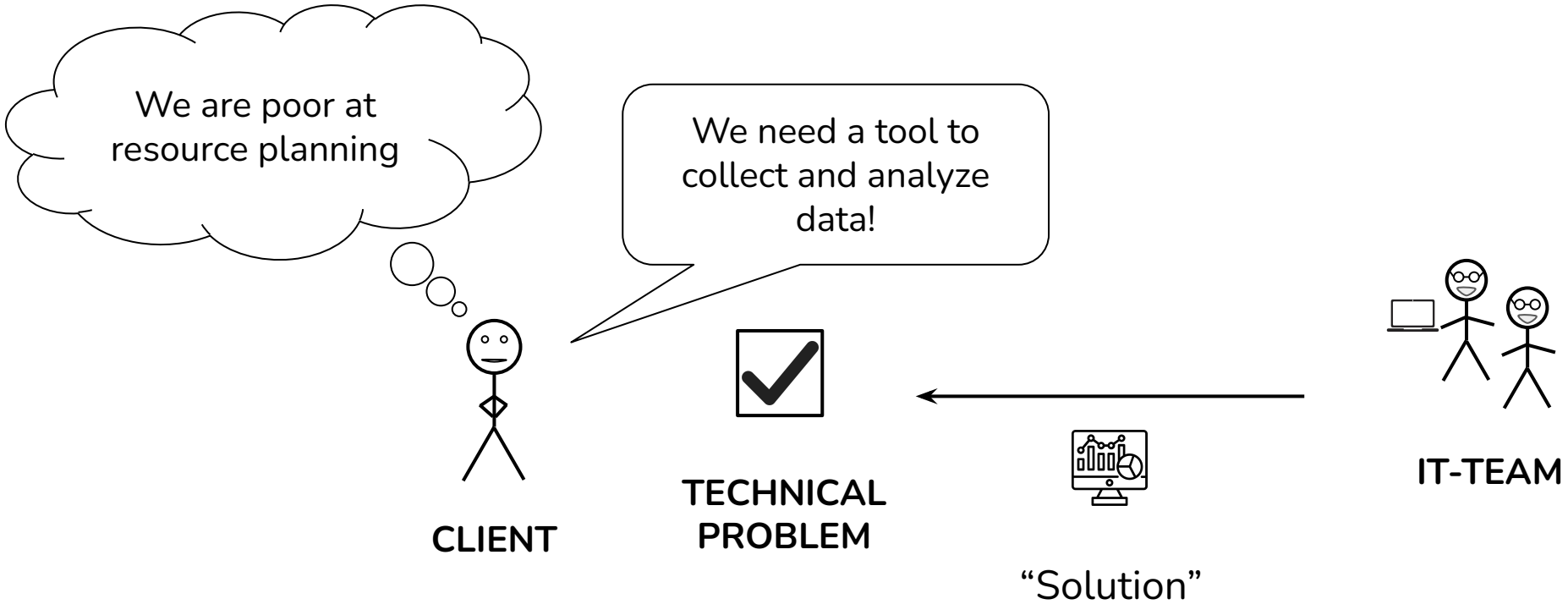
TRADITIONAL WAY OF ORGANIZING DIGITALIZATION



TRADITIONAL WAY OF ORGANIZING DIGITALIZATION



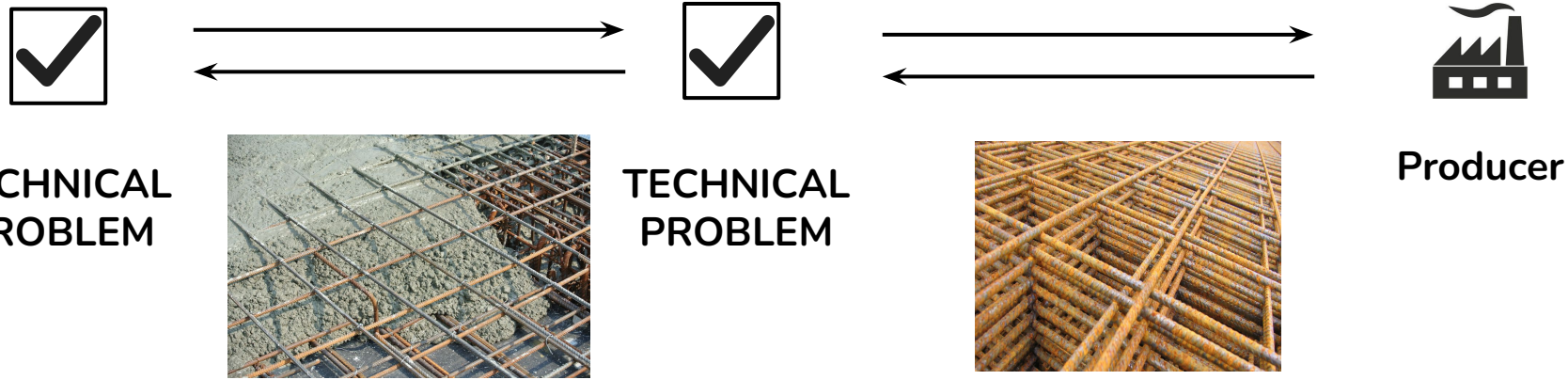
TRADITIONAL WAY OF ORGANIZING DIGITALIZATION



A GENERAL MODEL FOR PRODUCT CONSTRUCTION

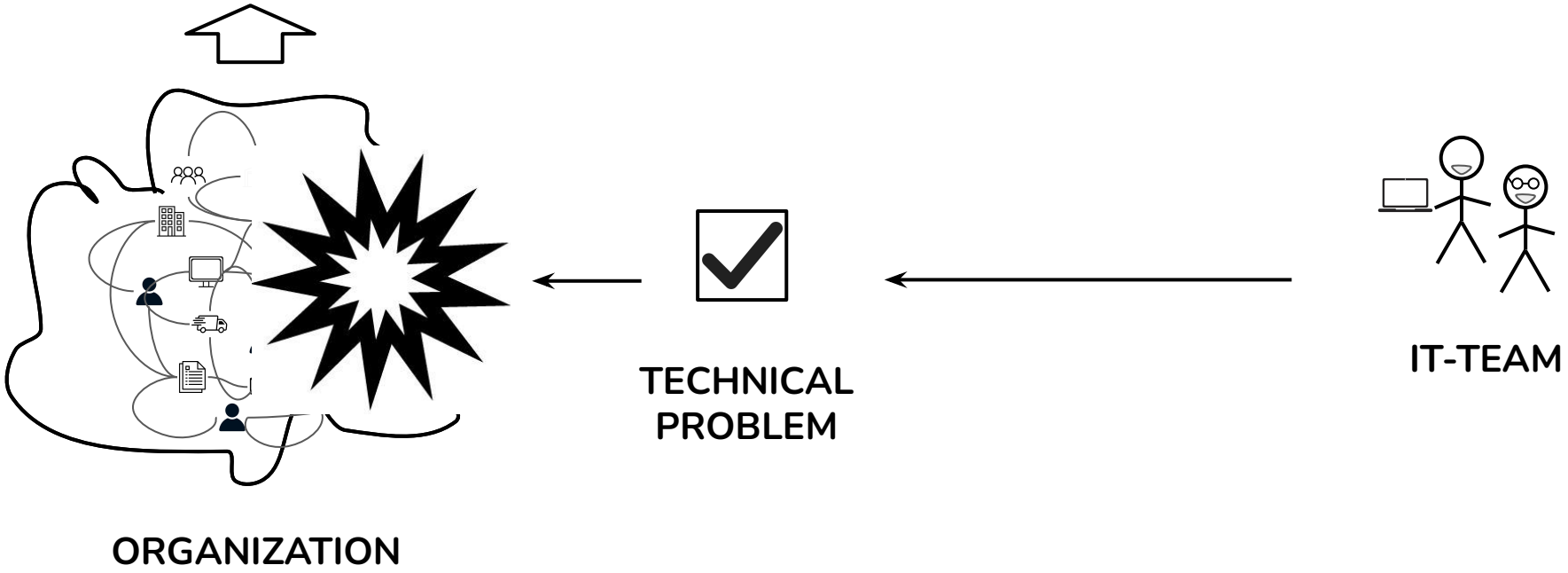
“We need a floor… ”

“We need rebar…”



TRADITIONAL WAY OF ORGANIZING DIGITALIZATION

~~BETTER~~ RESOURCE PLANNING?



WHAT HAPPENS?

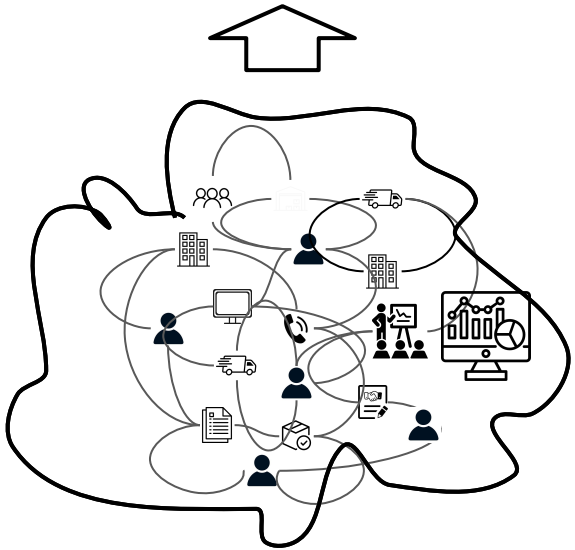
WHY DO WE NECESSARILY NOT GET WHAT WE EXPECT?

Note down some points - 1 min



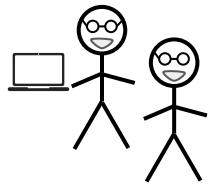
- Non-use and workarounds
- Tasks are shifter “around”
- New work created
- Reinforcing already poor organizational structures
- Addressing the wrong problem

BETTER RESOURCE PLANNING?





TECHNICAL PROBLEM

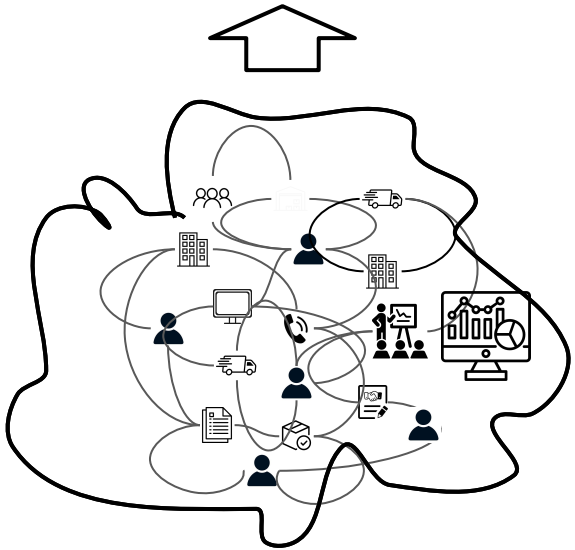


IT-TEAM

THE PRODUCT MEETS A COMPLEX SYSTEM - TOGETHER THEY REACT!

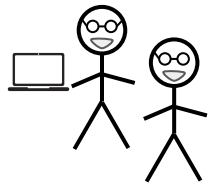
BETTER PATIENT TREATMENT?

BETTER RESOURCE PLANNING?



- Non-use and workarounds
- **Tasks are shifter “around”**
- **New work created**
- Reinforcing already poor organizational structures
- Addressing the wrong problem

TECHNICAL PROBLEM



IT-TEAM

THE PRODUCT MEETS A COMPLEX SYSTEM - TOGETHER THEY REACT!

DIFFERENT TYPES OF PROBLEMS

“We need a tool that can do X”

☑

TECHNICAL PROBLEM

- Can be divided into parts
- Is stable
- Based on known physical laws
- High similarity - can use standardized solutions





DIFFERENT TYPES OF PROBLEMS



SUMMER 1965

A ONCE-IN-A-LIFETIME ALIGNMENT

Calculations reveal it is possible for a spacecraft launched in the late 1970s to visit all four giant outer planets, using the gravity of each planet to swing the spacecraft on to the next. This alignment occurs once every 176 years.

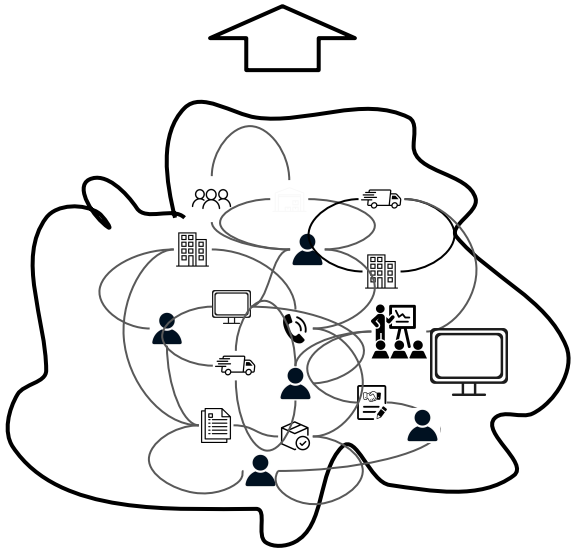
AUGUST 25, 2012

THE FIRST HUMAN-MADE OBJECT IN INTERSTELLAR SPACE

Voyager 1 enters interstellar space, passing beyond the heliopause, which is the boundary between

DIFFERENT TYPES OF PROBLEMS

BETTER RESOURCE PLANNING?



- Problem emerges out of a complex “whole”
- Dynamic
- Unknown social laws
- Always degree of uniqueness
- Not design of solid features, but emergent properties

→ Requires a different approach!

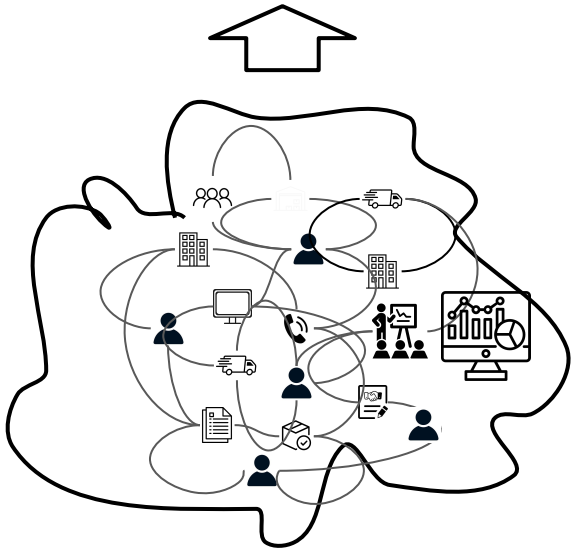
“SOCIOTECHNICAL SYSTEM DEVELOPMENT”

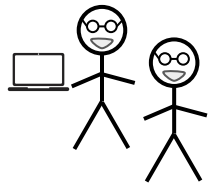
Not so good at this!

“PRODUCT DEVELOPMENT”

Good at this!

BETTER RESOURCE PLANNING?





TEKNISK PROBLEM

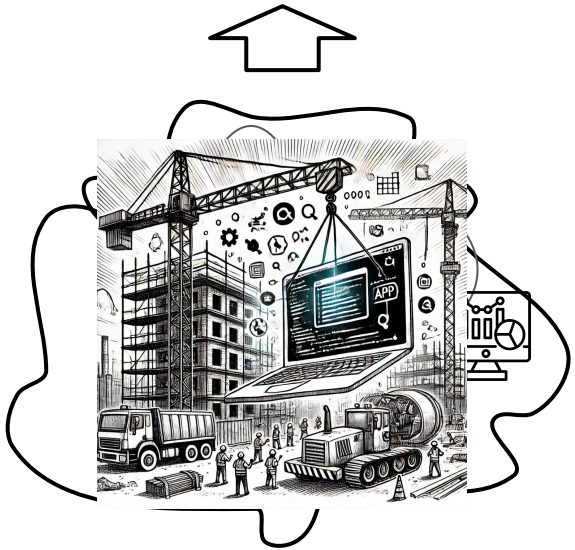
IT-TEAM

KREVER ULIKE TILNÆRMINGER!

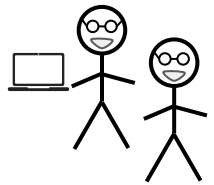
Very often, we use the project “logic” also here

- Measuring on delivery of IT
- Long-term planning
- “Costs” are calculated based on building technical stuff

BETTER RESOURCE PLANNING?



TEKNISK PROBLEM

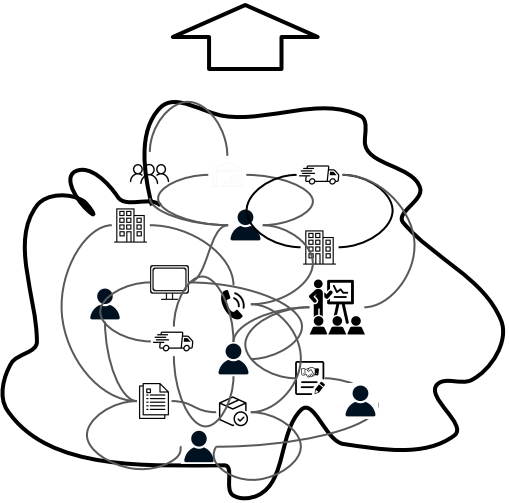


IT-TEAM

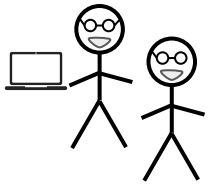
KREVER ULIKE TILNÆRMINGER!

DIGITALIZATION REQUIRES ACTIVE WORK WITH THE “WHOLE”

Poor planning



?



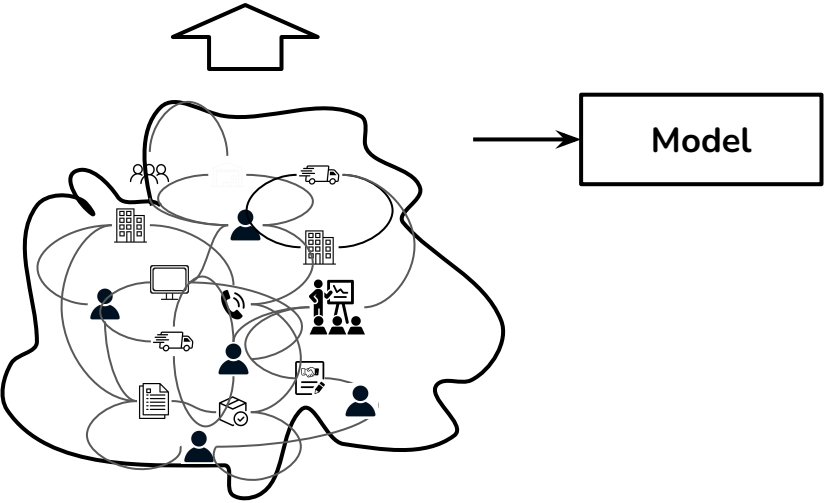
IT-TEAM

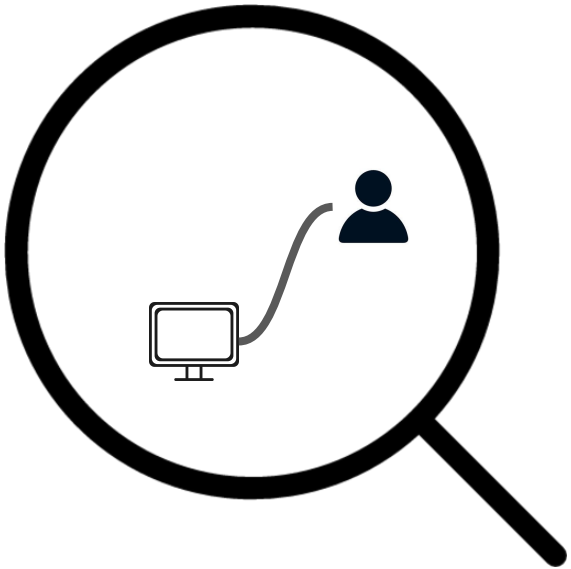
SOME ASPECTS OF DIGITALIZATION AS SOCIOTECHNICAL SYSTEM DESIGN

1. SYSTEMS THINKING

Largely intangible - relies on model!

Poor planning



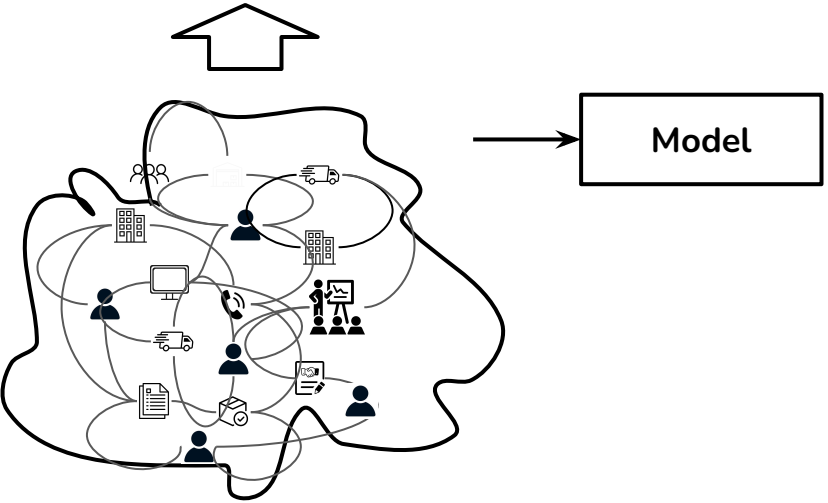


As technology specialist or engineer - a tendency to think:

what does planning <u>comprise</u> of?

1. SYSTEMS THINKING

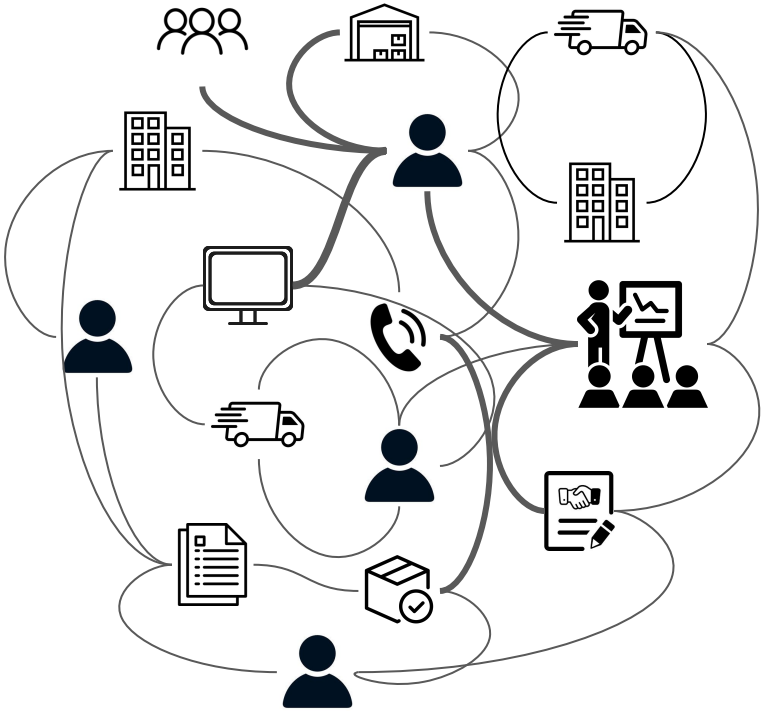
Poor planning



Example: planning in agriculture

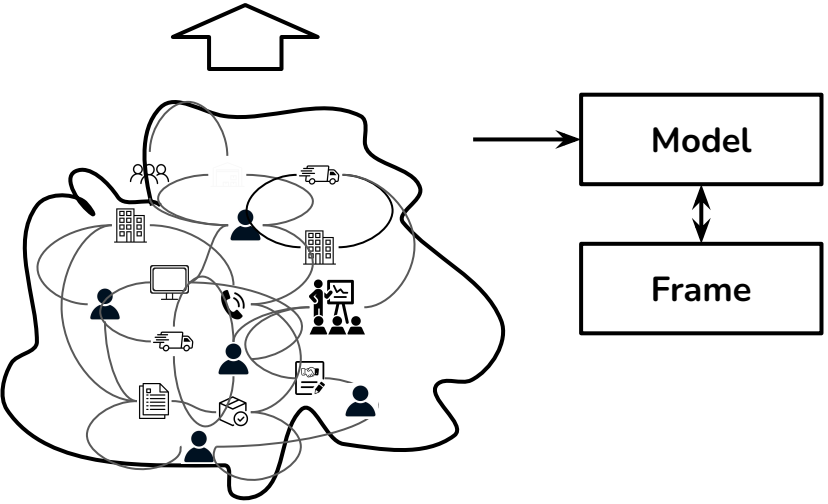
Alternative:

What is planning <u>a part</u> of?



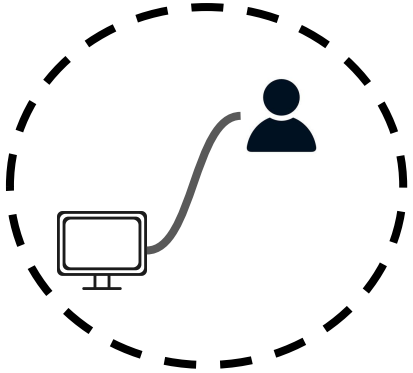
2. ACTIVELY WORKING WITH “FRAMES”

Poor planning



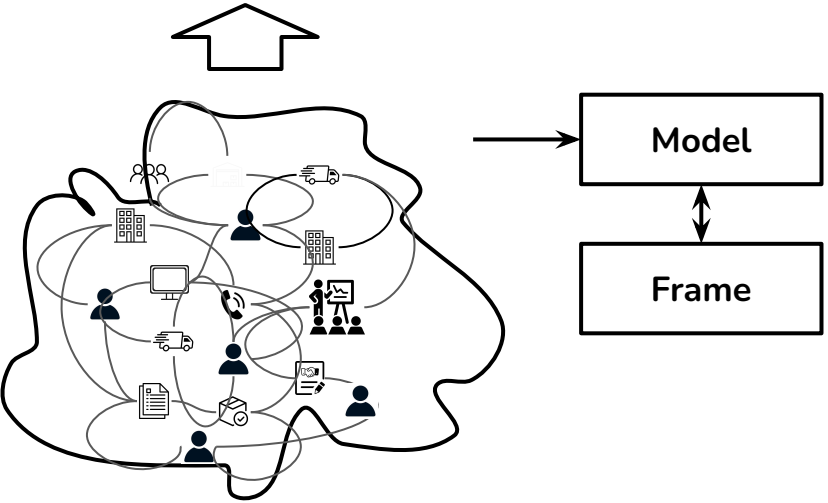
In technology development - we usually work with well-bounded problems

“We need a tool for X”



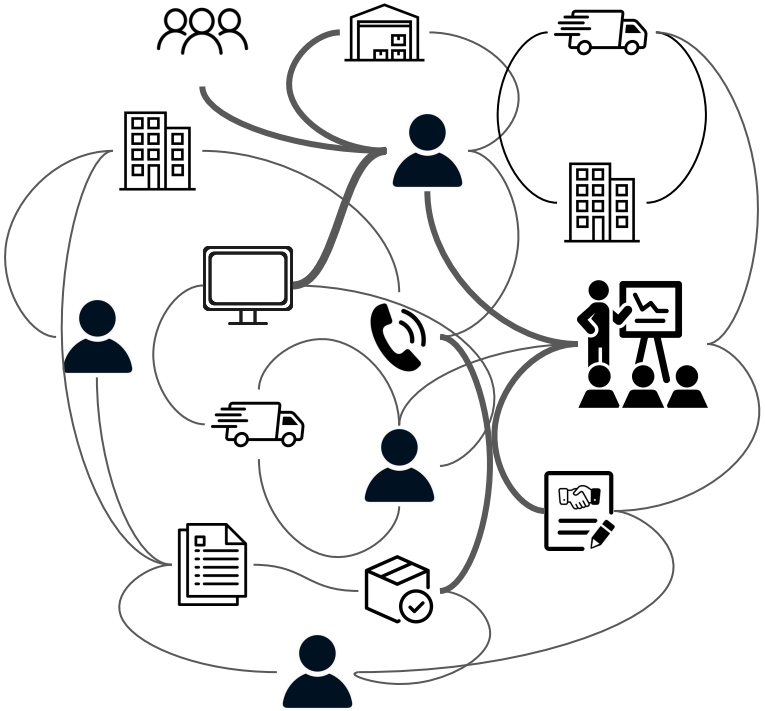
2. ACTIVELY WORKING WITH “FRAMES”

Poor planning



“Poor planning”

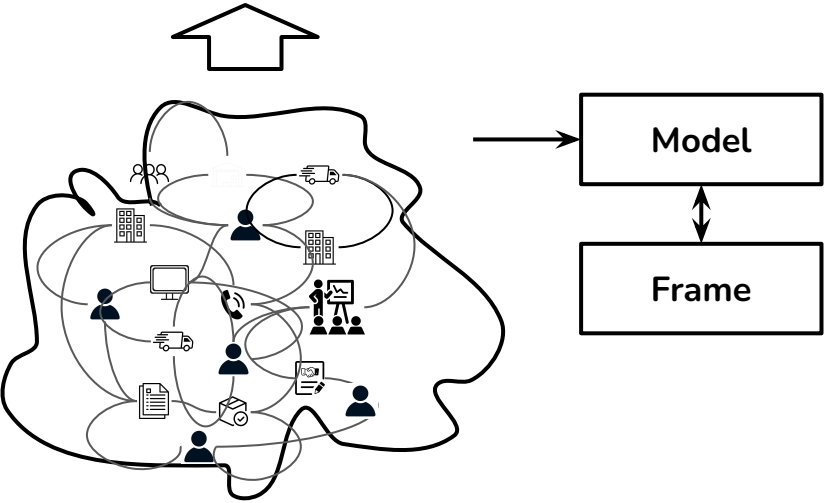
Open and must be “framed”

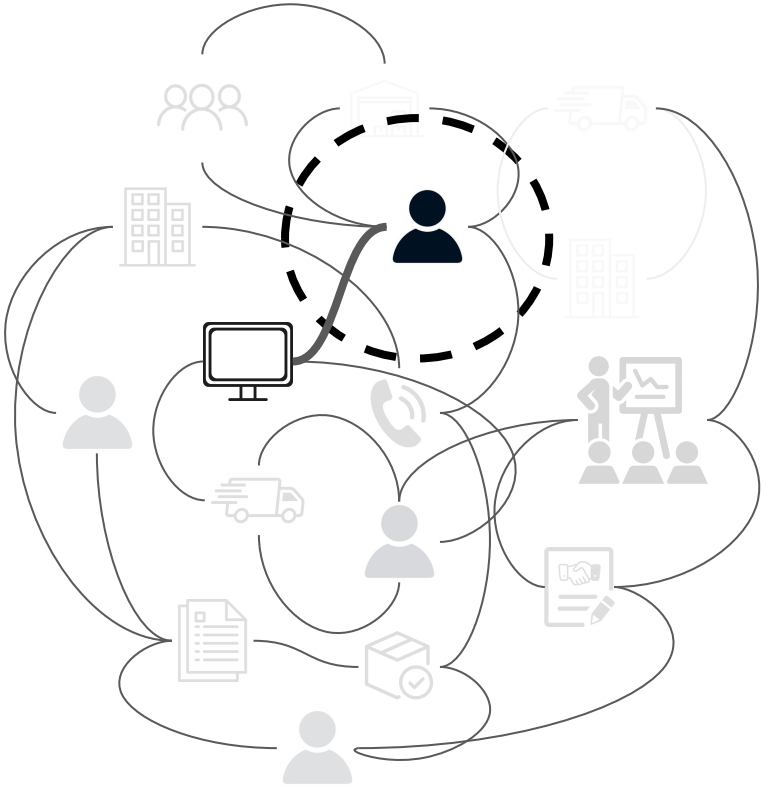


2. ACTIVELY WORKING WITH “FRAMES”

“The users do not know how to use the data analysis tools”

Poor planning

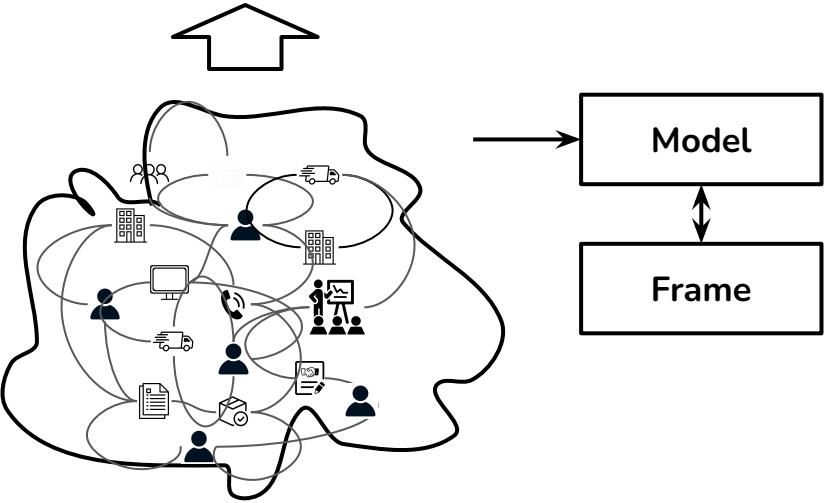


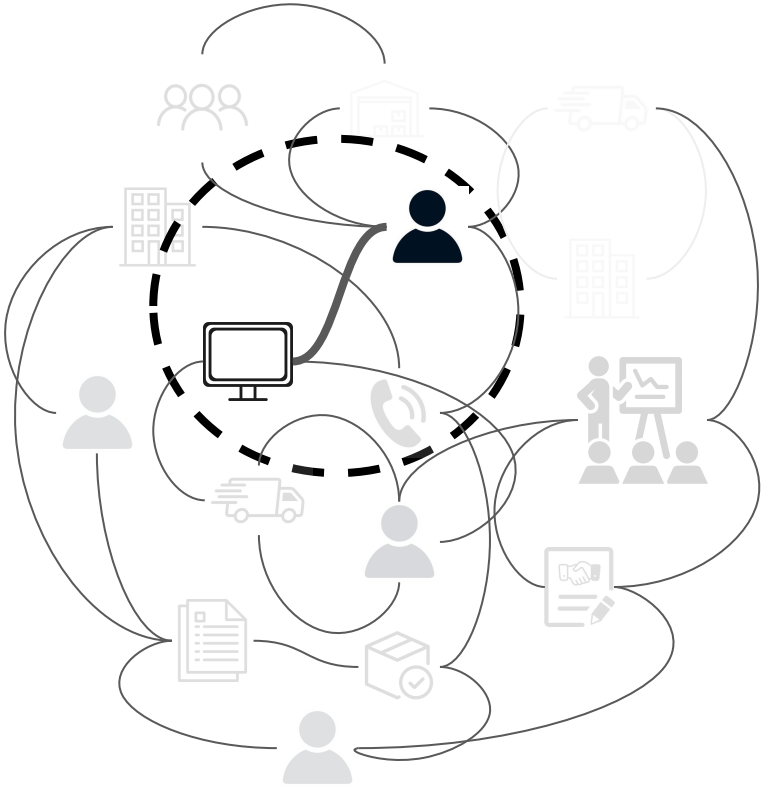


2. ACTIVELY WORKING WITH “FRAMES”

“The usability of the data analysis tools is poor”

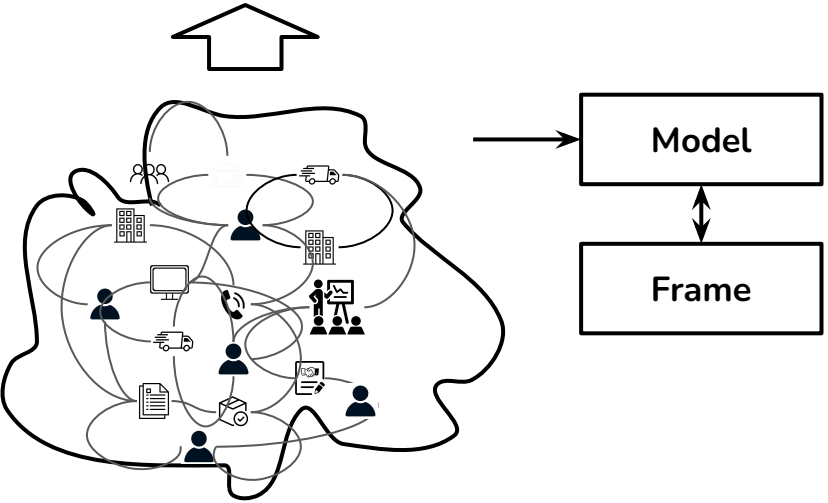
Poor planning



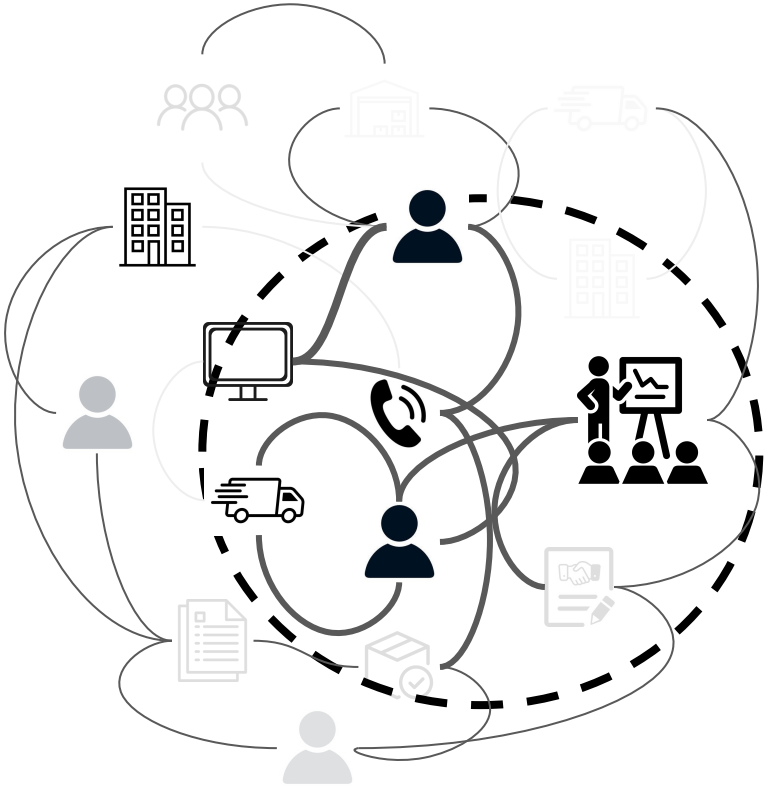


2. ACTIVELY WORKING WITH “FRAMES”

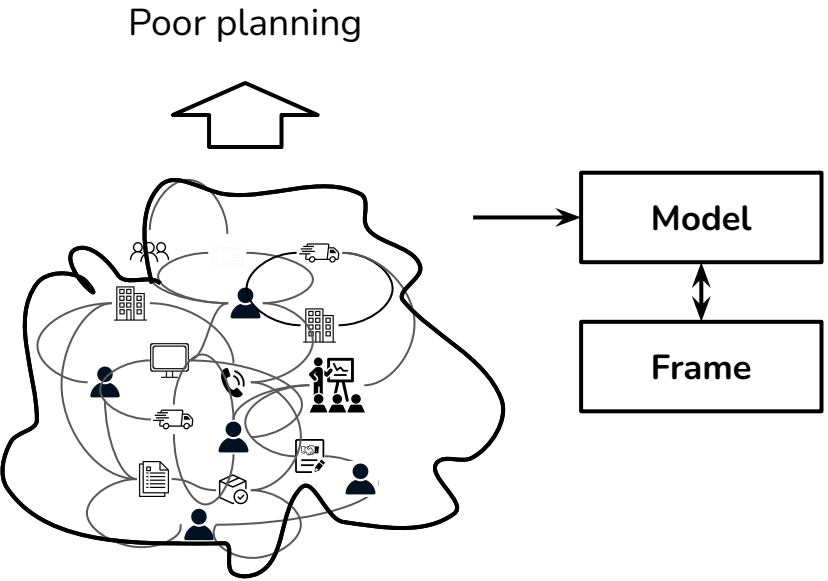
Poor planning



“Planners are not held accountable to their decisions

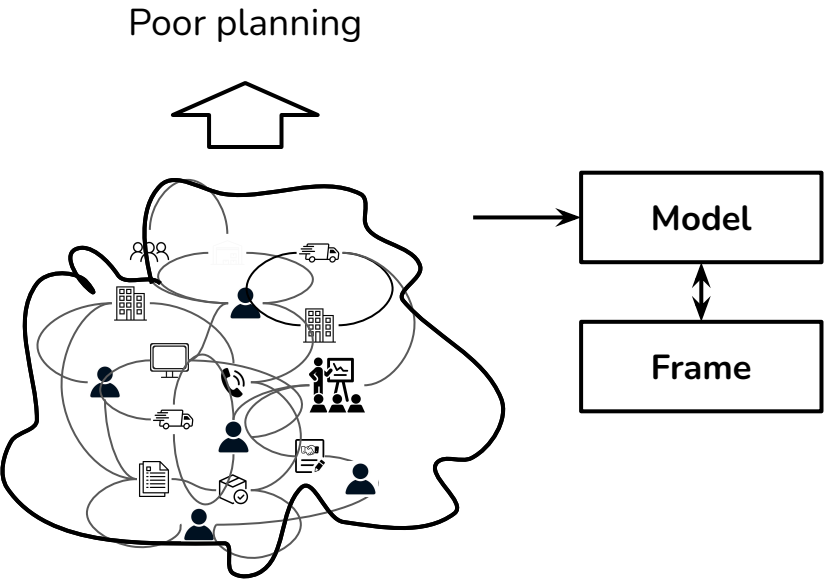


2. ACTIVELY WORKING WITH “FRAMES”



- We are often not aware of our frames
- “Trained incapacity”
- Many frames are true at the same time
- Some points to digital interventions that will have more effect than others

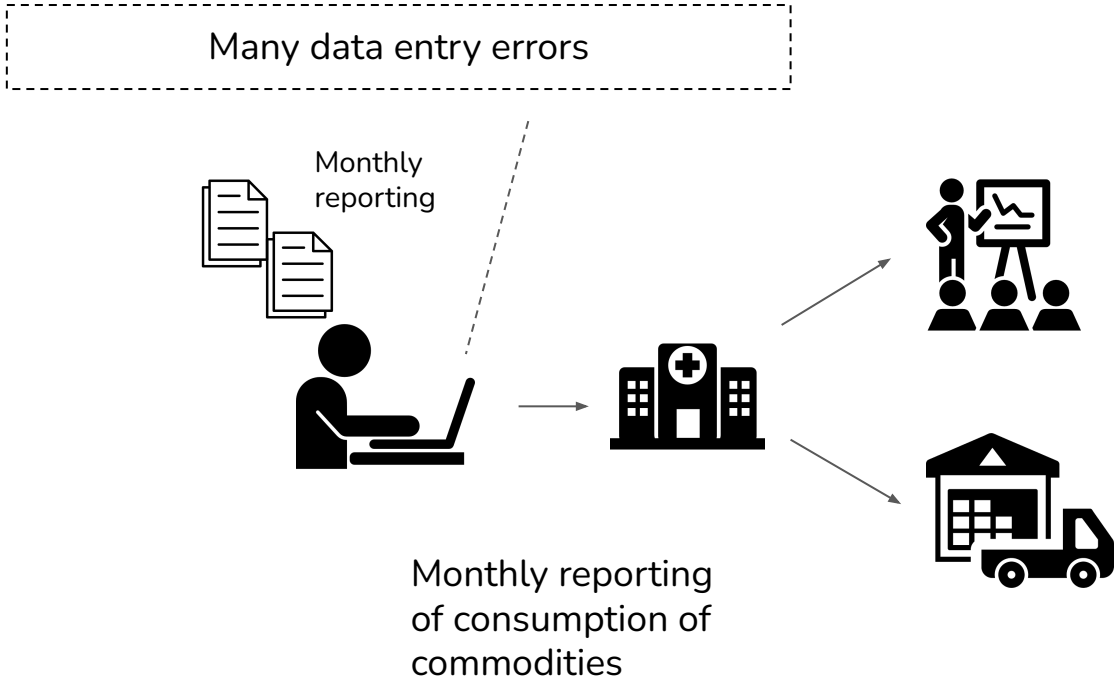
2. ACTIVELY WORKING WITH “FRAMES”



EXAMPLE - Logistics management system in Uganda

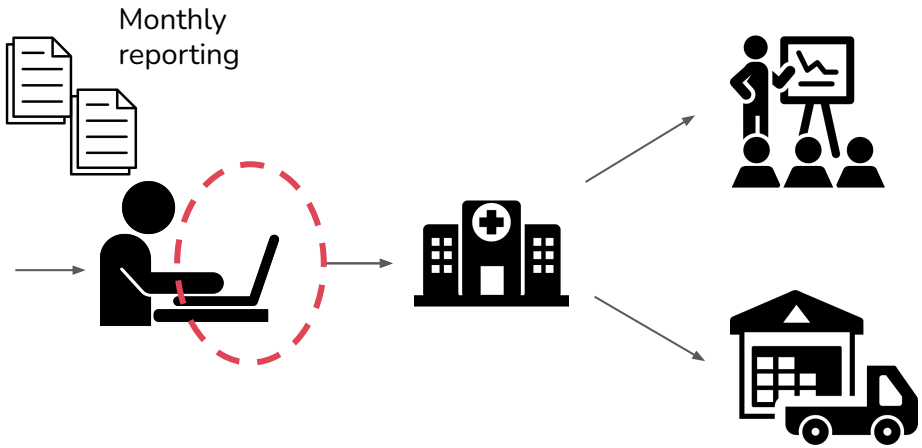
2. ACTIVELY WORKING WITH “FRAMES” - EXAMPLE

What is the right problem to address?



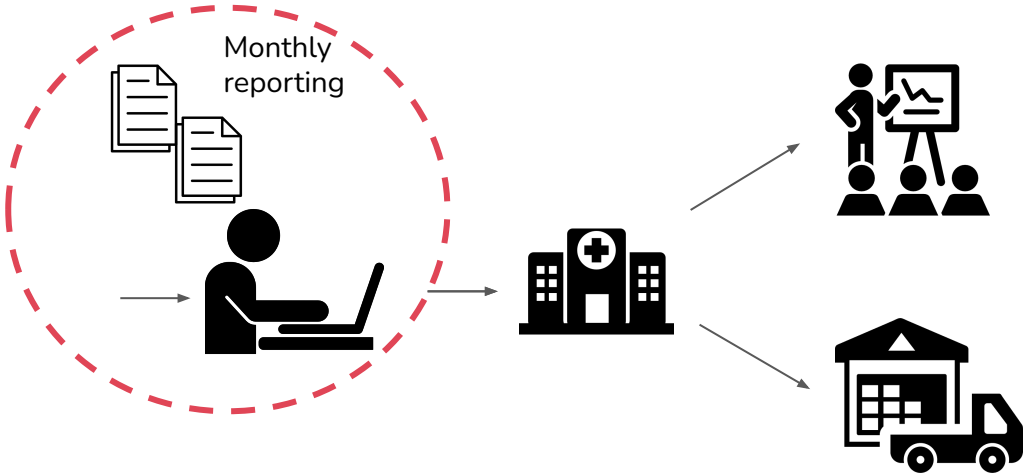
2. ACTIVELY WORKING WITH “FRAMES” - EXAMPLE

This is a problem of usability of the data entry screen



2. ACTIVELY WORKING WITH “FRAMES” - EXAMPLE

This is a problem of transferring data from paper to computer



2. ACTIVELY WORKING WITH “FRAMES” - EXAMPLE

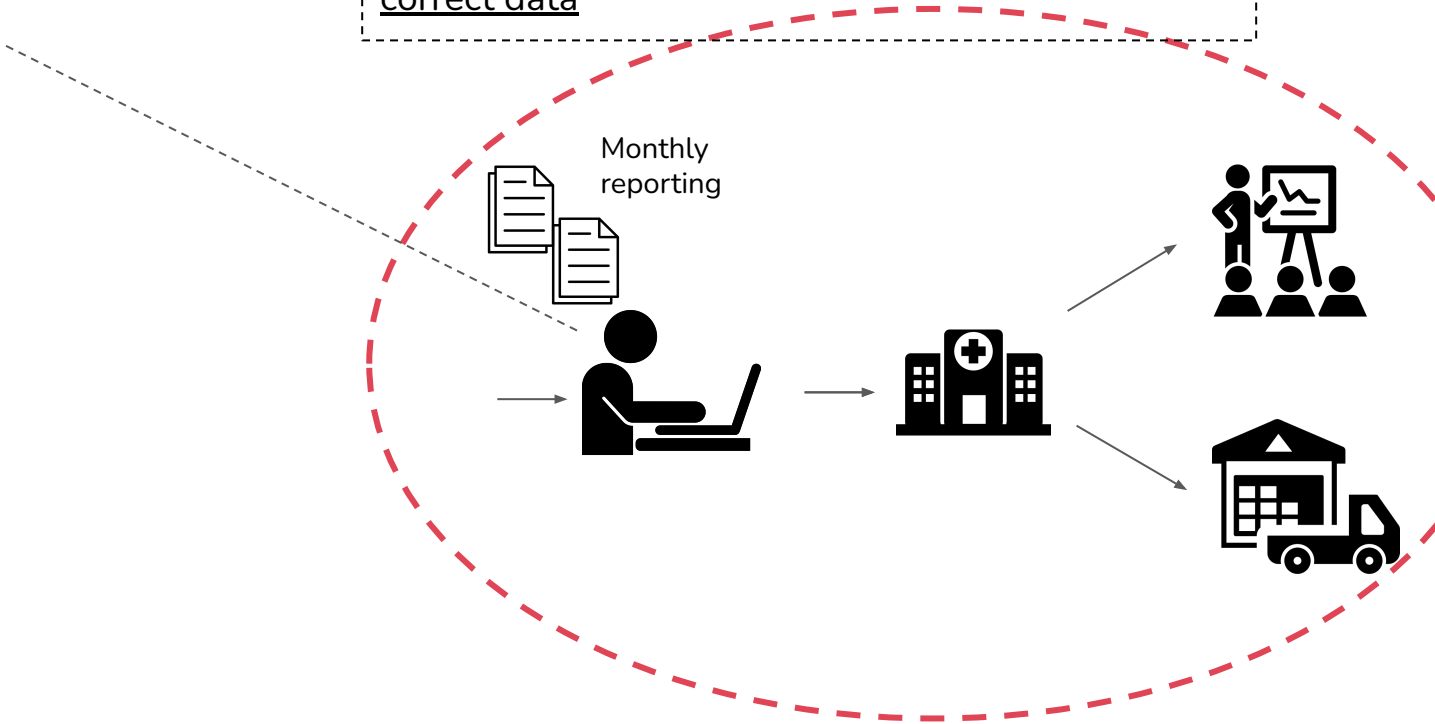
- Seems to be no link with what reported/requested and the amount shipped



2. ACTIVELY WORKING WITH “FRAMES” - EXAMPLE

- Seems to be no link with what reported/requested and the amount shipped

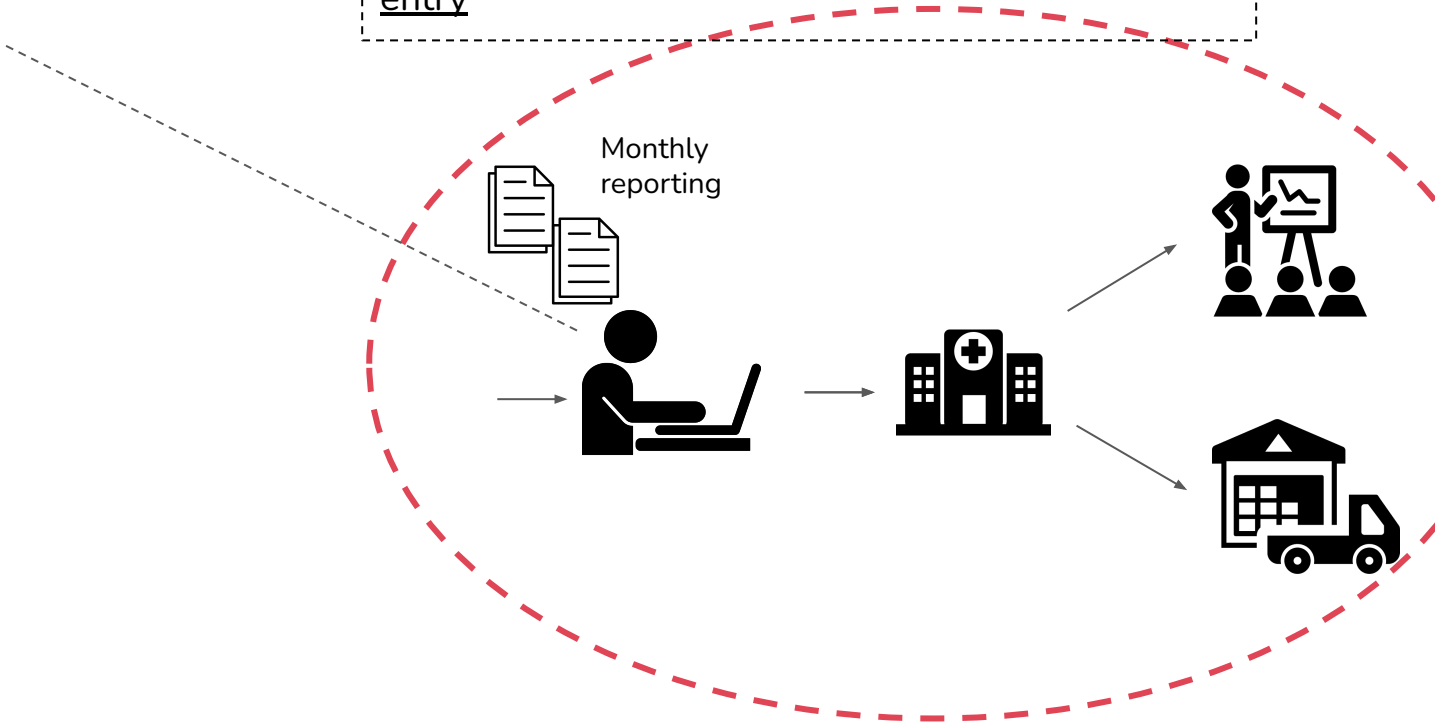
This is a problem of lack of incentives for entering correct data



2. ACTIVELY WORKING WITH “FRAMES” - EXAMPLE

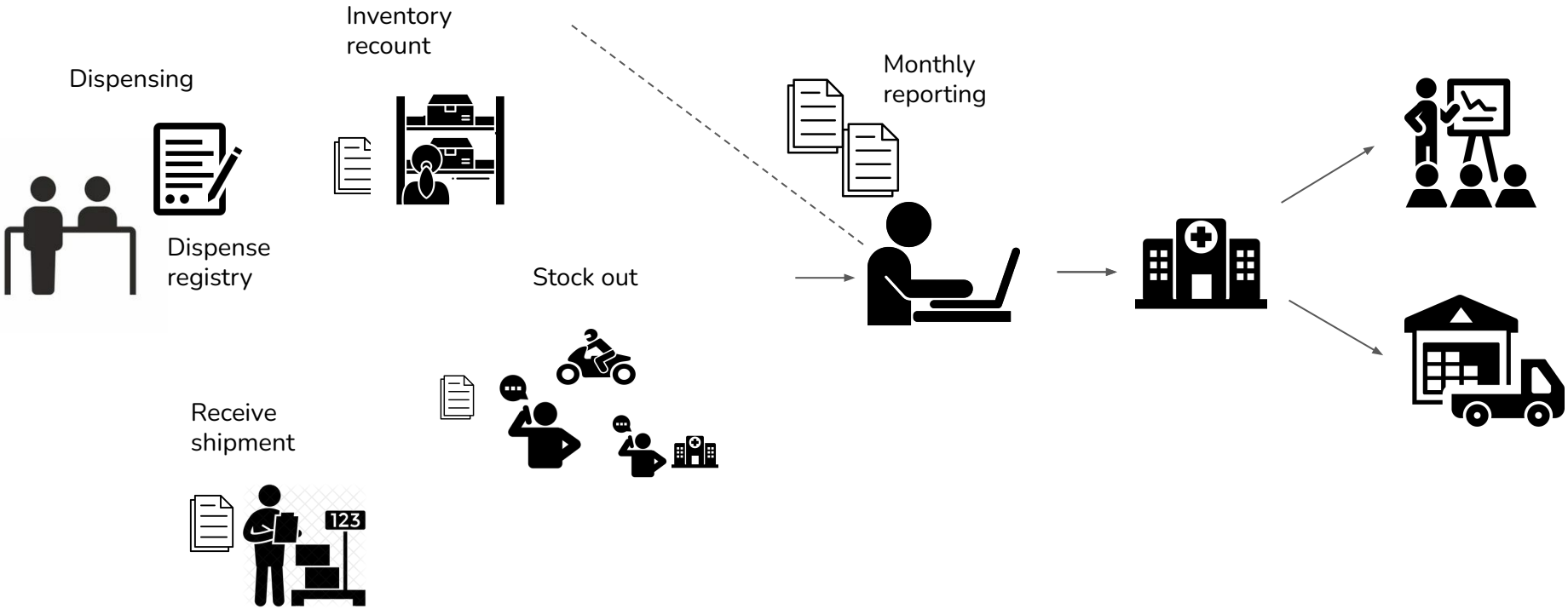
- Seems to be no link with what reported/requested and the amount shipped

This is a problem of disincentives for correct data entry



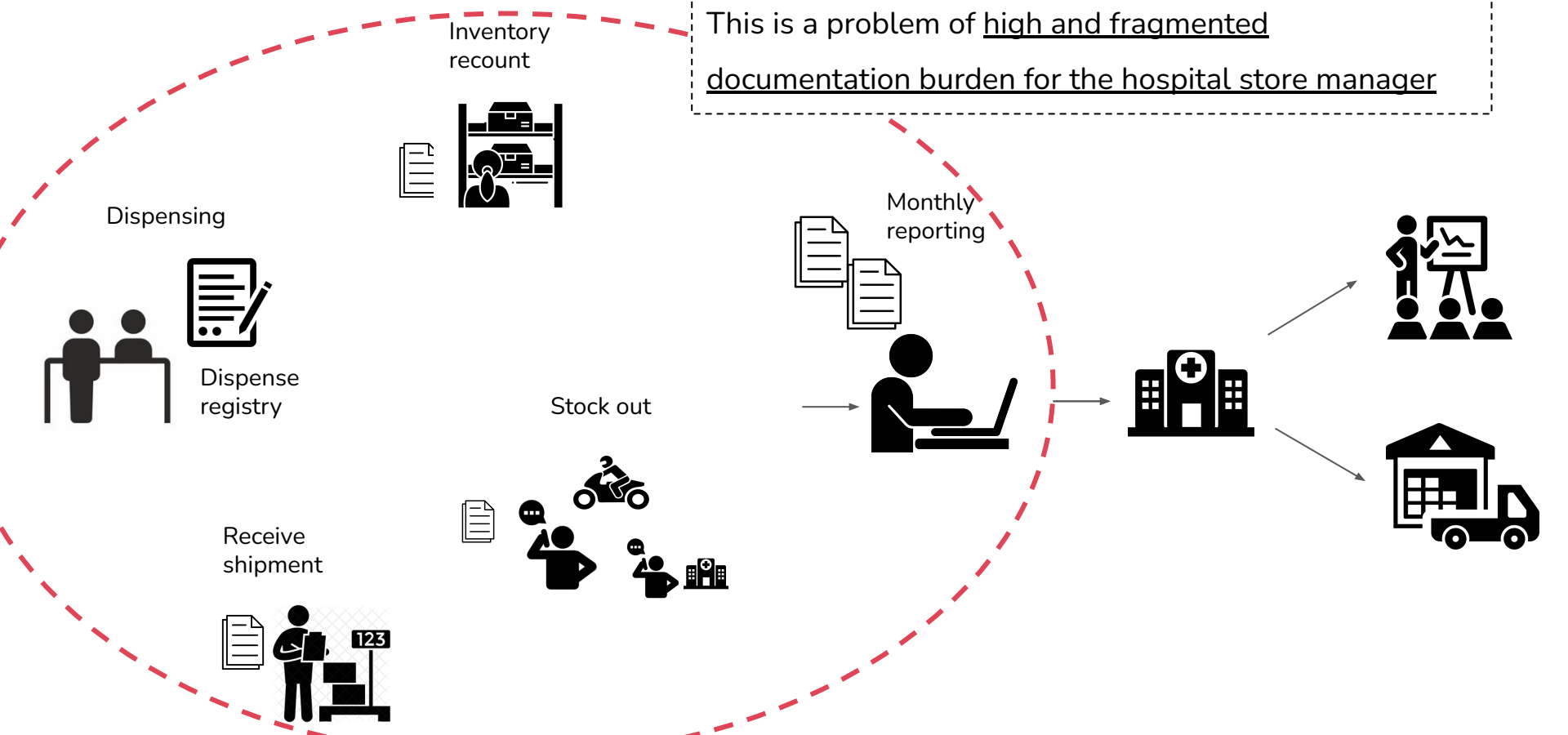
2. ACTIVELY WORKING WITH “FRAMES” - EXAMPLE

- <u>Have many paper forms and different systems, which amounts to a high documentation burden and difficulties of keeping overview</u>

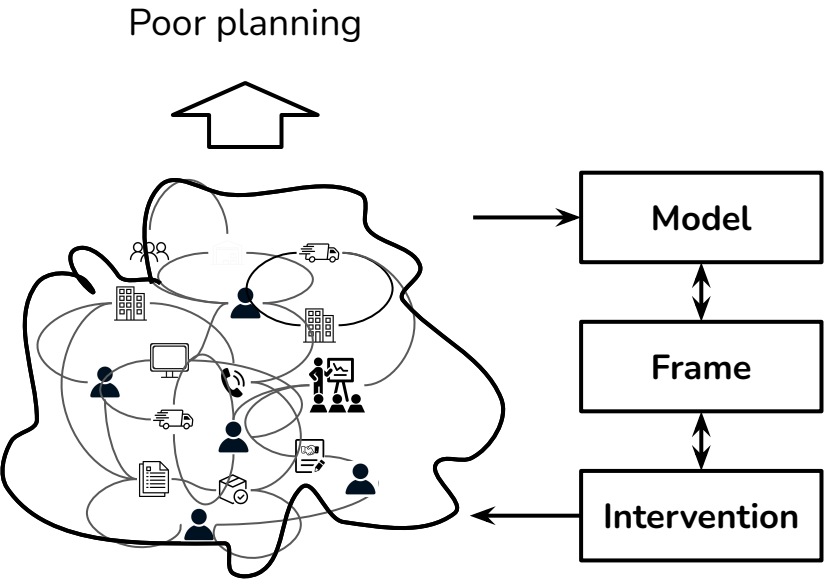


2. ACTIVELY WORKING WITH “FRAMES” - EXAMPLE

This is a problem of high and fragmented documentation burden for the hospital store manager



3. SYSTEMIC INTERVENTIONS

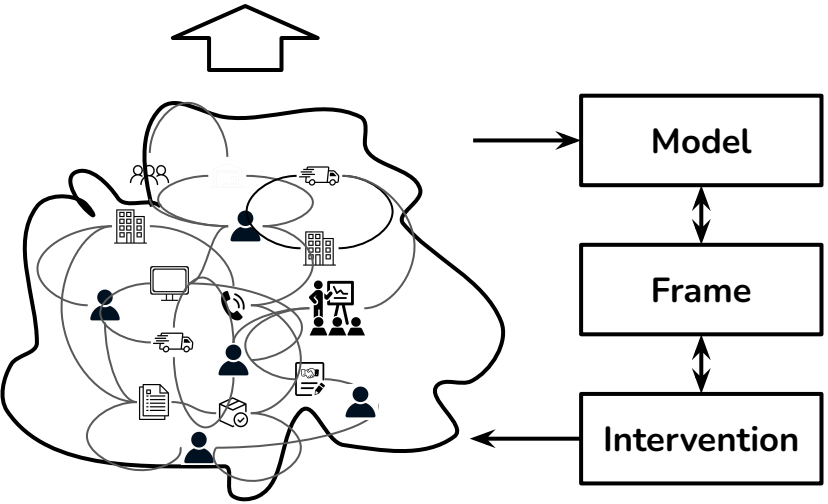


- From thinking independent “solutions”
- To systemic *interventions*
- Not a “solution” if not actually doing any good in the organization!

“The solution is ready and full of good functionality, now we just have to convince the employees to use it!”

4. CULTIVATION, NOT DELIVERY

BETTER PLANNING?



- The more complex the more unpredictable interventions will be!
- Not about delivering, about cultivating towards desirable emergence!
- More about this next week!

SUMMARY

Digitalization

- **Digitalization** involves making changes in organizations - sociotechnical systems, based on opportunities in digital technology
- Thus, both technology and sociotechnical systems design!
- We are better at the former and often organize all as if it is product development
- We have seen some elements of what sociotechnical systems development may look like
- Next week - how it affects **agility**

HOW COULD THIS BE RELEVANT TO YOUR MASTER PROJECT?

Note down some points - 1 min

