# AI and process mining for digital compliance, AML detection and management of KYC processes

September 24th

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Department of Computer Science

KØBENHAVNS UNIVERSITET

# Thomas T. Hildebrandt


- 2018- Professor, Department of Computer Science
  - Member of Danish Standards group for AI (and Cyber-security)
  - Head of new Data Stewardship study programme
  - Advisory board for D-seal (D-mærket)
  - 2018-2023: Founder and head of software, data, people & society research section

- 2012- Independent consultant and speaker on Digitalisation & AI
- 1999-2018 Researcher at IT University of Copenhagen, Denmark
- 1996-1999 PhD in Computer Science, Århus University

Recent and ongoing research projects:

| | | | |
|---|---|---|---|
| Effective, co-created & compliant adaptive case management for Knowledge workers EcoKnow.org<br>Innovationsfonden Grand Solutions Projekt 2017-2022 | Public Administration and Computational Transparency in Algorithms (PACTA)<br>INDEPENDENT RESEARCH FUND DENMARK 2019-2024 | Programming Technology Foundations for Accountability, Privacy-by-design & Robustness in Context-aware Systems (PAPRiCaS)<br>INDEPENDENT RESEARCH FUND DENMARK 2020-2025 | DATA4ALL & Nordic Refugee Determination: Advancing Data Science in Migration Law (NoRDASIL)<br>NordForsk 2021-2024 |

# What is the problem?

Annual costs of compliance management in the Danish Financial Sector in 2019:

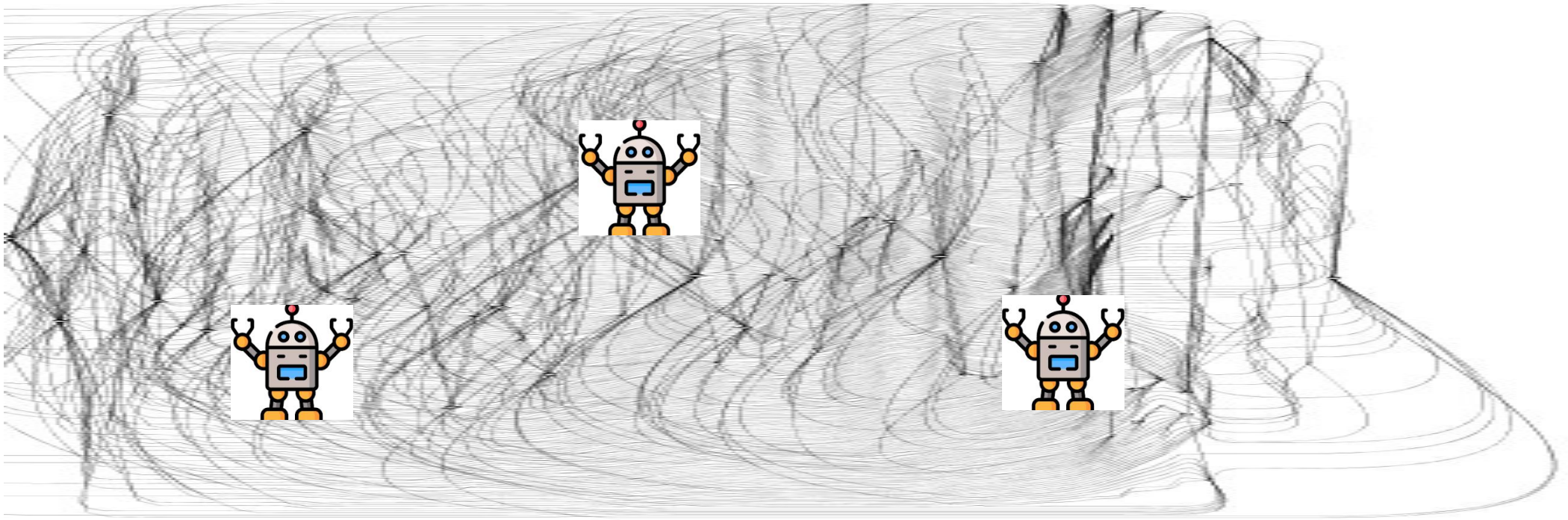
**DKK 3.400.000.000**

The documentation, regulations and guidelines

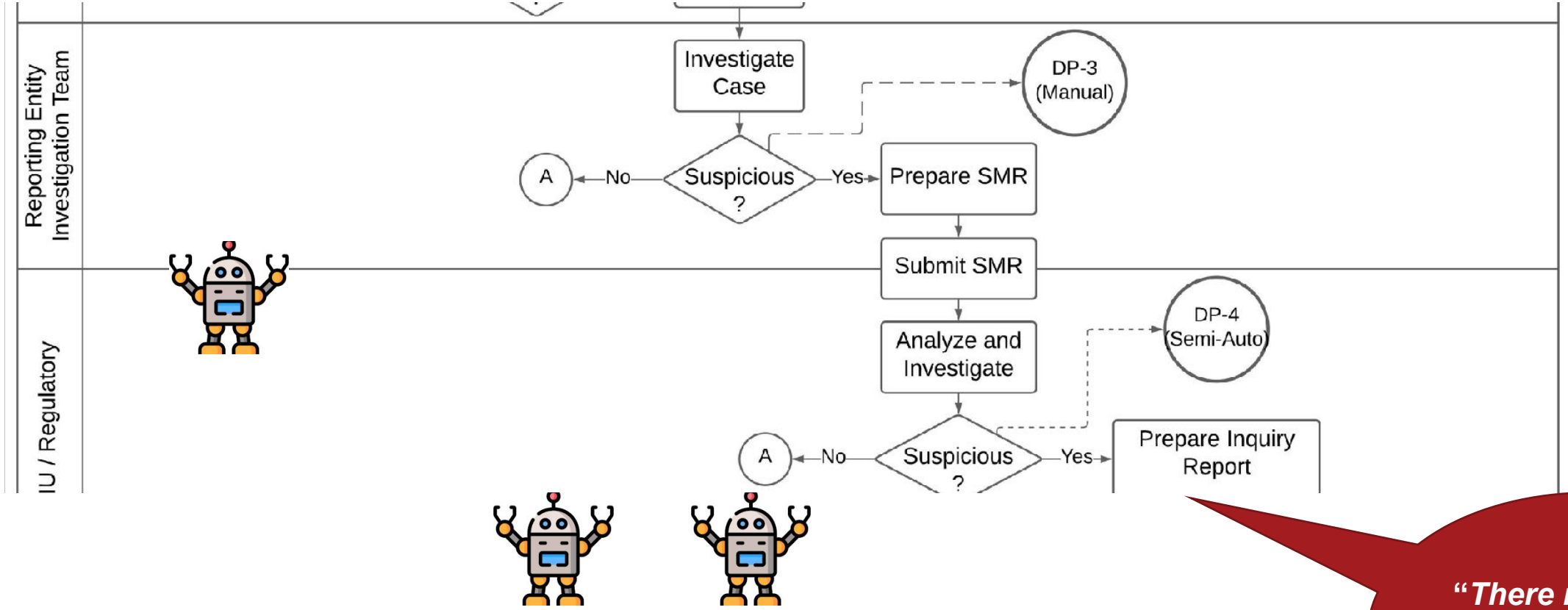
The processes in our bank

**How do we manage the processes? How do we ensure compliance? How do we detect unwanted behaviour?**

# Automation of individual sub tasks only helps a bit



# Simplifying the process to a pretty flow diagram makes it worse



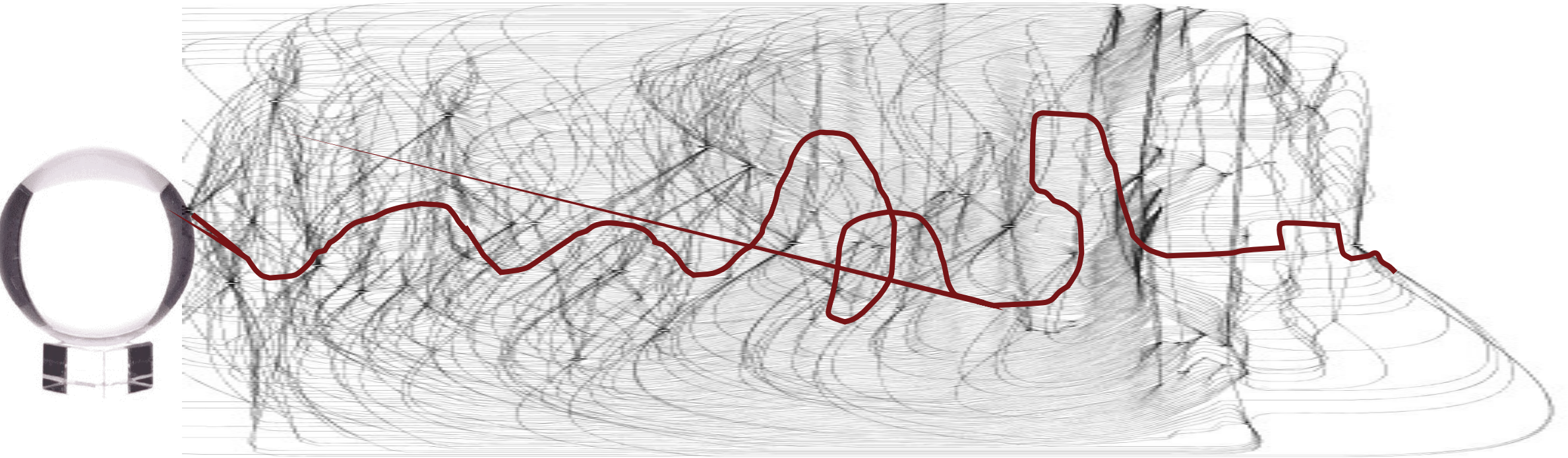




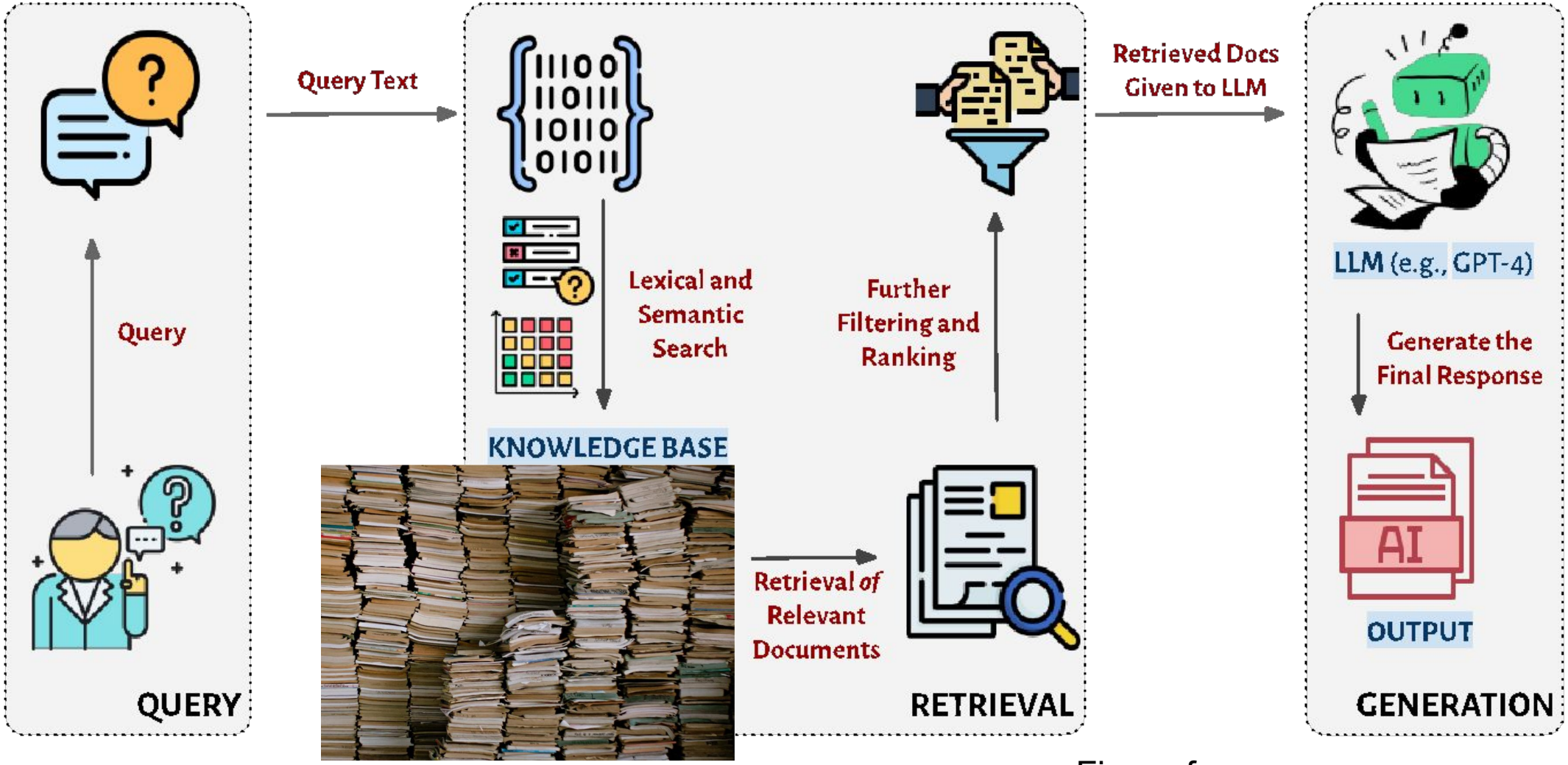



***"There no such thing as a single happy path"***
**Lars Reinkemeye**

# Attempting to predict the future path with AI is a dream



# Using Retrieval Augmented Generation to read our guidelines



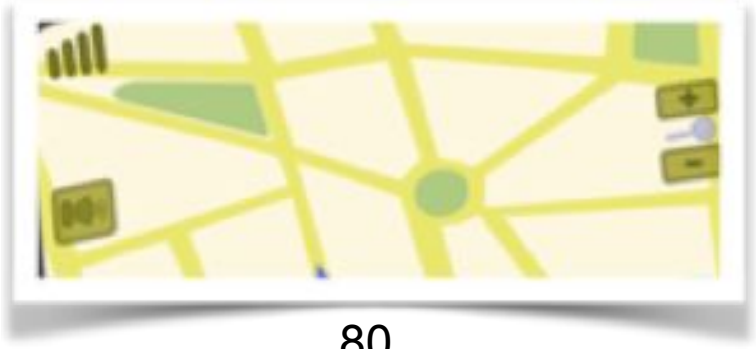

is not trustworthy, sustainable nor maintainable

Figure from:
**Hallucination-Free? Assessing the Reliability of Leading AI Legal Research Tools**

# What can we do instead?

Simple, high predictability and volume

Complex and unpredictable



Unknown territory

5 %

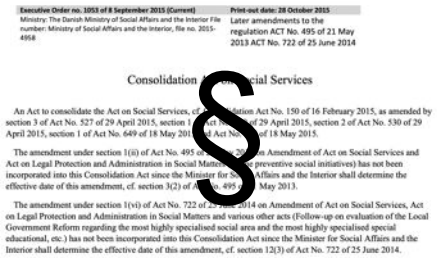
80 %

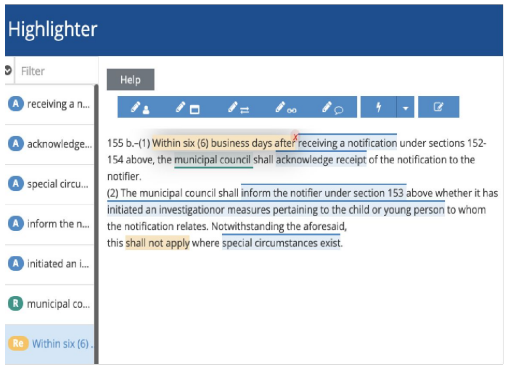
15 %

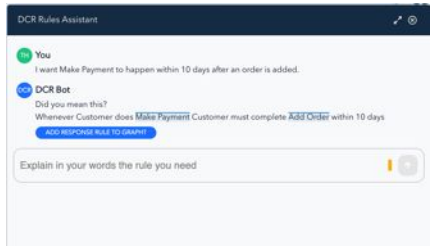
Can we get a
workflow GPS with autopilot and
a maintainable and explainable map
?

# DCR Solutions: Declarative Process Modelling and Mining as Maintainable & Explainable AI in Business processes

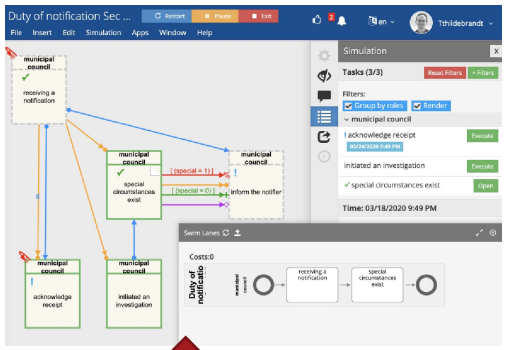
tool supported, mappings to executable & explainable models



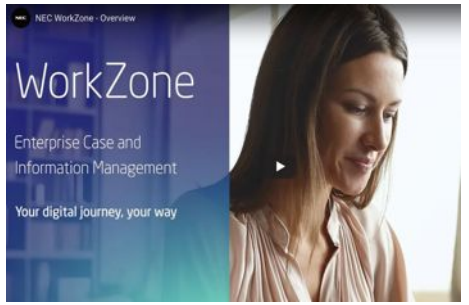

ChatGPT prompt




DisCoveR Process

automation via service requests


Dynamic Guidelines and self-service application forms




Case management support

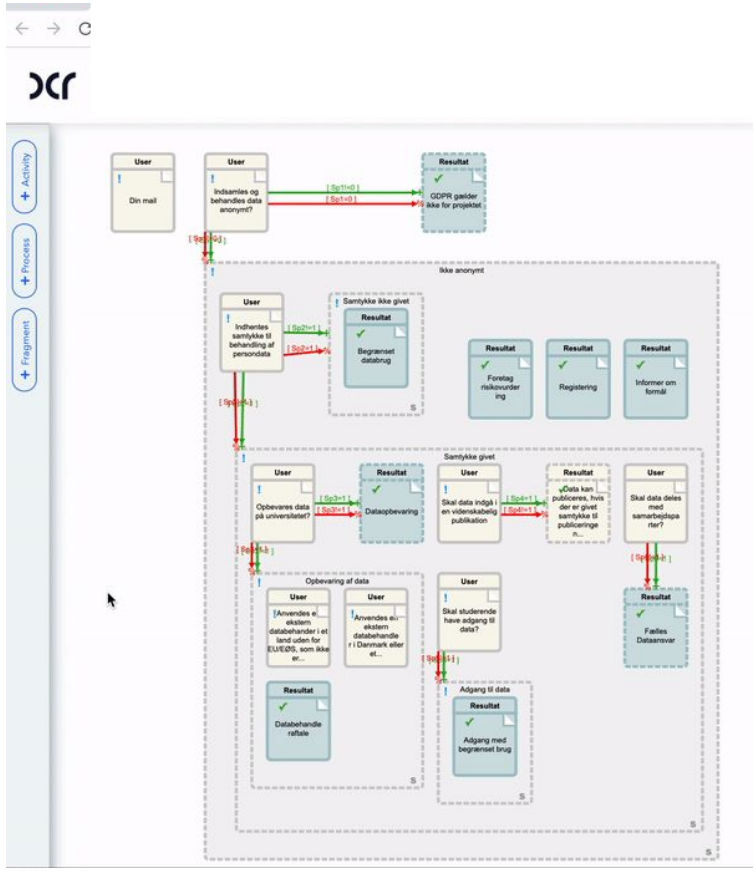
Historic Data

Successful spin-off from EcoKnow.org research project in 2018

# More than 35 end-customers are using DCR today!




# Example: Corona guidelines


11 page guidance, with 14 updates

Digital business process

DCR Decision Models

dcr-bifrost.azurewebsites.net/sop/1017805

# DCR SOP

## Corona - Nærkontakt SOP

Start | Kontakt med smittet | Konklusion

Next

**Få svar på om du er nærkontakt og hvad du skal gøre**

Ved at besvare spørgsmålende kan du finde ud af om du er nær kontakt, om du skal gå i selvisolation og hvornår du skal tage PCR test.

Bor du sammen med den smittede?

Har du haft direkte fysisk kontakt med den smittede?

Har du har været tættere end en 1 meter på den smittede i mere end 15 minutter?

**OBS**: Hvis du er omfattet af særlige omstændigheder bør du læse disse retningslinjer:

- Særlige retningslinjer for børn.
- Særlige retningslinjer for personale der arbejder i sundhedssektoren og med ældre.

# Know your customer

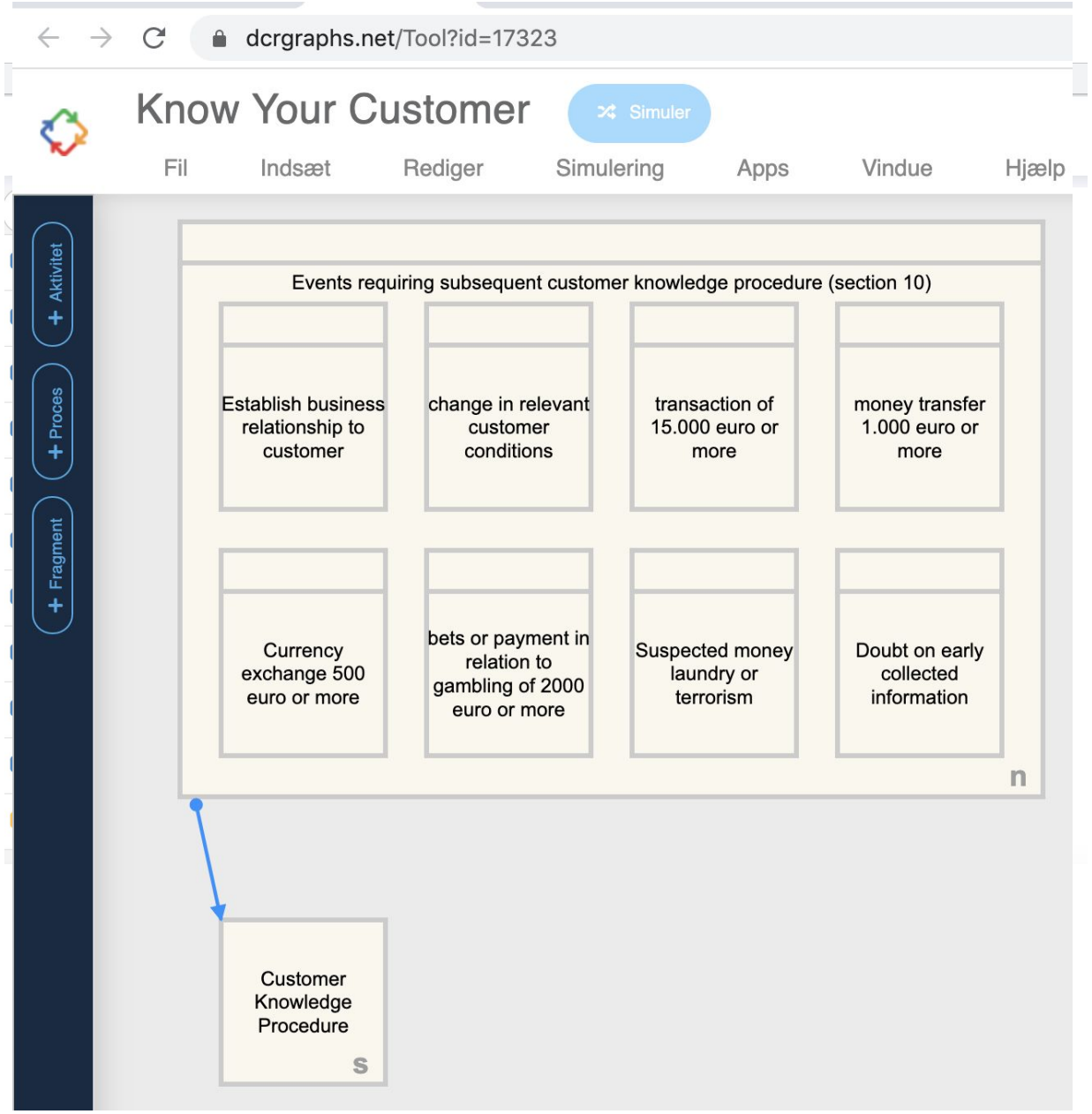
Kapitel 3

*Kundekendskabsprocedurer*

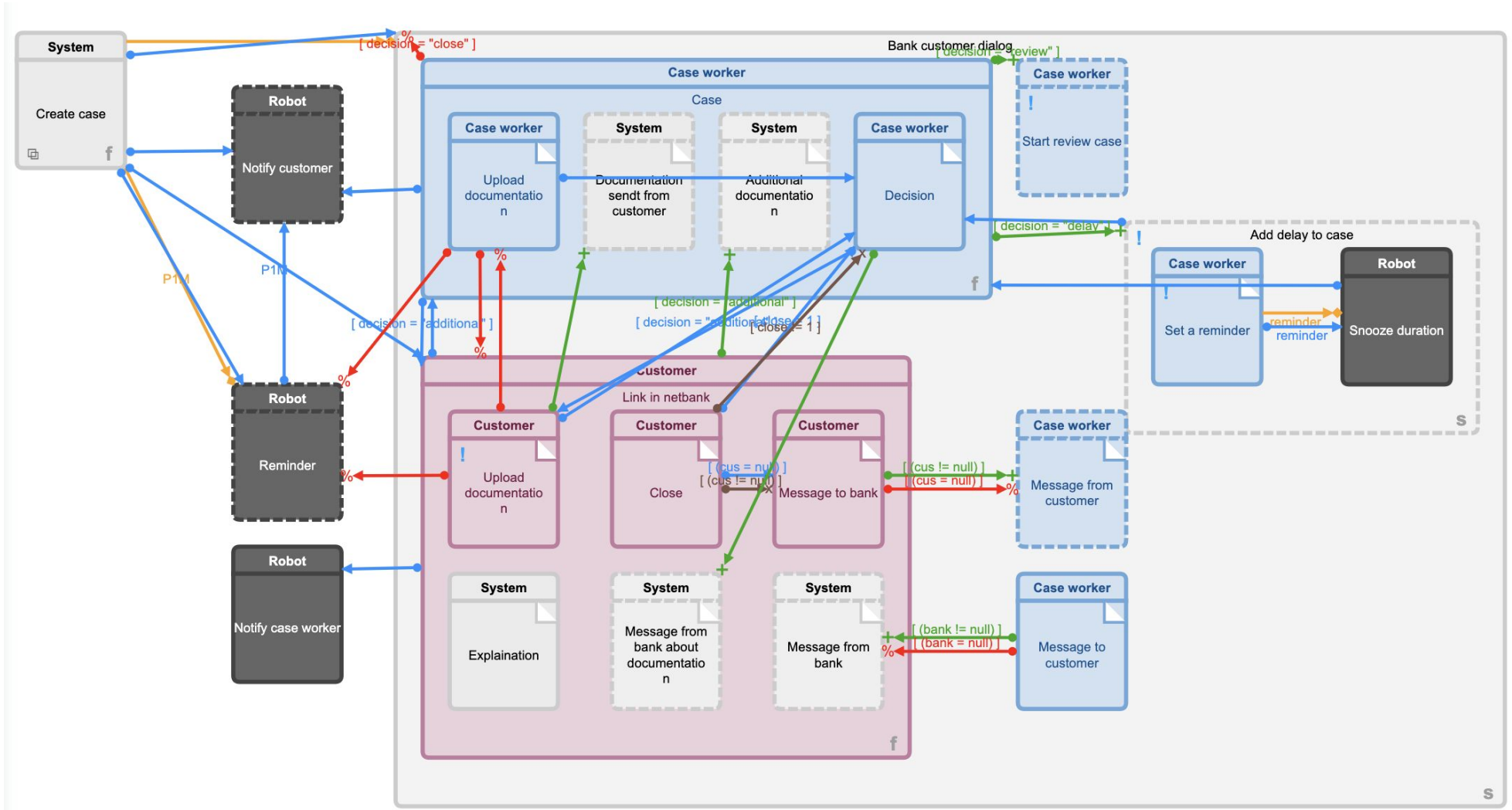
*Almindelige krav*

**§ 10.** Virksomheder og personer omfattet af denne lov skal gennemføre kundekendskabsprocedurer, jf. §§ 11-21, når

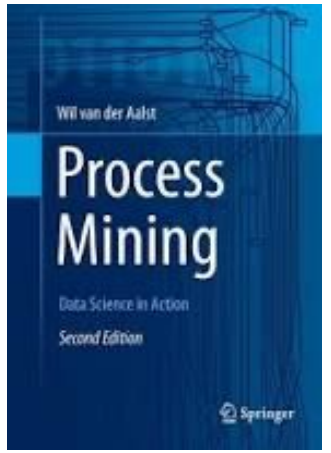
1) de etablerer en forretningsforbindelse, en kundes relevante omstændigheder ændrer sig, og i øvrigt på passende tidspunkter, herunder når virksomheden eller personen i løbet af det relevante kalenderår er juridisk forpligtet til at kontakte kunden med henblik på at undersøge enhver relevant oplysning vedrørende den eller de reelle ejere,
2) de udfører en enkeltstående transaktion på
   a) mindst 15.000 euro, hvad enten transaktionen sker på én gang eller som flere transaktioner, der er eller ser ud til at være indbyrdes forbundet,
   b) mere end 1.000 euro i form af en pengeoverførsel, hvad enten transaktionen sker på én gang eller som flere transaktioner, der er eller ser ud til at være indbyrdes forbundet, eller
   c) 500 euro eller derover ved valutaveksling, hvad enten transaktionen sker på én gang eller som flere transaktioner, der er eller ser ud til at være indbyrdes forbundet,
3) de i forbindelse med udbud af spil modtager indsatser, udbetaler gevinster eller begge dele på mindst 2.000 euro, hvad enten transaktionen sker på én gang eller som flere transaktioner, der er eller ser ud til at være indbyrdes forbundet,
4) der er mistanke om hvidvask eller finansiering af terrorisme, uanset at betingelserne i nr. 2 og 3 ikke er opfyldt, eller
5) der er tvivl om, hvorvidt tidligere indhentede oplysninger om kundens identitet er korrekte eller tilstrækkelige.

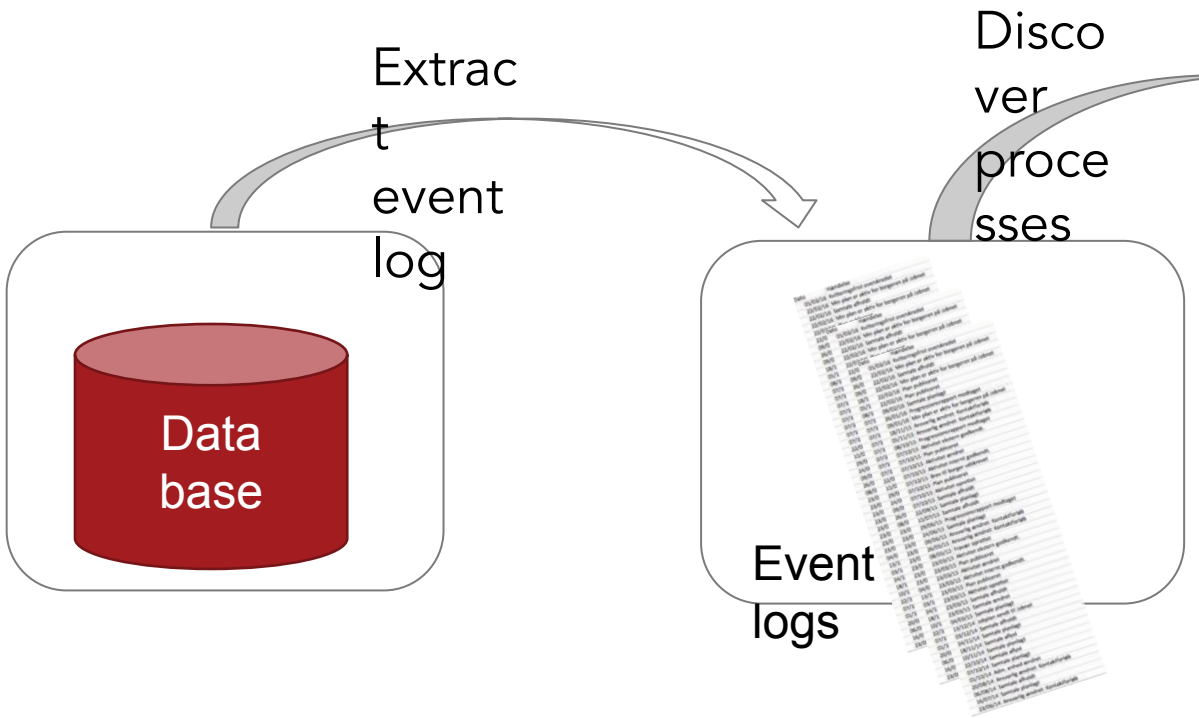


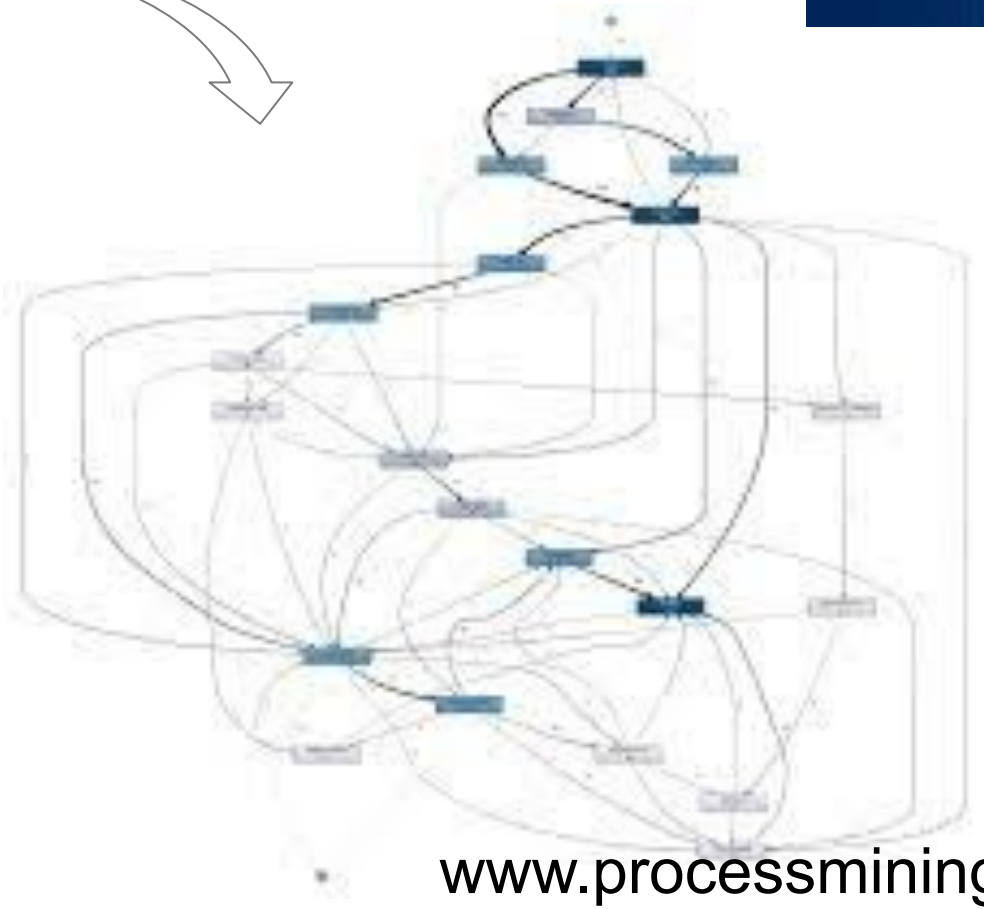
# Anti Money Laundering



# Process Mining



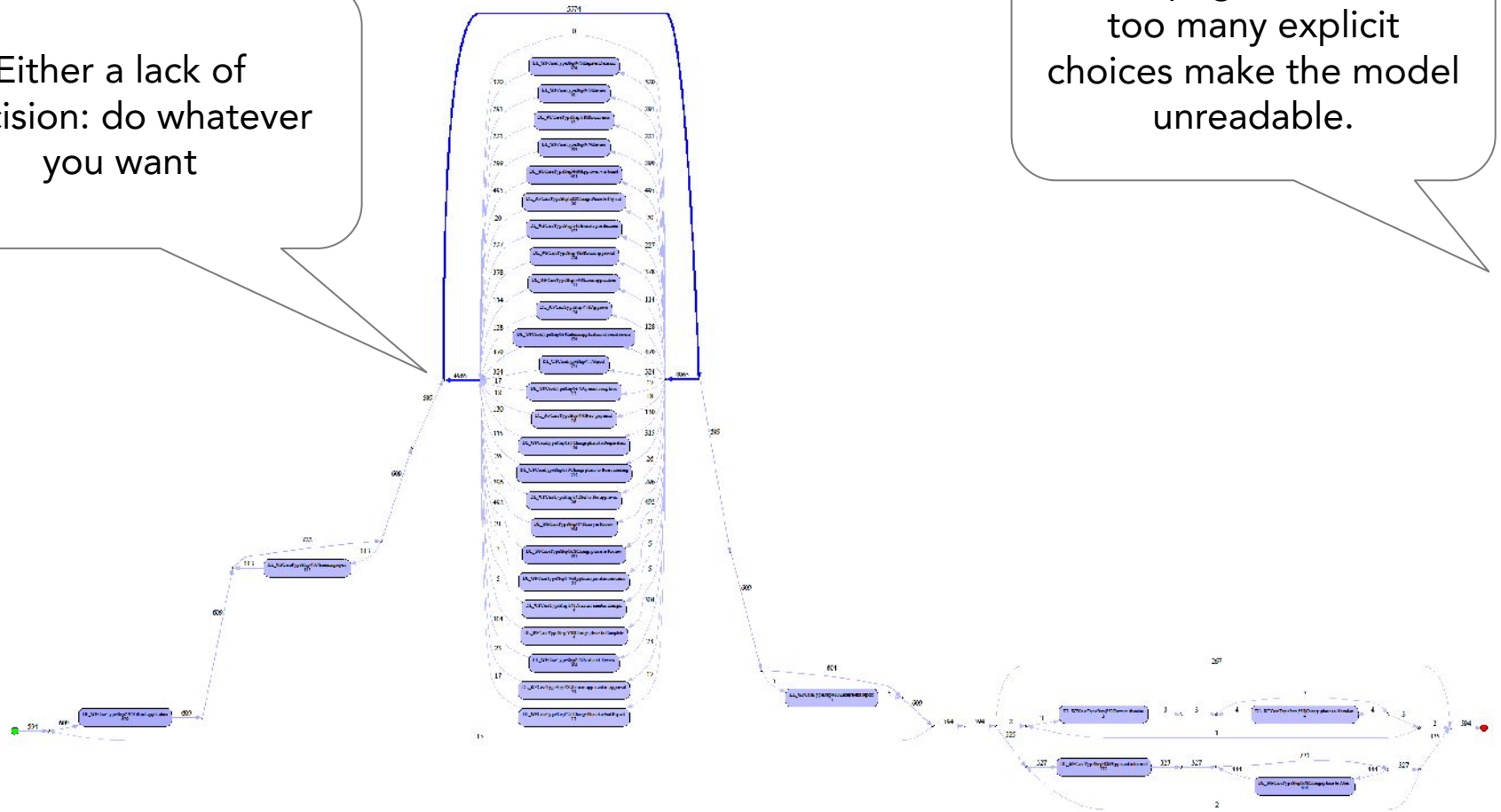



**1849-2016 - IEEE Standard for eXtensible Event Stream (XES)**

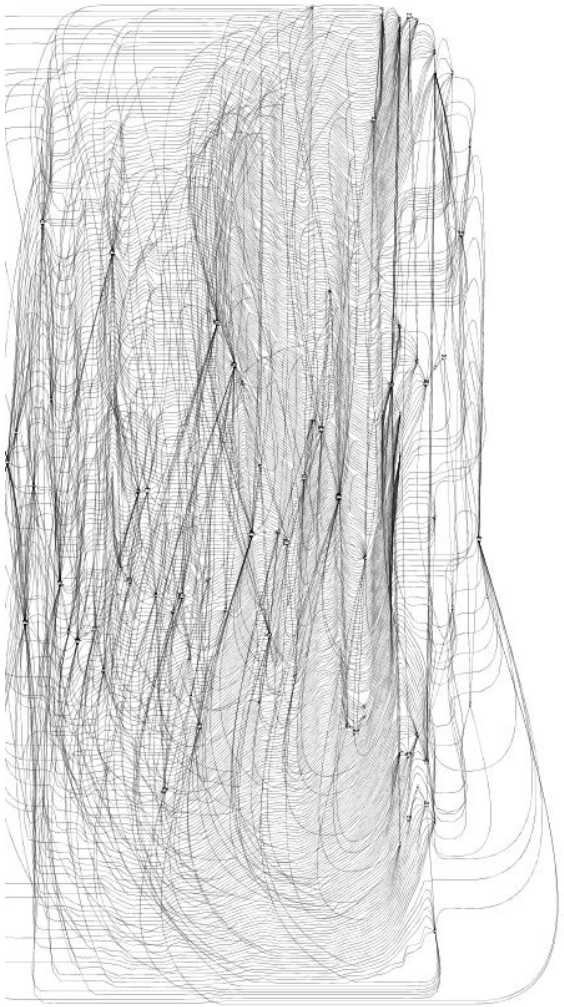
www.processmining.org/

# Traditional flow-based approaches

Either a lack of precision: do whatever you want



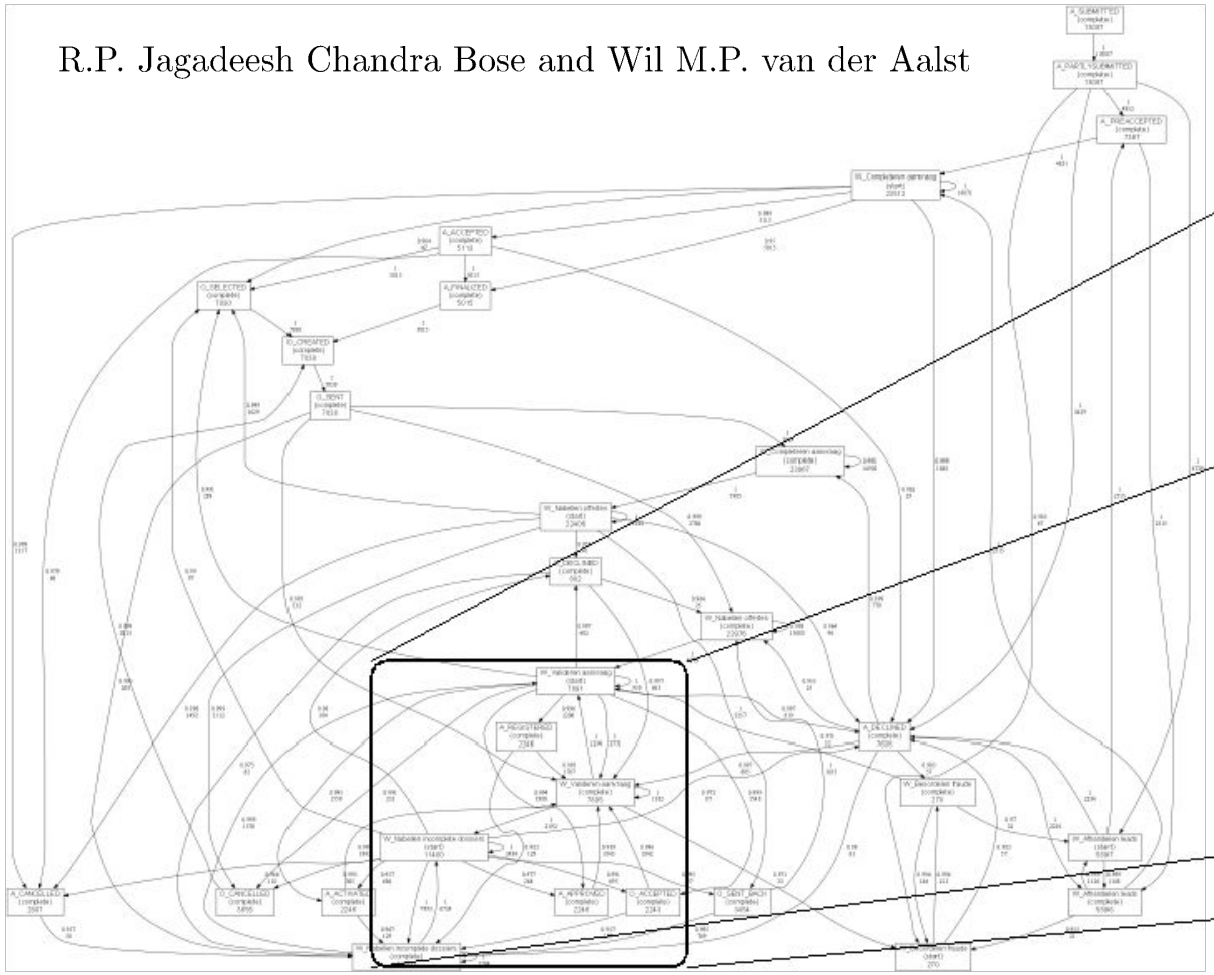
Or a “spaghetti model”: too many explicit choices make the model unreadable.



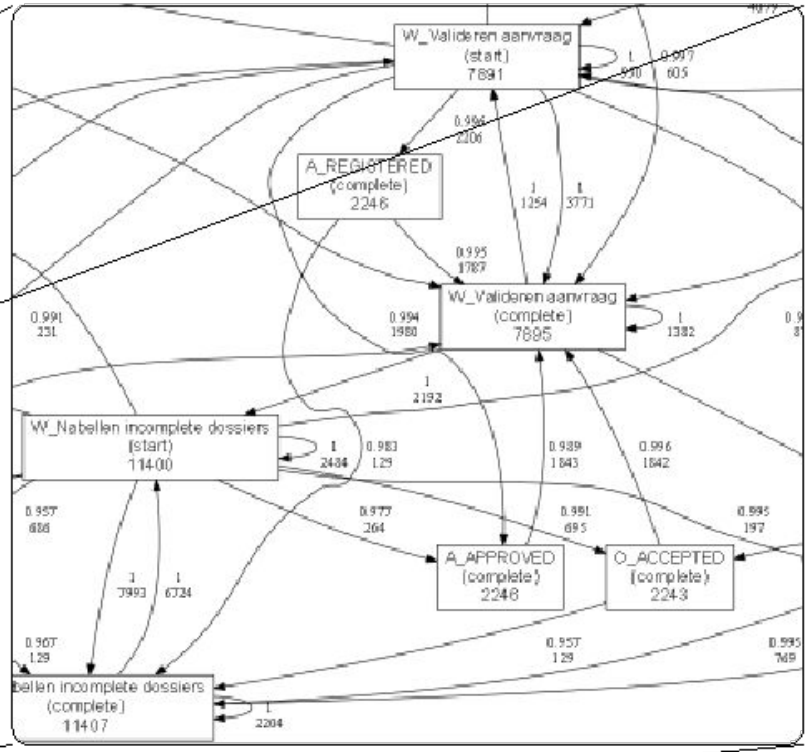
# Example: Mined spaghetti process from loan application log

**Process Mining Applied to the BPI Challenge 2012: Divide and Conquer While Discerning Resources**

R.P. Jagadeesh Chandra Bose and Wil M.P. van der Aalst



Traditional flow chart is incomprehen sible!



# Award-winning Process mining algorithm for discovery of DCR graphs from event logs


**Process Mining Conference 2021 + 2023**

3rd International Conference on Process Mining, October 31-November 4, 2021

Process Discovery Contest Best Overall Algorithm

awarded to:

Axel Christfort, Søren Debois and Tijs Slaats

for their process discovery algorithm:

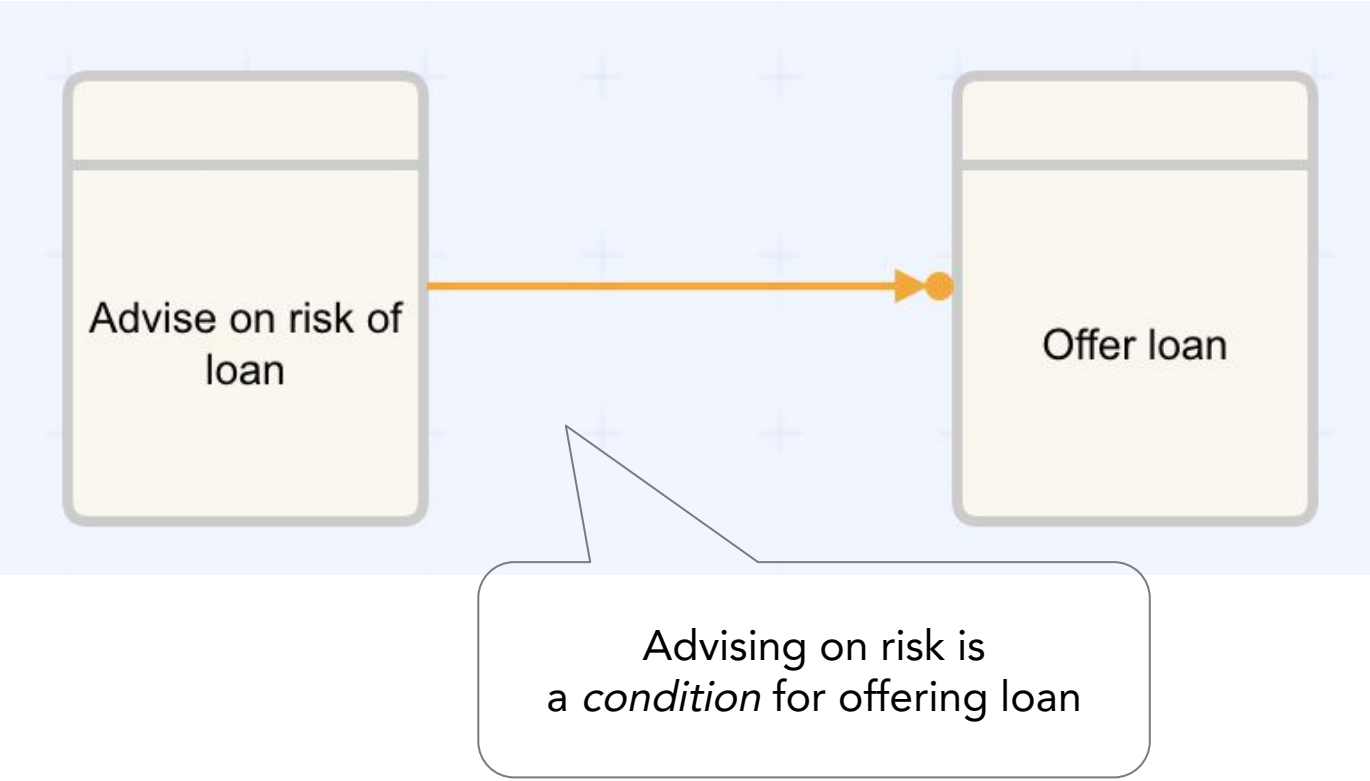
DisCoveRN

"Honorable mention" to
DCR Solutions from Gartner in 2023

# Our approach

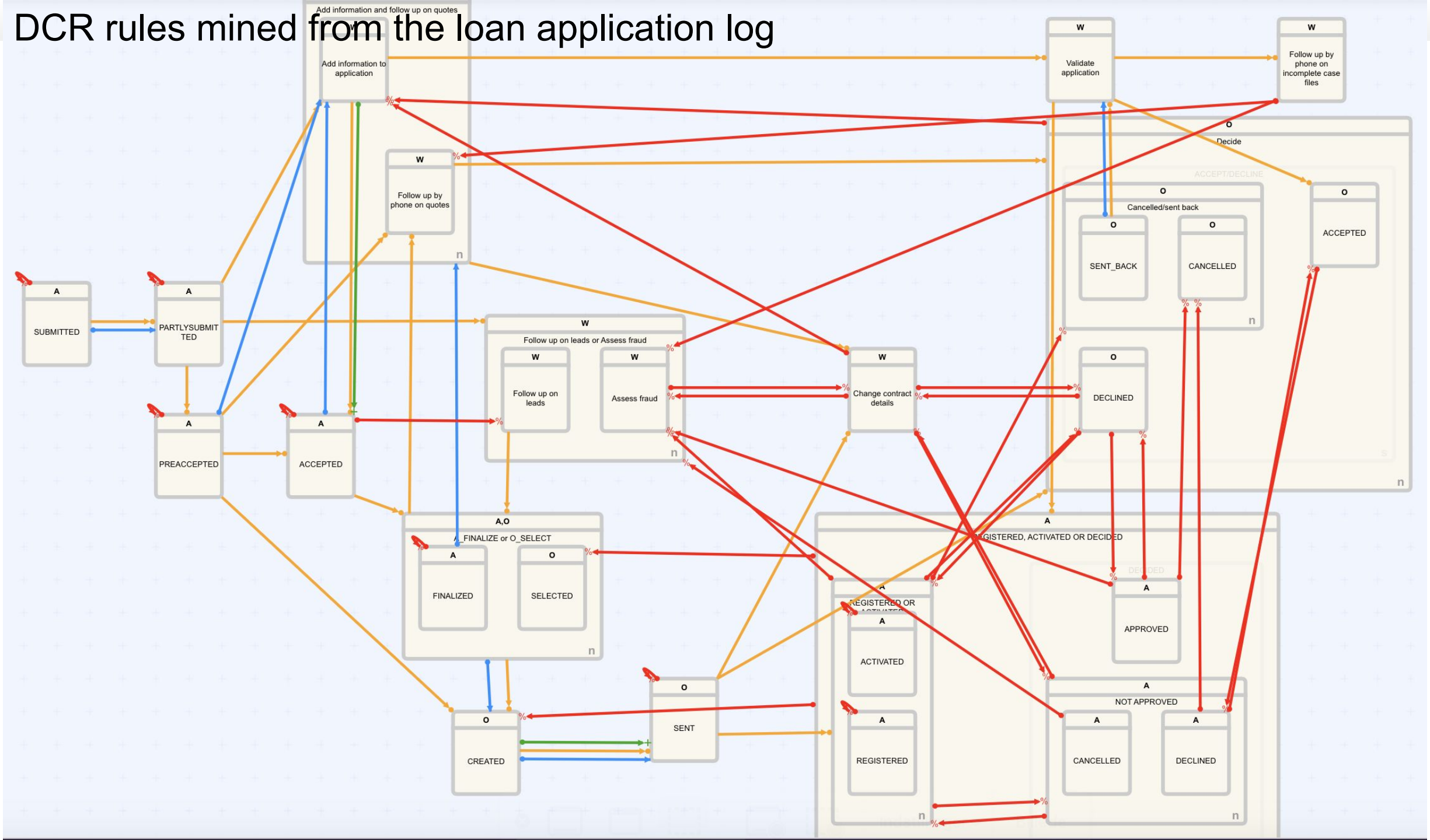
Mines business rules, which:

- Can be reasoned about in isolation
- Explain the rules of the process

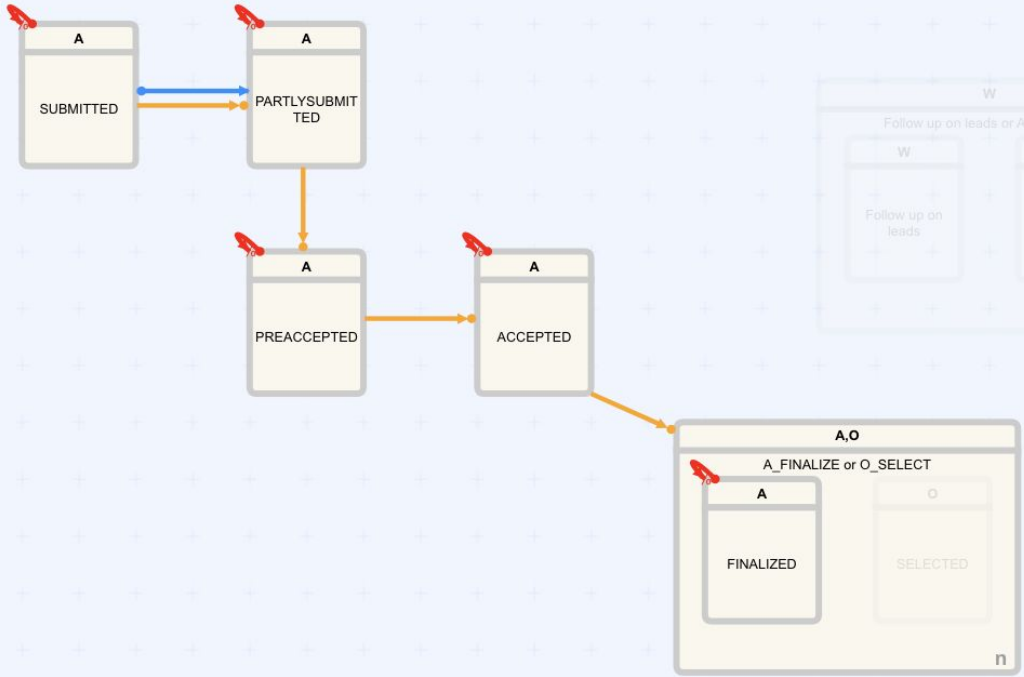


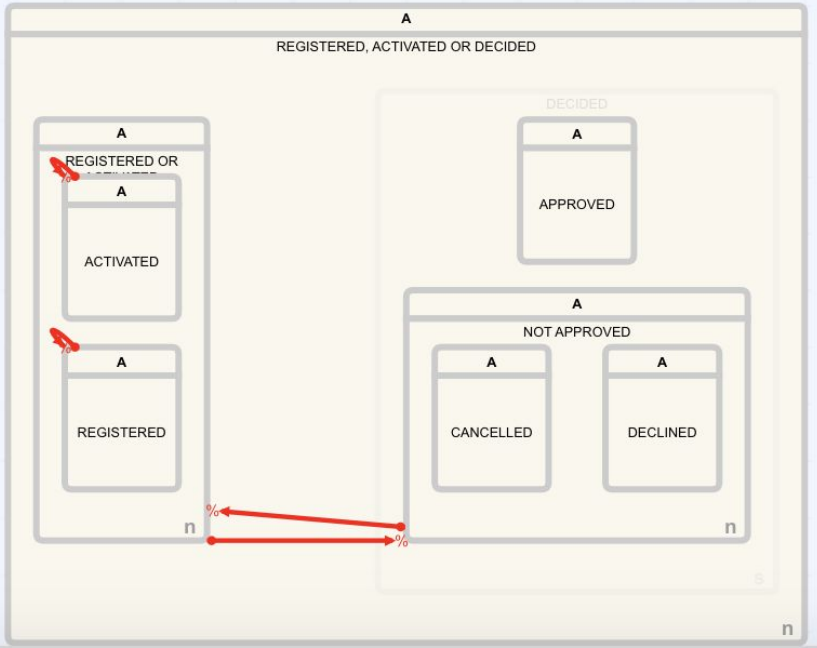

If this rule is found by the process mining algorith m the log is complia nt

# DCR rules mined from the loan application log

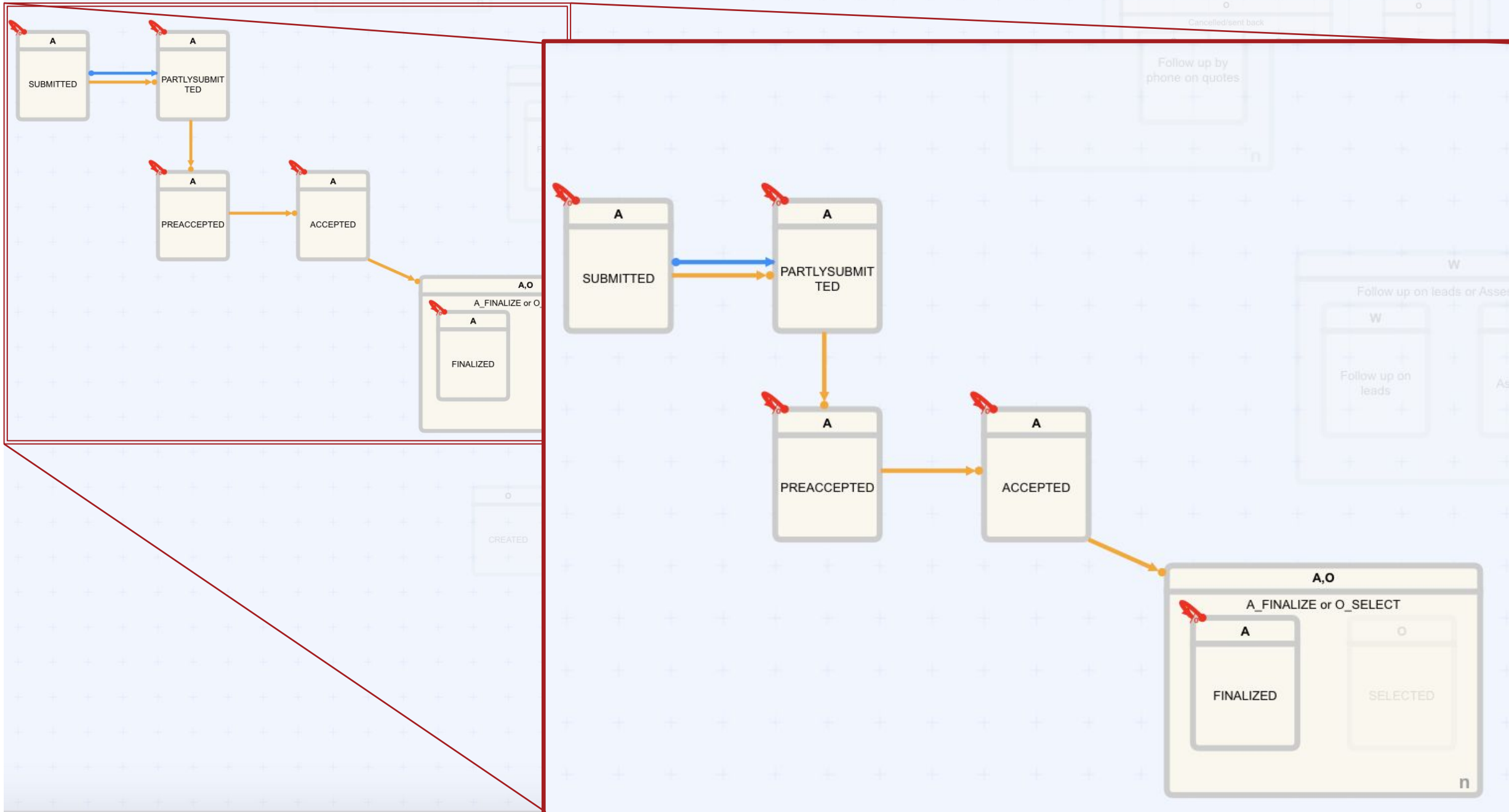


# Application sub process

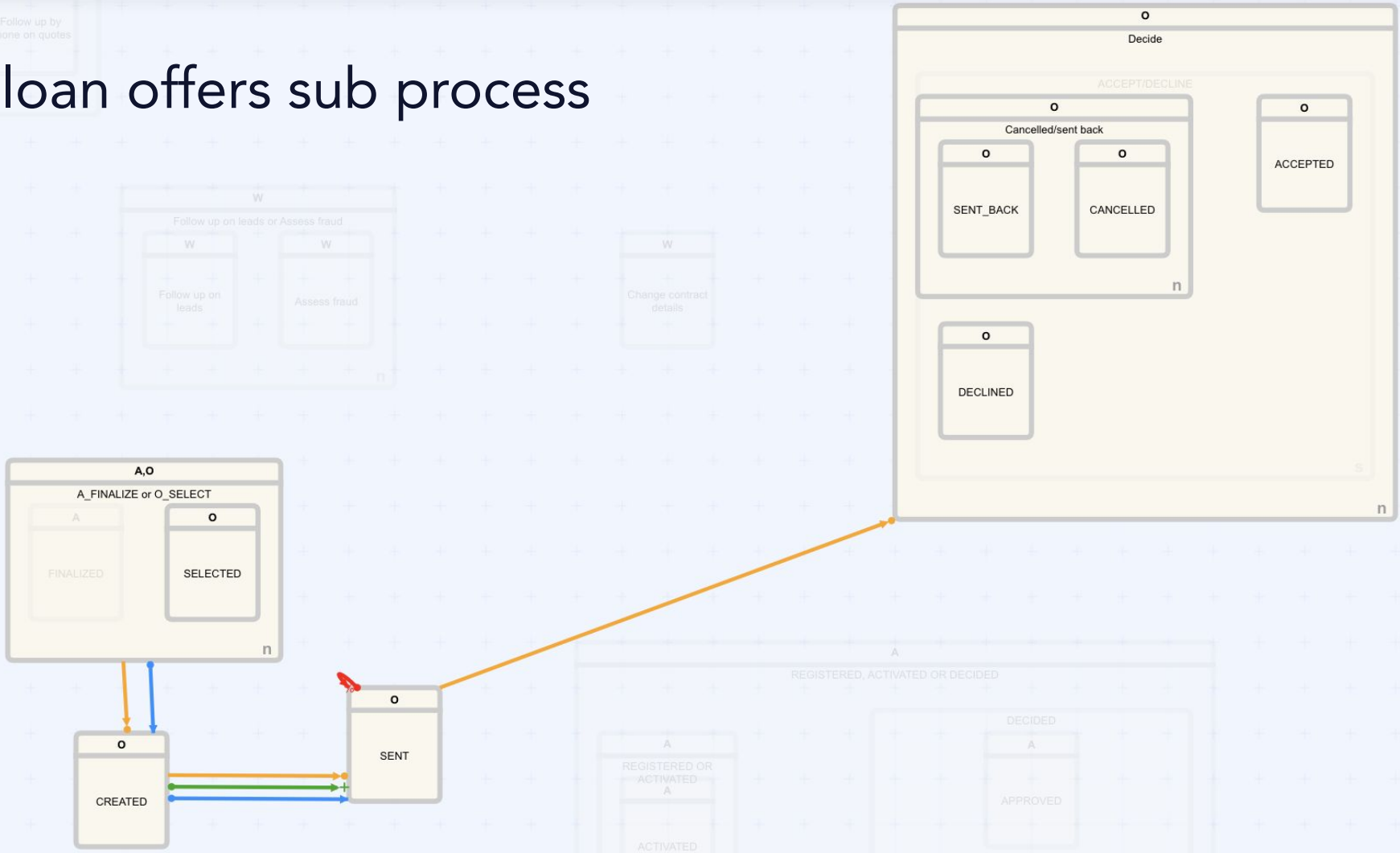


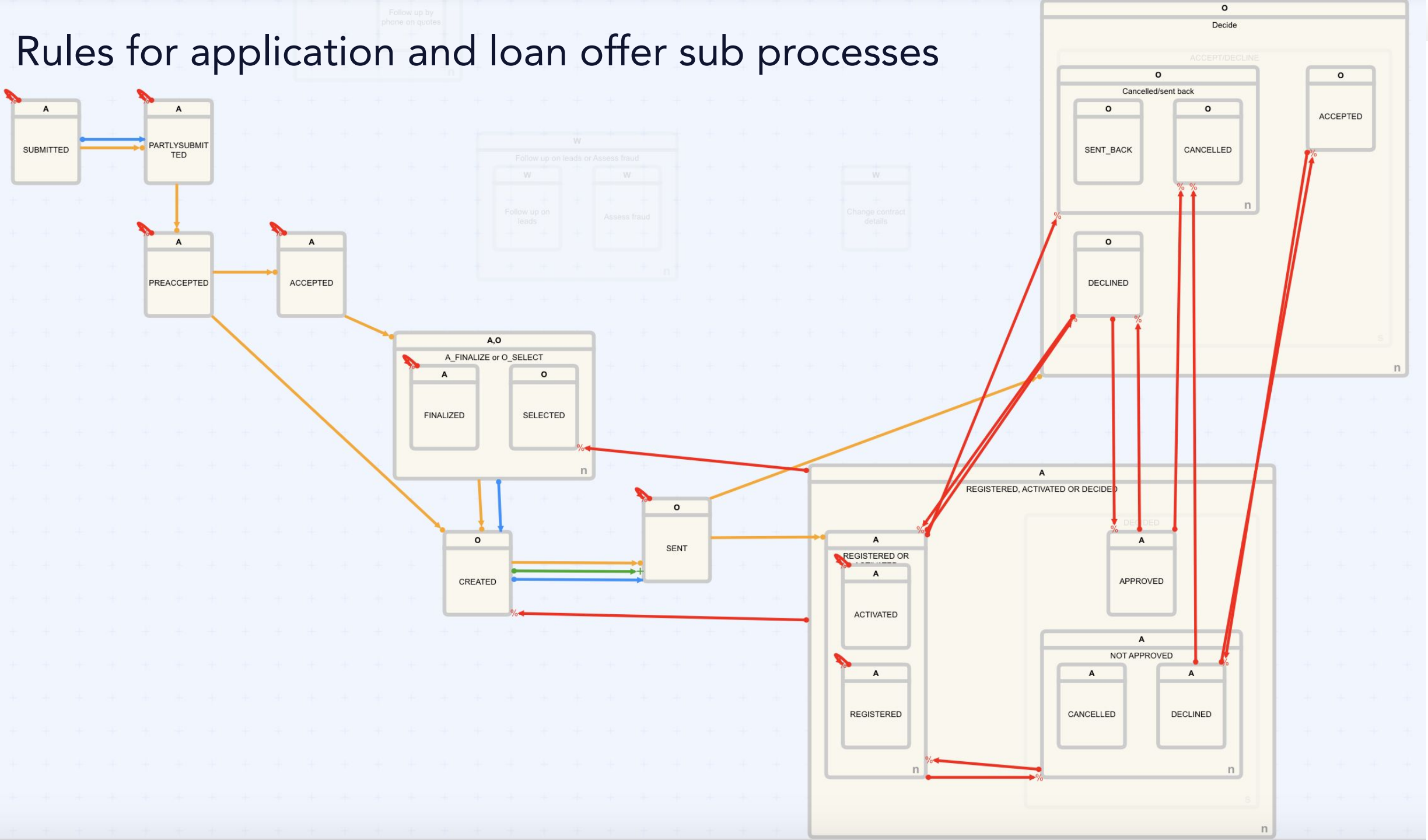
# Zooming in – very simple sequential sub process



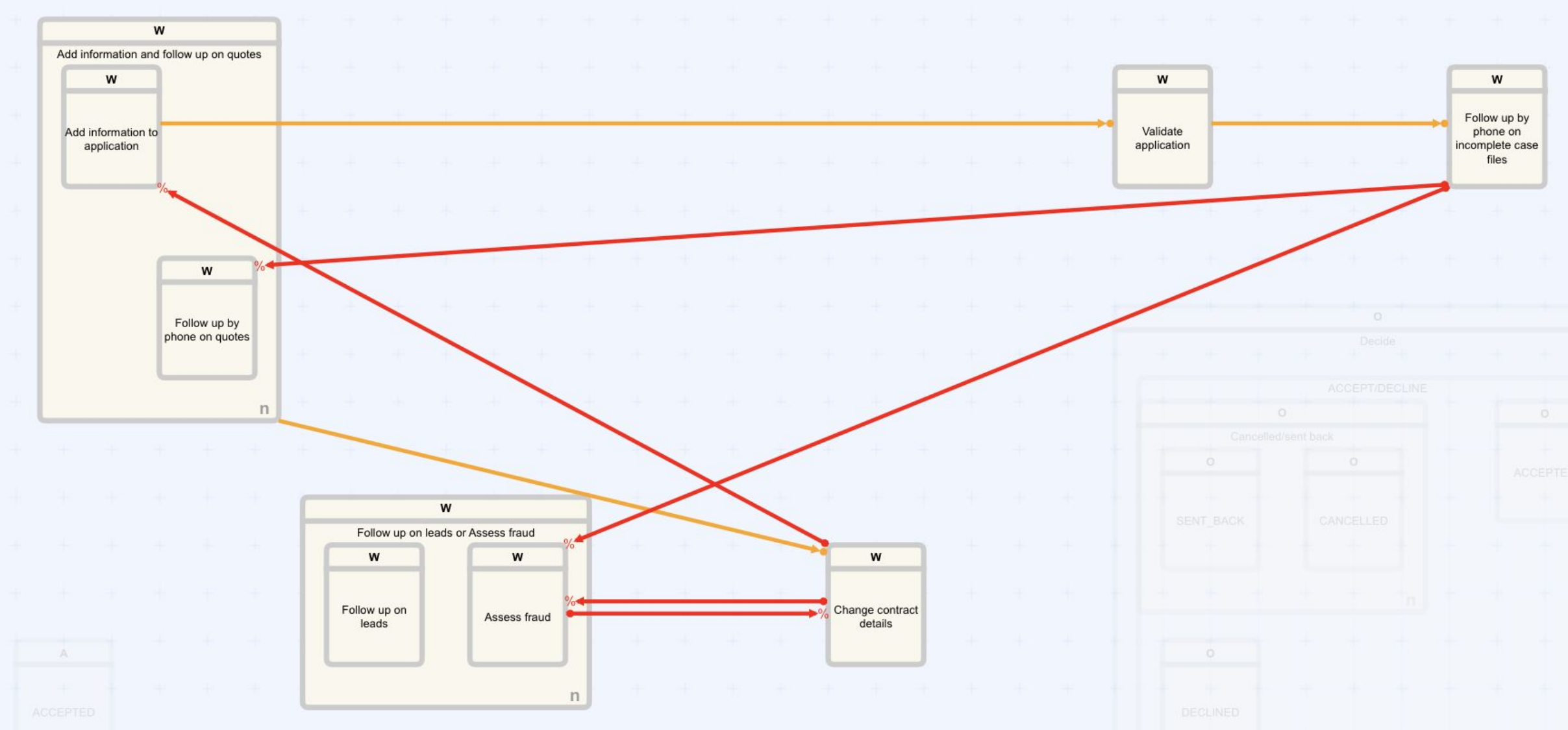
# Mined rules for loan offers sub process



# Rules for application and loan offer sub processes

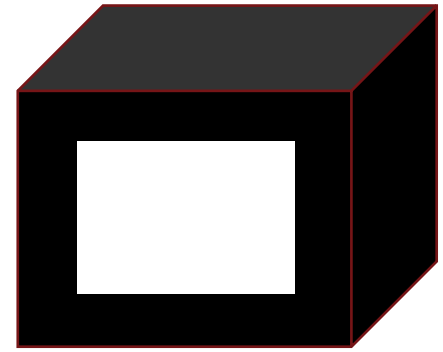


# Rules for case handling workflow sub processe

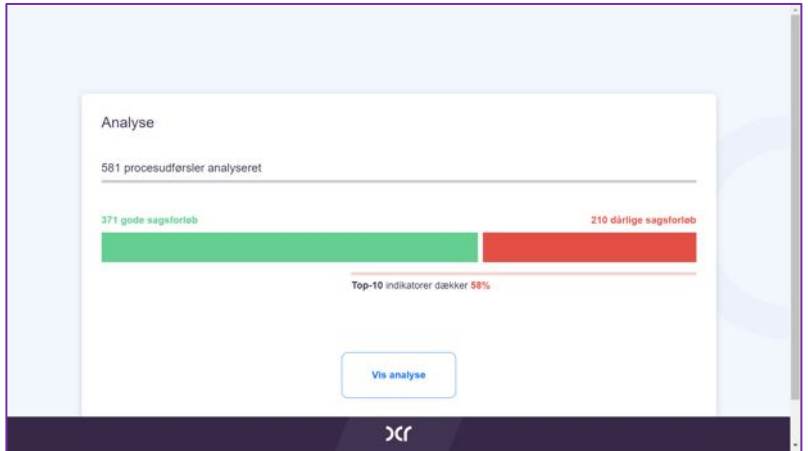


# Rule based Process Mining for continuous process improvements

This is how our process running and how can I improve it?



Process miner


# Conclusion: Hybrid AI hyper automation– try today!