

35th UN/CEFACT Forum Webinar

Advancements in AI towards facilitating cross border paperless trade

Artificial Intelligence in Trade Negotiation

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- Presentation (20m)
- Q&A (10m)



- **Slido**
 - <https://app.sli.do/event/bbvmajbl>
 - Event code : **#97199**
- **Type your question**
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Agenda

Outline

Background AI technologies

Evolutional Steps towards AI Negotiation

Baseline: Alternating Offers Protocol

Variant: Mutually Dependent Negotiations

Negotiation Rule Definition

Three Use Cases

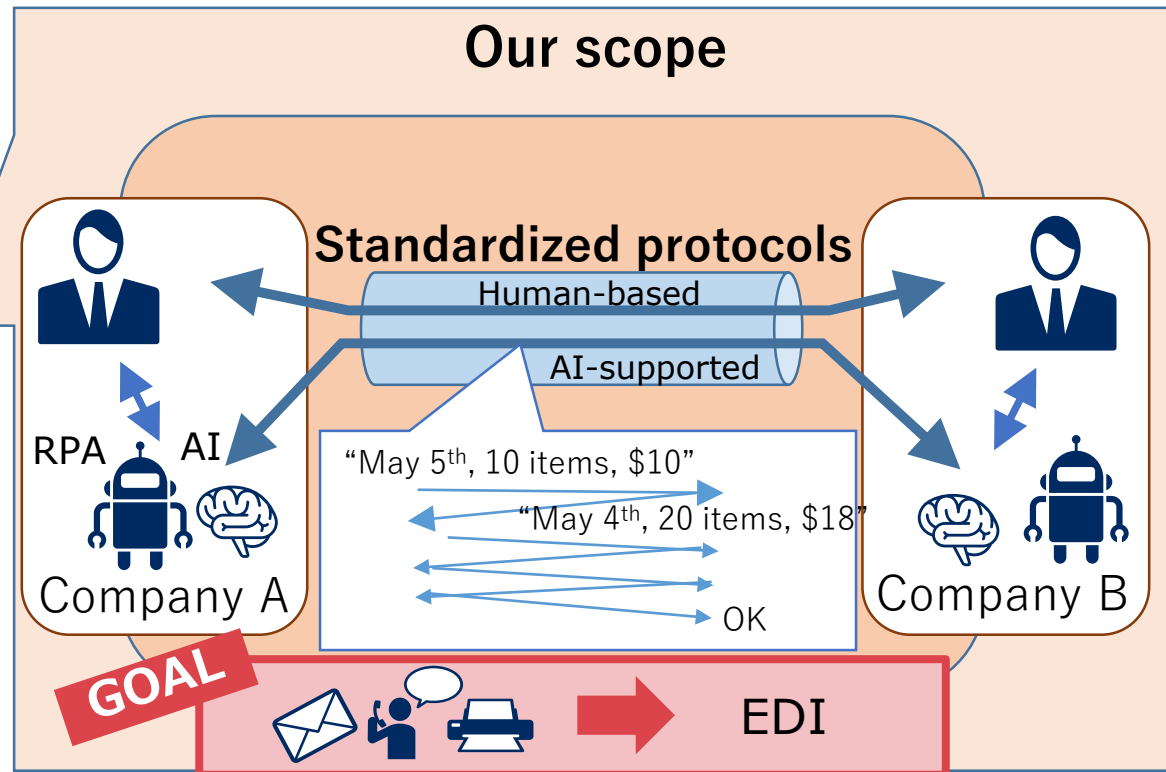
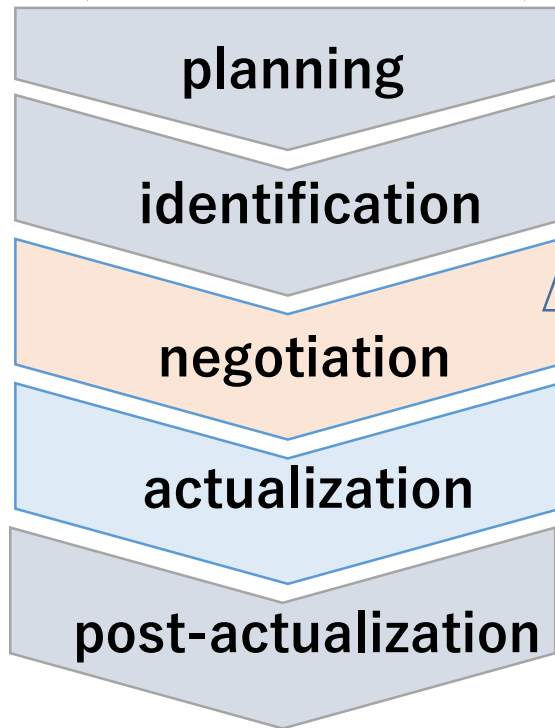
FYI: AI Negotiator

New Project in SCMP

Outline

A business negotiation requires several message exchanges until an agreement and is done via email, telephone or fax. EDI can replace the communication, and RPA/AI can replace a human negotiator

Five fundamental activities of a business transaction (ISO/IEC 15944-1)

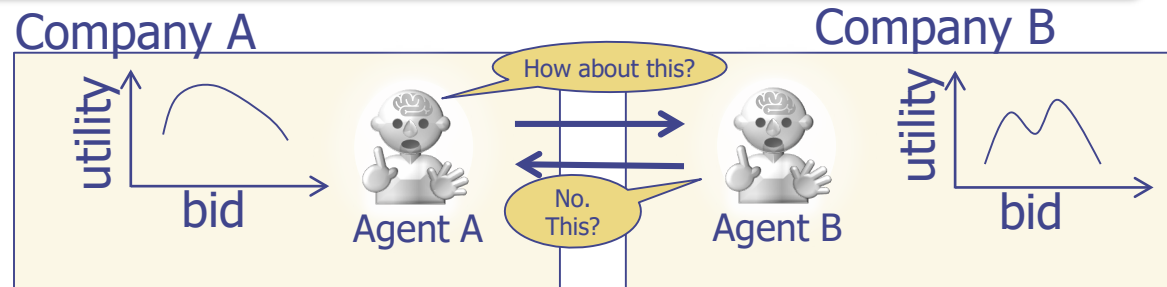


Background AI technology: Automated Negotiation

AI-based negotiation has been studied for decades. Strategies for bidding and acceptance are implemented as AI algorithms.

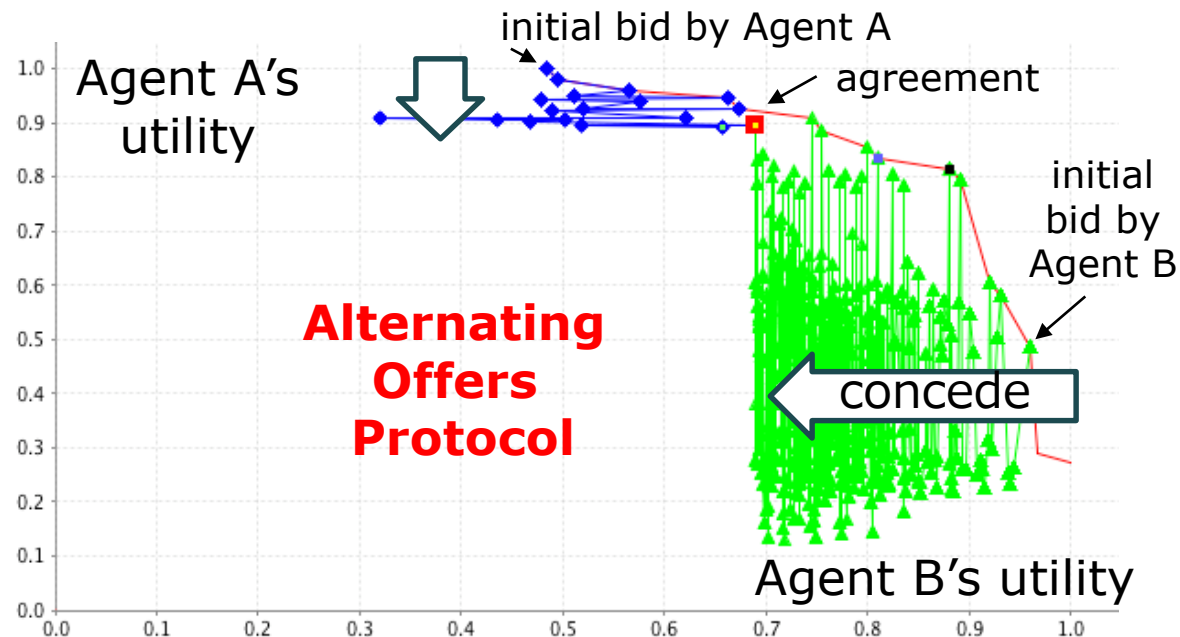
Automated Negotiation

- Game theoretic problem
- Alternating offers protocol
- Private utility function



ANAC

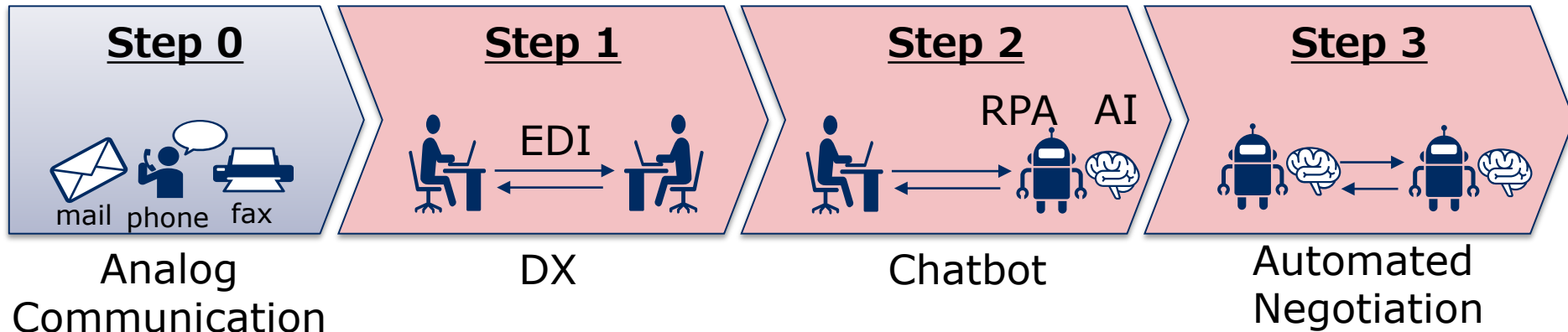
- AI Competition from 2010
<http://web.tuat.ac.jp/~katfujii/ANAC2020/>
- In conjunction with IJCAI/AAMAS
- We organize SCM league
http://web.tuat.ac.jp/~katfujii/ANAC2020/cfp/scml_cfp.pdf
- Open platform: GENUIS [1]
<http://ii.tudelft.nl/genius/>



[1] Raz Lin, et al., "Genius: An Integrated Environment for Supporting the Design of Generic Automated Negotiators," Computational Intelligence, 2014

Evolution towards Automated Negotiation

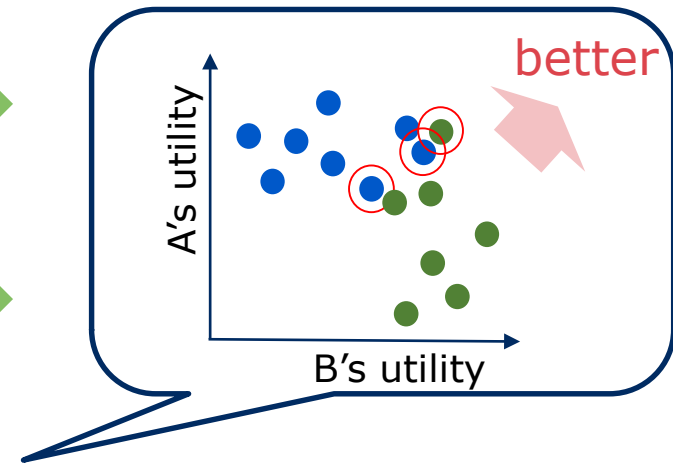
EDI replacement is just 1st step. As RPA/AI is used, negotiation becomes easier, and its agreement becomes faster and better.



Easier Negotiation

Faster Agreement

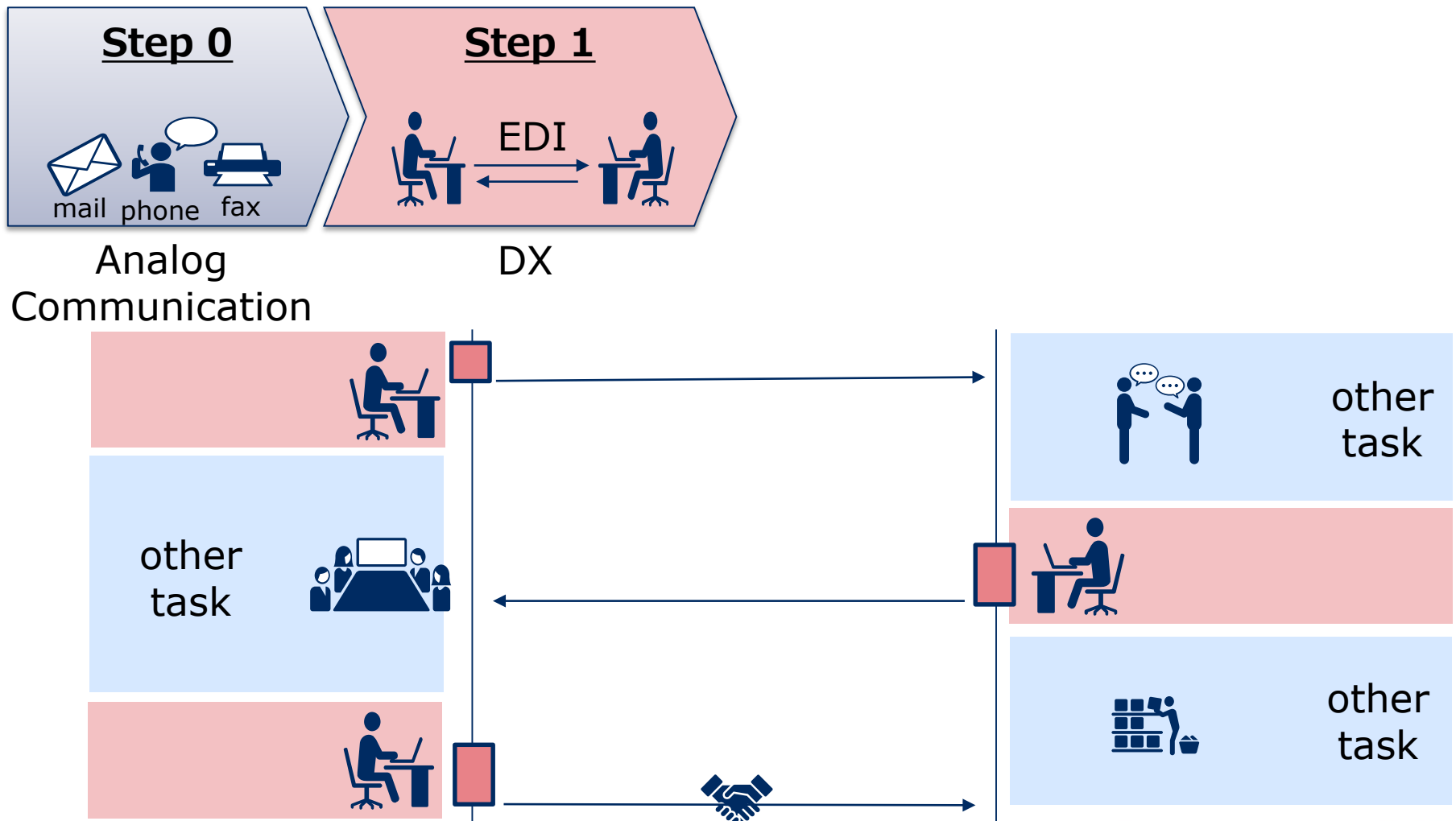
Better Agreement



As # of proposals increases, both utility tend to become better

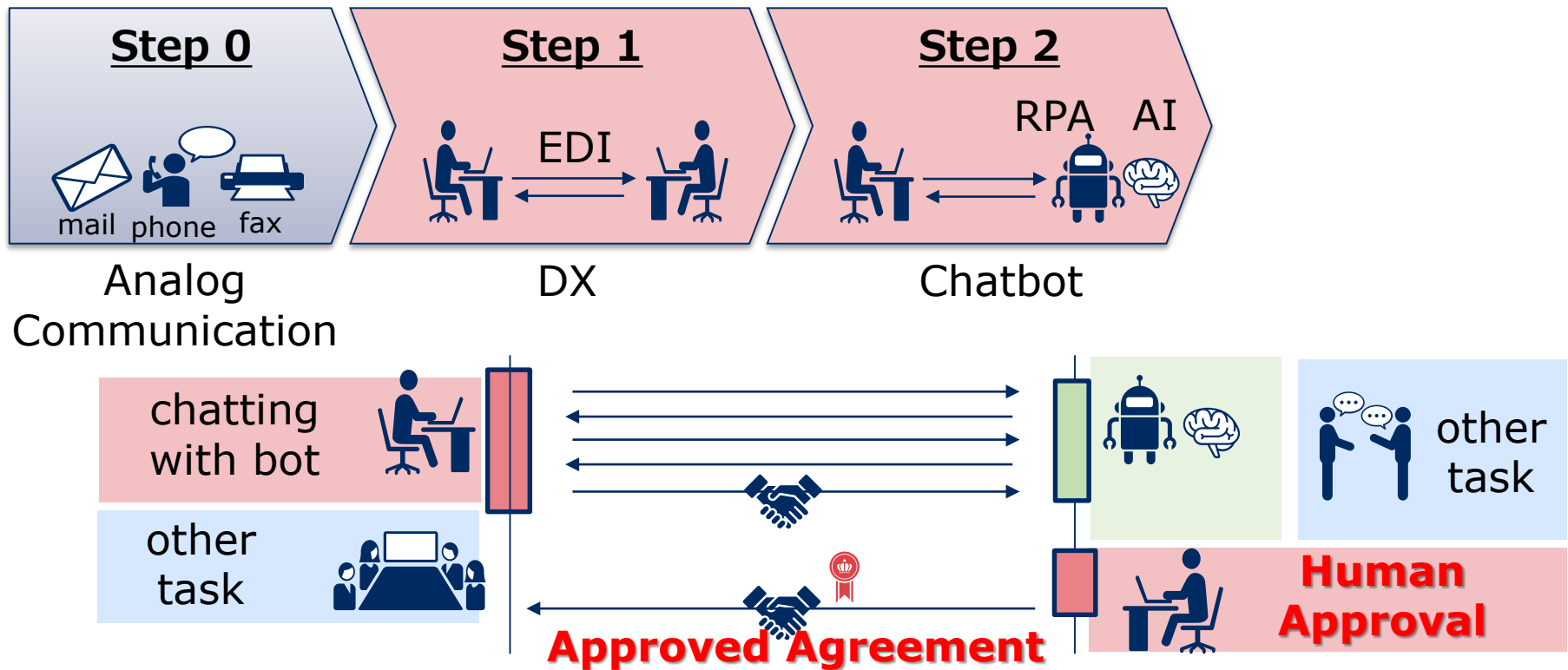
Digital Transformation (DX) of Negotiation

EDI can digitalize a negotiation process, but a human negotiation takes more time. Besides, the number of exchanges is limited.



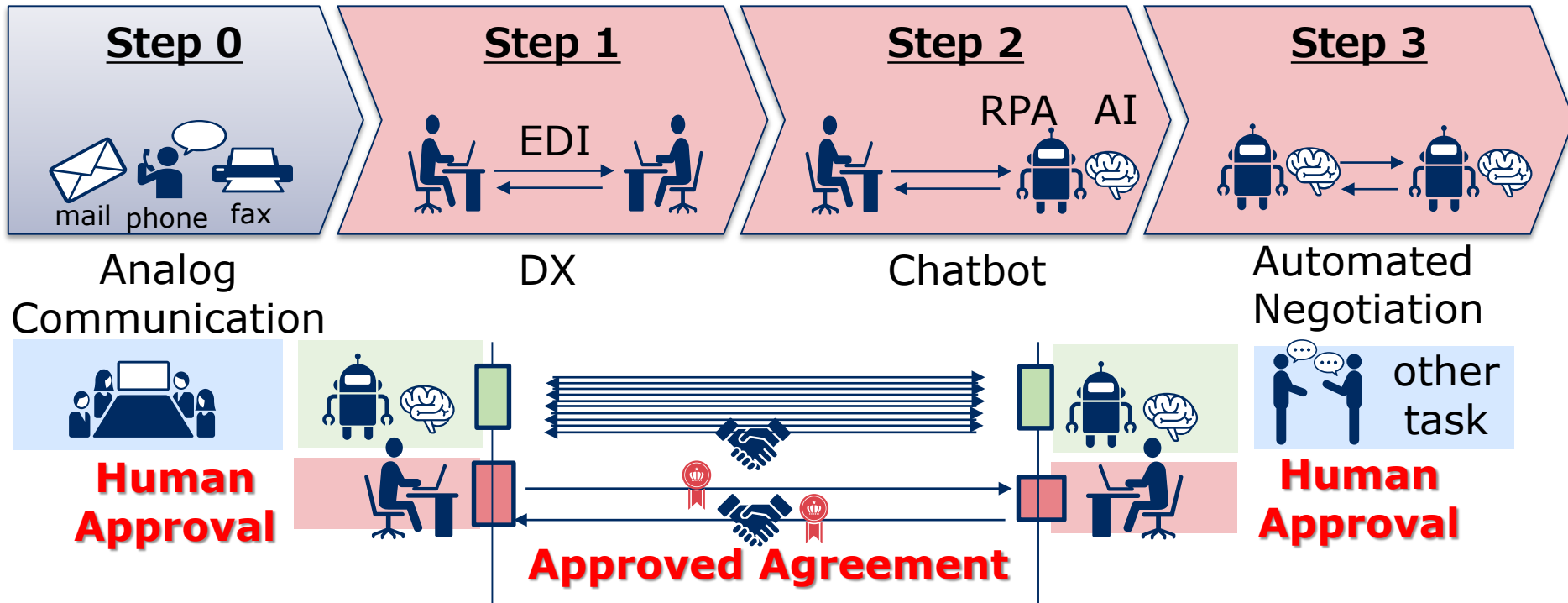
Chatbot for Negotiation / One-side Automation

If one side uses RPA/AI, the other side can enjoy the benefit of “chatbot”. The human need not wait for the counterpart’s action.



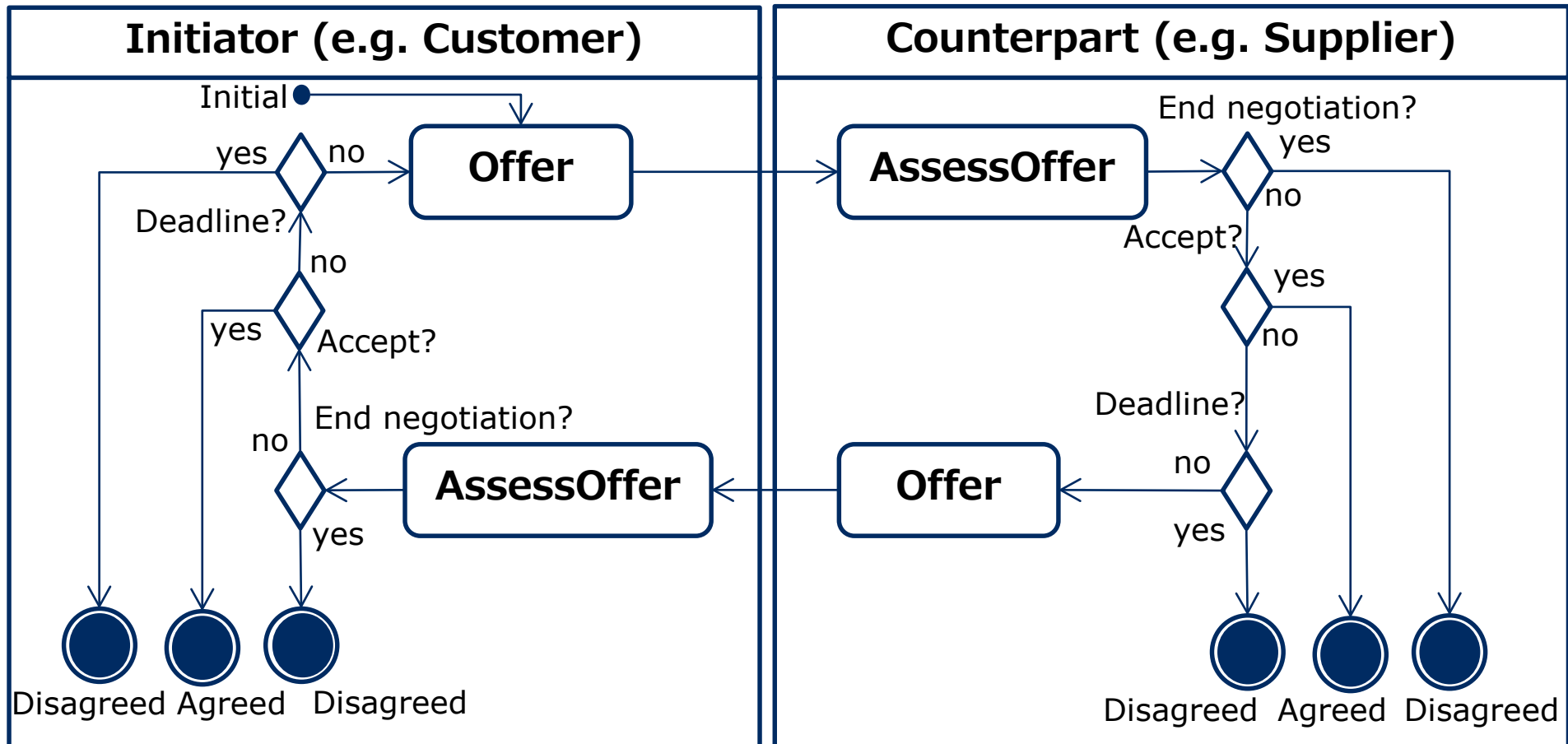
Automated Negotiation

If both sides use RPA/AI, a negotiation may automatically happen and closes. What human do is to approve their results.




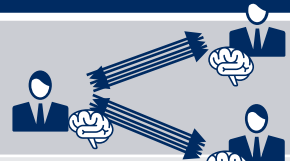
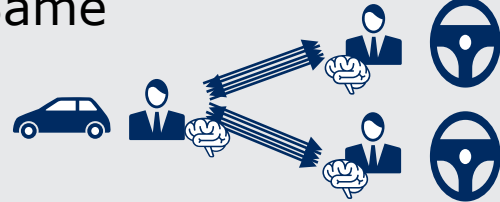
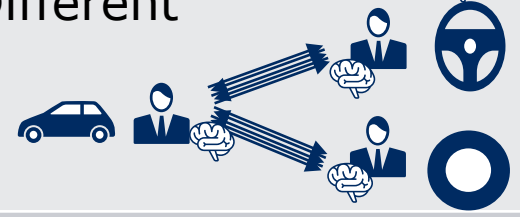
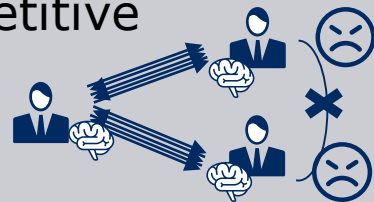
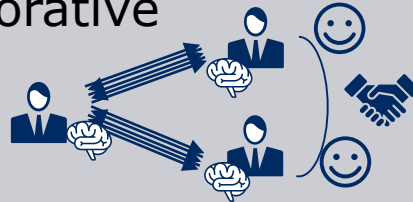
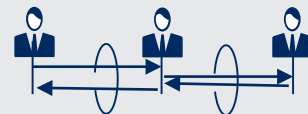
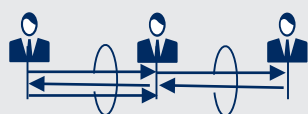
Baseline: Alternating Offers Protocol

Standardization for bilateral negotiation may start with the simplest protocol called Alternating Offers Protocol (AOP).



Variant: Mutually Dependent Negotiations

To represent a complex negotiation in real business, protocols for mutually dependent negotiations are required to be modeled.

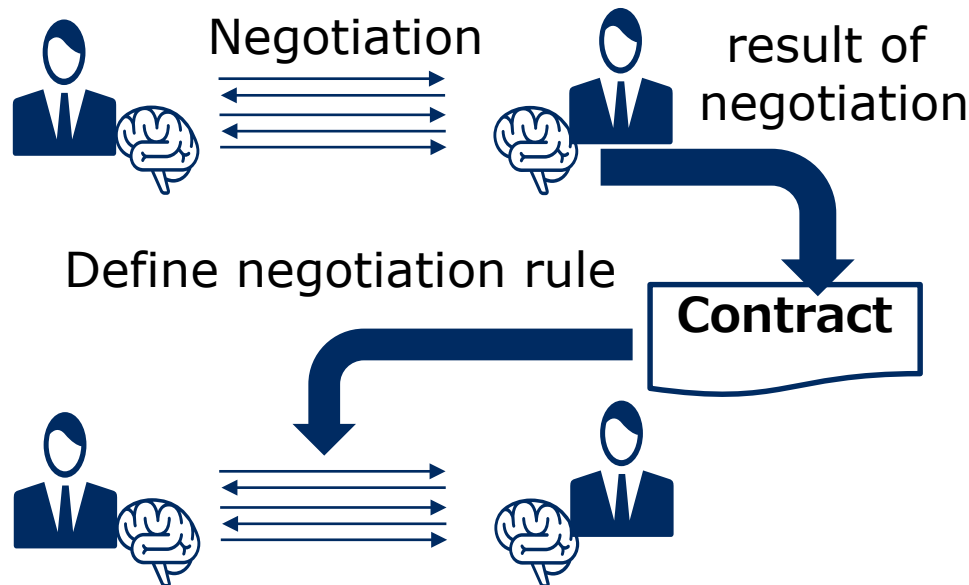
| | | Option 1 | Option 2 |
|------------|--------------------------|---|--|
| Tier | | Inter-tier (nested)  | Intra-tier  |
| Intra-tier | Product/Service Category | Same  | Different  |
| | Competitiveness | Competitive  | Collaborative  |
| Timing | | Sync.  | Async.  |

How to Define Negotiation Rule

A negotiation rule (e.g. deadline) must be defined in advance. A contract derived from previous negotiation may define the rule.

Options

1. Business custom
2. Publication from initiator
3. Previous contract



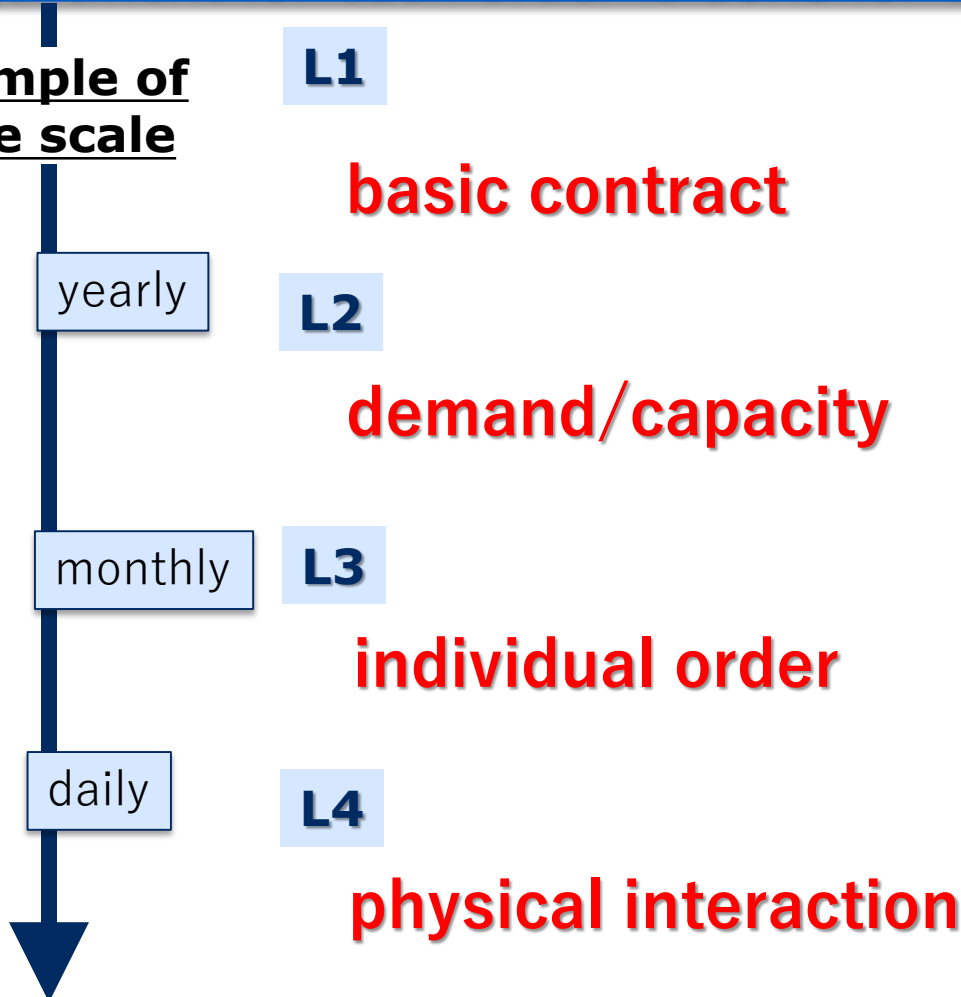
The result of negotiation is stored in a ledger as a contract

The contract may define the rule of succeeding negotiations

Negotiation for Different Contracting Level



In B2B, companies usually negotiate to have a yearly contract. Demand and capacity is adjusted a couple of months ahead. An adjustment for each order is done for deciding due date.



Example of time scale





Example of what to decide

What 
Who 
How much 

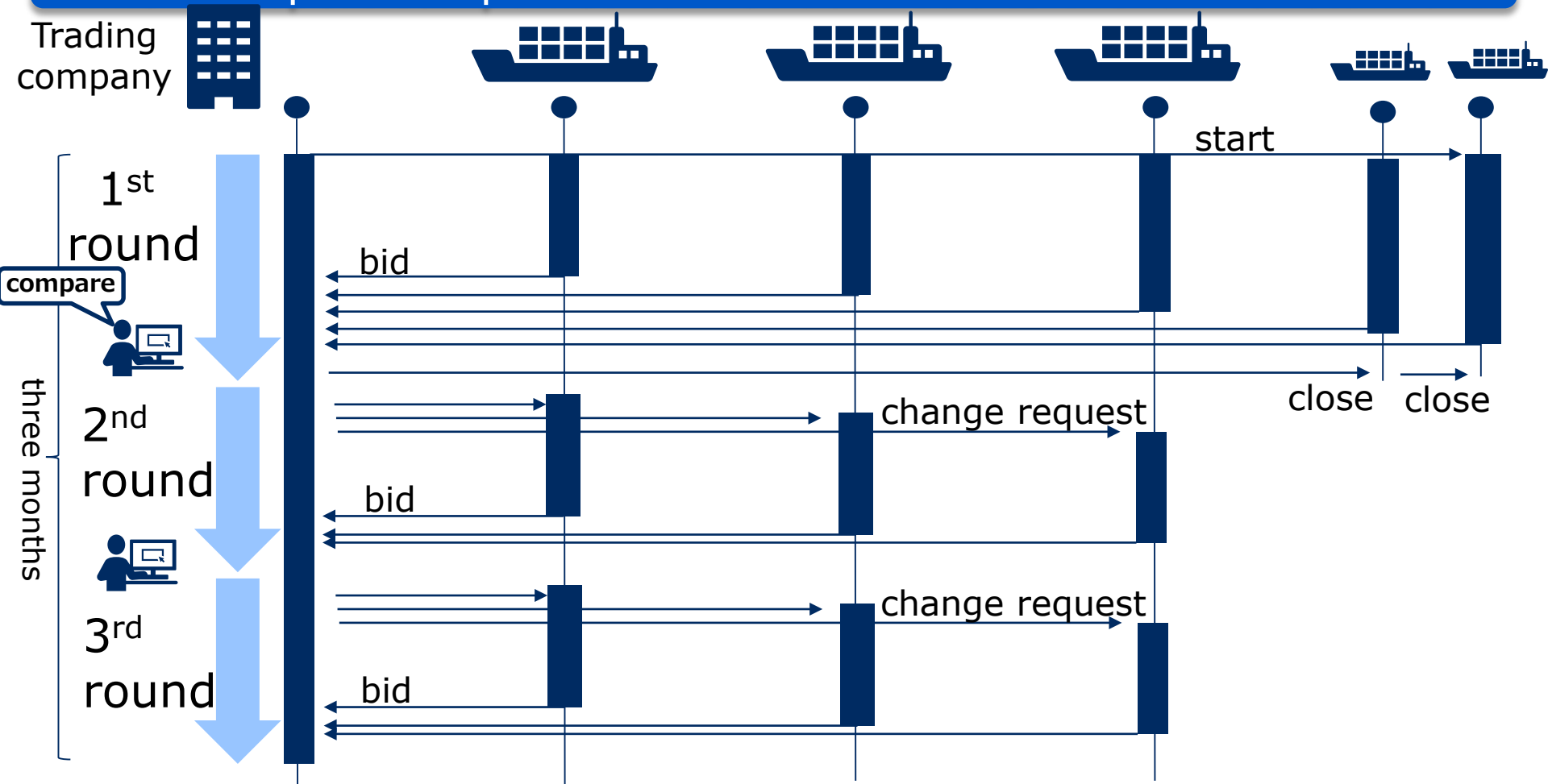
How many (rough)  x 200
Where (rough) 

How many (exact)  x 1
When (rough) 

When(exact) 
Where(exact) 

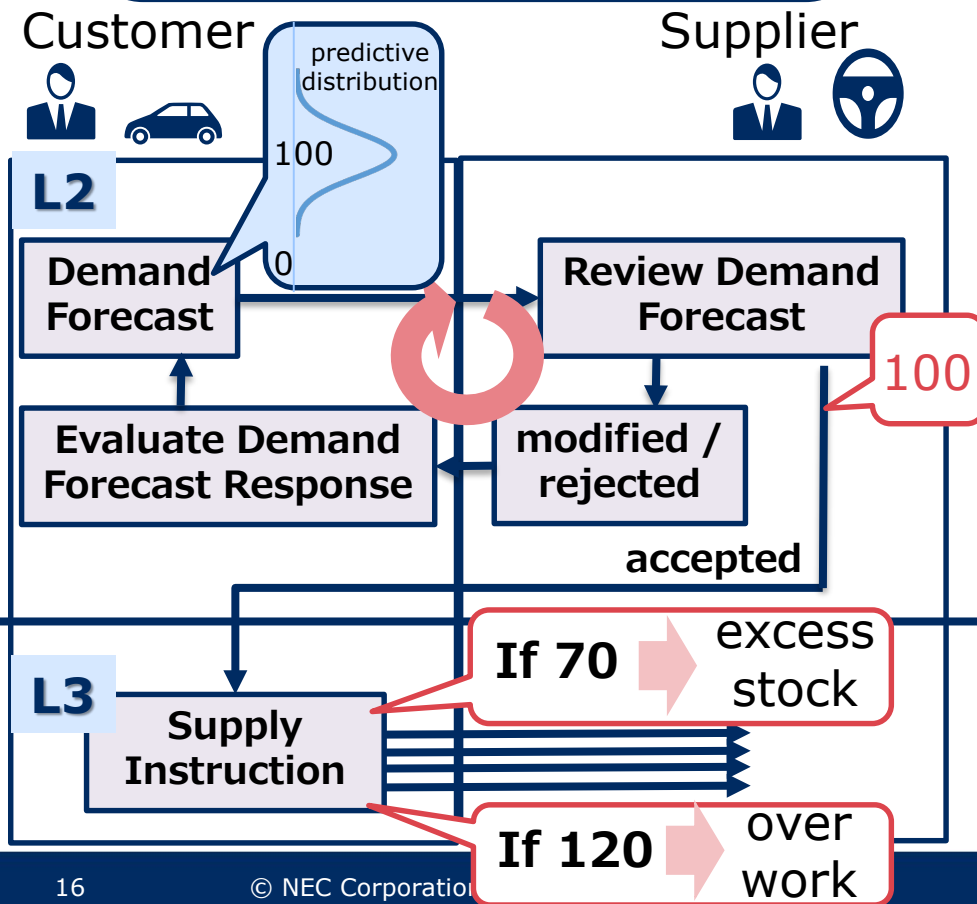
Use case: Marine Transport

A trading company chooses marine transport companies once a year. The company can compare bids by using a bidding system, while transport companies cannot do it due to the lack of standard.

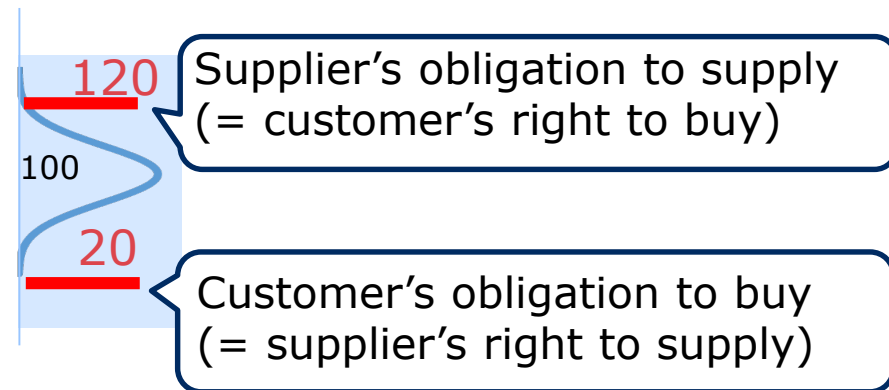


Cross Industry Scheduling defines a negotiation-like message exchange. But, the lack of obligation induces supplier's excess stock or over work. Obligations should be defined at first.

Vague obligation in Cross Industry Scheduling



Well-defined obligation for negotiation



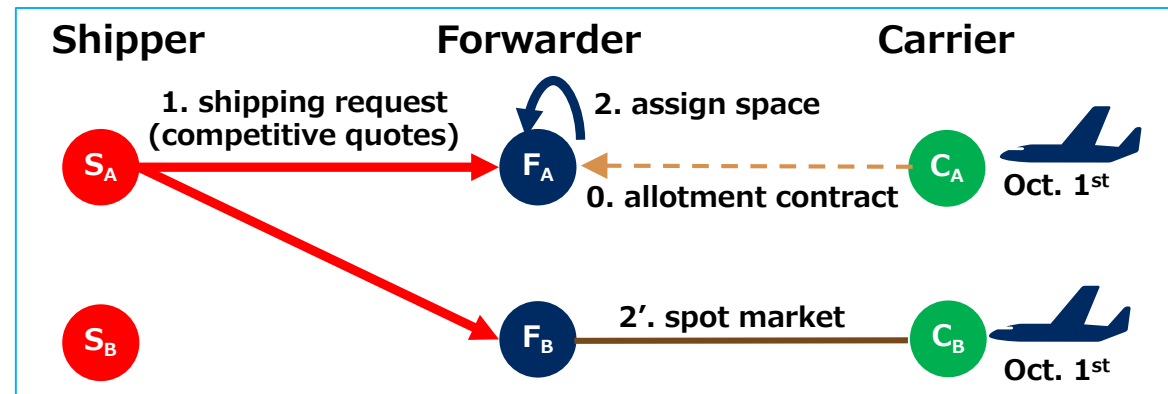
These topics are controversial.
So, we need to have more
conversation with industry

Use case : Freight Space Adjustment

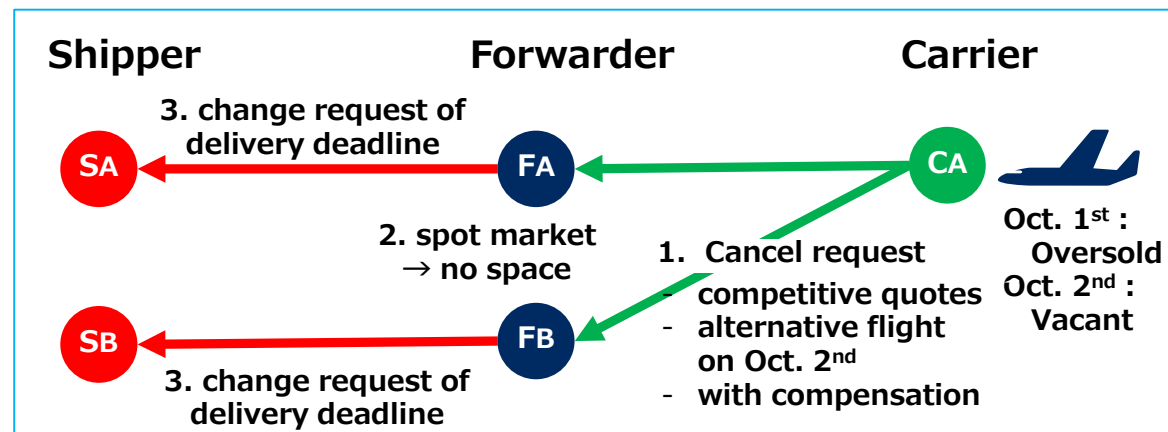
L3 individual order

A sudden change in demand or supply (e.g. COVID19) induces a negotiation for deciding price, delivery deadline, compensation, and so on. Complicated negotiation (e.g. nested) actually happens.

Order request from buy side

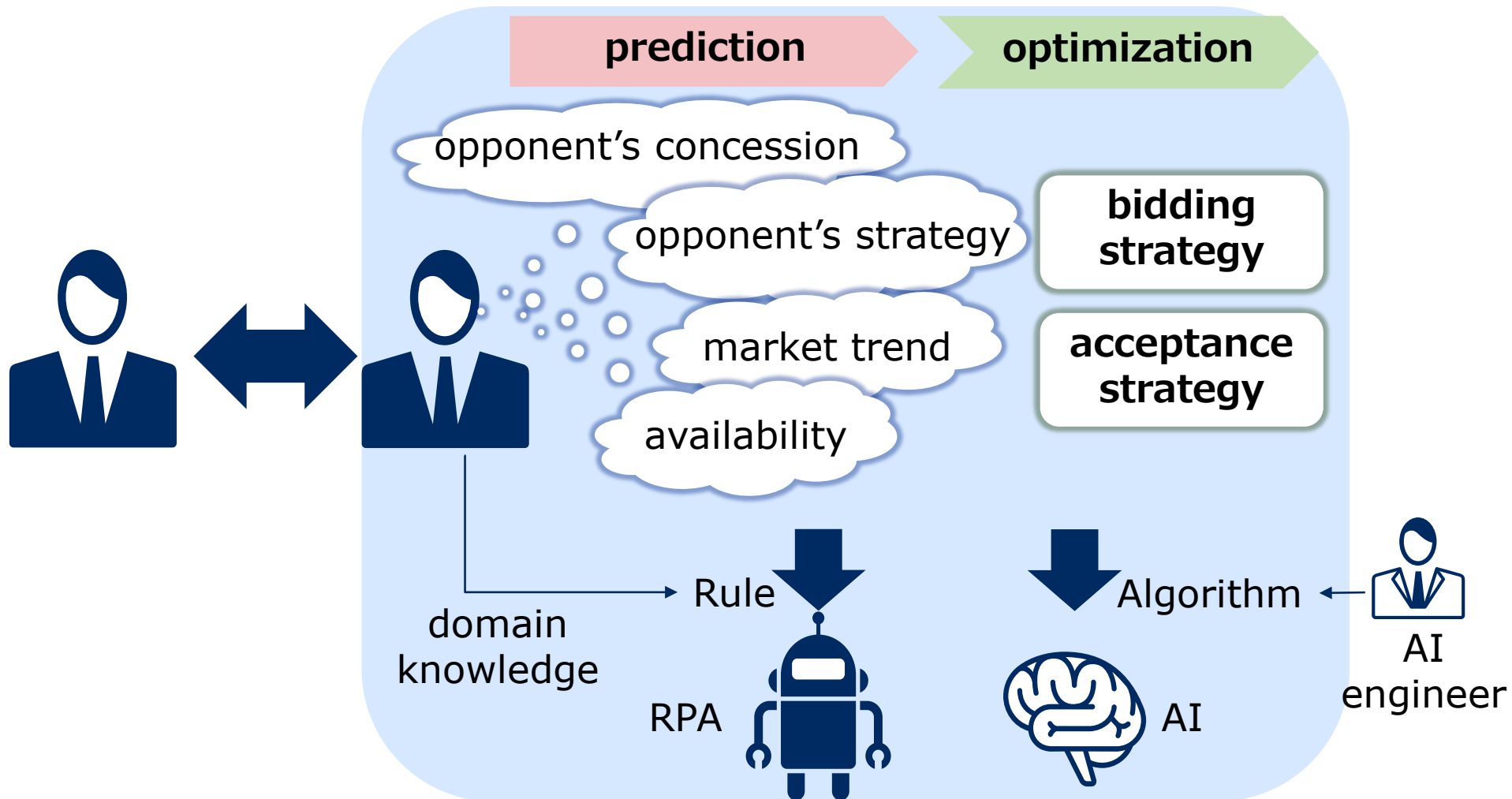


Cancel request from sell side



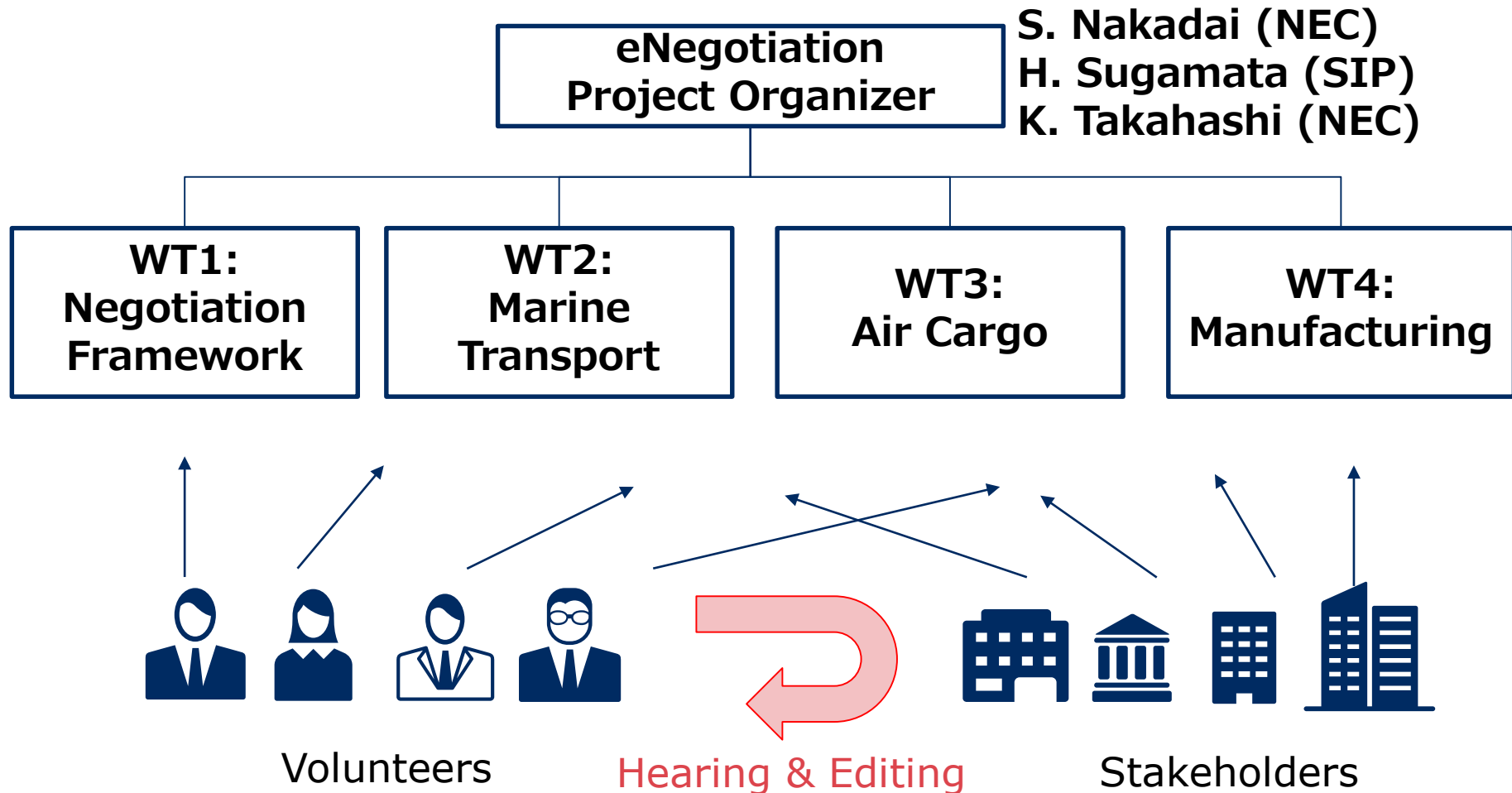
FYI: AI Negotiator

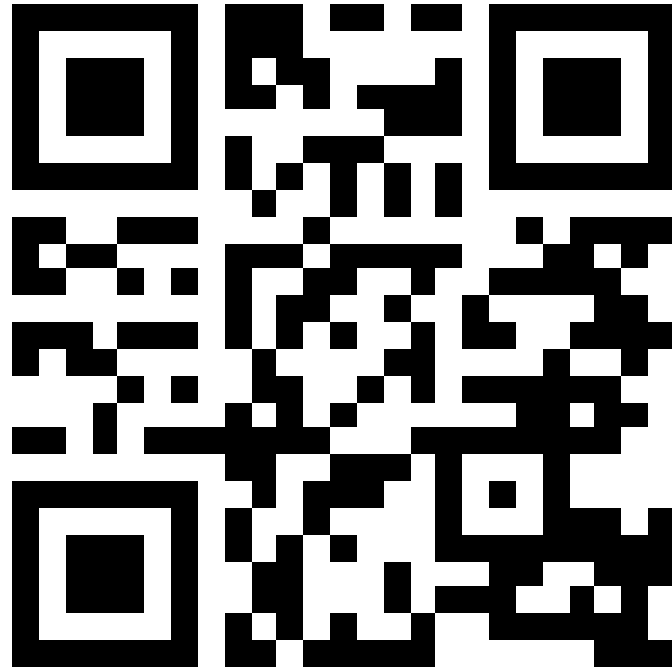
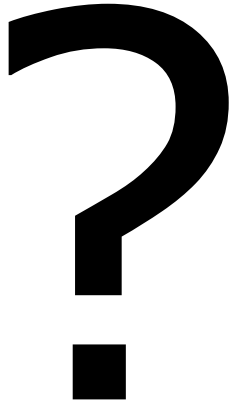
As a human negotiator does, AI negotiator should predict the circumstance of negotiation and optimize its own action



Kick-off Meeting Starts at 1pm (Geneva Time) on 13th

A new project in Supply Chain Management and Procurement Domain will start. Please join the kick-off meeting.





Slido

- <https://app.sli.do/event/bbvmaajbl>
- Event code : **#97199**

Acknowledgement

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