



# Shared Strategies in Agent Systems

## Dutch Eat at 5:30pm

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# Goal

- What are Shared Strategies?
- What are the Characteristics?
- How can we use them in MAS?

# Definition: Institutions

In Institutional Economics (Ostrom):

Set of rules actually used by a set of individuals to organize repetitive activities that produce outcomes affecting those individuals and potentially affecting others.



# ADICO Institutional Statements

1. Attributes: positions, roles
2. Deontic Type: obligation, prohibition, permission
3. Aim (action, outcome)
4. Condition
5. Or else: explicit, unique consequence

People younger than 18 are not allowed to buy cigarettes  
or else they will be fined.

Attribute      condition      deontic      action  
Or Else

# Why structure into ADICO?

- This decomposition for
  - summarizing and analyzing institutional statements
  - distinguishing between the different types
  - understanding the formation and evolution of these statements.



# Different types of ADICO

1. Rules
2. Norms
3. Shared Strategies

# ADICO Institutional Statements

## 1. Regulatory Rules **A D I C O**

People younger than 18 are not allowed to buy cigarettes

Attribute

Condition

Deontic

Action

or else they will be fined.

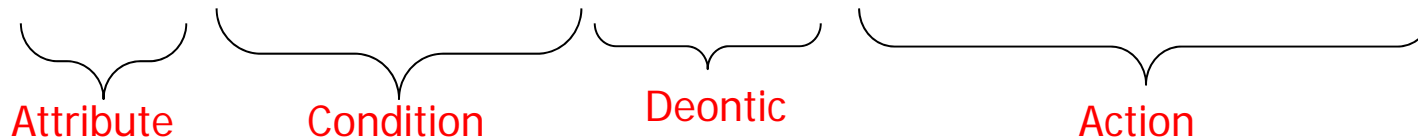
Or else



# ADICO Institutional Statements

## 2. Norms **A D I C O**

If you use a microwave, you must clean up your own mess.





# ADICO Institutional Statements

## 3. Shared Strategies **A D I C O**

Dutch eat at 5:30 pm.

Attribute

Action

Condition



# What are Shared Strategies?

- A type of behavioral pattern
- A *significant* number of individuals
- Not associated with any *deontic* modality
- Does *not* have a reward or punishment linked to its performance

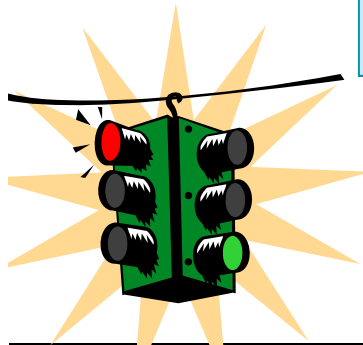
# Characteristics of Shared Strategies

- Can change: norms into shared strategies, vice versa..

In a busy stairway, walk on the right

- Depends on the context or location

If no police officer is in sight, skip the red light



# Characteristics of Shared Strategies

- Most people do the same thing, not everyone!
- Expectation at global level not individual



The person who places a phone call, calls back when the call gets disconnected



- No particular goal that everyone must reach following a strategy. Individual disobedience has no particular consequence.

Dutch eat at 5:30

# Characteristics of Shared Strategies

- More significant at the collective level rather than individual

Dutch eat at 5:30



# Formalizing ADICO statements

$$D_R(I | C) \rightsquigarrow o$$

where

- $D$  represents one of the modalities:  $\{O, P, F, S\}$
- $R$  being the attribute, represented as a set of roles;
- $I$  being the aim, represented as an expression from  $\mathcal{L}_P$ ;
- $C$  being the condition, represented as an expression from  $\mathcal{L}_P$ ; and
- $\rightsquigarrow o$  being the or-else, where  $o$  is represented as combination of institutional statements.

'Most' Operator

$$W(R) = R' \Leftrightarrow R' \subseteq R \wedge (|R'| > 1/2 \cdot |R|)$$

Weak Strategies

$$CS_R^-(I | C) \Leftrightarrow A(C \rightarrow \forall r_1 \in W(R) : e_{r_1} I)$$

$$JS_R^-(I | C) \Leftrightarrow A(C \rightarrow \forall r_1, r_2 \in W(R) : B_{r_1} B_{r_2} e_{r_1} I)$$

$$S_R^-(I | C) \Leftrightarrow$$

$$A(C \rightarrow \forall r_1 \in W(R), \forall r_2 \in W(R \setminus \{r_1\}) : B_{r_1} e_{r_2} I)$$

# Comparison

Related Concept	Example	References
Shared Strategy	Dutch eat dinner at 5:30pm.	E. Ostrom. Understanding institutional diversity. Princeton Univ Pr,
Situated Norm	In this ship dinner is served at 5:30 pm (or else no food).	F. Okuyama, R. Bordini, and A. da Rocha Costa. Spatially distributed normative objects. coordination, organizations, institutions, and norms in agent systems II,
Social Norms/ Conventions	When eating dinner, people start at the same time.	D. Villatoro, S. Sen, and J. Sabater-Mir. Of social norms and sanctioning: A game theoretical overview International Journal of Agent Technologies and Systems (IJATS),
Collective Intention	Those group of friend are committed to have dinner together at 5:30 pm.	B. Dunin-Keplicz and R. Verbrugge. Collective intentions. Fundamenta Informaticae,

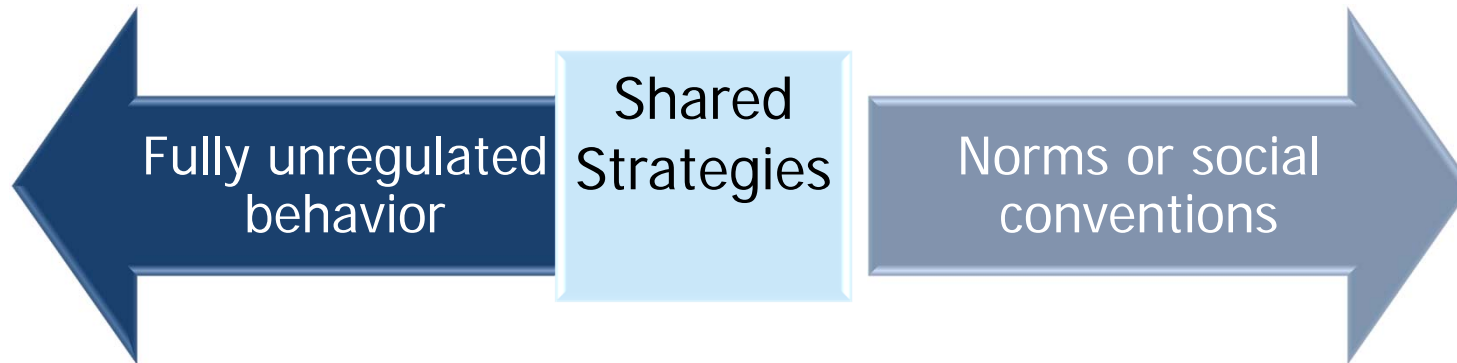
# Application

- Individual agents
  - Agent planning mechanisms
  - Cooperation, coordination and control mechanisms
  - Reasoning process in agent decision making, lower priority to shared strategies...
  - Agent architectures, norm internalization processes, norm emergence
- Agent-based simulation
  - The relationships between shared strategies and institutional design and evolution.
  - Study different aspects of normative, motivational and goal-directed attitudes .



# Conclusion

- Shared strategies result in global behaviors
  - taken into consideration by other agents or global viewers.



- The ADICO structure in general facilitates institutional evolution/ emergence.

**Thank you !**

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