

# Trace-based Approach for Consistent Construction of Activity-Centric Process Models from Data-Centric Process models

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**Presented By**

Jyothi Kunchala (first author)

**Co-authors:** Assoc Prof Jian Yu, Dr Sira Yongchareon  
**Auckland University of Technology**

Co-author: Assoc Prof Guiling Wang  
**North China University of Technology**

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# BPM

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- A fundamental tool that supports the design and alignment of organizational business processes and their systems
- A business process is an ordered set of activities that achieve a defined business objective

## Two major approaches for business process modelling

- Data-centric modelling
- Activity-centric modelling

# Data-centric Business Process Modelling

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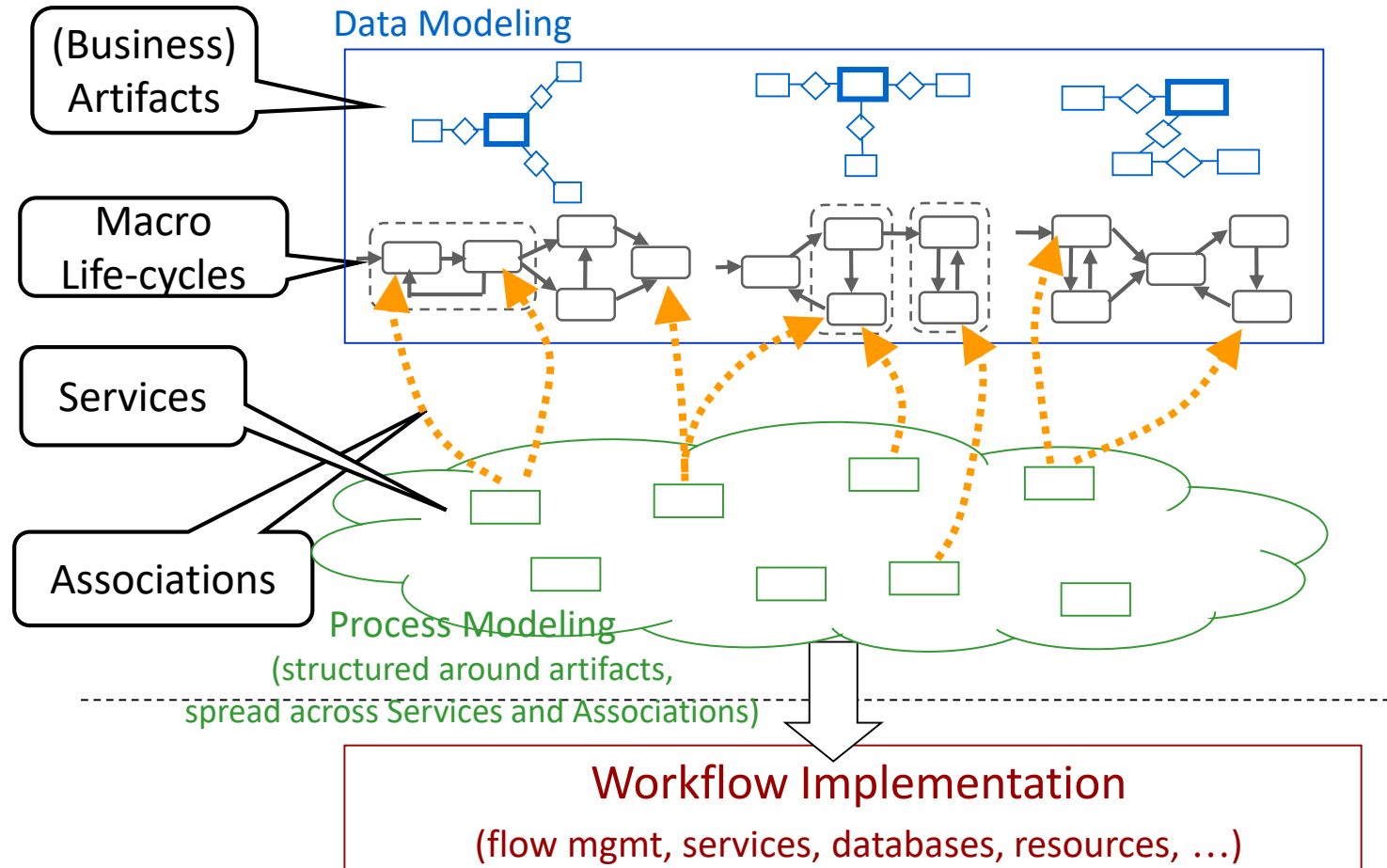
- To represent the information about business objects including their attributes and temporal relations.
- *Artifact-centric modeling* is a **new** data-centric approach that extends modelling *lifecycle* of business objects that includes their attributes, states and their interrelations.

# Artifact-centric Modeling

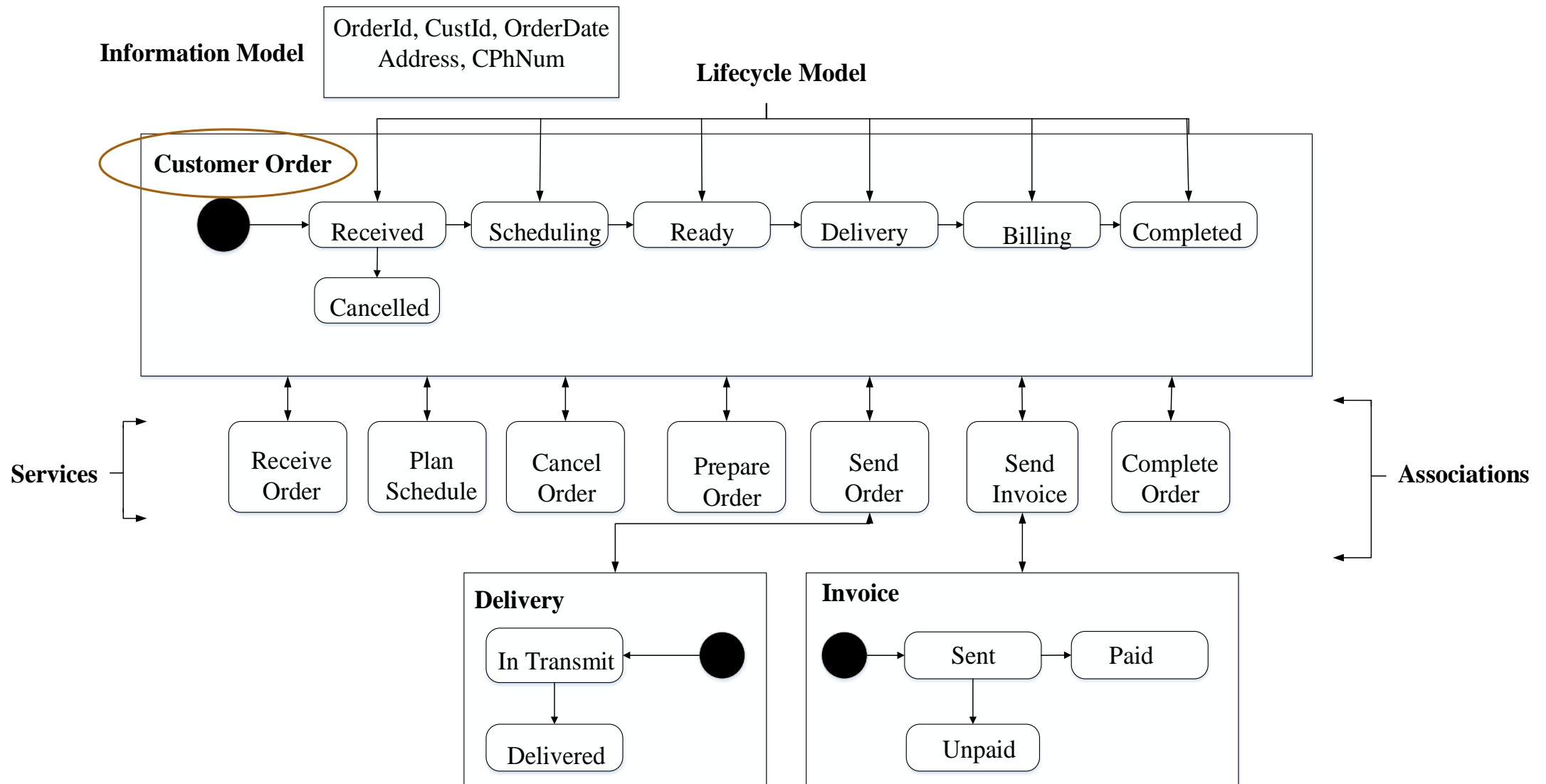
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- Based on key business entities-“business artifacts” (Nigam and Caswell, 2003)
- BALSAs Framework- Business Artifacts, Lifecycles, Services and Associations
- Provides equal support for process and data aspects
- Supports Componentization
- Applied to several industry domains: healthcare (e.g., PHILharmonic Flows framework), insurance, and finance (e. g., IBM Global Financing).

# Artifact-centric Modeling in a nutshell



BALSA Framework (Richard Hull, 2008)



# Customer Order processing scenario

# Declarative artifact-centric modeling

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- Well suited for highly volatile environments
- Enables a higher degree of flexibility
- However, declarative process models are *less comprehensive* compared to activity-centric process models due to large sets of *unstructured sets of business rules*.



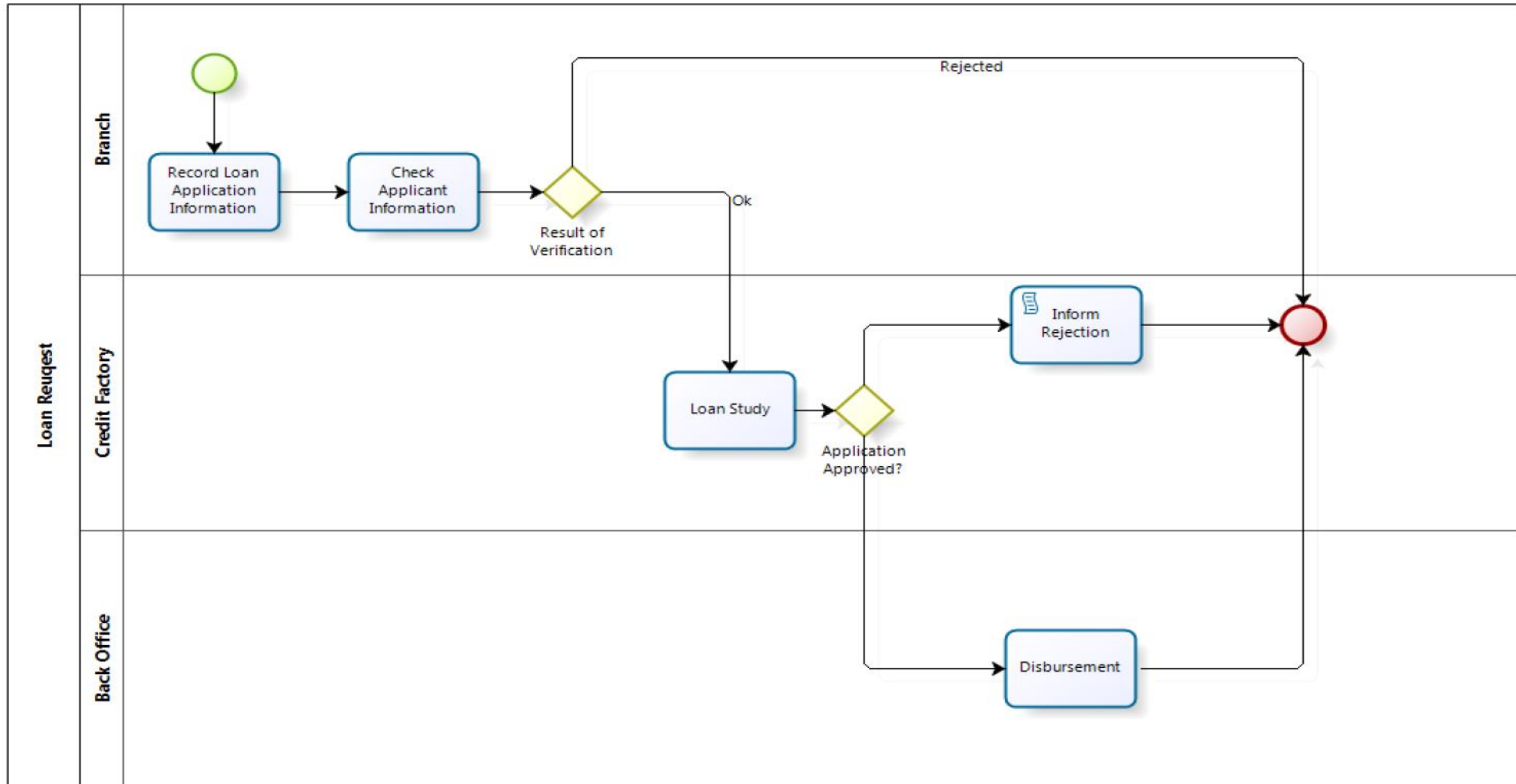
<p><b>Artifacts:</b> Order, Product, Invoice</p> <p><b>Activities:</b> Initiate Order (A), Receive Order (B), Analyse Order (C), Check Stock (D), Plan Product (E), Schedule Product (F), Manufacture Product (G), Ship Product (H), Send Invoice (I), Receive Payment (J), Close Order (K)</p> <p><b>Business Rules:</b> R1, R2, R3, R4, R5, R6, R7, R8, R9, R10</p>
<p><b>R1: Initiate Order request</b></p> <p>Pre-condition: <math>\lambda</math> (Order, wait)</p> <p>Activities: InitiateOrder (Order)</p> <p>Post-condition: <math>\lambda</math> (Order, init)</p>
<p><b>R2: Receive Order from the customer</b></p> <p>Pre-condition: <math>\lambda</math> (Order, init)</p> <p>Activities: ReceiveOrder (Order)</p> <p>Post-condition: <math>\lambda</math> (Order, received)</p>
<p><b>R3: Analyse the customer order</b></p> <p>Pre-condition: <math>\lambda</math> (Order, received)</p> <p>Activities: AnalyseOrder (Order)</p> <p>Post-condition: <math>(\lambda</math> (Order, confirmed) <math>\vee</math> <math>\lambda</math> (Order, rejected))</p>
<p><b>R4: Check stock for the product</b></p> <p>Pre-condition: <math>\lambda</math> (Order, confirmed)</p> <p>Activities: CheckStock (Product)</p> <p>Post-condition: <math>(\lambda</math> (Product, in stock) <math>\vee</math> <math>\lambda</math> (Product, not in stock))</p>
<p><b>R5: Plan and schedule for manufacturing the product</b></p> <p>Pre-condition: <math>\lambda</math> (Product, not in stock)</p> <p>Activities: PlanProduct (Product) ScheduleProduct(Product)</p> <p>Post-condition: <math>\lambda</math> (Product, planned) <math>\wedge</math> <math>\lambda</math> (Product, scheduled)</p>

## Declarative Artifact-centric Process Model

# Activity-centric Business Process Modeling

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- Based on the business activities and their control flows
- More comprehensive
- Ease of Implementation using languages such as WS-BPEL



# BPMN representation of Loan Request Process

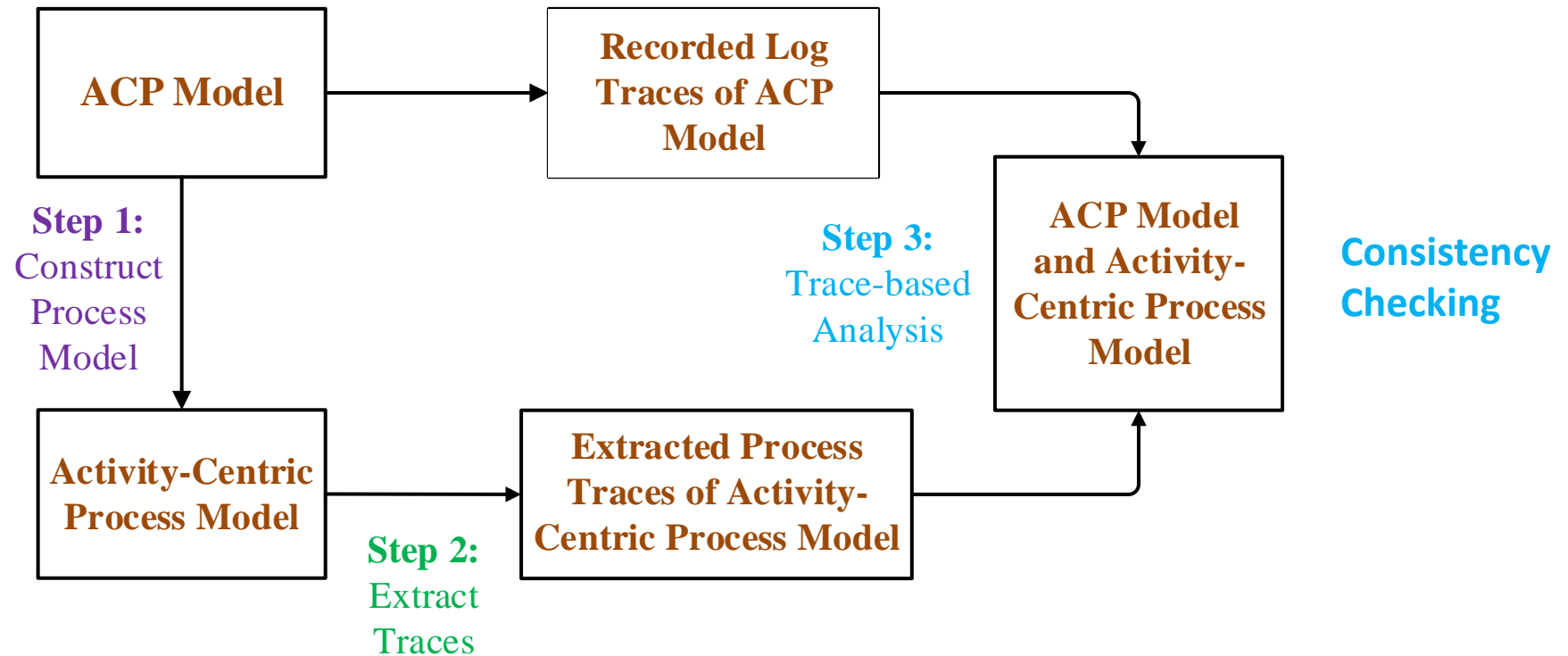
# Research Question :

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- How to transform the declarative artifact-centric process models into the activity-centric process models

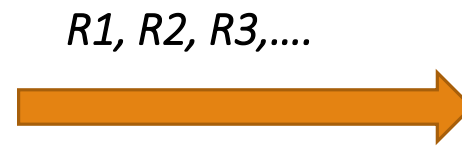
# Transformation Approach

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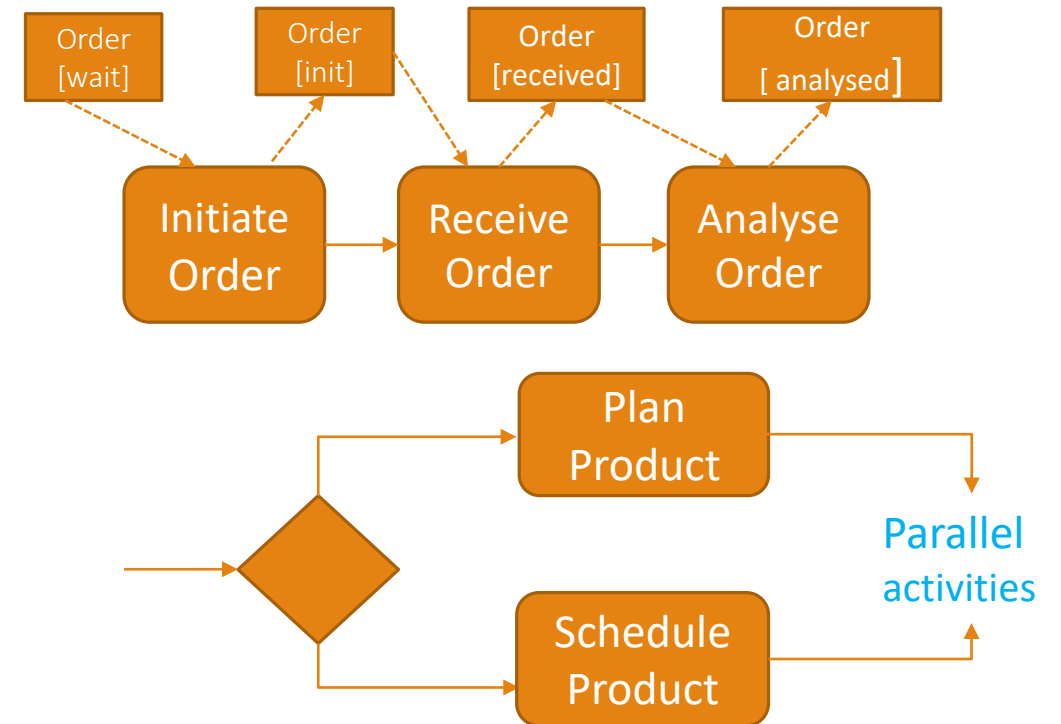


# Step 1: Constructing Activity-centric process model

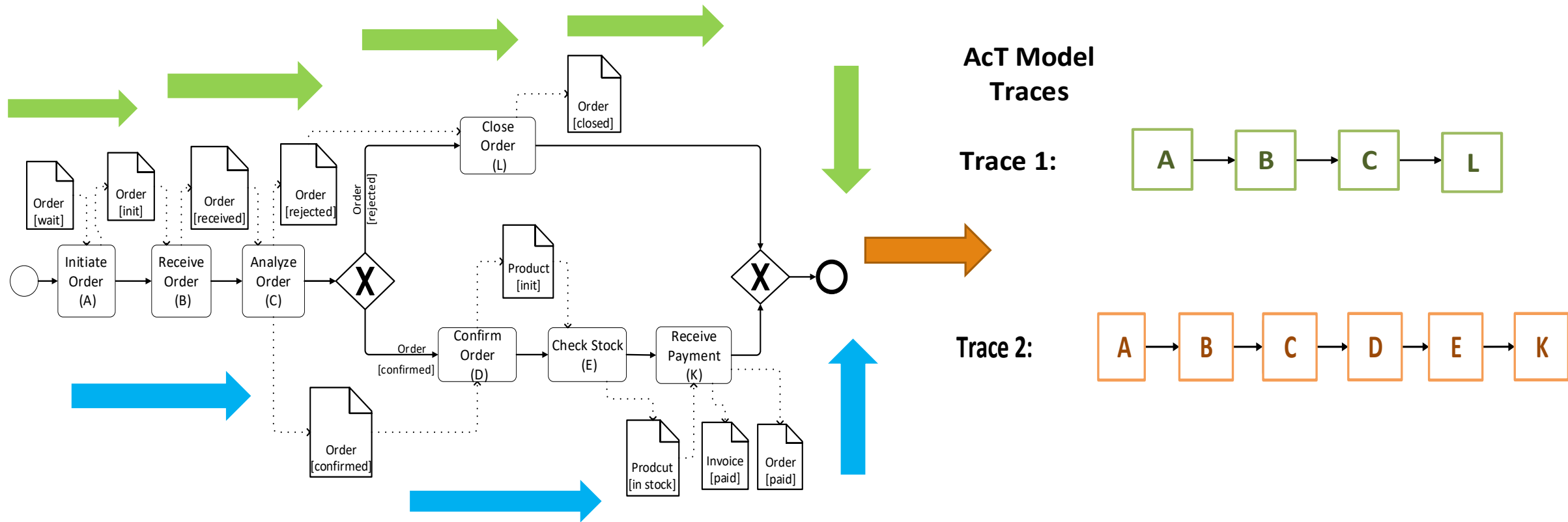
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Extract *activities, artifacts and states* from *business rules*



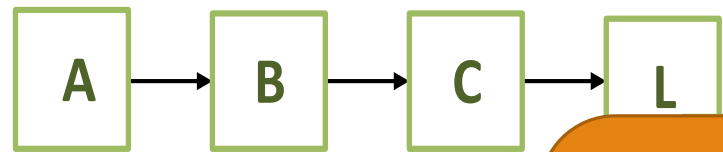
# Step 2: Extract process traces



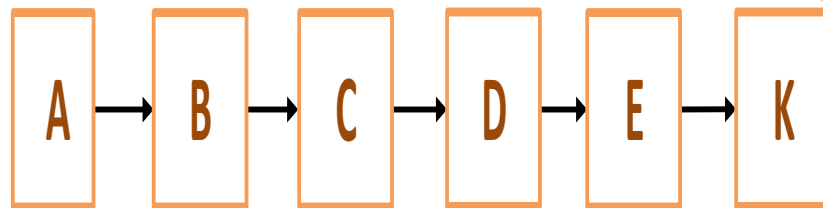
# Step 3: Trace-based Analysis

AcT Model  
Traces

Trace 1:



Trace 2:



ACP Traces	Activities
1	ABCDEK
2	ABCL



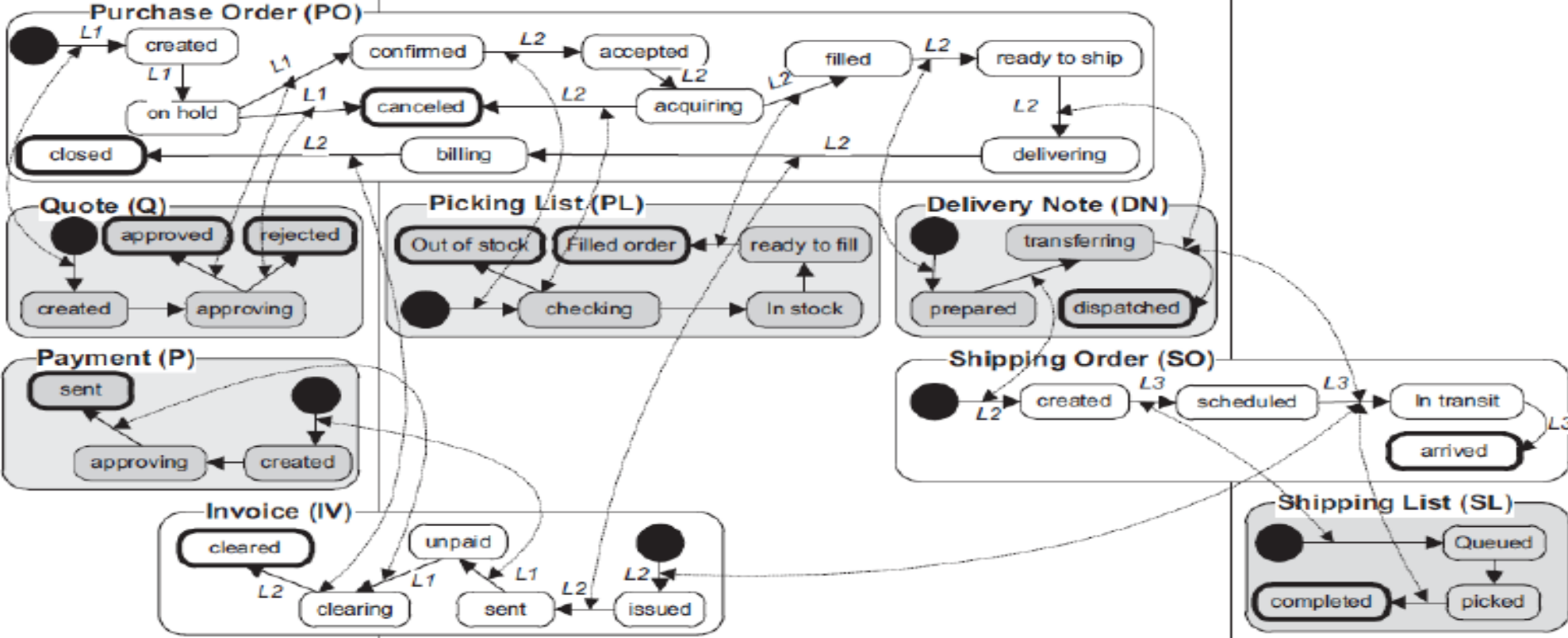
# Evaluation

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- Process models from Supply Chain business domain have been evaluated

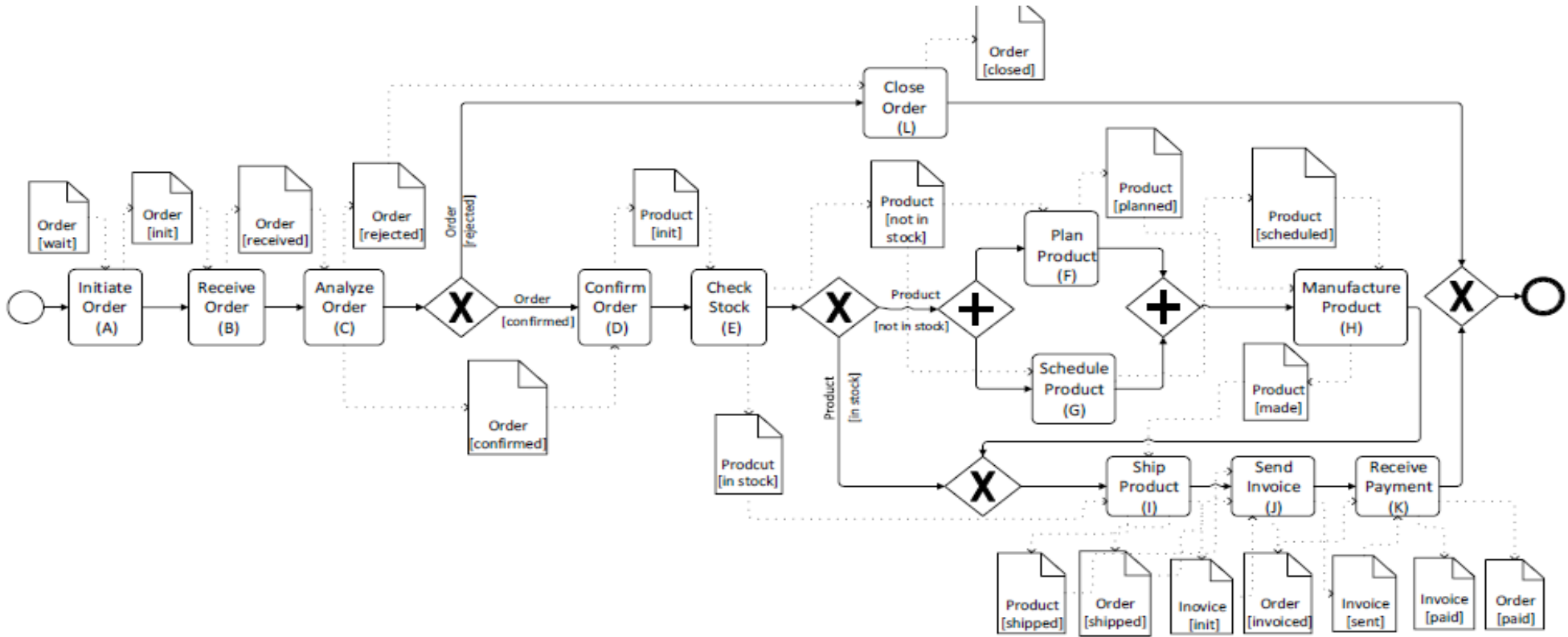
Process Model	Business Rules	Activities	Artifacts
1	11	12	3
2	21	32	8

# Evaluation



Purchasing Process Model (Yongchareon et al., 2015)

# Results

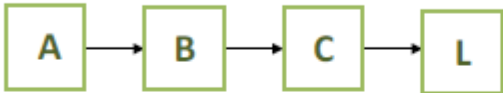


**Constructed Activity-centric Process Model**

# Results

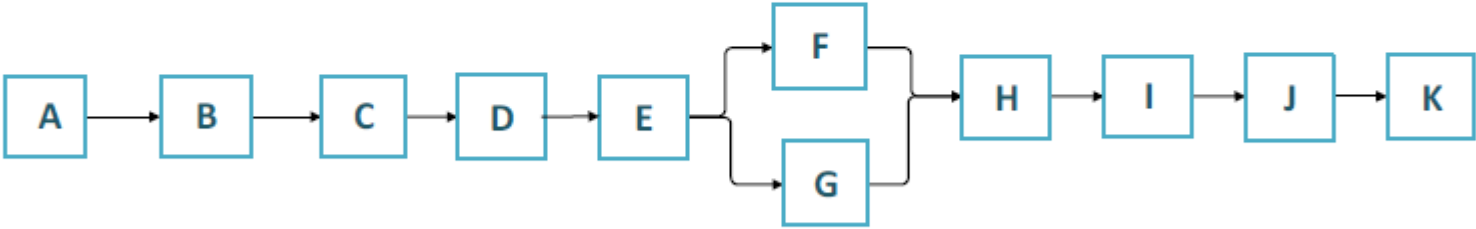
ACT Model  
Traces

Trace 1:

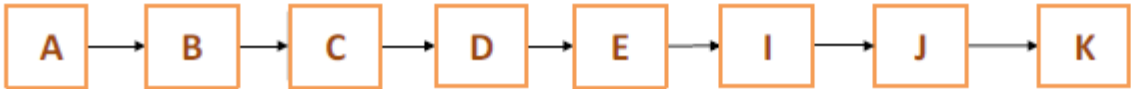


ACP Traces	Activities
1	ABCDEFGHJK
2	ABCDEIJK
3	ABCL

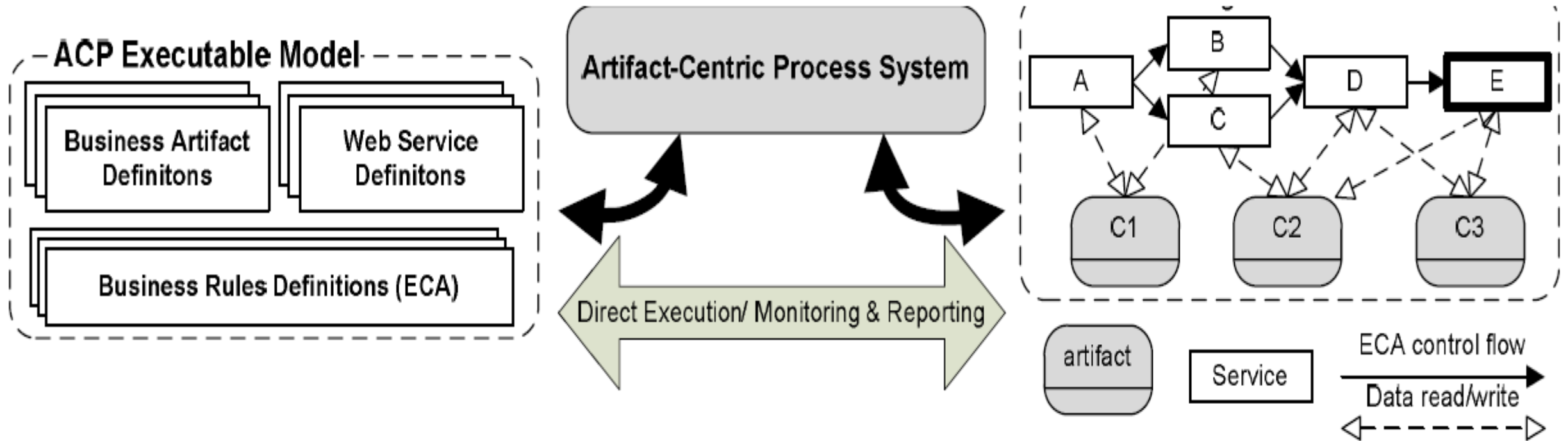
Trace 2:



Trace 3:



# ACP Realization Framework



**ACP Realization Framework to generate ACP process traces (Ngakmakeur et al. 2012)**

# Conclusion and Future Enhancements

- Proposed recursive algorithms
- Case Studies
- Quantitative Evaluation

## Future work

- Formalize the approach using mcrl2 process algebra
- Thorough evaluation of the proposed approach

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# Thank You

# Questions ?