Industrial Operations / Information Processing Convergence

Control Chain Management Body Of Knowledge

MI - Enterprise System
Meta model and taxonomy

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- Introduction
- **Enterprise system macro meta model**
- **Enterprise system taxonomy**

System view

- **Traditional views of an enterprise**
  - Describe the actual shape of the enterprise
  - Identify main processes
    - Marketing, Sales, R&D
    - Planning and Logistics, sourcing and delivery
    - Production, Quality, maintenance, Engineering…
  - Example: SCOR, VRM, PERA
- **System view**
  - Does not care about the actual shape and inner functioning
  - Only considers a high level meta model to map the main external interactions
  - Focuses on the what influences this shape

System approach: « understand » the whole

- **An enterprise is an extraordinary complex system**
  - No way to understand and figure out every aspect
  - Many aspects can be handled and seen differently
  - Beyond the specific product related knowledge, apparently trivial activities might be organized and taken differently
    - Maketing, sales, production scheduling, facility maintenance, research… are critical activities that might have unic approach in a given enterprise
      - *Public methods and theories offer basis for their handling. Example: TOC, Lean and 6 Sigma in Production. However, implementation is always specific given the particular organization and context.*
- **However, its I/O can be more easily captured and classifed**
  - The Cybernetics introduced the concept of « Black Bok »
    - Giving up understanding the inner complexity of a system
    - Analyszing its external behaviour

System approach: acting locally for global results

- **The system approach consist in**
  - Defining and measuring the right enterprise metrics based on its external interactions
  - Finding internal weaknesses and fixing them to improve is external – gloobal – behaviour
- **The intial steps are**
  - Identifying the enterprise system I/Os
    - To help developping appropriate metrics
    - A high level meta model of the enterprise
  - Defining a classification framework for systemic improvement
    - To identify the key system components acting on its behaviour

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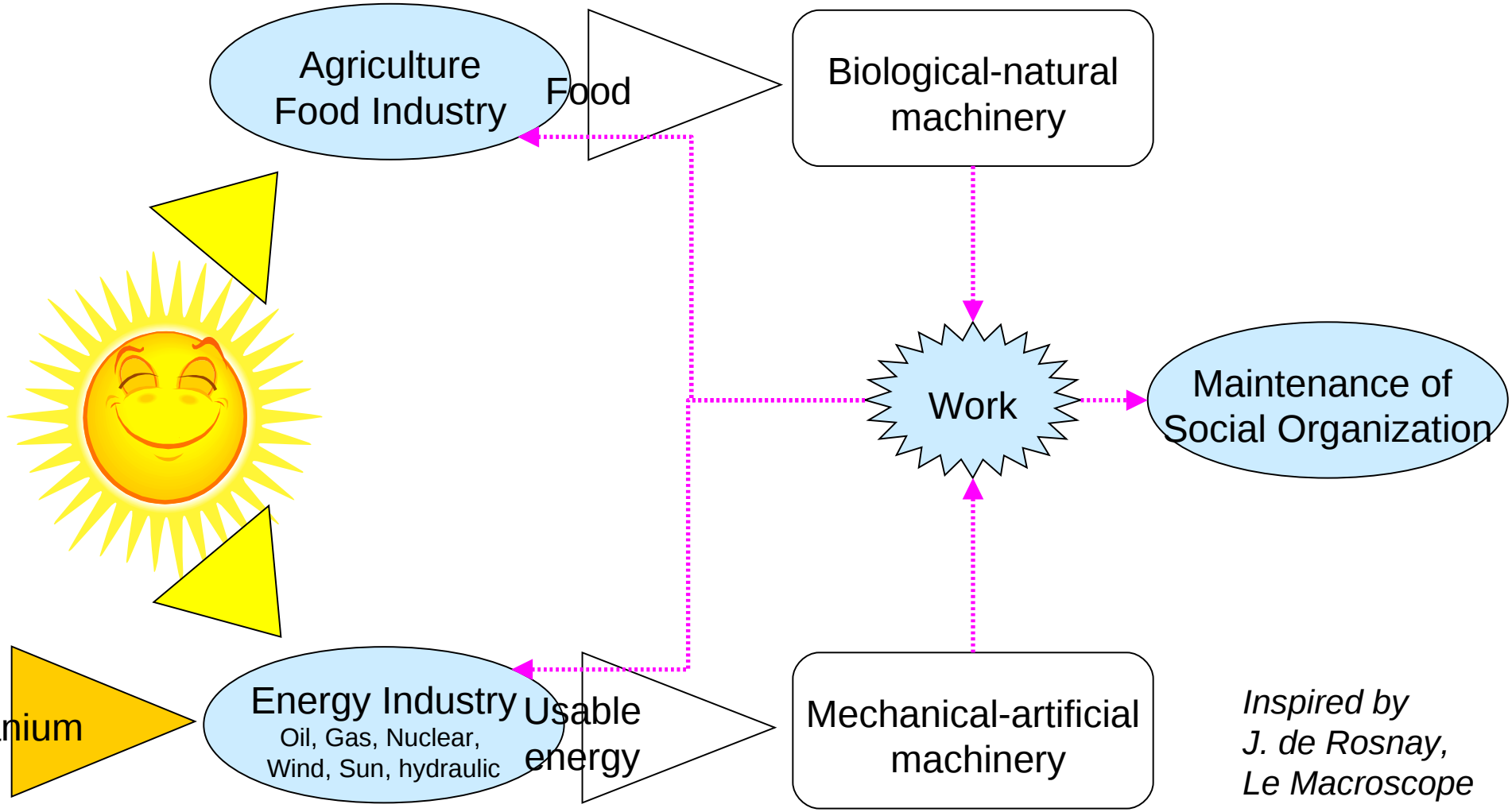
Enterprise is an Open, Complex System

- **Physical interactions:**
  - Earth, other Enterprises, internal Resources
- **Noospherical interactions:**
  - Goals of the World, Humanity, Humans, Owners, other enterprises
- **Social interactions:**
  - Nations, NGOs, Trade unions, Family
- **Complies with cybernetics' laws...**
  - Statistical behaviour on input change
- **...Not always**
  - Unpredictable reactions to unexpected events
- **A thermodynamic entity**
  - Consumes energy, applies it on matter
  - "Heat" (waste energy) when badly controlled (thermal entropy)

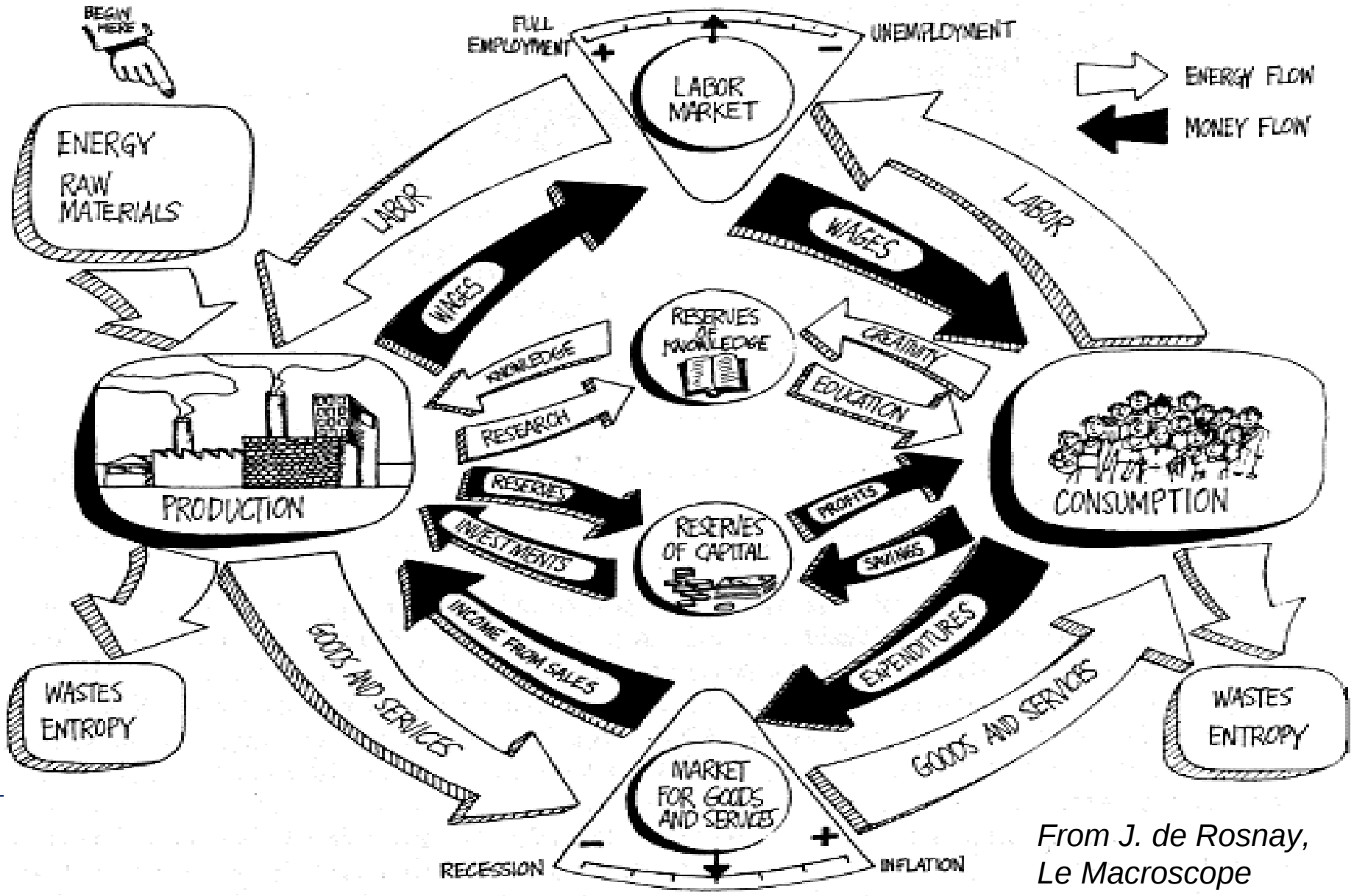
Industry eco-system (anthropo-centric!)



Inspired by
J. de Rosnay,
Le Macroscope

Industry Economics

Note : JDR represents only 2 flows: money and "energy" - Energy represents actually the 3 entities Energy / Matter / Information

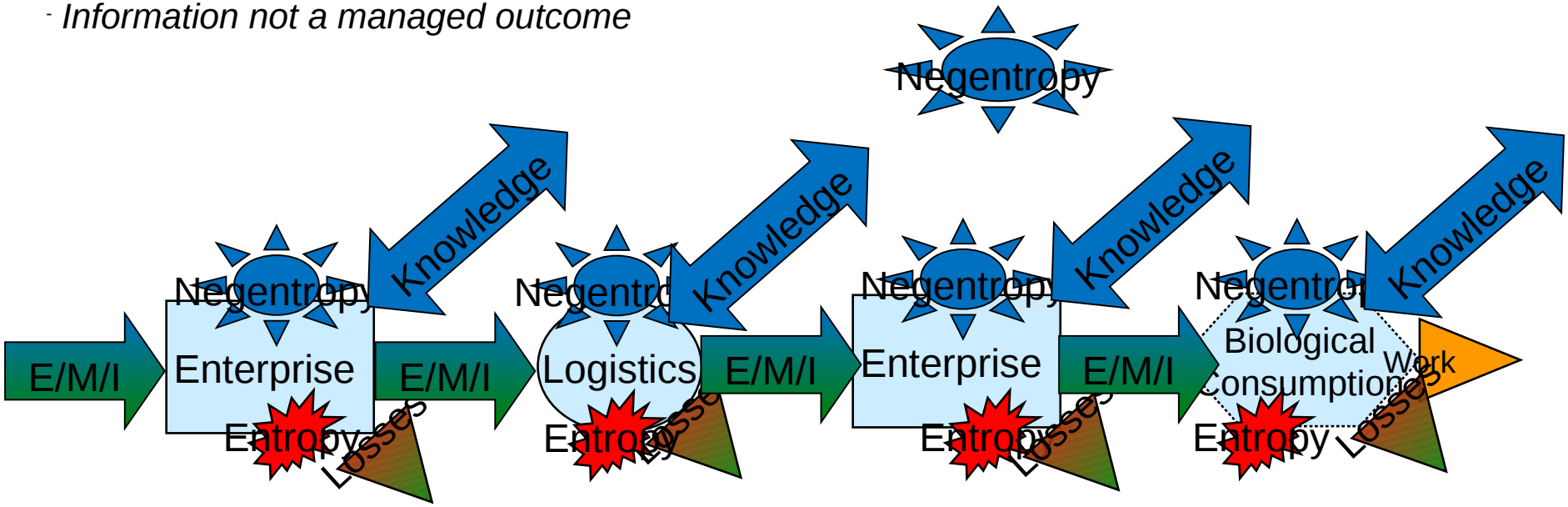


From J. de Rosnay, Le Macroscope

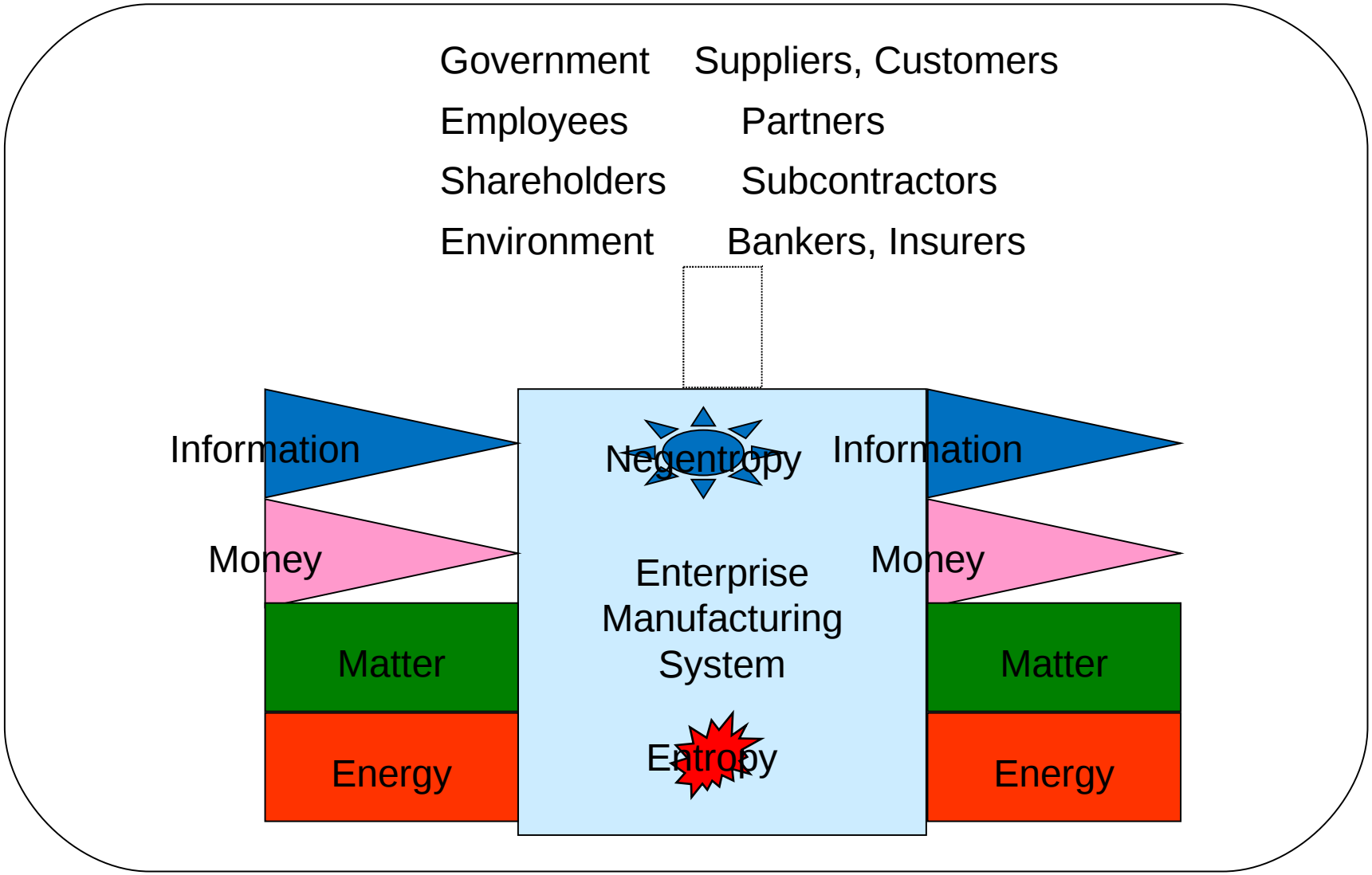
The enterprise black box: Energy Chain

Simplification for Industrial enterprises :

- *Energy / material grouped into Energy chain*
- *Information not a managed outcome*



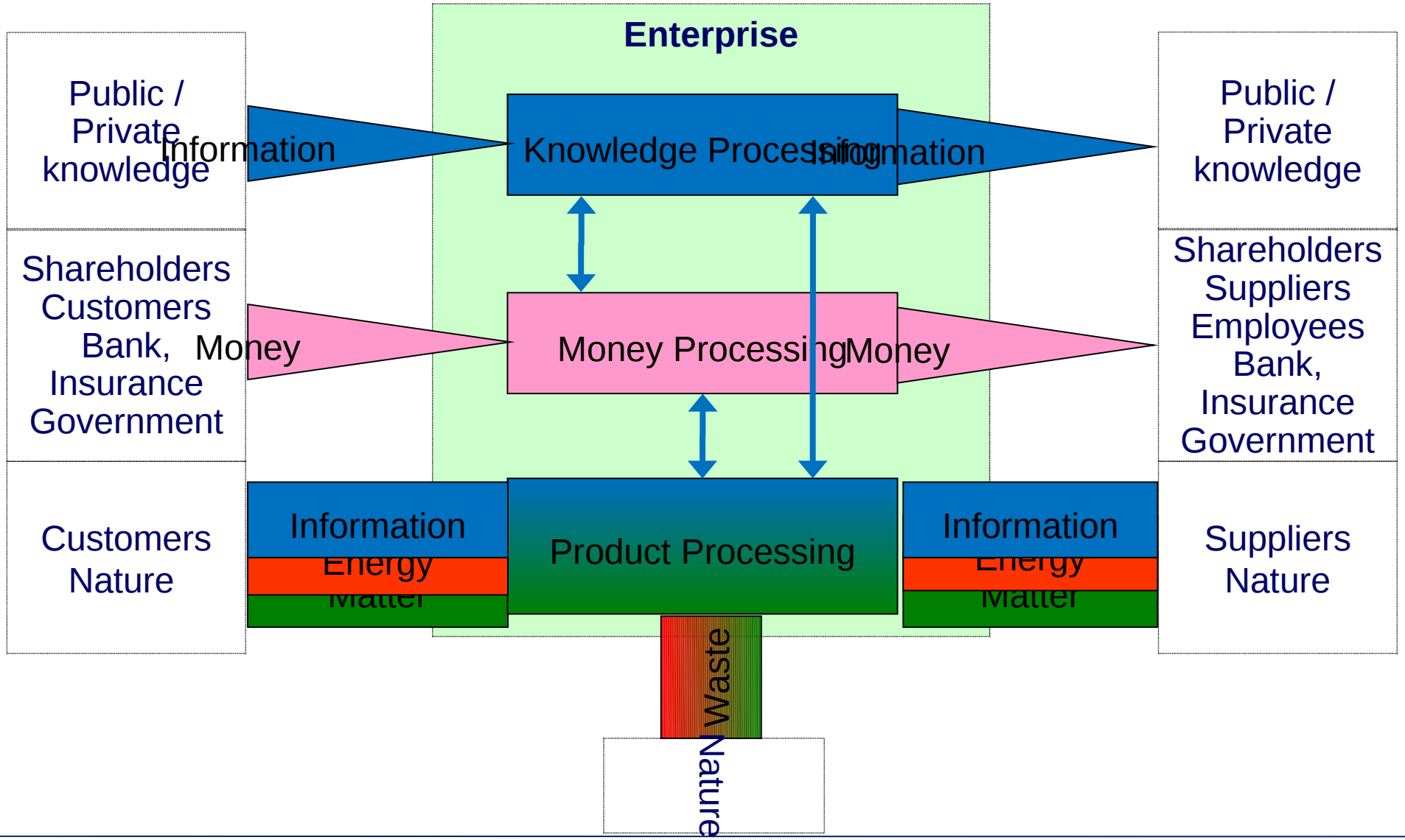
The enterprise black box



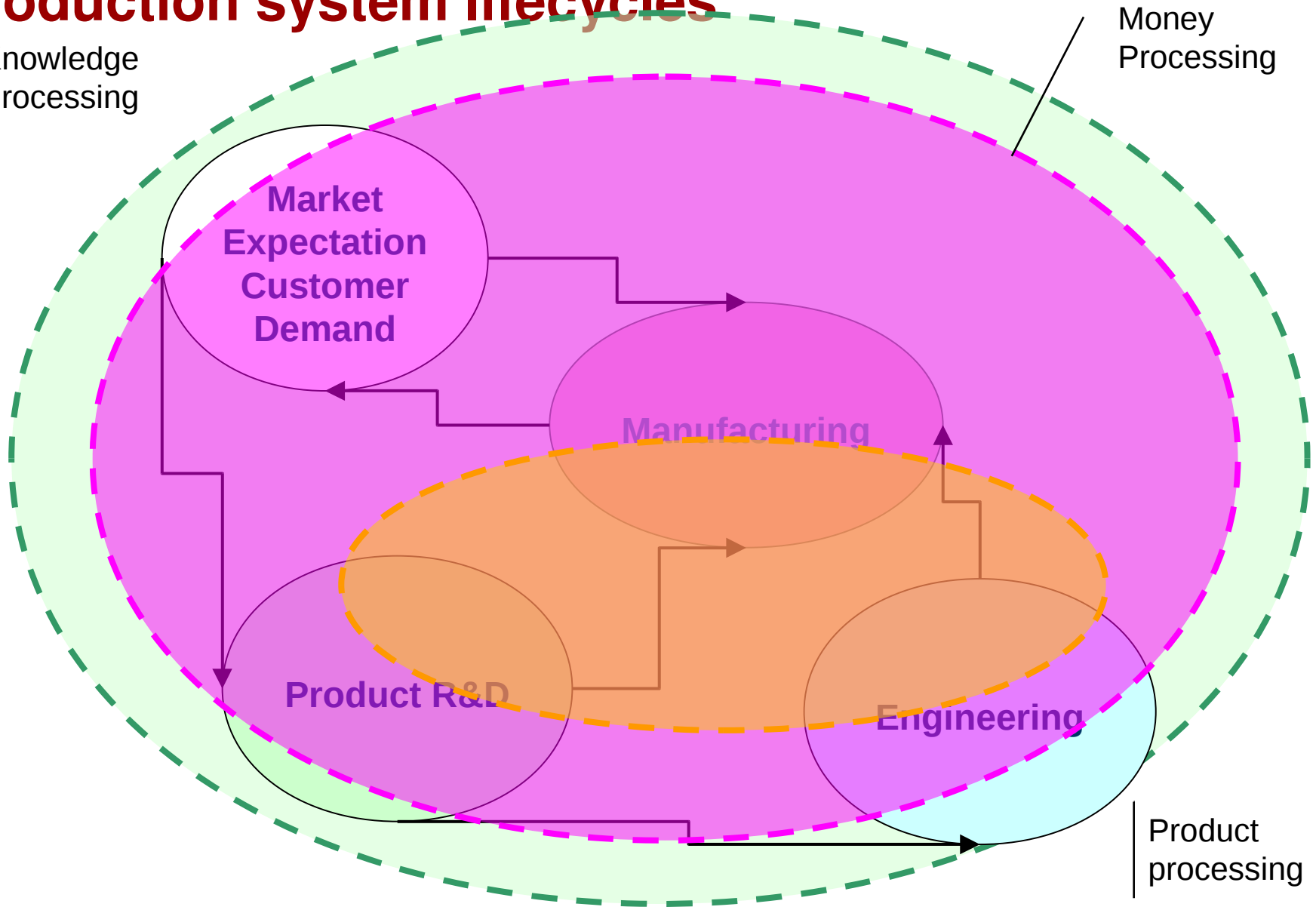
Industrial Enterprise System

- **An industrial enterprise's purpose is to make money by selling products**
  - as goods, energy, services (workforce or information)
- **An industrial enterprise interacts with many external "parties"**
  - Employees as "workforce contractors" – not exclusive part of the enterprise
  - Government imposing regulations, collecting taxes
  - Shareholders investing capital and retrieving interests
  - Nature providing free resources and bearing nuisances
  - Other enterprises as suppliers, customers, contractors, banks, insurance
- **An industrial enterprise has 3 main interaction domains**
  - Measurable input/outputs of the system
  - Product (matter, energy, information), Money, Knowledge

Industrial Enterprise System – Main processing domains



Production system lifecycles



Product processing

- **Creates Objective syntropic Value**
  - by combining simple elements of matter/energy/information into more complex elements of higher potential usage / energy / information
    - Saleable products
- **Handles physical flows and transformation, includes**
  - Facilities engineering providing processing capabilities
  - Sourcing, subcontracting, delivery
  - Operations (production, Utilities, Logistics, maintenance, quality ..)
- **Domain of responsibility**
  - To serve the Money processing diligently
  - To manage its resources efficiently
    - Avoiding waste
    - Minimizing entropy

Money Processing

- **Creates Economic Value**
  - for shareholders, employees, government
  - by connecting the product processing capabilities to the Market,
  - By creating Economic “subjective” value perceivable by customers
- **Includes activities not related to product processing**
  - Marketing, Sales, Purchasing
  - Planning
- **Directs the (product) Knowledge processing**
  - Translating the Market expectations into saleable products in terms of features, cost and timing
- **Directs the Product Processing**
  - Defining its mission (what to do, how to do, what to use)
  - Supervising its activities and Monitoring its performance
    - for what it is important for the money perspective

Knowledge processing

- **Exploit available knowledge, develop internal knowledge**
  - to improve Money processing and sustainability
- **Encompass knowledge about**
  - Marketing, Product, Facilities engineering
  - Operations, Organization
- **Knowledge is developed and used by**
  - People (methods, theories
  - Machines (mechanics engineering, electronic computing algorithms)
- **Supports the Money processing**
  - Process market requirements for feasibility and costing
  - Implements new products development
- **Supports the Product processing**
  - Operating procedures and continuous improvement support

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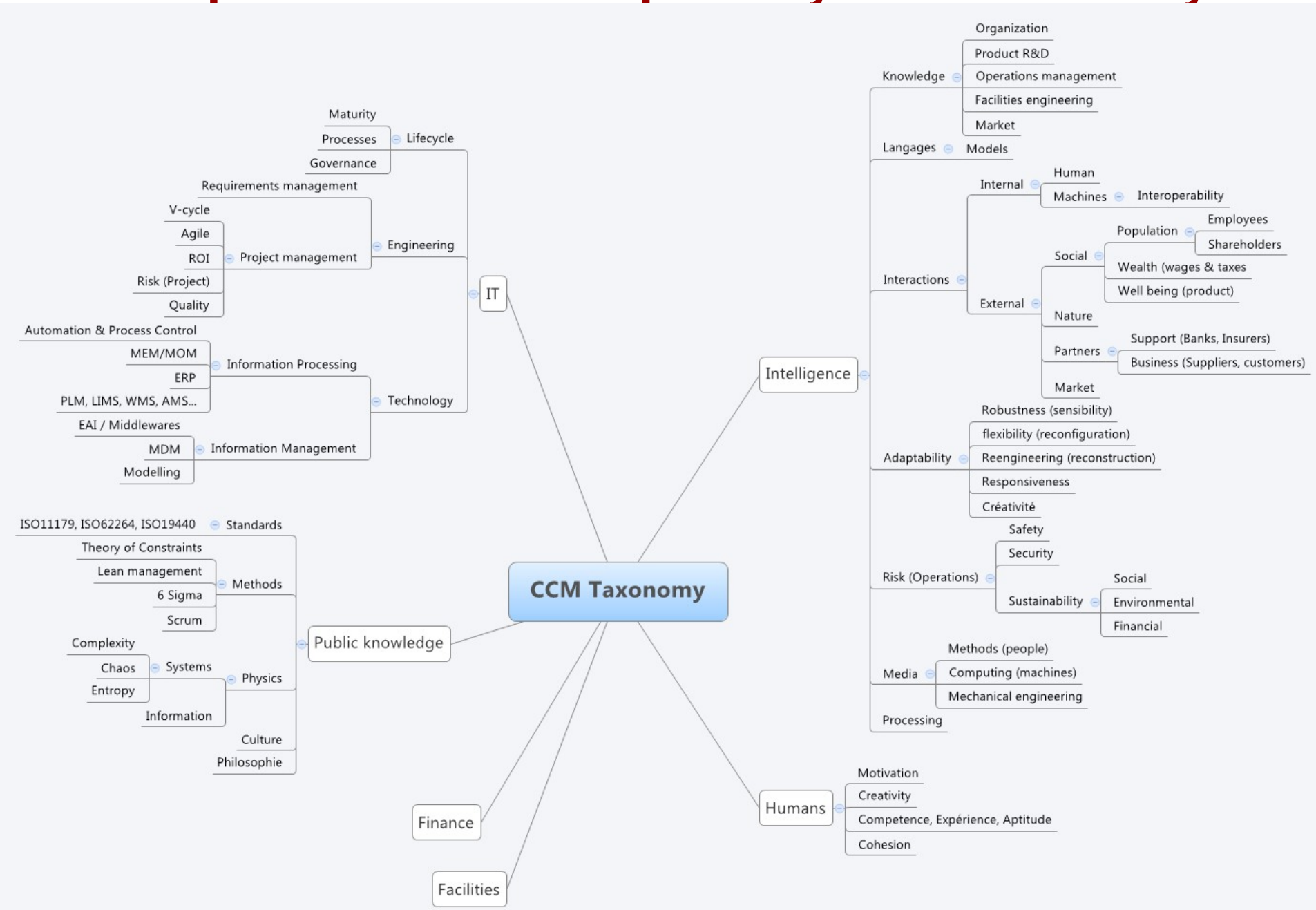
Development of an enterprise system taxonomy



Thank You !