

# Basic Entities of Processes

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## 1. Abstract

Simulations of production systems and projects should show their main characteristics and effects. Therefore we have to consider the principal physical properties of their entities and how they depend on each other in order to create a system. Building on experience in analysing and managing those systems we layout a basic framework, with which production systems and projects can be modelled.

## 2. Some remarks on simulation of work processes

In manufacturing and projects simulations don't have the weight they should have for operating and improving them. I see two main reasons for that:

1. They are not realistic enough on a system level. They don't reflect the main characteristics of the system.
2. They are too difficult to build, to change and to operate. Usually they cannot be built, modified and operated by operators and managers but only by external specialists.

Therefore production systems and projects mostly are operated on daily experiences or heuristic rules drawn from much simpler models or even on blind guesses.

If we look at common simulation systems, we see

- graphical model builders, with which rigid models are built. They don't have the flexibility to model varying and concurring orders and dependencies across resources.
- models coming out of those simulation frameworks and approaches that have a focus on animation and layout of transactions occurring in real systems.

After some decades of repeatedly seeing new systems and projects fail and underperforming, even after some simulation, my goal is to change the situation.

## 3. Basic Instances

As of now – and following an age old process analysis technique – I see only the following **basic transactions**, with which workflows can be described and therefore modelled:

1. **Operation:** some modification of an item or combination with other items,
2. **Transport:** moving an item from one instance to another,
3. **Inspection:** checking an item without modifying it,
4. **Delay:** waiting for release or some other instance to occur, or be ready
5. **Storage:** putting an item to some dedicated place since it is not needed by some other instance.

The items processed in those instances can be each some amount, form or configuration of

- **Energy,**
- **Material,**
- **Information.**

Each transaction needs a **resource** to be carried out, which has

- **name,**
- **location,**
- **capacity** – it can operate on several items such and such fast,
- **availability** – it is prone to disruptions and failures and must be maintained,
- **dependability** – it can impair the items,
- **dependency** – it depends on energy, materials, equipment and information which may or may not be available.

## 4. Two Views

Work systems can be viewed from two different angles:

### 4.1. Outside-in

In this view customers or orders **push** from the outside into the system and use its entities as resources in order to get served. We had this view in the Post Office. The system has to protect itself from too much load coming in or streamline its operations in order to serve well.

### 4.2. Inside-Out

In this view customers or orders, materials etc. are **pulled** into the system. We had this in the Dice Game. Activity comes from the system's entities. They move the items and their focus lies on getting their work done in order to serve the customers.

### **4.3. Which one to use?**

Those are two philosophies on which to build processes and also simulations. At the Moment I do not yet know which one to use for production and projects – time will tell. My intuition is that the second one is the predominant approach in production and projects today. So I will start with that one.

## **5. Next Steps**

I have to investigate this further.