02.Operational Portfolio Manufacturing

## Nature of task: manufacturing vs. service companies

ERP(package software that companies can take and personalise to support manager). ERP systems have vertical solutions tailored to the needs of specific industries. Vertical solutions are usually fine grained. The coarse grained distinction is made between manufacturing and service companies. There are framework for solution that are shared between industries(The ideal standard client doesn't exist).

Distinction between manufacturing and services: a manufacturing company has operation/production processes on tangible/physical goods, a service company takes information as an input and produces information as an output(intangible).

ERP was invented first for manufacturing companies and then it was translated to service companies.

IT portfolio in manufacturing companies
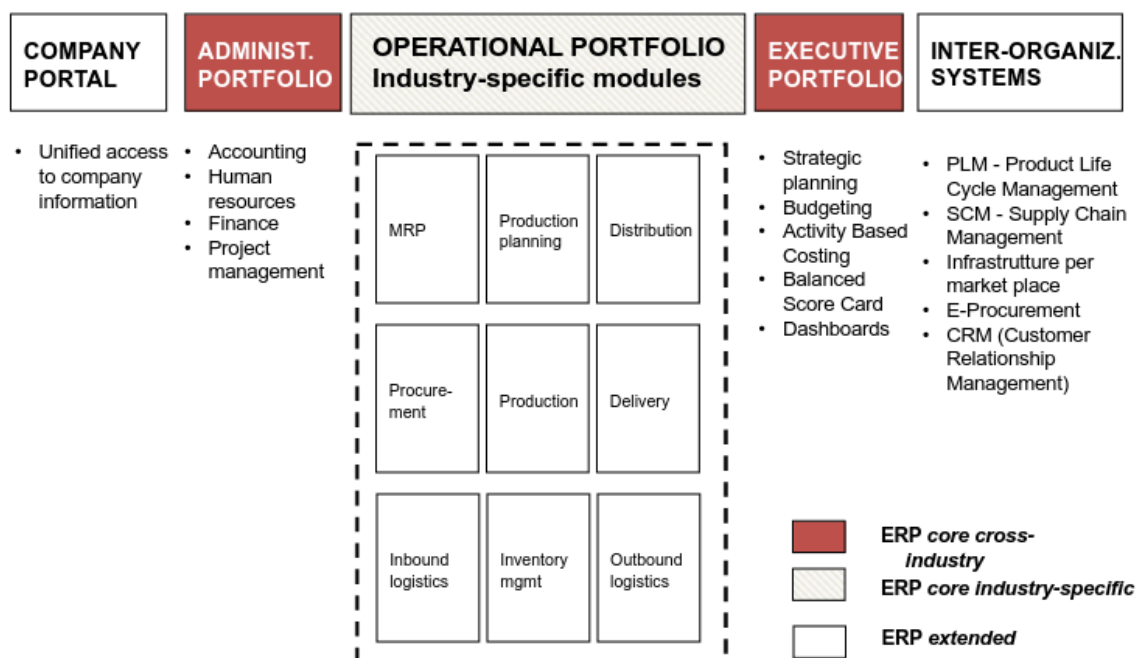
Portfolio typically refers to finance.

1. Administrative portfolio: It automates administrative and bureaucratic organizational activities, it handles the finance of the company, keeps track of the money flow, knows when is the best time to hire a new employee, manage company bank accounts, etc... Administrator Finance is the function that handles the finance of the company, handles the stocks of the company. IT was considered a portfolio application. It is almost always industry independent, it is country-specific, it represents the first step of automation as it

involves number crunching, it involves limited decision making while it is procedural and repetitive, it is traditionally considered stand-alone but it isn't(activity based costing), it can be functionally complex(example: balance sheet).

2. Operational portfolio: application that support operation

3. Executive portfolio: applications that support managerial roles
   These three functional areas have developed separately and are now integrated inside ERP systems. They constitute the core functionalities of ERP systems

Manufacturing production processes and inter-functional information processes

Porter's concept of information intensity

1. Information intensity represents the size and complexity of the information used by the processes of an organization (minimal in cigar manufacturing, maximum in banks)

2. IT intensity is the actual ability of IT to satisfy the information processing requirements of organizational processes (it is greater in banking than it is in insurance)

3. Management inclination is the degree to which a company's management considers IT as a strategic lever (it depends on a number of factors such as computer literacy, culture, company history, etc.).

4. In general, information intensity in greater in services than it is in manufacturing.

5. IT intensity can be greater in manufacturing than it is in services.

6. Historically, the management orientation towards IT was greater in manufacturing. Services have experienced a delay in IT development of about 10 years.

7. Degree to which information processing activities are structured and, thus, can be easily translated into a computing procedure (predetermined steps and decision tree).

8. Volumes, i.e. the amount of information to be processed.

9. Frequency with which a given operation is repeated

10. Computational complexity of operations, the simpler, the better.

Manufacturing production processes
Porter's value chain
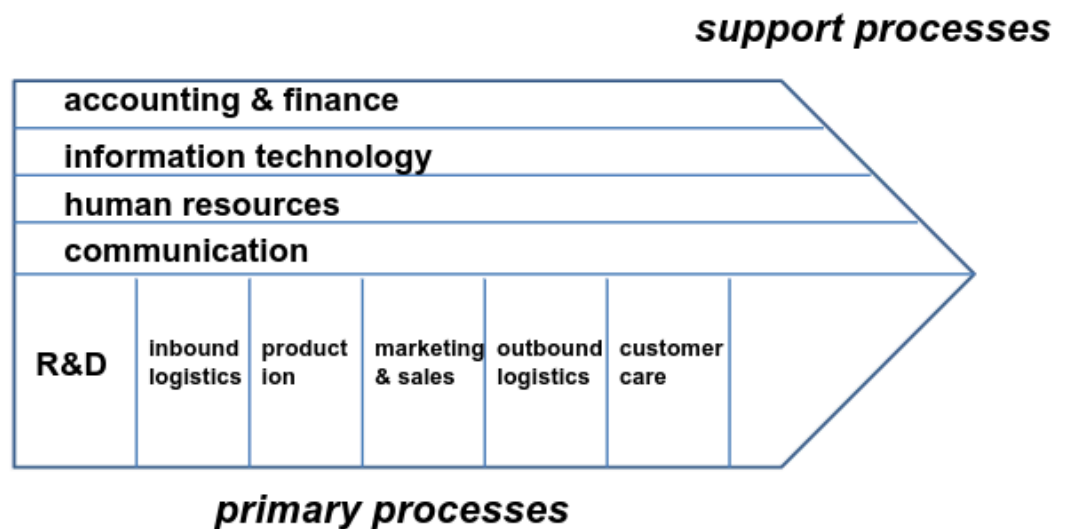
- Inbound Logistics: all the logistic used to acquire all the primary resources to product your products
- Outbound logistics: logistic used to reach the customer
  Forget the hierarchy and focus on what it is needed to do for success.
  Processes are interfunctional.

Manufacturing activity cycles

Iterative, Continuous
Important to think the production as a cycle to help developing the new infrastructures/IT/managerial choice in the right way.

1. Development cycle: It is in charge of designing and industrializing products and production processes
2. Logistic cycle: It is in charge of managing customers' orders, with the following activities:
   1. Procurement: acquisition of materials, physical management of materials (internal logistic processes), such as reception, warehousing, dispatching to productions plants, etc.
   2. Production: physical transformation of materials
   3. Sales and Distribution: order management, external logistic processes, post-sale processes (maintenance, customer support, etc.). Logistic is complex and takes a lot of time and resources.

Interfunctional information processes

1. Order management process: it manages the information regarding orders and activities associated to fullfill that order

2. Materials management process: manages information regarding materials about outgoing orders towards suppliers for usage in the transformation process
3. Operations management process: it manages the information regarding operations from materials dispatching to production plants to product delivery
Different products and different divisions involve ALL production processes and ALL interfunctional information processes → the information systems is tightly bound to organizational structure.
Different production cycles share information:

- Information on stocks is created by the materials management and used by order management during sales activities
- Information on stocks is created by the materials management and used by production
- Information on orders is created during sales activities and used by production
- Information on orders is created during sales activities and used by internal logistic

1. Interfunctional information is used by the planning and control processes (or management processes). Examples are:
    - Strategic production planning (which products to produce for which markets)
    - Budget allocation
    - Scheduling and operations management
2. Interfunctional information is used by administrative activities. Examples are:
   - Cash flow management
   - Project management
   An inner manager has to be efficient and effective as they have to coordinate other people and they have to know the various structures of the company teams/structures.
   Need to take care of this aspect for application as the interface needs to take care of different task spanning the entire process(SILO approach isn't useful anymore). Interfunctional means projecting your process taking in consideration all the parts of the process. This means that you are becoming less specialised and you are generalising.

Standard vs. Custom Production

- **Standard production**: products have a finite set of predetermined features that can be changed to accommodate customer preferences (e.g. colour, size, optionals, etc.). In this case, companies produce according to a sales plan, before actual orders are received. There can be some parts of the product that are customised as the customer wants but these new features will require times as the manufacturer is going to produce these last bits of process.
- **Custom production**: products are designed according to customer requirements and then produced on demand (if something is produced a corresponding order must exist). Differences between these type of production, if fully standard customers cannot decide anything on the product, fully custom you can specify everything. Can be a mix of the two where one type is more predominant but there are some characteristics of the other. The

customisation depends on the usage of the product.
Observations:

- There is a continuum between standard and custom production.
- Intuitively, custom production is associated with complex artifacts, while standard production is associated with simple artifacts.
- Actually, the degree of standardization and the degree of complexity of products are independent variables and all combinations exist.
- Information technology (IT) applies to all combinations, but functionalities are substantially different.
  If a market is not mature every product in the market has a great value, if there are already products of the same type your product has to be of an higher value to be considered.

Classes of operational information

Information stored in the DataBase:

1. Transaction information: it describes the flow of operational activities.
2. Operations planning information: it describes the objectives and the expected results of operational activities. Seemingly static as the processes don't change so much overtime
3. Catalog information: it represents a basic knowledge that is independent of the flow of production activities. It is referred to as a static type of information (although it is not) Concerned about changes in organisational settings, innovation is the thing that matter, companies don't buy the new product if they hadn't fully utilised the old one.

Transaction Information

Transaction information describes the flow of operational activities in terms of exchanges between responsibilities (or organizational units) and between internal responsibilities and external players. Examples are:

- Contracts with customers and suppliers
- Status of production activities
- Transfers of materials and half-finished goods between responsibilities.
- Certification of events, such as inclusion of a new product in the catalogue, the certification of a new supplier, etc
  It is also used to store information between units, to get information for planning purposes. Helps also to register costs of operations.
  Informations are added to the various rows to fullfill customer orders. In a company when you are done with your task you inform the system you are done with your task so the computer stores the information in the information database. This helps as triggers the next activities automatically/can inform to not act as the task isn't completed yet. It also stores important information on my activities, my efficiency and effectiveness(how long it takes to complete the task, the material I use) on the tasks(evaluating of my work without me writing a report, encouraging people to compile the reports precisely, people have to

want to compile the report, you have to spurt this behaviour with a positive approach). When responsibility of a task pas from a unit/individual to another one the system should store this information and attributing the responsibility to the right people. It is regulated by a contract that can be different from the employment contract. Needs to find this information into the transaction database.

Operations planning information

Operations planning information describes the objectives and expected results of operational activities. In short, it stores the production program. Example:

Product code	Quantity	Machine	notes
A25 blue	14	Laser 2	Quality check – all
E35 yellow	134	Line 35	Quality check – 10%
V18 green	36	Laser 1	Quality check – 10%

All the information is not needed only to produce but also to plan and control.
Takes in account the efficiency and effectiveness of the company. A company makes plans based on the information it can gather. Tries to maximise the capability to be competitive. These activities are supported by the Executive Portfolio. Everything usually happens automatically(in reality is 80% automatic, some checkpoints to handle exceptions). The less exceptions a company have the more mature it is. Needs to find a market niche and then uses software to support the production and management. The flexibility of a mature company is the capability to change the plans with some clicks, quickly changing production plans in accord to environment changes.

Catalog (or registry) information

Catalog information stores a basic knowledge that is independent of the flow of production actitivities. Examples are:

- Product catalog
- Customer directory
- Supplier directory
- Workforce directory
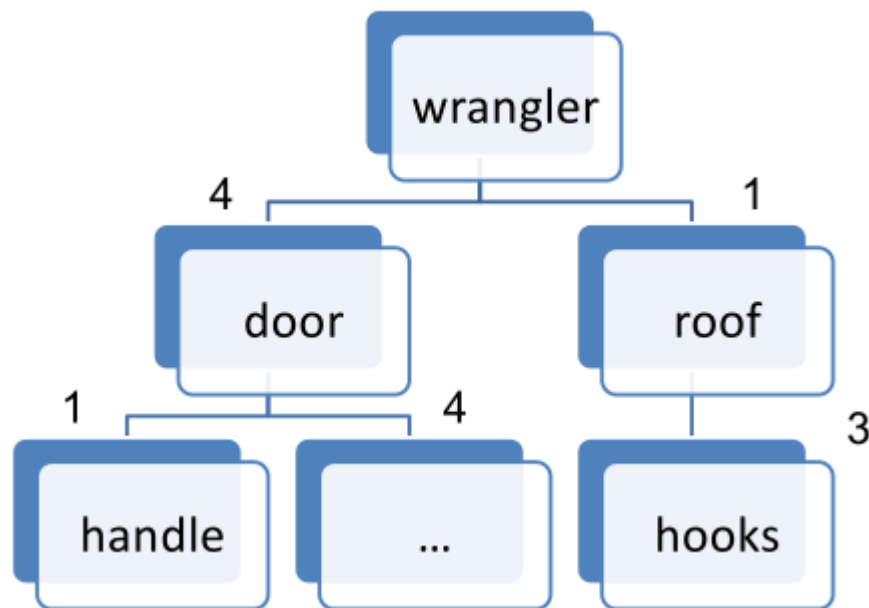- Product structure
  It is complex.
  It needs continuous maintenance (e.g. Internet sites). It impacts on organizational learning capabilities (it can limit the consequences of personnel turnover).
  It doesn't change frequently over time, so it can be considered static.

Problem arise when there is a catalogue that can become obsolete quickly as the information contained are related to a fast changing product.

Product structure

Hierarchical description of the structure of products, from elementary components to aggregate product parts. Example:

The relationships between components is only made by the needed materials/components to complete the product. The flexibility this structure gives is the one to calculate efficiently how the production works and so can predict very well how to improve/expand it.

Observations

1. Transaction information is the largest in terms of volumes
2. Catalog information is the most complex in terms of number of attributes (data schema)
3. Operations planning information is a key link between the operational and the executive portfolios
   This implies that the level of detail of operational information is a driver of the efficiency of coordination inside an organization.

The value of operational information

1. In and of itself, operational information is an organizational asset.
2. In some cases, the operational information can be sold(You are the product).

Computer integrated manufacturing (CIM)

The concept of IT integration

Historically, IT functionalities have been developed

- separately for each organizational function
- with no process view
- with the goal of automating (instead of supporting/changing) existing activities
  Different functions had
- separate data
- individual instead of shared objectives
  Information is created at the beginning of a cycle to be used later on. A proactive approach is needed to exploit information at an executive level with an integrated view of an organization.
  Needs to maintain your IT infrastructure updated as you don't want to remain behind and you want to maintain your process efficient.
  The goal of automation lead to no proactive mentality, separation of data and individual instead of shared objectives.

Horizontal vs. vertical IT integration

1. Horizontal integration: integration of systems along operating processes (Porter's primary processes). This lead to CIM(Computer Integrated Manufacturing)
2. Vertical integration: integration between the operational portfolio and the executive portfolio. This lead to MRP(Material Requirements Planning)
   Pay attention on not reinventing something that already exists but only improve your products, you can do better than your predecessor, improve their work.

CIM (Computer Integrated Manufacturing)

End goal is Efficiency.
Enabling technologies:

- numeric control machines and robots
- "mini" computers
  Deployment time frame: '60s-'70s. Main objective of CIM: optimal scheduling and production resource management. This lead to Production efficiency
  Needs to achieve an optimal scheduling and organizational structure.
  Sample functionalities of CIM:
- Transformation processes: scheduling of transformation activities, scheduling of machines, machine control, lead-time measurement
- Workforce management: allocation of specialists to production activities, work shifts, workforce monitoring
- Plant management: tracing of functional states, maintenance schedule, alarms
- Materials management: tracing of outgoing orders, deliveries, and internal logistic
- Quality management: quality control, data aggregation and analysis
  The mindset is to make the best use for my resources, I don't want idle time, I want maximum return.

MRP (Materials Requirements Planning)

Enabling technologies:

- CIM: precondition to enable MRP
- local area networks: connection among all the needed computer used to support CIM(use an information in an integrated way)
 Deployment time frame: '70s-'80s
  When companies recognised its value they got excited as it has an impact on organizational effectivness.
  Main objective of MRP: flexibility and scale economies through optimal planning.
  This lead to Production effectiveness. First step of vertical integration completed by the Executive Information System.
  Main idea: integrate product structure through
- Concurrent engineering of products
- Inside-out production processes


Common core components
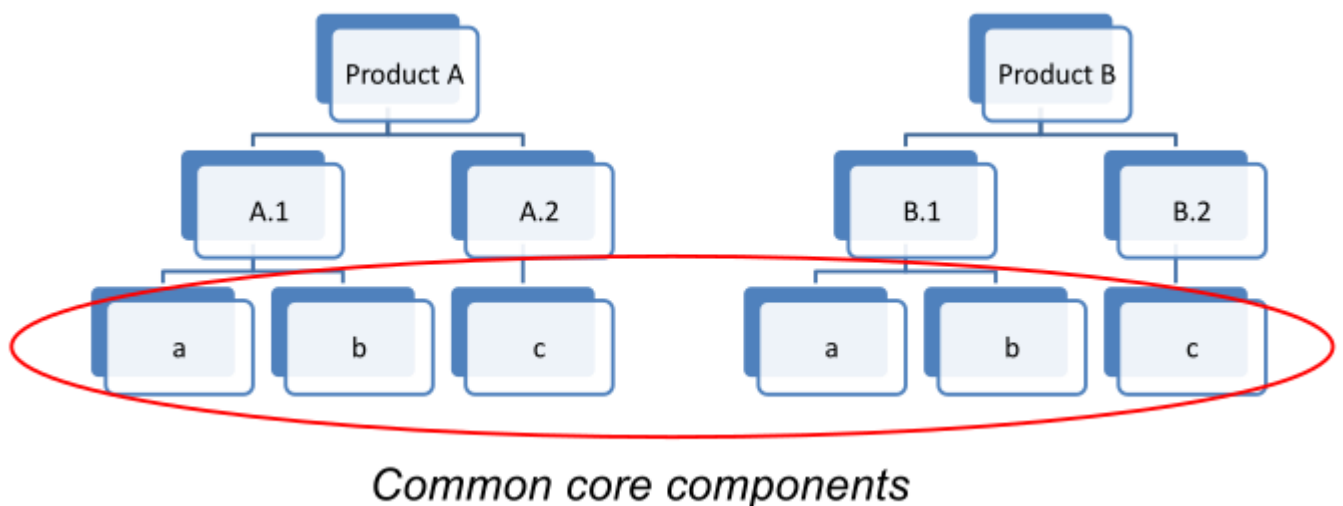
You made sure to have all the information on the process in one place and then the manager do his work, he sees where there could be a share of resources as employee, machines, production lines, etc...

It can help to overcome the bounded rationality of the manager that cannot see the entire scene alone.

At the bottom of the structure there are the simple materials, they aren't so distinct. For some product you have a feeling of the quality of a product even if you can't asses the real quality. You choose a product on the external, physical and some overall performance of the product(Highest level component). MRP design the product concurrently in a way they share the same lowest component for every product as the customer can't know we have standardise. The benefit is that we can make a plan. You don't have to keep in the warehouse the bottom level resources waiting they follow the plan for different product, you have more financial capacities and you have more flexibility as you can replan more frequently and quicker. You

can't share all the component and the limit is given by inside-out production. Product with the same low level component will share the production line until they share components.
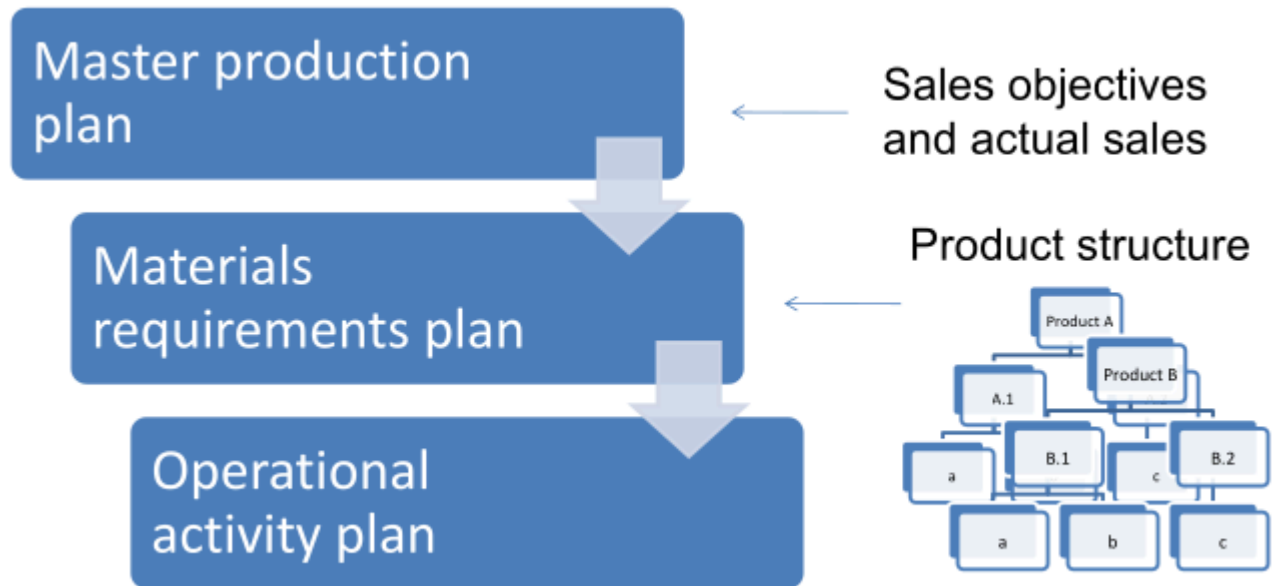
All the plans start from R&D as it is the base for all the production processes, the plans can be less optimised BUT they are more flexible, see the big picture.