

Building Production Systems

Analysis of Building Production Systems

by

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Parameters in analysing the BPS

- Building production process.
- The structure of the process.
- The participants.
- The role and relationships of the participants.
- Building system and its components.
- Construction system

Conventional BP Systems

- Relatively, they can be defined as local and regional building production systems.
- There is a convention between the design of building and environmental factors.

Conventional BP Systems (Process)

Initializing stage

- Entrepreneurs are the habitants as well.
- They demand the building not for selling but their needs.
- The program of the building is decided by entrepreneur
- Feasibility studies are not required.

Design stage

- Building is designed by the owner and/or constructor, not by a professional designer.
- Conventional principals, proportions, architectural elements and materials are used in design.
- Conventional techniques and materials do not allow new solutions in design

Tender stage

- This stage comes first, before design stage.
- There is no formal tendering process.
- The client find the designer/constructor (an artisan/craftsman) and delivers the project.
- There is no bid, no specifications. The references for the building are the other buildings constructed formerly.

Construction stage

- The building master constructs the building on his own or together with his team.
- The master knows about all the subsystems and structural and architectural elements and construction techniques.
- Local and conventional materials are used.
- Primitive construction tools are used.

Traditional BP Systems

- Compared to conventional systems, they are observed in a wider geographical area in terms of input, process and output characteristics.
- It is possible to see the same patterns in building production process and construction process, techniques, materials, equipments and details in different locations

Traditional BP Systems (Process)

Initializing stage

- The entrepreneur may demand the building as an investment for selling as well as for his/her own use.
- A feasibility study may take place at pre-design stage.
- The program and the scope of the building is defined by the specialist group that undertake the feasibility studies as well.

Design stage

- Designers are the professionals.
- Design is not restricted by local materials and techniques.
- New styles, materials, structural and architectural solutions are allowed.

Tender stage

- The project is delivered to a general contractor or subcontractors.
- A formal tender stage and bidding procedure may be applied.
- Formal documents (specifications, bill of quantities, contracts etc.) are used.

Construction stage

- The contractor and subcontractors undertaking the construction of the building are specialist professionals.
- Load bearing system is mostly reinforced concrete or masonry brickwork.
- Coordination and management of construction process gains importance due to the increasing complexity.
- In addition to simple tools advanced devices and machines (excavators, loaders, derricks etc) are used for the production.
- Natural and artificial materials are used.
- Some of the components are produced in industrial production areas (off-site) and then integrated to building.

Rationalized BP Systems

- They can be qualified as optimized or advanced traditional systems.
- They bring new precautions and solutions for the problems that can not be coped with by the traditional systems in terms of speed, quality and cost.
- They require an accelerated cash-flow compared to traditional system.

Rationalized BP Systems (Process)

Initializing stage

- Comprehensive feasibility studies are conducted by specialist groups for the selection of suitable technology among a variety of rationalized systems.
- Initializing stage is overlapped with the design stage.

Design stage

- New technologies that aims to speed up the construction process are taken into consideration in design stage.
- The technologies that include the optimization of formwork system affect the design process and the project remarkably
- It is not required to complete the design for tender and construction.

Tender stage

- Since the speed of the production process is important project delivery can be based on alternative approaches, e.g. negotiation instead of competition.
- The contractor can be employed at the design stage if desired.

Construction stage

- New methods (e.g. curing) are applied new additive materials (e.g. accelerating agents) are used to speed up the construction process .
- The sequence of the works may change (e.g. electrical installation before reinforced concrete curtain walls).
- Fast-track type process is applied and all the production activities overlap.
- New materials (e.g. mesh-reinforcement) are used.
- Mechanization level is higher compared to traditional system.
- Pre-cast components can be used along with the in-situ concrete load-bearing elements.

Industrialized BP Systems

- The components of buildings are produced in factories for diminishing the effects of environmental conditions on on-site production.
- A multi-staged production including the successive stages of prefabricated production, stockage, transportation and assemblage is observed and the coordination is important due to this character of the production.

Industrialized BP Systems (Process)

Initializing stage

- Comprehensive feasibility studies are conducted by specialist groups for the selection of suitable technology among a variety of prefabricated systems like skeleton, pannel, cell systems.
- There are dozens of subtypes of these systems developed by various companies that should be analyzed regarding to the restrictions of the project.

Design stage

- Design process has a reverse character compared to traditional design process. After the details of building system are solved the building is designed.
- Design-build project delivering approach can be applied as an alternative solution. So design and construction functions may be undertaken by the same company.
- The limitations emerging due to the successive stages of production should be taken into consideration in design stage (e.g. the restrictions in transportation process or assembly process).

Tender stage

- Due to the alternative approaches like design-build tender stage may come first before the design stage.

- If the technology was not considered in scheme design an adaptation process for the design is required.

Prefabrication stage

- The components of the building are produced out of site.
- Some of the components of some subsystems may be integrated to each other at this stage (e.g. electrical subsystem and partitions; in some systems all of the components of all subsystems)project.
- The quality of the components and the production process is higher than on-site production.
- New technologies can be applied to increase the quality of the components and the process (e.g. curing, pre-tension)
- Mechanization level is higher compared to the former systems.

Stockage & transportation stage

- The components can be produced for stockage in *open systems*.
- The limitations originating from the roads and vehicles should be considered and permissions should be obtained timely.

Assemblage stage

- Mechanization level is higher than the other systems. Capacity of the equipment depends on the size of the components.
- Alternative methods can be applied for the assemblage of the components (welding or concrete based assemblage).
- Fast-track process structure is preferred that is appropriate for the prefabrication.