



**ARE 513 Building Systems: Evaluation and Selection**

**Performance and Building:  
Problems of Evaluation**

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**Presented**

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**Outline**

- Introduction**
- Sub-Optimization in Building Process**
- Organization of Building Process**
- Temporary Multi-Organizations**
- Toward an Alternative Approach**
- Aggregate Project Performance**



- **Performance appraisal of building facility is primarily concerned with two issues:**
  - **The post-occupancy appraisal of built facilities.**
  - **The evaluation of the building process**  
The entire sequences of events that leads from the first inception of the project to it's completion.

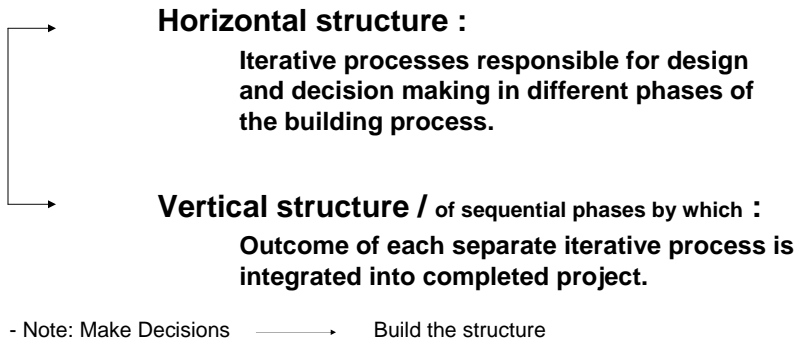


**The main objective of appraising the building process is**

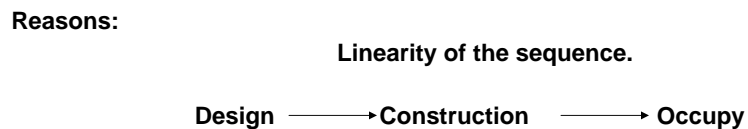
**to determine the extent to which conditions that were intended have been satisfied in the completed building.**



### Building process is traditionally:



Literature on performance appraisal considered the performance of the building as a whole is of no great utility:



Once the building is occupied, it is too late to improve the building process, and therefore any feedback suggestion that a differently assembled process could have produced a better building is useless.



**Thus, is limited to the horizontal structure which is the measurement of the performance of individual building systems.**

**Advantages of the method: It allows**

- Appraisal of building systems and manufactured product of the design and
- Decision making / selection of these systems.



**•Example:**

**•Window manufacturing:**

**Not only the performance of a window can be measured in terms of**

Major criteria such as air leakage, rain penetration, thermal and acoustical properties. ( a manufactured product)

**But also in terms of**

Suitability, reliability and flexibility in providing for the basic performance requirements of the occupancy of the buildings. (Decision making / selection of these systems )



**The sub-optimization (product/hardware) approach:**

**The optimization of products and hardware produces by these sub-processes becomes more important than that of the product of the entire building.**



**The sub-optimization (product/hardware) approach: ( Continue) His views:**

- As the data obtained from the appraisal of a building sub-system is primarily available to its design and manufactures only, it helps them further optimize their particular products.
- The owner and users of the building project do not gain from appraisal at this level data, even if it were made available to them, is too discrete to in any way help them to improve the building process next time around.

**The window example :**

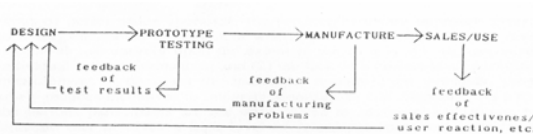


FIG. 1. Product Optimization in Single Organization



**Building process differ from other manufacturing processes:**

- Handed by a number of independent task organizations (designers, contractors, suppliers, etc)
- Relationship among the previous are temporary
- Information of building team is progressive (owner, contractor, etc.)



**Note:**

**Although the task organization appear at the staggered points in time and act as if they were entirely independent, the decision they make are highly interdependent.**

**Example:**

**A perfectly HVAC system may go shoddily if the design or installation of window turns out to sub-standard and the resulting air leakage exceeds the values anticipated by HVAC designers.**



**Conclusion;**

**The performance of a built facility is not equal to a simple aggregation of the performance of its part.**

**in other words  
about the product / hardware approach,  
optimization of sub-systems does not equal  
optimization of the whole project.**



**Each organization participating in the building team is itself an independent organization:**

- It has its own objectives
- It has its own long term plans, etc

**A temporary multi-organization has to cope with dissimilarities between two levels of objectives:**

- Temporary objectives of the organization responsible for the project / set by the client / users / community set.
- Permanent objectives of each participating organization:
  - Survived in the market place
  - Enhancement of the organization domain and its position in it.



**Once the individual firm become part of the project organization they have to accept certain limits**

- **The extent to which they may strive to achieve its own objectives within the envelope of resources available for the project**

**The degree to which a firm can meet its second objective depends on:**

- **The relative bargaining powers of the firm within the project organization**
- **The extent to which it can capitalize what bargaining powers its processes.**



**A situation can develop when an organization gains advantage at another's expense to the extend it may fail and jeopardize the first level objectives of the temporary organization**

**The main objective:**

**To create an environment that minimizes the risks of individual organizations failing to meet its second level objectives**





**Considerations for alternative approach:**

- **The strategic decision making in all building projects rests with the client / user / community set. Appraisal performance for the whole and not for individual.**
- **In projects procured by temporary multi-organizations greater pay-offs are available when a joint optimum return is sought (as opposed to the maximization of individual returns)**



**If the aim of performance appraisal**

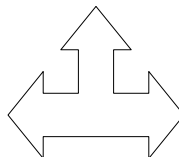


**To benefit subsequent building projects**



**Then it must satisfy two primary conditions**

**Take place at the level of the project**



**Its result must be expressed in a format to help client/user/community set optimize its strategic decision making function**





**The strategic decision maker must design the project organization to achieve both the maximization:**

- **Of the project-level objectives, and**
- **The participants' ones (to maximize their individual economic efficiency without any one of them ending up a net loser)**



**The strategic decision maker can control the outcomes by:**

**Allocating the bargaining power among the individual participants (the extent to which they are allowed to maximize their individual returns)**

**By accounting the expected outcomes of each task organization in terms of the final product, he can shift the traditional emphasis on sub-optimization toward optimization of the final product.**

$$\sum_{T=1}^n W_T U_T (X)$$

**Where:  $W_T$ = the relative weight accorded to the T th task organization (the bargaining power)**

**$U_T(x)$ = the economic efficiency benefits generated by the feasible solution X that accrue to the T th task organization.**

