

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



ENGINEERING MANAGEMENT

(GE 404)

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LECTURE #2

Project Management Organizational Structures

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- Objectives of the Present Lecture
- The Project Organization Structure
- Types of Project Organizations Structures
- Main Project Participants
- Structures of Contractual Relationship between the Project Participants
- Further Reading

Objectives of the Present lecture

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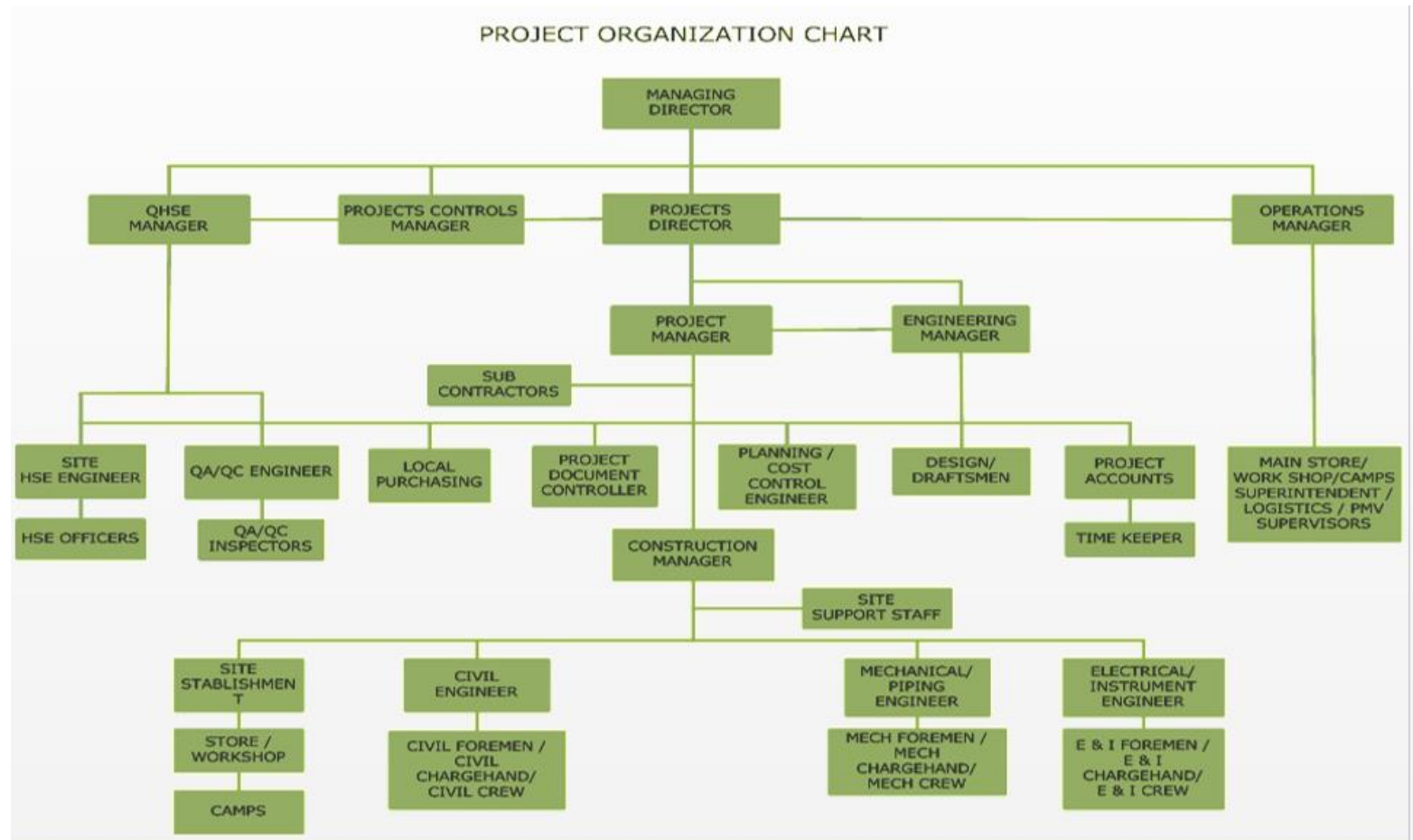
- To learn the ways through which organizational structure are defined
- To explain the popular structures of contractual relationship between the project participants

The Project Organization Structure

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- One of the important decisions of project management is the **form of organizations structure** that will be used for the project.
- A **project organization** is a structure that **facilitates the coordination and implementation** of project activities.
- The structure **defines the relationships among members of the project management** and the **relationships with the external environment**.
- The structure **defines the authority** by means of a graphical illustration called an **organization chart**.

Project Organization Chart



QHSE (Quality, Health, Safety, Environment): Four components of a responsible corporate management approach based on the belief that all accidents are caused by *human error* and are, therefore, *preventable with better training and administration*.

Objective of Project Organization

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- The main **objective** of Project organization is to **establish the relationship among:**
 - The work to be done
 - The people doing the work/**work team**
 - The work place(s)

Defining the Organization

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- Within the firm
 - Involves internal organization of personnel/employees (i.e. **to organize staff duties**)
- With other firms
 - Number of organizations involved
 - **Relationship** between the **organizations**
 - When each organization be involved in the project

Types of Project Organization Structures

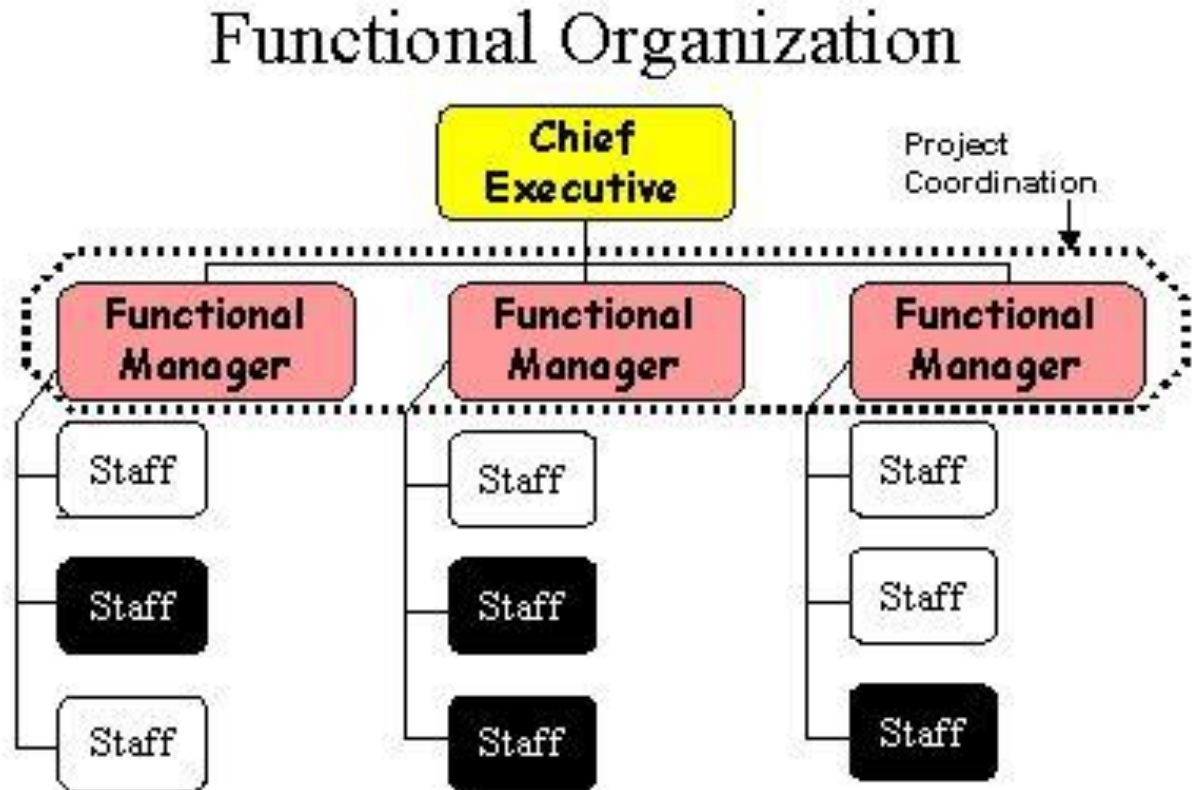
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- **Functional**
 - Personnel organized by *FUNCTION*, i.e. electronics, software, operations, etc.
- **Project**
 - Personnel organized by **Projects**, i.e. Ka Band receiver, Spectrometer, etc.
- **Matrix Organization**
 - Personnel organized in *BOTH* ways

Functional Organization

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Functional organization is a hierarchical organization where each employee has one clear superior, and **staff are grouped by areas of specialization and managed by a person with expertise in that area**

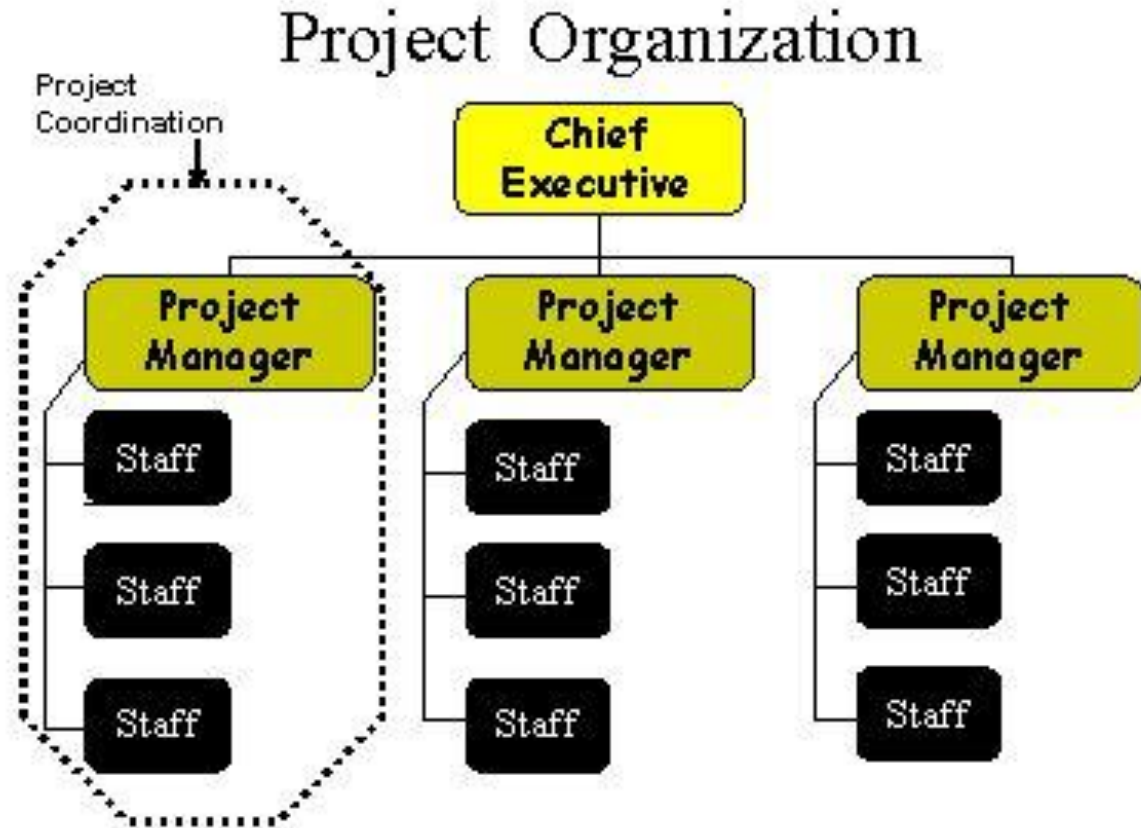


Black boxes indicate staff engaged in project activities

Project Organization

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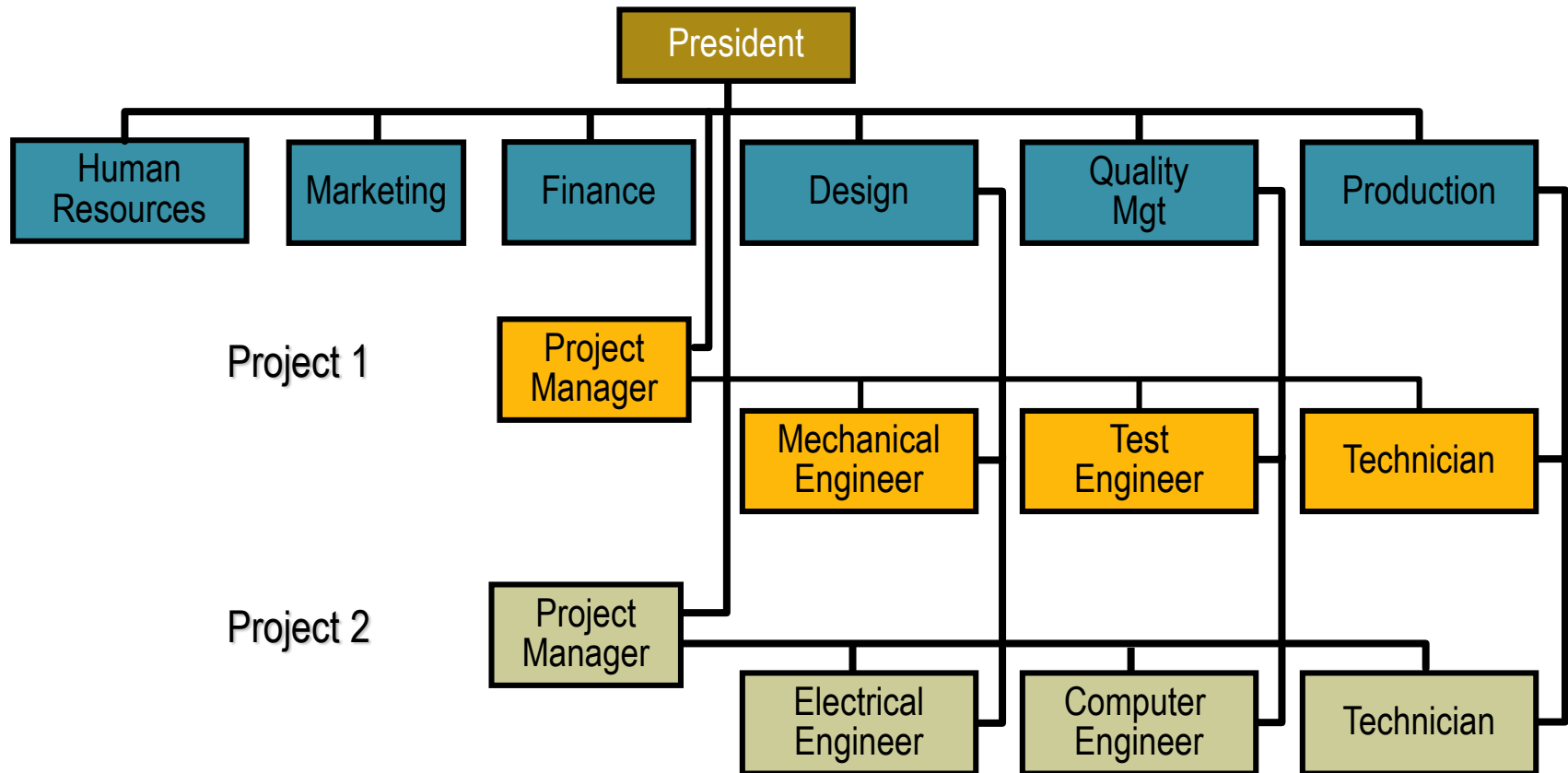
Project organization is any organizational structure in which the **project manager has full authority to assign priorities, apply resources, and direct the work of persons assigned to the project.**



Black boxes indicate staff engaged in project activities

A sample project organization

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“Project organization” works best when

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1. Work can be defined with a **specific goal and deadline**
2. The job is **unique** or somewhat unfamiliar to the existing organization
3. The work **contains complex interrelated** tasks requiring specialized skills
4. The project is **temporary** but critical to the organization
5. The project cuts across organizational lines

Characteristics of Project Organization

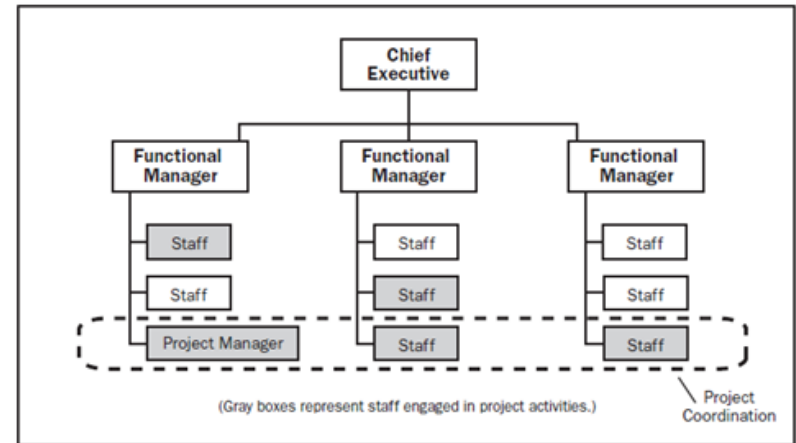
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- Often **temporary** structure
- Uses **specialists** from entire company
- Headed/leaded by project manager
 - Coordinates activities
 - Monitors schedule and costs

Matrix Organization

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- Matrix organization is any organizational structure in which the **project manager shares responsibility with the functional managers** for assigning priorities and for directing the work of persons assigned to the project
- Each staff member is a member of **2 distinct organizations**
 - Functional – Electronics, SDD, etc.
 - Project – PTCS, Ka Band Receiver, etc.



	Marketing	Operations	Engineering	Finance
Project 1				
Project 2				
Project 3				
Project 4				

Types of Matrix Organization

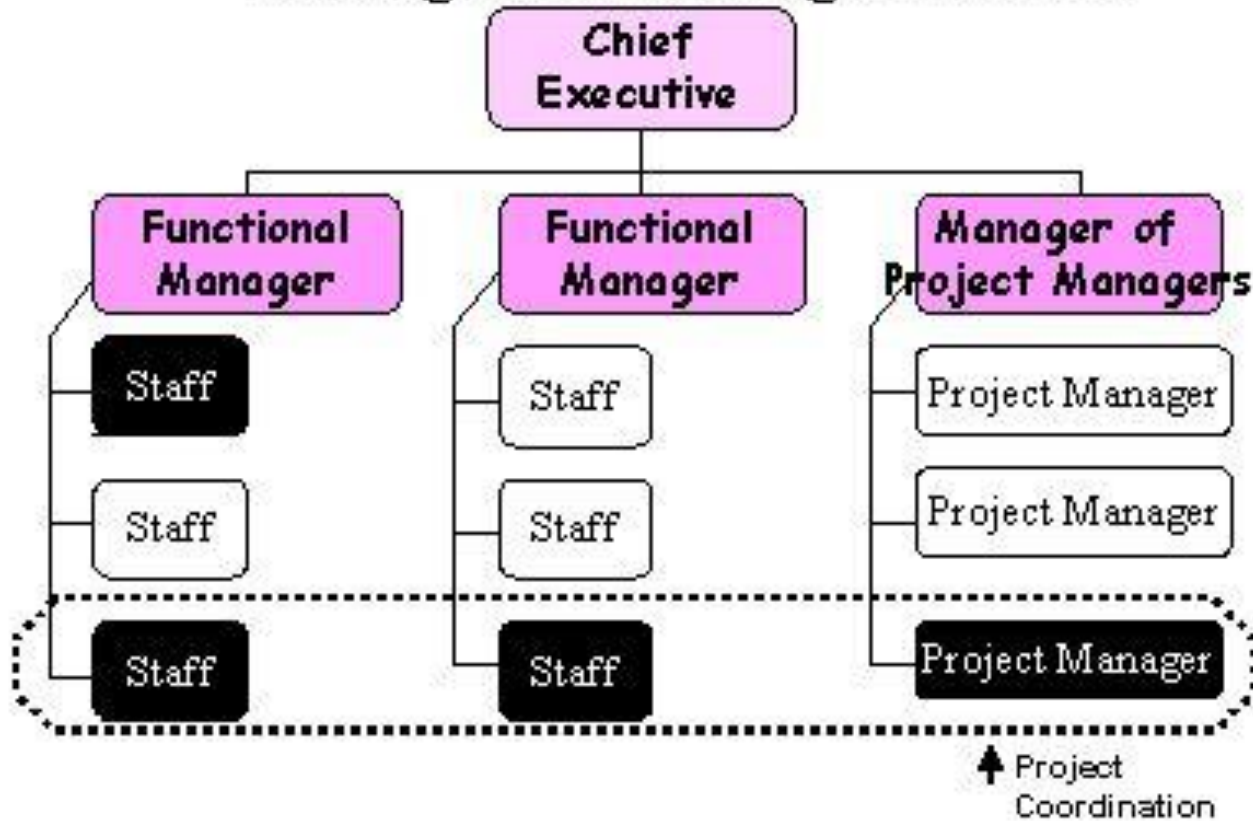
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- Strong Matrix
- Weak Matrix
- Balanced Matrix

Strong Matrix Organization

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Strong Matrix Organization

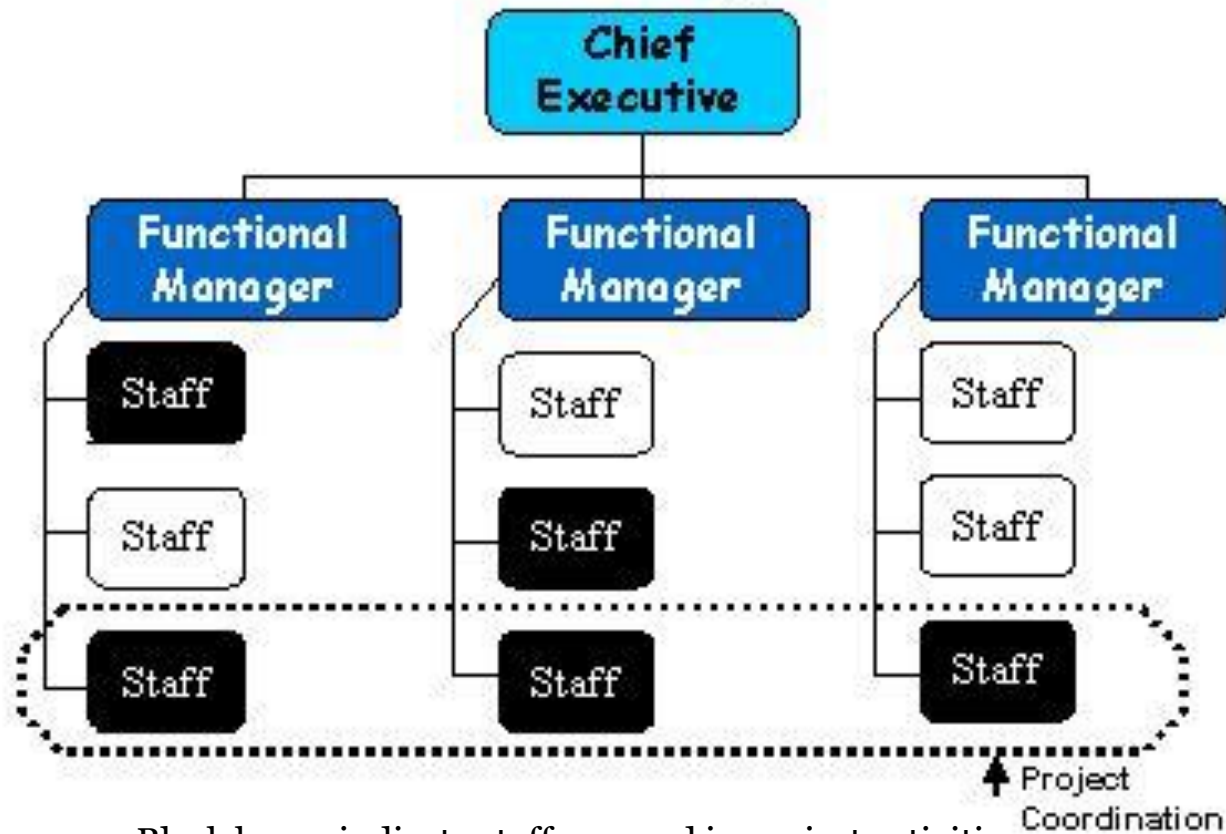


Black boxes indicate staff engaged in project activities

Weak Matrix Organization

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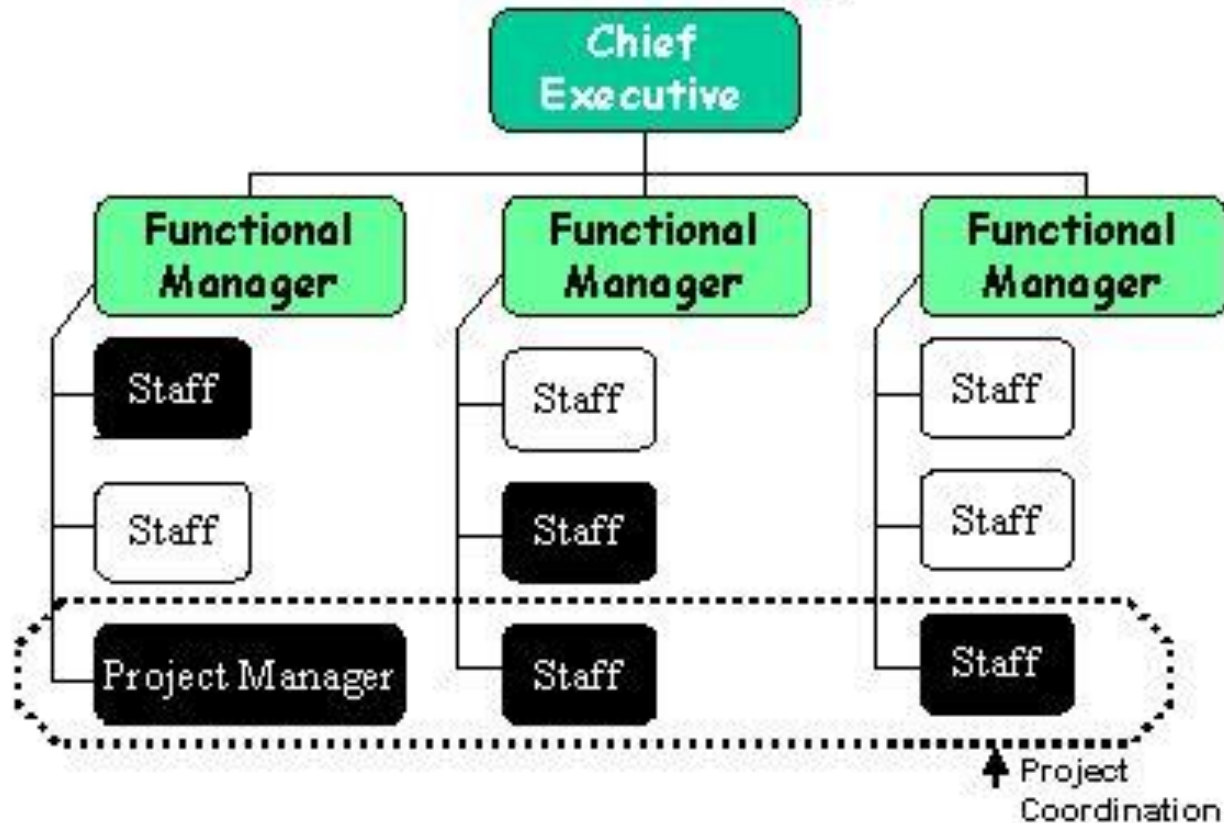
Weak Matrix Organization



Balanced Matrix Organization

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Balanced Matrix Organization

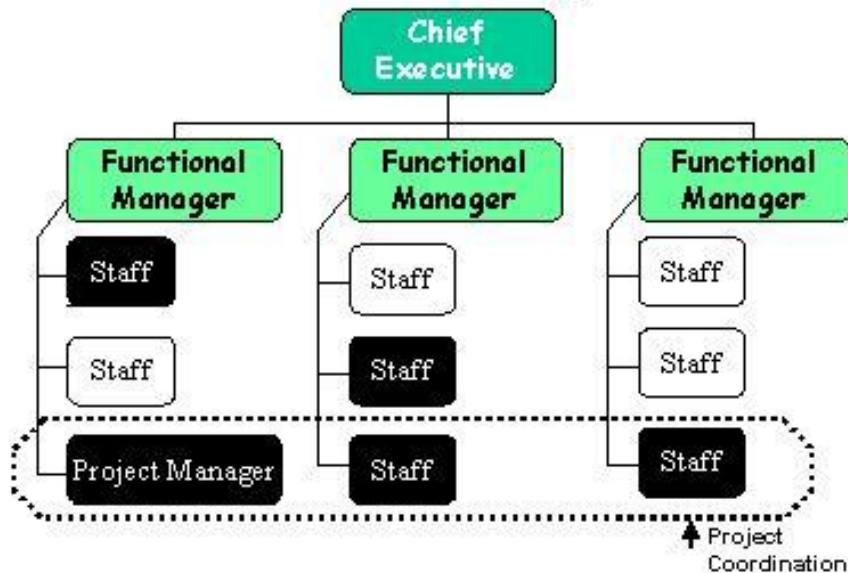


Black boxes indicate staff engaged in project activities

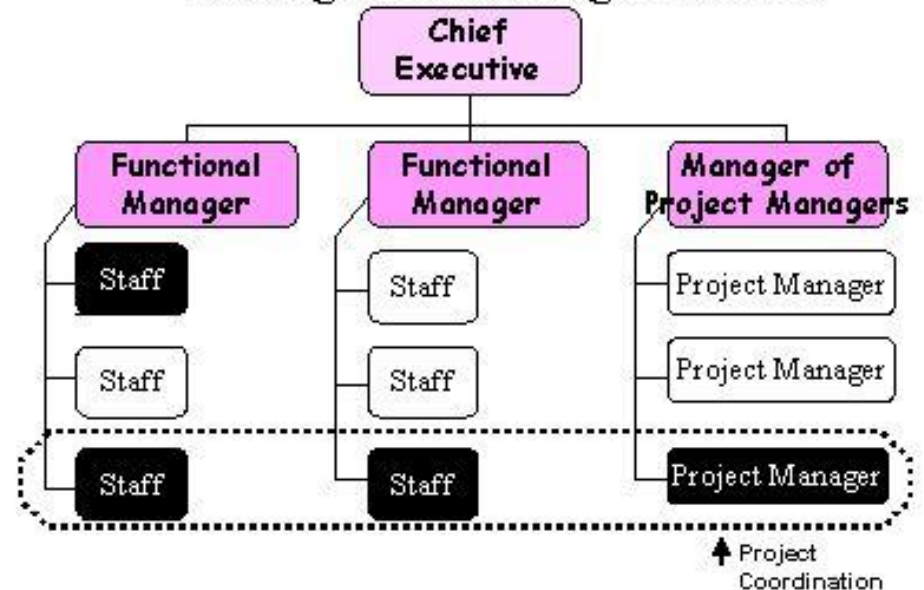
Balanced Matrix versus Strong Matrix Organization

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Balanced Matrix Organization



Strong Matrix Organization



Black boxes indicate staff engaged in project activities

Summary

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Project Characteristics / Organization Structure	Functional	Matrix			Projectized
		Weak Matrix	Balanced Matrix	Strong Matrix	
Project Manager's Authority	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Resource Availability	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Who controls the project budget	Functional Manager	Functional Manager	Mixed	Project Manager	Project Manager
Project Manager's Role	Part-time	Part-time	Full-time	Full-time	Full-time
Project Management Administrative Staff	Part-time	Part-time	Part-time	Full-time	Full-time

Main Project Participants

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- The Owner
 - Construction manager
- The Contractor
 - General and subcontractors,
 - Material and equipment supplier
- The Designer
 - Consultant and architecture/engineer (A/E)

Structures of Contractual Relationship between the Project Participants

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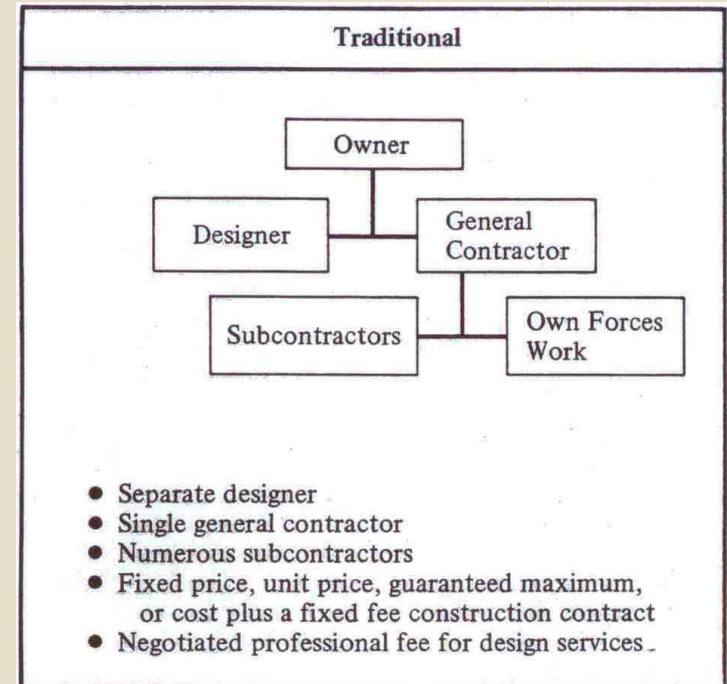
Four principal structures of contractual relationship exist between the project participants:

- Traditional
- Owner-Builder
- Turnkey
- Professional Construction Manager

Traditional

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- This is employed for **ordinary projects** of moderate size and complexity.
- In this, the **owner often employs a designer** (an architectural/engineering or A/E firm) which **prepares the detailed plans and specifications** for the constructor (a general contractor).
- The **general contractor is responsible** for the **construction** itself even though the work may actually be undertaken by a number of specialty subcontractors.
- The designer also **acts on behalf** of the owner to oversee the project implementation during construction.



Advantages and Disadvantages of Traditional Structure

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Advantages

1. Widely accepted and historically supported.
2. Using lump-sum the overall cost can be determined before awarding the contract.
3. Minimal involvement of the owner during construction.
4. Design-construct time can be reduced using phased construction.

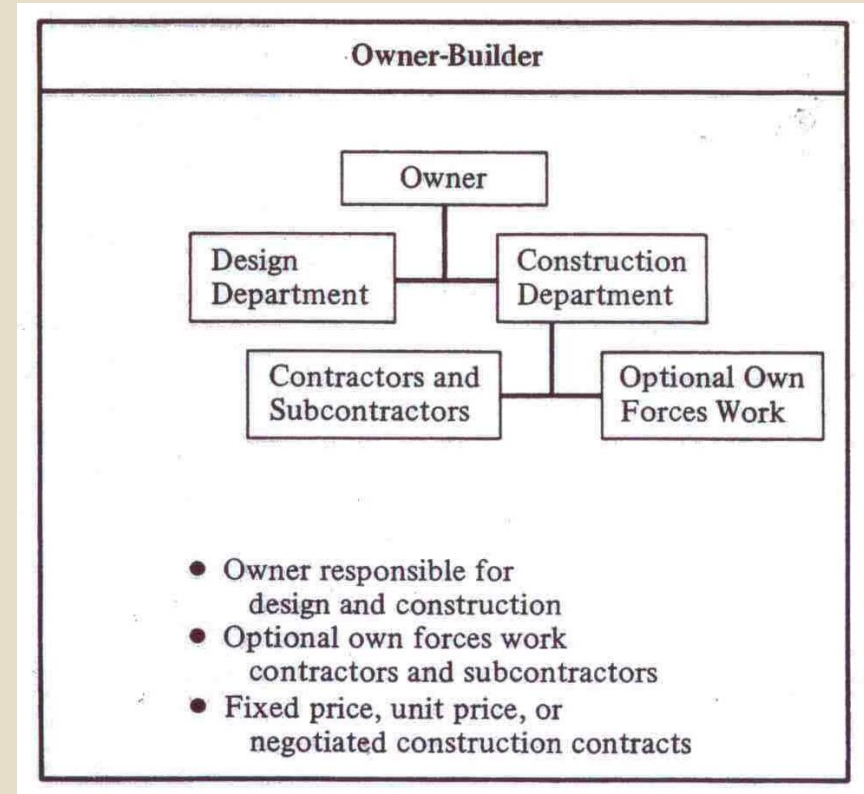
Disadvantages

1. Design may not benefit from construction expertise.
2. Overall design-construct time is usually the longest.
3. The owner and the designer are usually in an adversary position with general contractor (maximum vs. minimum quality).
4. Change orders will often end in disputes and may drive-up costs.

Owner-Builder

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- In this approach, **owner acts** as the general contractor on its own project, and is **responsible** for **design and construction**.
- However, the **owner may choose to subcontract a substantial portion of the project to outside consultants and contractors** for both design and construction, even though it **retains centralized decision making** to integrate all efforts in project implementation.



Advantages and Disadvantages of Owner-Builder Structure

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Advantages

- Justified when the volume of work is **relatively large and relatively constant** over a period of time.
- **The owner-builder can employ all techniques** of the design-constructor, the professional construction manager, and the traditional approach.
- Justified where the **project management** can be **separated** from **operational management**.

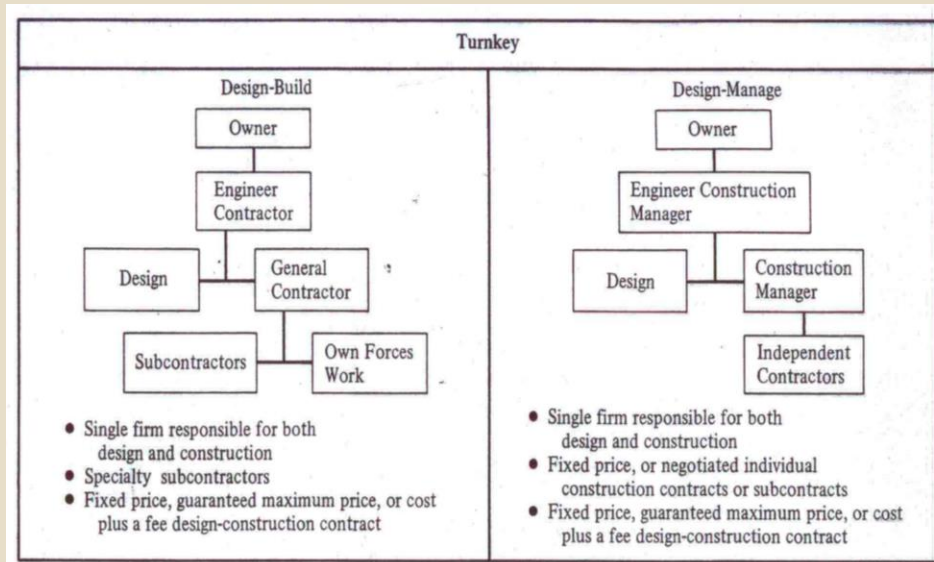
Disadvantages

- *Time.* Owner-builder structure, in general, **requires more time**.
- *Quality Control.* Quality is **difficult to maintain** in such structures.
- *Getting Finance.* Most lenders will not provide construction loans if the builder is an Owner-Builder. There are some very good reasons for this such as most people's **lack of experience**, a lack of **financial control** and the **risk that a project will be halted** due to family or other personal issues.

Turn-key

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- Some owners wish to delegate /assign all responsibilities of design and construction to outside consultants in a *turnkey* project arrangement.
- A contractor agrees to provide the completed facility on the basis of performance specifications set forth by the owner.
- This approach is the direct opposite of the owner-builder approach in which the owner wishes to retain the maximum amount of control for the design-construction process



Advantages and Disadvantages of Turn-key Structure

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Advantages

1. **Only one contract** for the owner. Design, construction, and know-how are furnished by a single organization.
2. **Minimal owner coordination** -dealing with a single organization.
3. Appropriate for **unknowledgeable** owner.
4. **Design-construct time** can be **reduced** through using phased construction.
5. **Construction expertise** can be **utilized** during **design** phased construction.
6. **Change orders** are **easy to handle**.

Disadvantages

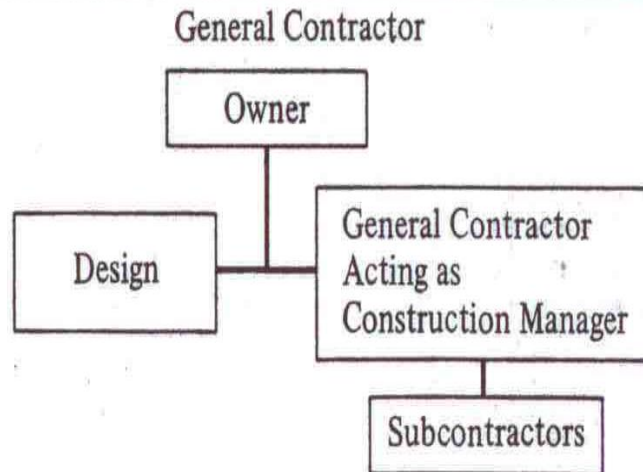
1. Usually **cost cannot** be **determined** before **construction**.
2. If the project cost is **fixed price**, the **overall quality** and performance may be **affected** to ensure profit.
3. The **owner may not** be **informed** if there is a design or construction **problems** that may **affect** the **schedule or the cost**.

Professional Construction Manager

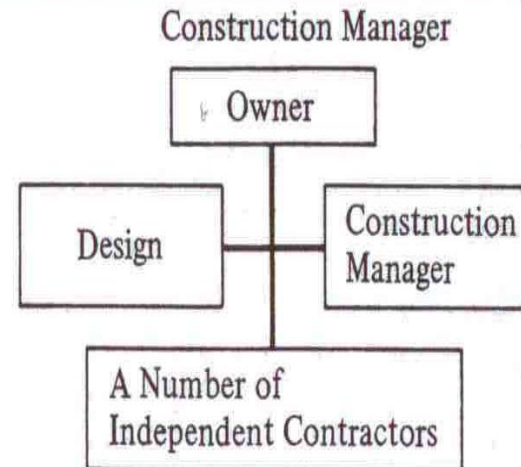
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- Professional construction management refers to a project management team consisting of a professional construction manager and other participants who will carry out the tasks of project planning, design and construction in an integrated manner.
- A professional construction manager is a firm specialized in the practice of professional construction management which includes:
 - Work with owner and the A/E firms from the beginning and make recommendations on design improvements, construction technology, schedules and construction economy.
 - Propose design and construction alternatives if appropriate, and analyze the effects of the alternatives on the project cost and schedule.
 - Monitor subsequent development of the project
 - Coordinate procurement of material and equipment and the work of all construction contractors

Professional Construction Manager



- Three-party team of owner, separate designer, and general contractor acting as a construction manager
- Fixed price or negotiated independent subcontractors
- Construction manager usually acting as agent for owner
- Negotiated professional fee for construction management services with cost reimbursement for subcontractors
- Negotiated professional fee for design services



- Three-party team of owner, designer and construction manager
- Fixed price or negotiated individual construction contracts directly with owner
- Construction manager may act as owner's agent to extent delegated
- Negotiated professional fee for construction management services
- Negotiated professional fee for design services

Advantages of Professional Construction Manager

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Advantages

- **Special construction skills** may be utilized at all stages of the project with no conflicts of interest between the owner and the designer.
- Independent evaluation of costs, schedules, and overall construction performance, including similar evaluation for changes or modifications helps assure decisions in the best interest of the owner.
- Full-time coordination between design and the construction contractors is available.
- Minimum design-construction time can be achieved through use of phased construction.
- The professional construction manager approach allows price competition from local contractors akin to the traditional lump-sum or unit-price methods.
- Significant opportunities are provided for value engineering in the design, bidding, and award phases.

Disadvantages

- The most significant disadvantage of many Construction Management contracting arrangements is that significant portions of the total services for which the Construction Manager is remunerated are not subject to competitive bidding.
- A second commonly seen disadvantage is the open-ended nature of many Construction Management contractual arrangements, which unnecessarily expose the Owner to the risk of unanticipated cost increases.

Further Reading

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Read more about the Project Management Organizational Structures from:

http://pmbook.ce.cmu.edu/o2_Organizing_For_Project_Management.html

Thank You

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Questions Please

