International Council on Systems Engineering
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Applying Systems Engineering to Develop a Management Operating System at a National Laboratory

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Agenda

- Motivation
- Transformation
- Management Operating System Framework
- Conclusion

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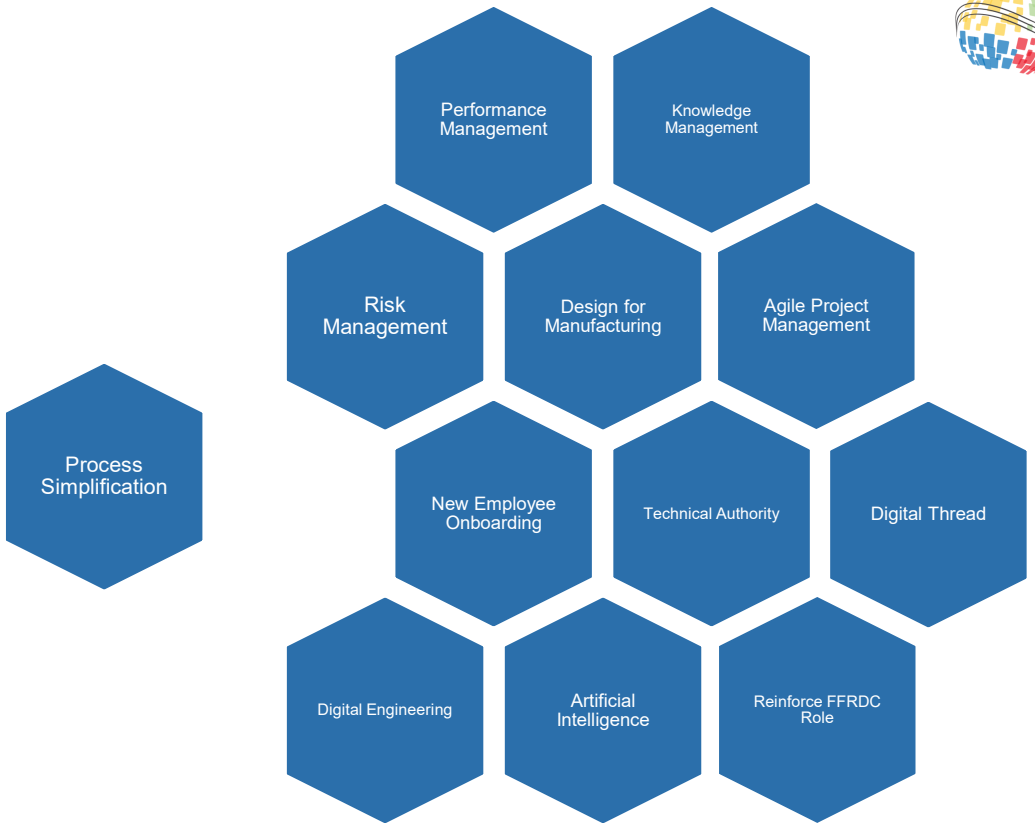
Things are changing rapidly

Why are we doing this work?

Have you heard these or similar terms?

In a time of quick change, we are increasing the amount of changes to our operations and workflows



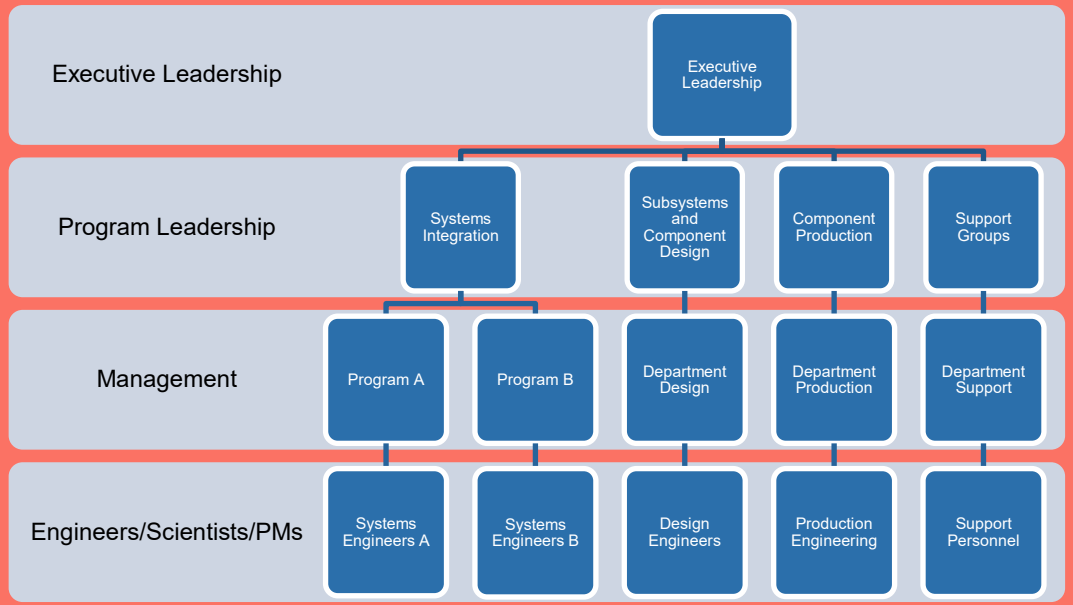
But are we taking a systematic look at how all these operations are interrelated?

Are we considering people's reaction to all these changes to how they do work?

Organizational Structure

Organizational structure adds complexity

- **For example, design engineers can be supporting both Program A and Program B**
- **In some instances Program A and Program B may have different (and divergent) operational tasks for the engineers**
- **Engineer needs to operate in two different *operational environments***



Two levels of complexity (at least)

Organizational Environment

Operational Environment

Can we create an operational environment that translates seamlessly regardless of Program (addressing organizational environment)?

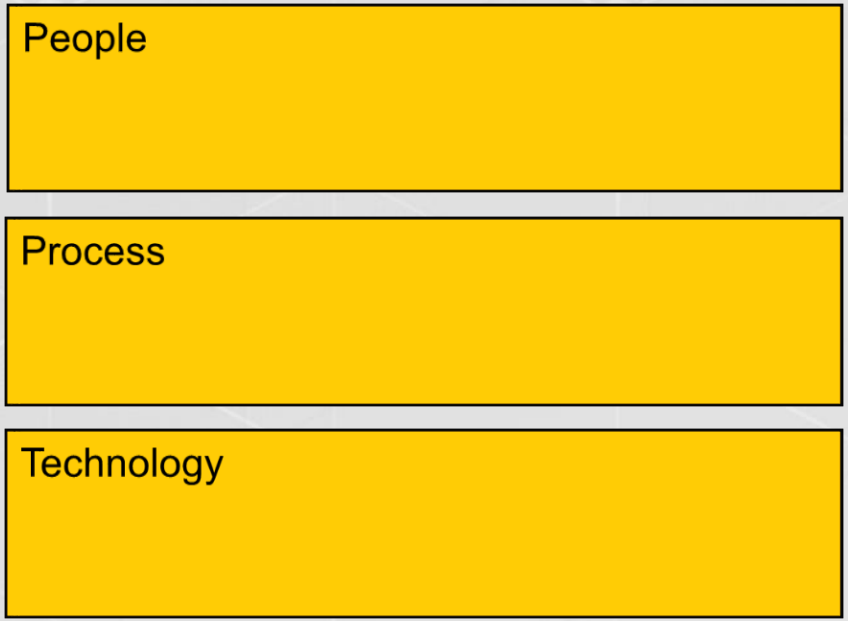
Are we taking into account the effects on people of being asked to change their workflows not only as time and new initiatives are implemented but also depending on what Program they are supporting any given day?

A Deep Transformation

A deep transformation to how we do work may be needed in a large organization with decades of history as the national security's threat environment evolves rapidly

- What are aspects of the current workflows that can be upgraded or streamlined by transformation initiatives?
- What aspects of the workflows can be leveraged across programs and portfolios?

Transformation

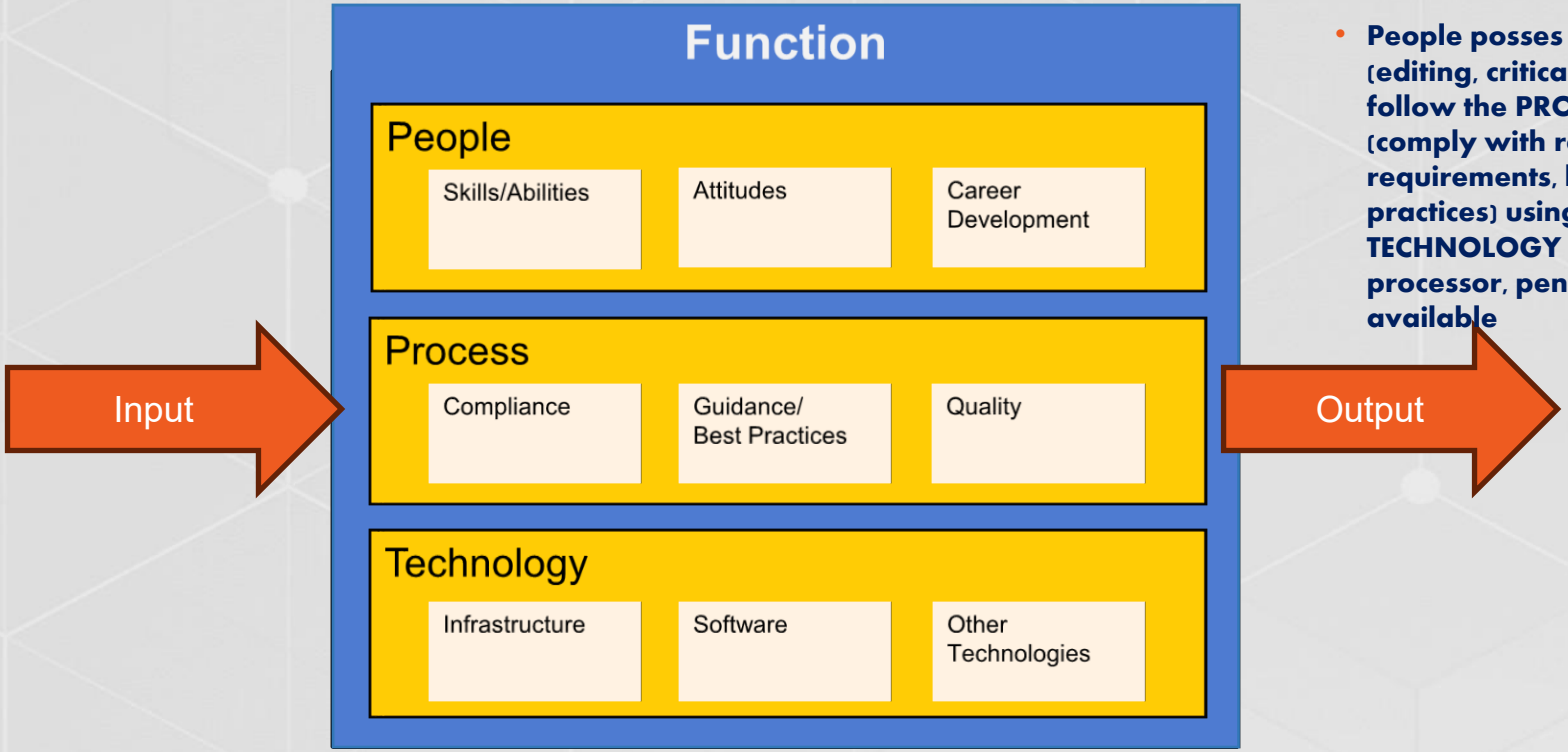


- Changes/transformations are commonly seen through the People-Process-Technology framework
- People: Skills, attitudes, abilities
- Process: Workflows, procedures, routines
- Technology: Tools, systems software
- Example: Transforming how we write reports…

Throughout this presentation I will be using our lexicon. Each organization needs to establish their own lexicon

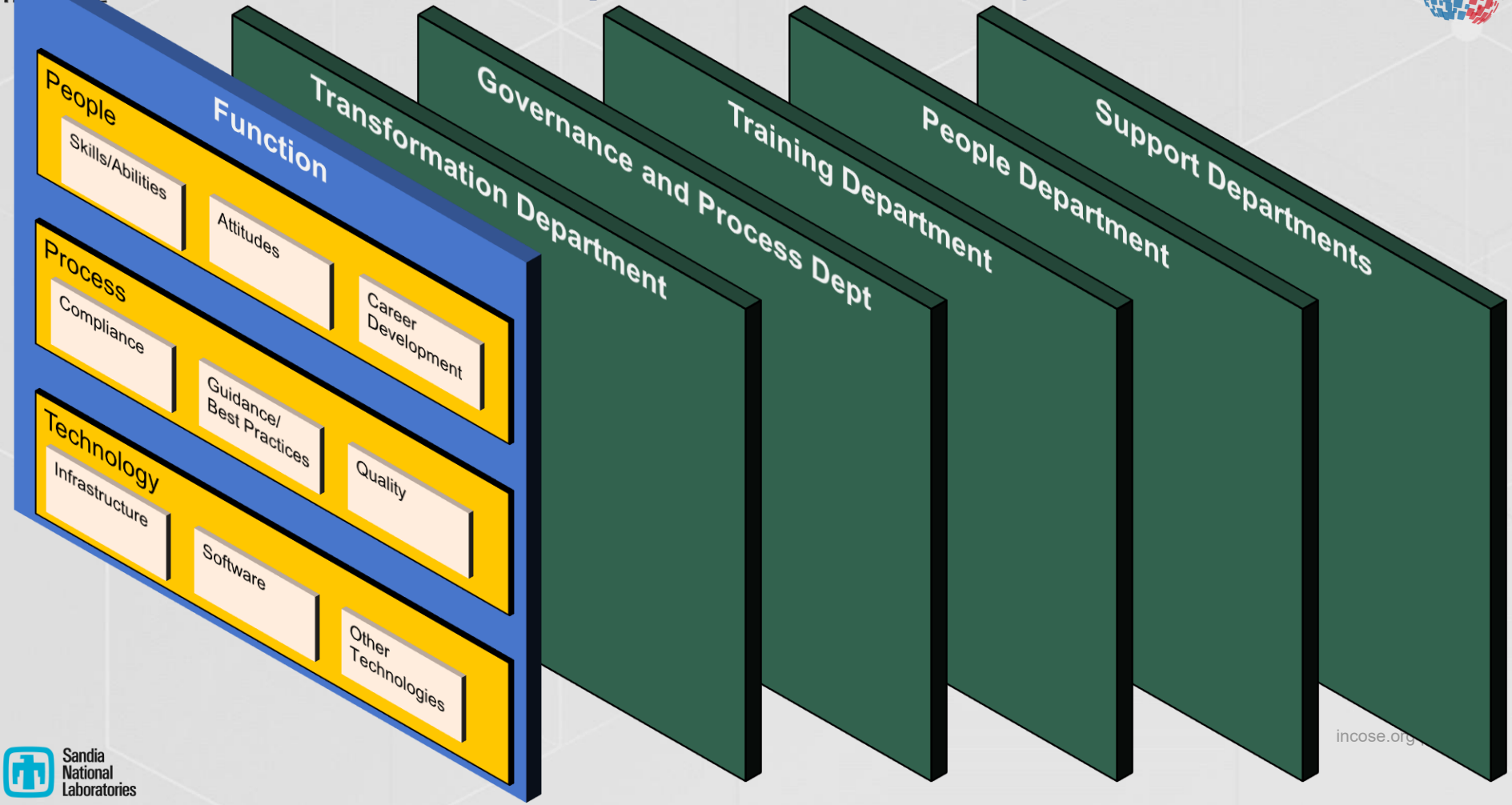
Report Writing Example

- People posses the SKILLS (editing, critical thinking) to follow the PROCESS (comply with reporting requirements, best writing practices) using TECHNOLOGY (word processor, pencil, AI) available



Functions are tasks that use an input to produce an output and are performed by a combination of People, Technology and Process Each function element is formed by sub elements (Functional Elements)

Functional elements are layered across several organizations



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Each organization manages different functional elements

Report Writing Example

- **If writer is a mechanical engineer in the MechE department what process and technology do they need and where can they find them?**

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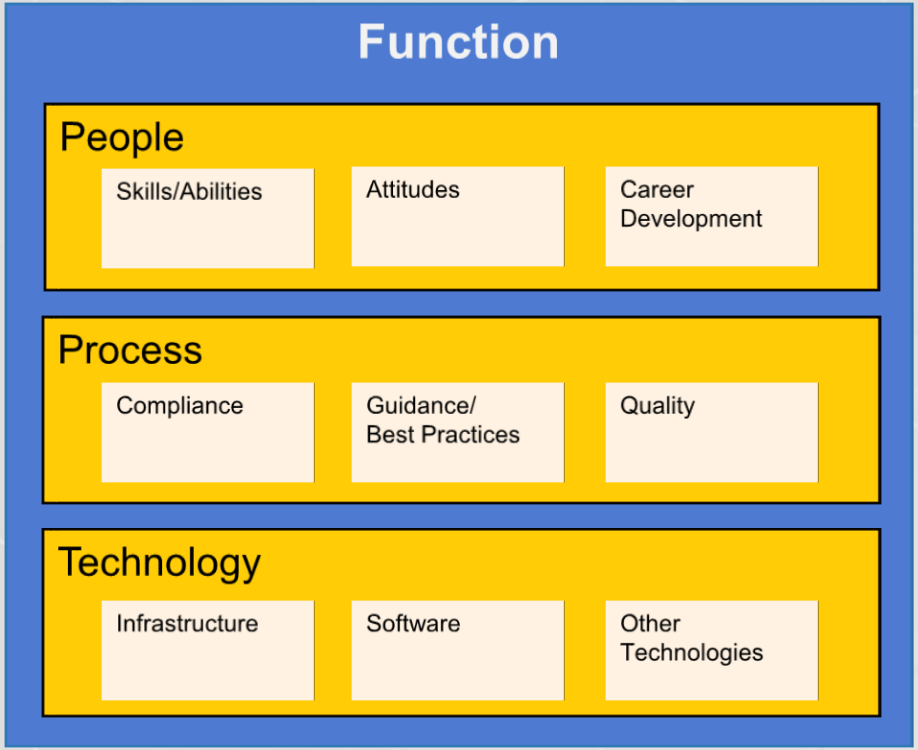


Functional elements need to be coordinated to ensure that function is effectuated properly

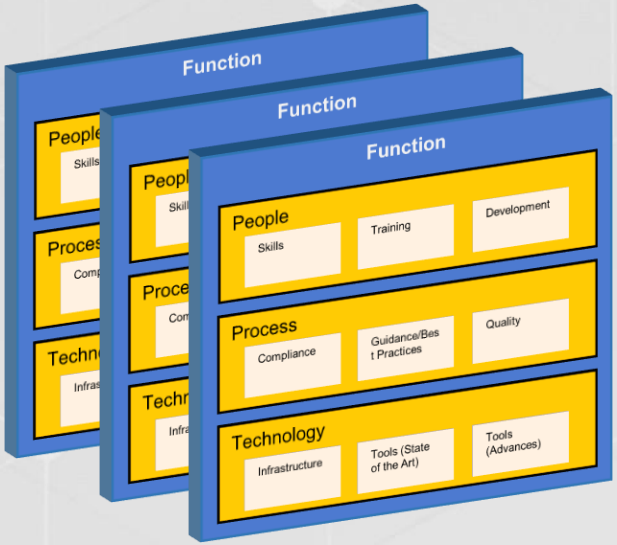
- The location of functional elements across the department allows them to concentrate on their competencies
- Provides an avenue to streamline processes and workflows when there is an understanding of who is responsible for what across the organization

Report Writing Example

- **Function: Write report**
- **For our mechanical engineer, if a transformation to use AI to aid in report writing is underway, who needs to act? How do we ensure that we have an effective way to integrate the elements of the transformation?**

But we are not done!

Functions are grouped to produce more tangible outputs
Can be assigned to deliverables

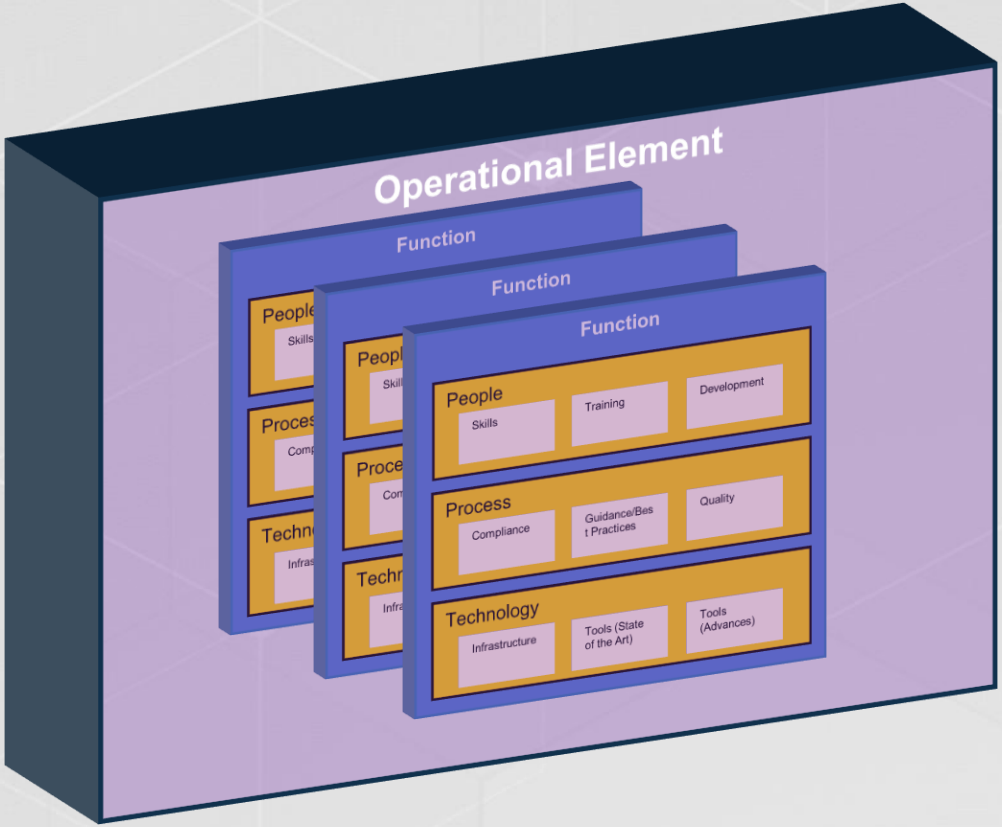


Report Writing Example

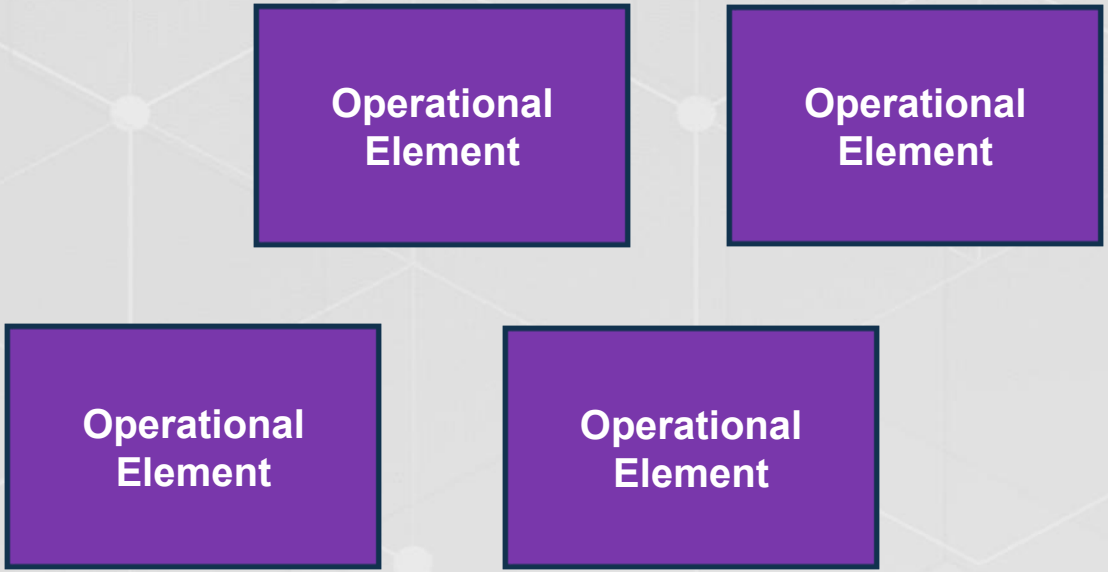
- **The written report may be part of a bigger deliverable assigned to a milestone (maybe a full design package to support a design review)**

Report Writing Example

- **Operational Element: Complete Design Package**
- **The written report may be part of a bigger deliverable assigned to a milestone (maybe a full design package to support a design review)**



These function groups are called operational elements



Report Writing Example

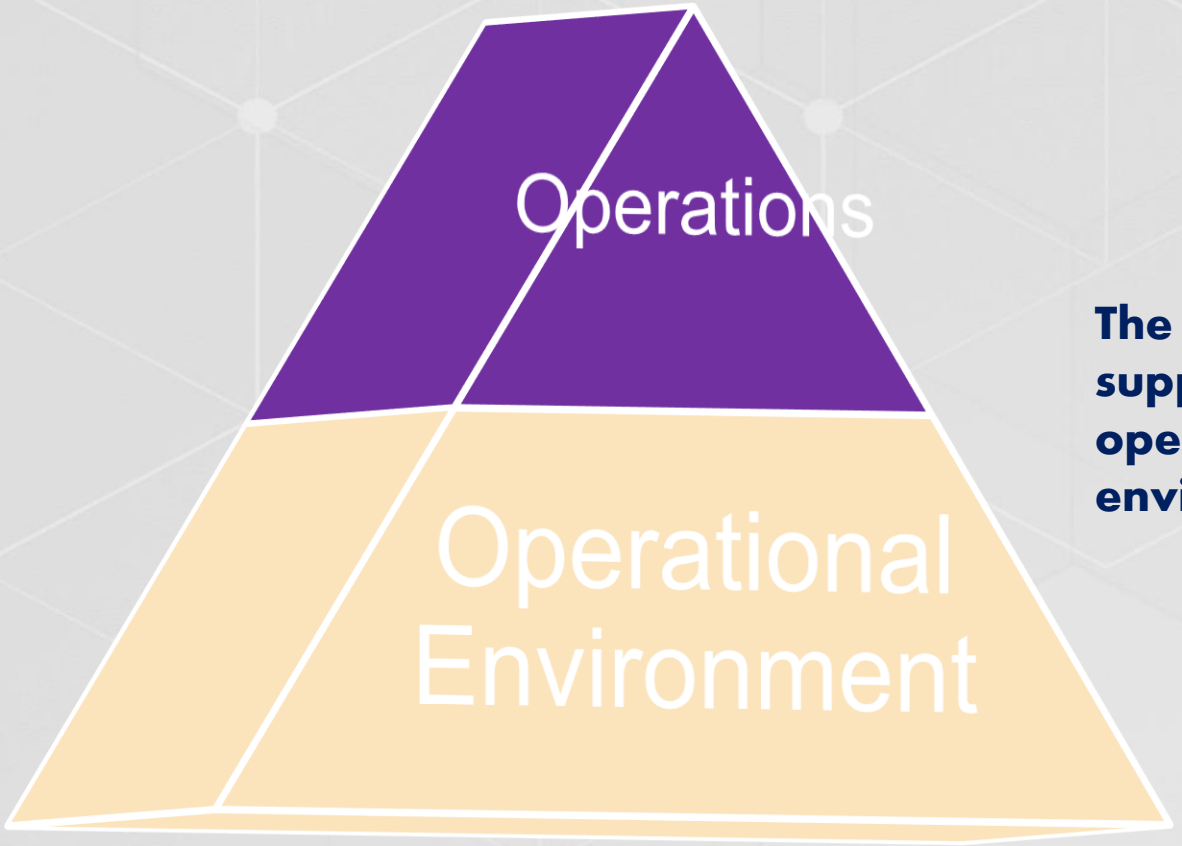
- Collection of Operational Elements (Project?): Final Product Design supported by Development Process
- We may have to generate several design packages (and write several reports) along the product development to support several design reviews (conceptual design, baseline design, final design)

The operational elements generate more tangible products that generate value for the organization

Report Writing Example

- **Operations: What steps/workflows/etc. we follow to deliver our products.**

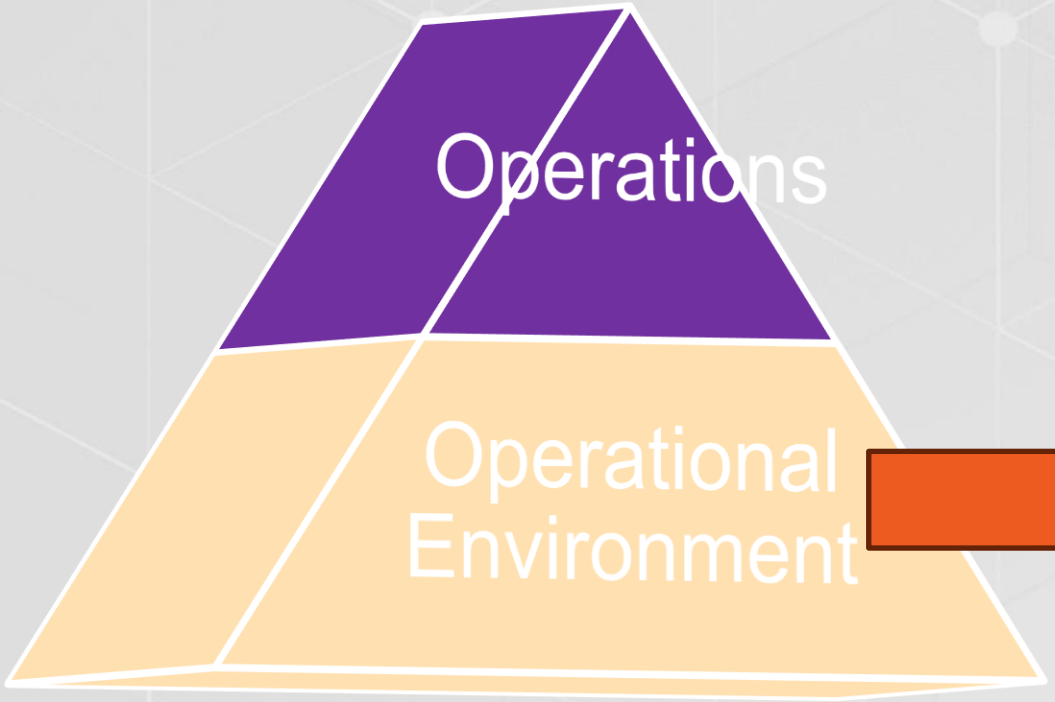
When put together, the group of operational elements form the operations for the organization



Report Writing Example

- **Operational Environment: Conditions "on the ground" to complete work/projects**
- **Does our engineer have to follow different rules to write his reports depending on the program he works in? How does he know what those rules are?**

The operations must be supported by an operational environment

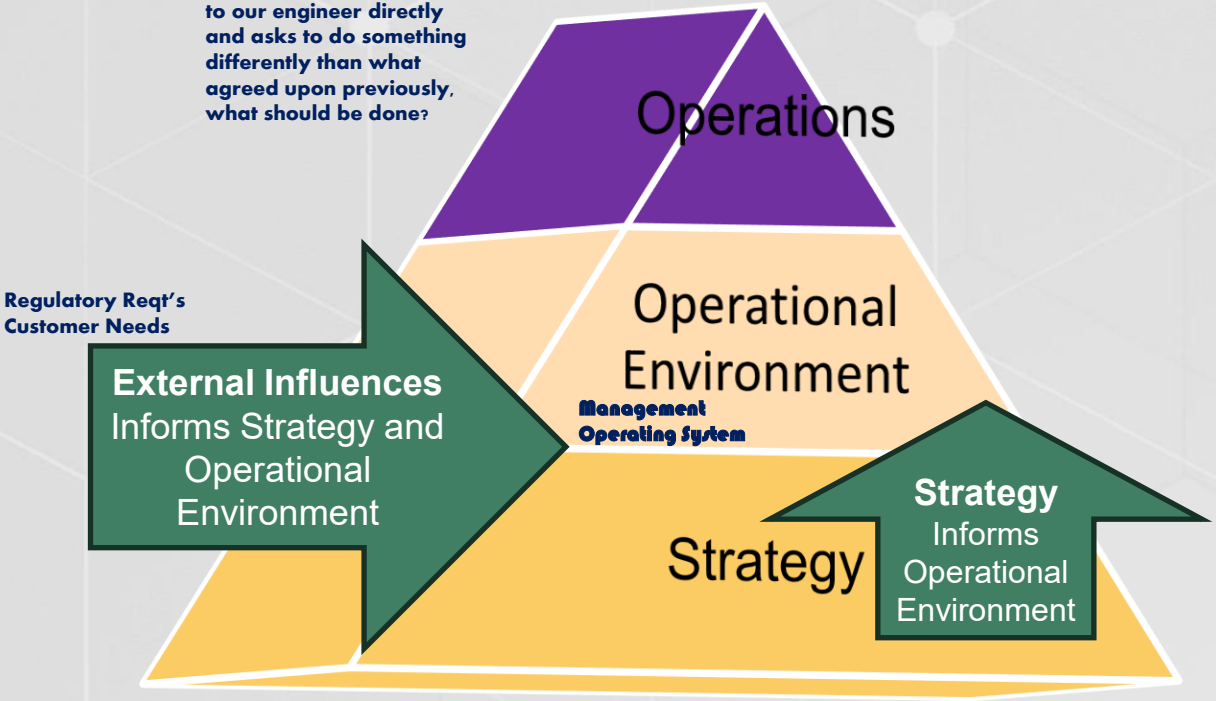


Management Operating System

A framework to support the organization achieve a consistent operational environment that is consistent across provides cohesiveness and a deep understanding of the operations

Report Writing Example

- **Strategy: How much does our report writing engineer knows/need to know about strategy?**
- **If a customer comes directly to our engineer directly and asks to do something differently than what agreed upon previously, what should be done?**

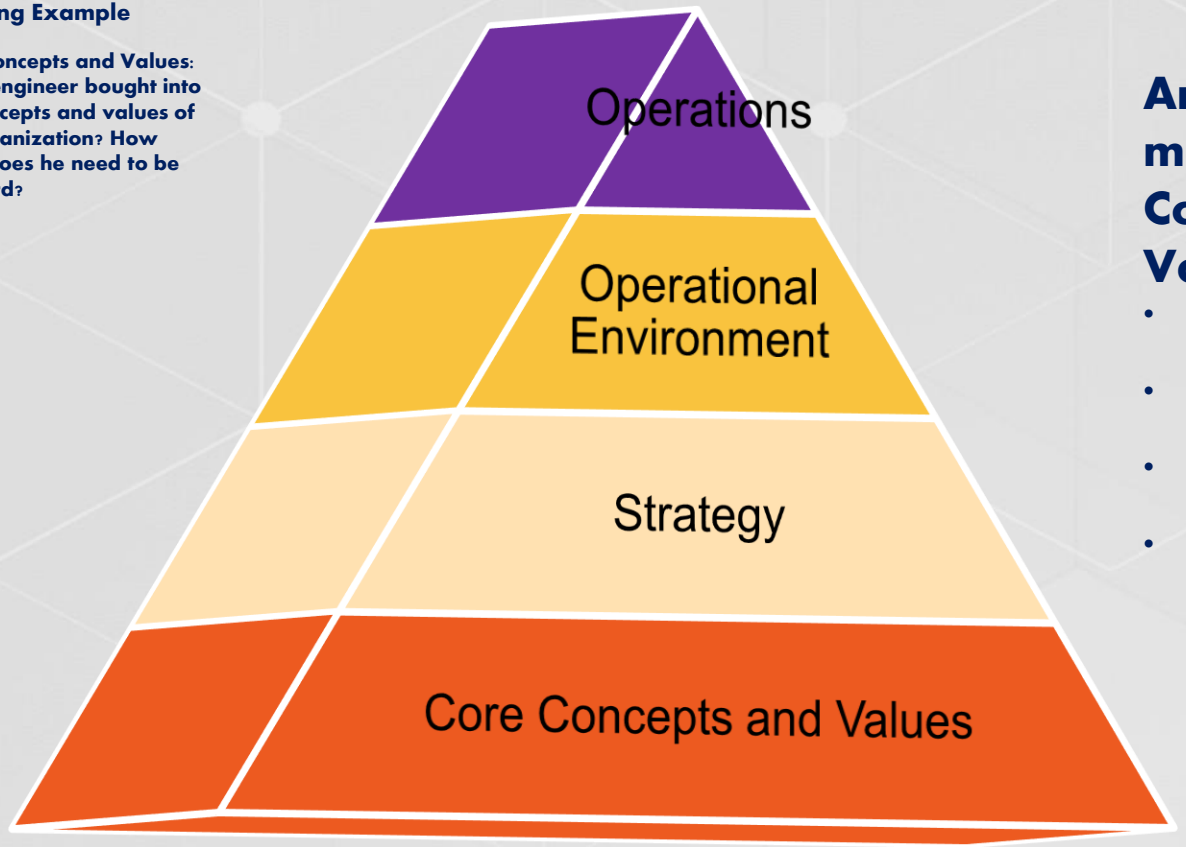


The operational environment is influenced and informed by the external influences and the organization's strategy

Provides a single point of entry for these influences into the operations and prevents undesirable reactive behaviors

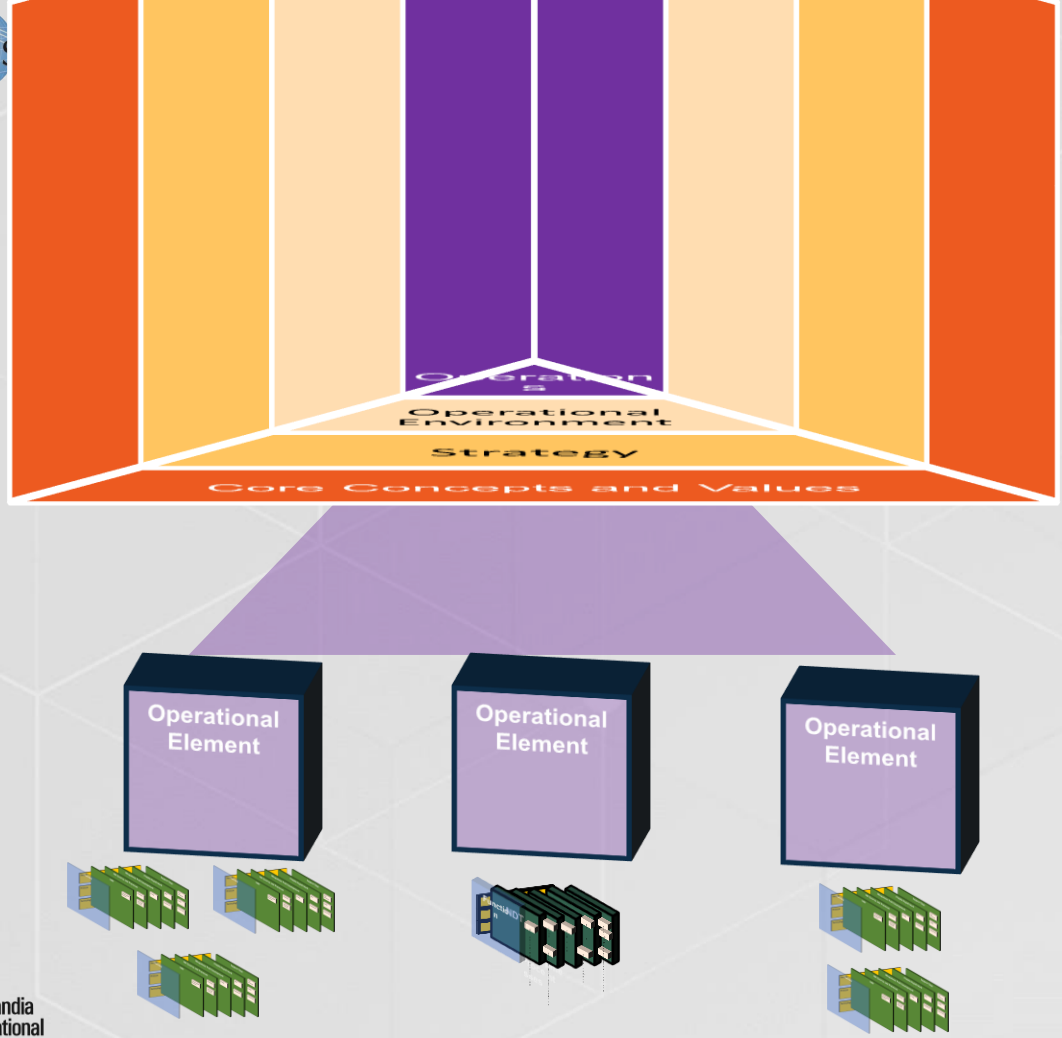
Report Writing Example

- **Core Concepts and Values: Is our engineer bought into the concepts and values of the organization? How much does he need to be onboard?**



And all these elements must be founded on Core Concepts and Values

- **Foundation of the Management System**
- **Flows Up and Down the Pyramid**
- **Shared by ALL in the organization**
- **Intrinsic to all elements in the pyramid**



Management Operating System

- Creates the cohesive and accessible Operational Environment for the organization
- Integrates Operational Elements
- Coordinates Efforts by Different Departments
- Ensures that People Process and Technology are always part of operational elements

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The operating system needs to be looked at with a systems engineering view

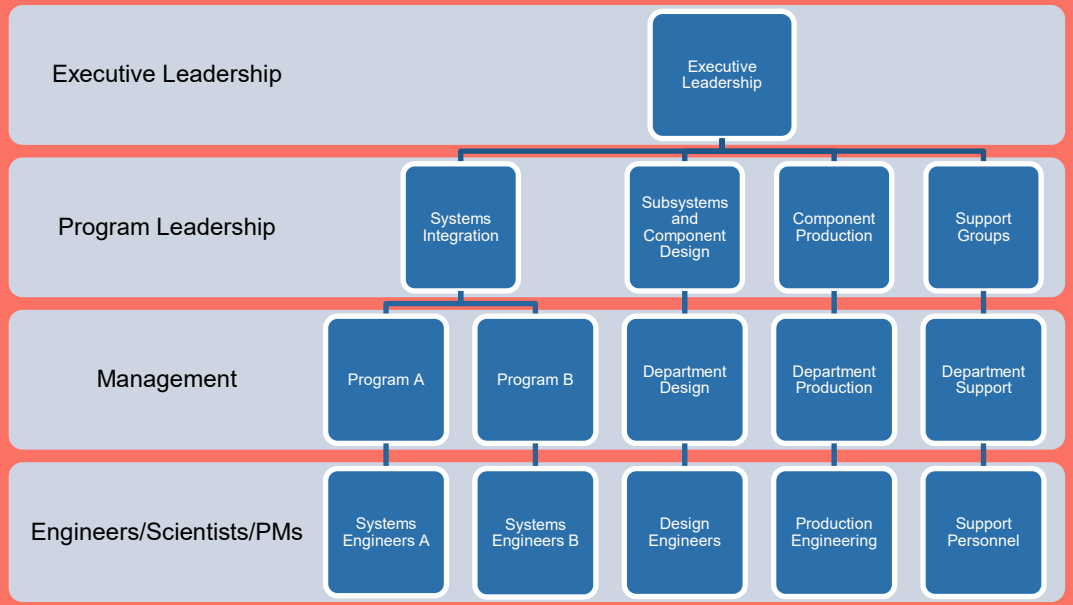
Autonomy and competency

Questions that need to be accounted for are dependent on the organization itself

- ***How much autonomy needs to be left at the program and department levels?***
- ***How much authority needs to be delegated or retained at the leadership levels?***

- **Not easy questions to answer**

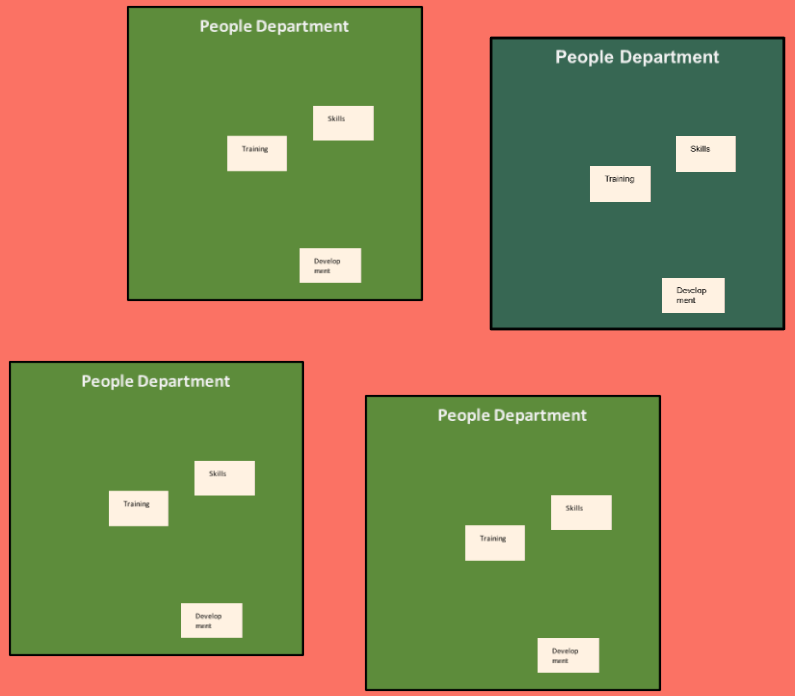
But the operating system must not forget about the organizational structure



Autonomy and competency

Understanding the responsibilities that are managed by each department, the right level of autonomy to develop their competencies

But the operating system must not forget about the organizational structure



Autonomy and competency

For example, the mechanical design department (People Department) can collaborate with the Training and Support departments to provide the resources necessary to do their jobs (engineers doing procurement?).

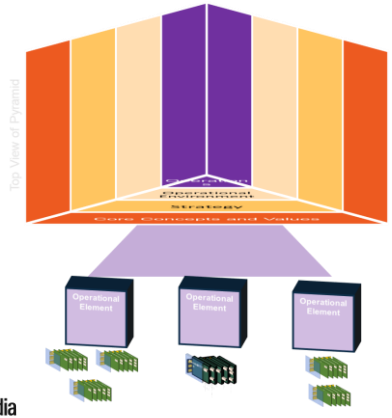
People department's competency is in mechanical design and should concentrate in growing those competencies.

A well designed operating system creates the links between the competencies across the organizations

Conclusion

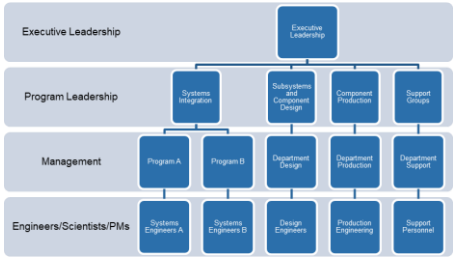
Systems Engineering

A Management Operating System is a complex, multi-dimensional system and requires a systems engineering lens to study
It is a dynamic system that needs to be well understood and maintained
If operations (and how they are flowed down and up the "operational pyramid") are not understood, they cannot be upgraded effectively



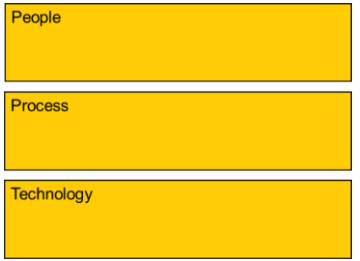
Organizational Dynamics

The inertia of organizational dynamics and the autonomy across the organization must be taken into account and is not a trivial element of a management operating system.
Such a system does not occur by happenstance (the fact that projects are completed does not mean that they are the product of good operations) and requires deep collaboration across the organization.



People

The people aspect of operations (and changing them) needs to be central. Concentrating in specific aspects of the operations (such as compliance or using the latest trendy technology) is not sufficient to transform an organization to position itself for successfully achieving its goals.



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