MANAGING SUPPLY CHAIN COMPLEXITY

Topics

- Define the concept of complexity

- Identify the types of complexity

- Discuss why complexity is (generally) bad

- Review why supply chains and organizations become complex

- Present approaches for reducing unwanted complexity

A True Story….

A number of years ago a fire destroyed the Japanese supplier that provided a critical brake P-valve to Toyota. Toyota's focus on lean caused the company to shut down all Japanese assembly operations within hours because of no backup supply or supplier. However, the response from other suppliers to help Toyota was nothing less than astounding. Seeing a direct linkage between Toyota's and their destiny, suppliers (including those that did not produce brake parts) did whatever they could do to build tooling and brake parts, all without contracts, lawyers, or negotiations. During the recovery Toyota's engineers came to realize that **over time they had designed 200 P-valve variations, many of which had complex tapered orifices that required highly customized jigs and drills**. This made the recovery from the fire that much more challenging.

Defining complexity....

- In 1964, Supreme Court Justice Potter Stewart expressed his opinion on what is obscene in a free society and what is an expression of art. When commenting about the difference between pornography and art, he famously said, "I know it when I see it."

- While there are no hard and fast rules telling us if something is too complex, we usually know it when we see it.

Defining complexity....

- Something is complex if it is complicated, intricate or hard to separate, analyze, or solve

- The issue is not whether something is complex or not, but rather at what point does something become excessively complex

- Complexity is like cholesterol—there is good cholesterol and bad cholesterol. And, we can tolerate the bad cholesterol up to a point (now, substitute the word "complexity" for "cholesterol" in the previous sentence)

Is this process too complex?

At a private U.S. university <u>any</u> change to an academic course or program must pass through a sequential series of steps before final approval:

1) the department that puts forth a proposal must have its members review and approve it,

2) the proposal is reviewed by a Dean's executive committee comprised of department chairs,

3) a College Policy Committee made up of business faculty reviews the proposal,

4) members from the entire business college vote to accept the proposal,

Is this process too complex? (continued)

At a private U.S. university <u>any</u> change to an academic course or program must pass through a sequential series of steps before final approval: (continued)

5) a sub-committee of the university Educational Policy Committee reviews the proposal,

6) the full university Educational Policy Committee reviews and votes on the proposal, and

7) the full faculty of the university vote whether to accept the proposal. The cycle time for this process can be <u>up to a year before final changes are put in place</u>.

Broad types of complexity....

Institutional complexity stems from strategic choices, the external context (such as regulations), and from major choices about organizational and operating systems.

Organizations that learn how to manage and exploit institutional complexity can generate additional sources of profit and competitive advantage.

When managed well, complexity can also increase corporate resilience by enhancing the ability to adapt to change.

Based on research by McKinsey

Broad types of complexity....(continued)

Individual complexity includes the way employees experience and deal with complexity. Employee role ambiguities, conflict, administrative burdens, duplicate roles, and ill-defined processes all contribute to individual complexity.

McKinsey research determined that companies reporting the lowest levels of individual complexity had the highest returns on capital employed and returns on invested capital.

Assessing Individual Complexity

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
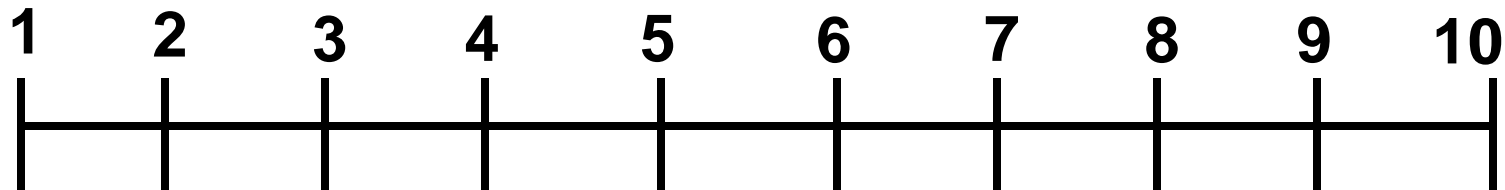
No administrative demands. Employees are able to focus 100% on achieving their key objectives without distractions. The "cycle time" required to accomplish objectives is short.

Heavy administrative burdens and constant distractions means employees are unable to spend much time on accomplishing their key objectives. The "cycle time" required to accomplish key objectives is long.

Specific types of complexity....

Designed complexity—this results from choices about where the business operates, what it sells, how it sells, to whom its sells, etc.

Inherent complexity—this is intrinsic to the business and can only be removed by exiting a portion of the business.

Specific types of complexity.... (continued)

Imposed complexity—this includes laws, industry regulations, and interventions by external organizations.

Unnecessary complexity—this results from a misalignment between the needs of an organization and the processes in place to support it. This is probably the easiest complexity to address.

Why complexity is (generally) bad….

✓ Complexity drives up costs

✓ Complexity is the antithesis of lean

✓ Complexity works against speed and flexibility

✓ Complexity stifles innovation

✓ Complexity affects quality adversely

✓ Complexity affects employee moral

Complexity drives up cost….

Scenario—Too Many Suppliers

While maintaining multiple suppliers for every purchase requirement was often seen as a way to create competition and guarantee access to supply, we now realize that a supply base that is too large in terms of numbers creates many adverse consequences, including costs that are unnecessarily high.

What are some of the beneficial effects of a rationalized supply base?

Benefits of fewer suppliers....

➢ Fewer contracts or purchase orders to negotiate and write

➢ Fewer material releases and receipts

➢ Less effort expended to process and handle material receipts

➢ Easier material traceability

➢ Better communication and relationships that support the pursuit of value-adding activities

Benefits of fewer suppliers....

➢ More attention given to supplier selection, thereby improving the effectiveness of that process

➢ Fewer accounts payable transactions

➢ Fewer Requests for Quotations or Proposals to manage

➢ Improved supply base quality and delivery as lower performers are removed from the base

Benefits of fewer suppliers.... (continued)

➢ Lower unit costs due to better leveraging of purchase volumes

➢ Fewer supplier performance reports or scorecards to generate

➢ Fewer supplier performance review meetings

What is NOT to like here?

Complexity is a quality killer….

Assume a design team creates a product with seven components, each with an average reliability of 99%. The overall reliability of this product is .99^7, or **93% reliability**. This corresponds to a **70,000 ppm** defect level.

Next, a design simplification project eliminates the need for two of the components, making the overall reliability .99^5, or **95% reliability**. This now corresponds to a **50,000 ppm** defect level, almost a 30% reduction from the original ppm level.

Another improvement project increased the average reliability of each component to .995. The overall reliability now becomes .995^5, or **97.5% reliability**. This further reduces the ppm defect level to **25,000** ppm.

How supply chains become complex….

✓ Engineers gone wild (overdesign, custom design components and products)

✓ Marketers gone wild (how many colors and varieties do we need? We need more!)

✓ Faster product development (faster development leads to more product introductions, which creates complexity)

✓ Lack of process thinkers and ill-defined processes

✓ Strategic choices (let's sell in 80 countries, no, let's make it 100!)

✓ Decentralization (lack of coordination, duplication of effort)

How supply chains become complex....
(continued)

✓ Continuous reorganizations and new programs

✓ Bureaucracy (systems of administration characterized by officialism, red tape, and a proliferation of rules, procedures, and positions)

✓ Mergers and acquisitions (lack of commonality)

✓ Complexity creates job security (what would we do with all the accountants, lawyers, and IRS employees if we simplified the tax code?)

✓ Complacency (a high level of self-satisfaction, often with an unawareness of actual dangers or deficiencies)

✓ Let's go global

Why does going global create more complex supply chains?

Longer pipelines in distance and time

Increased risk (damage, theft, etc.)

Different shipping terms (Incoterms versus U.C.C. terms)

Increased use of agents and other third parties

Extensive documentation requirements

Delivery variability

Reduced ability to plan due to longer cycle times

Increase in supply chain "touch" points and handlers

Multiple modes of transportation required

More challenging to identify the true cost of ownership

Ways to battle supply chain complexity…

Ways to battle supply chain complexity....

1. Simplify product designs

2. Standardize and reuse components

3. Pursue center-led supply and supply chain management

4. Put in place organizational design features that help reduce complexity

5. Become more rational (i.e., supply chain rationalization)

6. Empower employees (to reduce individual complexity)

Ways to battle supply chain complexity.... (continued)

7. Standardize and redesign processes

8. Create low-dollar purchase systems

9. Use information technology to streamline work

10. Survey suppliers, employees, and customers to identify complexity problem areas

11. Streamline contract reviews

12. Apply value-analytic techniques

13. Create complexity-related performance measures

Become more rational (#5)....

Rationalization is a continuous process of determining the right mix and number of something to maintain. It offers one of the most powerful ways to battle supply chain complexity.

Areas that might benefit from rationalization:

- supply base
- component SKU's
- product lines and product features
- customer base

- purchase contracts
- retail outlets
- production sites
- engineering centers
- distribution centers

Empower employees (#6)....

Scheduling Authority	Selection Authority
Represents the ability to schedule meetings without others approving the decision	Represents the ability to select leader(s) and/or new team members as required to complete assigned tasks

| Internal Authority	External Authority
Represents the ability of a team to control internal activities, such as allocating budget and material resources, determining goals, making timing decisions regarding the completion of activities, and requesting non-team members to support assignments as needed	Represents the ability of a team to make decisions that bind or commit an organization, similar to Legal Agency rights. This is conceptually the highest level of authority because it allows a team to operate independently of external managers

Apply Value Analytic Techniques (#12)

- ## What is value analysis?
  - ⊙ *The **organized** and **systematic** study of every element of cost in a part, material, process, or service to make certain it fulfills its function for the customer at the lowest total cost. It employs techniques which identify the functionality the user wants from the part, material, process or service*
  - ⊙ Value = Function/Cost
  - ⊙ Function is what a part, material, process, or service does (noun and a verb)

Value Analysis

Value Analysis Workshop Steps

Information Phase

Speculative Phase

Analytical Phase

Execution Phase

Conclusion Phase
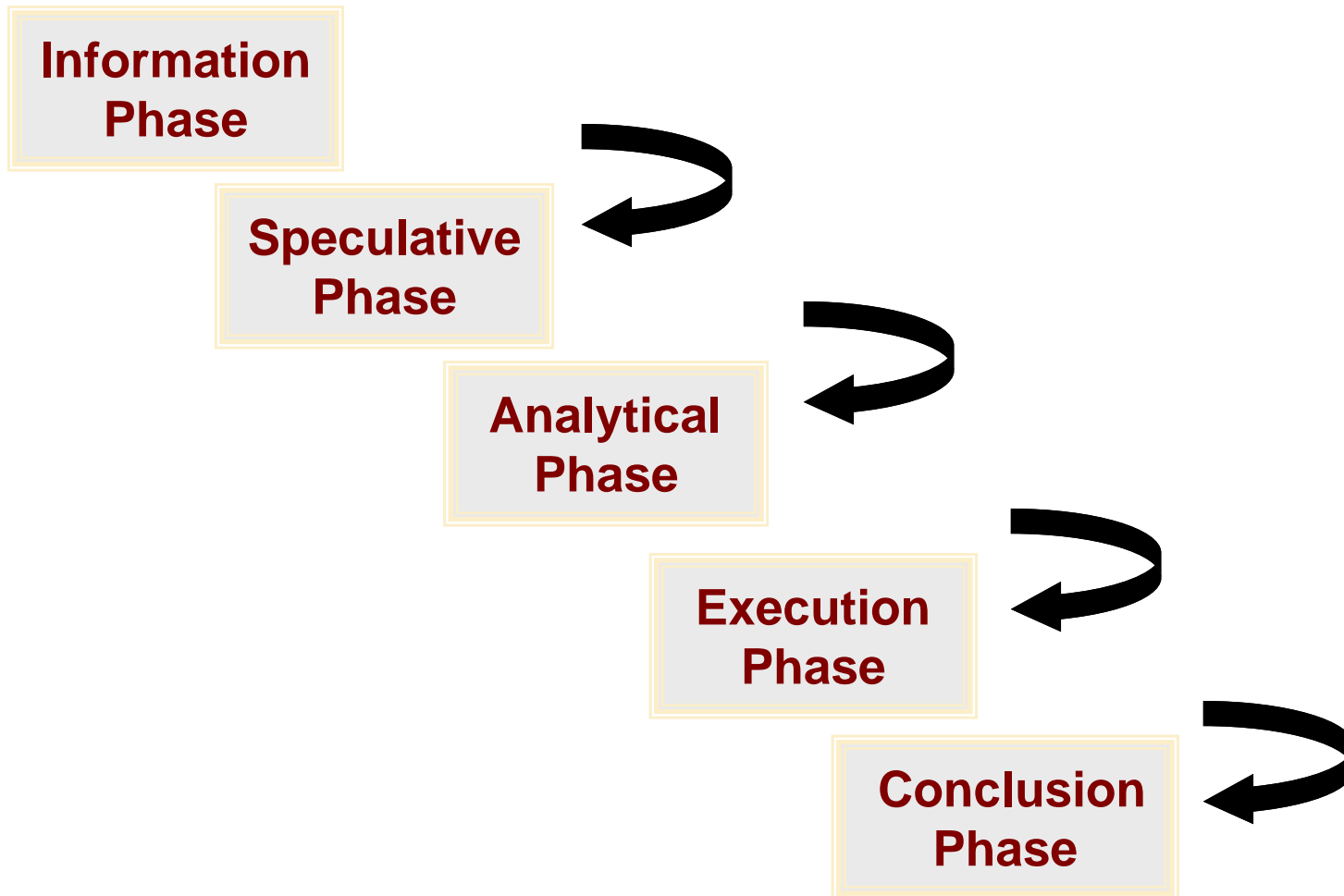
Create low-dollar purchase systems (#8)....

- Procurement cards issued to internal users

- Blanket purchase orders that allow internal users to issue material releases directly to suppliers

- Local purchase order books that allow internal users to issue orders below a certain dollar limit

- Online supplier catalogues and ordering capability

- Electronic purchase orders issued to suppliers

- On-site suppliers to manage and replenish inventory

- Electronic funds transfers

Thank you!