Enterprise Transparency: A Modular Approach to Support Decision Making in Complex Organizations

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The Business Enterprise

• Every organization is a set, portfolio, or collection of items, such as machines, people, projects and documents.
  — These items may barely connect to each other.
  — These items tend to be decomposable.

• Every organization is also a set of linear connections or chains, represented by supply chains and business processes.

• Every organization is also a web of connections, where each item in the web is a node.
We need to know what components we have...
...and how they are connected (or should be, in terms of alignment, coherence, coordination, synchronization, logical consistency, and complementarity)
Enterprise Integration

Organizational integration

Process-organization integration

Process integration

Process-technology integration

Technology-organization integration

Technology integration

Organization

Business Process

Enterprise Integration & Transformation

Enterprise IT
“So you want to understand an aircraft carrier? Well, just imagine that it's a busy day, and you shrink San Francisco Airport to only one short runway and one ramp and gate. Make planes take off and land at the same time, at half the present time interval, rock the runway from side to side, and require that everyone who leaves in the morning returns that same day. Make sure the equipment is so close to the edge of the envelope that it's fragile. Then turn off the radar to avoid detection, impose strict controls on radios, fuel the aircraft in place with their engines running, put an enemy in the air, and scatter live bombs and rockets around. Now wet the whole thing down with salt water and oil, and man it with 20-year-olds, half of whom have never seen an airplane close-up. Oh, and by the way, try not to kill anyone.” Senior officer, Air Division
Key Issues

• What and where are the key elements of the enterprise and its architecture?
  – What assets do we have?
  – What elements should we account for in our decision making?
• How are the factors behaving?
• Where are they headed?
• What is missing?
• What should we get rid of?
• What relationships in the system matter the most?
The Complexity Challenge

• Something is complex when the system is composed of many non-identical components who themselves have system-like properties (e.g., they are decomposable).
• Complexity emerges when mutual interactions between components bring about a behavior that is different than the behavior of the parts.
• ***Thus, how do we describe a complex system, such as a business, in a reasonably complete way?
The Purpose of Enterprise Modeling

• Simplify and explain complex systems
• Create visual / cognitive representations
• Facilitate understanding and communication across stakeholders (not just modeling experts)
• Capture multiple enterprise domains and show dependencies within and between
• To facilitate system analysis and decision making
Modeling Challenge

• How do we model an enterprise comprehensively?
• How do we reflect the appropriate level of granularity?
• What do we choose as nodes in the model?
• Does the description of a complex system itself have to be a complex structure of symbols? (Herbert Simon says no)
Herbert Simon

- Complex systems often take the form of a hierarchy (composed of subsystems).
- Many systems have a decomposable, hierarchic structure that enables us to understand and describe them.
- Hierarchic structures can be described in very economical terms because of the high degree of redundancy in them.
- We can have simple descriptions of complex systems.
Following Simon, we use the process of decomposition to wrap our heads around the complexities of the business enterprise.

- Culture
- Strategy
- Processes
- Organization
- People
- Information systems
- Facilities and locations
- Financials

Decompose and model each of these features!
We may also use decomposition to represent the external environment

- Demographics
- Climate change
- Markets
- Economies
- Energy
- Government
- Technology
- Science

Decompose and model each of these features!
Decomposition, which leads to hierarchy, aspires to the following...

- **Assetification** – the degree to which enterprise elements are codified in order to transform them into intellectual assets
- **Reusability** – the degree of reuse made possible
- **Composability** – how collections of elements may be reconstituted
- **Discoverability** – how readily elements may be found and assessed via discovery mechanisms
- **Transformability** – how readily elements may be altered and adapted
- **Alignment** – how effectively are elements coordinated and aligned
The Holy Grail?

- A comprehensive, fully-elaborated, flexible, user friendly, and navigable enterprise model
- ...aligned with a fully elaborated and integrated enterprise metrics architecture (that rolls up to an enterprise dashboard)
- ...aligned with an asset or knowledge management architecture and strategy
- ...aligned to the business strategy, structure, and technology of an organization...
Enterprise transparency looks like / sounds like...

- Starship Enterprise Management
- Enterprise Command Center
- “Main menu” enterprise architecture management
- Managing the enterprise super-system
- Enterprise of One
There are gaps in our understanding of hierarchical models.

- Missing layers
- Redundancy
- Language gaps
Hierarchy Pros and Cons

Pros:
• Decomposition
• Redundancy
• Aggregation
• Simplicity
• Traceability
• Compaction
• Granularity

Cons:
• Simplistic
• Less informative
• Dependent on consensus
Modeling Approaches

• **Layering**: business layer, application layer, technology layer, etc.
• **Modularity**: reductionism, decomposition, specialization, functions, etc.
• **Hierarchy**: tree diagrams, organization charts, pyramids, etc.
• **Chains**: workflows, processes, supply chains, value chains, etc.
• **Networks**: relationship diagrams, etc.
Process decomposition using a matrix hierarchy

Seek metrics and clues

Horizontal Granularity / Logic

- Manage Accounting
  - Activities
  - Activities
  - Activities

- Manage Marketing
  - Activities
  - Activities
  - Activities

- Distribute Products
  - Activities
  - Activities
  - Activities

Vertical Granularity / Logic
Business environment decomposition using a matrix hierarchy

Seek metrics and clues
Methodological Overview

- Comprehensive decomposition of internal and external factors (leveraging reference models)
- Ownership audit of modules
- Metrics overlay
- Content overlay
- Relational analysis (vertical, horizontal, and system)
Some enterprise domains are easier to model than others

<table>
<thead>
<tr>
<th>Organization Structure</th>
<th>Business Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Nouns</td>
<td>• Verbs</td>
</tr>
<tr>
<td>• Ownership is clear</td>
<td>• Ownership is lacking</td>
</tr>
<tr>
<td>• Comprehensive maps available</td>
<td>• Comprehensive maps are lacking</td>
</tr>
<tr>
<td>• Clear chain of command</td>
<td>• Unclear chain of command</td>
</tr>
<tr>
<td>• Functional / within boundaries</td>
<td>• Cross-functional / boundary spanning</td>
</tr>
<tr>
<td>• Misses activities that fall on boundaries or misses them altogether</td>
<td>• Misses locations and assets</td>
</tr>
</tbody>
</table>
Example: Enterprise Process Modeling Methodology

• Organize the total scope of business processes within a firm using multidimensional, hierarchical tree structures
• Define a value chain of parent nodes from which you may decompose all subprocesses of the firm
• Decompose and define a comprehensive model using “progressive elaboration”
• Responsibility assignment matrix ensures that each process has an owner
Example: Enterprise Process Modeling Methodology (cont.)

• 100% rule – the enterprise model captures 100% of all work performed by the enterprise
  – Process breakdown structure is not an exhaustive list of work. It is a comprehensive classification of business process scope.

• The enterprise process model should not be overly prescriptive or descriptive to allow creativity and flexibility

• Mutual exclusivity is not essential assuming overlaps and linkages are duly noted

• Terminal elements define business process at the most detailed level
### PLAN

<table>
<thead>
<tr>
<th>Plan Value Chain</th>
<th>Gather Value Chain Requirements</th>
<th>Assess Value Chain Resources</th>
<th>Align Value Chain Resources</th>
<th>Create Value Chain Plan</th>
</tr>
</thead>
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<table>
<thead>
<tr>
<th>Plan Supply Chain</th>
<th>Gather Supply Chain Requirements</th>
<th>Assess Supply Chain Resources</th>
<th>Align Supply Chain Resources</th>
<th>Create Supply Chain Plan</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Plan Customer Relations</th>
<th>Gather Customer Relations Requirements</th>
<th>Assess Customer Relations Resources</th>
<th>Align Customer Relations Resources</th>
<th>Create Customer Relations Plan</th>
</tr>
</thead>
</table>

### GOVERN

|---|---|---|---|---|---|---|---|---|---|---|

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<table>
<thead>
<tr>
<th>Govern Supply Chain</th>
<th>Govern Supply Chain Rules</th>
<th>Govern Supply Chain Performance</th>
<th>Govern Supply Chain Assets</th>
<th>Govern Supply Chain Personnel</th>
<th>Govern Supply Chain Finance</th>
</tr>
</thead>
</table>

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### EXECUTE

<table>
<thead>
<tr>
<th>Market</th>
<th>Research</th>
<th>Develop</th>
<th>Acquire</th>
<th>Build</th>
<th>Fulfill</th>
<th>Brand</th>
<th>Sell</th>
<th>Support</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Analyze Market</th>
<th>Define Opportunity</th>
<th>Define Product Req</th>
<th>Qualify Supplier</th>
<th>Schedule Resource</th>
<th>Order/Inquiry</th>
<th>Define Brand</th>
<th>Sell</th>
<th>Support</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Analyze Performance</th>
<th>Forecast Technology</th>
<th>Select Technology</th>
<th>Issue Request</th>
<th>Issue Material</th>
<th>Confirm Order</th>
<th>Differentiate Brand</th>
<th>Sell</th>
<th>Support</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Define Need</th>
<th>Acquire Technology</th>
<th>Design Product</th>
<th>Evaluate/Proposal</th>
<th>Build Product</th>
<th>Plan Load</th>
<th>Select Market Channels</th>
<th>Sell</th>
<th>Support</th>
</tr>
</thead>
</table>

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<table>
<thead>
<tr>
<th>Develop Case</th>
<th>Validate Technology</th>
<th>Validate Product</th>
<th>Phase Order</th>
<th>Package/Package</th>
<th>Fill Order</th>
<th>Process Return</th>
<th>Sell</th>
<th>Support</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Validate Opportunity</th>
<th>Protect Technology</th>
<th>Align Supply Chain</th>
<th>Receive Order</th>
<th>Stage Product</th>
<th>Ship Order</th>
<th>Educate Customer</th>
<th>Sell</th>
<th>Support</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Product Roadmap</th>
<th>Transfer Technology</th>
<th>Define Product Lifecycle</th>
<th>Verify Order</th>
<th>Release Product</th>
<th>Deliver Order</th>
<th>Deliver Service</th>
<th>Sell</th>
<th>Support</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Introduce Technology</th>
<th>Launch Product</th>
<th>Transfer Inventory</th>
<th>Authorize Payment</th>
<th>Verify/Invoicet</th>
<th>Install &amp; Test</th>
<th>Monitor Experience</th>
<th>Sell</th>
<th>Support</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Brand</th>
<th>Sell</th>
<th>Support</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Define Brand Req</th>
<th>Target Customer</th>
<th>Register Customer</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Differentiate Brand</th>
<th>Quality Target</th>
<th>Manage Incident</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Select Market Channels</th>
<th>Position Solution</th>
<th>Resolve Problem</th>
</tr>
</thead>
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<table>
<thead>
<tr>
<th>Architect Brand</th>
<th>Develop Relationship</th>
<th>Process Return</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Validate Brand</th>
<th>Assess/Measure</th>
<th>Educate Customer</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Protect Brand</th>
<th>Develop Proposal</th>
<th>Deliver Service</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Assess Supply Network</th>
<th>Present Proposal</th>
<th>Monitor Experience</th>
</tr>
</thead>
</table>

| Create Marketing Roadmap | Finalize Contract | |
Benefits of Contextual Fidelity

• “Contextual fidelity” increases the deeper you drill down in the model

• Contextual fidelity is defined as the degree to which elements depicted in an enterprise model hang together or have clear associations
Ontological Criteria

• **Perspicuity** – Is the model easily understood by users so that it can be consistently applied and interpreted across the organization?

• **Minimality** – Does the model contain the minimum number of objects necessary?

• **Precision** – Are objects in the model partitionable or do concepts overlap?

• **Functional completeness** – Can the model represent information necessary to support a task?

• **Generality** – To what extent is the model shared between diverse activities, such as between engineering, marketing, and research? Is the model specific to a sector or department?

• **Efficiency** – Is the model easy to understand?
Primary Research Questions

1. How can we best provide both broad and detailed views of the enterprise to support decision making and action?
2. What are the pros and cons of providing enterprise-wide transparency?
3. What issues and challenges emerge in attempting to provide more comprehensive and detailed views of the enterprise?
4. How can enterprise models be effectively documented and represented to support clue detection and prediction, that is, detection of symptoms, opportunities and threats in the business?
Approach

• Conduct current state assessment of enterprise transparency
• Perform enterprise decomposition to create comprehensive hierarchical model
• Conduct relational analysis to establish key interdependencies at a level abstraction that is simple, but useful
• Document challenges and lessons learned
• Conduct future state assessment once model developed to determine value
• Establish methodological best practices
Secondary Research Questions

1. What are the impacts of a single business entity on the performance of the enterprise?
2. What performance dashboard approaches work best for portfolio management?
3. To what extent can enterprise performance be traced to individual business elements?
4. What are the performance implications of contextualizing knowledge via an enterprise architecture management framework?
Future Directions: Situational Awareness

• Level 1: perceive critical factors in the internal and external environment
• Level 2: understand what those factors mean, particularly when integrated with decision maker’s goals
• Level 3: understand what will happen with the system in the future (predict)
• Level 4: act on best information possible