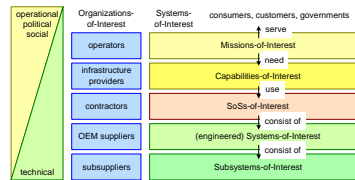


Introduction to Ecosystems

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Abstract

This presentation shows how various players across an ecosystem behave. It uses a simple layering model to explain the various roles.

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1 Introduction

Capabilities and services that we use at societal level are the result the work of many organizations. We simplify the classification of the organizations contributing to the capabilities and services to a 5 layer model, as Figure 1 shows. The five layers are

- operators delivering the actual capabilities
- infrastructure providers that manage the assets that the operators are using
- contractors that build, adapt, and integrate the systems of system that together form the infrastructure
- Original Equipment Manufacturers (OEM) suppliers that develop individual systems that the contractors further integrate
- sub-suppliers developing and delivering products and components to the OEM suppliers

The way of procuring from layer to layer shifts from an acquisition of solutions gradually into procurement of standardized catalogue products and components.

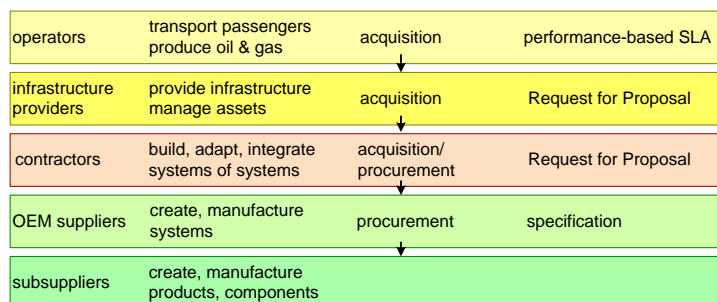


Figure 1: Characterization of Domain Layers

The focus per layer is shifting. Figure 2 shows the focus per layer. The higher the layers, the more operational, the deeper in the stack, the more technical the focus becomes. The figure shows a few examples from the rail transportation domain. Operators are inherently operationally oriented. Examples are operators in The Netherlands, such as NS and Arriva. Infrastructure operators are asset oriented. ProRail is in the Netherlands responsible for the rail infrastructure with a worth of many Billions with a yearly turnover close to 2 billion Euro. Contractors are construction project oriented. OEM suppliers have a development project or product focus, while sub-suppliers have a product or component focus. Companies

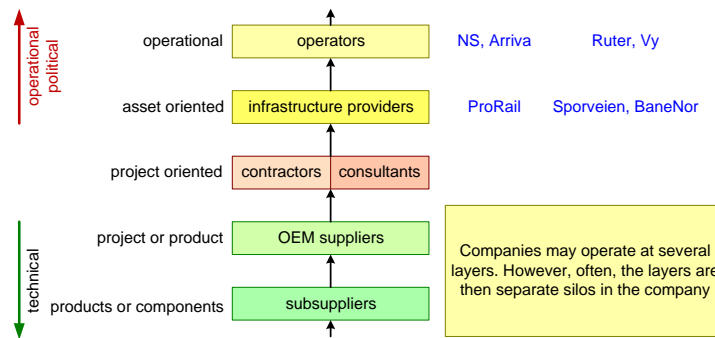


Figure 2: Positions in the Value Network Differ in Nature

may operate at multiple levels, although these tend to organizationally fit in different silos in that company.

Figure 3 summarizes these layers in terms of the organizations-of-interest and systems-of-interest: Operators serve consumers, customers, and governments with missions-of-interest. Operators need capabilities-of-interest that infrastructure providers provide, using SoSs-of-interest that operators deliver. The SoSs consist of (engineered) systems and SoSs that OEM suppliers develop and deliver. Sub-suppliers develop and deliver the subsystems-of-interest. High in the layers, the main concerns are operational, political, and social, while deep in the layers, the main concern is technical. Economic and legal concerns play in all layers.

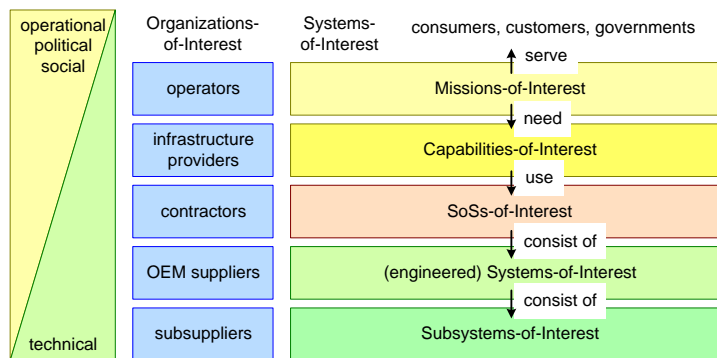
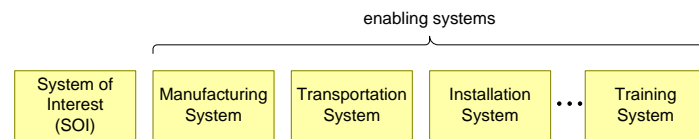


Figure 3: Perspective Changes from Layer to Layer

2 Enabling systems

Systems engineering teaches us that when we develop a system-of-interest (SoI), that we then also have to develop the related enabling systems. Figure 4 shows some examples of enabling systems, such as the manufacturing, transportation, installation and training systems. This list is far from complete. An essential enabling system is the entire supply chain, including its supporting structures, such as contracts, second suppliers, et cetera.



Development and Engineering must develop the System of Interest and all Enabling Systems

Figure 4: Development Has to Develop the System of Interest and its Enabling Systems

This applies recursively for each system when going down in the layers of the ecosystem.

3 Scope of Control

When developing products and components, the developing organization has more or less full control over the specification and design of the product. This changes fundamentally when we enter the Systems-of-Systems domain. SoSs inherently are independent, so, the SoS constructor and users don't have full control. The less cohesion there is between constituent systems in managerial sense, the lower the influence is anyone within the ecosystem has.

[1] provides a simple framework with a scope of control, a scope of influence, and a sphere of concern. Figure 5 shows the simple framework. The graph uses a more continuous scale on the vertical axis for the degree of influence. Be aware that full control is an illusion. The horizontal axis defines the system scope from small to large, also as continuum.

4 Layers of Ecosystems

Each layer of Figure 3 consists of an ecosystem itself. Figure 6 shows an elaboration of these layers. For example, an OEM company has suppliers (with their suppliers), partners offering complementary products and complementing services

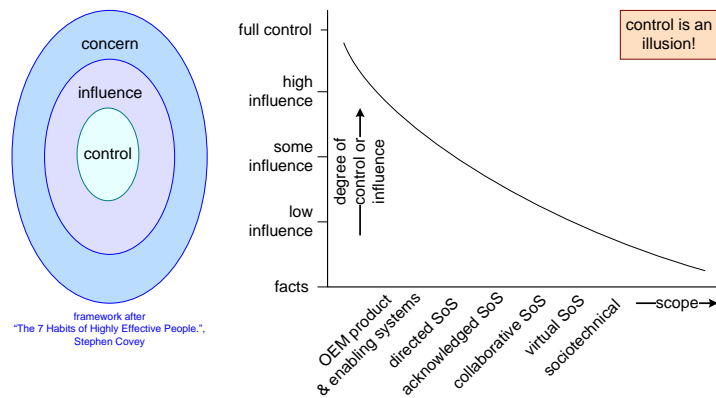


Figure 5: The Level of Influence Decreases with Scope

and systems. The OEM company will have competitors. Most of these organizations will interact with the customers of the OEM company, such as the contractor.

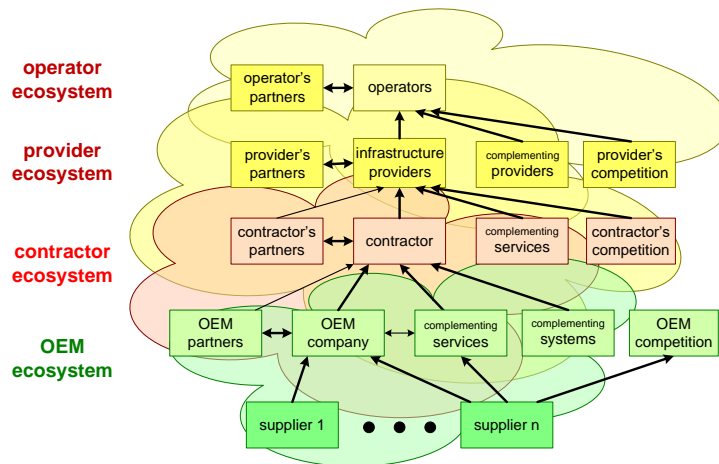


Figure 6: Each System and organization is part of its ecosystem

References

- [1] Stephen R. Covey. *The 7 habits of highly effective people: restoring the character ethic*. Free Press, New York, rev. ed. edition, 2004.
- [2] Gerrit Muller. The system architecture homepage. <http://www.gaudisite.nl/index.html>, 1999.

History

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- corrected linguistic errors

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- Added article version

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