

Enterprise (SoS) Architecture Model Kinds

Abstract

This paper contains a selection of the current Model Kind Definitions that support the Enterprise as a System of Systems (SoS) Architecture Description Frameworks.

- Link to [Current EntSoSADF Model Kinds PDF](#)

Author and Version

Bruce McNaughton, Version 0.4, 08-August-2022

Contents

Model Kinds	3
Architecture Description Language	3
Unified Modeling Language (UML)	4
Activity Diagram	4
Class Diagram	5
Object Diagram	5
Package Diagram	6
Sequence Diagram	6
State Machine Diagram	7
Use Case Diagram	7
Systems Modeling Language (SysML)	8
Causal Loop Diagram (CLD)	8
Conceptual Model	9
Dynamic Model	10
Rich Pictures	10
Stock and Flow Diagram	11
System Breakdown Structure (SBS) Diagram	11
Benefits Map	13
Business Model	13
Business Plan	14
Capability Model	15
Change Model	17
Competency Framework	17
Continuity Model	17
Customer Journey	18
Data Model	18
Financial Cost Model	19
Information Model	19
Job Role Model	19
Operating Model	20
Organization Chart (or Org Chart)	22
Process Activity Model	24
Process Decisions	25
Process Model	26
External Requirement Indicator Map	27
Technology Interaction Point	28
Risk Map	28
Road Map	29

Stakeholder Map	29
Strategy Map	30
Supply Chain Model	30
Value System Model	30

Revision History

V0.4 08-August-2022 Latest Versions

V0.3 27-January-2019 Update with all MK used for thisEntSoS AF.

V0.2 29-March-2018, Update to collection of Model Kind definitions used for all architecture description frameworks.

V0.1 08-October-2017 Update with revised positioning of Management System.

V0.0 14-September-2016 Initial Draft of Model Kinds.

Model Kinds

This section of the Architecture Description Framework specifies all of the model kinds used in this document. A model kind provides the instructions to create a specific type of model to support a specific viewpoint.

In general, only standard [Unified Modeling Language \(UML\)](#) Models have been created to support the Architecture Description Framework. Over time, descriptions of the standard models will be included in this section. The following UML models are used for the following purposes:

- **Conceptual Models** are created using [Class Diagrams](#)
- **Structural Models** (with system elements and relationships) are created using [Class Diagrams](#).
- **Behavioural models** are generally created using [Activity Diagrams](#), [Sequence Diagrams](#) and [State Diagrams](#).
[Causal Loop Diagrams](#) may also be used.

The [UML Architecture Description Language \(ADL\)](#) is used for this Architecture Description Framework. SysML diagrams can also be used rather than standard UML diagrams.

The following references provide instructions for creating the various UML models:

- [UML 2 and the Unified Process](#)
- [Applying UML and Patterns](#)

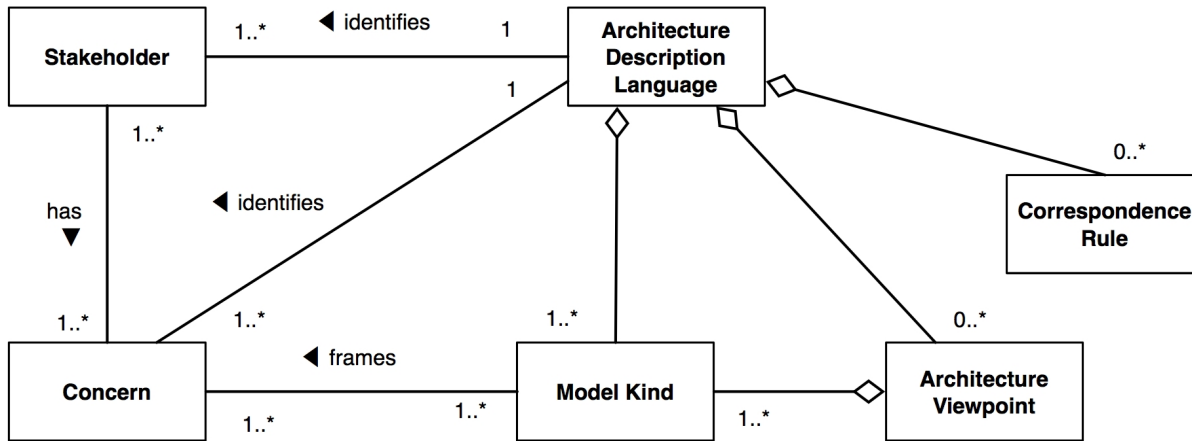
Link to [Current EntSoSADF Model Kinds PDF](#)

The following template will be used to describe each model referenced from a viewpoint. These model descriptions provide the instructions to create a specific type of model.

Description
Name and Description of the model.
Contents
A description of the contents of the model and any required or optional information.
Languages, Notations, Conventions
Any specific guidance related to the way the model is constructed or presented.
Methods - Create, Analysis, Identify
Methods or steps to create, analyse (use) and identify the need for the model.
Modelling Techniques
Any techniques standard approaches or workshop methods (SWOT or VPEC-T, etc) that may be useful to create or maintain the model.
Examples
Reference or link to any examples (copyable) that can be seen as representative of this model kind.
References
Model Kind Links

Architecture Description Language

The Architecture Description Language contains a specific set of Model Kinds for a specific modelling language. The following model is from ISO 42010:2011:



In general, Architecture Description Languages have a specification that is owned and managed by a development team. The following are the Architecture Description Languages used to support the Architecture Description Frameworks presented on this site:

- [Unified Modelling Language \(UML\)](#)
- [System Modelling Language \(SysML\)](#)

These modelling languages also have their own models or diagrams defined for specific types of situations. These diagrams have their own Model Kind specifications.

Unified Modeling Language (UML)

UML is an Architecture Description Language used to create the Architecture Description Frameworks used in the various system areas.

UML is also a best practice method with extensive documentation.

- [See UML](#)

As an Architecture Description Language, UML contains a number of diagrams described by Model Kinds. The following diagrams are used in the architectural area:

UML Structure Diagrams

- [Class Diagram](#)
- [Object Diagram](#)
- [Package Diagram](#)

UML Behavior Diagrams

- [Activity Diagram](#)
- [Sequence Diagram](#)
- [State Machine Diagram](#)
- [Use Case Diagram](#)

The diagrams have specific symbols / language elements that can be placed on a diagram. The instructions for creating each of these types of models is considered a Model Kind.

Activity Diagram

Description

An Activity Diagram is a standard UML Diagram.

Contents

Activity
Information Object
Flow / sequence
Start / Stop
Branch / Integrate

Languages, Notations, Conventions

[Activity Diagram](#)

Methods - Create, Analysis, Identify

[Activity Diagram](#)

Modelling Techniques

[Activity Diagram](#)

Examples

[Examples](#)

References

Model Kind Links

Class Diagram

Description

A Class Diagram is a standard UML Diagram

Contents

- Classes
- Associations

Languages, Notations, Conventions

[Class Diagrams](#)

Methods - Create, Analysis, Identify

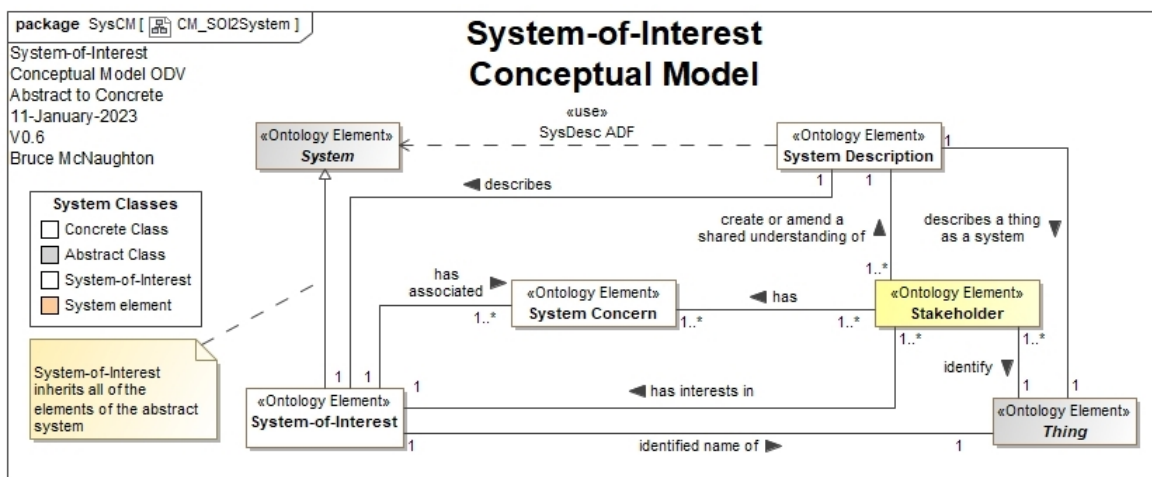
[Class Diagrams](#)

Modelling Techniques

[Class Diagrams](#)

Examples

[Examples](#)



References

Model Kind Links

Object Diagram

Description

An Object Diagram is a standard UML Diagram.

Contents

Objects (instances of classes)
Relationships

Languages, Notations, Conventions

[Object Diagram](#)

Methods - Create, Analysis, Identify

[Object Diagram](#)

Modelling Techniques

[Object Diagram](#)

Examples

[Examples](#)

References

Model Kind Links

Package Diagram

Description

A Package Diagram is a standard UML Diagram.

Contents

Packages
Classes
Associations
Dependencies

Languages, Notations, Conventions

[Package Diagram](#)

Methods - Create, Analysis, Identify

[Package Diagram](#)

Modelling Techniques

[Package Diagram](#)

Examples

[Examples](#)

References

Model Kind Links

Sequence Diagram

Description

A Sequence Diagram is a standard UML Diagram.

Contents

Classes
Objects

Interactions
Time Sequences

Languages, Notations, Conventions

[Sequence Diagram](#)

Methods - Create, Analysis, Identify

[Sequence Diagram](#)

Modelling Techniques

[Sequence Diagram](#)

Examples

[Examples](#)

References

Model Kind Links

State Machine Diagram

Description

A State Machine Diagram (or State Diagram) is a standard UML Diagram.

Contents

Class or Object States
Transition links

Languages, Notations, Conventions

[State Diagram](#)

Methods - Create, Analysis, Identify

[State Diagram](#)

Modelling Techniques

[State Diagram](#)

Examples

[Examples](#)

References

Model Kind Links

Use Case Diagram

Description

A Use Case Diagram is a standard UML Diagram.

Contents

Stakeholders
Use Cases
Dependencies
Includes

Languages, Notations, Conventions

[Use Case Diagram](#)

Methods - Create, Analysis, Identify

[Use Case Diagram](#)

Modelling Techniques

[Use Case Diagram](#)

Examples

[Examples](#)

References

Model Kind Links**Systems Modeling Language (SysML)**

SysML is an Architecture Description Language used to create the Architecture Description Framework used in the various system areas.

SysML is also a best practice method with extensive documentation.

- [See SysML](#)

SysML includes 9 types of diagram, some of which are taken from UML.

- Block definition diagram
- Internal block diagram
- [Package diagram](#)
- [Use case diagram](#)
- Requirement Diagram
- [Activity diagram](#)
- [Sequence diagram](#)
- [State machine diagram](#)
- Parametric diagram

Causal Loop Diagram (CLD)

Description

A Causal Loop Diagram is used to show the interactions and effects of various elements in a system on each other.

This is a variant of the System Diagrams from The Fifth Discipline

Another alternative is Stocks and Flows, in Thinking in Systems, Business Dynamics

Another alternative is Rich Pictures in Systems Thinking, Systems Practice

Causal Loop Diagrams contain arrows and shapes as defined in various sources.

They show interactions and influences over time.

See the various sources, Thinking in Systems, Business Dynamics

Contents

Languages, Notations, Conventions

Methods - Create, Analysis, Identify

Modelling Techniques

Examples

Examples can be found in the following locations:

- Scaling Lean and Agile Development
- Business Dynamics
- Wikipedia [Causal Loop Diagrams](#)

And the two on Causal Loop Diagrams

- * <http://www.youtube.com/watch?v=XReW1Op-wcQ>
- * <http://www.youtube.com/watch?v=Kx15APJSvV8>

References

Model Kind Links

Conceptual Model

Description

A Conceptual Model is created using a UML [Class Model](#) that shows concepts (ideas) and their relationship to other concepts (ideas).

Contents

The contents of the conceptual model depend upon the area being modelled. Each class represents a concept and each association represents the relationship between one or more concepts.

Languages, Notations, Conventions

[Class Diagrams](#)

Methods - Create, Analysis, Identify

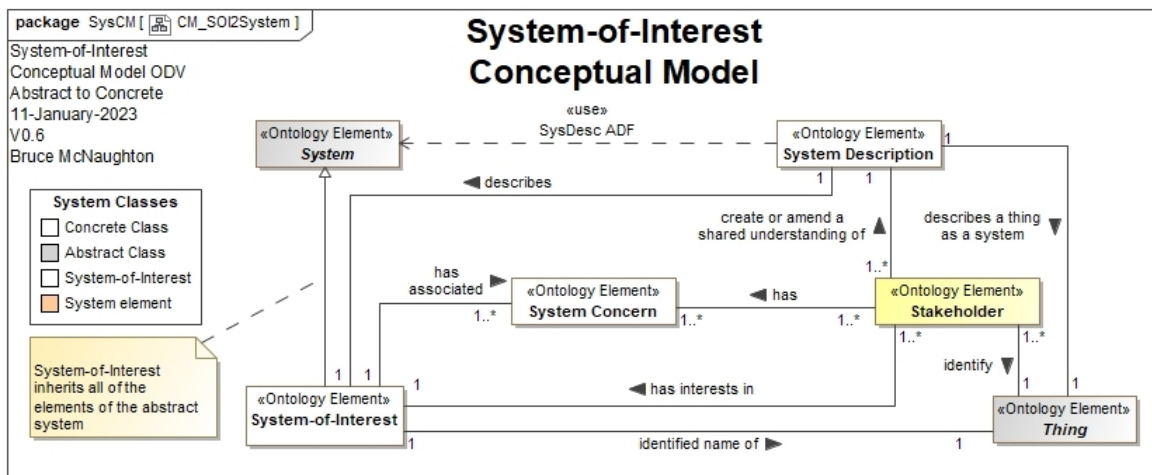
[Class Diagrams](#)

Modelling Techniques

[Class Diagrams](#)

Examples

Examples



References

Model Kind Links

Dynamic Model

Description

Dynamic models provide a basis for understanding how the organization changes based upon environmental changes or internal changes over time.

Contents

Models based upon Peter Senge's System Modelling Approach
 Models based upon Donella Meadows Stocks and Flows approach
 Models based upon John Sterman's System Dynamics models (similar to Stocks and Flows)
[Causal Loop Diagrams \(CLD\)](#)

Languages, Notations, Conventions

The selected dynamic model will determine the specific language and notations.

Methods - Create, Analysis, Identify

Create the dynamic model
 Validate the model against actual data or behaviours

Modelling Techniques

See the specific examples in the various books
[Causal Loop Diagrams \(CLD\)](#)
 Rich Pictures

Examples

Scaling Lean and Agile Development
 Business Dynamics
 Wikipedia [Causal Loop Diagrams](#)
[Counter Intuitive Behavior of Social Systems, Jay, W. Forrester](#)
[Causality and diagrams for system dynamics](#)

References

Model Kind Links

Rich Pictures

Description

A Rich Picture is generally used in Soft Systems Methodology to help understand the problem space; however, a rich picture can be created to support any activity.

See Wikipedia: [Rich Picture](#)
 See Wikipedia: [Soft Systems Methodology \(SSM\)](#)

Contents

Free form picture where symbols represent concepts and appropriate relationships are identified between the concepts.
 These diagrams are best co-created with a set of people that know the area and the problems.

Languages, Notations, Conventions

[Soft Systems Methodology \(SSM\)](#)
[Rich Pictures](#)

Methods - Create, Analysis, Identify

[Soft Systems Methodology \(SSM\)](#)
[Rich Pictures](#)

Modelling Techniques

[Soft Systems Methodology \(SSM\)](#)
[Rich Pictures](#)

Examples

[Examples](#)

[The Art of Rich Pictures from the Open University](#)

[Rich Picture Vlog from OU.](#)

References

Model Kind Links

Stock and Flow Diagram

Description

A Stock and Flow Diagram is related to a Causal Loop Diagram. The Stock and Flow diagrams adds the concept of Stock where a value can accumulate. The stock has an input variable and flow rate indicators along with an outflow to a variable with flow rate indicators.

Contents

- Variables
- Stocks

Languages, Notations, Conventions

[Stock and Flow description](#)

Methods - Create, Analysis, Identify

[Stock and Flow description](#)

Modelling Techniques

[Stock and Flow description](#)

Examples

Examples To be provided

References

Model Kind Links

System Breakdown Structure (SBS) Diagram

Description

A System Breakdown Structure (SBS) Diagram is a type of UML [Class Diagram](#).

This model highlights the system elements and systems within a system.

This type of system model is also a conceptual model or ontology and can establish the concepts and their relationships as well as the hierarchy of interaction.

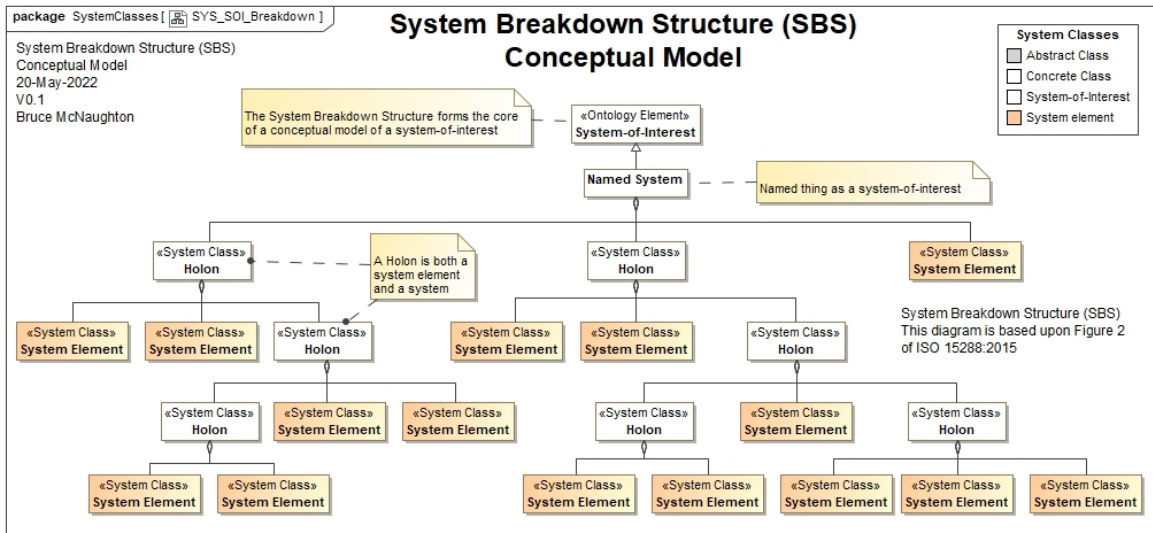
Contents

The System Breakdown Structure consists of the following:

- System-of-Interest.
- System-Elements
- Holons (a system element that is also a system)
- Associations
- Generalizations

See ISO 15288:2015 Figure 2.

The typical structure of an SBS is:



The System Breakdown Structure typically is included in the [Structure Section of a System Description](#).

Languages, Notations, Conventions

[See UML Class Diagram](#)

Methods - Create, Analysis, Identify

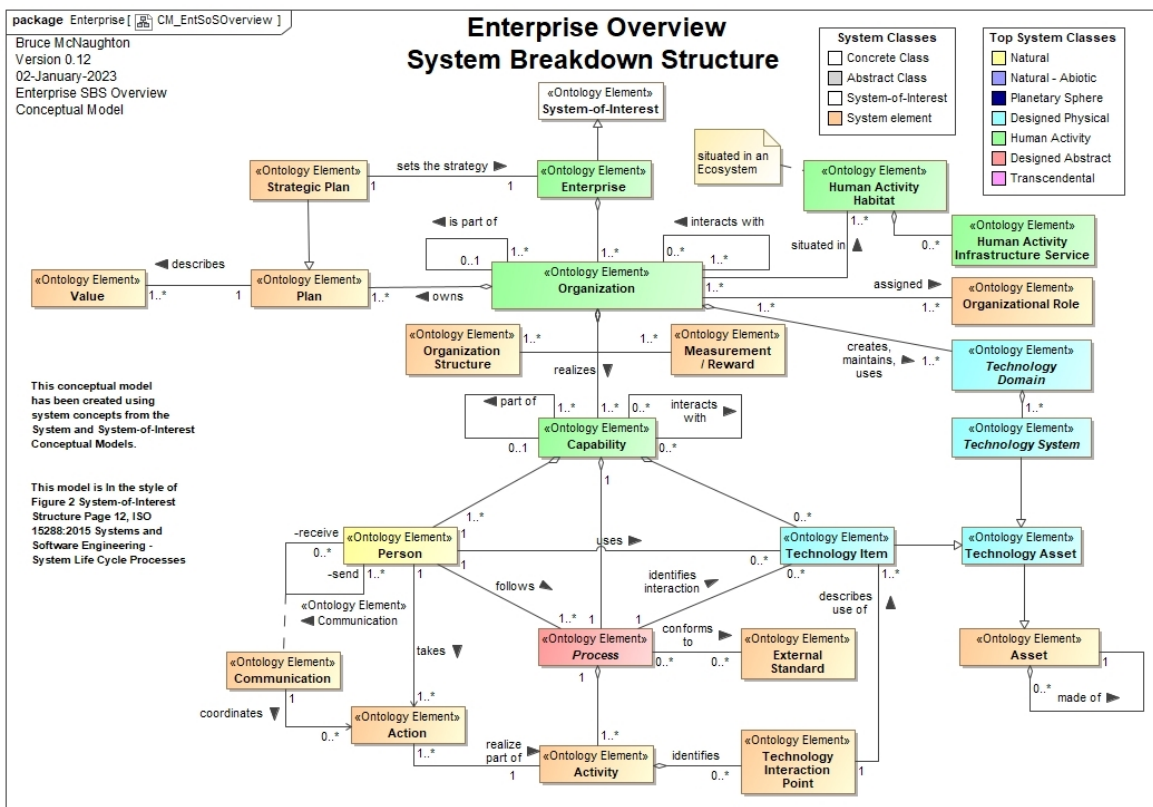
[See UML Class Diagram](#)

Modelling Techniques

[See UML Class Diagram](#)

Examples

[Examples](#)



The System Breakdown Structure typically is included in the Structure Section of a System Description. The [Structure Section of the Enterprise as a SoS System Description](#) includes examples of this type of structure. There are also many systems within the Enterprise that also provide examples.

For additional examples of system descriptions containing a structure section with an SBS. See the following [PDF: System Description: System \(Abstract\), Version 0.30, 27-December-2023 \(working draft\)](#) [PDF: System Description: Enterprise as a System of Systems \(SoS\), Version 0.17, 24-June-2023](#)

References

Model Kind Links
Benefits Map

Description

Get a description of this model from MSP... maps outputs, outcomes to benefits / objectives.

[Benefit maps and profiles london council](#)

[Benefits realisation - wikipedia](#)

the above includes results chains ... however the benefits models are based upon an early version of MSP.

Contents

Languages, Notations, Conventions

Methods - Create, Analysis, Identify

Modelling Techniques

Examples

References

Model Kind Links
Business Model

Description

A [Business Model](#) describes the Rationale of how an organization creates, delivers and captures value. <-- [Business Model G](#)

The Business Model Generation .. which contains use of Business Model Canvas is also a good reference to understand product / service positioning.

Contents

- Customer Segments
- Value Propositions
- Channels
- Customer Relationships
- Revenue Streams
- Key Resources
- Key Activities
- Key Partnerships
- Cost Structure

Languages, Notations, Conventions

Enterprise Language, See [PDF: System Description: Enterprise as a System of Systems \(SoS\), Version 0.17, 24-June-2023](#)

Methods - Create, Analysis, Identify

Created by Product Manager and their team for a specific product or service

Updated version available at the end of stage or larger Project within a Phase.

Modelling Techniques

Business Modelling looking at the key elements of a Business Model

This approach relates to the [Operating Model](#)

Examples

See [Business Plan](#) from Digital Equipment Corporation - Capturing a Product Team View of a new product investment.

See [Business Model Generation](#) and the Business Model Canvas

References

Model Kind Links

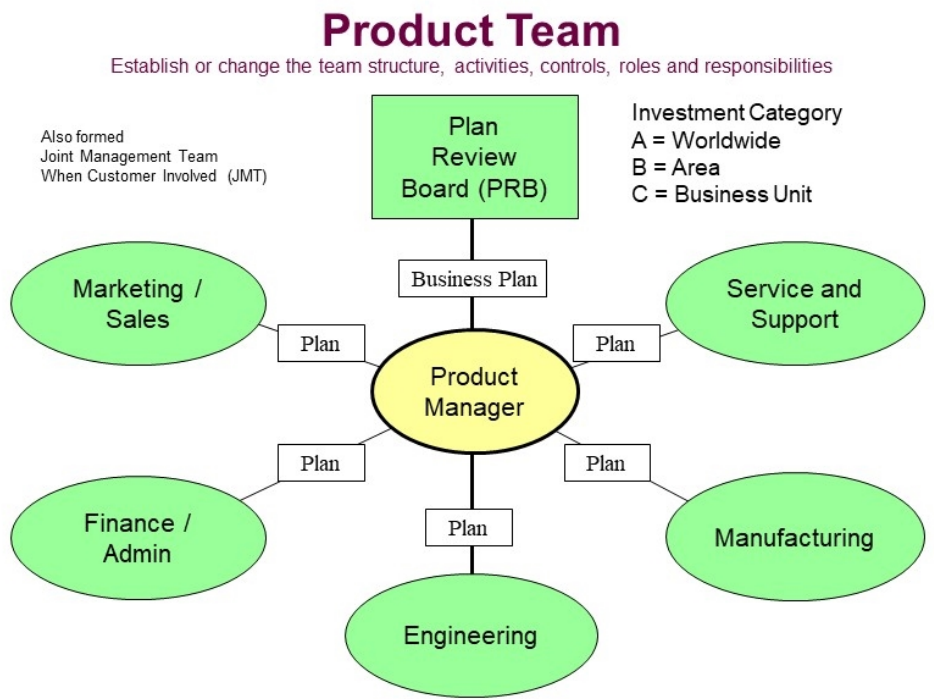
Business Plan

Description

The Business Plan is typically a plan produced by a product manager for a specific proposed product or service. This is roughly equivalent to a program plan when conducting an organizational transformation.

The Business Plan represents the contribution of all Members of a Product Team.

The resulting P/L for an investment in a product is a type of Investment Model.



A single individual takes on a functional role to represent the function on the product team. The individual is responsible for planning, resource assignment, and technical aspects of the role. Each role aligns their response to Product Manager goals. Example of Concurrent Engineering.



Customer Driven Solutions Limited, Enterprise as a System of Systems: VB.09 23-August-2022
Bruce McNaughton, Copyright 2000-2022

A Business Case for a Program is closely related to this Business Plan.

Contents

- Marketing Data
- Marketing Plan
- Engineering Plan
- Manufacturing Plan
- Customer Services Plan
- Top Level P/L Package
- Team structure

Languages, Notations, Conventions

P/L Package structure.

Methods - Create, Analysis, Identify

Created by Product Manager and their team

Updated version available at the end of stage or larger Project within a Phase.

Modelling Techniques

Business Plan

Examples

See Process document from Digital Equipment Corporation

See Business Model Generation and the Business Model Canvas (This is a product / service based model of the value delivered to customers.) This has some information for a business plan.

References

Model Kind Links

Capability Model

Description

The Capability Model identifies the key capabilities that have associated [capability descriptions](#) to be implemented by teams (organizational subsystems) that interact to deliver a the purpose / mission / contribution of the organization. The capability model (or models) also describes the capability dimension of the [Operating Model](#).

There are similar models that may serve the same purpose. Please see:

- [Value Chain](#) as an example of a Capability Model
- [Core Diagram](#)

The [Process Model](#) shows the relationships (interactions and dependencies) that underpin the various capability descriptions used within the organization or within a top level capability within an organization. This model is typically a list of capabilities or groups of capabilities that can be related to a set of organizations that will realize them

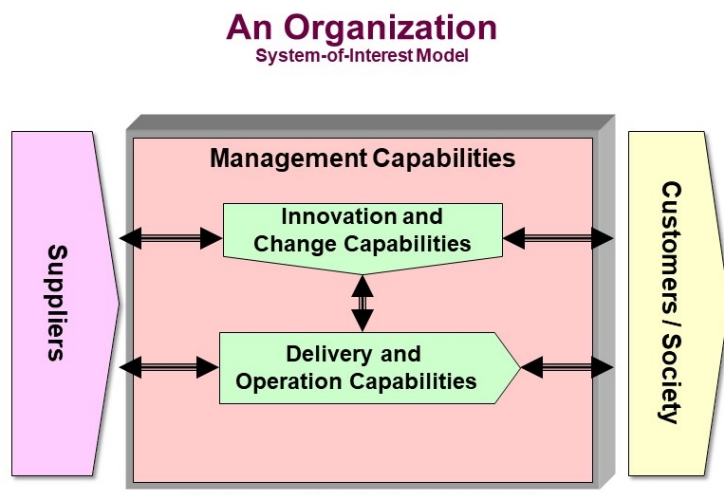
Each manager creates their team by planning for the realization of a set of capabilities within their team. See the [Team](#) system description for further information.

Contents

All organizations have three top level types of capabilities. All capabilities can be aligned to these three top level capabilities.

- [Management Capabilities](#)
- [Innovation and Change Capabilities](#)
- [Delivery and Operation Capabilities](#)

The top level capabilities are shown in the picture below.



Bruce McNaughton, 17-July-2013, Top Level Capabilities and their relationships.

All Successful Organizations, however simple, consist of systems within a system
(Management Principle One: The Puritan Gift)

All capabilities are working in parallel and Some people work in multiple capabilities



Customer Driven solutions Limited, Enterprise as a System of Systems: VB.00 20-August-2022
Bruce McNaughton, Copyright 2008-2022

Each of the top level capabilities will have an associated Capability Model. These include the current or target:

- Management Capability Model
- Development / Innovation Capability Model
- Delivery Capability Model (or Operating Model or BAU Model)

These models identify the capabilities delivered by one or more teams,.

Each capability in the capability model has a defined [capability description](#) can be allocated to one or more teams using the Team Model.

The allocation of the capabilities is a critical process of the organizational design process.

Other types of models may also be created. These relate to capability sets derived from particular areas. The [Integrated Management System](#) identifies a number of capability sets for each external standard that is used.

These capability models help people understand where capabilities are used within the organization.

Languages, Notations, Conventions

Each capability represents an organizational sub-system. These sub-systems can be represented on an organization chart as a [Team](#), Organizational unit or through a specific process description.

Capabilities are named based upon their purpose and contribution to the organization. These capabilities are also related to the processes and activities that deliver the capabilities.

A capability has one unique process that describes the capability. The Capability Models may use a process class to represent a capability.

Methods - Create, Analysis, Identify

Create: Identify capabilities and position on a diagram

Analysis: Use the team model and process model to confirm the scope and structure of the capability.

Identify: Identify the capabilities using the appropriate label and include in the Capability View of the Enterprise (SoS) Architecture Description

Modelling Techniques

The [Process Model](#) and related process descriptions can be used to model / understand capability interactions.

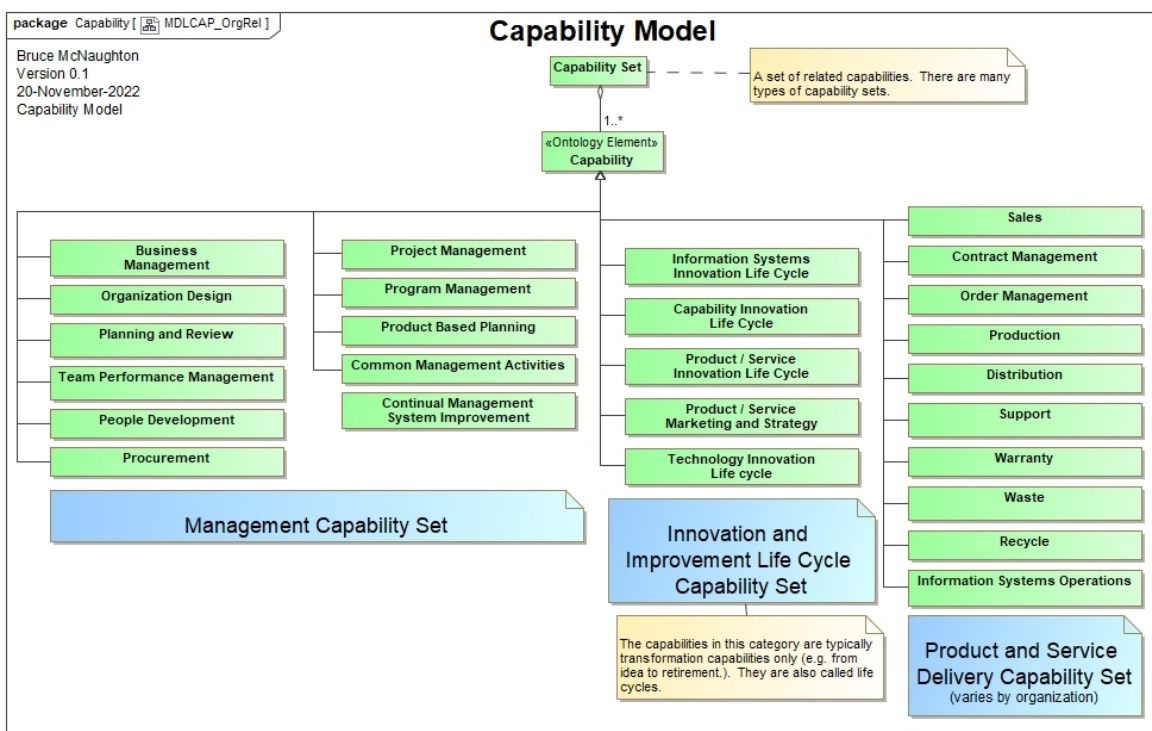
Various types of models can be used for the Capability Model. The simplest approach is to use a [Class Diagram](#).

Dynamic interaction of capabilities based upon the underlying process can be modelled on an [activity diagram](#) or a [sequence diagram](#).

[Object diagrams](#) can also be used to highlight the allocation of capabilities to organizations or teams. This will allow additional context to be provided for the capabilities.

Examples

Here is an example capability model:



Various capability sets also use capability models:

See [Planning System](#)

See [Integrated Management System](#)

References

Model Kind Links

Change Model

Description

Description

Contents

Contents

Languages, Notations, Conventions

Conventions for building the model

Methods - Create, Analysis, Identify

Steps, methods, and processes to create the model.

Modelling Techniques

ATechnique to create the model.

Examples

Examples of creating the model.

References

Model Kind Links

Competency Framework

Description

To create a model of the job families and their career progression.

Contents

For each job, position within a job family and relative position within all job families.

Languages, Notations, Conventions

Methods - Create, Analysis, Identify

Modelling Techniques

Examples

[Job Family Modelling, Hay Group](#)

References

Model Kind Links

Continuity Model

Description

Description

Contents

Contents

Languages, Notations, Conventions

Conventions for building the model

Methods - Create, Analysis, Identify

Steps, methods, and processes to create the model.

Modelling Techniques

A Technique to create the model.

Examples

Examples of creating the model.

References

Model Kind Links

Customer Journey

Description

The steps that customers take when they interact with an organisation to obtain a product or service.

Contents

Languages, Notations, Conventions

Methods - Create, Analysis, Identify

Modelling Techniques

Examples

References

Model Kind Links

Data Model

Description

A Data Model identifies the data elements used across the enterprise. This is generally used as a bridge between the Information Map and the systems design.

These models are used to identify and establish data types for information in databases and applications.

NOTE: This model is typically developed as part of an Information Systems Architecture Description.

Contents

Key Data Elements and their specification

Languages, Notations, Conventions

Data Dictionary

Methods - Create, Analysis, Identify

Modelling Techniques

Examples

XSD for XML data

Public Declarations for Application Data.

References

Model Kind Links

Financial Cost Model

Description

Description

Contents

Contents

Languages, Notations, Conventions

Conventions for building the model

Methods - Create, Analysis, Identify

Steps, methods, and processes to create the model.

Modelling Techniques

ATechniquet to create the model.

Examples

Examples of creating the model.

References

Model Kind Links

Information Model

Description

An information model identifies the categories and information objects used across the enterprise. This information relates to the business objects created and used by processes.

This information might be packaged into documents.

Where data is stored in a data base or used in an application, a [data model](#) would be developed as a bridge from the information map to the data model.

Contents

Information Categories

Information Objects

Relationships as necessary.

Languages, Notations, Conventions

Simple Model Structure (e.g ERD, or Class Diagram with relationships

[Ontology \(Information Science\)](#)

Methods - Create, Analysis, Identify

Modelling Techniques

Examples

PAG Online

References

Model Kind Links

Job Role Model

Description

To create a model of the various Jobs and Roles and their relationships
To establish the underlying skills, knowledge and experience for each class or family of jobs and roles.

Contents

For each team:
Identify the basic skills, knowledge and experience needed for each job or role.

Languages, Notations, Conventions

Methods - Create, Analysis, Identify

Modelling Techniques

Examples

References

Model Kind Links

Operating Model

Description

The [Operating Model](#) describes the way an the enterprise or an organization delivers value to its stakeholders. An operating model is established by a top management team as the way to realize the strategies to achieve its purpose. The top management team is defined as:

ISO 9000:2015: Top Management Team: person or group of people who directs and controls an organization at the highest level

This top management team establishes the scope of the operating model at their level within the Enterprise. This can be:

- The whole Enterprise
- A specific Organization
- A single Team

The [Operating Model](#) describes the Design of an Organization. The [Operating Model](#) describes the organization at specific points in time:

- **Current Operating Model:** The design of the current state Organization or whole Enterprise.
- **Intermediate Operating Model:** The design of the organization at a specific point in time during the transition to the Target Operating Model
- **Target Operating Model:** The design of the Desired future state of the organization or the enterprise.

The [Operating Model](#) is also related to the following architectural / design documents:

- Enterprise (SoS) Architecture Description created using the Link to [the Enterprise \(SoS\) Architecture Description Framework](#)
- Enterprise and Technology Architectures using the TOGAF Architecture Framework.
- Architecture Descriptions using the Universal Architecture Framework (UAF).
- Blueprint (2011 version or earlier) or Target Operating Model (2019) using the [Program Management](#) business process, [Managing Successful Programmes](#).
- Various [Organizational Design](#) (OD), Business Change or management approaches that describe the future state of the enterprise or organization (See [Management References](#))

The operating model can also be seen as a scalable operating model using a multi-dimensional approach. This multi-dimensional approach to organization design has been described by [Russell Ackoff](#) and [Jay Galbraith](#).

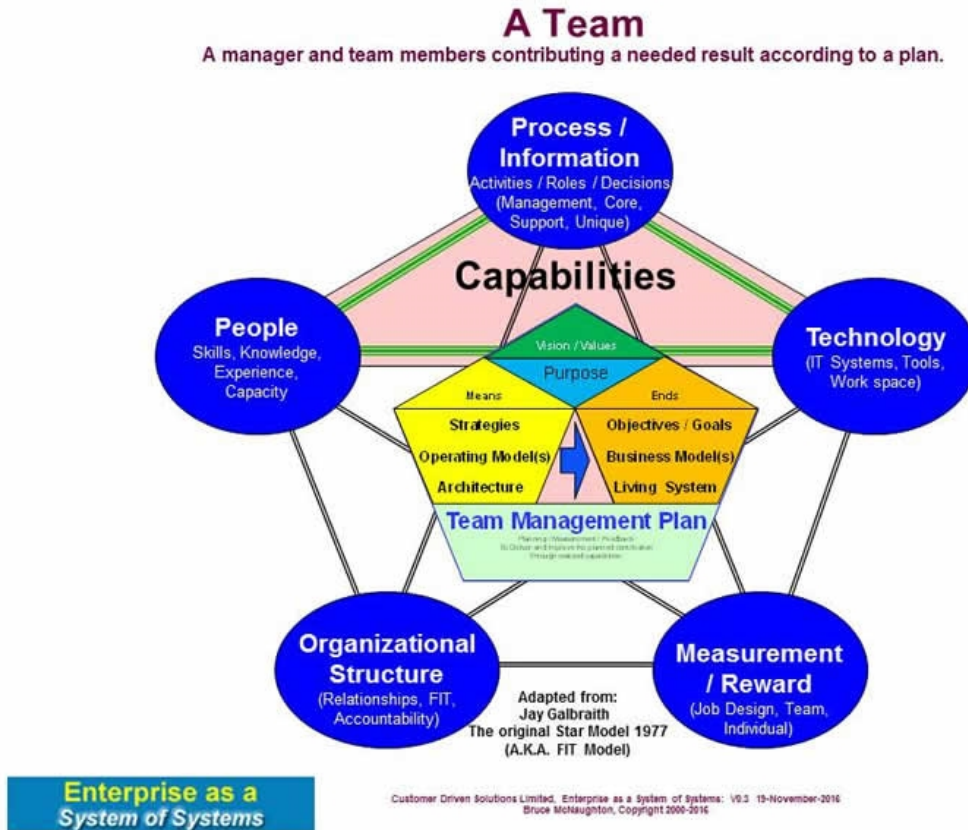
Link to [Enterprise or Organization Operating Model](#)

Contents

All of these approaches identify similar information to be included in the Description of the Operating Model:

- **Organizational Information**
 - Organizational Structure
 - Measurement and Rewards
- **Capabilities**
 - People with Skills, knowledge and experience
 - Process including Information
 - Technology.
- **Strategy, Objectives and Plans**

In this approach to the Operating Model, we have adopted / adapted the STAR Model from Jay Galbraith as the model of an operating model:



This model can be used to describe the entire Enterprise Operating Model or a single team (organization).

Languages, Notations, Conventions

All of the elements in the operating model are defined in the following Enterprise (SoS) System Description PDF: [System Description: Enterprise as a System of Systems \(SoS\), Version 0.17, 24-June-2023](#)

In addition, the conventions used for creating the Enterprise Architecture Description are based upon architectural practices based upon ISO 42010:2022.

Methods - Create, Analysis, Identify

The methods used to create the resulting design of the Operating Model (any version) are based upon typical change management practices:

- [Managing Successful Programmes](#), a Program Management Process.
- Architecture Frameworks: the instructions to create Architecture Descriptions based upon Architecture Viewpoints.
- Various [Organization Design](#) approaches (using the STAR Model, etc)

The Operating Model can be created as an Enterprise (SoS) Architecture Description using the Link to [the Enterprise \(SoS\) Architecture Description Framework](#)

Modelling Techniques

Many of the examples in the Enterprise as a System of Systems (SoS) website use the [Unified Modelling Language \(UML\)](#) as an Architecture description Language.

When using the architectural approach from ISO 42010:2022, the definition of the views and which models need to be created are provided in the Viewpoint. The Model Kind documents (such as this one) provide the details of a specific model. In this case, the Operating Model is a type of text and models integrated into a single package.

Examples

Examples of Enterprise (SoS) Architecture Descriptions are currently in development (two from the Sports area).

- Formula One Racing (Entertainment Organizations)
- National Football League (Entertainment Organizations)

Given the confidentiality of the Operating Models, there are few in the public domain. Typical examples are found in training courses.

Example Operating Model Headings from Managing Successful Programmes, 2019, aligned to the STAR Model operating model structure

Organization Structure

- Organize

Measurements and Rewards

Capabilities

- Capabilities.

People.

- Knowledge and Learning
- Culture

Process.

- Processes
- Information and Data

Technology.

- Technology. (typically IT)
- Infrastructure. (typically Physical Infrastructure)

Enterprise Plan.

References

Model Kind Links

Organization Chart (or Org Chart)

Description

To represent the structure of the teams or organizational units comprising the organization (or a part of an organization).

The organization chart is generally accompanied by a table listing the information about each team (or this may be available through the organization chart).

Contents

For each team:

- Identify the parent of the team, the type of the team, the manager of the team

Languages, Notations, Conventions

Typically a hierarchical representation of the organization.

However, the structure may also be presented as a multi-dimensional matrix (typically two axis) or a circle with more teams on a wider circle.

Methods - Create, Analysis, Identify

There are a number of approaches to Organization chart management.

1) Identification of Input, Output and Marketing Teams (and teams within them). (Russell Ackoff's model)

2) Identification of Teams within the 3 top sub systems ... Management, Innovation / Marketing, and Delivery.

Note: a lot of these specific approaches are documented in the Organizational Design Process (organizing activity of a manager).

Where necessary the decisions for the specific teams within the structure will be driven from the process not the model.

Note: Team Types and Team status can allow multiple organizational structures to fit within the same models. (Team Type and Team Status are part of the Organization Design Process).

Modelling Techniques

Draw organization charts using visio, powerpoint, or other type of tools (Oracle). Note the specific form is not as important as the accuracy of the whole organization.

Typically the challenge is making sure that there is always a current (Active) organizational structure that forms the basis for change management.

An Organization Structure (Organization Chart, or some other diagram) describes the relationships between the various teams identified in the management system.

This diagram should also indicate the type of team that is represented on the diagram... the types might be:

- Governance
- Org Unit (Permanent)
- Project (Temporary)
- Programme (Temporary)
- Specialist (Temporary)
- Supplier (External)
- Customer (External).

See the following documents to understand the key elements of an organization.

[PDF: System Description: Organization as a SoS, Version 0.13 05-December-2022](#)

Examples

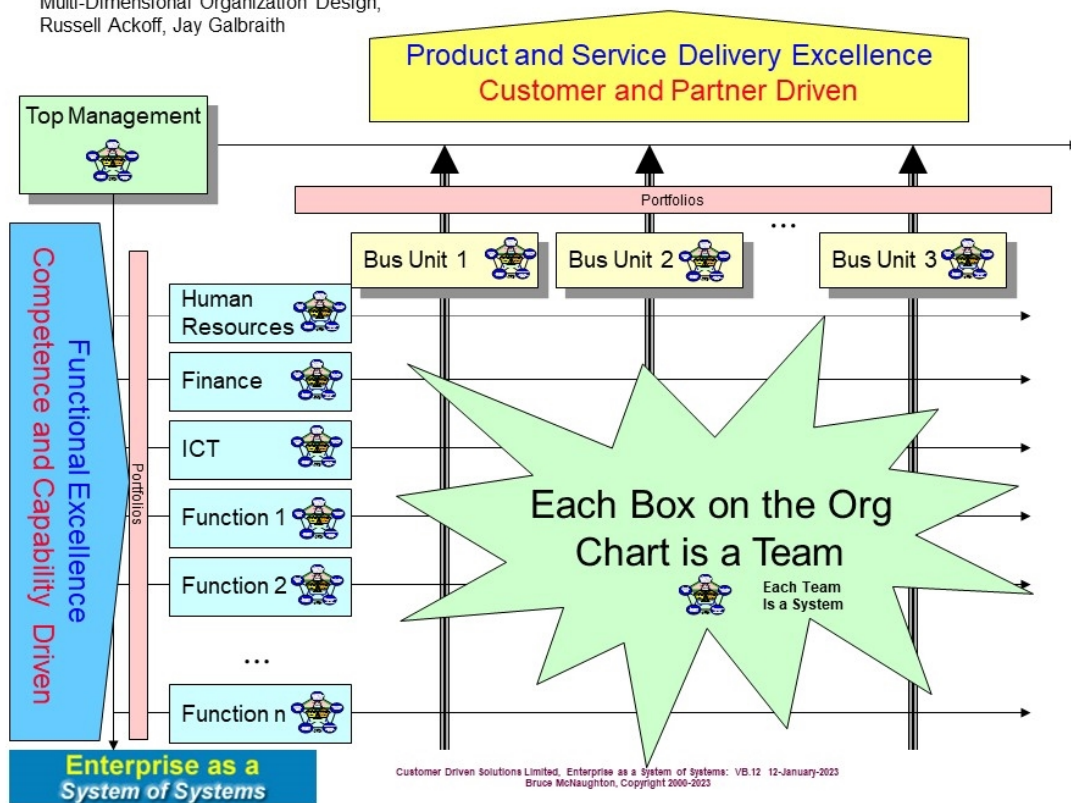
Hierarchy

Circle

Matrix (See Lean thinking, See

Multi-dimensional

Multi-Dimensional Organization Design,
Russell Ackoff, Jay Galbraith



84

References

Model Kind Links

Process Activity Model

Description

A Process Activity Model shows the relationship of the related activities and their use of information. This model is typically used to understand / analyze the activities within a single process. These activities form the basis for Role identification and related training.

Contents

There are many types of models that cover the formal relationships of activities. These are:

- BPMN
- Activity Diagrams (UML)
- IDEF
- DataFlow diagrams

Some use swim lanes to highlight the roles carrying out the work (BPMN / UML).

Each of the above standard models has a corresponding set of definitions to create them.

Note: Informal diagrams that are more understandable by a set of stakeholders are also in this set and must be based upon a formal model.

Note: These activity models also need to provide a way to identify [a "Technology Interaction Point"](#)

Languages, Notations, Conventions

See the procedures for each of the various activity models. Example: [UML Activity Diagram](#)

Methods - Create, Analysis, Identify

See the procedures for each of the various activity models.

In addition, the activity model may also identify some [critical decision points](#) that may bring in additional models

Modelling Techniques

[Brown Paper and Postits.](#)

methods and techniques

The [Soft Systems Methodology \(SSM\)](#) problem solving approach is a good approach for both identifying the activity model and the issues surrounding the implementation / changes necessary to implement the benefits.

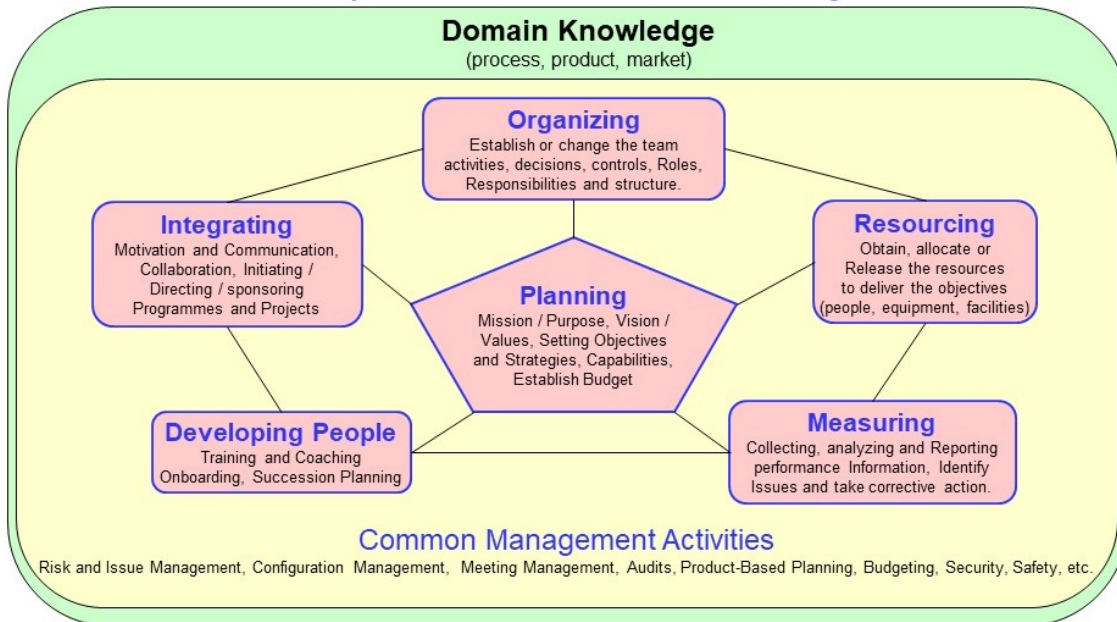
Examples

The Activities of a Manager are shown as a simple Activity Model.

The Activities of a Manager

Leadership

"The very best leaders are first and foremost effective managers".



Adapted from: Peter Drucker, *Management: Tasks, Responsibilities, Practices, 1974, Abridged*

Enterprise as a System of Systems

Customer Driven Solutions Limited, Enterprise as a System of Systems: VB.12 12-January-2023
Bruce McNaughton, Copyright 2000-2023

60

References**Model Kind Links****Process Decisions****Description**

A Process may contain a number of related decisions and actions. This can result in a number of types of models that represent the problems and the outcomes of the decision process.

- See [Wikipedia: Decision Theory](#)
- See [Wikipedia: Decision Tree](#)
- See [Wikipedia: Decision Analysis](#)
- See [Wikipedia: Action Axiom](#)

Additional information can be found in ISO 15288:2023:

- 6.3.3 Decision Management Process
- 6.3.4 Risk Management Process
- 6.4.6 System Analysis Process (for single parameter based decisions)

Contents

There are many types of decision models / tools that help describe processes. These are:

- Decision Trees
- Outcome Analysis (related to reviews or stages)

- Decisions modelled in Activity Diagrams related to a process.
- Log of decisions and rationale
- Others....

Note: These activity models also need to provide a way to identify a "System Interaction Point".

Languages, Notations, Conventions

Some tools have decision tree models others can be embedded in Activity Diagrams

Methods - Create, Analysis, Identify

See the procedures for each type of models / diagram being produced.

Modelling Techniques

[Brown Paper and Postits.](#)
methods and techniques

These decision analysis approaches need to be in line with Decision Analysis found in ISO 15288.

Examples

The Activities of a Manager are shown as a simple Activity Model.

References

Model Kind Links

Process Model

Description

The full set of Processes or a specific subset identified for the organization. This model provides a basis for the design of each process.

The process model identifies the relationships between the various processes. These models can also be used to map the processes to the [External Requirements Indicator Map \(ERIM\)](#).

Contents

The contents of a Processes Model are:

- Identified Processes for all processes or a named subset
- Relationships of the processes within the model.

Languages, Notations, Conventions

Processes must be identified by their exact names

The types are defined by the top level capabilities (generally).

Methods - Create, Analysis, Identify

Analyse the various capability models to identify unique processes supporting each Capability

Group the process by type if necessary

Identify the relationships between the processes (invoke, use work product, etc)

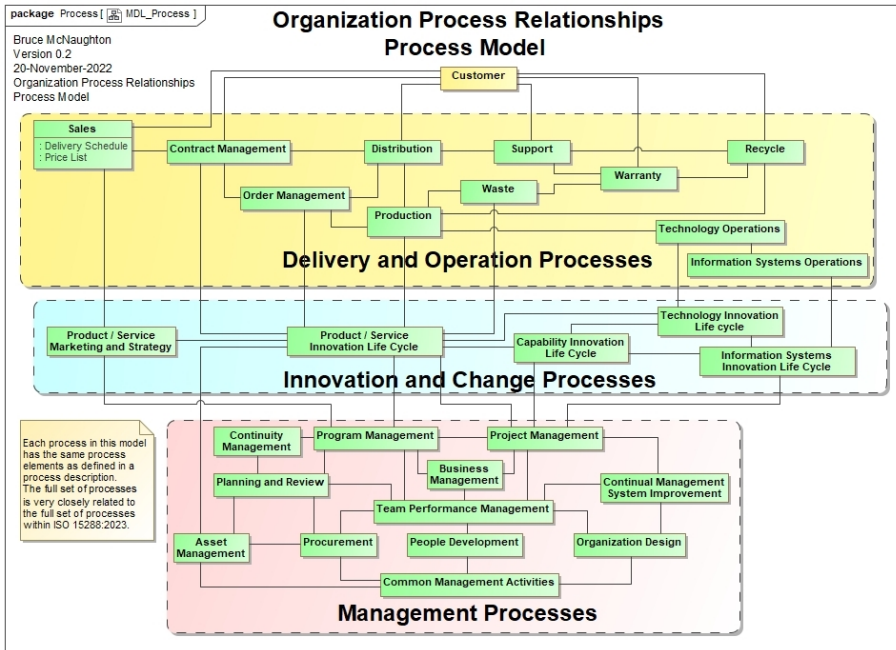
Review the model

Modelling Techniques

Simple Class diagram

or an Activity Diagram (optional)

Examples



References

Model Kind Links

External Requirement Indicator Map

Description

A mapping from requirements in an external standard, regulation or best practice document to the activities identified in the [Process Model](#).

There is also a rating associated with the item being mapped. This indicator drives any corrective actions or improvement investments.

External standards essentially place requirements on the way work is carried out or the way products and services are delivered and used.

Contents

For each external standard, regulation or best practice requirement, an indicator is prepared indicating the following:

- Identifier of the Requirement
- Processes / Activities that map to the requirements (may also map to measurements or artefacts)
- Assessment of the implementation of the practice

These will be rolled up by external standard, regulation or best practice to see how well the requirements are being addressed within the organization.

Languages, Notations, Conventions

The map is best viewed in a table with colors indicating the status of the implementation.

Methods - Create, Analysis, Identify

Create: Identify the external standards, regulations and best practice models to use

Analysis: Map the requirements to the current processes / activities and make an assessment (formal or informal)

Identify: Identify any actions that are necessary to close any gaps. Prioritise based upon planning.

Filter: Filter by external standard or best practice model

NOTE: comparisons across external standards or best practice should be avoided. They should always have an activity (work to be carried out) in a process as the focal point).

Modelling Techniques

Use the Activity Models of the work necessary to satisfy the external requirements. These may either exist or can form the basis for a new process.

Map the activities using a table or database for sorting, addressing duplicates, etc. (Basically Requirement to Activity / Process).

Examples

Similar to PIIDs for the CMMI SCAMPI process (older versions of the process).

References

Model Kind Links

Technology Interaction Point

Description

A Technology Interaction Point is a step within a [process activity description](#) that a user carries out to formally interact with technology, typically, an information system.

Contents

A technology interaction point identifies:

- The technology (typically an Information System) to interact with (may be multiple)
- The Reason for the interaction
- The specification reference ... typically a UML Use Case
- The response required.

Languages, Notations, Conventions

Typically this interaction is embedded in an activity description or a related document procedures, guidelines, etc or screen help.

The interaction point directs the user to the correct technology (typically an information system) to use.

Methods - Create, Analysis, Identify

Created: by analyzing the [Process Activity Model](#) that people use within a defined and managed process.

Analysis: Analysis typically ends up in the supporting specification for the specific interaction point. This may also be a number of specifications.

Identify: System Interactions Points should have a unique identifier and reference.

Modelling Techniques

Analysis of activities using the [Process Activity Model](#)

Examples

See BPMN examples (t.b.d). for the identification of the interaction point.

References

Model Kind Links

Risk Map

Description

Description

Contents

Contents

Languages, Notations, Conventions

Conventions for building the model

Methods - Create, Analysis, Identify

Steps, methods, and processes to create the model.

Modelling Techniques

ATechnique to create the model.

Examples

Examples of creating the model.

References

Model Kind Links

Road Map

Description

this is a timeline view of a sequence of initiatives that will be invoked in order to raise the maturity of the capabilities needed to address strategic gaps

Contents

Languages, Notations, Conventions

Methods - Create, Analysis, Identify

Modelling Techniques

Network Diagram, Gantt Chart, or similar representation (Tube Map).

Examples

References

Model Kind Links

Stakeholder Map

Description

The stakeholder map identifies the stakeholders with an interest in the organization.

The stakeholder map may also indicate the relationships of the stakeholders and their concerns. In some cases, there may be conflicting priorities or concerns which can also be highlighted on the stakeholder map.

Contents

Stakeholders and their concerns or interests

Optional any conflicting concerns

Languages, Notations, Conventions

Methods - Create, Analysis, Identify

The Critical System Heuristics (CSH) approach may be used.

Modelling Techniques

One or more of the following depending upon the audience:

- [Mind maps](#)
- [Rich Pictures](#)
- List of Stakeholders

Examples

References

Model Kind Links

Strategy Map

Description

this is as close to standard as they come... refer to Kaplan and Norton's work with Balanced Scorecards

Contents

Languages, Notations, Conventions

Methods - Create, Analysis, Identify

Modelling Techniques

Examples

References

Model Kind Links

Supply Chain Model

Description

The Supply Chain Model consists of a network of organizations that take raw materials and deliver the materials needed to begin the production processes within the Central organization. The Supply Chain is on the input side of the [Value System](#).

Contents

The model identifies the organizations that interact from collection of raw materials through various transformations and leading to the input to the central organization.

Languages, Notations, Conventions

The [Class Diagram](#) or the [Object Diagram](#) can be used to create a Supply Chain Model

Methods - Create, Analysis, Identify

Identify the raw materials used in the central Organization

Identify the organizations that are involved in delivering these raw / processed materials to the central organization as input to the production process.

Identify the relationships and sequence of this network of organizations in the supply chain.

Validate that the model is accurate for the inputs that have been identified.

Modelling Techniques

The typical techniques for the class and object diagrams apply.

Examples

See the [Value System](#) description

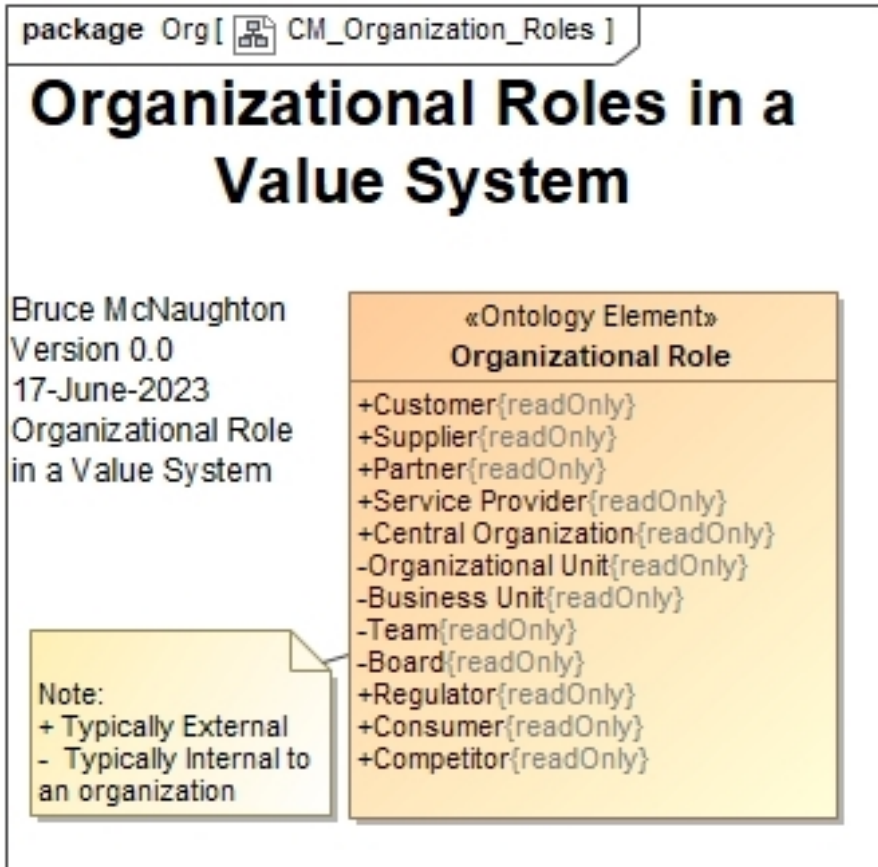
References

Model Kind Links

Value System Model

Description

A [Value System](#) describes a network of organizations interacting from raw materials to delivered products and services within an Enterprise to deliver value to customers / stakeholders. Each organization in the Value System takes on a role, such as, supplier, channel partner, support organization (banks, regulatory, consulting, etc) and the relationships. See the list below.



Each organization in the network of organizations represents a set of capabilities used to deliver value. Each organization has core capabilities that can be described using a capability model. The [Value Chain](#) is an example of a capability model for an organization in a value system.

Contents

The organisation (central organization) is placed at the center of the model. any other organisations such as generic or specific customers, suppliers, government organisations, etc. are placed in relation to the other organizations.

Languages, Notations, Conventions

Each box in the value system is an organisation; each of the interactions are described. Each of the organisations may have a more detailed description with specific information about the organisation, its capabilities and the influence.

Methods - Create, Analysis, Identify

Use brainstorming capabilities to identify the raw materials at the start of the start of the network of organizations.

Identify the organizations that deliver the raw materials to the Central Organization.

Identify the organizations deliver the finished goods to the end customers or channel partners.

- If delivered to a channel partner organization, Identify the intermediate organizations before the finished goods get to the end customers.
- If delivered to an integrator partner organization, identify the intermediate organizations before the finished goods get to the end customers.

Modelling Techniques

A UML Object Diagram or the Class Diagram are useful ways to model the value system as a network of organizations.

Examples

See the [value system description](#) for examples of value systems.

References

Model Kind Links

