MASSACHUSETTS INSTITUTE OF TECHNOLOGY

MIT Center for Transportation & Logistics

Rethinking your supply chain strategy in complex markets

November 14, 2012 - MIT CTL Advances in Supply Chain Management Webinar Series

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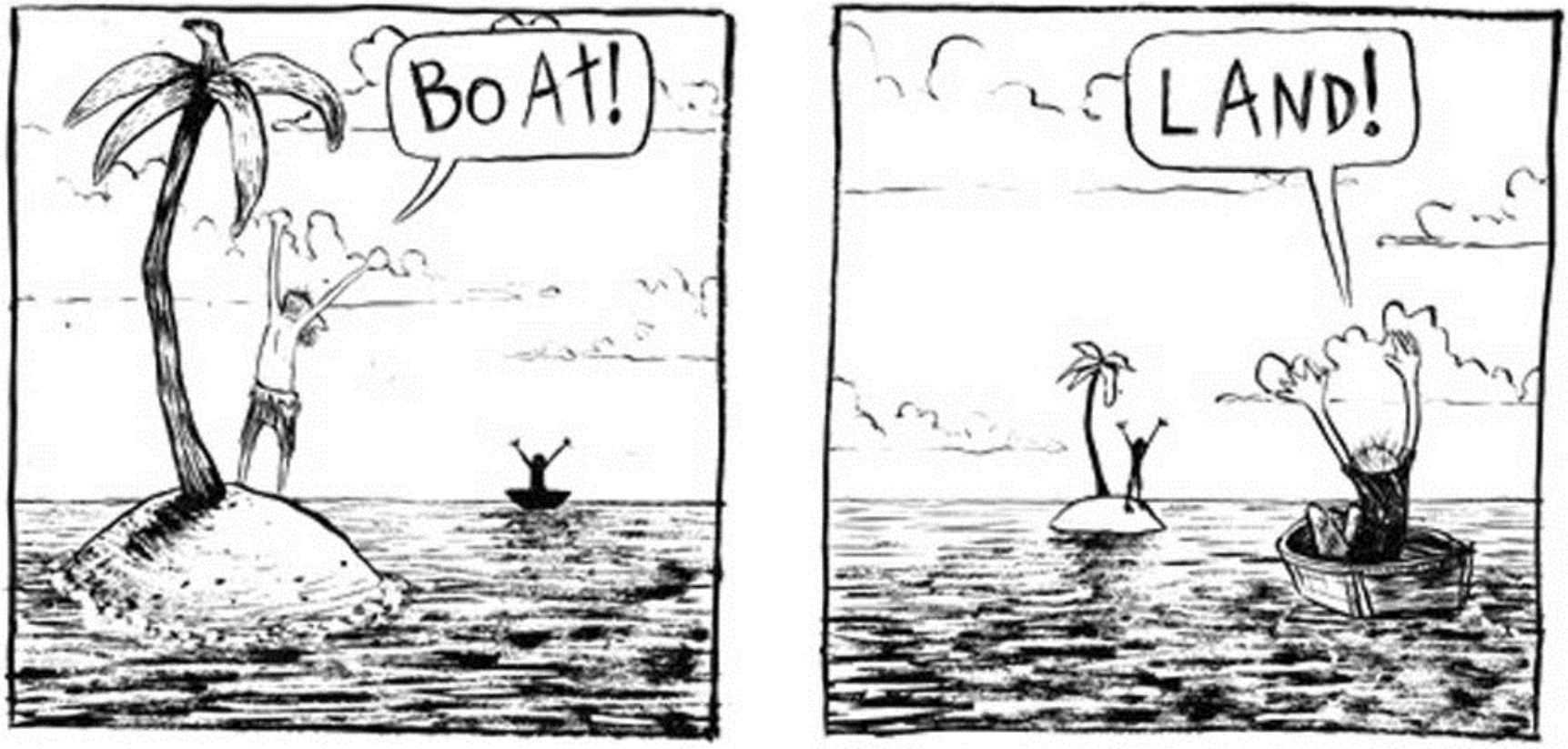
Director
Supply Chain 2020 Project

Collaborative management research:
an alliance between academics and practitioners

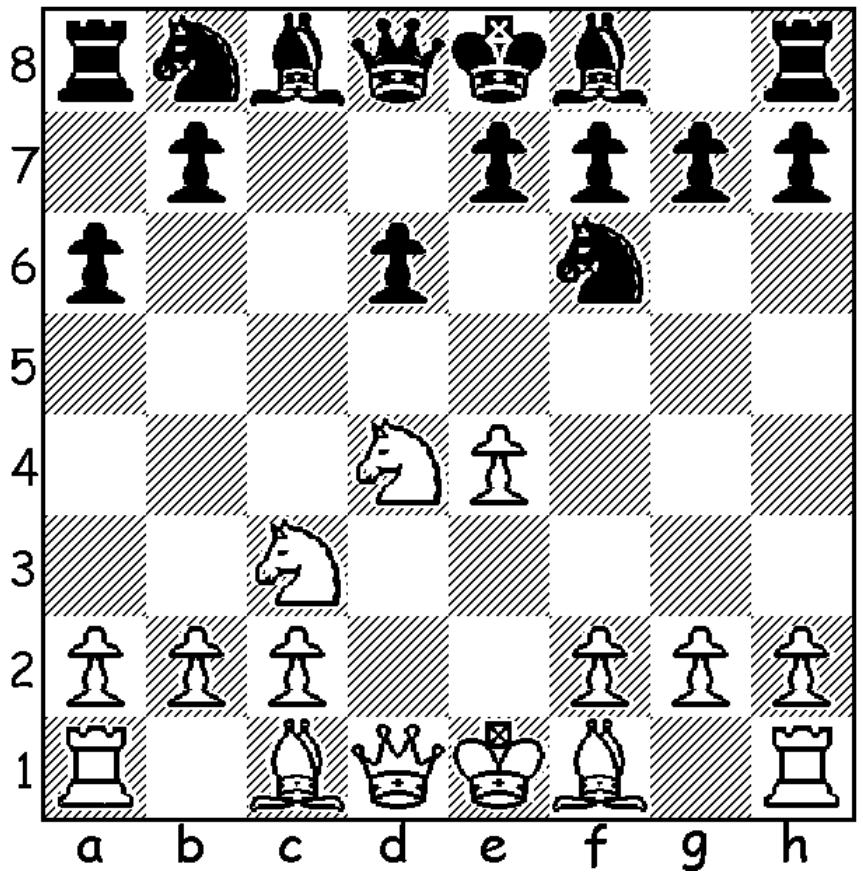


Source: Reddit. Trying to identify the author. If you have info, please let me know, so that I can credit him or her properly. Thanks.

1

A bit of theory on **complex problems**

Objective complexity



The **objective complexity** of a system is proportional to things like:

- the number of elements in the system,
- the number of their possible states, and
- the number of relationships between them.

Source: Edward Scimia / About.com Guide to the Sicilian Defense

Adapted from Dorner (1983) – Heuristics and cognition in complex systems

Subjective complexity

The **subjective complexity** of a system is determined by its objective complexity, but also by our capacity or **ability to understand** the system, and the **time pressure** exerted upon us to make a decision.

Adapted from Dorner (1983) – Heuristics and cognition in complex systems

Photos: Kasparov - Owen Williams, The Kasparov Agency.
Clock – The Chess Store

Well-defined problems

Well-defined problems are characterized by the following features:

- The aspired goal state is exactly known with respect to the criteria that must be met.
- The field of reality in which the problem is found is precisely known.

To keep them easily accessible to formal treatments (i.e. computer simulation), these problems are often:

- limited to static objects,
- limited to objects that are not very complex, and
- limited to completely *transparent* objects whose characteristics are evident and easily conceivable.

Source: Dorner (1983) – Heuristics and cognition in complex systems

Photo: The Photo Dictionary

The “other types” of problems

There are other types of problems, more common in daily life, which place other demands on us. It is frequently the case with these other problems that:

- The goal criteria are vague, and one is not at all certain what the aspired goal state is to be like.
- There are conflicts between goals, due to the contradictory relationships between partial goals.
- There is a lack of knowledge as to the possible *operators* and possible *states* of the system.
- It is often necessary to act with incomplete, inexact and/or incorrect information.

Source: Dorner (1983) – Heuristics and cognition in complex systems

Photo: Mining Technology

We can't eliminate complexity. **But we can tame it.**

Rx: Reduce the objective complexity of the system

Rx: Increase our ability to understand the system

Rx: Reduce time pressure in decision making

Reduce subjective complexity

Rx: Clearly specify the desired end state

Rx: Tend to conflicts between partial goals

Rx: Increase our knowledge about the structure of the system

Rx: Get more complete information

Define the problem better

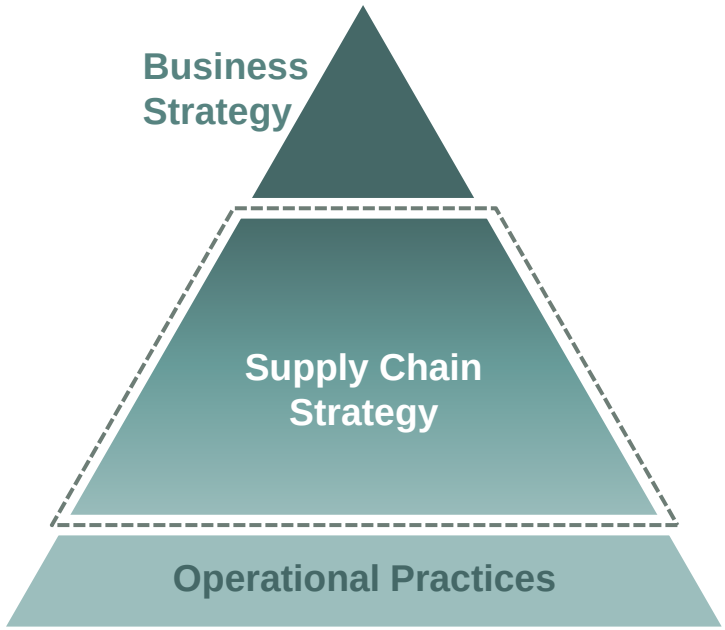
Source: Wikimedia Commons - (CC) BY - Robek

What a happy lion! Source: © kjdrill – All rights reserved

2

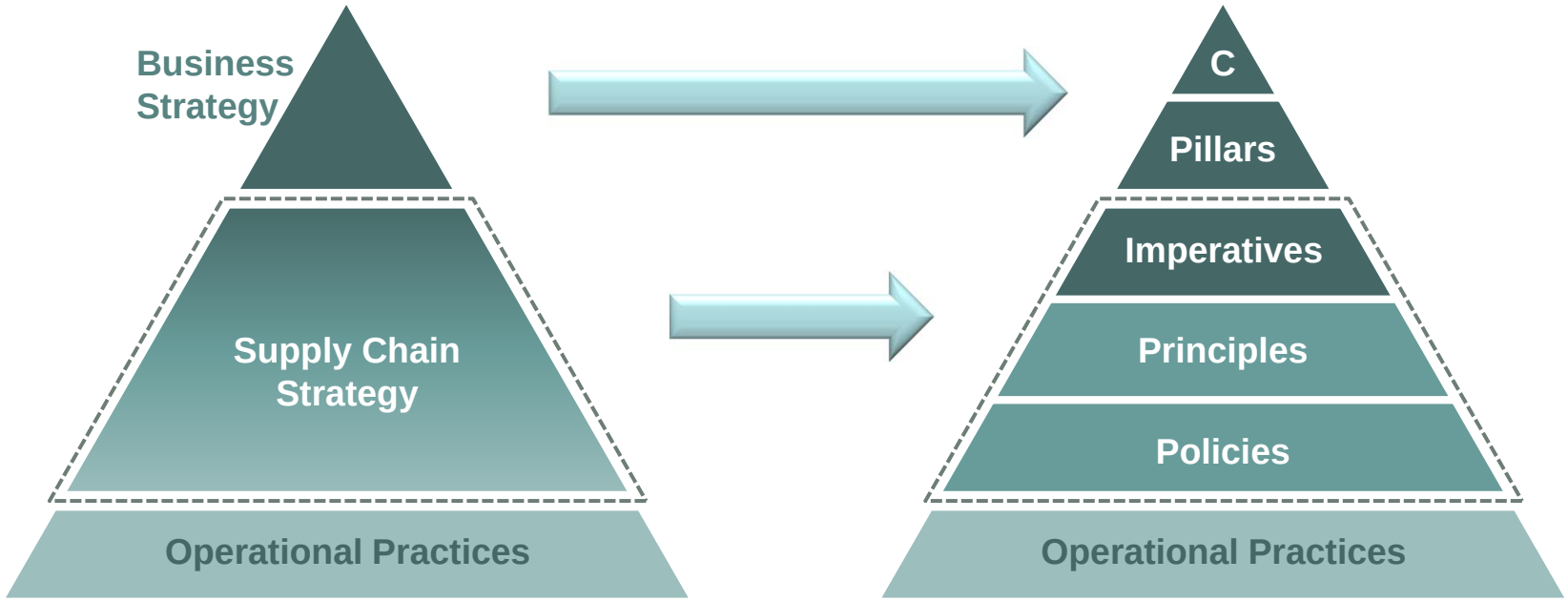
Outline of the SC2020 approach to **rethinking your SCS**

A pragmatic way to think about SCS



Source: Perez-Franco / SC2020 Project

A pragmatic way to think about SCS



Source: Perez-Franco / SC2020 Project

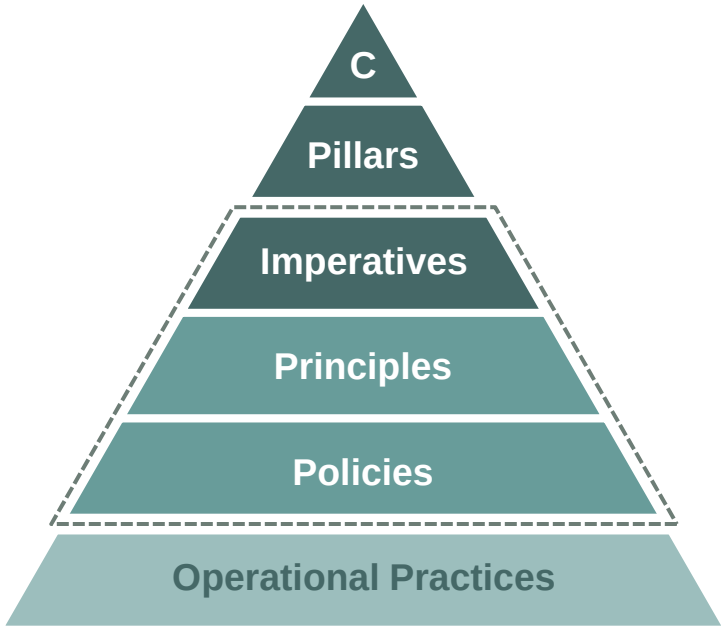
A working definition of supply chain strategy

The supply chain strategy of a business unit can be defined as the collection of supply chain relevant (SCR) imperatives, principles and policies that serve as the logical bridge between the business strategy and the operational practices of the business unit's supply chain.

Source: Perez-Franco / SC2020 Project

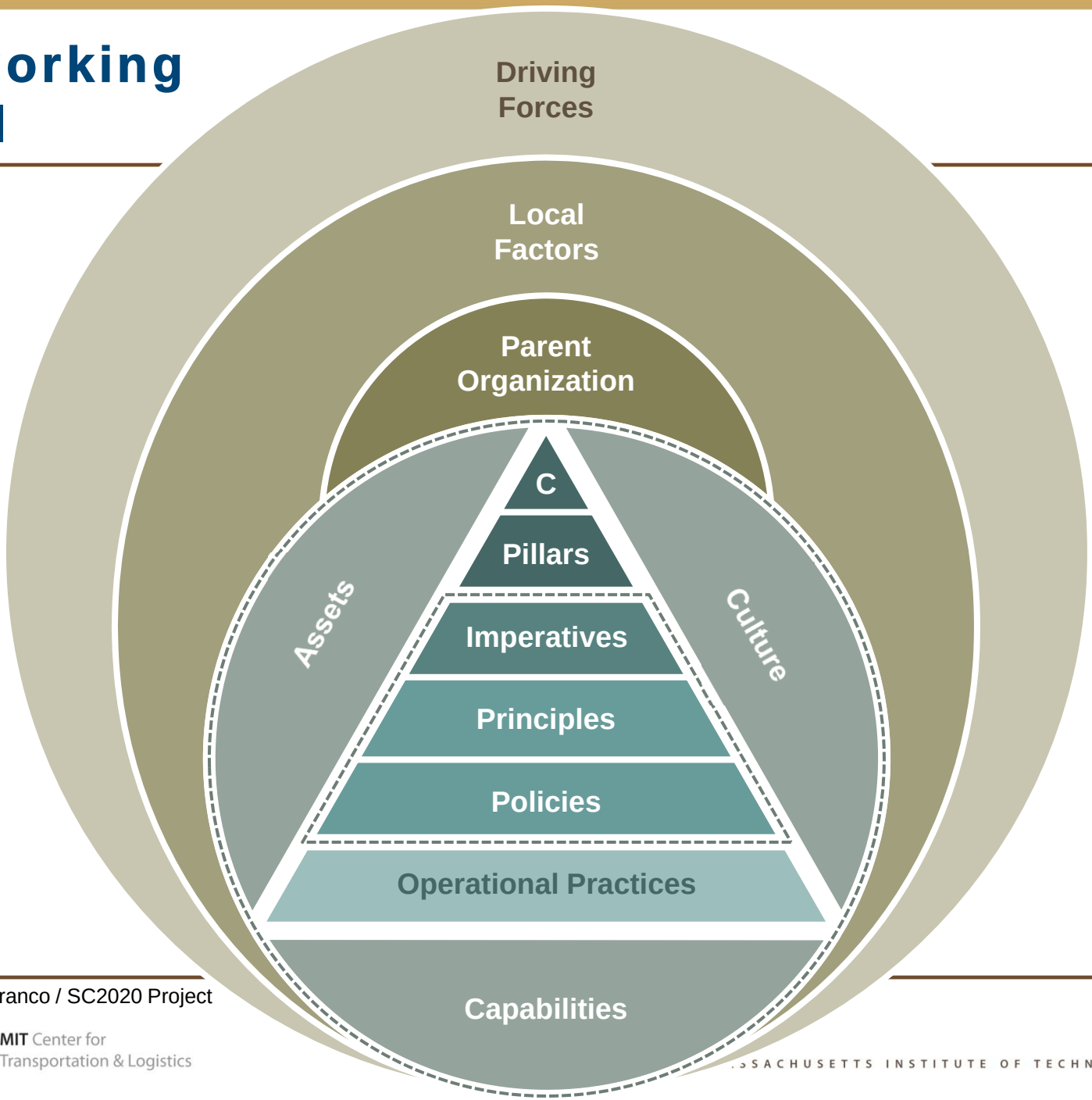
Conceptual elements and the strategy-operations continuum

Strategic in focus	Abstract in nature	Wider in scope	Statement of Purpose
Operational in focus	Concrete in nature	Narrower in scope	Statement of Practice



Source: Perez-Franco / SC2020 Project

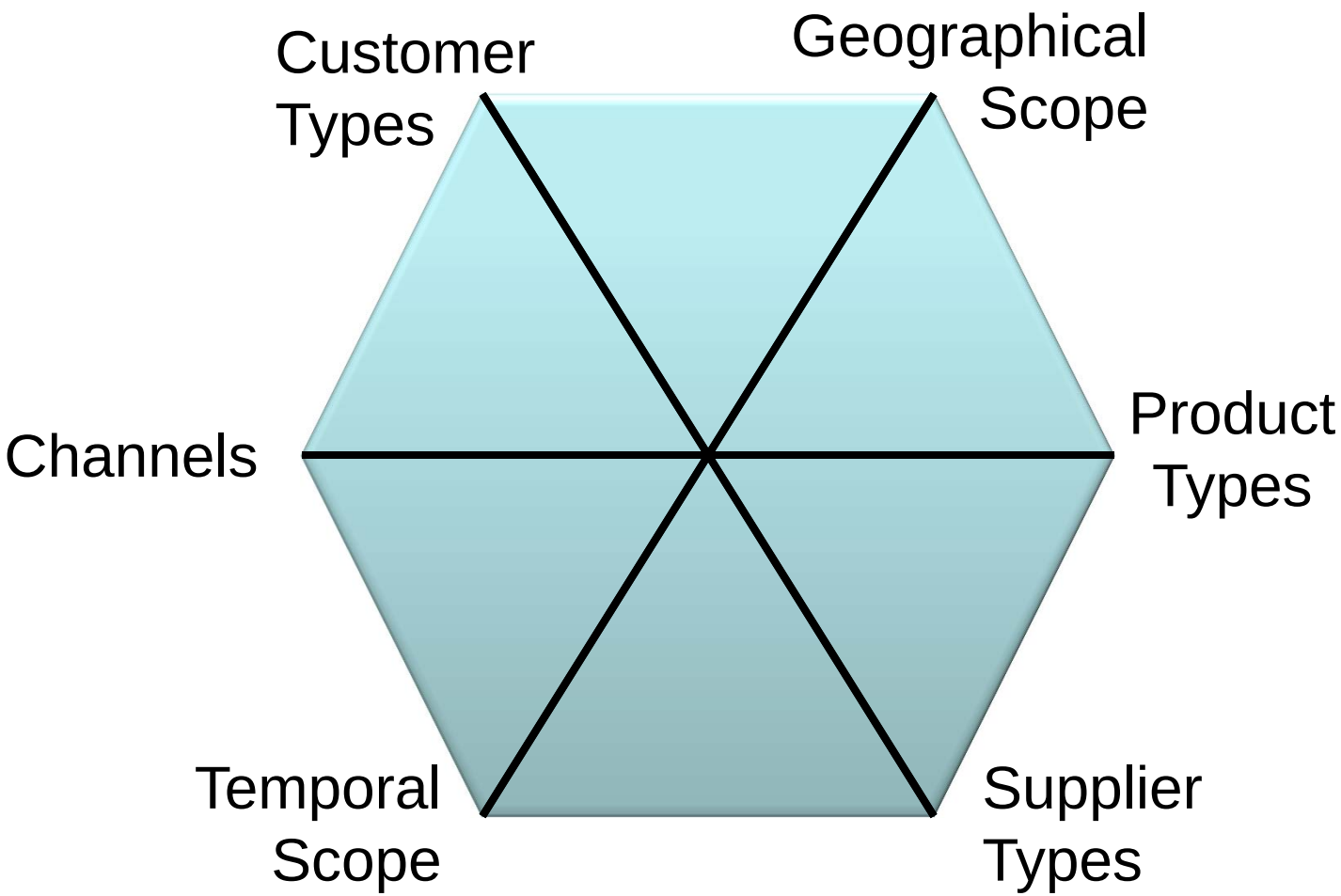
The working model



Source: Perez-Franco / SC2020 Project

Fundamental tasks in rethinking a supply chain strategy

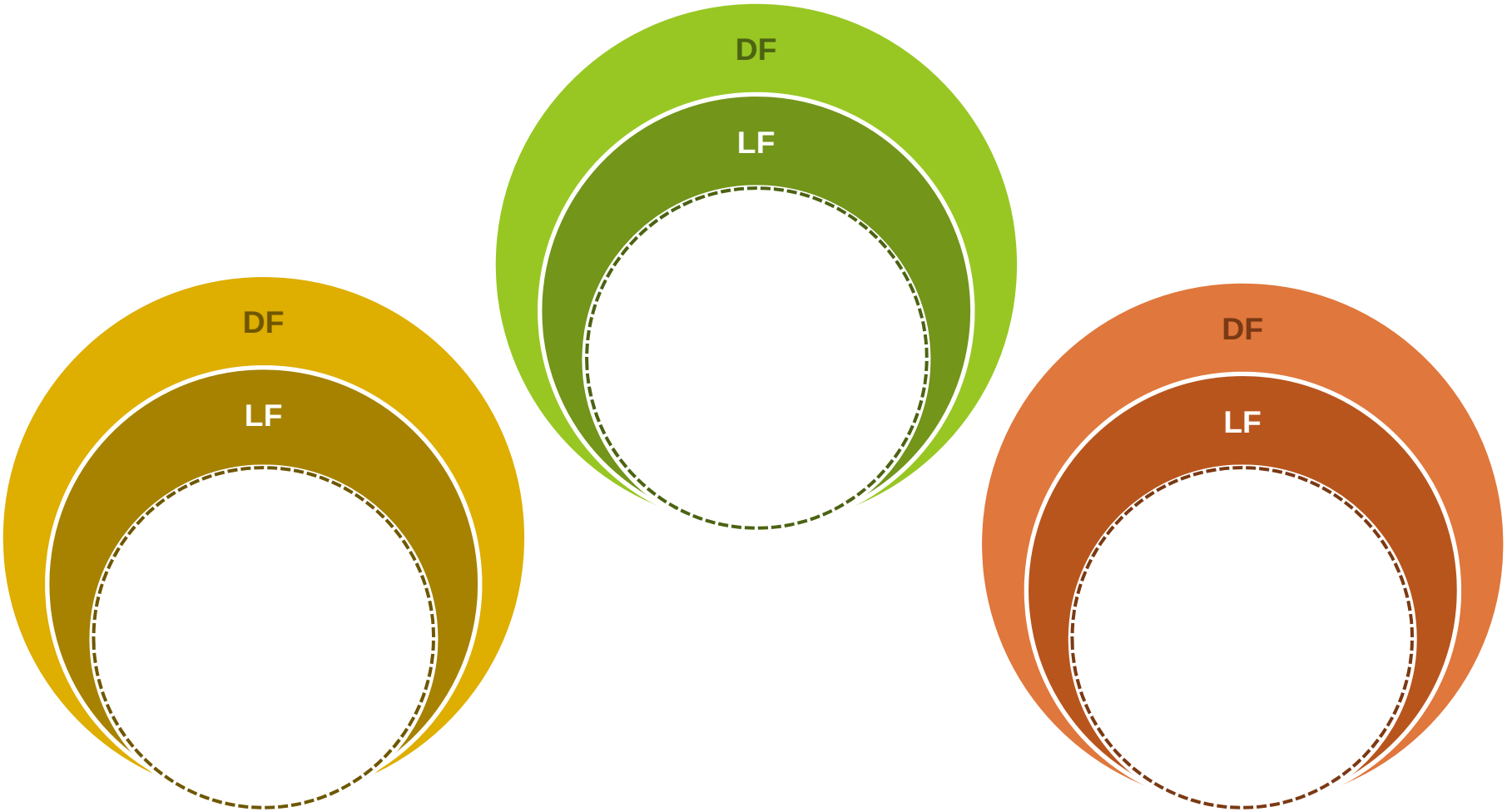
Task #1: Scoping, along the axes of complexity involved in rethinking a supply chain strategy



Source: Perez-Franco / SC2020 Project

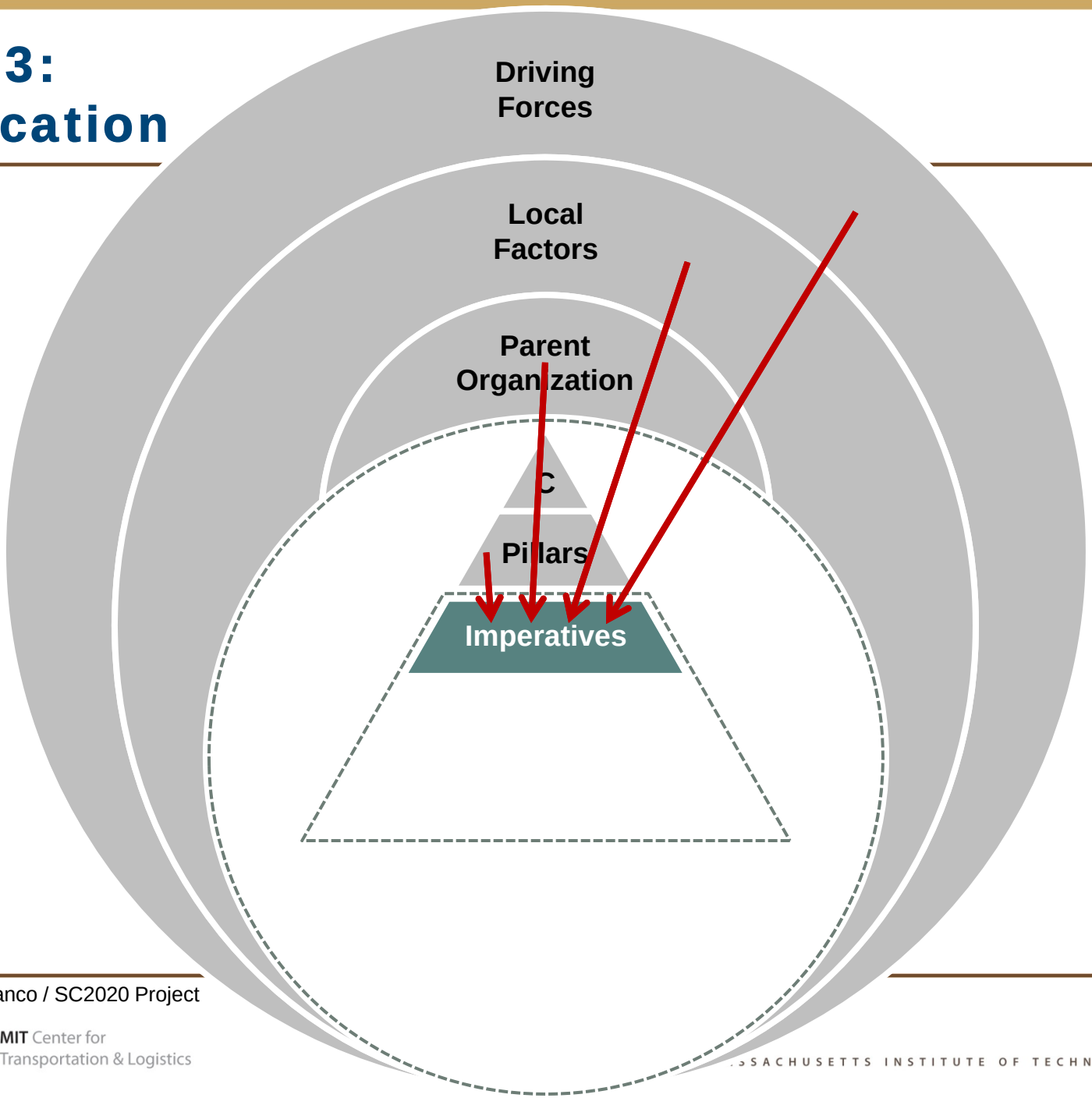
Task #2: Visioning

Thinking about alternative future scenarios



Source: Perez-Franco / SC2020 Project

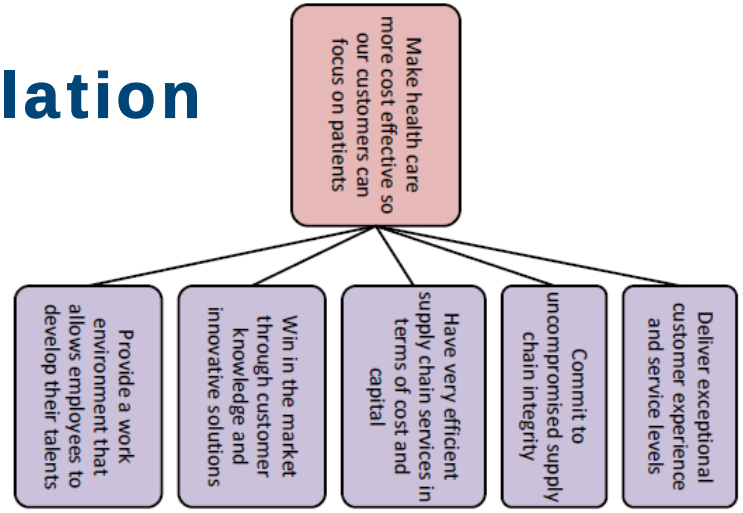
Task #3: Specification

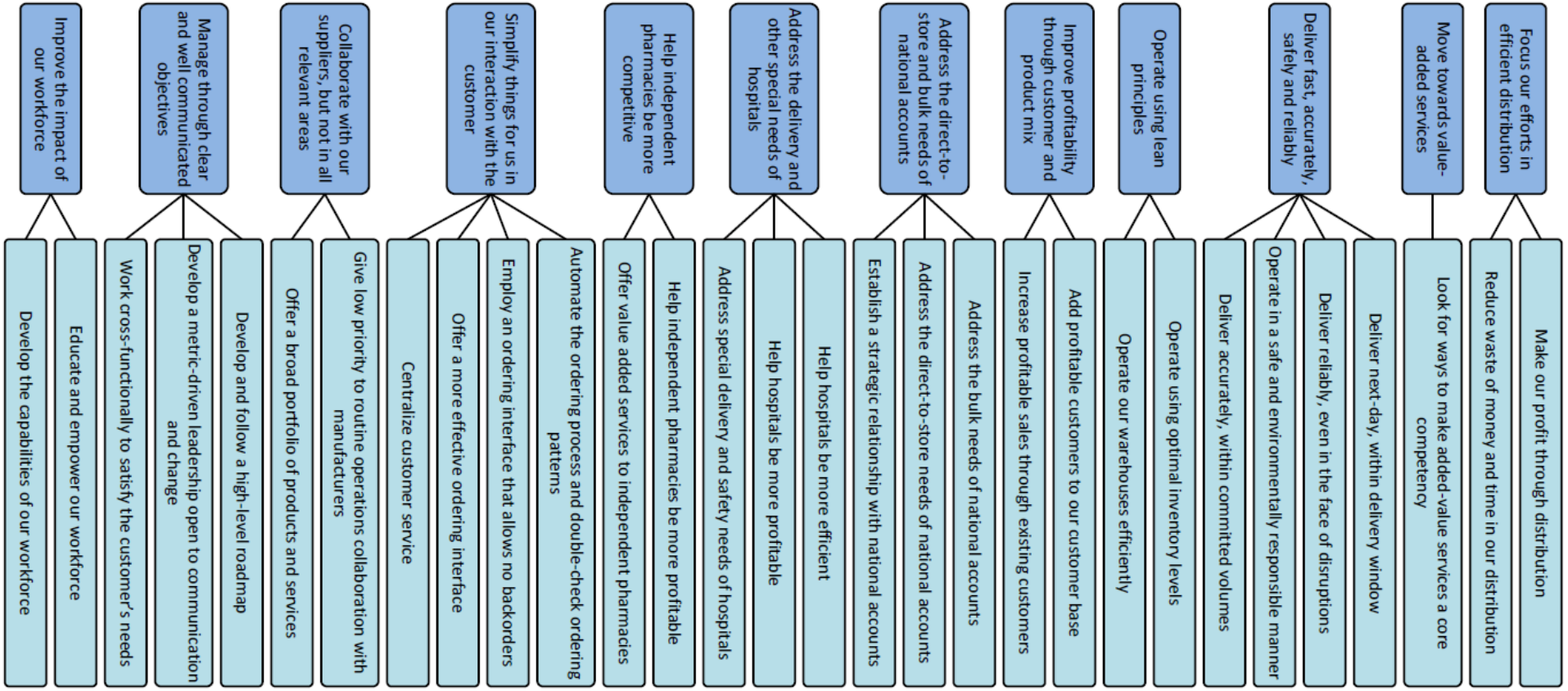


Source: Perez-Franco / SC2020 Project

Task #4: Articulation

Source: Perez-Franco / SC2020 Project



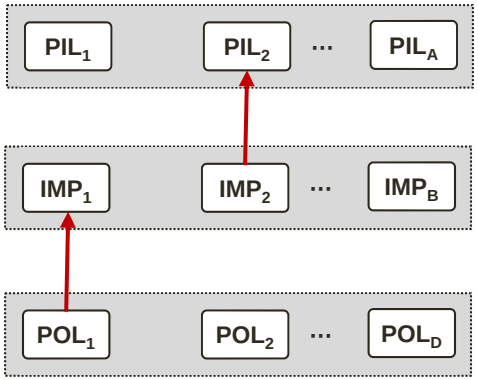


Task #5: Evaluation

Must-have evaluation criteria

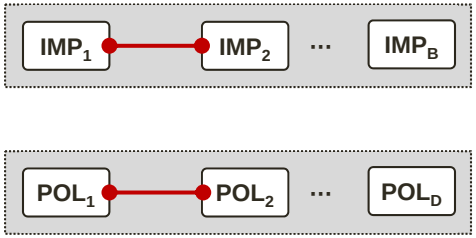
Criteria 1: **Support**

Every concept is **expected** to provide support to at least one concept from the layer above its own.



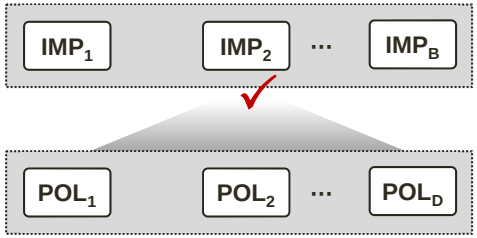
Criteria 2: **Compatibility**

Every concept is **expected** to be compatible with every other concept within the same layer.



Criteria 3: **Feasibility**

Every concept is **expected** to be feasible (e.g. realizable) through concepts in the layers below it.

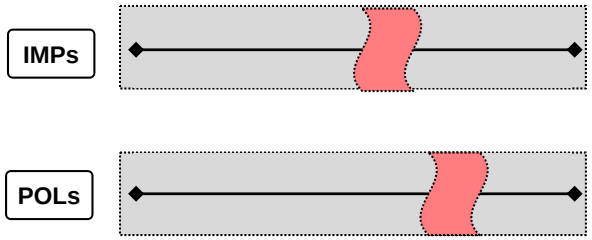


Source: Perez-Franco / SC2020 Project

Good-to-have evaluation criteria

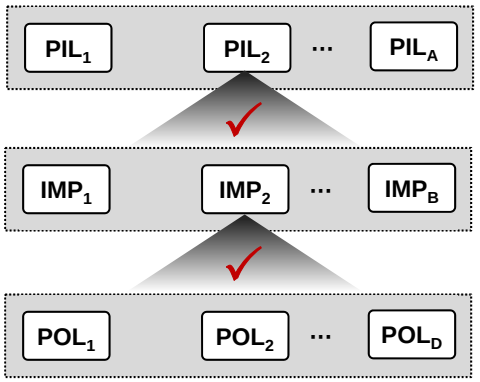
Criteria 4:
Coverage

Taken together, the collection of concepts within a layer **should** address all the areas of interest for that level of abstraction.



Criteria 5:
Sufficiency

Every concept **should** be fully satisfied by the collective support it receives from concepts in levels under it.



Source: Perez-Franco / SC2020 Project

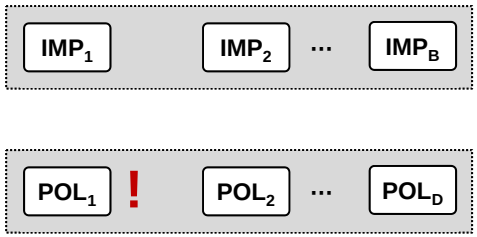
Nice-to-have evaluation criteria

Criteria 6:
Synergy

It is **desirable** for a concept to have mutually beneficial relationships, and to **not** have mutually detrimental relationships, with other concepts within its layer.

Criteria 7:
Parsimony

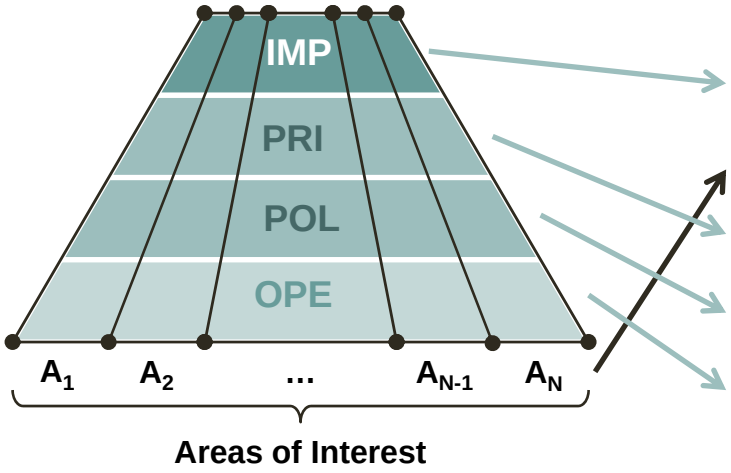
It is **desirable** for a concept to make better use of the resources it takes, in terms of producing results.



Source: Perez-Franco / SC2020 Project

Tasks #6 and #7: SCS Formulation through progressive conceptual system assembly (PCSA)

Task #7: System Assembly



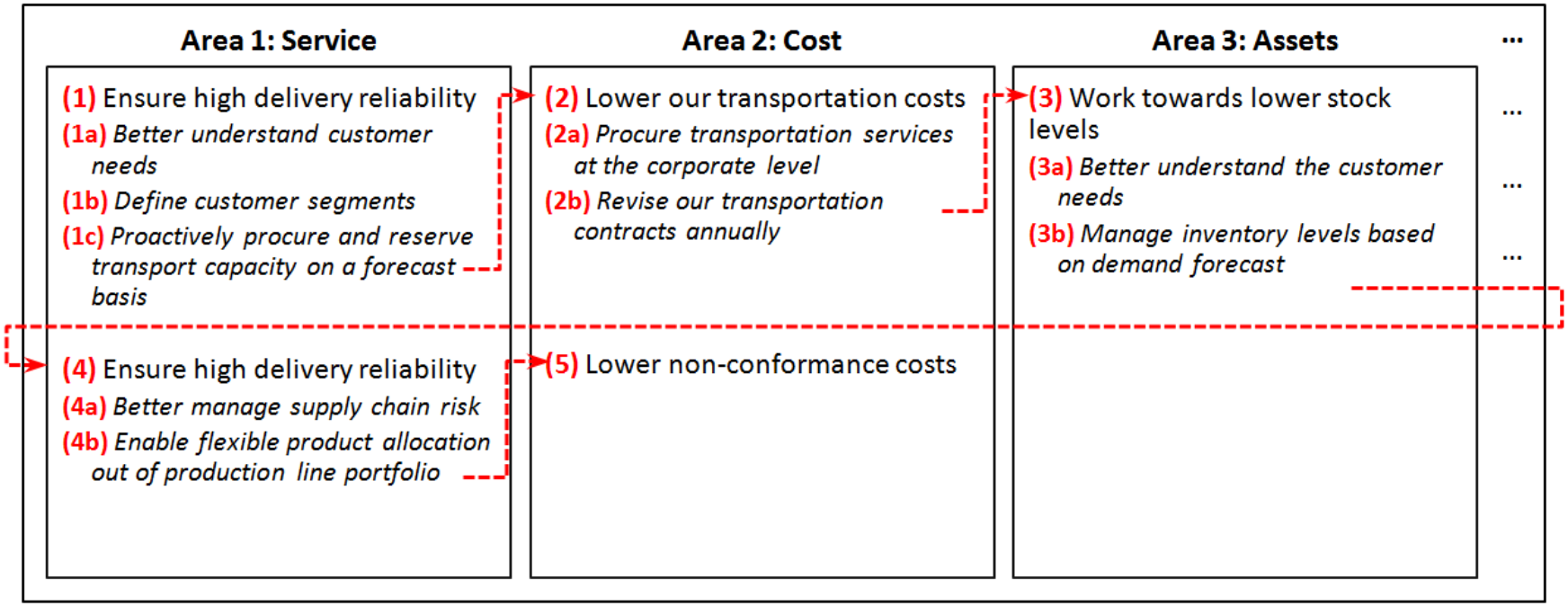
IMP	Imperative	Imperative		Imperative
AREA	**1**	**2**	**...**	**N**
PRI	Principle	Principle		Principle
POL	Policy	Policy		Policy
OPE	Practice	Practice		Practice

Concepts generated for Area 1 | Concepts generated for Area 2 | Concepts generated for Area N

Task #6: Concept Generation

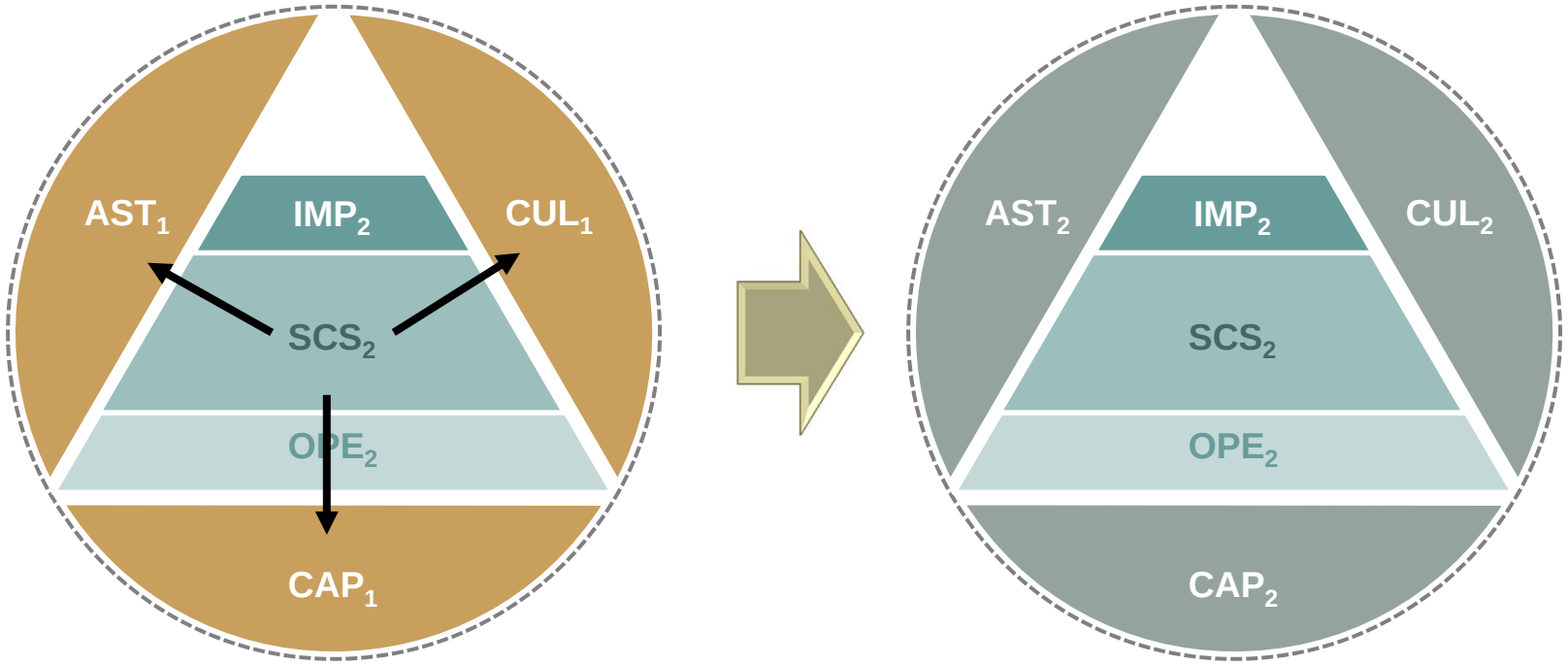
Source: Perez-Franco / SC2020 Project

Example of an ongoing PCSA (progressive conceptual system assembly)



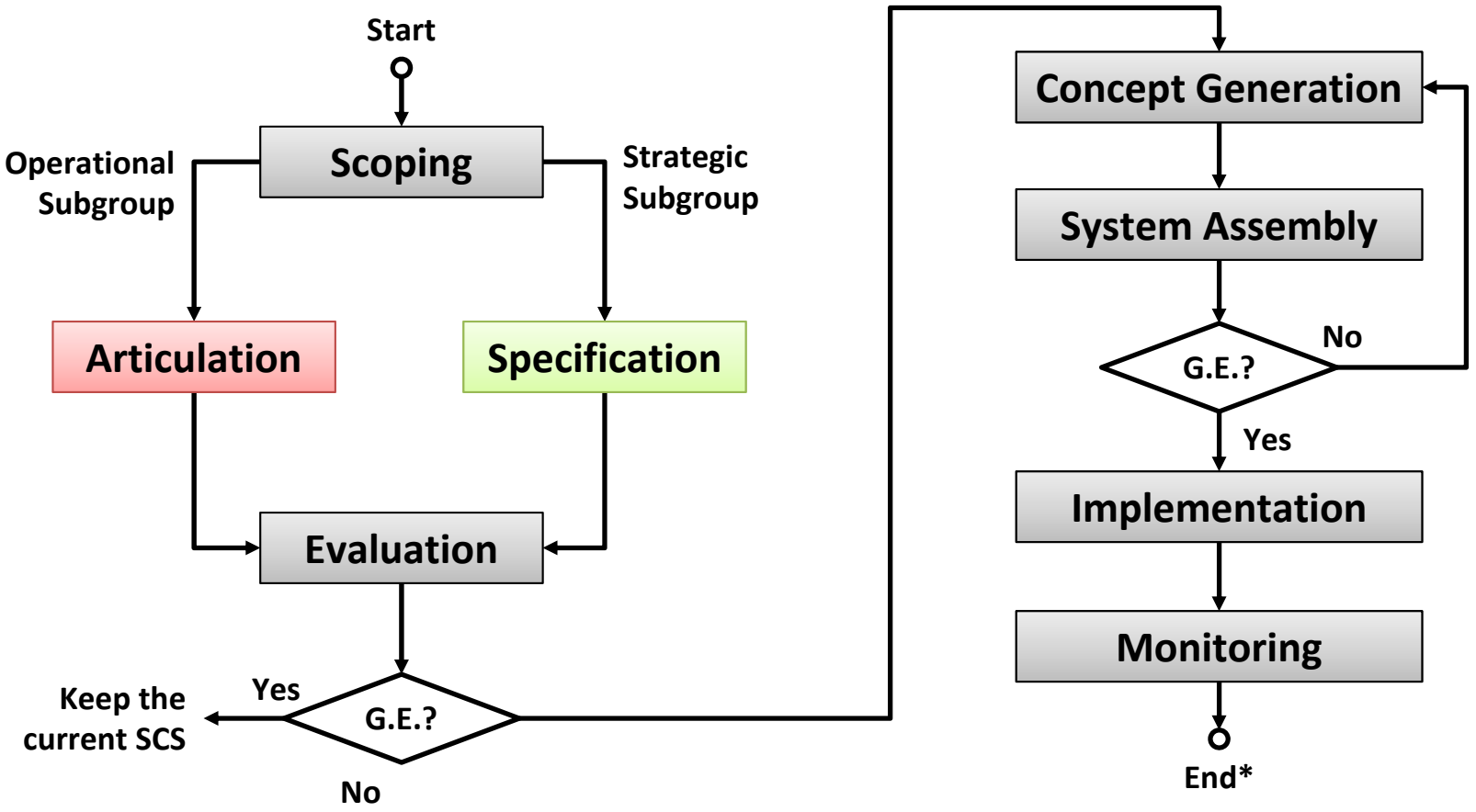
Source: Perez-Franco / SC2020 Project

Task #8: Implementation



Source: Perez-Franco / SC2020 Project

Sequencing the tasks: Rethinking the supply chain strategy of a business unit for the middle term



Source: Perez-Franco / SC2020 Project

3

HOW OUR APPROACH HELPS TAME THE COMPLEXITY OF **RETHINKING YOUR SCS**

Rx

Reduce the objective complexity of the system

Scoping allows us to focus on a part of the supply chain whose objective complexity we can handle.

Rx

Increase our knowledge about the structure of the system

Our *working model* of SCS helps you understand better the structure of the SCS and its context.

Rx

Get more complete information

Articulation and evaluation help us to get more complete information about the current state.

Visioning helps us get more information about the future.

Rx
Reduce the time pressure in decision making

Visioning helps us anticipate the effects of future events, and prepares us to react faster to change.

Rx

Clearly specify the desired end state

Specification allows us to define, through a set of clear goals, what success looks like for our SCS

Rx
Tend to conflicts between partial goals

PCSA helps us reformulate an improved SCS, while promoting compatibility and synergy among the elements.

Rx

Increase our ability to understand the system

In general, the *SC2020 approach* to rethinking a SCS helps you to better understand the SCS as a system.

Thanks for your time

I will be happy to take
any questions at this time

Join CTL

December 4, 2012 – Dr Yossi Sheffi Book Launch and Signing Event – MIT Media Lab -5:30 –7:00 PM http://logisticsclusters.mit.edu/book-launch-signing

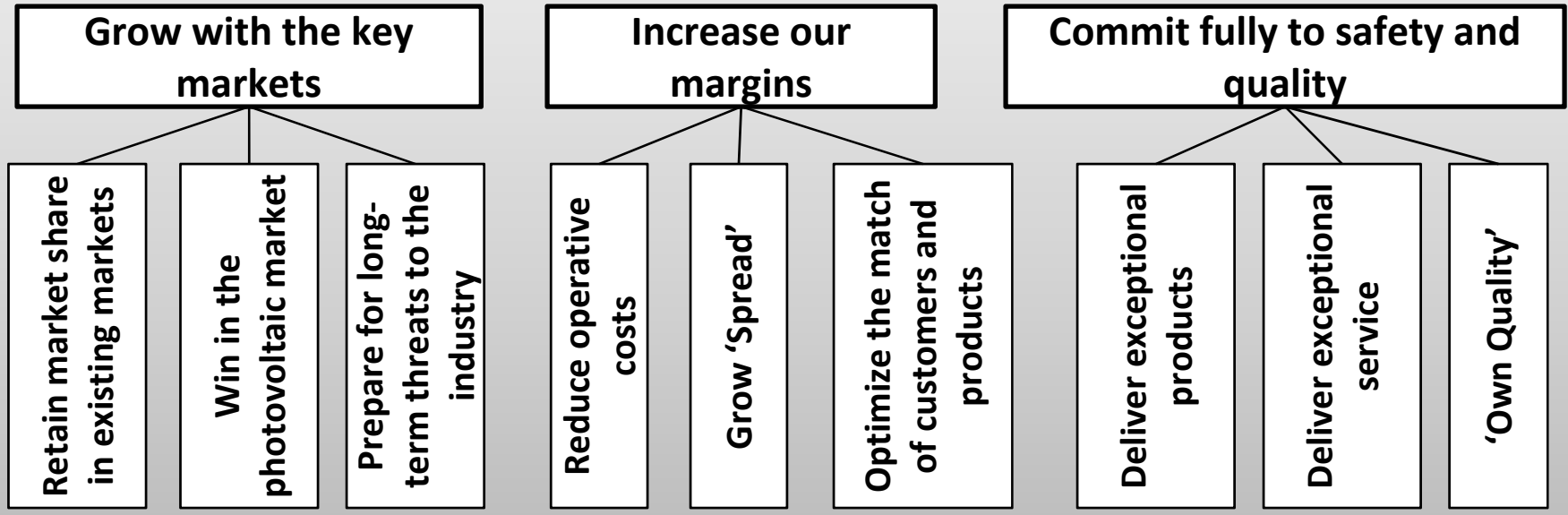
January 8-11, 2013 - Supply Chain Management: Driving Strategic Advantage – Executive Education Course http://ctl.mit.edu/events/execed-course-jan-2013

Questions about the CTL Supply Chain Exchange?
Contact Bob Vaz – rvaz@mit.edu

http://ctl.mit.edu

Back-up slides

General Expectations



Functional Expectations

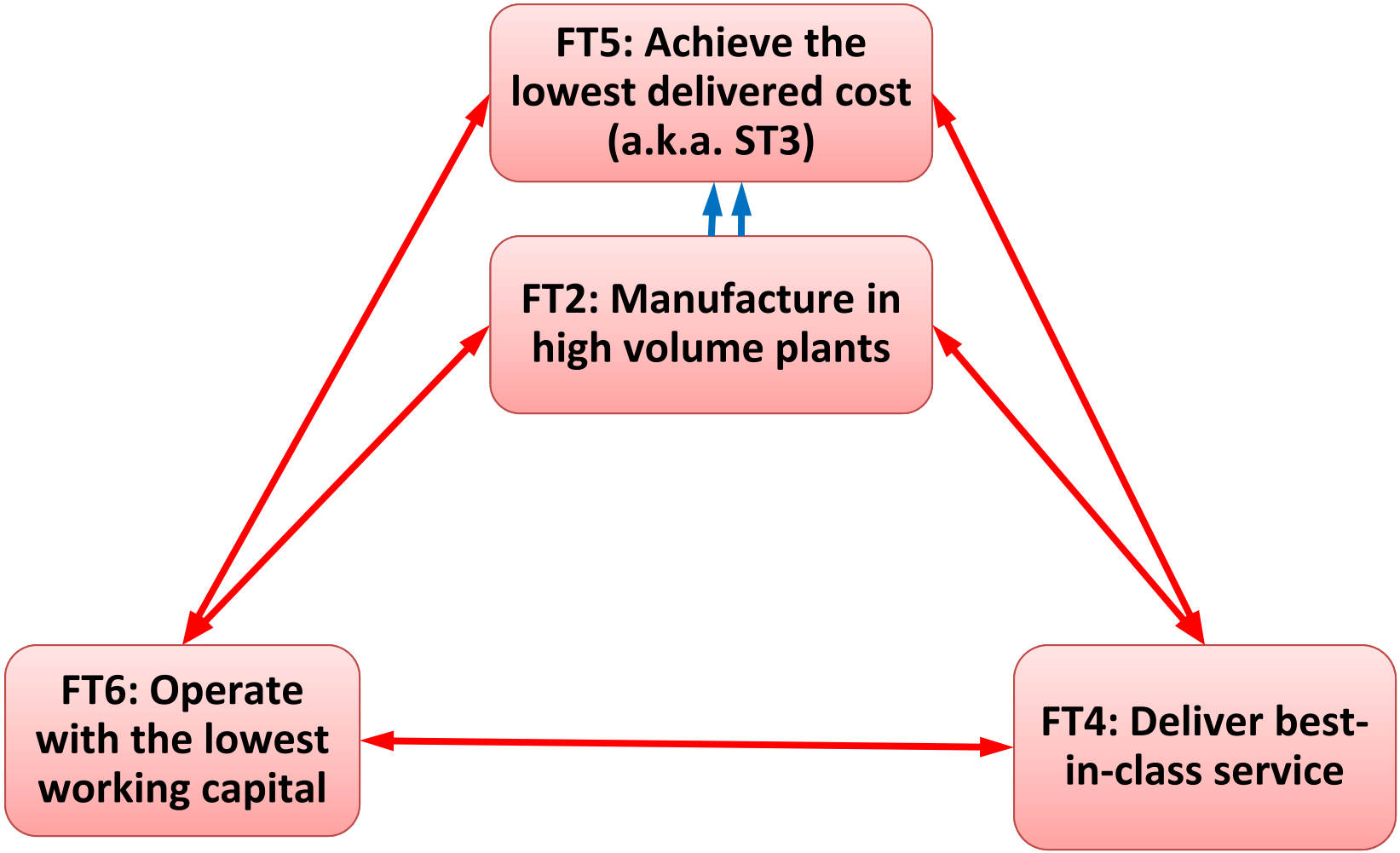
Customer Service:	Manufacturing:	Procurement:	Supply Chain:	Innovation:	Photovoltaic:
Meet all (e.g.>99%) commitments to customers flawlessly	Improve processes to reduce the cost of manufacturing	Manage the cost of raw materials and other supplies	Achieve lowest delivered costs position in all world areas	Focus innovation on high-impact process improvements and high-margin new products	Offer superior products and technical support

Sample of a within-level evaluation matrix

	FT1	FT2	FT3	FT4	FT5	FT6	FT7	FT8
FT1		0.6	1.4	-0.1	0.4	-0.4	1.4	0.4
FT2	0.5		0.4	-0.5	0.3	-0.2	0.9	1.1
FT3	0.0	0.3		0.4	0.4	0.8	1.2	0.4
FT4	-0.1	-0.8	2.2		-0.8	-1.2	1.9	1.8
FT5	3.0	1.8	1.3	-0.9		0.2	1.7	1.0
FT6	2.1	-1.1	1.1	-1.3	0.3		1.6	0.4
FT7	0.0	0.0	1.6	0.4	0.0	0.0		0.3
FT8	0.1	0.5	1.8	1.0	-0.3	0.0	0.4	

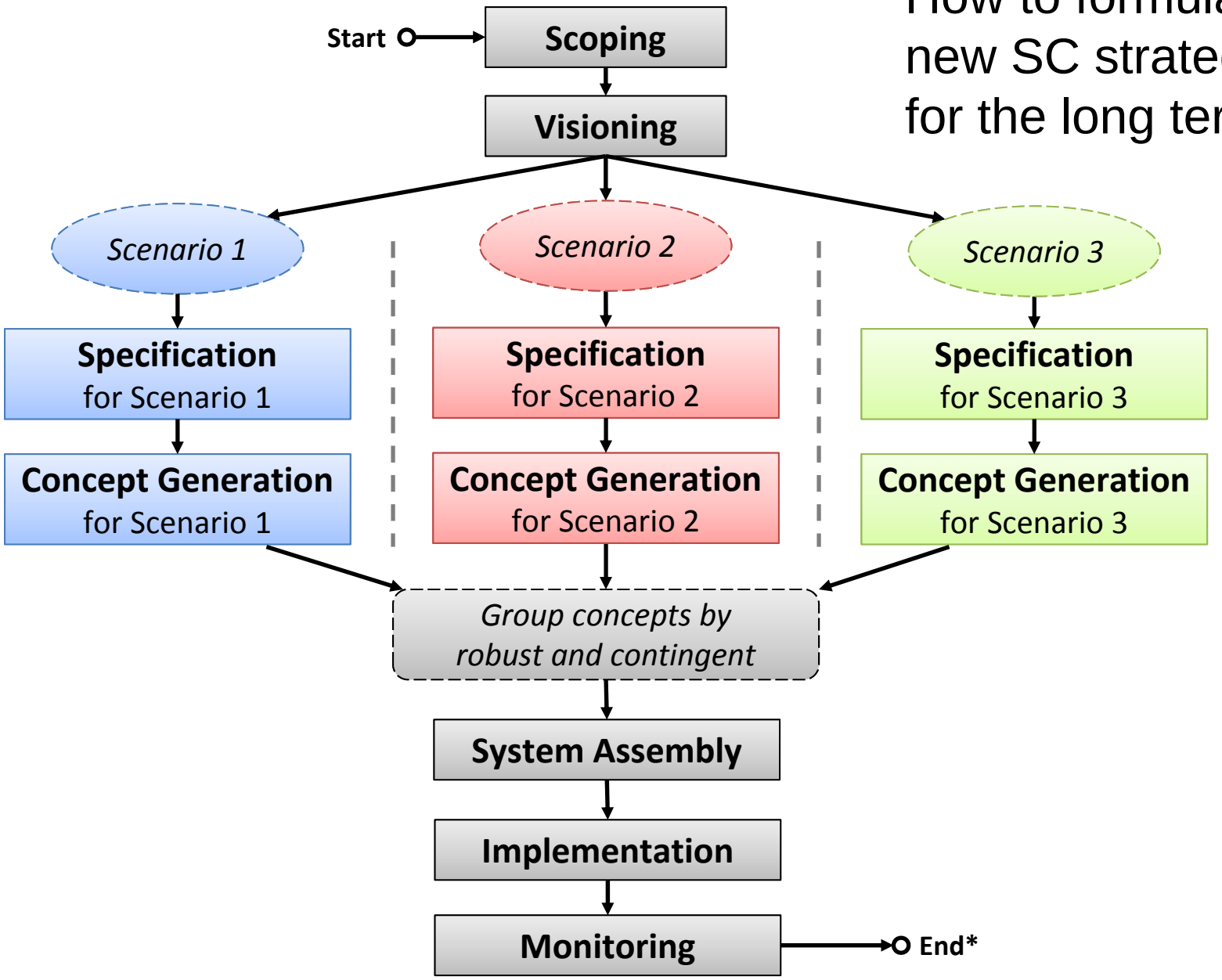
Source: Perez-Franco / SC2020 Project

Reciprocal conflicts we found in a project



Source: Perez-Franco / SC2020 Project

How to formulate a new SC strategy for the long term?



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