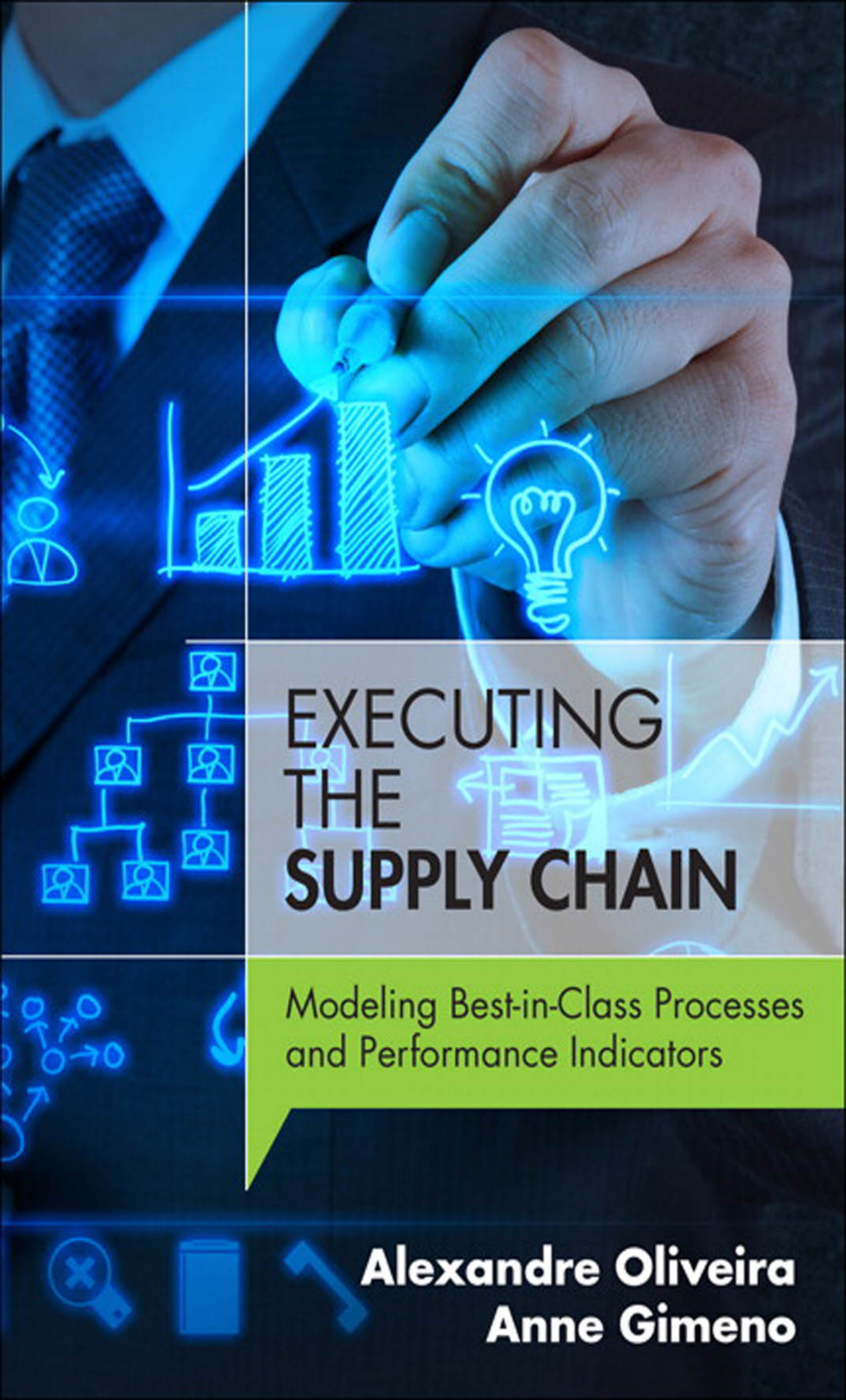

EXECUTING THE SUPPLY CHAIN

Modeling Best-in-Class Processes and Performance Indicators

Alexandre Oliveira
Anne Gimeno

Executing the Supply Chain

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Alexandre began his career at Procter and Gamble, where he gained executive experience in manufacturing, quality assurance, and logistics in assignment in Brazil and in Europe, but for the past 15 years, he has developed his career as consultant. Alexandre has worked as a senior consultant, trainer, and expert advisor for companies such as GE, 3M, Sony, Bayer, Pepsico, Pernod Ricard, Unilever, Avon, Adidas, John Deere, Eaton, Walmart, Motorola, and several others.

Alexandre holds a Bachelor of Arts degree in Chemical Engineering and a Master in Finance degree from the State University of Campinas (Unicamp, Brazil) and a Master of Science (Honors) degree in Logistics and Supply Chain Management from Cranfield's University School of Management, United Kingdom.

Since 2001, Alexandre has actively influenced logistics thinking in several supply chain organizations. He chaired the Logistics Committee at the American Chamber of Commerce (Amcham, Brazil, 2001–2004), chaired the Supply Chain Committee at the British Chamber of Commerce (Britcham, Brazil, 2006–2007), and he was Regional Vice-President of former Brazilian Logistics Association (2002–2003). He has lectured in MBA courses since 2004 in top regional universities such as State University of Campinas (Unicamp) and State University of São Paulo (USP).

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About I.B.S.

The Brazilian Institute of Supply Chain Management Professionals, a leading regional professional association since 2007, benefits its members via technical events, courses, and an annual congress in São Paulo, Brazil.

I.B.S. promotes knowledge transfer with other knowledge centers around the world. The Committee for International Cooperation (CCI) is the structure that builds partnerships for technical cooperation and knowledge exchange with foreign institutions. Ideal partners are national or regional professional associations or universities.

You can find more information about I.B.S. at www.ibpsc.net/IBS.

Preface

> "Vision without action is a daydream. Action without a vision is a nightmare."
>
> —Unknown

All companies have to deliver results to customers, to shareholders, and to stakeholders. Each one within the organization must be aligned to contribute to this endless effort.

But as supply chains increase in complexity, it has become less clear what results each knowledge area within the organization is expected to deliver. Even worse, it has become unclear whether all members of the organization are really capable of contributing to fulfill either customer or shareholder expectations.

The ability to understand the dynamic nature of modern supply networks and to assign practical actions to selected teams within the business has been lost over the years.

This book presents simple, though efficient, tools and methodologies to guide supply chain professionals in their continuous challenge of delivering better results each day. Enriched with many examples, this work is a reference to map processes, define controls, manage operations, and promote change.

Authors' Note

Over the years, the common understanding of world-class operations has evolved from the simplistic, focused management of functional silos to a comprehensive approach of supply network management as the driver to deliver ultimate shareholder value. Although many commentators have tried to describe this evolution, most have failed to properly address the supply chain's fundamental building block: knowledge management. Therefore, their analyses also overlooked the only element that delivers long-term sustainable shareholder value: people.

We are writing five books for Pearson that cover the most important features of this evolutionary journey. These books will provide detailed roadmaps and models to diagnose, implement, and sustain world-class supply chain network management in organizations of all types:

- *A Guide to Supply Chain Management: The Evolution of SCM Models, Strategies, and Practices* (an e-book) introduces the core concept of knowledge management as the only strategy capable of steering supply chains networks management to successfully compete in highly competitive markets. This introductory work reviews supply chain practice from its earliest stages and presents reference models that support our view of this discipline as a business driver to deliver shareholder value.

  This book introduces the *Supply Network Alignment Reference Model* (SNAR Model), which organizes the supply chain networks into knowledge areas that enable accurate decision making from the strategic level to daily management decisions.

  This book also introduces the *Supply Network Knowledge Management Maturity Roadmap* (SKMap). Before the development of a supply network reference model, it was necessary to understand the intermediate evolutionary stages of knowledge management within the supply chain. The SKMap organizes and correlates several strategies and practices according to a unique structure that allows you to understand how to face the future challenges of managing supply chain networks in fluid and complex environments.

- *Supply Chain Management Strategy: Using SCM to Create Greater Corporate Efficiency and Profits* explores how supply chain management delivers shareholder value. The introduction covers topics such as the supply chain master plan, cash-management cycle, purchase-to-pay cycle, and manufacturing-to-revenue cycle. This book introduces the Supply Network Business Value Model (SNValue Model) and discusses the supply chain mechanisms that generate value for the business. It addresses the following topics: enabling sales volume growth, enabling market-share growth, reducing revenue cycle, reducing lost sales, supporting marketing and sales initiatives, enabling customer experience by improving customer perception, managing the cost to serve, offering differentiated service packages, enabling margin growth, reducing cost of sales, balancing asset management, and balancing service level and cost structure.

  This book also presents the *Business Value Impact Chart* (BV Chart) and the *Balanced Control Panel* (BC Panel). The third part of the book covers how each of the SNAR Model knowledge areas can contribute to each of the factors that enable shareholder value. The tool used to establish these relationships is the BV Chart.

- *Executing the Supply Chain: Modeling Best-in-Class Processes and Performance Indicators* covers the supply network governance cycle and explains the mechanisms needed to understand the business though process mapping, risk analysis, and the definition and use of performance indicators for all areas directly or indirectly related to supply chain management. The second part of the book presents how each of the SNAR Model knowledge areas can be monitored and controlled by performance indicators. Other chapters present real world metrics from companies of different sizes, sectors and countries, and discuss benchmarking techniques.

- *Customer Service Supply Chain Management: Models for Achieving Customer Satisfaction, Supply Chain Performance, and Shareholder Value* focuses on the role of customer service as a strategic integrator for differentiated supply chain management. This book presents the *Customer Service Management Model* (CSM Model), a dynamic mechanism developed to evaluate the interactions present in the customer service environment. The model presents four pillars and provides a quantitative approach to understand the connection between them:

  1. Customer Service Level Expectation
  2. Supplier Service Level: Hired Performance
  3. Customer Service Level Perception
  4. Supplier Service Level: Delivered Performance

  Although the book discusses some traditional customer service elements such as pre-transactional, transactional, and post-transactional service, the most important topics are customer service strategies, managing service levels, and customer service organization, respectively.

- *Managing Supply Chain Networks: Building Competitive Advantage in Fluid and Complex Environments* presents a solid roadmap for managing knowledge within organizations across all industries. You learn how to build, implement, and sustain long-term knowledge management as a consistent strategy to deliver business value through supply chain innovation leadership.

  This book presents the *Supply Network Governance Diamond Model* (SNG Diamond) which is executed through…people!

The SNG Diamond Model is a common governance structure focused on the long-term success of the entire supply network that connects knowledge management and risk management and reviews policies that promote the innovative environment required to face the challenges of managing fluid and complex supply networks

1

Supply Network Governance Cycle

Despite the need to coordinate efforts within various elements of the supply chain has recently increased, companies do not yet understand the process of building efficient performance indicators for their operations knowledge areas.

Companies pursue continuous improvement and monitor performance through a set of lengthy and diverse indicators that allegedly represent a process or a cluster of processes.

Performance indicators should be used as decision supporting tools. For that reason, some attributes are expected:[1]

- They have to be quantitative. No performance output should be identified by words such as *good, regular, bad, weak, partial,* or *equivalent.* Metrics must be numbers—either absolute or relative (percentages).
- Performance indicators should promote the right behavior and appropriate organizational culture; therefore, it is desirable for a multifunctional approach to define them.
- Performance indicators must balance the effort to collect and analyze data and the benefits this indicator delivers to the business.

[1] Source: Adapted from "Keeping Score: Measuring the Business Value of Logistics in the Supply Chain," CSC, University of Tennessee.

- Performance indicators must be visible to people, accepted by the organization, and shared within various departments.
- Only what is really important should be measured. The challenge is to define a short list of metrics that are relevant and capable of representing the health of the processes.
- Performance indicators are sensitive to process performance oscillation. A good performance indicator reacts according to minimal process performance deviation.
- The performance indicator must be easily understood by all stakeholders.

Ideally, any performance indicators have all attributes described here. This book introduces a methodology to support companies to define a precise and valuable set of metrics entitled the Supply Network Governance Cycle (SNG Cycle).

The SNG Cycle proposes a five-step roadmap that guides companies from the early stages of acquiring fundamental business visibility through process mapping to advanced people management policies. These five steps are as follows:

1. Define the scope.
2. Map the process.
3. Analyze the risks.
4. Define the metrics.
5. Review the SNG Cycle.

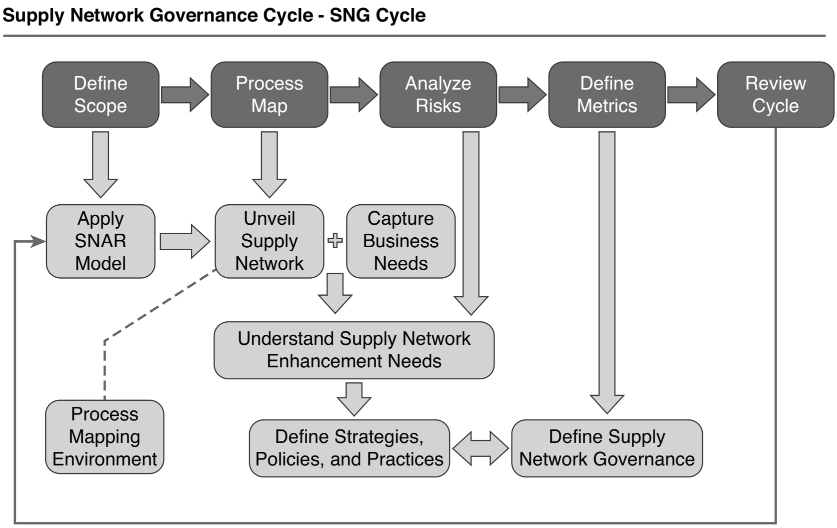

Figure 1.1 Supply Network Governance Cycle

1.1 Scope Definition

The mechanism the Supply Network Governance Cycle uses to identify the exact process scope (set of activities) to be mapped is the Supply Network Alignment Reference Model (SNAR Model) and its coding system (Oliveira and Gimeno 2014_01).

The SNAR Model provides a structured approach to map the extended supply network from different perspectives. These perspectives may vary both in scope (number of functions) and depth (functional details), using as an example a customer service team that is to map and monitor the transportation processes and its impact on several key customers.

Supply Network Alignment Reference Model - SNAR Model

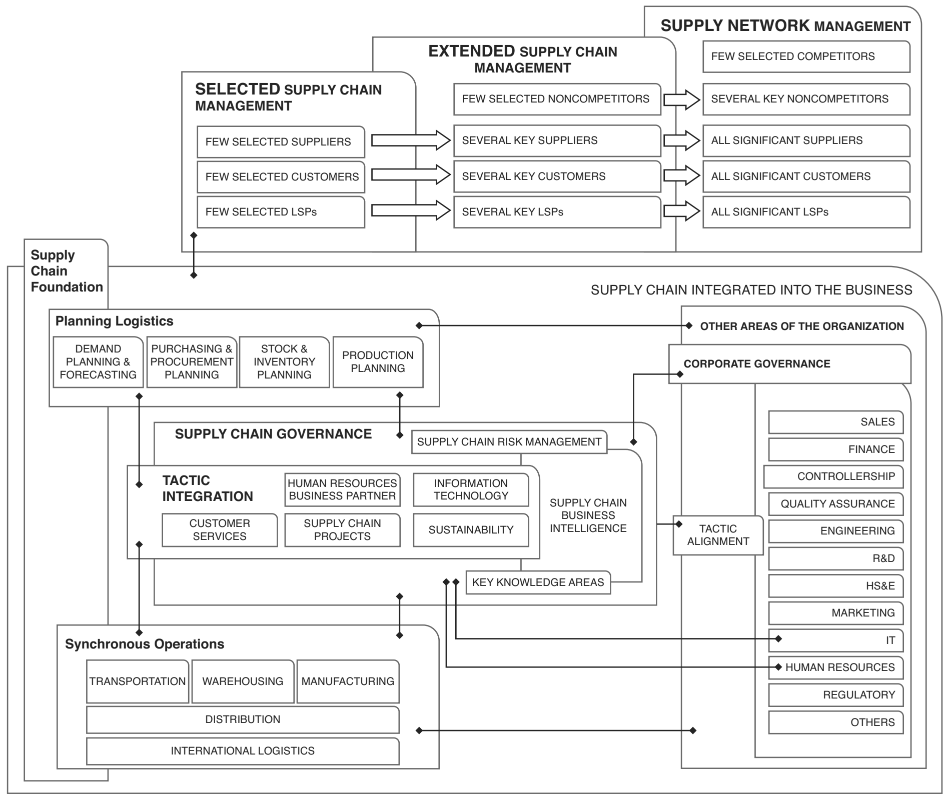

Figure 1.2 SNAR Model

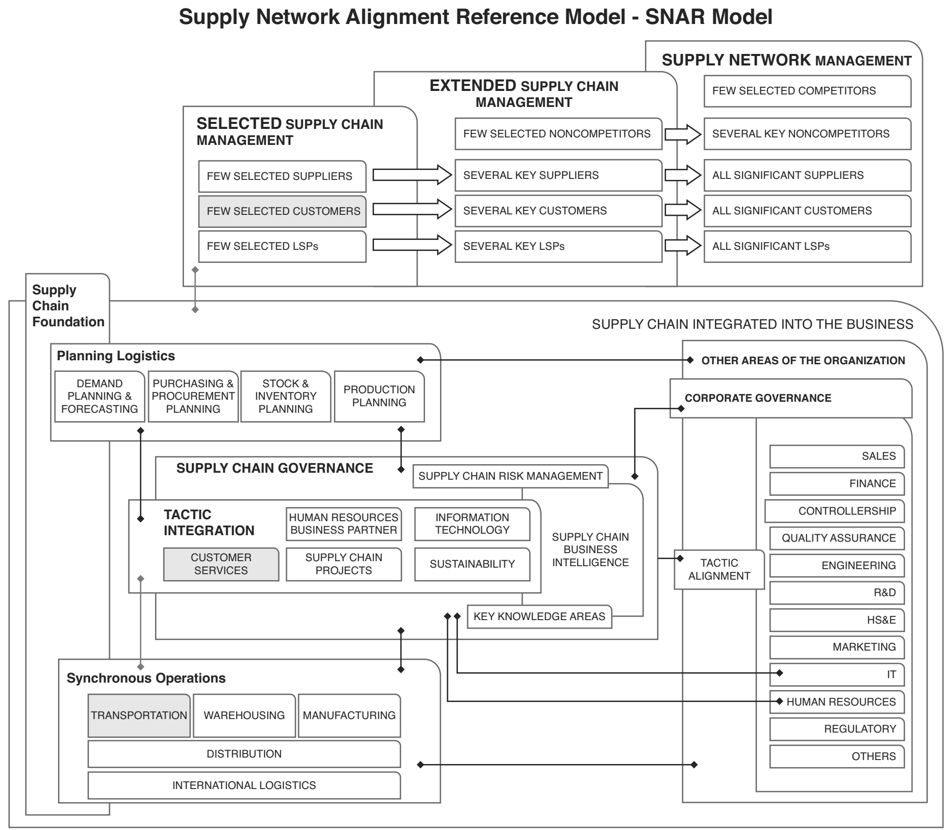

Figure 1.3 SNAR Model Customer Service and Transportation

A more specific approach identifies this environment according to the SNAR Model codification system: 01.02.01 (Transportation), 01.03.01 (Customer Service), and 02.01.02 (Preferred Customers).

01	INTERNAL NETWORK
01.01	Planning Logistics
01.01.01	Demand Planning and Forecasting
01.01.02	Procurement & Purchase
01.01.03	Stock and Inventory Control
01.01.04	Production Planning
01.02	Synchronous Operations
01.02.01	Transportation
01.02.02	Warehousing
01.02.03	Manufacturing
01.02.04	Distribution
01.02.05	International Logistics
01.03	Tactic Integration
01.03.01	Customer Services
01.03.02	Supply Chain Projects
01.03.03	Information Technology
01.03.04	Human Resources
01.03.05	Sustainability
01.04	Other Departments
01.04.01	Sales
01.04.02	Finance
01.04.03	Controllership
01.04.04	Quality Assurance
01.04.05	Engineering
01.04.06	R&D
01.04.07	HS&E
01.04.08	Marketing
01.04.09	IT
01.04.10	Human Resources
01.04.11	Regulatory
01.05	Supply Chain Governance
01.05.01	Key Knowledge Areas
01.05.02	Supply Chain Business Intelligence
01.05.03	Supply Chain Risk Management

02	EXTERNAL NETWORK
02.01	Preferred Supply Chain
02.01.01	Preferred Suppliers
02.01.02	Preferred Customers
02.01.03	Preferred Service Providers
02.02	Extended Supply Chain
02.02.01	Selected Suppliers
01.02.02	Selected Customers
01.02.03	Selected Service Providers
01.02.04	Preferred Noncompetitors
02.03	Supply Network Management
02.03.01	All Significant Suppliers
02.03.02	All Significant Customers
02.03.03	All Significant Service Providers
02.03.04	Selected Noncompetitors
02.03.05	Preferred Competitors

Figure 1.4 SNAR Model coding system

The next example applies the methodology to the Demand Planning and Forecasting Knowledge area (SNAR 01.01.01).

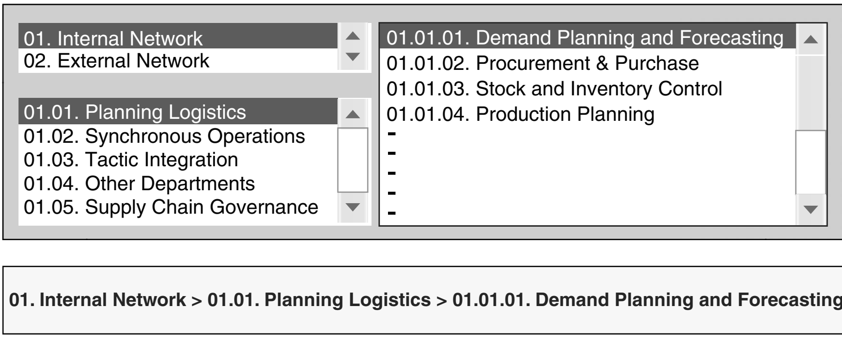

Figure 1.5 Selecting knowledge area

Once the knowledge area is selected, it is required that the process to be mapped has its scope detailed. The following example indicates two key subprocesses:

1. Finished goods demand forecasting [SNAR 01.01.01.a]
2. Sales & operations planning [SNAR 01.01.01.b]

The control chart is a tool that identifies the evolution in each step of the SNG Cycle. The rightmost column indicates the score each step can achieve; the maximum overall score is 16 points.

Code	01.01.01	Processes	Demand Planning and Forecasting	*02-feb*

Key Subprocesses (KSP):		Process Owners:
KSP a	01.01.01.a Finished goods demand forecasting	Dem.Planning Manager: T.Miros
KSP b	01.01.01.b Sales & operations planning	
KSP c		**Team Members:**
KSP d		S.J.Thomas, A.Xavier, T.Yian
KSP e		

Supply Network Governance Cycle

Not started = 0.00 Started = 0.25 Completed = 1.00

	KSP a	KSP b	KSP c	KSP d	KSP e	Scale
1. Define scope (apply SNAR model)	1.00					1.0
2. Process Map						
2.a Interviews						1.0
2.b Process observation						1.0
2.c Data analysis						1.0
2.d Organize data						1.0
2.e Elaborate flows						1.0
3. Understand business needs						1.0
4. Define Supply network improvement needs						1.0
5. Elaborate strategies						1.0
5.a Define metrics for strategies						1.0
6. Elaborate Policies						1.0
6.a Define metrics for policies						1.0
7. Define practices						1.0
7.a Define metrics for practices						1.0
8. Consolidate governance strategy						1.0
9. Implement cycle revision methodology						1.0
TOTAL SCORING	1.00	-	-	-	-	16.0

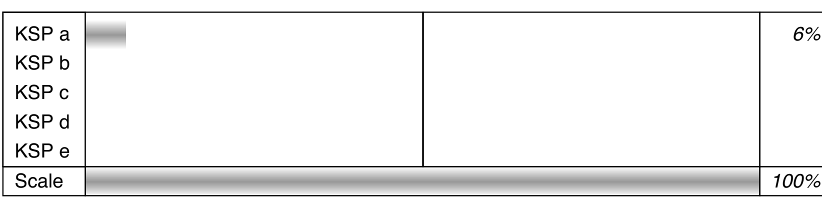

Figure 1.6 SNG Cycle, control chart

1.2 Mapping the Processes

The step of "mapping the process" is usually misunderstood to be the activity of drawing the process flows. Although the flows play an important role during any process mapping approach, alone they do not offer visibility to the supply network mechanisms.

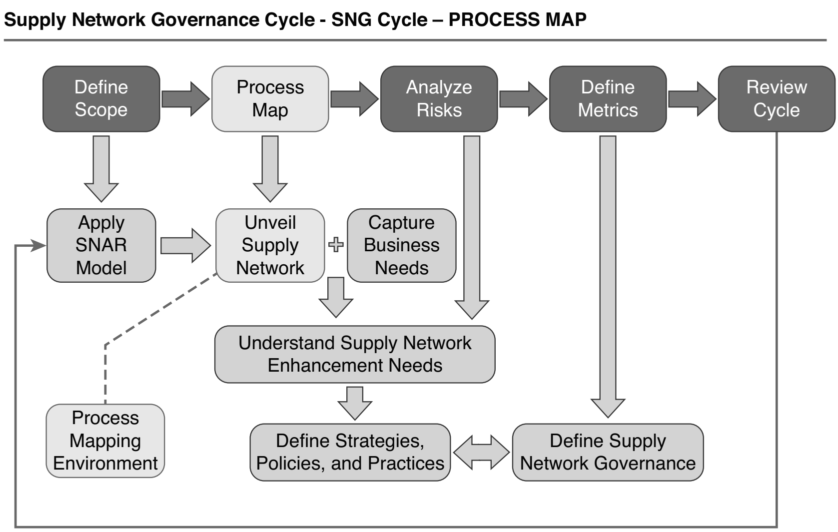

Figure 1.7 SNG Cycle, process map

Managing the process mapping environment requires three core primary and coordinated activities: interviewing people, observing the process, and analyzing data. The next sections explain the elements illustrated in Figure 1.8.

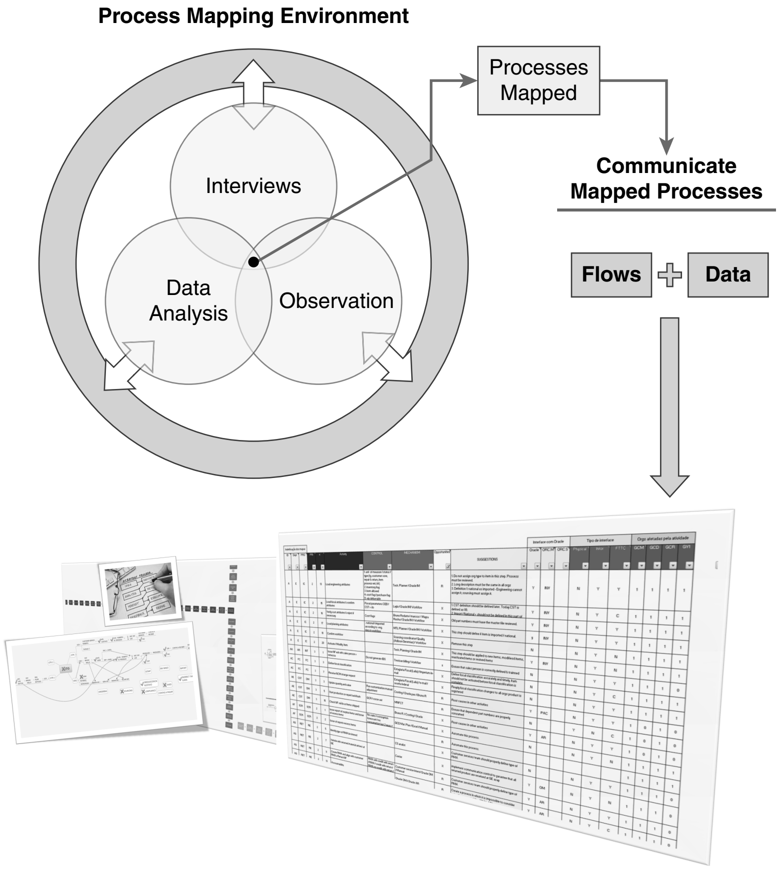

Figure 1.8 SNG Cycle, process mapping environment

These three core activities should follow some basic guidelines built after repeating experiences in different organizations. These guidelines are as follows:

- **Interviewing principles:** (1) One interviewee at a time; (2) open questions (avoid yes-no approach); (3) ongoing record and validation; (4) request complementary data; (5) draw preliminary flow during interviewing process; and (6) double-check all information received.

- **Observation principles:** (1) Information captured during initial interviews should be double-checked before observation starts; (2) observe the process in different moments; (3) open questions to process owners and team; (4) request complementary data; (5) use observations to revalidate preliminary flows drawn during interviews; and (6) double-check observation inputs whenever required.
- **Data analysis principles:** (1) Plan before requesting data; (2) understand the data received and evaluate whether it is exactly what had been required; (3) understand the context and check data adherence to the process; (4) analyze data; (5) double-check the analysis; and (6) revalidate flows previously drawn based on analysis outputs.

Following these three activities the organization needs to organize and communicate the acquired knowledge. A communication strategy is created and it is usually supported by two mechanisms: flowcharts and a supporting database (usually in the format of spreadsheets).

Once the process is mapped, the governance leaders need to capture real information on current business priorities (Figure 1.7, building block 5). Only by cross-checking the process maps and the business key demands is it possible to understand the supply network's enhancement requirements.

The visibility of the gaps between the current process standards ("as is" scenario) and the expected performance ("to be" scenario) is the basis for enabling an appropriate risk analysis.

The evolution within different subprocesses can be simultaneously registered in the control chart introduced in Section 1.1. The following example explores this feature using the Warehousing knowledge area (SNAR 01.02.02).

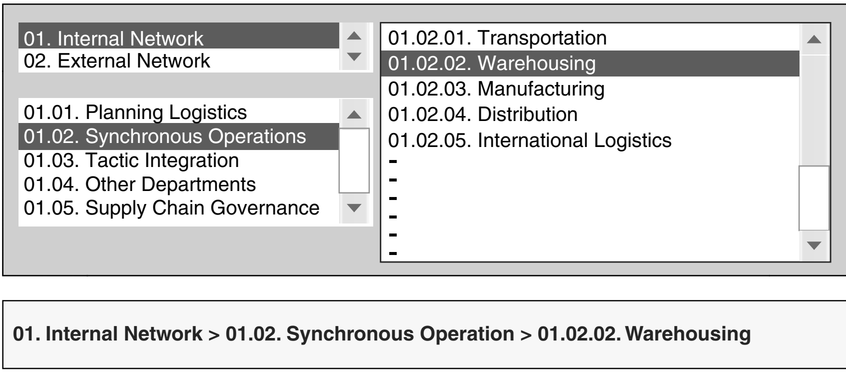

Figure 1.9 Selecting SNAR 01.02.02

As explained, it is now necessary to detail which key subprocesses (KSPs) are to be observed during the SNG Cycle. The following subprocesses have been selected: (01) Receiving operations, (02) Picking operations, and (03) Shipping operations. Note that in Figure 1.10 that all three key subprocesses have an equal score (6.0).

In contrast to the previous example, the mapping process and the definition of controls may be at different stages for different subprocesses.

In this example, the organization focuses on the extended supply network and the connections with all significant suppliers (SNAR 02.03.01), customers (SNAR 02.03.02), and service providers (SNAR 02.03.03). The management of the supply network also looks at selected noncompetitors (SNAR 02.03.04) and some preferred competitors (SNAR 02.03.05).

Code	01.02.02	Processes	Warehousing	*02-feb*

Key Subprocesses (KSP):		Process Owners:
KSP a	01.02.02.a Receiving operations	Warehouse Supervisor: A.Adams
KSP b	01.02.02.b Picking operations	
KSP c	01.02.02.c Shipping operations	Team Members:
KSP d		B.Smith, Q.Chang
KSP e		

Supply Network Governance Cycle

Not started = 0,00 Started = 0,25 Completed = 1,00

	KSP a	KSP b	KSP c	KSP d	KSP e	Scale
1. Define scope (apply SNAR model)	1.00	1.00	1.00			1.00
2. Process Map						
2.a Interviews	1.00	1.00	1.00			1.00
2.b Process observation	1.00	1.00	1.00			1.00
2.c Data analysis	1.00	1.00	1.00			1.00
2.d Organize data	1.00	1.00	1.00			1.00
2.e Elaborate flows	1.00	1.00	1.00			1.00
3. Understand business needs						1.00
4. Define Supply network improvement needs						1.00
5. Elaborate strategies						1.00
5.a Define metrics for strategies						1.00
6. Elaborate Policies						1.00
6.a Define metrics for policies						1.00
7. Define practices						1.00
7.a Define metrics for practices						1.00
8. Consolidate governance strategy						1.00
9. Implement cycle revision methodology						1.00
TOTAL SCORING	6.0	6.0	6.0	-	-	16.0

KSP a	*38%*
KSP b	*38%*
KSP c	*38%*
KSP d	
KSP e	
Scale	*100%*

Figure 1.10 Control chart, subprocesses

Code	02.03.	Processes	Supply Network management	*02-feb*

Key subprocesses (KSPs):		Process owners:
KSP a	All significant suppliers	SC Director: A. Gimes
KSP b	All significant customers	
KSP c	All significant service providers	Team members:
KSP d	Selected noncompetitors	C. Glows, P. Zizau, N. Prix
KSP e	Preferred competitors	

Figure 1.11 Selecting knowledge area, SNAR 02.03

The following figure shows the first key subprocess (KSP a: all significant suppliers) has been through all the SNG Cycle, whereas KSP e (preferred competitors) is in its early stages. This company is more comfortable in addressing its suppliers or its customers (KSP b), but the evaluation of significant service providers (KSP c) still requires the definition of metrics to monitor adherence to selected strategies.

Supply Network Governance Cycle

Not started = 0.00 Started = 0.25 Completed = 1.00

	KSP a	KSP b	KSP c	KSP d	KSP e	Scale
1. Define scope (apply SNAR model)	1.00	1.00	1.00	1.00	0.25	1.00
2. Process Map						
2.a Interviews	1.00	1.00	1.00	1.00	0.25	1.00
2.b Process observation	1.00	1.00	1.00	1.00	0.25	1.00
2.c Data analysis	1.00	1.00	1.00	1.00	0.25	1.00
2.d Organize data	1.00	1.00	1.00	1.00	0.25	1.00
2.e Elaborate flows	1.00	1.00	1.00	1.00		1.00
3. Understand business needs	1.00	1.00	1.00	0.25	0.25	1.00
4. Define supply network improvement needs	1.00	1.00	1.00	0.25		1.00
5. Elaborate strategies	1.00	1.00	1.00	0.25		1.00
5.a Define metrics for strategies	1.00	1.00	1.00			1.00
6. Elaborate policies	1.00	1.00	1.00	0.25		1.00
6.a Define metrics for policies	1.00	1.00	1.00			1.00
7. Define practices	1.00	1.00	1.00			1.00
7.a Define metrics for practices	1.00	1.00	1.00			1.00
8. Consolidate governance strategy	1.00	1.00	1.00	0.25		1.00
9. Implement cycle revision methodology	1.00	1.00				1.00
TOTAL SCORING	16.0	16.0	15.0	7.3	1.5	16.0

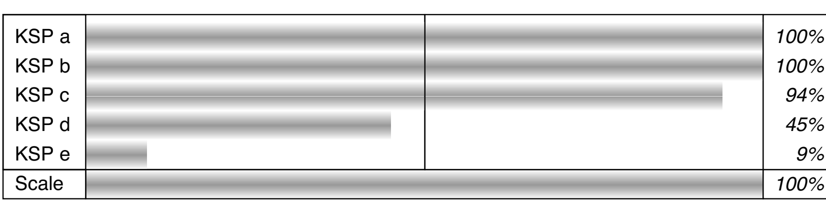

Figure 1.12 Control chart, scoring

The elaboration of flows occurs as interviews, observation, and data analysis are conducted. This is a nonlinear process, and interactions of several types may be required.

This methodology also requires that diverse people are part of the process. It is important to take into account the hierarchical and functional barriers that create disconnected islands of knowledge.

From the beginning of this process until the validated flows are finished, the organization need to recurrently go through interviewing, data analysis, or *in loco* observation.

It is possible to structure these dynamics according to six basic stages:

1. Start to map
2. First round flows
3. Preliminary flows
4. Refined flows
5. Validated flows
6. Organized data

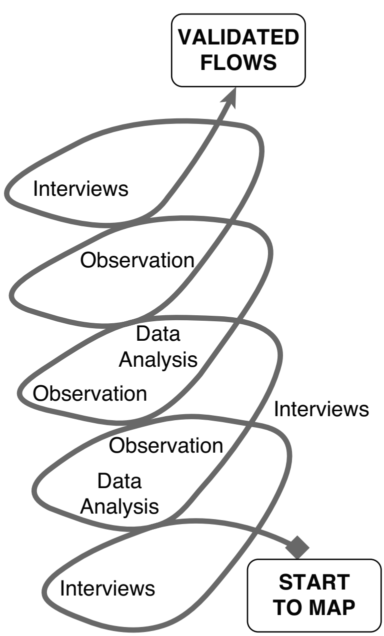

Figure 1.13 Process mapping spiral

The initial three stages are highly dependent on the interviewing sessions, which should consider interviewees with complementary knowledge, whereas information cross-checking on specific processes or activities may be left for a future occasion.

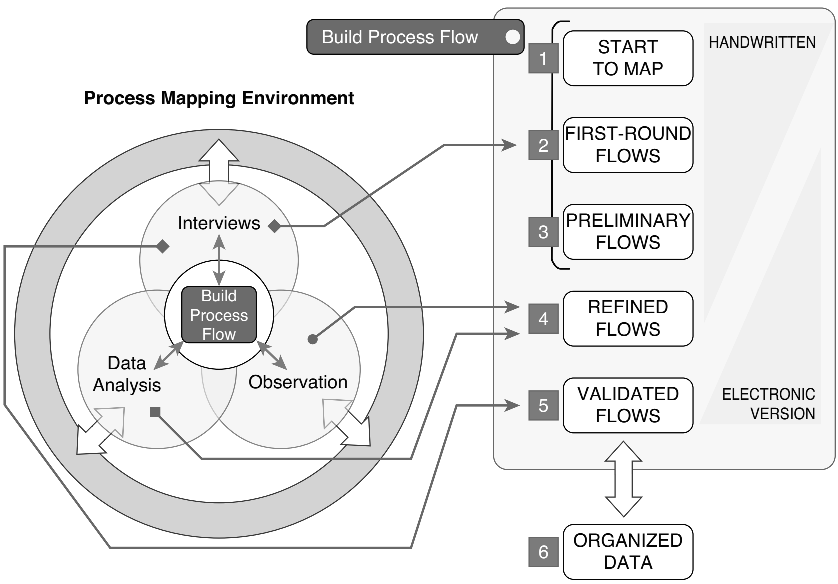

Figure 1.14 Process mapping details

This methodology has been applied to several consulting projects, and the period from initial interviewing to validated flows when supported by properly organized data varied from a few weeks to several months, depending on the scope range and depth. Figure 1.15 summarizes this feature based on some of the projects executed by the authors from 2001 to 2014.

Client Company	Headquarters	Processes Mapped	Mapping Period (months)
3M	USA	3	2.0
AGCO	USA	8	2.5
AJR	BRAZIL	2	2.0
BEIERSDORF	GERMANY	4	2.0
CAMOZZI	ITALY	2	1.0
DANISCO	DENMARK	1	1.5
DRAKA-COMTEQ	HOLLAND	2	1.0
EAGLEBURGMANN	GERMANY	1	1.0
FIRMENICH	SWITZERLAND	3	2.0
FLEXTRONICS	USA	6	2.5
FMC	GERMANY	3	2.0
GE	USA	9	4.0
HUSSMAN	USA	4	2.5
HYPERCOM	USA	7	3.0
KATOEN NATIE	BELGIUM	12	3.5
MAGNA CLOSURES	CANADA	5	3.0
MARCOPOLO	BRAZIL	1	1.0
PERNOD RICARD	FRANCE	1	2.0
SONEPAR	FRANCE	3	1.5
SONY	JAPAN	1	1.7
ZODIAC	ARGENTINA	2	2.0

Figure 1.15 Process mapping period

Although it sounds curious, the best tip to give to someone who needs to draw a flow for any given process is this: Start it! In fact, the only resources you need are pencil, paper, and an interviewee.

Figure 1.16 is the result of a 1-hour conversation with a customer service manager in a beverage company. The session focused on the order management process and identified several key activities, some of which are listed after the image.

This initial session identified a total of 34 elements. As the process mapping occurred, complementary data was analyzed, and observation happened; this initial picture evolved into a final validated version with 135 activities identified.

The methodology used to draw the flows may vary according to the final goals. Some of the best-known business process mapping methodologies[2] are, in alphabetic order, business model canvas, business process discovery, business process modeling, ethnography, IDEF, OBASHI, N2 Chart, organizational studies, process-centered design, SADT, systems engineering, value stream mapping, and workflow.

Once early, unconnected flows generated during first interviews are available, the mapping team can create more comprehensive diagrams. Although some teams would prefer to go electronic, this phase is usually done with pencil and paper because there is still much to find out about the process and rework is likely to be necessary before any fine-tuning activities.

The first round of flows builds a scenario similar to a puzzle. Often, a wide panel (or wall) is used to offer a complete view of the processes being mapped. Recent and old versions are usually side by side to facilitate overall visibility.

[2] http://en.wikipedia.org/wiki/Business_process_mapping, February 2014

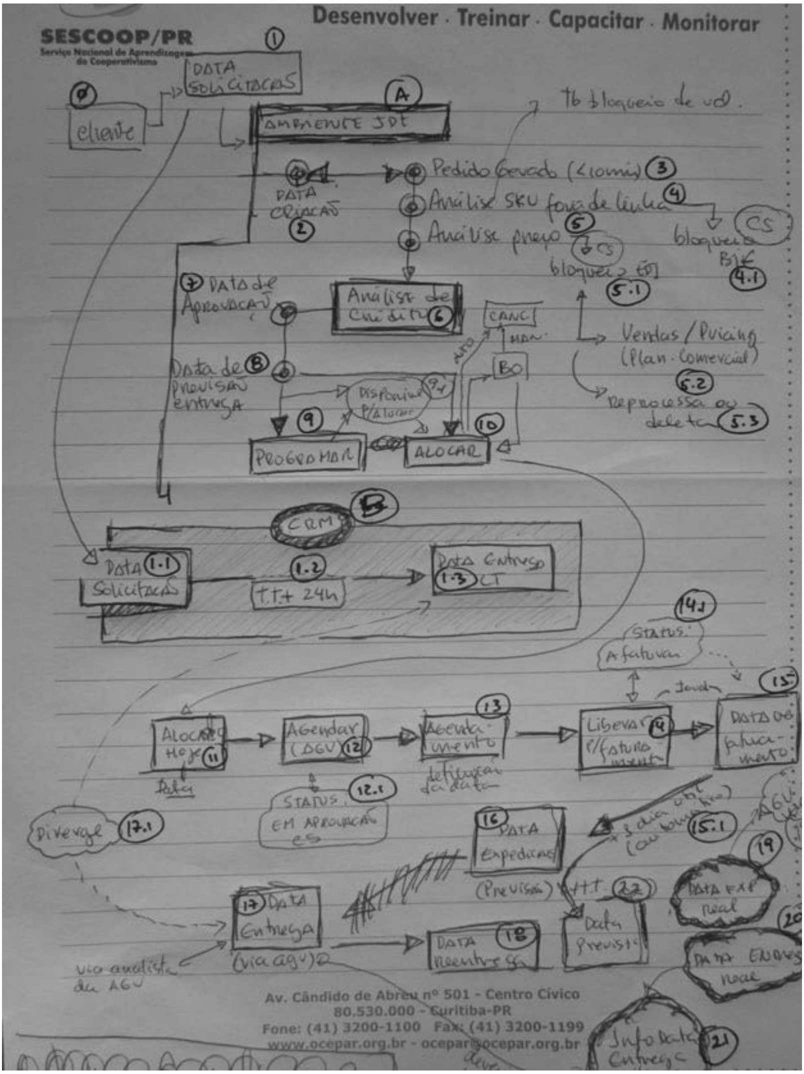

Figure 1.16 Process mapping, start

Some elements:

- 0 Client
- 1 Order request date
- 2 Order creation date
- 4 SKU analysis

- 5 Price analysis
- 6 Credit analysis
- 8 Define delivery date
- 12 Schedule delivery
- 15 Invoicing
- 16 Shipping
- 21 Delivery confirmation

Figure 1.17 First-round flows

Depending on the magnitude of the mapping efforts, a "war room" may be used to create a focused environment. More comprehensive projects involving larger teams and longer schedules will benefit from the structure of a war room. Figure 1.18 shows the war room used for a project at GE Transportation. This team worked simultaneously on 9 maps and created 49 flows connected to each other.

Some complementary interviews are expected during the phase of drawing the first round of flows. Additional sessions are usually required before the preliminary flows are done. The goal of preliminary flows is to organize all information captured so far in a format detailed enough to go into a thorough presentation to those who were interviewed. The next figure shows a war room where processes are organized on different walls. These maps were to go through a two-day session with the interviewees.

Figure 1.18 War room

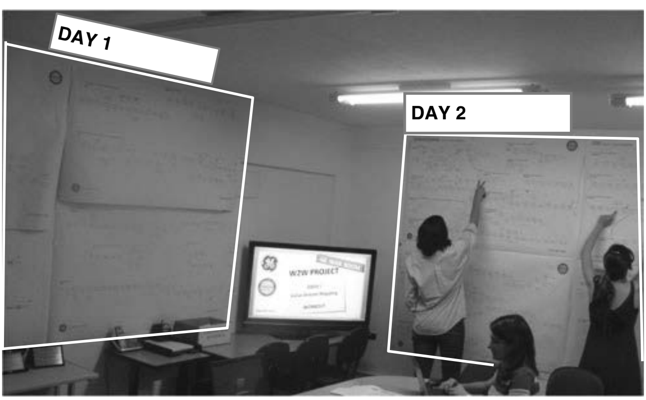

Figure 1.19 Preliminary flows

Following the adjustments resulting from the presentation of the preliminary flows to the interviewees, it is now time to complete the process diagnosis with *in loco* observation and data analysis. Each project is unique. Therefore, the selection of what data must be analyzed or what processes need observation do not follow a standard pattern. The process mapping team frequently plays detective in this phase.

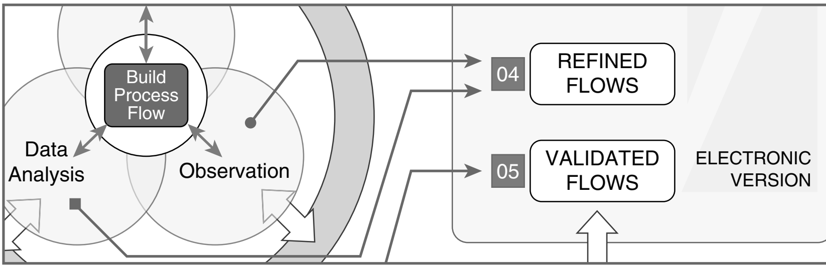

Figure 1.20 Refining flows, data analysis, and observation

Any process mapping must be executed with a clear purpose. The diagnosis will always be more efficient when a target has been defined in the early stages. Examples of these targets include the identification of:

- Low-productivity activities
- Activities with an interface with information systems
- Processes that generate inventory divergence
- Processes that cause customer dissatisfaction
- Any other approach that will improve organizational performance in any area of the business

There are infinite possible targets to a process mapping exercise.

Business Case

This process mapping was chosen to understand the root causes for recurrent inventory divergence in an external manufacturing facility that serves a large multinational electronics industry headquartered in the United States. This case is inspired by an operation that includes three mobile assembly lines, one parts warehouse, and one finished goods distribution center.

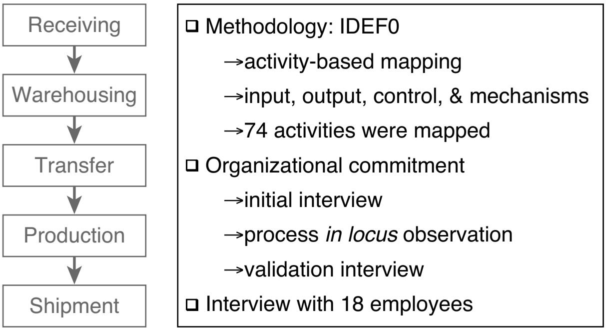

Figure 1.21 Case, scope

The mapping methodology used was IDEF0. Five processes were mapped: receiving, warehousing, transfer, production, and shipment. A total of 18 employees were interviewed and 74 activities identified. The goal of the mapping was to identify the cause of recurrent inventory divergence.

Each of the five processes was diagnosed after interviews, *in loco* observation, and data analysis. This diagram indicates 5 activities out of 12 are vulnerable and inventory divergence may occur. Note these items are parts for mobile devices. They are very small pieces; some of them can hardly be seen.

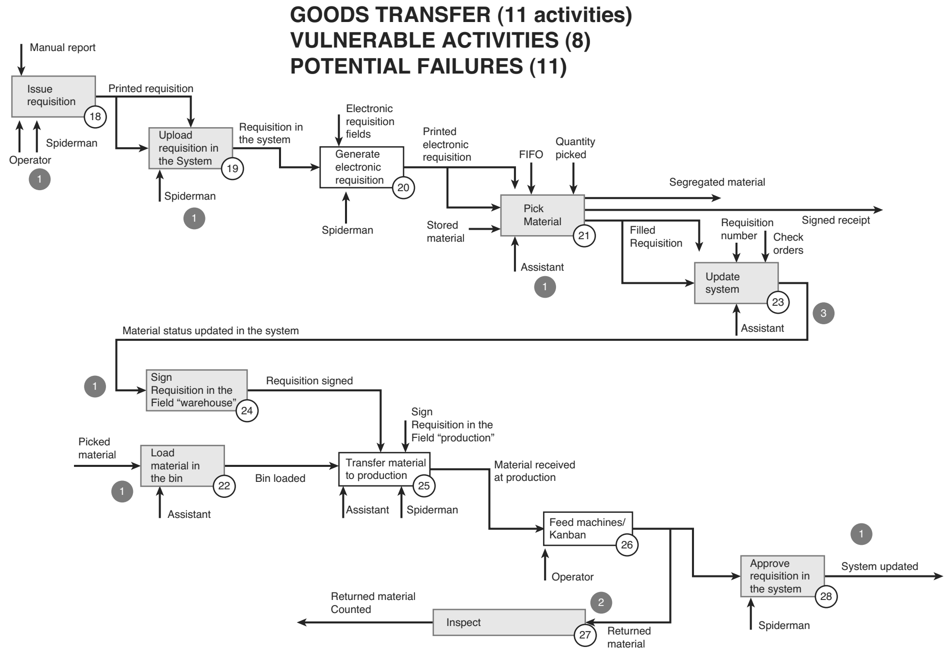

Figure 1.22 Case, map

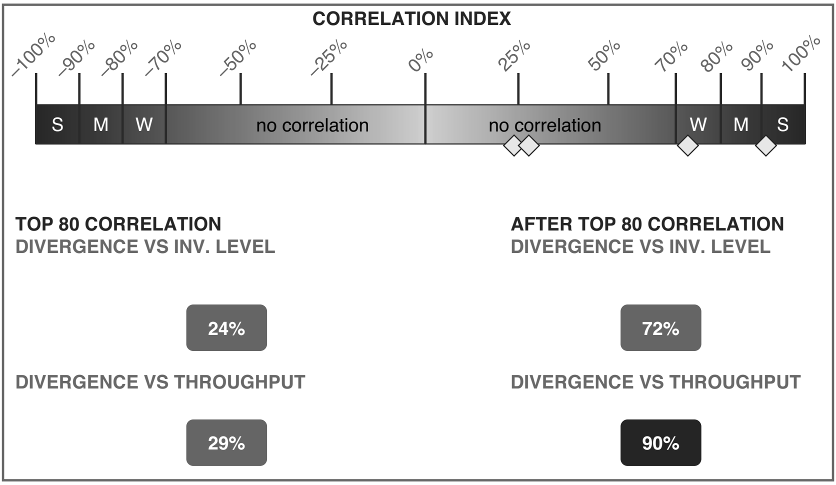

Figure 1.23 Case, analysis

A detailed data analysis investigated the eventual correlation between inventory divergence and inventory holding or volume throughput. Throughput was shown to be correlated to the divergence of 80% of the items. These items represented only 45% of the divergence in value.

The challenge is then to identify the reason why 20% of the items generate 55% of the divergence.

Other analyses were done, such as inventory aging and divergence value by shift and by operator.

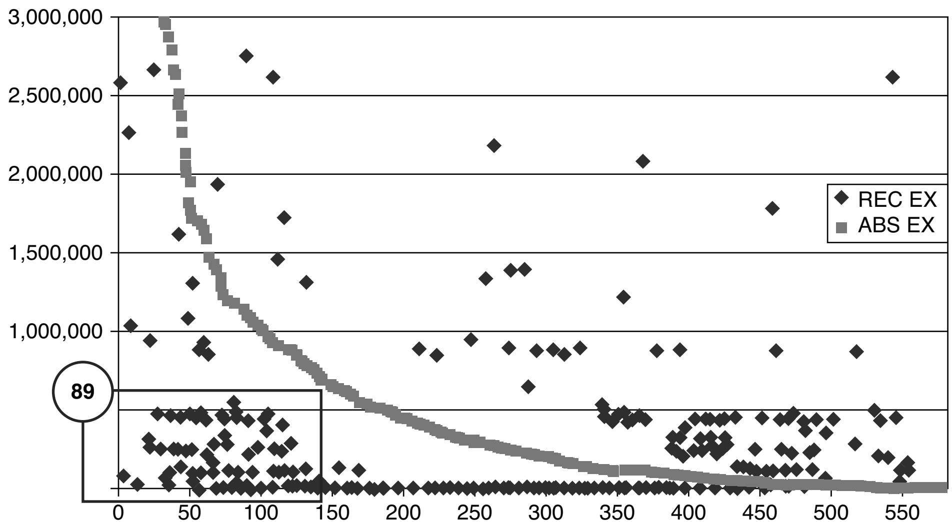

Figure 1.24 Case, analysis 2

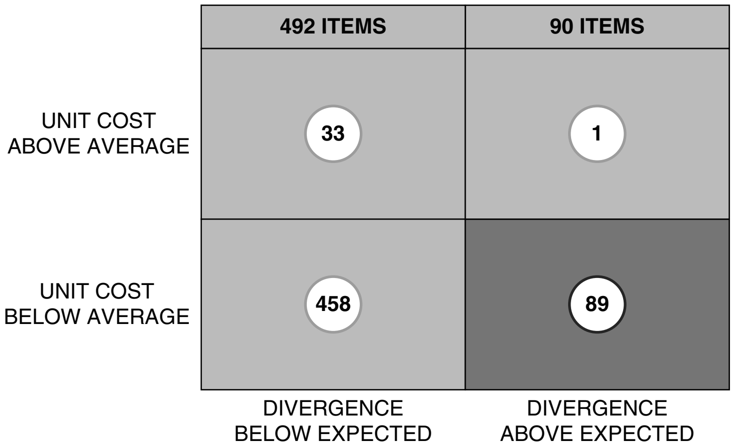

Figure 1.25 Case, analysis 3

A possible cause was the unit value of these items. If these 89 items (20% of total) had a unit cost above the average unit cost, this could explain why their divergence summed such a high value. But all these items with high value divergence had a unit cost below the average unit cost.

It was during the observation *in loco* of the manufacturing operation that one of the consultants noticed a junior operator was sweeping some items that were on the floor of the production area. When the consultant asked where these little items come from, the operator indicated three equipments (as circled in the map).

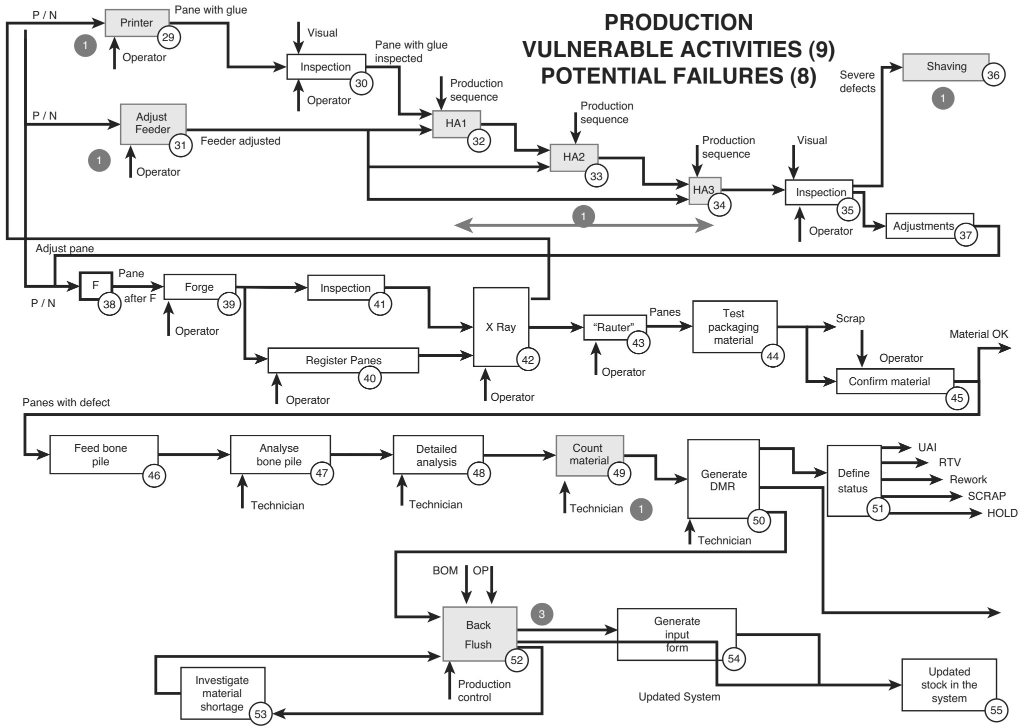

Figure 1.26 Case, diagnosis

Conclusion

These three process equipments identified in the production flow faced some performance issues and several small parts that were processed through them were systematically being scrapped without being properly registered. The company would only acknowledge the missing components during inventory audit, but would not be able to track them back to the root cause. The combination of several factors affected 80% of the items that responded to 45% of inventory divergence. This required process improvements in all mapped areas. And a single factor related to the manufacturing operation caused 55% of divergence by not registering losses on 89 items, which represented 20% of total stock keeping units (SKUs). As a consequence of the process mapping, the following report was issued. Some information has been omitted due to confidentiality reasons.

Project Report: Sample

A) SUMMARY

- There is a weak correlation between the generated divergence and the product quantity in stock.
- A strong correlation exists between the generated divergence and the product quantity put into motion by the company.
- The items that generated more divergence (top 80) don't fit into the patterns of correlation cited above, so they require better research.
- Some items have a higher % of losses than expected.
- Items with a % of losses higher than the expected can be originated by production activities.
- There is strong evidence of failures in the records of material transferences for the production and from the process of finished goods audit (FGA).

- There are generalized failures on all stages of material flow, with weak or nonexistent controls.
- There are three systems for the control/identification of divergences:
  1. Cycle count, which is inefficient
  2. FGA, which is a reactive system and therefore inefficient on the prevention of divergences
  3. Physical inventory, an equally reactive system
- There are points of vulnerability in the production associated with not reporting all losses.
- There are failures in the internal communication of operational problems.
- There are conflicts of interest in the hierarchy of decision making, from the top down and the bottom up.
- The impact of failures in the material flows is reflected in the materials divergence on the work in progress (WIP), but is not generated totally in the production

B) Transformation Plan: Basic Steps

- Phase 1: Elaboration/review of approximately 40 procedures (receiving, warehousing, and transference to production). Implementation of actions plans.
- Phase 2: Parallel to phase 1. Elaboration and implementation of continuous training program.
- Phase 3: After phases 1 and 2. Complete review and implementation of an independent cycle count program.
- Phase 4: Parallel to phases 1, 2, and 3. Elaboration or review of approximately 27 procedures (production & expedition). Implementation of action plans for those areas.

- Phase 5. After phases 3 and 4. Implementation of a process-based audit with total independence, on a daily basis, reporting to the site top management.

C) Potential Barriers to Implementation

- Reorganization of the internal communication system
- High turnover of employees
- Overloaded leading team (supervisors/managers)
- Leading team (supervisors/managers) with little experience on:
  - Procedures elaboration techniques
  - Internal audit techniques
  - Cycle count program (design, start-up, rollout, ongoing)
- Many vulnerable activities that must be adjusted simultaneously

D) Loss-Elimination Scenarios

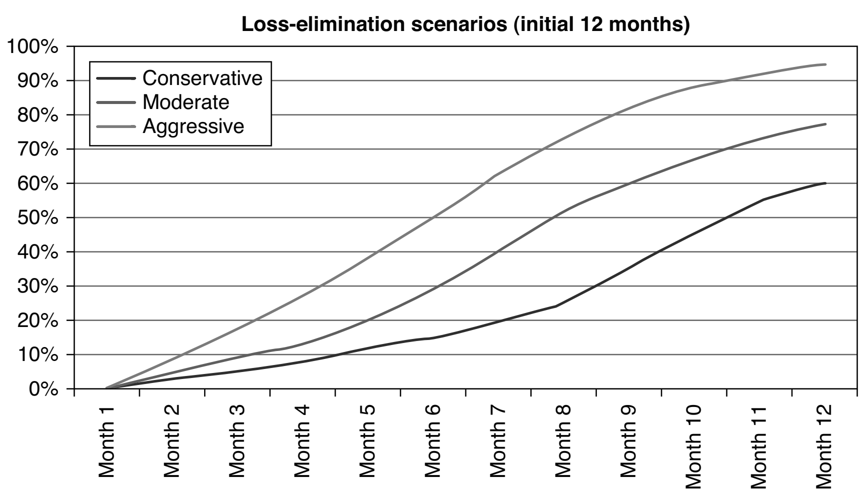

Figure 1.27 Loss-elimination scenarios, 12 months

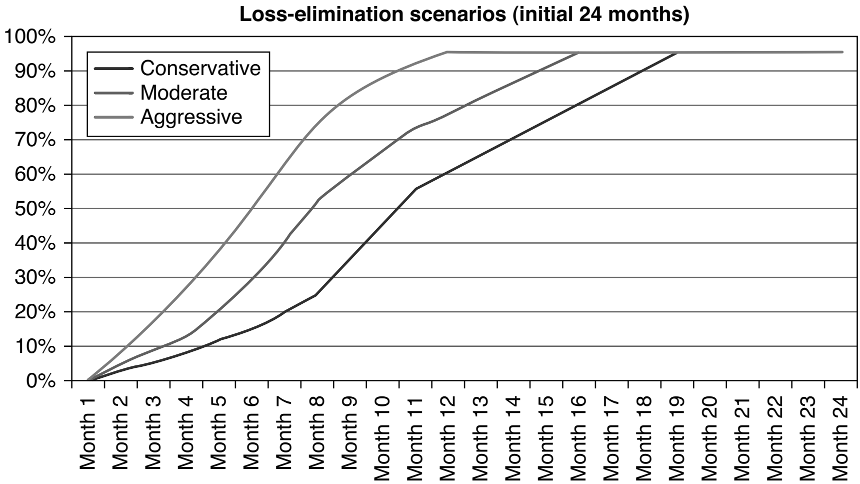

Figure 1.28 Loss-elimination scenarios, 24 months

Validated Flows

At this time, nearly all the information has been captured in various interviews, innumerable data has been analyzed, and all significant processes have been observed *in loco*.

This session differs from previous ones because it is not an interview. Ideally, the interlocutor will only confirm that the presentation is accurate and represents the processes mapped with high fidelity. If relevant, new information comes up at this time; this will indicate that the previous stages have not been properly done.

The format this connected puzzle presents is varied; there is no golden rule. The more information the mapping team has captured, the more resources will be available to illustrate this final flow.

The following image is based on the process mapping of a warehousing operation of a retailer. Note the arrows indicate correlations between different subprocesses. Some graphs (histograms) offer a time-based approach to the process map.

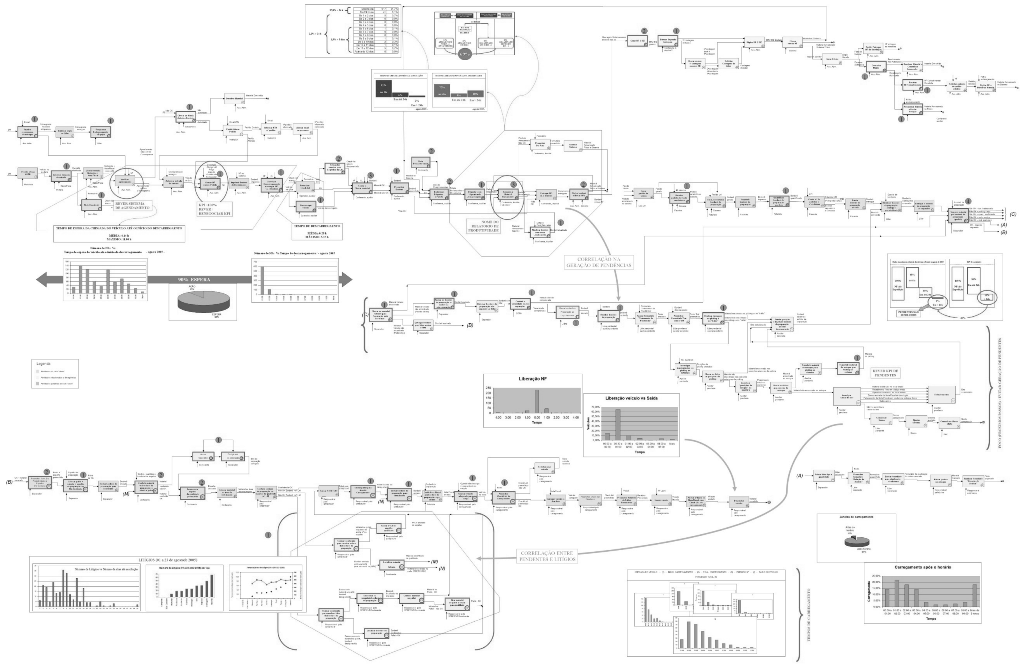

Figure 1.29 Disclaimer: The processes identified in this map will vary based on the organization/ industry goals, and so readability (or nonreadability, in this case) is not a factor for example purposes here.

Although the final version of the flow may offer a comprehensive perspective of the mapped processes, it is impossible to converge into it all the information captured during the interviews, data analysis, and *in loco* observations. The use of complementary organized data is therefore fundamental.

Given the popularity of spreadsheets, these are commonly the best way to organize all information captured during the mapping process. The format is highly customized according to the outputs of the project. Note that each line of the spreadsheet represents one specific activity mapped.

# MAP	Área	PRO	n°	Activity	Physical	Infro	CFFT	Interface F/ C/F	Critical points	CONTROL	MECHANISM	OBS
A	E	IC	15	Load fiscal attributes & confirm attributes	N	Y	Y	N	Y	Fiscal parameters CEB/CST = do	Layls/ERP IM/Workflow	
L	MP	KITS	5	Explode items of loco BDM & place internal requlsition “integrated system”	N	Y	N	Y	Y	For MWS integrated system kit list/99 SKU’s	GCM Mtl. Planner/Excel/manual	
AE	CST	DM	5	Start production or repair black flush	Y	N	N	N	Y	MCC/corse aut	MNFCT	
K	MP	GCR	29	Verify item necessity	N	Y	N	Y	Y		Mat. Plan. Org	
K	MP	GCR	30	Transfer item from org to org	N	Y	N	N	Y		Mat. Plan. Org	
M	PUR	PUR DIR	13	Issue PO	N	Y	N	Y	Y	Local item/Direct buy	Buyer	
M	PUR	PUR DIR	24	PO goes through approval levels	N	Y	N	N	Y		Buyer, coordinator, or manager	
W	AP	IS	2	Calculate taxes	N	Y	Y	N	Y		Dascan	
W	AP	IS	9	Inform issues	N	Y	Y	Y	Y		Corretora SISBACEN	
AG	RET	RE	13	Accountability	N	Y	N	N	Y		ERP OM/ERP AR	
AG	RET	RE	14	Reversal of the additional account	N	Y	N	Y	Y		Finance AR manual	Classify
N	IMP	IP	28	Create new req	N	Y	N	Y	Y		Mat purchase	
O	IMP	CC	14	Issue NF-e before material receipt	N	Y	Y	Y	Y	Arrival note in MG not removed to EADI/Import experts	External Consultancy	

Figure 1.30 Example of organized data

1.3 Risk Analysis

By having the processes mapped, a number of vulnerabilities are identified and properly registered, as discussed in the previous section. These vulnerabilities must be classified and prioritized. These dynamics may occur through three different mechanisms:

1. Reactive (focused) approach
2. Proactive (comprehensive) approach
3. Intermediate (business-driven) approach

The reactive approach to process vulnerability understanding (risk analysis) begins with a known issue. For example, a warehousing operation (SNAR 01.02.02) that registers a low picking productivity. This scenario calls for a focused process mapping to understand the activities, controls, and mechanisms mainly associated with picking operations.

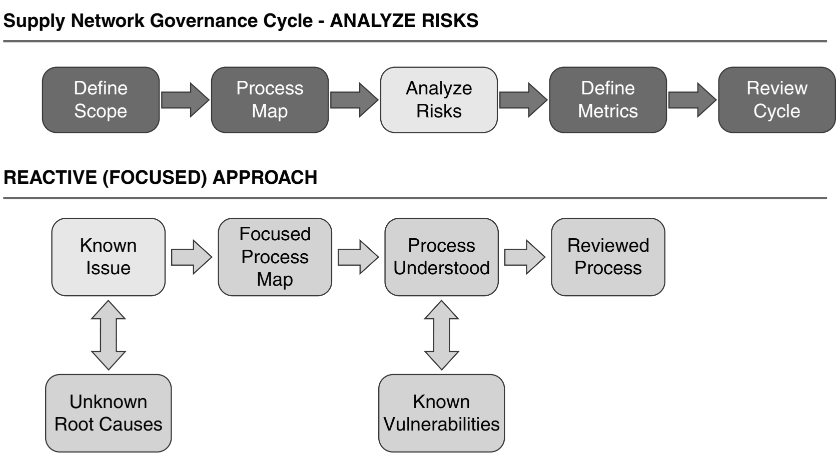

Figure 1.31 Risk analysis, reactive approach

As the specific processes are mapped and the vulnerabilities are understood, process revisions may occur. It is important to remember that process mapping necessarily includes the three pillars:

interviewing people, observing the process, and analyzing data. The difference between actual process and future processes defines the transformation effort.

The proactive approach to risk analysis occurs in two situations:

1. Several diffuse issues have disabled the reactive (focused) approach.
2. It is a planning initiative, prior to the identification of any significant issues, and expects to give visibility to unknown inefficiencies.

The proactive approach begins with a comprehensive process mapping, covering several knowledge areas; it is suggested to follow the SNAR Model for defining the process mapping scope.

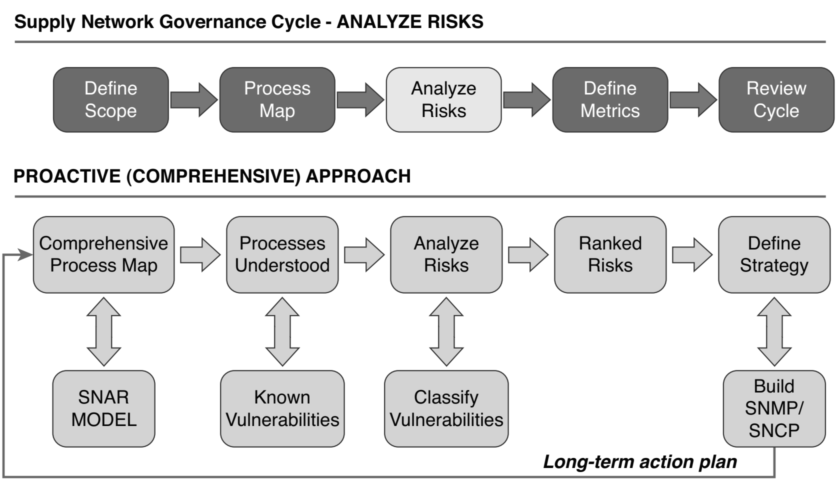

Figure 1.32 Risk analysis proactive approach

After the processes are mapped, innumerable vulnerabilities are exposed that demand prioritization. As the risks associated with vulnerabilities are ranked, it is possible to define the implementation strategy. Depending on the extent of the process mapping, it is possible to build a Supply Network Master Plan (SNMP) as a reference for the transformation process.

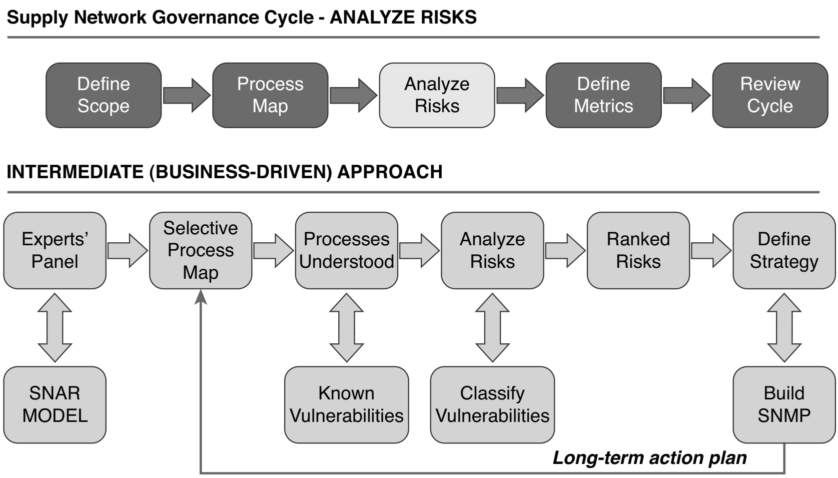

Figure 1.33 Risk analysis, intermediate approach

In addition, the implementation strategy may enable the elaboration of a Supply Network Continuity Plan (SNCP). The intermediate risk analysis approach involves the contribution of experts in the operations to be mapped.

The experts panel selectively reduces the number of processes to be mapped, instead of a comprehensive process mapping a number of selected processes go through the risk analysis.

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