CHAPTER 2

SYSTEM DESIGN & STRATEGY

FIGURE 2-1.

THE LOGISTICS CYCLE

WHAT A SUPPLY CHAIN MANAGER NEEDS TO KNOW:

The supply chain manager needs to know the following, which are covered in this chapter:

- The value and components of a supply chain strategy, and approach to developing a supply chain strategy
- Key elements of logistics system design, and the process of system design
- The role of data in supporting design decisions and in meeting the strategic objectives of the supply chain.
- Considerations for implementing a logistics system

2.1 NATIONAL SUPPLY CHAIN STRATEGY (OR MASTER PLAN)

2.1.1 WHAT IS A SUPPLY CHAIN STRATEGY?

A supply chain strategy, often referred to as a master plan, is a strategic roadmap aimed at strengthening the national supply chain to deliver public health commodities. It is comprised of two parts: a strategic approach that outlines the vision and principles of the unified supply chain, and an operational plan that details the timeframe, responsibilities, and costs of each activity required to bring the supply chain vision to fruition.

2.1.2 WHY IS A SUPPLY CHAIN STRATEGY IMPORTANT?

The strategy is critically important to public health supply chain management because it provides the guiding policies and interventions, along with corresponding implementation activities, to address the systemic challenges and goals that have been identified. While a strategy is helpful at any point in time, it is particularly useful when countries are addressing system challenges or are ready to introduce new approaches or resources to address supply chain issues.

Supply chain strategies are developed for defined periods of time, often five or 10 years, but should have specific points when they are assessed and refreshed to address new circumstances, challenges, and technologies. This allows stakeholders to define a set of objectives and activities they would like to accomplish over a defined time period, track progress, and continue to visualize the future state.

A supply chain strategy is critical to achieving supply chain integration in a number of ways. It helps to define a set of activities required to optimize the supply chain over time, and can uncover challenges or threats as well as approaches to overcome them. The process of developing a strategy also aligns stakeholder objectives around a vision for the supply chain. This helps ensure coordination of activities implemented by multiple partners, avoids duplication of efforts, and best leverages limited funds. Plus, the strategy helps define and clarify the various stakeholders' roles in the supply chain and the implementation of the strategy. These activities are critical to connecting actors and organizations along the integrated end-to-end supply chain.

2.1.3 HOW DO YOU DEVELOP A SUPPLY CHAIN STRATEGY?

Although countries have adapted the strategy development process for their particular situations, there is a general approach, which is described below.

Defining the need for a strategy is the first step in the process. A rapid assessment provides the evidence base to understand current capacity and performance. Rapid assessment tools include the Supply Chain Compass (see chapter 9), an on-line, high-level diagnostic tool that helps determine how mature the public health supply chain is across key managerial and functional areas. This analysis can then be used to drive a discussion of how the supply chain can support overall health goals in the short and long term. This should include consideration of the performance management system (see chapter 9), and use of agreed-upon KPIs to measure progress against the strategy. Once stakeholders reach consensus, a detailed implementation plan can be developed, which defines the key activities, roles, timeframes, and resources required to implement the strategy.

The timeframe for strategy development varies significantly across countries. A West African country master plan development is shown in figure 2-2. In this case, while discussions about developing a master plan took place over several years, from 2007 to 2010, the initial strategy development was about two months. The master plan was updated in 2015.

Although critically important, strategy development is just the first step in the process. Regularly updating and revising the plan ensures that stakeholder objectives, roles, and incentives are well aligned, and that everyone is moving towards strengthening the supply chain system. On an annual basis, stakeholders can review progress, validate assumptions, and set new priorities for the coming year.

FIGURE 2-2.
TIMELINE OF MASTER PLANNING ACTIVITIES IN A WEST AFRICAN COUNTRY

2.2 SYSTEM DESIGN

In virtually all health programs, products move from one place to another. The way that products move may not be rational, the quantities of products that move may not be based on actual data, and the methods used to move the products may not be standardized or optimized (although they should be). The purpose of designing the logistics system is to optimize the flow of commodities and information, and to standardize the related business processes.

The need to design any of these elements may arise arises during strategy development. Design can help achieve strategic, tactical, and operational improvements. Without a deliberate, well-considered design vetted by stakeholders, the supply chain system is unlikely to be successful.

At the same time, design rarely represents an entire system overhaul, but rather incremental improvements to interrelated components over time. The scope of the design may involve one or several supply chain components simultaneously, as identified in the strategy (i.e., information systems and the physical supply chain network).

Regardless of the scope, the design process must be driven by a robust evidence base, not only to define which elements require re-design, but also to help stakeholders make the best technical design decisions for a particular context. This evidence includes analysis of system performance, the physical network, or related costs. These are described later in this chapter.

Whatever the design, it should embody the strategy's principles. The goals of the system design process must align with those of the strategy process. For example, if the goal of the supply chain is to improve availability of products regardless of cost, the designers can pursue the most effective approaches, rather than those that are most cost-effective. On the other hand, if there are resource constraints, policy makers and program managers must identify and address trade-offs in the design. Any design decision has trade-offs. The supply chain manager needs to identify and understand these trade-offs, to make informed decisions around system design elements.

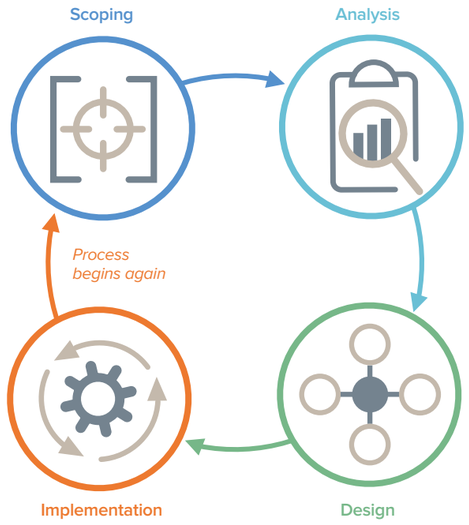
System design is a key contributor to the evolution of supply chains. Designing logistics systems helps to standardize systems, thus moving them along the supply chain maturity model from ad hoc, where there is significant fragmentation of efforts, to organized, where more standardized systems govern the supply chain. The design process can also lead to optimization, which moves supply chains towards greater integration by helping create an interconnected organization whose functions, people, and processes are aligned from end to end.

2.2.1. DESIGN PROCESS

The system design process includes four key activities, which are shown in figure 2-3 and then described in greater detail.

FIGURE 2-3

SUPPLY CHAIN SYSTEM DESIGN PROCESS



2.2.2 SCOPING

The first step in the system design process is to identify whether a system requires design or re-design, and if it needs to be re-designed, what elements need to be updated. A system design is not necessarily an all-or-nothing proposition. It can address a discrete component that requires optimization, or involve a range of system elements.

The design scope may emerge from either formal or informal assessments or out of a strategy exercise that defines the strengths and weaknesses of the existing system. The second activity– analysis– described below may glean additional insights about some of the system's performance drivers, and may require additional iteration of the design's scope.

Once the need is determined, it is important to define the scope of the design. Scoping the design activity involves defining the issue to resolve and the scale to resolve it. Depending on the issue, designing or re-designing a logistics system may involve one or more elements:

- Network design, including storage and distribution points
- Business process for resupply
- Information systems
- Inventory control systems
- Organizational structures and functions

For example, if health facilities routinely stock out of medicines before their next replenishment, the inventory control system should be revisited to determine if the facilities are holding adequate stock as well as whether the resupply processes and calculations are accurate or need to be updated.

The scale of the effort will specify what products or program supply chains are involved, for what geographic region (e.g., national or district), and what sector (e.g., social marketing, private, public).

2.2.3 ANALYSIS

Having evidence and data available to support design decisions is necessary to achieve improved functioning to meet the strategic objectives of the supply chain. Increasingly, analyses used to drive supply chain design decisions in the private sector have been adapted for use in public health, leading to more evidence-driven designs. Depending on the scope, analyses useful to the design include one or a combination of the following:

- Supply chain performance analysis evaluates the supply chain strengths and assets, and chronic and occasional system weaknesses. These may include analytical tools to delve more deeply into human resource capacity, business process mapping, and reviewing information system design and performance. A plethora of indicators have been developed in commercial and public sectors to base these analyses.
- Network analysis identifies the most efficient network of storage nodes and transport routes through which products flow to make strategic and tactical decisions. These include, among others, where to locate warehouses and cold stores for optimal service level and efficiency, how to set inventory levels, and which transport routes can achieve the greatest efficiency and service levels.
- Cost and cost effectiveness analysis provides insight into the cost drivers of supply chains. Economic evaluations are used to analyze the cost and consequences of investing in various supply chain interventions to strengthen and improve performance. (see chapter 10)
- Segmentation analysis considers the universe of required products for a particular program according to their characteristics (e.g., cold chain, bulky) and destination (e.g., primary health care, community level) to determine which products to use and how they should flow together in different segments.

The data required to conduct these analyses is shown in the table below.

TABLE 2-1

ANALYSIS	TYPE OF DATA COLLECTED (ILLUSTRATIVE)
1. Performance analysis	Staffing plans, job descriptions, and professional competency; existing business processes and SOPs; LMIS data collection records, processes, and flows; KPIs and data dictionaries, etc.
2. Network analysis	Commodity flows, volume throughput, service delivery patterns and targets, disease transmission patterns (e.g., malaria hotspots) and geospatial data (e.g., location of health facilities and storage facilities)
3. Cost analysis	Financial and commodity throughput information and human resource and operational costs
4. Segmentation analysis	Health facility characteristics (e.g., seasonal variability services provided, average order size, timing of resupply) and the product characteristics (e.g., shelf life, cold chain requirements, value, variability of demand)

2.2.4 DESIGNING

The system design process should be driven by evidence collected during the analysis phase. The earlier scoping exercise will specify which system components will require design. The process may include design of the entire system–the organizational structures and functions, inventory control and information systems, and business processes–or just some of the components.

While some elements may be designed with assistance from technical experts, the process should be structured so that stakeholders and users provide input on the final design. Including customers' feedback on their requirements ensures that the system is designed accordingly and is responsive to users' needs. A further benefit is that these individuals can be active advocates for the system during implementation.

Every design decision has trade-offs, so designers need to weigh the technical and resource implications to come up with a final decision. Cost effectiveness analysis can help identify trade-offs between potential options based on resources available. For example, the less frequent the resupply period, the greater the warehousing needs; the higher the inventory carrying costs, the less the transport needs. This underscores the importance of considering KPIs during the design process.

This system design activity may take different formats–from a large workshop to small working meetings. The first step in the design process should be to review the evidence from the analysis phase. This evidence will provide the designers with information needed to consider the viability of certain options, including:

- Whether or not a level should be removed
- Whether consumables and vaccines should be delivered jointly
- Whether transportation routes should be optimized for more efficient movement of products

Using the analyses, designers can better understand the impact and, most importantly, the trade-offs of certain decisions. The analyses also can help them reach agreement on key design options that best achieve the strategic objectives agreed upon at the beginning of the process.

Once the elements of the system are designed, the next step is to define the business processes required to operationalize the design. The business processes are the set of linked activities required to get products to customers at health facilities. These include the processes to place orders and to fulfill those orders, among others. Then, individual and organizational roles and responsibilities should be developed relative to each business process. This information will form the basis of standard operating procedures (SOPs) or a similar document that details the system operations.

Finally, an implementation plan should be developed as part of the design, and include key activities, timelines, estimated costs, and roles and responsibilities required to implement the system. No matter how well it is designed, the system will fail without a well-planned, properly resourced implementation plan.

2.2.5 IMPLEMENTING

Designing is the first step in building and strengthening systems. Next comes implementation, which is the longest, most resource- and time-intensive phase of the process. Implementation includes all the activities required to put systems and processes in place, and ensures that the people involved in the supply chain understand and have the capacity to play their roles. Implementation activities include:

- Documenting, printing, and distributing SOPs or guidelines, and tools and forms (e.g., LMIS forms) required for operating the system
- Training workers at all levels in their new or updated roles
- Creating organizational or coordination structures for the supply chain, including logistics management units or teams to review data and take action (see chapter 9)
- Developing and implementing information systems, including digital and mobile solutions
- Adjusting the physical infrastructure, including storage and transport assets
- Developing and implementing a performance management framework for the system

Implementing a logistics system is an ongoing activity because the system is dynamic and needs to be flexible to accommodate changes that occur within a program or the external environment. The system must be continuously monitored as part of routine performance management to identify whether adjustments are needed to ensure that the system functions optimally. As improvements are identified, the system design process begins again, in a virtuous cycle of continuous improvement.

Photo courtesy of Myanmar: QIT with candle light (Taungyi,S Shan)