The Stages of System Design

1. ANALYSIS

1a - Advocacy, Assessment, or Event: Most countries engage in system design as a result of related planning activities or events such as during a new vaccine introduction, Effective Vaccine Management (EVM) assessment, or application for Health System Strengthening (HSS) or cold chain inventory procurement (e.g., CCE OP). It is applied in the context of existing questions that are facing supply chain managers, such as bottleneck analyses, programme assessments, or emergency response planning.

Based on related planning processes or events, it is during this stage that country leaders investigate the needs of the supply chain (SC) design and begin to build a business case. The assessment is largely based on both qualitative feedback (interviews) and quantitative feedback, such as type, format and availability of data that speaks to a high-level on the potential role of supply chain design.

Estimated Timeframe: Depends on relationship to engagement.

Meeting Time: Depends on type of engagement

Objectives:	Key Outputs:	Resources Required:
• Determine how SC system design links to related immunization goals • Identify key gaps and challenges • Sell decision-makers on the need to invest in further assessment	• Supply chain assessment including status of SC data, what type system design approach is possible. • Link between supply chain objectives, bottlenecks, and performance	• 1-2 in-country staff to champion/promote iSC change • Workshop facility • Supply chain artifacts

Questions to answer before moving forward:

- What are the key objectives of the supply chain and how are they measured?
- What are the key challenges facing the supply chain and how does this impact performance?
- What is the catalyst driving the supply chain to change?
- What type supply chain design approach (stakeholder workshop, modeling, optimization, simulation, etc…) best matches with need and the available data/information?

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1b - Introduce: During this stage, country stakeholders are introduced to system design analysis and opportunities to consider supply chain changes in their local context. Through an interactive workshop, attendees learn how to instill informed, system design analysis into key decision-making activities as part of a broader continuous improvement approach.

If a project is beginning outside of an Assessment or Event, as described in (1a), then it is recommended to use the Introduction stage to explore the key questions in (1a) with the stakeholder audience in (1b). The workshop focuses on three main concepts, as described below.

1. Learn about the concepts of system design, common strategies, where it has been applied, and the benefits it provides.
2. Apply system design analysis to the local, unique country context, identifying the key questions, challenges, and opportunities for change.
3. Prioritize and map a path forward to implement system design analysis, generating momentum for future work.

This workshop can be extended, dependent on country needs, to include a detailed project planning exercise for countries that have already established their core team and are prepared to fund and staff a modeling project.

Estimated Timeframe: 1-2 months, includes planning/scheduling, data preparation, meeting time, meeting report, project plan, and communications plan.

Meeting Time: 4-5 day workshop

Objectives:	Key Outputs:	Resources Required:
• Improve knowledge about system design benefits and key components • Identify stakeholders and generate momentum • Define champion and roles	• Opportunity landscape - the list of possible elements to change, such as distribution policies, inventory policies, storage locations, etc. • Stakeholder analysis • Process organization diagrams • Agreement of the system design approach	• 1-2 in-country staff to champion/promote iSC change • Workshop facility • Supply chain artifacts

Questions to answer before moving forward:

- What is system design, redesign, optimization, and why do I care?
- What can we change, what is possible, what are our options?
- Who needs to be involved to make decisions, provide input, and approve work?
- What is the system design approach to be used and what are the expectations?

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1c - Data Collection, Validation and, Modeling: This stage – as an iterative process within the full set of stages - helps develop an understanding of the existing system performance and set a baseline for future targets as well as a vision for the overall project. Significant amounts of data will need to be gathered and the exact data will depend on the type of system design undertaken, including volumetric throughput, facility locations and capacities, equipment, vehicles, costs, workforce, skills, policies, and future decision points.

Before using the SC data and assumptions, requires validation by key stakeholders so that when results of the analysis are presented to key stakeholders they are comfortable with the data been used and thus focus on the finding of the analysis and not questioning the data used in the analysis.

With this information, countries can quantify and evaluate how the supply chain will perform under different conditions and assumptions, and analyze the trade-off of cost, availability, and risk on the supply chain objectives. This data can be used to assess the likely impact of different supply chain options, scenarios, sensitivities, and optimal operations. It is common and expected that this stage is iterative. As you learn more information, you tweak the model, modify data, and change scenarios to better match reality.

The resulting Supply Chain Model can be maintained over time and reconsidered repeatedly to evaluate the forecasted impact of future supply chain changes.

Estimated Timeframe: 4-5 months, includes data collection, validation, and a series of in-person workshops to align team members and validate scenario results.

Meeting Time: 2x4-5 day workshops

Objectives:	Key Outputs:	Resources Required:
• Link MoH objectives to model and questions • Develop and validate baseline and realistic assessment	• Collection, validation, and gap identification of key supply chain data • Baseline of existing system performance • Preliminary conceptual model scenarios • Sensitivity Analysis	• 4 people in country, 50% time • Local modeling capacity

Questions to answer before moving forward:

- Is the supply design approach able to realistically "model" the current state?
- How to measure performance?
- What is the status quo performance?
- What are options for change and their impact?

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1d - Planning: Based on the results of modeling, this stage is where the system is actually designed. Using the outputs of the analysis begin to make design decisions, the next steps include costing, implementation planning, risk assessment and KPI development. Depending on the approach, this stage could return to modeling as decisions are made; as the modeling can be used help understand the risks and costs of certain decisions. For example, if computer modeling has been used in the system design approach, then these models could be used to inform the phased implementation, by modeling the likely impact of each stage and the likely risks during the implementation.

Before proceeding, it's also critical to stop and review all the components of the system design, including a phased implementation approach to validate the reality of what will be changed when, with what resources, and by whom. While each stage involves a report back to stakeholders and decision-makers, this stage formalizes the final proposals from the technical group.

All of the hard work from the previous stages culminates in a final review and validation of the objectives, performance, proposals, costs, and expectations. Being an iterative process, it is OK if during this stage, it is recommended to return to the modeling analysis due to new information or challenged assumptions. Much of the work is already accomplished, and better data, assumptions, and buy-in will result in better project outcomes.

Estimated Timeframe: 2 months

Meeting Time: 2 x4-5 day workshops

Objectives:	Key Outputs:	Resources Required:
• Finalize detailed plans to improve supply chain performance • Align with key stakeholders and decision-makers on proposed path forward including the policies and procedures that will need to be altered	• Decision on future system design • Costing analysis, costed proposal(s) to alter the supply chain design • Forecasted improved performance and/or cost savings • Implementation plan • Change risk assessment and mitigation plan • M&E framework	• 1-2 in-country staff to support optimized outputs • Local modeling/experts to help develop optimal scenarios and implementation plans • Experts from throughout health system to demonstrate feasibility

Questions to answer before moving forward:

- What (exactly, specifically) has to change in the preferred scenario?
- Who is impacted by the changes?
- What is the cost and performance of the preferred scenario(s)?
- Key executive and management team is on-board and supportive?
- Funding exists when needed to begin implementation?
- Who will do what/when? phased implementation

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2. PHASED IMPLEMENTATION

2a - Implementation: The success of a system design is defined by how effective and efficient the system is in practice. Conducting a phased implementation allows supply chain managers to monitor the performance of the system and introduce any necessary adjustments for subsequent phases. During the planning stage, an initial implementation plan was developed, which lists the key milestones, activities, and associated timelines that need to be met to roll the system out. The implementation plan includes the model of training that will be used, the number of trainings that will be needed and who will conduct them. It identifies where the system will initially be implemented and describes the roles and responsibilities of those involved with implementation. Also included are the resources required to implement the system, such as resources that may be in the form of new LMIS forms, computers, funding for trainings and transport, printing of training materials, etc.

A first step in the implementation stage is to codify the design into a standard operating procedures (SOP) manual, a set of detailed business processes that guide those responsible for implementation. The SOP manual includes KPI, job aids, and system tools (e.g. WMS/LMIS forms/screens). A training curriculum based on the SOPs is developed. The SOP manual will also guide any terms of reference for outsourced services. With these core implementation documents, training can commence and tenders issued for outsourced services.

Once roll out is complete, continuous monitoring of the system is critical to ensure success. During the planning stage, a monitoring and evaluation plan was developed, identifying the data that are collected, aggregated, and analyzed to help determine system performance. These data should be routinely presented and discussed so that informed decisions can be made about expansion, changes to roll-out, or changes to assumptions.

Estimated Timeframe: ~6 months, but actual timing depends on many factors, such as frequency of resupply and ability to collect quality data for evaluation

Objectives:	Key Outputs:	Resources Required:
• Implement new system • Test system	• SOP manual • Training curriculum • TORs for outsourced services • People trained • Contracts issued • KPIs and description of system performance and any necessary changes to the system are documented. • Timeline for incorporating changes into future phases	• SC personnel at each level of the system • All resources specified as part of the implementation plan • M&E leads to document process and lessons learned

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2b - Evaluation: Initial implementation is evaluated and an optimized model is further developed based on results. At this stage, the evaluation may highlight that original assumptions were mistaken, and it may be necessary to return to the modeling phase for further analysis and planning. Likewise, the implementation may have produced more knowledge of challenges, such that new questions need to be answered. It is through this type of analysis that programmes can plan a continuous improvement approach to programme management, looping back to the modeling phase to generate evidence in response to new challenges.		
Estimated Timeframe: Depends on scope of project and amount of data to evaluate		
Objectives: • Determine what is working and what is not working • Agree on potential changes to Phased Implementation Plan	**Key Outputs:** • Regional/national scale-up plan • Prioritized changes • Updated Phased Implementation Plan	**Resources Required:** • National-level commitment to review progress and next steps • Local experts to alter model based on reality

2c - Expansion: Over time, the project is integrated into national plans and is rolled out across more geographic areas. Evaluation and refinement continues based on data generated.		
Estimated Timeframe: Depends on scope of project		
Objectives: • Continued commitment to implementation • Transition Scale-up to Ad-hoc	**Key Outputs:** • Next generation immunization supply chain	**Resources Required:** • National level leadership • SC personnel at each level of the system