

## Chapter 3      *The Network Development Life Cycle*

### **Topics covered:**

Network analysis. Network design methodology. Writing of a Request For Proposal (RFP) and quotation analysis. Prototyping/simulation. Implementation.

### **3.1 Introduction**

The Network Development Life Cycle (NDLC) depends upon previously completed development processes such as strategic business planning, application development life cycle, etc.

To fulfill strategic business goals, a top-down approach must be taken to the overall information systems development process.

### **3.2 Information Systems Development: Process & product**

- **Process:** used to visualize what should be done at any point of the development cycle.
- **Product:** milestone or deliverable indicating completion of one stage of the development cycle.

There is a need for significant analysis and design, and associated products or deliverables, prior to the commencement of any network analysis and design activities.

### **3.3 The Network Development Life Cycle**

The NDLC is of an ongoing nature. The network design must be dynamic to support any changing requirements.

### **3.4 Network Analysis and Design Methodology**

A network analysis and design methodology is a practical, step-by-step approach to network analysis and design.

#### **3.4.1 Overall Characteristics**

- Requirements (business, application, and data) definition is required prior to network design activities.
- Expected compliance with requirements in a Request For Proposal (RFP) by both in-house personnel and outside consultants.
- Activities from various stages often take place simultaneously and backtrack to previous activities is sometimes needed.
- This methodology is an overall guideline rather than “cookbook” instructions.

#### **3.4.2 Critical success factors of the NDLC**

These factors are best seen as habits or behaviors, rather than discrete events to be scheduled or planned. They include:

- Identification of all potential customers and constituencies:
  - All groups must be consulted.
- Political awareness:
  - Corporate culture: hierarchical, distributed, or open.
  - Backroom politics can play a role in systems design.
  - Find ways to ensure objectivity of the analysis and design process.
- Buy-in:
  - Reach consensus on the acceptability of results of each stage.
  - Approved results of one stage become the foundation or starting point for the next stage.
  - Makes the final presentation smoother.
- Communication:
  - With all groups.
  - Write memos, communicate with key people in person, etc.
- Detailed project documentation:
  - Prepare agendas
  - Take meeting minutes
  - Action items
  - Use a project binder for all the above

- Process/Product awareness:
  - Stay focused: what is the process/product at each stage?
  - Keep meeting on track: no off-subject discussions.
- Be honest with yourself:
  - Be your own harshest critic (no one else knows the potential weaknesses or areas for improvement in your proposal better than you.
  - Use peer reviews.
  - Not all weaknesses can be corrected (e.g., financial or time constraints).

### **3.4.3 Overall Guidelines**

- Start with a clearly defined problem:
  - Identify affected parties and representatives.
  - Held brainstorming sessions to define problems and requirements of a solution.
- Understand strategic business objectives defined by senior management.
- Collect baseline data from customer groups about the current status of the system and network. This is used to measure eventual impact of the installed network.
- Feasibility studies and buy-in:
  - Feasibility study: problem definition and associated alternatives recommendations for further study.

## **3.5 Strategic Information System Design**

The primary mission of a network is the delivery of the right information at the right time to the right decision-maker in the right place. All these components are determined by the strategic information system design (SISD).

- The SISD process starts with review of strategic business goals articulated by senior management.
- Then, SISD describes the overall characteristics of an information system that fulfills these goals.
- The evaluation criteria associated with these goals is a key product of SISD and must be objective and measurable. This assures the objectivity of the entire network analysis and design phase.



- Percent-to-fit goal:
  - Arbitrary percentage determined by user groups
  - Sets minimum threshold of compliance for vendor proposals to warrant further consideration and invitations for demonstrations (e.g., 50% of priority 1 features are met). This applies to in-house development as well.
  - Objective “score”: counting how many features of each priority are present in a proposal.
  
- Proposal evaluation and the make or buy decision:
  - Invite selected vendors for demonstrations.
  - Buy-in on selected vendors and vendor selection process.
  - Check every feature included in vendor’s proposal at the demonstration.
  - Make or buy decision.
  
- Outsourcing:
  - Hire outside contractors to operate and maintain corporate information systems and networks.

### **3.6 In-house Network Analysis and Design**

A network must be designed to deliver solutions and performance in response to specific, well defined, data, application, and business layer requirements.

- Data traffic analysis:
  - Payload type analysis
  
  - Transaction analysis
  
  - Time studies

- Traffic volume analysis
- Mission critical analysis
- Protocol stack analysis
- Network configuration alternatives (Logical design):
  - Local carriers may be limited in their offering of certain data transmission services.
  - Capacity: ensure sufficient bandwidth is allocated to handle sudden increase in demand.
  - Reliability: sufficient redundancy is implemented
  - Security
  - Cost
- Network hardware analysis and configuration alternatives (Physical design):
  - Depends on the results of the two previous analysis reports. If these are valid, then networking devices chosen to tie the network together should be valid as well.
- Prepare a comprehensive budget
  - Prevent surprises: required or anticipated facilities upgrade are identified during survey (in RFP preparation)
  - Three cost categories: Acquisition, Operations, and Anticipated growth
- Prepare the final proposal, i.e., RFP response or network design document that includes:
  - Customer's requirements and how this design meets those requirements.
  - Existing network
  - Logical design
  - Physical design
  - Network design testing results (prototyping, simulation)
  - Implementation plan
  - Budget and expenses associated with the project

### **3.7 The Network Implementation Process**

- Pilot tests: to safely roll out new systems or networks. E.g., deploy/implement the new system on one site, monitor performance, fix problems, and gain experience before deployment on a wider scale.
- Project management:
  - Detailed task lists
  - Manual or using project management software.
- People are important: buy-in at every stage by all affected parties.

### **3.8 Automating the NDLC**

- CANE: Computer-Assisted Network Engineering (CANE): Analysis and design software used to model a current network.
- Simulation tools: performance engineering software tools: overall network performance modeled is a result of the effect of a series of mathematical formulas.
  - Ability to predict performance of various networking scenarios (i.e., what-if analysis).
  - Benefits: spot network bottlenecks, test new applications and network configurations before deployment, re-create circumstances, and replicate traffic volume and transaction types.
- Network management tools.

### **3.9 References**

1. “Applied Data Communications - A Business-Oriented Approach” by James E. Goldman, 1998
2. “Top-Down Network Design” by Priscilla Oppenheimer, Cisco Press, 2001