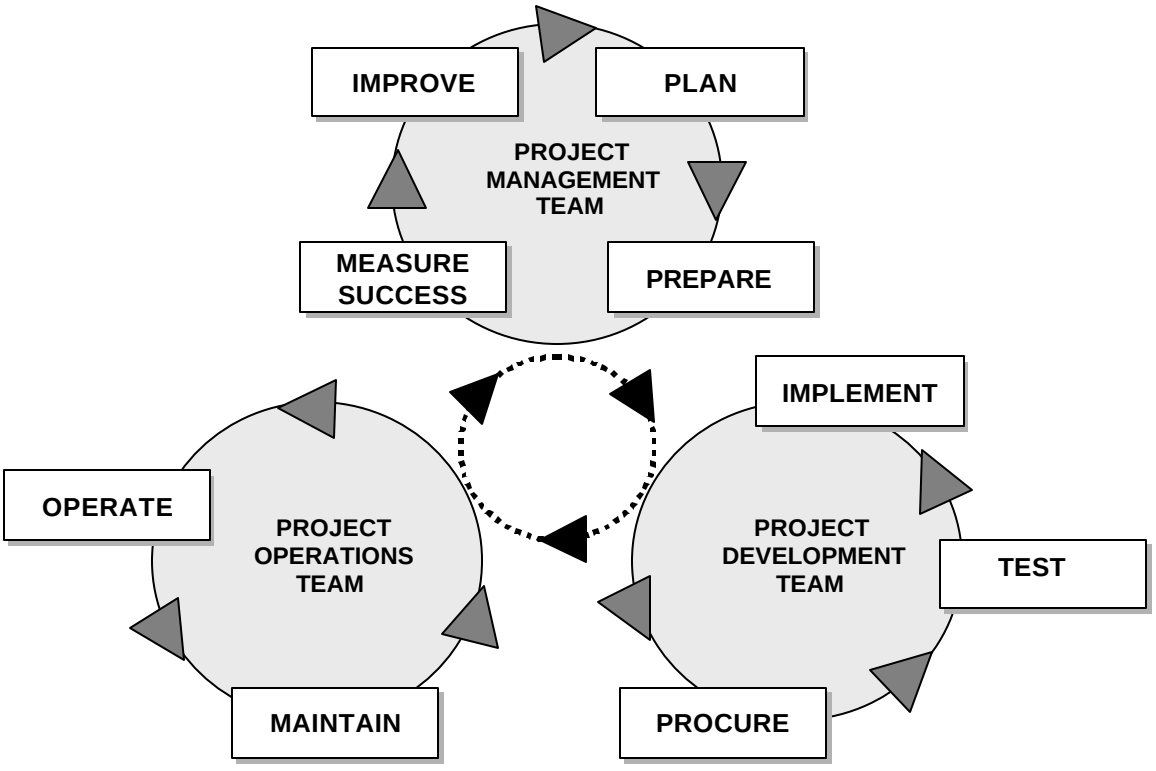
A.1.2. The Process of Setting Up Information Systems

Development and implementation of information systems is seen by many decision makers as a paradoxical mixture of opportunities to harness modern solutions and gain new technology and, at the same time, an intimidating situation, as they become aware of the limitations of their own understanding and knowledge of the variety and complexity of issues brought forth by IS&T. From the identification of the simple essential steps through to reference material on many technical details there is a wealth of available published materials to assist in those processes.

Fundamental to the understanding of the process of setting up IS&T is the concept of added value — all participants must get out of an information system at least as much as they put in, as well as the system — it must generate benefits greater than its own cost, otherwise the system by definition becomes a burden. Information systems are almost totally dependent upon the staff who provide and record the information, yet these are usually the lowest valued and least involved. If this fact is not recognized and benefits realized for these contributors, there is a high probability of building inaccuracy, instability, and future failure into any information system. Good practice and positive guidelines do exist and some are reproduced in this Guide, along with lists of positive learning points as well as warnings of hazards to avoid.

A.1.2.1. The Process

Figure 2. Dynamics of the Process of Developing and Operating IS&T



The nine components (Figure 2) involved in developing, deploying, and operating IS&T are:

- Plan
- Prepare
- Procure
- Test
- Implement
- Operate
- Maintain
- Measure Success
- Improve

There follows a brief description of each of the first three components (Plan, Prepare, and Procure), which are pertinent to the initial phase of systems development. They will be discussed in detail throughout this document.

Component 1. PLAN

[a] Define knowledge needs
- define information outputs
- define data needs and sources

[b] Define scope of the project
- is it too large?
- is it feasible?

[c] Understand legacy information systems — electronic or not

[d] Do cost/benefit analysis (business case)

[e] Identify Resources

[f] Do process analysis

[g] Identify appropriate technical experts

[h] Define users

[i] Define indicators of success

[j] Ensure top level commitment

[k] Define project management methodology
- all viewpoints
  - business
  - technical
- user

[l] Identify Change Agent
- is there someone with the SKILLS internally or externally?
  - respected
  - knowledgeable
  - energetic

Component 2. PREPARE

[a] Design new/refined processes (if required)
[b] Designate project director
[c] Define functionalities required
[d] Identify training needs (immediate and continuing)
- IT staff
- operations staff

Component 3. PROCURE

[a] Write RFP specifications
- technology
- capabilities
- training
- accountabilities (both parties)
- maintenance needs
- project management responsibilities
  - vendor
  - purchaser
  - guarantees, etc.

[b] Prepare negotiation strategy - "buy", don't be "sold"
[c] Prepare proposal evaluation and selection process
[d] Identify possible vendors
- advertise

[e] Distribute RFP
[f] Short list responses
[g] Demonstrations on site - define expectations
[h] Select according to predefined process
- ensure decision is defensible

[i] Manage unsuccessful vendors
[j] Write contract

A.1.2.2. Standards — the Principal Strategic Issue

The most important strategic issue in information systems is standards. Data processing, technical, and electronic standards are essential if equipment is to be able to interconnect. Data definitions and terminologies will be essential if health professionals are to communicate. Specific technical components such as the recording and transmission of images have their own international standards. And in the country-specific setting, the requirements for statistical and other analyses to be passed upwards to support informed decision making must be compatible and follow specific standard definitions.

This Guide gives a wide range of references to international standards, enabling local decision makers to draw directly upon best international practice. Failure to adhere to open technical standards will result in isolated "islands of automation"; failure to adopt data and terminological standards will result in "islands of information". Only compliance with recognized standards, which are too complex for local development, will ensure an integrated information system.

A.1.2.3. Cost-Benefit Analysis

The only justification for any information system, or particular component, is that the benefits justify the costs. Those benefits must be identified, being justified not only in monetary terms but also considering improvement of access, quality of care, better return of resource utilization, better clinical end results, user satisfaction, and improvement of the overall community health status.

There may be more than one way of meeting an information need; there will almost certainly be competing calls for application of information system development funds; and there will certainly be other competing demands such as for diagnostic equipment or increased pharmaceutical supplies. Given limited and finite resources, the right decisions can be reached only by appraising the alternative options to see which gives most added value, as well as being affordable within budget.

A.1.2.4. Incremental Development

Rarely can one develop a complete Information System in less than two years. Even in the most industrialized countries, where fully integrated electronic patient record systems are appropriate in very large hospitals, attempts to specify and implement major systems in one exercise have been fraught with difficulties and have often gone seriously over budget. A stepped approach, adding compatible components in a phased basis, has major attractions.

A.1.2.5. Stakeholder Support

Obtaining the support of key stakeholders and their interests is essential. Good and bad experiences abound; Canada has considered it worthwhile to invest heavily in identifying local views and obtaining stakeholder support — by contrast, the Department of Health in England minimized this step, which led to mistrust of some of the perceived objectives and technical standards of the strategy and consequent definition of requirements and project implementation delays. Key amongst stakeholders are staff, whose understanding and commitment are essential to information system success, commencing with the data recording process. In the U.S. a high failure rate of technically sound medical information systems has been identified due to user or staff resistance. Systems must therefore be defined, then procured or developed, using organizational methods that are openly focussed on all user needs.

A.1.2.6. Security and Confidentiality

Given the very sensitive nature of health care information, and the high degree of reliance by health professionals in particular on reliable records, security and confidentiality must be seen to be clearly and effectively addressed. Security relates to the physical safety of information, including protection against accidental loss as well as against unauthorized alteration. Confidentiality relates to ensuring that only persons with a clinical responsibility see patient-specific information. At the same time, the regulations and technical standards developed must be realistic in terms of recognizing the realities of health care delivery.

A.1.2.7. Education and Training

The importance of education and training cannot be overemphasized. Education relates to change in professional practice, as information systems often give opportunity to work in a new and more appropriate manner. This can apply as much to finance staff, maintenance staff, and pharmacists as it can to clinical health professionals, and the education in new ways of healthcare practice must be undertaken through professional channels. Training, on the other hand, is specifically related to the information system itself, for which all staff must be trained on how to use the equipment, how to enter data, and how to get out appropriate analyses. Training in particular must be ongoing, both to give update training as staff become more familiar with the system and wish to make better use of the functionality, and also to ensure that new staff are trained in information system use as part of their induction training.

A.1.2.8. Project Management

Information systems projects are notorious for running over-time, and over-budget, yet often still failing to deliver all the specified functions satisfactorily. This could be largely avoided by effective project management, including planning, quality assurance, and resource management components. Obtaining an effective system is not simply a process of competitive tendering, local development, or acceptance of an externally funded donated system. The procurement process should be planned and structured, in order to match the solution to the need and circumstances. This in turn needs a systematic approach to defining the requirements and the available resources, including running costs and staff availability.

A.1.2.9. Ongoing Evaluation and Development

Information systems must never become static, or they lose their value. The context in which they operate, the clinical patterns they support, and the policy environment will all change, and therefore so must the information systems. Additionally, the development and progressive roll-out of new technical infrastructures means that new opportunities will also arise, which should be exploited when cost-benefit analysis shows this to be justified. Scientific evidence from formal evaluations should be

sought for any health information technology application. Equally important, and more within the control and responsibility of the operational implementing organization, is ensuring that information systems are evaluated and adjusted in the light of how they are perceived, and how they change practice within the organization, and ultimately change the organization itself. Evaluation of the use and effects within the organization should therefore start from the time of implementation, using structured approaches.

Beginning Automation: A Case Study

Background

A hospital of 120 beds, located in a major city, decided to automate information. At the time, the hospital had two desktop computers and three laptops, and only a few of their personnel knew how to use a computer to perform basic tasks. The administration was willing to make another effort to create a network to automate all the information. It is important to mention that the same administration had tried to develop systems in the past few years, but the vendors had provided solutions that led to poor results, creating a very skeptical environment for any new companies trying to offer products or services.

The Plan

Needs assessment is performed and creation of a three-year project is suggested to the administration, following priorities and budget limitations:

1. First-year objectives were to buy some workstations, start training personnel, and to develop a Human Resources/Personnel and a Financial-Billing module.

2. Second year, start installing a network and initiate the development of an Admission module and Medical Inventory.

3. During the third year, integration of all the modules and completion of training all the necessary personnel.

Results

The first year of the plan started on schedule, equipment was bought, training was provided and requirements were gathered for the HR/Personnel and Financial-Billing modules. Development of the modules started slowly due to the lack of experience of some engineers, and precious time was lost setting standards and getting everyone at the same level. Modules were implemented on schedule.

continues next page…

continuation from previous page…

In the second year there were problems with the budget, several months were lost, and installation of the network was left behind. The Admission and Medical Inventory modules were developed and implemented. By the end of this year, people were getting tired and the interest from management and employees was very low.

Training was provided for the new modules but problems persisted because employees were expecting that the modules would make work easier and not so much detail oriented and complex. Also, duplication of data and concomitant added effort to record data was being questioned by some employees.

At the beginning of the third year, problems with the quality of data started to appear. Employees were careless about data entry and management was getting reports with very questionable results. Management started to question the quality of work of the modules and the integration was postponed. A few months later the administration of the hospital changed, and due to the questionable results of the data in the modules, no priority and budget were assigned for the next year.

Commentary

Expectations in data automation are too high in many of our institutions. It is incredible the amount of money and effort involved not only in development but also in maintenance and training in corporations and governments. This amount of effort never ends, technology is taking us into a very complex environment where only the people with a realistic, systematic, and objective-oriented vision will accomplish the goals and expected results proposed for IS&T implementation.

Lessons Learned

- Vendors will provide anything to anyone. Selection of vendors should be done using a very objective evaluation, and by getting professional help to make your selection a successful one. Poor design in computer systems creates future complex automation problems.

- Full commitment from management is indispensable, and integration of employees into the automation process will make for better acceptance of new working procedures, due to a better understanding of the institution goals, while automation will be accepted as a normal process of institutional development.

- Consistency in every automation process is necessary to guarantee good data and analysis information.