VII. MANAGING INFORMATION TECHNOLOGY

329. Much has changed in the twenty years since the matter of capital assets was addressed in the 1980 *Handbook.* Four prominent advances have greatly expanded the capabilities of a statistical agency:

(a) Powerful, relatively inexpensive computer equipment has been made available to all staff members in many statistical offices;

(b) User-friendly applications software has given staff members control over a number of key statistical functions, ranging from questionnaire design to collection, editing, tabulating, mapping and publishing. Readily available off-the-shelf components have made in-house application programming easier, and component reuse within the organization has become more common;

(c) Computer networking has facilitated internal access to data and metadata through established tiered client/server environments;

(d) Information technology has made timely access to external sources of information feasible for staff members, thereby making it possible to conduct research, gather general information and perform other relevant tasks at all levels of an organization rather than solely through top management.

330. These advances and other related changes have given rise to new concerns regarding the management of the information technology environment. The information technology framework includes hardware, software, staff resources and commercial services.

A. Two information technology (IT) management models

331. The present chapter, rather than focusing on the management of particular technologies, will investigate whether there are broader themes that will withstand the inevitable and fast-paced technological changes to come. Thus, for example, such topics as the pros and cons of a client/server model or the optimal network structure within an agency are not considered here. Instead, the reader is introduced to two organizational models that have a reasonable chance of being valid over the next ten years or so. The models are followed by some general recommendations that should be valid independently of particular technological winners and losers.

Model I

332. In model I the statistical agency makes detailed and comprehensive decisions about its informatics infrastructure, which includes both hardware and a common software architecture. The term "software architecture" refers not only to the underlying database management software and consequent standardized definition throughout the agency, but also to the standard user interface, groupware (e.g. products such as Lotus Notes as well as standard naming conventions and archiving conventions), personal software such as spreadsheets, and the integrating tools to "glue" the software together. Some agencies have gone so far as to prohibit private personal file storage on workstations to ensure that no other software except that approved by the central informatics area is found on individual machines. Maintenance, updates and decisions on new software are all determined by the central organization.

333. Since Model I assures one common infrastructure, this approach serves to bind together the organization and prevent information anarchy. It also makes it much easier to integrate different functions of the agency such as registers and cognitive research. However, it may stifle creativity, and parts of the organization may not have the tools they need to perform their functions properly. The success of this model is clearly dependent on the effectiveness of policies and personnel in the central informatics division.

Model II

334. Model II also recognizes the need to avoid information anarchy. This approach relies on standards - hardware, software, and telecommunications - to provide for a coherent informatics environment in the organization, rather than on a standard and unyielding infrastructure. Although at first glance it may seem that this is easier to implement - certainly most staff outside the informatics organization will embrace it because it provides for more local flexibility and decision-making - from a central management view it is harder to implement. In practice, it has proved exceedingly difficult to ensure that new software, even if it meets the standards, will transparently integrate with existing software. In addition, changes to the existing software may cause unforeseen problems in the local new software products. A positive aspect of Model II is that it allows some flexibility and potential adaptation of new software even if the central informatics staff makes decisions that turn out to be shortsighted.

335. Reflected in both models is the general understanding today that software applications should be developed as closely as possible to the substantive user. In the first model all the software tools would be defined, provided and maintained by the central informatics organization. In the second model, although the basic tools and a set of standards to be met would be defined by the central organization, the substantive user would have greater freedom overall in implementing the project. Both models have shown that they can be successful. The choice is often made as much by taking into account the culture of the organization as on technical grounds.

B. Review of some concerns prevalent at the end of the 1970s

336. In the 1970s and early 1980s as statistical agencies tried to integrate mainframe computers into their operations, concerns were very different. A number of recommendations emerged regarding the way the systems analysis workforce should be managed, relations with other government computing establishments and the types of software to implement or to avoid. These recommendations are summarized below:

- Do not squander specialized human resources; they are scarce and must be kept together under central supervision;
- Document all systems extensively;
- Organize the workforce creatively so as to provide both functional and subject matter experience, i.e., balance versatility and specialization;
- Promote training activities by building in on-the-job training.

337. With respect to the first observation, it is still true that specialized informatics expertise is scarce. However, depending on the size of the organization and its levels of decentralization, it may be more sensible to locate some of these resources within the functional areas of the statistical office. Training and staff development should be planned and updated on a regular basis. The importance of documentation cannot be underestimated, although the difficulties in achieving this objective are as great today as they ever were. Finally, the exchange of experience and know-how between area specialists and application developers should be encouraged.

338. While most of the earlier recommendations still hold, the following items from the 1980 *Handbook* have been bypassed by changes in the information technology industry:

- Do not subcontract any systems work and programming, other than certain one-time applications, to outside agencies;
- Do not assign systems analysts and programmers to new projects until they have completed clear documentation of data and programs for ongoing projects;
- Do not leave administration of hardware to other parties unless it is guaranteed that statistical processing will get the highest priority.

339. With respect to the first two recommendations, instead of asking how it should be developing software applications, the correct question for the statistical agency might better be: "Should a statistical agency be engaged in any customized software development, whether developed by its own staff or subcontracted?". The evidence to date says that an agency develops its own software at its peril. The history of customized software projects is replete with those that were never completed, or partially completed and over budget. Comprehensive off-the-shelf software products are now available and

reinforce this admonition. A rule that some have used is that if seventy to eighty per cent of an agency's requirements can be met by a product that actually works, then the agency should consider changing or dropping the remaining twenty per cent of its requirements. With respect to the last recommendation, it is worth noting that many companies are increasingly seeking others to operate their hardware infrastructure. The practice of concentrating on the core functions of an organization and contracting out, or outsourcing, others that can be better done by specialized organizations is one of the greatest opportunities, and challenges, to statistical agencies in the IT area.

C. Working with the commercial sector: outsourcing

340. Organizations generally receive the best value if the commercial products and services they use can be adapted to the requirements of their mission. The common reasons for considering outsourcing include the following:

- Proven, commercially viable technologies are available only in the marketplace;
- "Standard" or "commodity" products are less expensive owing to competition;
- Vendors often have specialized skills that are difficult to maintain "in-house";
- The statistical agency can concentrate on its core mission (which is not IT project development);
- Competition can bring innovation to bear on a mission requirement;
- Risks can be shared with a vendor if the rewards are great enough;
- Proprietary or unique software or systems may be available only from a vendor.

341. Standard IT products are those that have high market penetration, such as the personal computer, and industry standard characteristics, and are available as commodities from a variety of sources. This category also includes some classes of software and network service products such as computer operating systems, office software suites, some statistical packages, network portal services and web hosting. These items are the most likely candidates for outsourcing - not only the product itself, but often its maintenance, update and replacement.

342. Commercial sources are often used to conduct IT project development and implementation or provide specialized skills such as network management and proprietary database knowledge. These sources are used where cost-effective and when the designated tasks fit an organizational strategy for in-house versus outsourced skills and responsibilities. The requirements for this category are the most diverse, and vary not only from country to country, but also from organization to organization. Past performance and the experience of other similar organizations can be the most effective aid in deciding the level, source and scope of outsourcing IT project development and support.

343. Government agencies can also accomplish their missions by outsourcing large pieces of their operations, instead of just outsourcing bits and pieces. In doing so, they must, however, take care not to jeopardize their core functions or the confidentiality of the information that is being handled. Under the proper conditions, vendors can be given the incentive to accomplish the required end results by innovative methods. Recent examples include the collection of delinquent taxes by commercial vendors (see also chapter IX, section A).

344. Outsourcing can often allow the risks to be shared with a vendor, along with the rewards. Often a vendor can share in the benefits of implementing a project, either through rights to data and/or products developed, or by receiving revenues from services provided, such as dissemination. This arrangement can give a significant incentive to vendors to be successful and receive a return on their investment in the project.

345. A vendor can offer a unique product, such as market-leading software that is effective enough to overtake the competition. Careful market analysis is needed to be sure the acquisition of the product is justified and does not present excessive risks in its application. For more specialized systems, such as Geographic Information Systems, such analysis is often a requirement owing to the dominance of a single or a few vendors. Generally speaking, care should be taken not to invent something that is much more cost-effectively available in the market, recognizing that the commercial products may be unique and/or proprietary. Attempts at government specification of formats and standards that these products must meet have often met with failure. Care must be taken not to create a sub-optimal solution to a problem best left to the creativity and competition of the private sector.

346. Finally, one of the most vexing problems in outsourcing is maintaining a healthy, productive and ethical business relationship with a commercial supplier. Too often, government contracts provide significant penalties and "protections" that the Government may impose, but fail to recognize how to provide significant incentives for the vendor. A good practice is to decide in advance on the definition of success for the vendor and then include that consideration in the design of the contract. Managing the business relationship in an adversarial way almost always leads to project failure at some point in larger IT projects. Conversely, most reputable vendors are in business for the long run, and understand that the overall success of a project is the most important objective.

347. Whether or not outsourcing is used, the likelihood of success of an IT project is greatly increased if it follows sound management practices. However, finding or recruiting managers in the statistical agency with the skill and experience to manage an outsourced function effectively can be almost as difficult as finding the specialized technical skills to carry out the work internally. The next section examines the extent to which sound management practices have been identified.

D. Sound IT project management practices

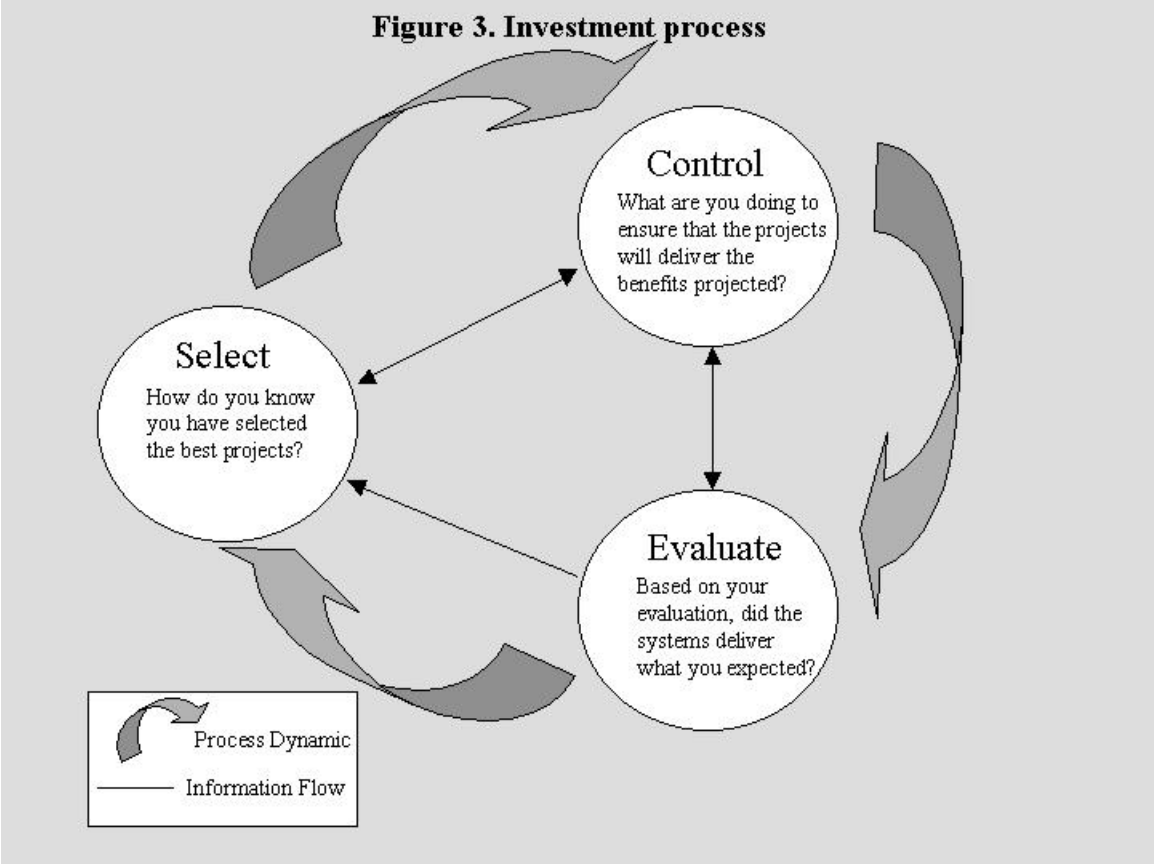
348. Owing to the importance of information technology as well as the poor results of too many IT projects, a great deal of effort has been applied lately to the identification of good project management practices.[74] These can be summarized as follows:

- Attention from top-level management;
- Effective risk analysis in guiding direction;
- Avoidance of untried leading-edge technologies and a preference for small projects;
- End-user involvement in project formulation and management.

349. The preparation of a detailed IT project plan is now common practice for invoking the necessary discipline to ensure that these practices are followed. The project plan is designed to analyse return on investment, identify risks and mitigation strategies, ensure modular development to avoid large-scale failures, and provide for oversight and review at crucial steps along the way. No sizeable IT project should be undertaken without utilizing this management process. In the United States, for example, the process is specified in detail in Public Laws 103-62, 104-13 and 104-106, which govern IT budgeting and procurement. In addition, Office of Management and Budget Memorandum M-97-02 describes three major phases of the investment and control process for IT projects:

- Selecting (screening, evaluating risks and return, and assessing how the project will help accomplish agency mission);
- Controlling (monitoring against costs, schedule and performance);
- Evaluating (post-implementation reviews, adjustments and lessons).

[74] "United States", in *Management of Large Public Information Technology Projects: Case Studies* (Paris, Organisation for Economic Co-operation and Development, PUMA/SBO/RD [2001] 1).



Source: "United States", in *Management of Large Public Information Technology Projects: Case Studies* (Paris, OECD, PUMA/SBO/RD [2001] 1).

350. Management discipline of this nature has been largely responsible for improving the success of larger IT projects in the Government of the United States over the past five years. Nevertheless, while this approach has been found by others to be useful, the only "certainty" that the chief statistician can rely on is the changing IT environment, characterized by the following:

- Continual availability of new and different IT capabilities and products;
- Claims by marketing organizations of amazing results in applying their products;
- Lobbying by internal staff who have become advocates of a product or specific technology in which they have become skilled and knowledgeable;
- Continual pressure to reduce costs and improve delivery of products.

351. Keeping an eye on how well commercial products are faring in the marketplace is critical to avoid ending up in a "blind alley" with an orphaned product. The larger vendors generally provide more stability and support of products over the long term, while many of the smaller vendors, who rely on a narrow product line, tend to have more volatile business prospects. Even if you have a solid technology management process in

place in your organization, it is still a challenge to choose appropriate technologies to fulfil mission requirements. Generally, it is best to:

- Avoid new or "immature" technologies;
- Assess the results of others who have already applied the product;
- Decide if the product is compatible with the existing information technology architecture of the organization;
- Assess the risks, and evaluate the relationship between price and performance for the product.

352. New and emerging technologies are notoriously difficult to assess in terms of when, or if, they will mature and become mainstream products. In the 1980s, it appeared that imaging technology for document storage and retrieval was ready to emerge as a major market force and several large IT companies invested heavily. When the technology failed to perform as expected, they all lost, and that market still struggles below most of the market projections for the technology. In contrast, the worldwide computer access provided by the Internet and the associated explosion of the technology beyond any projections made before 1995 are potent testimony to the power of a technology whose time has come.

353. Learning from the experience of others with similar business issues is also a powerful tool. For example, visiting other countries that have adapted technology for similar functions and comparing their results can be very helpful. It is often difficult, however, to account for differences in applications and operating environments from organization to another. It is critical to ensure that the technology, when applied successfully in one organization, can be similarly applied in another. Carefully inspecting the adaptations necessary to operate in another environment can make the difference between success and failure during implementation.

354. Finally, before choosing to adopt a new technology, it is critical to assess the risks and determine, conservatively, the projected price in relation to performance. It is crucial to remember that the track record for such implementations is notoriously poor; managers must be convinced that the IT project plan is complete and solidly demonstrates a successful implementation strategy.

Conclusions

The effective management of information technology in a statistical office is a careful balance of management discipline coupled with the innovative application of new and progressive technologies. Experience with the high rate of failure of these projects has shown that the following practices can significantly reduce the risk:

- Attention from top-level management;
- Effective risk analysis in guiding direction;
- Avoidance of untried leading-edge technologies and a preference for small projects;
- End-user involvement in project formulation and management.

In addition, a deliberate organizational strategy and management model for managing in-house versus outsourced technical skills can best guide the long-term strategy for accomplishing the statistical office mission.