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Competition and Control in Clinical Laboratories: An Information Technology Perspective

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The health care industry is growing more competitive as a result of demands for lower cost and increased quality of services. It would be naive to assume that clinical laboratory professionals in hospitals will be insulated from these pressures. In fact, they may be subjected to even more competitive pressure than other workers in the health care sector because of the portability of both laboratory specimens and information.

This portability, in conjunction with technologic advances such as improved analytic instruments and more sophisticated laboratory information systems (LIS), provides both the technical means and the financial incentives to shift hospital laboratory testing to commercial reference laboratories. The weakening of the centralized hospital laboratory model also encourages the migration of laboratory testing to remote hospital sites such as the patient bedside, the operating rooms, and the emergency department.1

One of the most appropriate and effective responses to these competitive pressures on the part of laboratory professionals in hospitals is to increase the quality and efficiency and decrease the cost of the primary outputs of the clinical laboratories—test results. This goal is accomplished, in large measure, by exercising greater control over the quality and efficiency of laboratory inputs and intralaboratory processing. Laboratory inputs are classified as either processes or products.2 Intralaboratory processing consists of analysis and then the generation of test results. We define the quality and efficiency of the clinical laboratory outputs quite broadly in order to encompass the value-adding dimensions provided by the LIS. These dimensions include such information management features as formatting, access, currency, comprehensiveness, flexibility, simplicity, and response time to access the information.3 We define information management, a postanalytic activity, as information storage, retrieval, analysis, and communication.

CONTROLLING THE INPUTS AND OUTPUTS OF THE LABORATORIES

Control over the inputs and outputs of the clinical laboratories is called backward and forward vertical integration, respectively.2 An example of backward vertical integration is the incorporation of phlebotomy team personnel into the management structure of the hospital clinical laboratories to ensure that patient specimens, one of the most critical of all laboratory inputs, are collected properly and in a timely fashion.

Forward vertical quasi-integration is achieved, in part, by controlling the LIS, the primary means for communicating test results to laboratory clients such as clinicians. We use the term quasi here to indicate that the laboratories exercise only partial control over the professional practice of hospital clinicians through LIS "ownership." Complete control by the laboratories over hospital clinicians could be potentially achieved if the clinicians were laboratory employees, hardly a likely prospect.

Partial control by the hospital clinical laboratories over clinicians is exercised in two ways. The first is the monopoly awarded to the laboratories to perform tests in the facility. The second element of control consists of the natural tendency on the part of hospital clinicians and ad-
TABLE 1.
UNDESIRABLE CONSEQUENCES FOR THE CLINICAL LABORATORIES IF LIS SOFTWARE IS DEPLOYED ON THE HOSPITAL MAINFRAME COMPUTER

- Loss of control of the most important strategic asset of the laboratones, the database
- Interposition of the mainframe group as an interface between the laboratones and hospital clinicians, the most important laboratory client group
- Loss of those resources normally allocated to the laboratories for the support of automated information processing
- Blocked information management career path for laboratory professionals
- Establishment of limits on the opportunities within the laboratones to provide quality enhancement and cost reductions, many of which will result from the deployment of information technologies

ministrators to attempt to avoid the organizational disruptions and other switching costs that would be experienced if the methods for generating and distributing test results in a hospital were suddenly altered. Switching costs for clinicians are increased each time new and appealing value-added LIS features are offered by the laboratones, particularly those that the competitors of the laboratones cannot match.

LOSS OF FORWARD VERTICAL INTEGRATION TO THE MAINFRAME GROUP

A major loss of forward vertical integration is experienced by the clinical laboratones if their automated information processing responsibilities are ceded to the hospital mainframe computer group. A common scenario for such a change involves the deployment of a LIS software module on the mainframe computer, as opposed to running the LIS software on a standalone computer in pathology. Such a step has a number of undesirable consequences for the laboratones (Table 1).

All other things being equal, the mainframe computer group would appear to be a formidable competitor for the laboratones with regard to control of automated information processing. The natural advantages enjoyed by the mainframe group vis-a-vis information management personnel located in the clinical laboratones are itemized in Table 2. For the most part, however, the clinical laboratones have had little difficulty competing with hospital mainframe computing personnel for control of information processing in the laboratones.

The evidence supporting our contention that the clinical laboratones can compete successfully with the hospital mainframe unit lies in the number of systems installed by vendors of turnkey standalone LISs compared with the number of laboratory modules installed by vendors of hospital information systems (HIS). For this information, we turn to a 1990 survey by Wisten and Marlowe. Approximately 2,057 systems have been installed by a dozen LIS vendors with more than 50 client sites (microcomputer- plus mini- computer-based systems), whereas about 394 laboratory modules have been installed by the three major HIS vendors included in the survey (HBO & Co., MED-ITECH, SMS). This yields a ratio of greater than five to one in favor of the standalone systems. In fact, the true ratio may even be higher than this because smaller standalone LISs were not tallied in this calculation, and some of the HIS installations are actually standalone LISs.

Two major reasons explain the success of the standalone LISs. First of all, standalone systems usually offer greater functionality than LIS modules running on mainframe computers. The opinions of laboratory personnel tend to be weighed heavily when LIS software is purchased by a hospital, and they will most frequently choose a standalone LIS on this basis.

Second, even if a mainframe module were to offer capabilities equivalent to those of a standalone system, laboratory personnel are usually reluctant to delegate control of the LIS to an external party. If the mainframe personnel fail to operate the laboratory module effectively or allow it to fall out-of-date, the effectiveness and efficiency of the clinical laboratones will suffer greatly. In all likelihood, this reliance on standalone LISs will continue because of the increased acceptance by hospital chief executive officers of distributed departmental systems and the growing technical sophistication in integrating heterogeneous departmental information systems in hospitals.

INTRAMURAL COMPETITION AND CONTROL

Although we have emphasized extramural competition and control problems up to this point, these same issues can also arise within a pathology department with a standalone LIS. One such example is the intramural competition between personnel working in individual clinical laboratones and those assigned to the LIS unit. Such competition is stimulated, in part, by the gradual shift of political power from individual laboratories to LIS personnel as the LIS becomes established as an important horizontal and vertical integrator in the laboratones.

Fortunately, a solution is readily at hand to ameliorate the competition and control issues between personnel in the individual laboratones and those in the LIS unit. The solution entails empowering personnel working in the individual clinical laboratones with regard to computer activities by formally assigning LIS-oriented tasks to them. Friedman and Mitchell refer to such personnel as hidden because they do not officially appear on the personnel roster of the LIS unit, but they still make important contributions to the success of LIS projects. The advantages of having LIS-oriented personnel working in the various laboratones are listed in Table 3.

TABLE 2.
NATURAL ADVANTAGES HELD BY HOSPITAL MAINFRAME PERSONNEL OVER PERSONNEL IN THE CLINICAL LABORATORIES WITH REGARD TO AUTOMATED INFORMATION MANAGEMENT

- Direct reporting relationship to hospital administrators, who are cognizant of the strategic importance of the laboratory database and who would like to exercise greater control over it
- Recognition as the ranking computer professionals in the hospital, resulting in a tendency to be assigned major computer projects by default
- Control over powerful computers and administration of large budgets, resulting in sufficient resources for new program initiatives
TABLE 3.  
ADVANTAGES OF HAVING LIS-ORIENTED PERSONNEL EMBEDDED IN THE VARIOUS LABORATORIES

- Increases the effective manpower applied to LIS tasks, reflecting the work shift to such activities.
- Creates upward job mobility for personnel who find the work rewarding.
- Decreases friction between the laboratories and the LIS unit because of the liaison function of the bridging personnel.
- Enriches the strategic-planning expertise in the LIS unit because of the talent and leavening supplied by the bridging personnel.

Once a decision has been made to distribute some of the tasks and responsibilities of the LIS unit to personnel working in other laboratories, the next question is how to partition such work. Anthony² has developed a classic planning and control organizational framework consisting of strategic planning, management control, and operational control that provides insight into this question:

- Strategic planning refers to the process of scanning an organization’s external environments and then setting objectives consistent with the demands of environments, the characteristics of the organization, and the people within it. Resources needed to achieve the stated objectives are then identified.
- Management control refers to the process by which managers ensure that the necessary resources are obtained to implement the stated objectives.
- Operational control is the detailed process by which resources are used to carry out specific tasks effectively and efficiently.

Carrying out each of the three elements of the planning and control framework requires a different perspective. Personnel responsible for strategic planning must couple a detailed knowledge of what tasks can be carried out with an understanding of what demands are being communicated from a complex external environment. Personnel responsible for management and operational control must understand how the available resources can be used to carry out the mission. This latter process requires knowledge of the capabilities of the intralaboratory equipment and personnel.

The external environment of a hospital laboratory includes other hospital clinical departments, hospital administrators, third-party payers, external reference laboratories, and laboratories in other hospitals. Strategic planning, therefore, requires an understanding of the demands and threats posed by several distinct forces, and the establishment of achievable objectives that will both satisfy the demands and counter the threats. If the wrong objectives are established and the wrong resources acquired, the laboratories will suffer, regardless of the quality of the management and operational control.

We believe that a substantial portion of the operational and management control relating to LIS operations can be partitioned to personnel working in individual clinical laboratories. However, strategic planning relating to information systems and broad-scale information management should remain the purview of LIS personnel. LIS personnel are much better situated to understand the external environments in which the evolving information management strategies must fit. Provided with the feedback from the “hidden” laboratory personnel into the LIS unit, LIS personnel will be additionally knowledgeable to maintain a clear understanding of the internal characteristics of the individual laboratories and the personal characteristics of the individuals working in them.

CONCLUSION
Although the concepts of competition and control may seem somewhat foreign to many laboratory workers, they are very relevant to events in the health care industry today. In fact, the prospective reimbursement system was introduced specifically to promote competition. Because the primary product of the clinical laboratories is information, decisions pertaining to automated information processing are intimately linked to control issues. We favor the notion of total control of the LIS within pathology. However, even this scenario can elicit intramural competitive pressures. Such pressures can be substantially reduced by empowering the stakeholders working in the various laboratories with regard to LIS-oriented tasks and responsibilities.

REFERENCES
1. Friedman BA, Mitchell W. Using the laboratory information system to achieve strategic advantage over the competitors of hospital-based clinical laboratories. Clin Lab Med in press.