A NEW COMPUTING LABORATORY TO EVALUATE AND TEST HARDWARE, SOFTWARE AND SYSTEMS

INTELLECTUAL PROPERTY BASED ORGANIZATIONAL SETTING NO. 1

Donald F. Costello
Wolf-Dieter Grossmann

July 1981
WP-81-92

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS
2361 Laxenburg, Austria

ABSTRACT

The proliferation of minicomputers and the seductive nature of belief in hardware solutions to a complex problem, has led the authors to suggest the creating of a new computing laboratory (NCL). The laboratory would permit clients to seek help in the system design aspects of their problem and to test the proposed hardware/software/systems solution on a NCL workbench. The importance of a entrepreneurial management style for the enterprise is stressed.

A NEW COMPUTING LABORATORY TO EVALUATE AND TEST HARDWARE, SOFTWARE AND SYSTEMS

INTELLECTUAL PROPERTY BASED ORGANIZATIONAL SETTING NO. 1

Donald F. Costello and Wolf-Dieter Grossmann

How often have you heard the a certain company, government agency, or university researcher making the mistake of ordering a computer without really understanding how to use it or exactly where it will be used in the enterprise? It is obvious that computing manufacturers and their aggressive sales force are paid to sell hardware. They are not equipped to do an objective evaluation of what is really needed by the purchasing client. On the other hand the buyers are often so aggressive in their desire for hardware that salesman have no other choice but to sell. Often, perhaps more often than we would care to admit, hardware is bought but due to many difficulties not used adequately. Computer consultants are often well suited for traditional system design but are generally not situated to offer their client an important and an essential service, namely, a reasonable hands-on hardware/software/systems test opportunity. Visits to vender shop or to a computer manufacturers'

home offices are valuable but rarely leave enough time for thorough testing. What is perhaps more important, is that most information systems development in today's world is incremental. Hardware and software explode and magnify the original problems and the need to reconfigure the problem, the hardware and the software is the rule not the exception. This article suggests that organizations, communities, trade organizations and states should consider establishing a new computing laboratory designed to evaluate and test hardware, software, and systems combinations for the clientele they serve.

What would this new computing test laboratory look like? Like some of the electronic laboratories of the recent past it would be composed of workbenches--but now micro-electronic computing workbenches (MCW) designed for not just testing small electronic parts but for evaluating and testing hardware black boxes, software and operating systems in combination. Like other shared facilities each workbench would have to be scheduled for use in advance. This would also be necessary so that the workbench would be appropriately configured. Some of the workbenches could be supplied by computing manufacturers and would permit easy connecting and disconnecting of that manufacturers peripheral devices. It would often be necessary to permit the workbench to be connected to some source of larger computing power. Most MCWs would permit mixing manufacturers' equipments. Thus an environment would be provided to test manufacturer A's computer with manufacturer B's disk drive. Some would be basic workbenches. These would build the computer and peripheral devices out of elementary parts in a pilot plant fashion. The number and types of hardware configurations for workbenches would only

be limited by the inventory and the associated interface equipment. So far we have concentrated on the hardware aspects of these workbenches.

All workbenches in the new computing laboratory would be designed to test *systems* feasibility. In other words, workbenches would also involve many levels of software, interdisciplinary teams of workers, and other technology necessary to test a complete system design concept. In addition to being equipped with the hardware/software/systems components, a careful management scheme must be established to ensure that the laboratory environment is friendly, encouraging and critical. A reasonable systems evaluation and tests procedures are not in the general ken of the clients who will use the MCW. They often need to learn these concepts while they are testing their proposed systems.

Let us go through one example of a working systems test. The client usually should have systems analysts' assistance to define his problem. This step is key and can be very involved. At this point, we will assume it is done and reasonably well done. In collaboration with consultants, a hardware environment can be chosen to address the defined problem. This, perhaps, is the most simple of all his problems, but usually the only one solved by the sales force of the manufacturers. Now the software problem can be discussed. Is canned software available to support the client in his chosen environment? How far will it go in helping solve the client's original problem? If no canned software is available, how difficult will it be to program the system in question? Can the client do the programming himself? In the light of the added software frame of reference, the user may now desire a change in the hardware and repeat this subphrase of the design process before finally being assigned to a

workbench.

In a college or university environment the client of the new computing laboratory might be a faculty member interested in testing a new approach to augment their instructional work in class or it may be a researcher interested in exploring and interacting with a large commercial data base in a minicomputer environment. In a government environment the client might be an administrator asking to have his office system simulated so that he might compare ten various manufacturers' approaches. A small businessman may need help in seeing if a specific minicomputer can really solve his perceived problem.

As we said earlier, the laboratory staff would, of course, have to develop the skills necessary to elicit a proper system description from the project sponsor so that the proper problem is being addressed. It may, of course, turn out that no hardware is needed to solve the problem that is presented. Assuming that a problem is well defined, the laboratory staff may have to spend considerable time and money configuring the workbench. They may have to order software, develop a test data base, design simulation routines, etc. The aim, of course, is to provide an experimental environment that would permit the client to see and touch and feel the system being proposed to solve the original problem. As the laboratory evolved, the cost of configuration should gradually decrease.

In the course of testing, iterations, modifications and new ideas will obviously surface and redefine the environment. This would require reconfiguring, rescheduling and possibly a restatement of the problem.

Let us assume that at some point in time a configuration results which leads the client to believe that the project has enough potential that it is time for a cost benefit analysis. (This is not to say that some back of the envelope calculations would not have been made earlier.)

Here is where creative management can play an important supporting role? Whose costs and what benefits does the client wish to include? University faculty members, government administrators, and the general user population can be incredibly naive in computing the total time and total costs to build or configure a working system. It is often said that "hardware is the least important part of the problem." In costing systems it is not unheard of to find a five thousand (pound, dollar, mark) unit computer (terminal, software package, database) requiring a forty thousand unit total investment. The benefit side of the problem can be even more complicated. The benefits need to be calculated as a function of the projected use of the system. Is it a work-of-art having a single use by a single user (for one class or one groups of students or one evaluation)? On the other end of the scale it is important to ask the question "Is there a mass production possibility for the system?". If a system is thoughtfully designed it is possible that the system will be used many times over, in many situations and thus have the total costs amortized over many projects. In other words, someone should ask the question, "Will the finished system have commercial possibilities?". The general client of the laboratory (and most computer people as well) are not prepared to make this calculation. In another article one of the authors postulates the existence of an Intellectual Property Manager who is trained to aid in these type of decisions (Costello 1981). In any event,

staff would be needed to help in these calculations.

What would it take to make a laboratory like this work?

In addition to a superb staff, the laboratory would of course need to have a comprehensive library of hardware and software manuals (all kept up-to-date), a large software library, a reasonably sized terminal, mini-computer, microprocessor inventory, easy and efficient connections to large computers (for those systems requiring such a connection), a superior maintenance staff, spare parts, and so on.

The managerial style of running such a laboratory might be described as benevolent/entrepreneurial. This is a new business concept. Not only are the technologies involved varied and conflicting but the accounting techniques, marketing techniques and planning techniques needed to insure success are very diverse and experimental. The laboratory should clearly not be tied to any one manufacturer. The staff should be astute enough to recognize opportunity and wise enough to estimate true total costs. In addition, a critical "make it fail" attitude is necessary so that premature commitments to heavy investments are not made.

The laboratory should be designed to produce a profit. Much of the profit should in some way be returned to the staff. New equipment, costly staff training and advanced facility have to be carefully balanced against personal reward for exceptional ideas and performance. The ability to access technological risk, judiciously participate in certain situations and to share in the profit and loss requires a management technique and staff attitude that is usually more common among fledgling manufacturing plants than in computing laboratories. Developing understanding and

skill in managing intellectual property and the individual and organizational rights in these properties is a key factor in the success for management of such a laboratory. (Costello 1981)

One result of the establishment of such a laboratory would be an improvement in the social and economic environment available to potential computer clients who realize the illusive nature of the ingredients necessary to develop successful hardware/software systems. A secondary result of such an environment would be a better understanding of a proactive management style. All in all it is our claim that this new computing laboratory would increase the probability and lower the cost for successfully implementing computer systems designed to solve real problems.

REFERENCE

Costello, D.F. 1981. Effect of the Technology on Management of Intellectual Property in United States Colleges and Universities. WP-81-xx. Laxenburg, Austria: International Institute for Applied Systems Analysis. (forthcoming)