INFORMATION MANAGEMENT:
A KEY TO BUSINESS SURVIVAL IN THE 1990S

Stewart Holmes, President
Stewart Holmes & Associates
Corvallis, OR

Today, and at least through the 1990s, everyone connected with the forest products industries will have to think and act **proactively** to help their companies survive in a rapidly changing environment that already includes:

Diminishing timber supplies,
International markets of fast growing importance,
Rising costs and diminishing supplies of energy,
Rising demand for specialty and secondary wood products,
Stricter environmental regulations,
(fill in your own list here).

The need for quality information, not just quantities of information, to deal with these issues has become acute. And the need has spread down to managers and operators at all levels of companies. Managers and operators of lumber drying facilities are going to play increasingly important roles in the survival of lumber and secondary wood products mills in the 1990s and beyond.

In doing that, your view of your company's operations, and the operations you're responsible for, will be shaped in large part by the quality of information you have available to you. If you're going to perform well in the 1990's, which you will have to if your company is going to survive, you're going to have to have unlimited access to the right information, in the right place, at the right time. You can no longer afford to operate only on the basis of the information that typically flows down from the accounting, inventory management, and shipping departments.

Each of you has and will continue to have unique information needs. And your individual needs and abilities to manage that information will be unique.

What you and your companies can do to deal with these new and unique information management problems is the topic of this article. I'll describe the issues related to the management and use of information, the difficulties most people and companies have dealing with information and its management, and what we can do to start making more sense and more profit from the information we use daily. Companies that don't deal quickly and successfully with these issues, by making the necessary changes in the ways they produce and deal with information about their raw material supplies, their customers, their operations, their regulatory environments, are going to have a rough go of it in the next decade.

The good news is that the rewards are already accruing to those willing to make the improvements. Users of new and improved systems typically report impressive increases in quality and productivity. IMSs are providing managers with the information they need to produce and sell higher grades of lumber; perhaps the only grades that may return a reasonable profit to the mill. And those companies are selling to new markets nationally and internationally. If you've been waiting for others to work the bugs out of the new systems, wait no longer.

The Need for Information

To be competitive throughout the 1990's, today's managers and operators must develop and start using information management systems (IMSs) that will provide them with continuously up-to-date information about all the operations they're responsible for as well as other operations throughout their plants.

For example, kiln managers and operators will need to know what types of logs produced the lumber in the air yards and the conditions under which the logs were stored. They will need to know how and where the lumber was stored and its current moisture content. They will need to know the moisture content of the lumber at all times during drying and when the lumber will reach a certain desired final moisture content.

Kiln operators will need immediate feedback, feedback that will flow directly into the kiln controller, from the in-line moisture content meter, the planer operator, and the graders, about the condition of the lumber coming out of each zone and area in the kilns. They will use that information to alter their practices, constantly improving the way they produce the highest quality dried products.

Lumber drying supervisors will need to know the location and condition of all of the lumber throughout the plant in order to schedule the processing of that lumber. Sales managers will need to know the same information in order to be able to sell, and arrange for the shipping of, the lumber in advance of its completion. And the list goes on.

Every lumber producer must develop and use IMSs. No business will be able to compete without them in the coming decade.

In these systems, data are processed and converted into useful information. "Data" are the (numerical) facts and figures, often processed by computer, generated by the hundreds of operations and operators around a mill. "Information" is the usable knowledge we can get about those operations from our analysis of the "data" using common sense and more formal means. We then use that information for operating, planning, and controlling the (production) processes.

The amount of data processed and information produced increases enormously each year. Changes from pneumatic to electronic equipment normally are accompanied by greatly increased levels of information generating capabilities due to the more ready availability of computer-usable data from electronic instruments. Such changes will only increase in the coming decade.

Your customers are changing every day. They are demanding higher quality solid-wood products and are willing to pay a premium price for them. International markets typically demand the highest quality products available. Changes in the natural, energy, tax, political, and safety environments, to name a few, have placed increased demands on us for more and better information. All these factors add to the already complex demands on the average manager for planning and control making their decision making activities more important to the productivity and profitability of their companies.

The value of information is based ultimately on its usefulness. Useful information allows us to gain insights into what's happening and provides us with options to follow based on those insights. As such, useful information must, in the least, be

**timely,
integrated with other relevant information,
consistent,
accurate, and
relevant to the operation at hand.**

If the information lacks these features its use could cause conflicts among users, incorrect decisions, misallocation of resources, and missed opportunities. Late and inaccurate information about the dispatch of chip trucks would be of little use to a kiln operator. On the other hand, immediate feedback of moisture content and grade information is of great use to a skilled kiln operator.

Information Management Systems

I'll define an information management system (IMS) as an *organized method* of providing *past, present, and projected* (future) information related to a company's *internal operations* and *external affairs*. Such a system supports the *planning, control* and *operation* functions of a company by providing information that is *timely, integrated* with other relevant information, *consistent, accurate,* and *relevant* to the functions under review. (There are 15 key (italicized) terms in that definition. You might want to reread it a few times to make sure you get all the points.)

IMSs shouldn't be confused with the data processing systems used mostly for preparing standard reports useful for specific applications, for example, control of operations. A data processing person might prepare standard daily/weekly/ monthly reports of movements of lumber through the mill, air yards, dry kilns, planers, and shipping department based on a variety of reports and counting systems used by managers and operators throughout the mill.

Another type of information generating system is called a "decision support system". These are normally individual-user structured and initiated. For example, a kiln operator might use a microcomputer (PC) and spreadsheet program (Excel, 1-2-3, Quattro) (the DSS) to "run some numbers" about lumber moisture contents at the planer, and from the grade tickets, to check up on the results of a recent drying run.

An important distinction and shortcoming of these systems is that they provide a limited view of the overall operations structured in a way that doesn't facilitate comparing information from all over the mill. These systems might be usefully locally but they don't provide a true competitive advantage for a company and they certainly won't allow the company to compete successfully in the rapidly changing environments of the future.

Developing and Implementing
an Information Management System

Now that you're convinced that you and your company need an IMS, let's look at what it takes to set one up, to use it, and to maintain it.

Operational and strategic decision making

Before your company can successfully develop an IMS, management must decide :

what it wants to do,
what it wants to make,
what it wants to be known for,
who its customers are and will be,
how it will market its products and services,
and so forth.

I call such matters the **operational and strategic goals and objectives and critical success factors**.

Your company's goals and objectives should be so clearly spelled out and so well known throughout the company that everyone in the company should be able to repeat them almost word for word to each other, customers, the public, and outside agencies.   This may be a difficult first step but it's a **critical** first step. Imagine what a football game would be like if the quarterback and all the players were sent out onto the field by upper management without being told what the game plan was and what the signals meant that would be called in from the sidelines?!   Without up-front agreement on these critical   matters it will be difficult (or impossible) and expensive to develop and maintain an effective IMS.

Your strategic mission and goals statement might start with something like the following.

> "Our mission at Stewart Technologies Inc. |*an organization that complements Stewart Holmes & Associates Inc.*| is to advance our customers' operational effectiveness and profitability through automation of their production processes and management control systems. We bring to the wood products industry a unique combination of knowledge, proprietary hardware and software, and information management services.

> "At Stewart Technologies we are driven to help our customers better cope with present or expected critical shortages of timber and energy. Our desire is to help our customers develop effect product and marketing strategies for the emerging U.S., European Community, and the Pacific Rim markets for primary and secondary wood products.

> "We are committed to establishing long-term relationships with our customers and to helping them meet and exceed their goals for developing solutions unique to their production and management systems."

Once there's agreement, managers must sit down with operators and decide on the form and content of data to be provided to and informational reports to be obtained from the IMS. Typically, once the goals and objectives are agreed to the types of data required will be determined automatically. The IMS must be designed with these inputs and outputs in mind if it is to be able to provide **usable, useful, complete, accurate, timely, and relevant information and reports**. The types of information and reports may vary significantly in timing, form, and content depending on whether they're used for operational control, monitoring performance, or short- and long-range planning and forecasting.

IMS life cycles

Just like most other things, IMSs need constant upkeep and will "wear out" at some time. Most IMSs have life cycles consisting of the introduction, growth, maturity, and decline phases. The introduction is critical to the acceptance of the

system by all users, though not necessarily to the success of the IMS. During growth it's important that issues related to expansion of the system to all users, technical problems, and the reluctance of all users to use it be dealt with. No one should be left out. Everyone in the company is a contributor to the success of the company and should be an important part of the IMS. This is particularly true of users in such critical functions as lumber drying where the profitability of a company can be made or broken based on the quality and quantity output of the kilns.

During maturity the quality and types of information made available should be constantly improved to achieve greater flexibility and to keep users enthused about using and contributing to the systems improvement. The best way to get kiln operators involved in contributing to and using an IMS is for management to better recognize the essential nature of their work to the profitability of the company and to make changes in the system that express that realization. The sooner that happens the better it will be for most companies.

Finally, during the decline, the existing IMS should be phased out and replaced by a new system and the process started over. This is no different from the life cycle of a piece of machinery like a dry kiln or lumber stacker, though many companies hold on to such equipment far beyond their reasonable useful life.

IMSs evolve as companies evolve

As companies grow, as they change their goals and strategies, as management styles evolve, as organizations reorganize, the types of information systems required also change. As companies grow, information systems typically become more formal. Managers are less likely to take the time to walk around and talk with operators. The result is that managers have to rely more on regular reports. Kiln operators have told me that the general manager of the mill has not been out to take a look at the dry kilns and boiler in years. It's not unheard of for a mill manager to have only a general understanding of the way dry kilns work, what condition they're in, what they can do for the company's profitability and productivity, etc.

Information management systems also tend to grow around functional lines. Lumber production becomes separated from green inventory management becomes separated from kiln drying becomes separated from..... In each case, area (functional) managers tend to impose their own requirements on the information systems that they may have even designed to help them manage. Such requirements may include data in a particular format, and using a particular lumber scale, volume or board footage measurement system. In a few limited situations such systems may be useful but generally they are not because they aren't useful by others in the mill. Top management continually must be on guard to prevent any such breakdowns in the system.

The Database

Every IMS requires a database. The database is the central location where the data are stored. The type of database is not nearly so important as the fact that it exists and that the data are readily availability to all potential users. Data are a critical resource that need to be treated like any other resource like kilns, logs and forklifts. Everyone in the company should know that the data exists, where it is, and in what forms it can be had. And everyone should have unlimited access to all but the most sensitive data. Regarding what is sensitive data, my thinking is that if you're properly located in the market, produce quality products, and have

satisfied customers, you shouldn't have to worry about other companies getting hold of some of your cost and production data. It just won't do them any good nor your company any harm. If I were a kiln operator, I certainly wouldn't worry about another kiln operator using my schedules and I wouldn't use anyone else's. Our kilns and lumber are just too different to want to take a chance with making a mistake.

The purpose of the database is to allow the generation of useful and usable information for many different types of users. Successful IMSs, therefore, must have a flexibility built into their databases that allows users to learn from and grow with the system and must allow the system to grow from user inputs. An inflexible system, like inflexible managers and operators, will eventually stop operating smoothly and effectively and could cause great strategic harm to a company. Out of date and inflexible databases can create the same sorts of inefficiencies as can out of date kilns, equipment, controllers and operators. But don't let the fact that you're forced to operate with 50 year old kilns and equipment prevent you from developing and operating with the most up-to-date IMS and database.

Most people use both "common sense" and analytical means to analyze and deal with problems. Effective IMSs must provide enough flexibility to allow varied inputs from varied users and provide a wide range of model types for the different users. Not everyone thinks the same, nor uses information in the same way, so you need to build in the flexibility for a wide range of users. Successful systems allow users to redefine, restructure, generate, and incorporate new information in the system. Don't fall into the trap of thinking that just because you hired some smart IMS developers to help you put together an excellent database, that you're going it right from the start, and that your needs will never change. It'll never happen. Everything else changes, why shouldn't a database?

Identification of users needs also will provide the framework for development of the database. Knowing what data will be required to produce the desired information provides a basis for identifying alternative ways and costs of building the system up. As managers and operators will be the primary users of the information, it's essential that they be totally involved with development of the database. It seems pretty obvious that if management is going to expect quality information and products from the lumber drying operations, that they're going to have to involve the kiln operators in the development, implementation and use of the database and IMS.

The framework of the IMS will automatically determine where the data will come from and whether the data will be performance (past), operational (present), or budgetary and cash flow (future) oriented. How much and often data are developed and entered into the system will depend only on the urgency of need, which will change all the time.

Using Information Management Systems

The success of any information system depends not so much on the quality and quantity of information produced as it does on the **usability, usefulness, timeliness, and availability** of the information to operators and managers.

Users typically interact with IMSs in one or more of four ways. **First,** users may receive information regularly, as in the case of reports of lumber produced, stacked, in inventory, kiln dried, surfaced, graded and shipped. For example, kiln operators might receive reports regarding the purchase of logs and shipping of green lumber. But, since such reports typically are inflexible and unchanging, some users may overlook them at times due to their regularity and lack of direct

operational usefulness. How many kiln operators study those reports intently and provide feedback to management about them?

Second, users may interact directly with the database through a terminal. Kiln managers and operators would have access, via computer terminals in their offices and control room, to information about the location, moisture content and grade status of all green and dry lumber inventories. This requires that these people be trained to use the computer and database and understand how to work with the data to develop usable and accurate information. Such access provides the potential for greatest flexibility and usefulness of the data and information produced. It also provides the opportunity for greatest errors in judgement and action if put in the hands of inadequately skilled persons. That's an issue easily resolved by a variety of means including the use of consultants, community colleges, and universities for training,

Third, users may request that someone else prepare a report for them that contains the desired information. A kiln operator might ask an assistant to prepare a report on the status of all the lumber from a single kiln that was sent through the moisture content meter and planer. An operator may work with an outside firm on the preparation of such reports, at least until the operator develops the ability to do the work him- or herself.

Fourth, users may be provided only with summary information from the database prepared routinely by another person. A manager might receive monthly reports from the kiln operator summarizing the output of each kiln during that month and predicting the amount of lumber that will be dried during the upcoming month based on lumber in air drying inventory.

Human information processing limitations

When deciding on inputs and outputs we need to be aware of our limitations in processing information. We humans, as information processors, are interacting with our environments, that is, the people, lumber, and machinery around us, on every level continuously. How we deal with and react to data and information is as important as any other aspect of an information system. A few important considerations are the following.

We have to be "tuned into" the situation and must perceive the information as useful. We can't be thinking about something else when we get information and we must understand how the information is necessary and important to our work and our company's survival. Managers, especially, need to be sure that everyone develops and maintains this sensitivity and "tuned in" attitude. They can do that by walking around and talking with everyone daily. But we as individuals must ultimately be responsible for maintaining that attitude

We have only a small capacity for taking in information, especially numbers and other facts. As a result, many of us tend to work with only small amounts of data, which can lead to false conclusions being arrived at due to small sample sizes. We need to strike a balance between working with enough data to prevent that happening, while also working with small enough amounts of data, and data in graphical form when possible, to assure that we'll make sound decisions.

Managers should consider hiring consultants at the outset to work with them and operators to develop methods for presenting the data and for helping transform the data into useful information. Overworked nightshift boiler/kiln operators-forklift drivers may be sensitive to this given the stresses they normally face. Managers and the operator's daytime colleagues need to be sensitive to this and be sure to stress the importance of the person's work and the value of the lumber

he/she's working with.

People can handle more information when its presented in a familiar format. On computer screens important information can be highlighted by different colors, blinking lights or cursors, and oversized characters to make it more readily noticeable by users. One reason I've heard operators say they prefer using circle-chart recorders is that they find the circle charts easier to understand. While that's not surprising given that most of them haven't had the chance to work with anything else, most operators find that once they've used a computer-based controller they never would want to go back to using only a circle-chart recorder. The circle chart is simply too limited in its usefulness.

Computers can provide displays of text and tables of information in addition to graphical displays of information. These displays can greatly improve our ability to grasp the nature of the process and what's happened and happening. Operators, managers, and maintenance persons now, from a display perhaps in another building or at another site, can view the status of the dry kilns operations, the final control actuators, and other aspects of the system as if they were right there beside the equipment. This provides enormous benefits in terms of control and planning.

Finally, the timing of reports may affect the processing and use of information. Some people may pay less attention to periodic reports especially if those reports typically are filled with no new information. It may be necessary to generate reports less frequently and to have them contain more new and important information.

Human resources management

Perhaps the most important key to success for most IMSs is to make every manager and operator an expert in their part of the IMS. By making them all important parts of the system they will develop an interest in making the system work.

However, there are two significant and unfortunate shortcomings of too many systems. First, too few operators and managers are encouraged or allowed to make improvements in current operations based on their use of the system. This may be the fault of management and shows a lack of respect for these persons' intelligence and experience and perhaps a false or undue concern only for the profitability of the company.

Second, many operators and managers are unable to take in and act on the data and information. Many of these people are not able to do that because they don't understand the process or the way to make changes in it. While there may be good reasons why many people don't start out with the necessary understanding, there are few reasons they can't gain that understanding given the availability of learning opportunities -- on-the-job training by colleagues, in-plant workshops by consultants, community college courses, industry and related magazines, newsletters, audio and video cassette tapes, books, etc.

Another significant issue is the reaction of many operators and middle managers to information systems. I'll discuss that at the end in "The Future of IMS".

Working together to make it work

Essential to the success of any information management system is that everyone work together to make it work. I can't stress enough the importance of everyone -- top management, supervisors, operators -- being involved in the development, implementation, and improvement of the system. One of the big

hurdles many kiln operators will need to jump over is the one of getting mill managers to understand the importance of the lumber drying operations on the mill's profitability and productivity. If managers can come to that appreciation they're much more likely to put the attention and money into the operations that they merit.

Many top managers have not been involved in the development of IMSs perhaps because they've failed to notice the difference between electronic data processing functions first ascribed to "IMSs" and the planning and control functions that form the significant focus of IMSs. That seems to be changing, however, as these managers come to realize the operational and strategic value of information. Information systems are becoming viewed more as a strategic resource like the accounting, marketing, and finance functions.

When planning and developing IMSs, you must take into account the efficient use of all of your company's resources. You need to coordinate current and future developments both in operations and management functions. You must better integrate all of the functional areas in the company. And you need to consider all the criteria that will be used to evaluate the IMS once it's installed and running.

In addition to strategic planning, mechanisms for control must be incorporated in the IMS. The relationships between people, equipment, computer programs, etc., must be defined in terms of performance criteria against which they will be evaluated.

Decision making in most companies is a complex process involving interactions among many people in constantly changing environments. No one can know everything about the people and processes with whom and with which they work. We all have different experiences with these aspects of our companies. The longer we stay with a company the more, and more useful, experiences we have. We need to keep these facts in mind when dealing with others and help others deal effectively and efficiently with the situations they are responsible for. We need to help each other grow with our responsibilities because ultimately we all are part of the same business. If we just keep in mind that the better qualified everyone in the company is to do their jobs the better off the entire company will be, we all will be better off.

Cost/benefits analyses

Typically one of the most important, but most difficult, operations is the development of cost/benefit analyses for the different operations around a mill. In "Working together to make it work" I wrote about the importance of mill managers, developing an appreciation of the lumber drying operations and the kiln operator's work. One very effective way for operators and managers to achieve this is to develop a cost/benefit analysis of the drying operations. Unfortunately that's a lot easier said than done.

The reason it's easier said than done is that there don't exist well-defined, specific costs and benefits attached to operators, equipment, computers and related control software, etc. all of which are required to produce a cost/benefit analyses. But don't despair. There are sources of information you can use to develop cost/benefit analyses and there are people who can help you do them.

In general, if a new or improved system produces benefits that contribute to profit or reduce costs more than the cost of that system, then that system should be considered for use. Most IMSs help reduce costs by providing better control. Most IMSs can increase profitability by allowing managers to deal with changing

customer and market needs and desires. Most IMSs increase a company's long-term viability by helping them understand and react to changing internal and external environments.

I won't deal with cost-benefit analyses here but it's safe to say that a good way for most kiln managers and operators to proceed and to keep top management supporting their efforts is to have an excellent plan and to act on it by taking many small steps fast. I'll describe that in more detail when I discuss the installation of IMSs in lumber drying operations in "Prototyping: Many Small Steps Fast".

Security

Security is an important issue that must be dealt with from the start. When designing an information system it's essential that the hardware and software required for data acquisition, storage, retrieval and report generation be protected from physical abuse and sabotage. Electronic components in every part of a mill from the plant floor to the office require special care to protect them from their physical environment and problems with the electrical system. Computers should be protected with uninterruptible power supplies and hard disks should be backed up frequently and backups stored in remote locations safe from fires and theft.

Some, but very little, data needs to be protected from unintended disclosure to competitors and customers. Computer-based systems are particularly vulnerable to breaches of security and companies need to do what's necessary to minimize the potential for such losses. Keep in mind, however, that your competitors are going to find out most of what they'd like to know about your company by asking your customers about you. If you keep alert to such tactics and keep your customers happy with your service and products you shouldn't have to worry much about the competition.

Most operational and management data should be put in plain view of everyone so that everyone can participate in their own way to making the company more productive and profitable. In general, the more people know about what's happening around them the more helpful they can be in improving the profitability and productivity of the company. Studies have shown, for example, that simply by putting information about production (and production goals and objectives) in full view of everyone, people become more productive.

Dry kiln operators, and other persons involved with the dry kilns like forklift drivers, can help improve the way lumber is moved through the entire mill by knowing as much as possible about what is in green inventory, how long the lumber has been there, what it's current moisture content is, where the lumber is, etc. They could collect the data necessary and post it on charts and graphs in their areas so that everyone could see what was happening. If managers would provide these operators with the tools and time necessary to develop and maintain this information the entire mill would be more productive and profitable.

Prototyping: Many Small Steps *Fast*

Many of you probably are familiar with the process in which a new system is conceived, developed and implemented in such a way that each major step is completed before the next one is implemented. In these situations the assumption is made at the outset that managers and operators know or can determine, before the process starts, exactly what the specifications for the system should be and what they'll be able to expect from that system.

In the past, when there weren't critical shortages of logs and electrical energy, when the lumber markets were more stable, when customers weren't so demanding, when the regulatory environment wasn't so strict, in general, when everything was more stable, this traditional approach often worked well. Today, however, when new competitors, new markets, new technologies, new equipment, new regulations, ... seem to crop up every week, companies that want to remain productive and profitable need faster and cheaper ways to respond to those changes. Investing large amounts of time and money in large and relatively permanent changes probably isn't the way to go.

An effective survival tool for the 1990s and beyond will be "prototyping". Prototyping involves looking at the (information management) systems development process as a fluid one where changes are made in small, incremental stages with the circular process

--> design--> implementation--> use--> feedback--> analysis
--> modification--> design--> implementation--> ...

happening continuously. Prototyping puts products and services in the hands of users quickly and allows them to modify and direct changes in the product on a continuous basis as needed. Prototyping allows managers and operators to move quickly in response to changes in internal and external factors that can affect the productivity and profitability of the company. Prototyping can be the difference between being able to compete effectively locally and internationally and not.

Taking a more familiar operation as a basis for studying the process of prototyping, let's look at a lumber drying operation. If I were responsible for increasing the throughput of the operations and was currently in charge of several 30-year-old kilns and a boiler that could barely keep up in the winter, I might consider one or more of the following options. In each case I would either do some calculations on my own of the likely cost/benefits of the change or I'd have the company accountants, an outside consultant, one or more vendor's reps, or other people help me. What you would consider would depend on the conditions of your equipment, species and dimensions you're drying, local weather (especially as it affected air drying), volume of production required, how deep your company's pockets are (mine aren't), etc.

Refurbish the structure and insulation in the roof (first), walls (second), and doors to save energy and provide for faster heatup and better control of drying conditions.

Add a heat exchanger for the same reasons.

Redo the heating and condensate handling system, including the creation of two or four zones and proportional-control valves,

Install a pin-type lumber moisture content meter to provide for closer control (using my existing manual system) towards the end of drying and to determine the end-point in the process.

Install a simple automatic control system on one kiln to get a feeling for how it would affect both lumber quality and kiln throughput.

Install a dual or variable-speed fan motor controller.

I might do each of those things one at a time on one kiln and measure the exact incremental effect each change had on the operations. That would require measuring heat and steam use during the drying of similar charges before and after each change was made. At the end of the conversion process on the first kiln,

which, since the cost would be nominal compared to the expected payback, I'd have a very good feel for what I should spend my money on with the other kilns.

As just demonstrated, prototyping consists of making many small changes FAST, taking careful measure of the effects of those changes, and then taking advantage of the findings to upgrade the rest of the kilns in the most cost-effective fashion. Parts or components from different vendors systems might be used instead of complete turn-key installations to determine how well that component and vendor satisfies the requirements. You might have to insist that vendors provide you with what you need not just what they want to sell.

An important consideration in all this is that operators and managers have to understand very well how process controllers really work, how lumber dries in response to different conditions, how to measure lumber moisture content, and how to design and develop new control systems. They have to understand all these factors in order to be able to analyze what's happening in response to the changes they're making. Managers and operators must become, in their own ways, true knowers, appreciators, analyzers, and designers of systems.

IMSs in Dry Lumber Manufacturing

There are many ways that the managers of a lumber mill could organize, develop and run an IMS. The most effective and efficient IMS would encompass all of the operations and would have data from all operations coming to a central database. Companies faced with smaller budgets might consider establishing an IMS for a single operation (remember prototyping). Managers of lumber drying operations might develop an information system that contained some of the following components.

Some of the "information" systems described next are available from one or more kiln and controller manufacturers. Others can be developed by managers and operators in house, with the help of equipment manufacturers, or by consultants. The intent here is not to talk about kiln controller functions but about those aspects of the operations that provide managers and operators with information they can use to make decisions about the operations that will affect their company's productivity and profitability.

Green lumber inventories

In planning the use of the dry kilns and related facilities, managers and operators benefit from knowing what types of logs were cut, how much lumber of different species and dimensions is on hand, when the lumber was stickered for green storage, where the lumber is in the air yards, what the average moisture content of the lumber is, etc. Any information that helps move green lumber through inventory and into the kilns in such a way as to provide for as much air drying as possible and for the grouping of similar drying types of lumber would be beneficial.

Managers can use this information for planning the purchase of raw materials, controlling overhead and inventory holding costs, and planning longer-term sales, especially of slow-drying woods.

Drying process management

Effective drying time.--If it's not possible to maintain the desired set point temperatures for part of the schedule, drying may slow significantly. When that happens it's impossible for an operator to determine how much longer the

lumber needs to dry to reach a particular moisture content. A controller that can keep track of the "effective drying time", the amount of time the set point conditions remain within operator-specified limits of the desired dry- and wet-bulb temperatures, can help operators assure adequate drying at each stage in the process. A controller can do this by keeping track of how much and for how long conditions were outside those temperature limits. Some percentage of the amount of time below those temperatures is added automatically to that segment of the drying schedule in order that the lumber be dried adequately under those conditions.

Condition of final control actuators.--The amount (percent) open and timing of the openings of valves can be correlated with the rate and timing of drying. If the vents stay closed, or if little or no steam is called for long periods of time, a controller might consider that an indication that the lumber had ceased to dry appreciably under those conditions. The controller then would either make the drying conditions more severe or would consider drying finished and take appropriate action.

Production management and sales

Inventory management.--A controller that can display and track the movements of lumber through the dry kilns makes it possible for operators to better manage the drying process and conditions. Knowing the species, dimensions and grade of the lumber is important for conditions control, especially if hierarchical control of the steam (heat) supply to the kilns is possible. Sales persons who can track lumber from the green chain through the planer can sell that lumber in advance of availability thus providing for a faster return on investment and smoother handling and shipment of the material.

Time to end of drying.--A controller that could predict (month/day/hour) when the lumber should be dry based on current "estimated" MC (and the way that species, dimension and grade of lumber is expected to lose MC) would be useful to sales persons and managers needing to move the lumber through other operations and into the market. Most controllers operate on a time-based schedule, which dictates the time-to-the-end-of-drying. As most species dry in relatively short periods of time, this feature would find use only in systems drying lumber that took many weeks or months to dry. The controller would have to be able to measure or calculate the current MC and calculate, based on historical data, how long it would take the lumber to dry.

Maintenance and repair.--Most controllers provide "screens" of information regarding the current state of sensors and final control actuators. Users -- operators, managers, repair and maintenance persons -- can see the status of these elements and may be able to change the status of final control actuators from the computer by inputting desired conditions. For example, fans can be started and stopped, and vents and valves opened and closed from the computer. This allows checking the operating condition of the actuator and fixing it in a desired position for any reason.

Alarms.--Operators and managers need and want to be alerted to changes in the systems they're responsible for, especially if some danger or hazard is involved. Information systems usually should provide such information immediately in the form of printed reports and alarms.

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Availability of other types of information
through custom programming

Some operators, managers and maintenance persons have the skills and time to take advantage of different functional abilities and information from the controllers and related equipment. If not, they should consider purchasing equipment from a manufacturer who can provide the desired custom programming. You want the equipment and IMS to be able to grow with the skills and needs of the users.

Is There an IMS in Your Future?

There are dozens of issues that will affect information management systems and whether and how they will be developed and implemented by companies. Most issues touch on the changes that will be required of people and companies in response to the changes in their environments brought on by the IMS. Some of those issues that must be addressed are as follows.

Organizations.--Who will be responsible for what, once "everyone" in the company becomes totally involved in the process? Who will report to whom? How well will companies be able to keep up with changes in their and related industries? How will managers and operators deal with each other as operators become more significant players in the system?

Personal development.--Where will companies get the more highly trained people they will need as managers and operators? How will people be retrained as required to handle the increased levels of responsibility and authority and what will happen to those who can't or won't change? Most people will have to retrain at least 5 or 6 times in their lives for totally different jobs: How will they cope? How will businesses keep up with the demands of the more highly skilled workers who will want and demand changes in their environments to keep them stimulated? Who will help the executives make the strategic decisions required by an ever faster moving market?

Accounting.--How will companies deal with the new short- and long-term financing required by more rapidly changing systems and prototyping? How will managers make the rapid investment decisions required? How will managers deal with time-value of money issues?

Technology.--How will companies keep up with changing technology, especially in the manufacturing, computer, and telecommunications sectors? How will managers and operators cope with the increasing demands placed on them by such factors as Information management systems?

We're all continually changing and interacting with our environment. How well we adapt to and cope with the changes will determine how happy and healthy we'll be. It also will determine how well we'll perform in the work place and how productive and profitable our companies will be.

How well equipped are you, your colleagues, and your company to deal with the changing realities of the lumber industry and every changing markets nationally and internationally? What do you need to do to put yourself in a more competitive position? How are you going to do that?

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Conclusion

Those are some tough questions that require some hard thinking. The important point is that we've still got a little time to do our thinking and start acting proactively. But we must move quickly if we're going to survive through the 1990s. Regardless of who you think is right regarding the environmental, energy, regulatory, and international markets issues, they won't go away and they won't be solved in the immediate future. We must adapt, move on, and keep moving.

I've tried to explain one way you can do that by developing systems that will help you deal effectively with all the data and information coming at you. If you can develop information management systems that will give everyone in your company almost unlimited access to the right information, in the right place, at the right time, you'll be a long way down the road to success.

To repeat what I said at the start, the good news is that the rewards are already accruing to those who were and are willing to make improvements and change with the needs of the marketplace.