FROM DATA TO WISDOM
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INTRODUCTION

A presidential address is usually expected to contain words of wisdom. If this is your expectation, you will be disappointed. This paper is short on words *of* wisdom but long on words *about* wisdom. In this case, a word to the wise is not sufficient.

Wisdom is located at the top of a hierarchy of types, types of content of the human mind. Descending from wisdom there are understanding, knowledge, information, and, at the bottom, data. Each of these includes the categories that fall below it — for example, there can be no wisdom without understanding and no understanding without knowledge. Nevertheless, it is my impression that on the average about forty percent of the content of human minds consists of data, thirty percent information, twenty percent knowledge, ten percent understanding, and virtually no wisdom. This allocation of mental space is particularly well reflected in the minds of our political leaders and those who educate them.

Managers of systems are currently drowning in a sea of symbols spewed out by mature computer-based management information systems (MIS). More sophisticated computer-based knowledge systems are still young. Younger still are systems that generate understanding. Ones that generate wisdom have yet to be born. *Of what would such a system consist?* It is to this question that this paper is addressed.

Management Information Systems

Data are symbols that represent properties of objects, events and their environments. They are products of *observation*. To observe is to sense. The technology of sensing, instrumentation, is, of course, highly developed. Information, as noted, is extracted from data by analysis in many aspects of which computers are adept.

Data, like metallic ores, are of no value until they are processed into a useable (i.e. relevant) form. Therefore, the difference between data and information is functional, not structural, but data are usually reduced when they are transformed into information.

Information is contained in *descriptions*, answers to questions that begin with such words as *who*, *what*, *where*, *when*, and *how many*. Information systems generate, store, retrieve, and process data. In many cases their processing is statistical or arithmetical. In either case, information is inferred from data.

About twenty years ago I identified five misassumptions all or some of which are incorporated in most computer-based management information systems. These, I believe, still account for the continuing failure of most of these systems to satisfy the managers they are supposed to serve. Briefly, these misassumptions are as follows.

The first is: *management's most critical information need is for more relevant information*. This is false: management's most critical need is for *less irrelevant information*. A number of studies, including ones in which I have had a hand, have shown that most managers suffer from information overload and, as the overload increases, the amount of information they use in making decisions actually decreases. Most managers could not read all the written and printed material they receive even if they spent all their working hours in reading. Moreover, more than half the data and information they receive are unsolicited. Nevertheless, very few information systems deal with this tyranny of the majority. Therefore, *filtration*

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of irrelevant information and *condensation of relevant information* are the two information services most sorely needed by managers. Studies have shown that even good scientific writing can be reduced by two-thirds without loss of content, and that bad scientific writing can be reduced by one-hundred percent without loss of content. Despite all this, filtration and condensation are rarely provided by computer-based management information systems.

The second misassumption is: *if managers are given the information they want, they will perform better*. The skill of good managers lies in their ability to manage effectively systems that they do *not* understand. They do so with a predominance of intuition over rational thought, but not without a great deal of rationalisation. Now, there is an old adage to the effect: *the better a phenomenon is understood, the fewer variables are required to explain it*. (Recall $E = mc^2$). In another form this principle is: *the less a phenomenon is understood, the more variables are required to explain it*. Therefore, when most managers are asked what information they want, they say "everything". When everything is provided to managers already suffering from information overload, the amount of information they use decreases.

The third misassumption is: *if managers are given the information they need* — in contrast to want — *they will will perform better*. The only condition under which we know what information is needed to solve a problem is when we have a complete understanding of the entity that has the problem, its environment, and *their* interactions. There are few cases in which such complete understanding exists. Where it does, solutions can be deduced by management scientists who have more time available and are paid less than managers. Therefore, where we know what information is needed to solve a problem, a manager is not needed to solve it. To use him to do so is to waste his time.

The fourth misassumption is: *the more information is shared by managers in an organization, the better that organization will perform*. This is true only where there is no conflict among the managers. There is frequently more conflict between managers in the same organization than between competing organizations. The ability of conflicting parties to harm each other increases with the amount of information they have about each other. Therefore, the 'ideal war' is one in which none of the parties has any information about the other(s).

The fifth and last misassumption is: *managers who use the outputs of an information system do not have to understand how that system works, only how to use it*. The trouble is that systems designers and operators, even those who understand their systems, do *not* understand management. Without such understanding they have no criteria for determining relevance and the degree of accuracy and reliability of information required by managers and therefore frequently provide them with misinformation. In effect, these designers and operators wind up managing management without either they or their managers being aware of it.

Because of the prevalence of these misassumptions, most managers would rather have their information system in the form of a Miss or Mrs. than an MIS.

Knowledge Systems

Knowledge is know-how, for example, how a system works. It is what makes possible the transformation of information into *instructions*. It makes *control* of a system possible. To control a system is to make it work *efficiently*. To increase efficiency is either to increase the probability of producing a desired outcome with fixed resources or to decrease the amount of resources required to produce it with a specified probability. All control systems have knowledge systems imbedded in them.

Knowledge can be obtained in two ways: either by transmission from another who has it, by instruction, or by extracting it from experience. In either case the acquisition of knowledge is *learning*. When computers are programmed, they are instructed and thereby are 'taught' how to do something. In addition, ever since

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Claude Shannon developed his electronic maze-solving rat, computers have been programmed to learn from experience but such learning is generally very elementary.

Computerized *expert systems* are knowledge systems that have had the knowledge of an expert programmed into them. They are seldom learning systems, that is, capable of learning on their own. The ability to acquire knowledge on one's own is *intelligence*. Unfortunately, many of the systems said to embody 'artificial intelligence' do not have this capability, hence are misnamed.

Learning takes place when one's efficiency increases over time or trials. It can take place when the conditions that affect relevant efficiency either remain constant or hitting a target increases. When the relevant conditions change — for example, when a strong wind crosses the shooting range — new learning is required to maintain or increase efficiency. Such learning is called *adaptation*.

Learning and adaptation may take place by trial and error or *systematically* by detection of error and its correction. *Diagnosis* is the identification of the cause of error and *prescription* is instruction directed at its correction. Systematic learning and adaptation require *understanding* error, knowing why it was made and how to correct it.

Understanding Systems

Systems that generate understanding of purposeful systems and thus facilitate and accelerate learning and adaptation exist, but they are generally man-machine systems. They cannot be completely automated at this time. Although machines have been used to explain error in the operations of machines, up to now they cannot be so used for purposeful biological and social systems. Therefore, management support systems that generate understanding require human participation. Such systems must be able to detect errors, determine their causes, and correct for them. I have described such a system in Chapter 6 of my book *Creating the Corporate Future* (John Wiley & Sons, New York, 1981). My colleagues at INTERACT and I have built or guided the building of such systems in a number of corporations including Anheuser-Busch, Kodak, and ALAD, Armco's Latin American Division.

Learning and adaptation, and knowledge and understanding, focus on efficiency, not *effectiveness*. Both efficiency and effectiveness are determined relative to one or more objectives. The *value* of these objectives is not relevant to the determination of efficiency, but it is relevant to the determination of effectiveness. The effectiveness of behavior is a function of both its efficiency for one or more desired outcomes and the values of those outcomes.

Now I can make a critical point: *intelligence is the ability to increase efficiency; wisdom is the ability to increase effectiveness.*

The difference between efficiency and effectiveness, that which differentiates wisdom from understanding, knowledge, and information, is reflected in the difference between *growth* and *development*. Growth does not necessarily imply an increase in value; development does. Development is the process by which wisdom is increased. Therefore, a system that generates wisdom promotes development.

Now, in order to specify the characteristics of a wisdom system, I must define 'development' and formulate the conditions necessary for it to take place.

Development

Growth and development are not the same thing. Growth can take place with or without development, and development can take place with or without growth. A group of cells may grow without developing, and a person may develop without growing. Development is not a condition or state defined by what a person has. It is a *process in which an individual increases his ability and desire to satisfy his own needs and legitimate desires, and those of others.* A legitimate desire is one the

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fulfillment of which does not reduce one's own chances or those of others of satisfying any of their needs or (legitimate) desires. Therefore, it is a desire which is not in conflict with any other legitimate desire.

Put another way: development is an increase in potential, not an increase in attainment. It has more to do with how much one can do with whatever one has than with how much one has. It is more a matter of learning than of earning, and therefore is better reflected in quality of life than in standard of living. Robinson Crusoe is a better model of development than J. Pierpont Morgan.

This is not to say that how much one has, wealth, is irrelevant to development; it is very relevant. How much people can actually improve their quality of life depends not only on their desires and abilities, but also on what resources are available to them.

Because development consists of increases in desire and ability, it cannot be given to or imposed on another. One party cannot develop another, but can encourage and facilitate the development of another.

An *unlimited* ability to satisfy one's needs and desires and those of others can be called *omnicompetence*. This is a necessary ideal of everyone who desires or needs anything because need and desire must be accompanied by a desire to satisfy one's needs and desires. Thus the attainment of omnicompetence implies the ability to satisfy all other desires, even the fulfillment of other ideals. For this reason I call it a *meta-ideal*. To develop, then, is to make progress toward this meta-ideal.

Note that in omnicompetence the distinction between ends and means disappears: the ultimate ends consists of the perfect means for satisfying any legitimate desire.

Social systems — societies, institutions, corporations, and other types of organization — are created by people to enable them to pursue their goals and objectives, and must function in four ways that were identified by ancient Greek philosophers: they must pursue *truth, plenty,* the *good,* and the *beautiful.*

1. The pursuit of the *truth* is the scientific and *technological* function of societies. It consists of encouraging and facilitating the production of the information, knowledge and understanding required by individuals to select the most efficient means available and to develop means that are increasingly efficient.

2. The pursuit of *plenty* is the *economic* and *educational* function of societies. It consists of encouraging and facilitating the provision of the resources required in the pursuit of ends. Doing so involves the production and distribution of such resources — making them generally available, making their availability known, providing access to them, and protecting them against appropriation by others.

3. The pursuit of the *good* is the *ethical-moral* function of societies. It is directed at removing conflict within individuals (peace of mind) and between individuals (peace on Earth), and promoting cooperation between them. Unless conflict within and between individuals is removed, and cooperation among them promoted, progress toward the attainment of some objectives is not possible.

The function of ethics-morality is to specify neither what ends nor what means should be selected as ethicists and moralists have tried to do. Let me explain.

Ethicists and moralists have traditionally taken two approaches to their pursuit of the *good:* one absolute and the other relative.

Absolutistic Ethics/Morality

In the absolute approach to ethics and morality rules of conduct are formulated, conformity to which is taken to constitute the good. The Ten Commandments, the Golden Rule, and Kant's Categorical Imperative are examples. In reducing ethical-moral judgment to a determination of conformity to rule, such judgments are restricted to the dichtomy *good* and *evil*. There are no 'in betweens'. This invariably gives rise to ethical-moral dilemmas. No set of ethical-moral rules has yet been formulated which does not lead to unresolvable problems. This is true even for the

Ten Commandments. For example, there are times when honoring one's parents and telling them the truth are in conflict.

However, there are even greater difficulties with defining the good as conformity to a set of rules, whatever the nature of the rules. Who authenticates such rules? The usual answer is 'God'. What assurance do we have that those who claim to speak in His name are authorized to do so? How do we account for the incompatibility of rules derived from different concepts of God? Which God is authenticated and how?

Conscience has also been suggested as an alternative authenticator, but it provides no better anwers to such questions. Whose conscience? How do we deal with conflicting dictates of different consciences? And so on.

A different approach to ethics and morality is required. It is not based on conformity to rules of conduct, but on *the way decisions are made*, on process, not product. Put another way, I propose that a decision is ethical/moral because of characteristics not of what is done, but of how the decision to do it is made.

Specification of an ethical/moral decision process must address two questions: 'Who should be involved?' and 'How should they be involved?'

The 'process principles' I propose are ideal, hence not attainable but capable of continuous approach. The first such principle is: *All those who are directly affected by a decision (the decision's stakeholders) should be involved in making that decision*. The concept 'stakeholder' has become a familiar one in corporate circles, less so in public circles. In corporations, stakeholders are taken to include at least their employees, shareholders, creditors, debtors, suppliers, customers, government, and the public. Competitors are excluded because they are not *directly* affected by what a corporation does, but indirectly through the behavior of customers, suppliers, and others.

Clearly, the number of stakeholders of some corporate decisions runs into the millions and there is no practical way of involving all of them in every decision. This is the same problem that the government of a democracy faces: it cannot run a referendum on each issue to be decided. This problem can be solved for all the *internal* stakeholders by use of what I have called a 'circular organization' an organization in which each individual can participate in making decisions that affect them directly. (This design is described in Chapter 7 of *Creating the Corporate Future, op cit.*). The circular organization does not cover all the external stakeholders, but includes their representatives. This does not differ significantly from the current practice of having stockholder representatives on corporate boards. However, it requires inclusion of representatives of *all* types of external stakeholder. An increasing number of corporations are including such representatives on their boards or are setting up special boards consisting of a large number of representatives of a particular type of stakeholder, for example, customers, wholesalers, or retailers.

There is one stakeholder group, larger than all the others combined, that is almost always ignored: *future generations*. They may be the ones most seriously affected by what is done today. How can their interests be taken into account when we do not know what their interests will be? However, we do know one thing they will be interested in: *making their own decisions*, not having us make their decisions for them.

Future generations should be allowed to make their own decisions. This requires *keeping their options open*. We should not be making decisions that reduce the range of choices available in the future, but we do so continually. In many of our decisions we do not even take into account our own future interests. In short, when we consider ethical/moral values at all, we generally restrict our considerations to the short run, and sacrifice the long run for it. Those with wisdom are recognized as capable of effectively balancing short- and long-run interests. We need a principle to guide this balancing process. I will return to this question after considering the relativistic approach to ethics because the same need emerges from it.

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Relativistic ethics/morality

The alternative to absolutistic ethics is relativistic or instrumental. It asserts that the good is what works. This reduces the good to the efficient and raises a set of questions that are as difficult to answer as those raised by absolute ethics. For example, which evaluation should prevail when what is 'good' for one person is 'bad' for another? When an act is good for a short-run goal but bad for a long-run objective, or *vice versa*, which evaluation should prevail or how should both be taken into account? Since every end is itself a means to a more general end, we are bound to get into trouble with relativistic ethics unless there is one ultimate end that everyone values above all else. If there were such an end, then, in principle, all evaluations could be made relative to it.

I have already pointed out that one cannot desire anything without desiring the ability to attain it. Therefore, the desire to increase one's ability to obtain what one desires is universal, rationalistically — that is, tautologically — so because it derives from the nature of desire, not from what is desired. Therefore, the ability to satisfy any and every desire, *omnicompetence*, is an ideal because it can never be attained but it is capable of being approached without end. It is *meta* because its attainment implies the ability to attain any other ideal.

Omnicompetence, then, is the ultimate good. Wisdom is the ability to evaluate any choice with respect to the amount of progress toward this meta-ideal that the choice makes possible. It is the ability to see the long- as well as the short-range consequences of any act and evaluate them relative to this ideal.

4. The pursuit of *beauty* is the *aesthetic* function of societies. This is the least understood of the four requirements of development. For example, most would agree that at least developed societies have made scientific, technological, economic, and educational progress. Fewer, but still some, would argue that ethical-moral progress has also been made. However, hardly anyone would argue that we have made significant aesthetic progress: that we can either produce better art or appreciate natural or man-made beauty more than our predecessors.

The pursuit of beauty is directed at promoting the formulation of ideals, inspiring their pursuit, and providing rewards for engaging in that pursuit.

In *The Republic*, Plato conceived of art as a potentially dangerous stimulant that could threaten the stability of society. He saw it as producing dissatisfaction with the way things are, hence disrupting the *status quo*. Therefore, he believed art was a thorn in the side of his utopian Republic, the perfect state.

For most of us today such a society is not ideal. We prefer a state in which there would be an unlimited number of problems yet to be solved and an unlimited number of objectives yet to be pursued. We derive at least as much satisfaction from the pursuit of solutions and objectives, as we do from attaining them. An ideal state for us, therefore, is not one in which we have everything, but one in which there is always more to be had, and in which we have ability and desire to acquire it. Our concept of utopia is dynamic, not static, as it was for Plato.

In contrast to Plato, Aristotle conceptualized art as cathartic, a palliative for dissatisfaction, hence a producer of stability and contentment. He saw art as something from which one extracts satisfaction here and now. Where Plato saw art as *creative*, Aristotle saw it as *recreative*.

These apparently contradictory views of art are actually complementary: they are concerned with two aspects of the same thing. Recreation is the extraction of satisfaction from what we do regardless of what we do it for, its *intrinsic* value. It provides 'the pause that refreshes', thereby recreating the creator. We could not maintain continuous pursuit of ideals, which we can never attain, without payoffs along the way. Art also inspires us to further progressive efforts. It's what makes what we do meaningful, possessed of *extrinsic* value.

Now, what has all this to do with wisdom?

Information systems incorporate mental processes of relatively low order and therefore can to a large extent be automated. These systems generate information out of data.

Computer-based knowledge systems require higher-order mental faculties, but lower to apply knowledge than to generate it. In general, they do not develop knowledge, but apply the knowledge developed by people. However, some do learn and adapt and acquire knowledge in the process.

Understanding requires diagnosis and prescription. Although we have been able to automate systems that diagnose and prescribe where machine behavior is involved, and to some extent in biological systems, little progress has been made to date in psychological and social systems. However, there are no obstructions in principle to the development of such automated capabilities.

Information, like news, ages relatively rapidly. Knowledge has a longer life-span, although inevitably it too becomes obsolete. Understanding has an aura of permanence about it. Wisdom, unless lost, is permanent; it becomes a permanent endowment of the race.

As previously noted, information, knowledge and understanding all focus on efficiency. Wisdom adds value, which requires the mental function we call *judgement*. Evaluations of efficiency all are based on a logic which, in principle, can be specified, and therefore can be programmed and automated. These principles are general and impersonal. We can speak of the efficiency of an act independent of the actor. Not so for judgment. The value of an act is never independent of the actor, and seldom is the same for two actors even when they act in the same way. Efficiency is inferrable from appropriate grounds; ethical and aesthetic values are not. They are unique and personal.

At least this is how it seems to me. From all this I infer that wisdom-generating systems are ones that man will never be able to assign to automata. It may well be that wisdom, which is essential to the effective pursuit of ideals, and the pursuit of ideals itself, are the characteristics that differentiate man from machines.