PART I

THE PRINCIPLES

CHAPTER 1

INFORMATION ON INFORMATION

Information is ever present in our daily lives. Many of us are barraged with it. Yet it is very hard to respond to the question "What is information?" We all have a vague idea of what information constitutes.

Many words express the idea of information: Consider *data*, *knowledge*, *being*, *writing*, *sign*, and *symbol*, to name just a few. But objects such as a name, a song, a picture, or an idea also contain a shared quality called information. Some information is considered more valuable than other information, typically because a person puts a higher value on it. Old information can become valuable in a new context or when used by contemporary technologies for making novel combinations. The iPod is just one example of such a technological transformation of information.

Information is more than simple data. Data can be viewed as a series of symbols, facts, or rough observations. Individually, these mean nothing to us; only when data is experienced in the correct context are we able to process and analyze it. When data changes a person's level of knowledge, we call it information.

Data, as such, is neutral. The very same data can be important to one human being and totally unimportant to another, the reason being that the context and the information receiver are different. Knowledge is more than just information. To change information

into knowledge, we add elements such as experience, importance, value, understanding, opinion, and reasoning. Knowledge is particularly, some say only, in our heads. That is why it takes such a long time to become an expert or to grow up. After all, you cannot buy experience. You must acquire it in the course of your life. The more knowledge and, with it, experience we collect, the more wisdom we get. Wisdom comes with age and is nothing less than applied knowledge.

Information, on the other hand, is what we communicate to one another. To understand information, you need to understand how communication takes place and how information is transmitted with the latest technologies, among people at large, and between individuals.

These information flows convey meaning; in the business world, these flows are the basis for decision-making by employees. Some authors argue that the majority of communication-related problems in business can be traced back to an inadequate understanding of the nature of information.

Information is the glue that holds together most of our organizations. In today's turbulent business climates, information also acts as the lubricating oil for achieving competitive advantage. But why bother about the characteristics of information or a well-established definition of information? The answer is that today, most businesses are information businesses, most employees are information workers, and profit is made by having better access to and using better information than your competitor. Therefore, employees need to better understand the ambiguity inherent in information, the complexity surrounding the deployment and usage of information, and the intricacies of information.

So what precisely is this thing called information? We are so used to dealing with information in our everyday lives that we often fail to see the complexities involved. However, to be productive with information, you have to know what information is all about.

In the rest of this chapter, I will be discussing the history of information and its main characteristics and attributes. Although the word information is used numerous times each day, a single definition has not been established. Therefore, I will take one of the most salient definitions, as it shows a clear relationship between information and the human mind.

HISTORY OF INFORMATION

Around 45,000 years ago, *Homo sapiens* lived scattered all over the world. People were hanging around the savannah, exchanging noises with other cavemen, hunting: Life was good.

Slowly, these people started to develop linguistic competence via the spoken word (often in the shape of a story), via the written word, or via drawings on a permanent medium. Cave paintings bear witness to this. These paintings represented not only stories. From the hieroglyphics of Ancient Egypt to the Minoan clay tablets and the writings of the Maya and Aztecs, graphic depictions also served as transactions between the members of communities. We could call them the first examples of bookkeeping.

The invention of the printing press in 1455 by Johann Gutenberg created a true revolution. Around that time, hundreds of monasteries with highly qualified monks were involved in copying books by hand. Fifty years later, they were out of work. Even at that stage, a team of 20 skilled workers printed 25,000 books per year. Around 1500, that was as many as 10 million books by 40,000 different authors.

Because so much information became available, people became more skillful in dealing with information. We have seen exactly the same thing happen at the advent of the Internet. The more information is accessible and available to the general public, the more people are informed on events in their immediate environment, and the more they develop a growing desire to influence it.

Even today, information reaches us in increasingly different ways. Over the last 50 years, the printed book as a medium has met with competition from many new media, such as radio, television, CDs, DVDs, and e-books. New technologies such as cell phones and the Internet have exerted a major influence on the distribution of information, which in many cases has even become available for free. In other words, we are offered knowledge in more ways and at no cost. You could call this a democratization of information.

MEANING OF INFORMATION

How did the word *information* come into existence? The word is derived from the Middle English word *enforme*, which was derived from the Middle French *enformer*, which in turn evolved from the

Latin *informare*. In Latin it meant to give form to, to shape, to form an idea of, or even to describe. Forming an idea always occurs in the mind of a person, of a subject.

Information was used in English from as early as at least the 14th century but did not get its current spelling until the 16th century. Chaucer introduced the word *information* into the English language in one of *The Canterbury Tales*, written between 1372 and 1382. In *Gulliver's Travels* (1727), Jonathan Swift applied the word *information* in a way that had appeared as early as the mid–15th century and which sounds more familiar to us: "It was necessary to give the reader this information."

Two main perspectives on information emerge: 1) information as something mental (the content), and 2) information as something material (the medium or the representation of information). The first view is often referred to as an intangible or nonmaterial entity; the second is material and informative. Paper, clay tablets, walls, or other objects give us plenty of room to write our thoughts down. There are many storage devices, even things such as the knot in your handkerchief. Almost anything can be used to store information. All it takes to store information by means of an object is an agreement that this particular configuration represents that information. Likewise, contemporary information technologies give us numerous devices that can store representations of information.

These two concepts, information and the representation of information are often confused in everyday usage, but they are different and have different properties. For example, information can be both retained and given away, as I will show in the next section. One cannot do that with the physical surrogate without creating a second physical version. Furthermore, the medium is not the message, although it may strongly affect the message. Having a radio or a subscription to a daily newspaper or even access to an e-mail system does not guarantee that a person has read, seen, or heard the message and understood it.

CHARACTERISTICS OF INFORMATION

When talking about information, we intuitively know that it is not the same as traditional, tangible, physical resources, such as ore, lumber, machines, equipment, land, minerals, or gems. These latter resources

are considered limited, which contributes to a value system for their exchange. They can be depleted and diminished. No more than one person at any given time can hold these tangible things.

Information has its own characteristics. For instance, information can be used to substitute resources or to substitute automation for human labor. Information is also diffusive: It spreads and it changes. Information has been the greatest threat to oppressive governments. Information can be communicated via a commercial, a photograph, or body language; it can be hidden in the words of a novel or newspaper. Information is human; it only exists through human perception.

This section describes the main characteristics of information based on the works of a number of leading authors.[1] *Characteristics* describe features that are related to information but are not specific to, unique to, or closely connected with it.

Access

Access is a prerequisite to the use of information. Accessibility not only refers to physical access to information but also applies to knowing what information is available. The latter is often called the intellectual accessibility of information (am I able to use it?). Knowledge about information that is available means knowing how to use what is available—for instance, knowing how to use search engines, abstracts, and indexes. It also means knowing who knows what. Evidence from recent research shows that people primarily turn to other people for information, rather than to databases, the Internet, or traditional repositories like file cabinets.[2] In buildings, you could ask people on the same floor; in your neighborhood, you ask acquaintances; at home, you look in your file cabinets and computer file systems.

The popularity of verbal sources of information can be explained largely by the fact that people regard these sources as very reliable. If the other person is perceived to be an authoritative and dependable source of information, then the degree of trust is very high. Personal sources are very information rich. They often provide additional cues to the accessed information—by conveying emotion via a smile or tone of voice, or by providing extra information that the person requesting the information had not initially sought.

Scarcity is likely to be at the heart of most efforts to obtain competitive advantage from information. In this context, *scarcity* is the value of information that is new or is not freely available to competitor organizations or other potential users.

If you are familiar with an information source, you will use it first. This source of information could be anything: a document, a person, a Web site, or a physical collection. These are not always the best sources. But as long as you get a reasonable answer, you will stick with that source. Of course, there could be a better source, provided that you know the source already or wish to invest time in searching for it.

Access to information is easier for those who belong to a social group that has privileged access to the requested information. Another advantage of membership is the trust among its members. Interpersonal information sources and other related networks are readily available.

People

Information is very human: It only exists by the grace of human perception, and its receiver determines its value. Information is extremely democratic: More information for me does not mean less information for the other person. Additionally, more information certainly does not mean better information. The correct amount is often determined by the receiver of the information, who evaluates any newly acquired information using his or her existing knowledge.

Your educational background, experience, and capabilities are the main drivers in deploying and using information. Your reading and literacy levels are likely to influence your access to information. Additionally, your ability to use technologies to access information is a strong predictor of effective information behavior. The personal skills that you have built up over time in using information also help when encountering new situations.

Your cultural background decides to a high degree whether information is experienced as useful and significant. This does not just apply to the language, but also to the ethics and customs a person supports.

There is an old saying that knowledge is power. Access to information and its near opposite, hoarding information, are both subject to political and economic powers. Power can be used to limit access to

information. Limiting others' access to knowledge is in itself a source of power. Putting constraints on access to information and its distribution has always been a privilege of the owner of the information.

Feelings

One of the main reasons people look for information is its ability to reduce uncertainty about events in the real world. As early as 1948, information was already defined as the reduction of uncertainty. In this case, uncertainty is related to the amount of information available: The less information is available, the greater the uncertainty. Decreasing uncertainty requires obtaining more information, but increasing information may not always resolve uncertainty. Moreover, it is sometimes impossible to completely reduce uncertainty. Take for example the stock market, or tomorrow's weather. How much information do you need to predict whether stocks go up or down? Because stocks are part of the stock market, you might need a lot of information to make your prediction.

When you communicate information, you often have specific reasons for doing so. Perhaps you wish to incite someone into action, or show them a different perspective. However, this intention also applies to the recipient; he or she has to be willing to accept a change in his or her brain.

Trust is a precondition for using information properly. People initially seek information from other people, simply because they trust them. Those people are part of their social network and have proven to be good sources of information in the past.

You could say that information has to be true for it to be called information. But this definition means that we also need a word for false information. Worse, information can sometimes be a little true or almost true, or it can be made false on purpose. That is why the human brain is important in the interpretation of data. We are able to deal with vagueness or nearly complete data. The truth is the degree of reliability and correctness as attributed to it by the user.

Medium

The medium used to represent information plays an important role. Equally important is the presentation and formatting of the information

being used, as some formats are more appropriate than others in present-ing particular information.

Our sensory functions can be addressed in many different ways. We may hear information on a one-on-one basis, in a group of peo-ple, or in a public speech; we may hear it privately from someone in another location through a telephone or a two-way radio; we may hear it through a public medium such as a radio broadcast or recorded audio tape. Some media may be partly visual, like public speech. Other media are heavily dependent on visual impact, most obviously television, video, cinema, and, of course, the display screen of a com-puter. A particular piece of information can be transmitted by any or all of these methods, although some are more effective than others in specific circumstances.

People differ in the way they acquire and analyze information. The three main informational preferences are:

1. *Visual.* About 70 percent of all people prefer to receive infor-mation by seeing images, concepts, schemes, and so forth.
2. *Auditive.* In the preferred style for 25 percent of all people, information is conveyed through sound, music and the spoken word.
3. *Kinesthetic* or *haptic.* This is preferred by some 5 percent of all people, who learn and acquire information mainly through experience, touch, movement, experimentation, and so forth.

Once information is represented on a certain medium, it is immedi-ately shut off from those who do not have a preference for that medium or simply cannot use that medium. People with an aptitude for listening generally find it hard to respond effectively using e-mails. They would rather talk to someone directly instead of putting their ideas and reaction into bits of information. Some people are strongly visual. They prefer pictures over text. To them, a book without pictures does not read well.

Information often forms part of technology. Without its informa-tion component, technology has little value as a resource—but that also works the other way around. Information is closely connected to the technology that carries the message. A lot of information reaches us via some medium, electronic or otherwise; even our brain is ulti-mately a combination of chemistry and electricity.

Time

If one rapidly needs information, time is the key factor in deciding which information source to use; this is the concept of urgency. However, a second rationale of the time factor is the implicit cost/ benefit analysis. Even when people know a dependable information source—be it a person, document, or something else—they often turn to other people because they can get an answer quickly. This approach also includes interactivity; if the information is not exactly right, a short dialogue can steer the information-seeking process.

   Another major advantage to the information seeker is the fact that the information source can relate to his information profile (Chapter 5). Most people have a pretty good idea what the other person wants. They have already interacted for some time, so they are familiar with the seeker's preferences and information habits. Benefits can also be realized in terms of gaining access to information that is not explicitly sought for but closely related to the information needed; the possibility of follow-up questions; and less annoyance in terms of not finding what one is looking for.

Usage

A lot of information is not used in its original form. We all cut and paste bits of information, adding our own pieces, and then distribute that information as being our own original. This practice holds some risk, in that the reliability of the information must be established over and over again. On the other hand, this is often a service provided by the sender, who combines or aggregates pieces of information to explain his message to the specific target group more clearly.

   The use of your information does not result in a reduction of your possessions. Unlike, for example, oil, most information is not scarce. After all, information is not lost when it is distributed. However, information does hold a lot of value to some organizations. Information on research and development of new products and services must not be made public. That is why employees in these areas are bound by strict rules of conduct with regard to information.

   Information takes context into account—the context of the user and his or her mind. Only human beings are capable of picking up on possible ambiguities in a message. However, wrapped up in their

own contexts, people do not realize the importance of the context to the receiver of the information (e.g., Is the language, including the semantics, understood? Is the receiver's background properly taken into account? Are situational factors addressed?).

Context also refers to timing issues and even to the physical space in which the information is distributed. Our brains often remember the physical space sooner than the information itself, simply because our brains are geared to understanding a vast amount of contextual information.

Information is not tangible and it is the only resource that grows with use. Because information never depletes, it can be reused as often as you like, or even applied in a new way. There are plenty of examples: Music, books, data on locations—all of these share information without losing it. That is why information has several life cycles.

New technologies are sometimes responsible for these life cycles. Music throughout most of the 20th century was recorded on a record. In the late 20th century, the same songs were put on CDs. These days, the same songs are provided as mp3 files, accessible as separate files rather than a collection. A single song can be downloaded, carried with hundreds of others (related or not) on an mp3 player, or played interactively through the Internet.

Moreover, some information may be temporarily out–of–date until a new request or new insights provide a fresh look on old information. The oil crisis in 2005 meant that small oil fields regained attention, partly because prices were expected to be high for a prolonged period, but also because inefficient wells could be made profitable. Information about these wells became relevant again.

ATTRIBUTES OF INFORMATION

An attribute is defined as a characteristic or recognizable quality of an object (e.g., size, color, material, shape, or age) and is used to describe, analyze, or characterize it. Put another way, a attribute is a characteristic that describes. Attributes can be thought of as questions that are asked about the feature.

Various authors have tried to identify the attributes of information.[3] There are many categories, including such attributes as expandable, compressible, substitutable and shareable. The intangibility of information is also often emphasized. Others describe attributes such as quality, currency, accuracy, and comprehensiveness as significant. Some believe that information should be seen as something tangible, physical, and concrete, while other viewpoints emphasize the intangibility of information. Due to these different (and often conflicting) views of the information phenomenon, the attributes of information have not yet been identified uniquely. Here, the most salient attributes are described in alphabetical order.

- *Ambiguity*. Information is always potentially ambiguous. We are required to interpret it within a context to identify a specific meaning. It is precisely for these reasons that the importance of the human mind of the receiver of the message is emphasized in the definition of information.
- *Amount*. In contrast to most other resources, more information doesn't necessarily mean better information. It is even hard to assess the quantity of information that is needed for making a decision. Which has more information, a telephone directory or a large newspaper? How much information do you need when asking a question? Do you give directions to the respondent in terms of the amount of information that you expect as an answer?
- *Consumption*. Information is not lost when it is given to others. It also does not diminish when it is used. Sharing information can even lead to an increased value for both sender and receiver.
- *Dynamics*. Information has an intrinsic dynamic and unarguably influences its immediate environment. It is almost impossible to study information as something separate. In organizations, particularly, information should always be viewed in relation to its deployment and its use.
- *Format*. The format in which information is presented determines whether the recipients can do anything with it. The recipient should be experienced with the medium and the resources necessary to use that medium.

- *Inappropriability*. Information is inappropriable because an individual who has information can never lose it by transmitting it. Information can be owned, but that ownership is rarely exclusive. In other words, if I have information and I give it to you, then both you and I have use of the information. Information can, therefore, not enter into traditional economic exchange, because it becomes the possession of both buyer and seller. Information is thus said to be "leaky," because when it is transferred, it may go not only from seller to buyer but also to third parties. They may be in the vicinity and acquire the information solely through, for example, overhearing it or viewing it from afar.
- *Indeterminacy*. A person who sends information has no absolute guarantee of 1) who exactly is going to receive it and 2) how they are going to interpret it. This indeterminacy arises from the fact that information usually takes the form of a coded representation of entities in the real world, which must be interpreted.
- *Individuality*. Information comes in many different forms, and is expressed in many different ways. The same information can be represented in different media, addressing different senses of the recipient.
- *Knowledge*. Information changes our level of knowledge. That is not a once-only occurrence, but a continuous process. Keep in mind that only human beings are able to turn information into knowledge; knowledge is information that has been received as well as understood.
- *Multiplicative Quality*. Information can be used to create more information or to make better decisions, which cause actions that generate more information, and so on. This is called the self-multiplicative quality of information.
- *Redundancy*. The communication of information always has an element of redundancy (i.e., nonessential information), primarily to resolve problems of ambiguity and indeterminacy. However, this apparent redundancy may prove to have value in some situations.
- *Supply*. Information is plentiful. That is why it is often not the information that defines the value, but the time and the attention it receives from the recipient.

A DEFINITION OF INFORMATION

You would think that more than 600 years of use would tend to settle a word and result in a consensus on its meaning. This has not been the case with the term *information*. Information has become the single most important word of the 21st century. Especially in the last five decades, as the various phenomena that people call information began to be objects of empirical study, different meanings of the word have proliferated.

Most people agree that information has no meaning except when it has an impact on a human being. Therefore, my favorite definition of information is:

Any difference that makes a difference to a conscious, human mind[4]

This definition emphasizes 1) that data can come from anywhere and anything, even the internal mind of the receiver, 2) that the scope of coverage is broad, 3) that the intention of the sender is not necessary for the receiver to apply meaning to data, and 4) that a perceived difference emphasizes the personal experience of the receiving human being.

The receiver of the information appreciates the information in his or her personal context, deriving (or attempting to derive) information from the message as sent, no matter the sender's intent. For example, the beauty of a book or a piece of music is that the actual interpretation of the words, lyrics, or sound varies according to individuals, as they interpret it within their personal knowledge structure.

The latter point assumes that information does not exist independent of a conscious mind. Information is intrinsically meaningless on its own and remains so unless a human being interprets it. You can send information and try to provoke a response, but you can never be sure how others will interpret the information they receive from you. Moreover, you do not know the mood they are in when receiving the message, nor do you know precisely their interests, motivation, beliefs, attitudes, feelings, sense of relevance, and so on. Hence, it is not the meaning you put into the message as a sender that matters, but the meaning the audience puts into the message.

VALUE OF INFORMATION

The value of information cannot be determined in advance, because a human being has to actively assess the information to determine its real value. To have value, information has to be transformed by human cognitive processes into human knowledge, without which no products of tangible value can be produced or exchanged.

Valuing information is also an inherently difficult task because of the unique features of information, which distinguish it from other material resources. Examples of these features are:

- Information is not depleted by use.
- Information is noncompetitive.
- Information has no inherent value in and of itself; its value depends on context and use.
- You cannot easily exclude individuals from the benefits of using information.
- The exchange of information does not imply either loss or simple redistribution.
- Before they consume information, consumers have a hard time in determining an exact value on the utility of consumption.
- To estimate the value of information, consumers use branding, word-of-mouth, and signaling as clues.
- Information has no scarcity value.
- Information is costly to produce and cheap to reproduce.
- Information goods are often priced according to customer value, not according to actual production costs.
- Most information goods are *experience goods*: Consumers must experience it to value it.
- Production of information goods involves high fixed costs and low variable costs.
- Most of the fixed costs of producing information are sunk costs, costs that are not recoverable if production is halted.
- There are no natural limits for additional copies of information.
- If information is hoarded for the exclusive use of a limited number of people, it can actually fail to achieve its full potential value for those who hoard it. If, however, information is exchanged

and traded, the value resulting from its use increases for all parties in the transactions.

- Paradoxically, when more people receive and use information, it will experience an overall increase in value.

Information is not like food or energy, of which everybody needs a bare minimum in order to survive. Information has value only when a recipient has some need for it and has the capacity to process it. The issue is how much money someone is prepared, directly or indirectly, to pay to acquire the information; that, ultimately, is the measure of its value.

What users are seeking is information that best meets their needs. Up to a certain point, each additional piece of information increases the value of all the pieces that have already been acquired. At a certain moment, the point is reached at which there is so much information that it is no longer possible to effectively use it. This is the point of information overload.

The valuation of information will never be an easy task. Fundamental to a discussion about the value of information is the assertion that it is tied to individuals, cultures, or organizations, and thereby to an identity, role, or orientation related to those aspects. An essential characteristic of information is that it has no value except when in use. People make use of the information they receive for their own benefit, combining it with the information they already have to put it to work.

NOTES

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