Characteristics in information processing approaches

Johan Frishammar*

Department of Work Sciences, Halmstad University, Box 823, S-301 18 Halmstad, Sweden

Abstract

This paper describes and compares different information processing approaches (terms). The purpose is to identify similarities and differences in the terms, relate them to and compare them with each other, but also to identify their underlying concepts and the course of events they represent. The terms or approaches addressed are Environmental scanning, Business, Competitive, Competitor, Market and Political intelligence, Marketing research and Information management. It was concluded that all approaches have a strong future orientation and strong ties to decision-making, and advocate that information is ennobled in one way or the other. The main differences lie in their focus, and in their scope. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Information processing; Intelligence; Scanning; Comparative study

1. Introduction

A central theme in books and articles within different areas of the field of business administration is that the world (i.e. the external environment of firms) is changing at a faster and faster pace. The reasons given for this is globalization (Oxelheim, 1998), investments in IT-technology (Maier & Kelly, 1997) and the rapid pace of technological change in combination with escalating costs of research and development (Ashton & Stacey, 1995). Therefore, companies are believed to need information about environmental events. Information is important since it is believed to be a cornerstone for long-term company survival. Information can reduce uncertainty (Ginzberg, 1980), risks in decision-making (Gilad, 1996), is an important input in the process of strategy formulation (Lozada & Calantone, 1997), serve as a base for competence development (Hamrefors, 1996) and so on. But the process of gathering information is not trouble free. A theme stressed in the literature is the paradoxical situation that, although there is an abundance of

*Tel.: +46-35-16-73-17; fax: +46-35-12-81-75.
E-mail address: johan.frishammar@work.hh.se (J. Frishammar).
information available, it is often difficult to obtain useful, relevant information when it is needed (Edmunds & Morris, 2000).

Useful, relevant and [when it is] needed are the keywords here. By consulting the literature, a tentative conclusion may be that companies do not necessarily need more information; what they need is useful and relevant information in time. This fact has been noticed by researchers within different academic disciplines, not to mention the variety of consulting firms within this area. But the area is blurred, we feel. The reason for this is that there are a lot of different terms (that we will later label approaches) used to describe how useful and relevant information might be collected, interpreted, analyzed, distributed and so forth. Some of the more popular terms used are Business intelligence, Information management, Marketing research, and Environmental scanning. These terms or approaches have a lot in common, but also there are significant differences.

1.1. Purpose

Thus, the purpose of this paper is to identify similarities and differences in these terms, relate them to and compare them with each other, but also to identify their underlying concepts and the course of events they represent.

The intent with this paper is not to present a complete list of references on the subject, but rather to study some of the literature at hand as a first step towards a mapping of the characteristics stressed in the different terms/approaches.

2. Terms, concepts and course of events

As mentioned in Section 1, it is important to look behind terms to discover their meaning. Carl Hempel (1969) made this point clear; it is very important to make a distinction between terms and concepts. By looking behind the terms we mean trying to locate the domain(s) (course of events) they are supposed to reflect, but also to try to identify the concept(s) underlying the terms.

A term (word or sign) is believed to represent a certain object or a course of events (i.e. domain). The object or course of events is contained in a certain concept; the term means this

![Fig. 1. The difference between terms, concepts and course of events. Source: Zetterberg, 1968.](image-url)
concept (Zetterberg, 1968). In this paper, Marketing research is an example of a term. The term is represented by the Marketing research process, which is a course of events or a domain. Marketing research may be defined as “the function that links the consumer, customer, and public to the marketer through information”, which is the concept that the term Marketing research means. The purpose with this distinction is basically to facilitate communication and exchange of meaning. This idea is shown visually in Fig. 1 below.

3. Information processing approaches

In this section, the terms or approaches Environmental scanning, Business, Competitive, Competitor, Market, and Political intelligence, Marketing research, and Information management will be described. The approaches are not compared in this section, only described. The information system approach is described together with the term Information management. Our intent was originally also to include Management information systems (MIS) as an approach here. This proved very difficult since there seems to be no consensus with regard to how the term is used. Lee and Gosain (1999, p. 234) claim that the MIS discipline is “a fragmented adhocracy characterized by research that is rather personal, weakly coordinated in the field as a whole, with weak entry barriers from one fragment to the other and common sense language dominating”. Based on our limited knowledge of the field, we agree with these authors and therefore choose to exclude the term/approach MIS in this paper.

3.1. Environmental scanning

According to Augilar (1967, p. 1), Environmental scanning is defined as “the activity of acquiring information”. Hamrefors (1999, p. 3) has a somewhat complementary view and claims, “by scanning I mean the behavior of attending to the events and phenomena in the environment”. Under the term scanning Augilar (1967) includes not only purposeful search but also undirected viewing. Augilar maintains that the importance of scanning derives from the importance of the decisions involved. He further argues that information is useful for making decisions about strategy and long-range plans. The dependence of decision-making on scanning becomes apparent as soon as one examines the various steps of the decision-making process, according to the author. The most important type of information received through Environmental scanning is external strategic information, and information is classified as such when it refers to information about events or relationships in the firms outside environment that unveil opportunities to exploit the firms strengths, accentuate the firms weaknesses, or highlight potential threats facing the firm (Augilar, 1967).

Before proceeding, what is actually being scanned? How can “environment” be defined? According to May, Stewart, and Sweo (2000) most research definitions of organizational or business environment has been based on the work of Duncan (1972). Duncan defines the environment as all of the relevant factors outside an organization’s boundary that are

---

1In this paper, the words “term” and “approach” are used synonymously.
incorporated into its decision-making. Further, the environment could be anything material or social in the surroundings, close or distant to an individual (Hamrefors, 1999). Considering these relevant factors, the environment can be divided into two distinct strata named task and general environment (Bourgeois, 1980). The task environment involves sectors in which there is direct interaction with other organizations, suppliers, customers, and competitors being good examples. The general environment includes sectors with indirect interaction with the organization such as government, economic conditions, and socio-cultural factors (Hamrefors, 1999).

Environmental scanning is, according to Hamrefors (1999), a quite new phenomenon on the organizational scene. Only in the latest 15 years has this topic started to be of importance on the agenda of many organizations, even if it is by no means a new phenomenon. When consulting the literature, we can see that from the 1960s onwards a lot has been written using the term Environmental scanning in such prominent magazines as ASQ, Management Science, Academy of Management Journal, and the Strategic Management Journal. Issues that were addressed among others were environmental uncertainty (Duncan, 1972; Milliken, 1987) environmental characteristics (Emery & Trist, 1965; Bourgeois, 1980), scanning behavior of executives (Hambrick, 1982; Daft, Sormunen, & Parks, 1988; Sawyerr, Ebrahimi, & Bahman, 2000) and scanning behavior in relation to competence development (Hamrefors, 1996).

3.2. Business, competitive, competitor, market and political intelligence

The question of Environmental scanning has been raised in several contexts. One is the need to identify changes in the organizational environment that the management thinks is important for the organization. This kind of Environmental scanning is often labeled Business intelligence (BI), a wording that reflects that it is often inspired by Military intelligence (Hamrefors, 1999). Business intelligence could be broadly defined as systematized Information management (planning, collection, analysis and dissemination) aimed at generating insight into the future developments that are assumed to have an impact on the organization as decision support in organizations (Svensson-Kling, 1999).

Usually, the term intelligence is used for indicating that it is an organized activity and an interpretation of the environmental events, rather than sheer information about them. To put it another way, intelligence is actionable, processed, and organized information (Barndt, 1994). Another characteristic of intelligence is that it is future oriented. By using organized intelligence activities one tries to forecast how relevant parts of the environment will develop in the future (Svensson-Kling, 1999). In the literature the term intelligence is often used to capture the process and organization of transforming information into something that makes sense (Weick, 1995) and that could be used in decision-making.

Almost all major corporations have Business intelligence units today (Pagels-Fick, 1999). The purpose of BI is proactively to support information to decision-makers for their actions. Often a distinction is made between tactical and strategic intelligence, which originates from the military intelligence tradition that the authors of BI often come from. Furthermore, the proactivity of BI often distinguishes between the ability of finding critical information, without the decision-makers having to ask for it, and the proactivity to anticipate future questions from the management (Hamrefors, 1999, p. 6). Methodologically, the BI operations are based on the intelligence cycle.
This cycle has been described by many authors (Ashton & Stacey, 1995; Collins, 1997; Lagerstam, 1988 among others), all having their own version of the same basic cycle. The cycle used here is adopted from Ashton and Stacey (1995) (Fig. 2).

The first step includes planning the intelligence activities. Effective intelligence is based on clear identification of user or customer needs to be served by the intelligence activity and careful forethought about information gathering and analysis. The second step is to collect source materials. Sources of information can be internal or external, formal or informal, personal or electronic. The secret, according to Ashton and Stacey (1995), lies primarily in narrowing down what information is relevant, identifying where to find it, and knowing how to analyze it in order to support decision-making.

The third step involves analysis of the materials and sources to interpret their meaning in the light of intelligence objectives or user needs. This includes, for example, interpreting the meaning of information, to develop results, and to assess implications. The fourth step is to deliver the information products. This can be done through formal presentation, through e-mail, or by other means. Once developed and disseminated, intelligence results are applied or used in some way to affect organizational decisions or actions (step 5). Typically, the findings are either used as the basis for specific action or simply stored for possible later use in actions. Finally, in step 6, the intelligence process and results should be evaluated with regard to whether they serve user needs and ultimately have beneficial impacts on the organization. The purpose of the evaluation is to improve future operations by making them more responsive to company needs, to further clarify those needs and to adjust practices accordingly (Ashton & Stacey, 1995). By looking at the model,
it is easy to get the impression that the activities are sequential, starting with the planning of intelligence activities. It should be emphasized though that the intelligence cycle describes a continuous activity; a never-ending process oscillating between search and decision (Hamrefors, 1999).

### 3.3. Marketing research

Effective decision-making depends on the quality of the information input, and Marketing research plays an essential role in providing accurate and useful information (Churchill, 1999; Kumar, Aaker, & Day, 1999). Marketing research is the firm’s formal communication link with the environment. It is the means by which the firm generates, transmits, and interprets information from the environment about or relating to the success of the firms marketing plans (Churchill, 1999).

Marketing research is broadly concerned with the application of theories, problem-solving methods and techniques to the identification and solution of problems in marketing. Marketing research may be defined as “the function which links the consumer, customer, and public to the marketer through information—information used to identify and define marketing opportunities and problems; generate, refine, and evaluate marketing actions; monitor marketing performance; and improve our understanding of marketing as a process” (Malhotra, Peterson, & Kleiser, 1999, p. 6). Marketing research links the organization with its market environment. It involves the specification, gathering, analysis, and interpretation of information to help management understand that particular market environment, to identify its problems and opportunities, and to develop and evaluate courses of marketing action (Kumar et al., 1999).

As with the Business intelligence cycle, the Marketing research process (see Fig. 3) has been described by several authors, for example, Churchill (1999), Kumar et al. (1999). Except some minor differences, the process seems to be quite similar, independent of the author. Step 1 in the research process, agree on research process, comprises a shared understanding between the manager and the researcher of problems or opportunities to be studied, decision alternatives to be evaluated and users of the research results. Then, the research objectives are established (step 2). The research objective is a statement, in as precise terminology as possible, of what information is needed. A research objective has three components. The first is the research question. It specifies the information the decision-maker needs. The second and third elements help the researcher make the research question as specific and precise as possible. After establishing objectives, it is necessary to have an estimate of the value of the information—that is, the value of obtaining answers to the research questions. Such an estimate will help determine how much if anything should be spent on research (Kumar et al., 1999).

The research is then designed, the data collected, the data analyzed, and the results are reported together with recommendations (steps 3–6).

Over the last ten years, research within the area of Marketing research has been concerned with advertising and media research, brand evaluation and choice, brand management, buyer and consumer behavior, channels of distribution, new product research, pricing research, and other marketing-related activities (Malhotra et al., 1999).
3.4. Information management and information systems

Information management has emerged as the most common brief name for the management of the use of information technology in an organization. In this context, information technology refers to the hardware and software of computing and telecom, and associated resources. A central theme in Information management, independent of perspective, is information processing. Information processing might be viewed as doing something to information to make it into something else, e.g. subjective knowledge, differently arranged information or summary information (O’Brien, 1995).

In general terms, Information management can be viewed as a response to, and a search for new and improved means of controlling the information explosion and the resultant increasing complexity of decision-making by improving the flow, the control, the analysis and the synthesis of information for decision-makers. The following definition of Information management may be used: “The aim of Information management is to promote organizational effectiveness by

Fig. 3. The Marketing research process. Source: Adapted from Kumar et al., 1999.
enhancing the capabilities of the organization to cope with the demands of its internal and external environment in dynamic as well as stable conditions. Information management includes organizational wide information policy planning, the development and maintenance of integrated systems and services, the optimization of information flows and the harnessing of leading edge technologies to the functional requirements of end-users, whatever their status in the parent organization. Information management has two dimensions, the management of the information process and the management of data resources” (Rowley, 1998, p. 361).

Rowley (1998) has also suggested a framework for Information management, with the intention of presenting a structure of the knowledge, research and practice within the area of IM. This framework can be found below (Fig. 4).

The framework shows the different levels at which Information management can be studied. Outside the circles we find the information environment—the environment that surrounds information contexts; it consists of political, legal, regulatory, societal, economic and technological forces. In the same way business or marketing systems exist in a wider environment, so the contexts in which Information management occurs can be placed in a wider context. The outer circle—information context—is the context in which information systems are encountered. The context influences system design, and encompasses the user. Organizations and businesses are an important category of context, but other contexts are also possible, including education, home and community. Information contexts are the contexts in which information processing and management take place.

As can be read in the definition of IM above, part of Information management is information systems, a point also made by Cronin and Davenport (1991). These systems are used in many organizations for daily operations (Heikkilä, 1996). An information system may be defined as an organized combination of people, hardware, software, communication networks, and data
resources that collects, transforms, and disseminates information in an organization (O'Brien, 1995). Information systems (the middle circle) are the systems designed to enter information, store it and facilitate effective retrieval. Facilities to support efficient and accurate data entry must be coupled with adequate physical storage capacity and appropriate logical database structures. Systems include hardware and software, and data, and in some models, users. Information systems should be the invisible tools that support the information processing of individuals or organizations. The impact of such systems on information processing and developments in information processing in recent years have been so significant that it is appropriate to consider this level in the framework explicitly. An alternative perspective might actually be that the entire framework is concerned with information systems, since either an organization or an individual can be regarded as an information system (Rowley, 1998).

The key issues in IS from IS-managers perspectives are (1) improving the links between information systems strategy and business strategy, (2) developing and implementing information infrastructure, (3) implementation of knowledge management systems, and (4) reducing IT-projects completion time and budget deviations (Gottschalk, 2000). Recent academic research has centered on IS development, studies of decision support systems, IS evaluation, IS implementation, and studies of expert systems/artificial intelligence (Claver, Gonzales, & Llopis, 2000).

Finally, the inner circle—the information retrieval circle—is concerned with the individual interfacing with a system or range of systems or sources with a view to meet specific conscious or unconscious information requirements. It concerns the actions, methods, and procedures for recovering information from stored data. Information retrieval commences with an individual’s explicit or implicit need for information. Typically, the individual will then select one or more sources which on the basis of previous experience might expect to offer access to the required information. Once an appropriate source has been selected the user interacts with that source (Rowley, 1998).

4. Comparison of the different approaches

After describing the different terms/approaches used to describe how information might be collected, interpreted, analyzed, distributed and so forth, it is now time to compare these approaches with the characteristics mentioned in each approach. As will be soon evident, there are a lot of similarities between these approaches even if the terms used seem to differ a lot at first glance. The comparison of the different approaches and their characteristics are summarized in Fig. 5.

First, we will claim that all the approaches are future oriented in the sense that they aim at generating insight into future developments. Augilar (1967) claimed that the most important type of information received through Environmental scanning is information that let the firm exploit its strengths, accentuate weaknesses, or highlight potential threats. This information can be used for making decisions about strategy and long-range plans, something that appears in a close or remote future. Svensson-Kling (1999) claims that one characteristic of Business intelligence is that it is future oriented. By using organized intelligence activities a company tries to forecast how relevant parts of the environment will develop in the future. This should not be surprising, since BI is viewed as a part of the broader area named Environmental scanning. Further, the purpose of the evaluation step in the intelligence cycle is to improve future operations by making them more
responsive. Since Market, Competitor, Technological, and Political intelligence are viewed as subgroups to the approach Business intelligence, they too are future oriented, trying to generate insights from various areas. And so is the approach Marketing research. Marketing research may help a decision-maker to understand a particular marketing environment (Kumar et al., 1999) in order to evaluate courses of action for the future that might concern new product research or consumer behavior, for example. The approach Information management is also future oriented, at least to some extent, although this is not explicitly stated in the preceding description. Although a lot of emphasis is put on IT-technology and infrastructure, the aim is to support decision-making (Rowley, 1998), aiming at better future decisions.

Information management has its prime focus on the management of the use of information technology in organizations. Here, information technology refers to hardware and software of computing and telecom, and associated resources (O’Brien, 1995). Information management also focuses on information policy planning, information systems and optimization of information flows (Rowley, 1998). Here, the issue is not what kind of information that is at stake; the issue is, for example, how information is distributed to end-users—by which means.

Some of the approaches but not all are based around a certain methodology, i.e. how the activities are carried out. Environmental scanning is, according to Augilar (1967), based around the scanning process; see Augilar (1967, p. 33). This process is comprehensive and extensive, looks like an enormous blueprint, and is not contained in this report. Business intelligence, and its

<table>
<thead>
<tr>
<th>Approaches</th>
<th>Future Orientation</th>
<th>Focus</th>
<th>Methodology</th>
<th>Ennobled (Value-added)</th>
<th>Ties to decision-making</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Scanning</td>
<td>Yes</td>
<td>Acquire general info of events or phenomena in the environment</td>
<td>Scanning process</td>
<td>Yes and No</td>
<td>Strong</td>
<td>Broad, contains BI</td>
</tr>
<tr>
<td>Business Intelligence</td>
<td>Yes</td>
<td>Interpretation of information of changes in environment</td>
<td>Intelligence cycle</td>
<td>Yes</td>
<td>Strong</td>
<td>Part of Env. Scanning, contains all other intelligence terms</td>
</tr>
<tr>
<td>Competitive Intelligence</td>
<td>Yes</td>
<td>Interpretation of information about competitive position</td>
<td>Intelligence Cycle</td>
<td>Yes</td>
<td>Strong</td>
<td>Part of BI</td>
</tr>
<tr>
<td>Competitor Intelligence</td>
<td>Yes</td>
<td>Interpretation of information about competitors</td>
<td>Intelligence Cycle</td>
<td>Yes</td>
<td>Strong</td>
<td>Part of BI</td>
</tr>
<tr>
<td>Market Intelligence</td>
<td>Yes</td>
<td>Interpretation of information with focus on customers</td>
<td>Intelligence Cycle</td>
<td>Yes</td>
<td>Strong</td>
<td>Part of BI</td>
</tr>
<tr>
<td>Political Intelligence</td>
<td>Yes</td>
<td>Interpretation of information about political factors</td>
<td>Intelligence Cycle</td>
<td>Yes</td>
<td>Strong</td>
<td>Part of BI</td>
</tr>
<tr>
<td>Marketing Research</td>
<td>Yes</td>
<td>Information from environment about firms marketing plans</td>
<td>Marketing Research Process</td>
<td>Yes</td>
<td>Strong</td>
<td>Narrow, but touches on other approaches</td>
</tr>
<tr>
<td>Information Management</td>
<td>Yes (to some extent)</td>
<td>Prime focus on management of IT but also info policy planning, info systems, info flows</td>
<td>N/A</td>
<td>Yes and No</td>
<td>Strong</td>
<td>Broad, contains information systems</td>
</tr>
</tbody>
</table>

Fig. 5. Comparison of the different information processing approaches.
subgroups Competitive, Competitor, Market, and Political intelligence all seem to be based around the intelligence cycle, described by Ashton and Stacey (1995), Collins (1997) and Lagerstam (1988) among others. The cycle may vary from author to author, but the basic idea remains the same. The intelligence cycle is described in page 5 in the report. Marketing research is based on the Marketing research process, described in page 7. It is worth to note that the Marketing research process can be cyclical; provided results and recommendations may trigger new problems or opportunities, thus starting the process all over again. But the process may also be carried out just on a one-time basis. In contrast, the intelligence cycle describes a continuous activity; a never-ending process oscillating between search and decision (Hamrefors, 1999).

Information management is not, based on our limited research, based on a certain common methodology. This might be due to the fact that the IM approach is focused more on infrastructure, and that the IM approach is more diverse than for example Marketing research. Moreover, most of the approaches appear not to be able to avoid the consideration of the processing of information in one way or the other, i.e. making information *ennobled*. In the Environmental scanning approach, the issue of information processing is not addressed explicitly. However, Augilar (1967) talks about purposeful search for information, which can be interpreted as separating important information from less important. In the different intelligence approaches (Business, Competitive, Competitor, Market and Political intelligence), ennobling of information is central. Intelligence usually indicates an interpretation of environmental events, rather than sheer information. Intelligence is actionable, processed and organized information (Barndt, 1994). When information is transferred into something that makes sense it is often called intelligence (Weick, 1995). Marketing research, too, is concerned with ennobling of information. It involves, among other things, interpretation of information (Kumar et al., 1999), and so is Information management, to some extent. Information processing is considered a central theme, and is viewed as doing something to information to make it into something else (O’Brien, 1995).

Further, all approaches have strong ties to decision-making. The dependence of decision-making becomes apparent as soon as one examines the various steps of the decision-making process, according to Augilar (1967). The tie to decision-making is also apparent in Duncan’s (1972, see p. 3) definition of environment. Business intelligence, as well as the other intelligence approaches, is tied to decision-making too. The aim of BI is to generate insight into future developments as decision support in organizations (Svensson-Kling, 1999) or as Hamrefors (1999) puts it, the purpose of BI is to proactively support information to decision-makers for their actions. Ashton and Stacey (1995) has similar thoughts and thinks that once developed and disseminated, intelligence results are applied or used in some way to affect organizational decisions or actions. This is not surprising since adequate information is a prerequisite for rational decision-making. The Marketing research approach is also strongly tied to decision-making. Churchill (1999) claims, for example, that effective decision-making depends on the quality of the information input, and that Marketing research plays an essential role in providing accurate and useful information. Finally, Information management is concerned with decision-making too. Rowley (1998) claims, for example, that IM is a means for controlling the information explosion and the resultant increasing complexity of decision-making by improving the flow, the control, the analysis and the synthesis of information for decision-makers.

Finally, each approach has a distinct scope, marking the boundaries or frame of the approach. Environmental scanning has a broad scope, and contains the approach of Business intelligence
within its scope. The approach of Business intelligence, in turn, contains all the other intelligence terms or approaches within its scope. The scope of Information management can also be said to be broad, and contains within its boundaries the term information systems. With regard to some issues, for example the purpose of making information ennobled and future orientation, these two approaches touches on each other in terms of scope. Marketing research might also be related to these two in terms of scope, since there might be similarities with, for example, Marketing intelligence (Walle, 1999) and Information management in terms on ties to decision-making.

5. Discussion and comments

As we have shown, there are many similarities between the different information processing approaches described and compared in this report. As can be seen from Fig. 5, the main difference is in their focus and scope. The approach that deviates most from the others is Information management with a strong emphasis on information technology and systems. It has to be emphasized though that if other characteristics had been chosen for comparison, the result may have been completely different.

It is also important to remember that different terms or approaches are defined and described differently by different authors. In this report, we have sometimes implicitly assumed that all authors within an approach using the same term also share the same ideas with regard to the underlying concept and course of events. This is not necessarily true, even if there seems to be some kind of consensus with regards to what the terms used means and represents. With regard to
the term MIS we did not find that consensus, and therefore we excluded that term. Much more can be said and criticized with regard to the contents in this paper; it is far from complete. But hopefully it contributed with at least something more than easing up the knots in our minds a bit. Finally, a figure trying to position the different terms in relation to the others in terms of scope is provided, just to visually show how we perceive the approaches (Fig. 6).

The point is to visually show that these approaches are not considered completely separated from each other in terms of their focus; rather, there are significant overlaps between the different approaches described.

Acknowledgements

Thanks to Professor Sven-Åke Hörte and to Pär Lager for valuable comments.

References


Johan Frishammar holds a M.Sc. degree in Business & Economics from Luleå University of Technology, and is currently a Ph.D. student at Halmstad University. His research focuses on the link between information and competitive advantage.