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How Senior Executives Think and Work:

Implications for the Design

of Executive Information Systems

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Abstract

How do senior executives think ? Where do they get their information from ? What strategies do they use in learning about their organisational environments ? Which information media do they prefer to use ?

Finding answers to these questions is fundamental in helping us understand how to build Executive Information Systems (EIS). This paper reviews the literature on senior executive work and decision making before presenting some practical guidelines for the design and implementation of high level executive information systems.

Keywords

Executive Information Systems, Executive Support Systems, CEOs, Senior Executive Decision Making, Environmental Scanning

1. Introduction

It has been suggested that computer-based management information systems are not very useful to managers (Ackoff 1967, Dearden 1972, Dearden 1983, Grayson 1973). The claim is that managers, especially those at senior levels, live in a world which is largely unpredictable, unstructured and not very receptive to computer support.

However, this picture is changing. Recent developments in hardware and software, have seen the arrival of what can loosely be referred to as Executive Information Systems (EIS). These systems are specially designed for senior executives by providing a variety of information for managing the organisation (Rockart and DeLong 1988). Executive Information Systems have had a short but chequered history. Some have reported great successes [see Lockheed Georgia's MIDS in Houdeshel and Watson and Phillips 66 Company in Applegate], while still other reports estimate that up to 50 percent of EIS projects fail (Burkan 1989).

Mintzberg (1989), suggests that many information systems fail because they do not deliver the information managers really need to perform their jobs. He believes that information systems designers are more concerned with technology and fitting data to their hardware than with understanding the real information needs of senior executives.

From the Information Systems professional's perspective, the heart of the problem seems to be the lack of an overall conceptual framework for understanding how executives work, how they use information, and how a computer based system might fit into this scheme.

The purpose of this paper is to go some way towards providing such a framework by reviewing the literature on executive work. This shall help us to focus on some of the important issues to consider when designing executive information systems. Hopefully, future systems can be built which meet the information needs of senior executives.

2. Why are senior executives different from other knowledge workers?

The first question which we need to address, is why are senior executives so special? A number of studies have attempted to answer this question by systematically studying the behaviour of senior executives.

One of the earliest studies was that of Sume Carlson (1951) where she looked at senior executives from nine Swedish companies. The executives recorded in a diary where they worked, who they contacted, how they communicated, what kind of activity they engaged in, and what actions they took. Carlson interpreted these self-reports and concluded that unlike other knowledge workers in 1951, senior managers seem to have little control over how they spend their time.

Rosemary Stewart (1967), also using a diary method to study senior executives in the UK, agreed with the Carlson study and supported the finding that executives' jobs are very fragmented. Stewart found that managers must attend sequentially to many different

people and problems, and they seemed to have little control over when and to whom they must attend.

While both the Carlson and Stewart studies were concerned with recording what managers actually did during their working days, they did not put forward any conceptual models which we could use in the design of information systems.

Henry Mintzberg (1975) conducted a study to find out what senior executives really do. The research is based on the synthesis of existing work as well as Mintzberg's own study of 'shadowing' five CEOs using a technique of structured observation for one intensive week. The method was designed to capture data on both the work characteristics and job content of the executives.

Mintzberg's basic contention is that the way we think about the work of senior managers is wrong. Since the turn of the century, with the work of Henry Fayol, we have believed that managerial work can be broken into four activities : planning, organising, coordinating or controlling. After performing his research, Mintzberg concludes that the Fayol model is not an good way to view managerial work and suggests an alternative framework.

The 'roles' model which Mintzberg developed is based on the premise that the senior executive is distinguished from other knowledge workers by having vested formal authority over their organisations. This authority leads the executive into unique interpersonal situations, and these in turn grant the executive access to a wide range of privileged information. These two roles combined (interpersonal and informational) enables the executive to make important decisions which their colleagues are ill-informed to make.

The key to understanding Mintzberg's model is that each of these roles are interdependent and cannot be viewed in isolation. The model suggests that senior executives because of their status, have access to a large amount of information. They need to be able to share this information with their colleagues so that important signals are sent throughout the organisation. Successful executives are able to divide up these roles without losing the integration between them.

Mintzberg observed that top managers are the nerve centers of an information network. Managers have extensive contacts both within and outside the organisation. They are plugged into channels for rumour and gossip, and are surrounded with formal information systems that provides periodic summaries and analyses of organisational activities.

Mintzberg found that the executives he studied spent over eighty percent of their time communicating.

While Mintzberg's work has made a major contribution in helping us to understand the nature of executive work, his research methodology has been strongly criticised. Most of the arguments revolve around the degree of observer bias and low confidence in the external validity of the study. However, Kurte and Aldridge (1983) used the structured observation technique supplemented by unstructured interviews on four top managers for a

one week period. They found that the results of Mintzberg's field study are replicated in all important respects.

3. How do senior executives think ?

The common image of a senior executive is someone who sits in his/her office making decisions in a systematic and rational manner. But how accurate is this image ?

In a study of what senior managers think and how they think Isenberg (1984) found that against conventional wisdom effective managers do not conform to the rational model of first clarifying goals, assessing the situation, formulating alternatives, estimating the likelihoods of success, making their decisions, and only then taking action to implement these decisions. Nor do top managers select one problem at a time to solve, as the rational model implies.

Isenberg discovered that successful executives rely heavily on a mix of intuition and disciplined analysis in their decision making.

Two findings about the way senior managers do not think stand out from the study. First, it is hard to pinpoint if or when they actually make decisions about major business or organisational issues. Second, they seldom think in ways that one might simplistically view as 'rational'.

3.1 The concept of Mental Models

Several recent studies have explored the concept of mental models (Mintzberg 1973, Kotter 1982, Isenberg 1984) in the hope of discovering why some executives are more effective than others. For example, Treacy (1985) examined the use of models in corporate decision making noting that very few explicit, formal models are built or used by senior executives. Executives are more likely to use informal, mental models for planning and control. This trend was also identified by Mintzberg (1973), when he observed that "managers identify decision situations and build mental models not with the aggregated, historical abstractions that a formal management information system provides but with specific tidbits of informal or soft data".

The idea of a mental model is central to the design of Executive Information Systems. Each of us have our own mental models which help us understand the world around us. The quality of our decision making is strongly influenced by the quality of the models within our heads.

Perhaps the best way to illustrate how an executive might use a mental model to understand his/her organisation is to quote Bob Wallace, President of Phillips 66, a large US Petroleum company (in Applegate 1988).

" ... During World War 1, I was an antiaircraft gunner in the Navy. I used binoculars to sight enemy planes - sweeping all areas of the horizon, watching for evidence of incoming

enemy fighters. At first I was overwhelmed by the vastness of the sky and the speed of the aircraft. My supervisors taught me to take mental snapshots - glancing at different parts of the sky, looking for specific characteristics that distinguish enemy planes from friendly ones. Managing Phillips 66 is very similar ..."

Isenberg (1984), observes that the all managers have mental maps of the problems and opportunities facing them. The map is neither static nor permanent; rather, executives continually test, correct and revise it. It therefore follows, that by enhancing the mental map of executives through the delivery of quality information, the opportunity exists for improved executive decision making.

3.2 The concept of "Thinking/Action" Cycles

The rational model also assumes that the decision maker acts in a way where information about an important decision is gathered and then some reflection takes place. After 'considering the options' a choice is made and the selected course of action is implemented.

The literature has shown that in practice very few executives operate in this way. For most executives, "thinking" is inseparable from "acting". Isenberg (1984) proposes the idea of "thinking/acting cycles" to explain this behaviour. Analysis, Isenberg claims is not a passive process but a dynamic, series of activity and reflection. One of the most important implications of the "thinking/acting" concept is that action is often part of defining the problem, not just implementing the solution.

In another study, Kotter (1982) found that rarely do executives make decisions ; rather they are more concerned with setting and managing agenda items within their organisations. Many successful executive, in fact, operate almost in a mode of anti-decision by asking probing questions and raising issues to key organisational participants (King 1985).

4. The sources of executive information

Just where do senior executives get their information from ? What is the process they use to learn about their environments ? Which sources are the most highly valued ? Which sources do executives prefer ? These are the questions which this section of the paper will address.

It has been well established that there is a direct relationship between the quality of information used by decision makers and their decision making performances (O'Reilly 1982). Among the many studies attempting to measure the concept of 'quality' of information, Zmud (1978) has proposed that the dimensions of relevance, reliability, timeliness, completeness and readability are important in influencing an executive's perception of information quality. It has also been demonstrated, that even for high quality information, too much information past some optimal point can actually lead to decreased decision making performance (O'Reilly 1980, Parsons 1989).

4.1 The Internal/External Split

MIS texts generally agree that top-level executives require information which is externally orientated in order to perform the tasks associated with their position. The literature has broad support for this conceptualisation, claiming that external information becomes more important at higher levels in the organisation (Anthony, Dearden and Bedford 1984, El Sawy 1985, Keegan 1974).

In one study of the sources of information used by executives, Jones and McLeod (1986) found that a large proportion of senior executive information comes from the environment and was divided equally between people and organisational sources. However, information gathered from persons in the environment was valued more highly than information originating from within the organisation. An earlier study by Blandin and Brown (1977), also reported that, as the perceived uncertainty of the environment increased, managers relied more heavily on external and informal/personal sources of information.

With regard to internal information sources, Jones and McLeod (1986) concluded that the senior executives they studied obtained most information from subordinate levels closest to them. The executives liked to work with subordinates one or two levels down from them ; with thirty percent of all information transactions originating from these level.

These finding are important for designers of executive information systems as they suggest that senior executives need to be plugged into external informal sources of information. Information systems of this kind present the information systems professional with new problems and challenges.

4.2 Environmental Scanning

In the proceeding sections we have discovered that building up interpretations about the organisation and its environment (either through internal or external information sources) is a basic activity performed by senior executives. An important question, is how do senior executives learn about their environments ? In the literature, this activity is know as environmental scanning.

Environmental scanning refers to the acquisition of information about events, trends and relationships in an organisations environment, the knowledge of which would be of assistance to the top executive in identifying and understanding strategic threats and opportunities (El Sawy 1985 p.53).

Environmental scanning is the means through which top managers perceive external events and trends. Scanning represents a difficult organisational problem because the environment is vast and complex, and managers experience bounded rationality - they cannot comprehensively understand their environment.

El Sawy (1985) attempted to understand the strategic scanning behaviour of CEOs in order to provide some guidelines for designing computer-based systems for supporting and

enhancing this scanning process. He concluded that CEOs are very systematic scanners when it comes to strategic information, and that their information sources are limited, mostly personal, and external to the organisation. The CEOs considered their scanning activities so important, that they did not delegate it to subordinates.

El Sawy also discovered that executives scanned for two types of information. First, specific strategic information which would be used directly to identify organisational threats and opportunities, and secondly, "cognitive accommodation" or "wisdom increasing" information which would provide background support for their own mental models.

In another study, Daft, Sormunen and Parks (1988) reported that chief executives in high performing companies scanned more frequently and broadly in response to strategic uncertainty than their counterparts in low-performing companies. The study also showed that chief executive scanning in high performing firms was characterised by careful tailoring of scanning to perceived strategic uncertainty compared to chief executives in lower-performing firms.

5. Information delivery mechanisms

Several studies have demonstrated that senior executives place little reliance on formal information sources, preferring instead to deal with issues in an informal, face-to-face manner where possible (Mintzberg 1973, Ives and Olson 1981, Daft and Lengal 1984, McLeod, Jones and Poitevent 1984, Jones and McLeod 1986, Jones, Saunders and McLeod 1989, Tyler, Bettenhausen and Daft 1989).

One of the most interesting models to explain this behaviour is the Daft-Lengal (1984) framework of information richness. Different media have different capacities of richness. For example, a manager may prefer to deal with a subordinate face-to-face (high richness) rather than by telephone (medium richness) because important signals such as facial expression and body language may be lost over a phone.

In the Daft/Lengal framework, face-to-face communication is the most information rich media, followed by audio-video, audio only and then written media. Face-to-face is the richest form of information processing because it provides immediate feedback. With feedback, understanding can be checked and interpretations corrected. The face-to-face medium also allows the simultaneous observation of multiple cues, including body language, facial expression and tone of voice, which convey information beyond the spoken message.

The telephone medium is somewhat less rich than face-to-face. Feedback capability is fast, but visual cues are not available. Written communication is less rich still. Feedback is slow. Only the information which is written down is conveyed so cues are limited to that which is on paper. Formal numeric documents are lowest in information richness because they provide no opportunity for visual observation, feedback or personalisation.

According to Daft, Lengal and Trevino (1987), the medium which an executive will select is based on the medium's ability to reduce uncertainty and equivocality.

Uncertainty represents a lack of information regarding events. Equivocality refers not to a lack of information, but to an ambiguity with information, i.e. multiple and conflicting interpretations about some organisational situation. Equivocality reduction, rather than uncertainty reduction, preoccupies senior executive information processing.

When equivocality is high, the need exists for rapid information exchange between executives. Assumptions, scenarios and outcomes are discussed until some common view is reached or at least approached. As a result, increased emphasis is placed on the role of informal, typically face-to-face, information systems and on the use of soft rather than hard information (Brookes 1985).

This model begins to explain why top managers make little use of formal information systems and could go some way towards answering arguments that formal information systems are not very useful for senior executives.

6. Some implications for EIS design

Now that we have reviewed some of the literature on senior executive work, decision making and information sourcing behaviour, it should be possible to make a number of tentative statements regarding the design of executive information systems.

First, an EIS needs a different design approach from that applied in the building of conventional information systems. Executive information needs are hard to define, unpredictable and subject to change at very short notice. Furthermore, senior executives rarely make decisions under the rational model ; they seem to acquire most of their important information through a process of environmental scanning. This suggests that our design paradigms for information systems need to be revisited.

Second, senior executives need to be able to communicate with other organisational members, not only to source information but also to disseminate information which they have been privileged to access. This would suggest that, to be effective, a 'critical mass' of senior executives would need to be on-line before the EIS could be adopted in the organisation.

Third, the purpose of an EIS should be to enhance the executives' mental models of their organisations. These mental models, or images that are projected on the executive brain, guide the executive in their day to day decision making behaviour. Therefore, a prerequisite to building executive information systems would be to analyse how individual executives construct their personal models. Are some executives more graphical than others ? How much information is too much ? What level of accuracy is needed ? Which information sources provide this executive with the greatest value ? These questions need to be answered prior to the delivery of screens on desks.

7. Conclusion

Finally, we as researchers have only begun to understanding how senior executives operate. The task ahead seems daunting, indeed, some would say impossible. However, if we are to provide information systems that are useful for senior executive, then the only way we shall succeed is by coming to grips with how senior executive really think and work.

REFERENCES

- Ackoff, R. L., Management Misinformation Systems, *Management Science*, pp. B147-B156, Vol 14, No 4, Dec 1967.
- Anthony, Robert N., Dearden John and Bedford Norton M., *Management Control Systems*, 5th Edition, Richard D. Irwin Inc., Homewood, Illinois, 1984.
- Applegate, Lynda M., Phillips 66 Company: Executive Information System, Case Study No 9-189-006, Boston, Mass., Publishing Division, Harvard Business School, 1988.
- Blandin, J. S. and Brown W. B., Uncertainty and Management's Search for Information, *IEEE Transactions on Engineering Management*, pp. 114-119, 1977.
- Brookes C. H. P., A Framework for DSS Development, *Proc. International Conference on Decision Support Systems*, San Francisco, California, pp. 80-97, The Institute of Management Sciences, Providence, RI, 1985.
- Burkan, Wayne C., Wringing Every Last Dollar from Your EIS/DSS, *Proc. Ninth International Conference on Decision Support Systems*, San Diego, California, George Widmeyer (Ed.), pp. 5-10, The Institute of Management Sciences, Providence, RI, June 1989.
- Carlson, Sune, *Executive Behaviour : A Study of the Work Load and Working Methods of Managing Directors*, Strombergs, Stockholm, 1951.
- Daft, Richard L. and Lengal Robert H., Information Richness: A New Approach to Manager Information Processing and Organization Design, in *Research in Organization Behaviour*, eds. B. Shaw and L. L. Cummings, Vol 6, pp. 191-233, Greenwich, Conn., JAI Press, 1984.
- Daft, Richard L. and Lengal Robert H., Organizational Information Requirements, Media Richness and Structural Design, *Management Science*, pp. 554-571, Vol 32, No 5, May 1986.
- Daft, Richard L., Lengal Robert H. and Trevino Linda Klebe, Message Equivocality, Media Selection and Manager Performance: Implications for Information Systems, *MIS Quarterly*, pp. 354-366, Vol 11, No 3, Sept 1987.
- Daft, Richard L., Sormunen Juahani and Parks Don, Chief Executive Scanning, Environmental Characteristics and Company Performance : An Empirical Study, *Strategic Management Journal*, pp. 123-139, Vol 9, No 2, Mar-Apr 1988.
- Davis, David, SMR Forum : Computers and Top Management, *Sloan Management Review*, pp. 63-67, Vol 24, Spring 1984.
- Dearden, John, MIS is a Mirage, *Harvard Business Review*, pp. 90-99, Vol 50, No 1, Jan-Feb 1972.
- Dearden, John, SRM Forum: Will The Computer Change the Job of Top Management ?, *Sloan Management Review*, pp. 57-60, Vol 25, No 1, Fall 1983.
- El Sawy, O. A., Personal Information Systems For Strategic Scanning in Turbulent Environments : Can The CEO Go On-Line ?, *MIS Quarterly*, pp. 53-60, Vol 9, No 1, Mar 1985.
- Grayson, C. J. Jr, Management Science and Business Practice, *Harvard Business Review*, pp. 41-48, Vol 51, No 4, Jul-Aug 1973.
- Houdeshel, George and Watson Hugh J., The Management Information and Decision Support System (MIDS) at Lockheed-Georgia, *MIS Quarterly*, pp. 126-140, Vol 11, No 1, March 1987.

- Isenberg, Daniel J., How Senior Managers Think, *Harvard Business Review*, pp. 81-90, Vol 62, No 6, Nov-Dec 1984.
- Ives, Blake and Olson M. H., Manager or Technician? The Nature of the Information Systems Manager's Job, *MIS Quarterly*, pp. 49-63, Vol 5, No 4, 1981.
- Jones, Jack William and McLeod Jr. Raymond, The Structure of Executive Information Systems: An Exploratory Analysis, *Decision Sciences*, pp. 220-249, Vol 17, No 2, Spring 1986.
- Jones, J. W., Saunders C. and McLeod R. Jr., Information Media and Source Patterns Across Management Levels : A Pilot Study, *Journal of Management Information Systems*, pp. 71-84, Vol 5, No 3, 1989.
- Keegan, W., Multinational Scanning: A Study of the Information Sources Utilised by Headquarters Executives in Multinational Companies, *Administrative Science Quarterly*, pp. 411-421, Volume 19, 1974.
- King, William R., Editor's Comment : CEOs and their PCs, *MIS Quarterly*, pp. xi-xii, Vol 9, No 3, 1985.
- Kotter, John P., What Effective General Managers Really Do, *Harvard Business Review*, pp. 156-167, Vol 60, No 6, Nov-Dec 1982.
- Kurke, L. B. and Aldrich H. E., Mintzberg Was Right : A Replication and Extension of The Nature of Managerial Work, *Management Science*, pp. 975-984, Vol 29, No 8, August 1983.
- McLeod, Jr. Raymond, Jones William Jack and Poitevent J. L., Executives Perceptions of Their Information Sources, in *Transactions of the Fourth Conference on Decision Support Systems*, Edited by Zmud R W, Dallas, Texas, pp. 2-14, April 1984.
- McLeod, Jr. Raymond and Jones William Jack, A Framework for Office Automation, *MIS Quarterly*, pp. 86-104, Vol 11, No 1, March 1987.
- Mintzberg, Henry, *The Nature of Managerial Work*, Harper & Row, New York, 1973.
- Mintzberg, Henry, Manager's Job: Folklore and Fact, *Harvard Business Review*, pp. 49-61, Vol 53, No 4, Jul-Aug 1975.
- Mintzberg, Henry, *Mintzberg on Management : Inside Our Strange World of Organisations*, The Free Press, New York, 1989.
- O'Reilly, C. A., Individual and Information Overload in Organisations : Is more Necessarily Better ?, *Academy of Management Journal*, pp. 684-696, Vol 23, 1980.
- O'Reilly, C. A., Variations in Decision Makers' Use of Information Sources : The Impact of Quality and Accessibility of Information, *Academy of Management Journal*, pp. 756-771, Vol 25, 1982.
- Parsons, Andrew, Better Data, Worse Decisions ?, *Information Strategy : The Executive's Journal*, pp. 20-24, Vol 5, No 4, Summer 1989.
- Rockart, John F. and De Long, David W., Moments of Executive Enlightenment, *Information Strategy : The Executives Journal*, pp. 21-27, Vol 5, No 1, Fall 1988.
- Rockart, John F. and De Long David W., *Executive Support Systems: The Emergence of Top Management Computer Use*, Dow Jones-Irwin, Homewood, Illinois, 1988.
- Stewart, Rosemary, *Managers and Their Jobs*, Macmillan, 1967.
- Treacy, Michael E., Supporting Senior Executives' Models for Planning and Control, Working Paper No. 125, Center for Information Systems Research, Sloan School of Management, MIT, Cambridge, Mass., June 1985.
- Tyler, Beverly B., Bettenhausen, Kenneth L. and Daft, Richard L., The Use of Low and High Rich Information Sources and Communication Channels in Developing and Implementing Competitive Business Strategy, *Academy of Management Best Papers Proceedings*, pp. 245-249, 49th Annual Meeting, Washington, 1989.
- Zmud, Robert W., An Empirical Investigation of the Dimensionality of the Concept of Information, *Decision Sciences*, pp. 187-195, Vol 9, No 2, 1978.