Executive Information Systems Literature (1983-1992): A Survey

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Abstract

Since its first appearance in the late 1970s and early 1980s, executive information system (EIS) has been reported to improve executives' productivity in line with the rapid growth of the EIS market. In this paper, we aim to provide both researchers and practitioners with a comprehensive bibliography on EIS. This bibliography consists of papers which were extracted from (1) INSPECT commercial database service, (2) previous surveys in books and journals, and (3) major conference proceedings. A total of 227 papers, published between 1983 and 1992, were identified and categorized by topic, and journal or conference. The major findings indicate that EIS has been widely used in both profit oriented organizations and non-profit oriented organizations and that the nature of system has been the most active topic among the researchers and practitioners. However, the survey suggests that further research should be focused on development and implementation methodologies of EIS, especially requirement analysis and EIS planning.

I. Introduction

Advanced information technology (IT) has contributed to a wide use of computer in business administration area and changed the business environment significantly. The most prominent change is that top managements, who once have been regarded as computer-illiterate, have been willing to use computers in their major tasks without difficulties with the emergence of executive information systems (EIS). EIS no longer requires special trainings or keyboard skills from top managements to use. Furthermore, the number of companies which developed their own EISs is growing rapidly since its first appearance in the late 1970s and early 1980s. For example, International Data Corporation, one of the major market research firms, reported that the U.S. market for EIS is growing at a compound annual rate of 40 percent [1].

The objective of this paper is to give an overview of what is currently happening in this important area. After introducing major characteristics of EIS, papers on EIS published in journals and conferences between 1983 and 1992 are classified based on their topics. Comprehensive bibliography also provides

both researchers and practitioners with an atlas of EIS research and development directions.

II. Methodology

2.1 What is EIS

EIS has been regarded as an information system for top managements. Typical definitions of EIS are as follows.

"Executive information system refers to a computer-based system specifically designed to meet the needs of top executives and to eliminate the need for intermediaries [2]."

"Executive information system is a computer-based information delivery and communication system which supports the needs of top managers [3]."

"Executive information system is a computerized system that provides executives with easy access to internal and external information that is relevant to their critical success factors [4]."

When referring to information systems for top managements, several other terms are also used. Rockart and Treacy [5] reported that top managers had become to use computers in their daily activities widespreadly and defined an information system for executives as executive information support system (EISS). Later in 1988, Rockart and De Long [6] coined an executive support system (ESS) to refer an information system for top managers.

"Executive support system (ESS) is the routine use of a computer-based system, most often through direct access to a terminal or personal computer, for any business function. The users are either the CEO or a member of the senior management team reporting directly to him or her. Executive support systems can be implemented at the corporate or divisional level [6]."

We adopted Watson and others' definition [4] in this survey and used EIS and ESS interchangeably because there was little difference between them.

2.2 How to classify

Based on the above-mentioned definition, we collected papers in two ways. First, we used 'INSPEC', the commercial database services. Then, we conducted manual compilation in order to complement the survey. During this process, 38 IS and IS-related journals in [7] were referenced.

Then, we classified the papers based on the following criteria.

(1) Case Study: papers reporting the application of a specific company or industry. The case studies are further divided into 2 sub-categories: those for profit oriented organization and those for non-profit oriented organization.

The profit oriented organization and the non-profit oriented organization consist of 7 and 4 sub-areas, respectively.

(2) Theory: papers discussing general conceptual theme, development and implementation methodology without concerning a specific company or industry. The theory is also divided into 2 sub-categories: those for conceptual theme and those for development/implementation methodology. The conceptual theme and the development/implementation methodology have 5 sub-areas, respectively.

(3) EIS Package: papers introducing the package for EIS development.

During the categorization, we excluded the papers which had only abstract or which did not deal with EIS specifically. Each author read abstracts of papers and discussed the classification. When conflicts occurred among authors, authors read the full paper. As a result, a total of 227 papers were analyzed.

III. Discussion

The classification by topics is summarized in Table 1. While the number of papers on theory amounted to 145, accounting for 63.8% of total surveyed papers, that of papers on case study and on EIS package introduction took 72 (31.7%) and 10 (4.4%), respectively. This indicates that EIS is in still young and developing stage in information system area.

<Table 1 to be inserted>

Before starting the survey, we assumed that the beneficiaries from EIS would be mainly profit oriented organizations. The findings, however, indicate that EIS is used widely in non-profit oriented organizations as well as in profit oriented organizations. Among 72 cases surveyed, 27 cases were reported on non-profit oriented organization. In particular, it is interesting to note that the healthcare area (12 cases) enjoys EIS. Finance area (9 cases) including banks and insurance companies, machinery area (7 cases) such as manufacturer of aircraft equipments, and government area (7 cases) are also main users of EIS.

Meanwhile, papers on nature of system (39 papers) such as attributes or characteristics of EIS are most active topics to researchers and practitioners, followed by those on impact of EIS (24 papers) and those on nature of user and his/her works (23 papers). Compared with active research on conceptual theme, research on development/implementation methodology proved to be relatively less discussed yet. In particular, only 4 papers are discussing requirement analysis for EIS.

Table 2 shows the classification by journal and conference. Journal papers accounted for 68.7% of total surveyed papers, while conference papers took 31.3% of total surveyed papers.

<Table 2 to be inserted>

International Conference on Decision Support Systems (DSS-xx Transactions) and annual Hawaii International Conference on System Sciences (HICSS) are major conferences for EIS researchers and practitioners to attend. 41 papers are presented in DSS-xx Transactions, and 13 papers are presented in HICSS, which accounted for 76.1% of total conference papers. For journal paper, Computerworld ranked first with 15 papers. MIS Quarterly (8 papers), Computers in Healthcare (8 papers), Information Week (6 papers), and Journal of Information Systems Management (5 papers) also contributed to wide spread use of EIS. Besides them, 56 journal published at least 1 paper. This indicates that we need an EIS specific practitioner publications.

V. Conclusions

Based on our subjective criteria 227 journal and conference papers are classified. The survey says further research should be focused on development/implementation methodology for EIS, in particular, requirement analysis and EIS planning.

Although this is by no means an exhaustive survey, the current available amount of literature indicates the surge of the recent interest in this topic. The comprehensive bibliography (See Appendix) provides a focus and source of up to date information on the developing field of EIS with practitioners as well as researchers.

- References -

[1] ALEXANDER, M. (1989). "Executive information systems catch on," Computerworld, February 27, pp. 31.

[2] TURBAN, E. and SCHAEFFER, D.M. (1987). "A comparative study of executive information systems," in DSS-87 Transactions, pp. 139-148.

[3] PALLER, A. and LASKA, R. (1990). The EIS Book. Homewood: Dow Jones-Irwin.

[4] WATSON, H.J., RAINER, R.K., JR. and KOH, C.E (1991). "Executive information systems: a framework for development and a survey of current practices," MIS Quarterly, 15(1), pp. 13-30.

[5] ROCKART, J.F. and TREACY, M.E. (1982). "The CEO goes on-line," Harvard Business Review, 60(1), pp. 32-88.

[6] ROCKART, J.F. and DE LONG, D.W. (1988). Executive Support Systems, The Emergence of Top Management Computer Use. Homewood: Business One Irwin.

[7] GILLENSON, M.L. and STUTZ, J.D. (1991). "Academic issues in MIS: journals and books," MIS Quarterly, 15(4), pp. 447-452.

Appendix: Bibliography of EIS (1983-1992)

1. Case Study

1.1 Profit Oriented Organization

1.1.1 Finance Area

[1] CHUN, W.C. (1991). "Executive information systems: an application scenario in retail banking," Information Services & Use, 11(4), pp. 213-224.

[2] FEDOROWICZ, J. and GUINAN, P.J. (1991). "Information acquisition behavior: a pilot study of EIS users," in DSS-91 Transactions, pp. 33-43.

[3] FRIEND, D. (1989). "Insurance for management," Insurance Software Review, 14(3), pp. 92-96.

[4] JAMES, B. and PHILIPPAKIS, A. (1992). "Toward the total quality executive information desktop: design of an enterprise wide EIS at security corporation," in DSS-92 Transactions, pp. 10-20.

[5] KADOR, J. (1988). "Executive information system moves NatWest USA beyond spreadsheets," Computers in Banking, 5(9), pp. 66-68.

[6] KUEHN, R. and FLECK, R.A., Jr. (1991). "Implementing an EIS in a large insurance corporation," Journal of Systems Management, 42(1), pp. 6-11,17.

[7] MCLEOD, M. (1990). "A new line in executive toys (EIS)," Banking Technology, pp. 36-39.

[8] STANAT, R. (1986). "Building a document-based competitive intelligence system," in DSS-86 Transactions, pp. 60-64.

[9] VOLONINO, L. and ROBINSON, S. (1990). "The experiences of Marine Midland Bank in sustaining an EIS," in DSS-90 Transactions, pp. 164-172.

1.1.2 Machinery Area

[10] APPLEGATE, L.M. (1987). Lockheed-Georgia company: executive information systems (Harvard Case 9-187-135). Harvard Business School, Boston, MA.

[11] ARMSTRONG, D.A (1990). "How Rockwell launched its EIS," Datamation, 36(5), pp. 69-72.

[12] EVANS, W.F., GRAY, P. and RHODES, J.E. (1989). "Executive information systems for manufacturing: a case study," in DSS-89 Transactions, pp. 46-52.

[13] FIDELIO, J. (1986). "EIS evolution: Polaroid system poised to enter the CEO's office," Computerworld, 20(43), pp. 45,51.

[14] HOUDESHEL, G. (1990). "Selecting information for an EIS: experiences at Lockheed-Georgia," in 23rd HICSS, pp. 178-185.

[15] HOUDESHEL, G.(1987). "The management information and decision support (MIDS) system at Lockheed-Georgia," MIS Quarterly, 11(1), pp. 127-140.
[16] RUNGE, L. (1990). "Prototyping the G.E. aerospace executive information system: a case history," in DSS-90 Transactions, pp. 203-204.

1.1.3 Chemical Area

[17] APPLEGATE, L.M. and OSBORN, C.S. (1988). Phillips 66 companies: executive information systems (Harvard Case 9-189-006). Harvard Business School, Boston, MA.
[18] BOWAN, R. (1990). "Chevron's executive information system: the rise of executive computing in Chevron," in DSS-90 Transactions, pp. 11-12.
[19] BRODY, H. (1988). "Computers invade the executive suite," High Technology Business, 8(2), pp. 41-45.
[20] GLEASON, R.,MICHAUD, R. and AKKOOR, R. (1989). "Domestic pharmaceutical marketing EIS application for Upjohn company," in DSS-89 Transactions, pp. 29-32.
[21] NEIL, B. (1990). "Benefits of computerized business management," Business Quarterly, 55(1), pp. 114-117.
[22] SCHENK, K.D. and VITALARI, N. (1990). "User initiation and participation in the implementation of an executive information system: a case study," in DSS-90 Transactions, pp. 173-185.

1.1.4 Electronics Area

[23] POTTS, D. (1989). "Remote access brings color to management information," ICL Today, 5(2), pp. 32,34-35.
[24] SCHENK, K.D. and HOLZBACH, R.L. (1992). "How HuRBIE changes information gathering at Westinghouse: a human resources EIS," in DSS-92 Transactions, pp. 21-33.
[25] SCHMIDHAUSER, F.J. (1990). "Pilot at Sony: information without wait-days," Office Management, 38(6), pp. 70-72.
[26] SUNDUE, D.G. (1986). "GenRad's on-line executives," in DSS-86 Transactions, pp. 14-20.
[27] WATERS, K.M. (1990). "ESS/DSS technology and strategic management," in DSS-90 Transactions, pp. 28-40.
[28] WATERS, K.M (1984). "Executive information system gives quick access," Computerworld, 18(22), pp. 63.

1.1.5 Telecommunication Area

[29] CARROLL, C. and LARKIN, C. (1992). "Executive information technology: a strategic necessity at Motorola Codex," Information Systems Management,

9(3), pp. 21-29.
[30] DUGAN, M. (1990). "Meeting a competitive challenge: upgrading computer resources at Grumman Data Systems," Industrial Management, 32(5), pp. 21-23.
[31] HALE, D.P., HASEMAN, W.D. and GROOM, F. (1989). "Integrating islands of automation," MIS Quarterly, 13(4), pp. 435-445.

1.1.6 Transportation Area

[32] COTTRELL, N. and RAPLEY, K. (1991). "Factors critical to the success of executive information systems in British Airways," European Journal of Information Systems, 1(1), pp. 65-71.
[33] Execucom Systems Corporation (1990). "Executive information streamlines Greyhound Dial's operations," in Executive Information Systems: Emergence, Development, Impact (H.J. Watson, ed.), pp. 337-342
[34] O'LEARY, M. (1990). "Putting Hertz executives in the driver's seat," in Executive Information Systems: Emergence, Development, Impact (H.J. Watson, ed.), pp. 343-347.

1.1.7 Other Areas

[35] ALBALA, M. (1988). "Getting to the pulse of the company (executive information system)," Personal Computing, 12(10), pp. 196-198.
[36] GEE, P. (1990). "Relieving executive stress (information systems)," Communications Management, pp. 15-16,18.
[37] HAMALAINEN, P. (1989). "Enhanced benefits from business information services: JOTI - an executive information system," Information Services & Use, 9(4), pp. 191-196.
[38] HARDWICK, J. (1986). "Information support for senior executives," in DSS-86 Transactions, pp. 21-23.
[39] MANCEY, J. (1990). "Exploiting EIS," Industrial Computing, pp. 33-34.
[40] PLEIN, H.R. (1989). "EIS at PCA," in DSS-89 Transactions, pp. 25-28.
[41] SMITH, M.W. (1990). "Executive information systems: one retailer's experience," Retail Control, 58(10), pp. 3-9.
[42] SULLIVAN-TRAINOR, M. (1986). "Gillette buys its EIS, Firestone builds," Computerworld, Oct. 27, pp. 38,42.
[43] TIIRIKAINEN, V. (1991). "Scandinavian experiences with executive systems," in DSS-91 Transactions, pp. 63-67
[44] VOLONINO, L. and DRINKARD, G. (1989). "Integrating EIS into the strategic plan: a case study of Fisher-Price," in DSS-89 Transactions, pp. 37-45.
[45] WATSON, H.J., HESSE, B.A., COPPERWAITE, C. and DEVOS, V. "Selecting EIS software: the Western Mining Corporation," in Executive Information Systems: Emergence, Development, Impact (H.J. Watson, ed.), pp. 191- 201.

1.2 Non Profit Oriented Organization

1.2.1 Healthcare Area

[46] DODSON, E. (1990). "Technology enters the hospital's executive suite," Computers in Healthcare, 11(12), pp. 39 40.
[47] EARLE, D.V. (1991). "EIS: unlocking the computer's strategic potential," Computers in Healthcare, 12(7), pp. 47-49.
[48] EMERY, C.C. (1991). "Implementing an executive information system at Samaritan Health Services," in DSS-91 Transactions, pp. 28-32.
[49] EMERY, C.C. (1991). "Samaritan Health Services profits from executive information system," Computers in Healthcare, 12(7), pp. 27-32.
[50] FOSTER, K. (1992). "Green light for better info (executive information systems)," Health Service Journal, February 27, pp. 27-28.
[51] FRANKS, T. (1991). "The strategic advantage: decision support through EIS," Computers in Healthcare, 12(1), pp. 36-39.
[52] LAUGHLIN, M.L. (1992). "Executive information systems: winning the numbers game (in health care)," Computers in Healthcare, 13(4), pp. 20-22.
[53] MCBRIDE, N. (1992). "Across the great divide (hospital management information systems)," Health Service Journal, February 27, pp. 30-32.
[54] MINEAR, M.N. (1991). "Implementing an executive information system," Computers in Healthcare, 12(7), pp. 34-35.
[55] PETERBURG, Y., SMITHSON, S. and PEEL, V. (1991). "Executive information systems for NHS senior management," in Medical Informatics Europe 1991, pp. 701-705.
[56] RACO, R.F. (1988). "Leveraging the hospital executive (decision support systems)," Computers in Healthcare, 9(8), pp. 28-30.
[57] ROBINSON, M. (1990). "Executive support systems," Information Executive, 3(4), pp. 34-36.

1.2.2 Government Area

[58] GANON, V., FARAL, J., GANON, E. and LEIFERMAN, U. (1990). "URUCIB: an executive information system in the presidency of the Republic of Uruguay," Information Technology for Development, 5(3), pp. 361-379.
[59] HOLLAND, C. (1991). "Developing an ESS for the Michigan State Senate," in DSS-91 Transactions, pp. 45-47.
[60] KASS, E.M. (1990). "Texas saddles up EIS," Information Week, (No. 259), pp. 47-48. 61] MOHAN, L. and HOLSTEIN, W.K. (1989). "EIS in the public sector: a case study," in DSS-89 Transactions, pp. 53-54.
[62] MOHAN, L., HOLSTEIN, W.K. and ADAMS, R.B. (1990). "EIS: it can work in

the public sector," MIS Quarterly, 14(4), pp. 435-448.
[63] SHERIF, H.E. and EL SAWY, O.A. (1988). "Issue-based decision support systems for the Egyptian cabinet," MIS Quarterly, 12(4), pp. 551-569.
[64] SIMARD, A.J and EENIGENBURG,J .E. (1990). "An executive information system to support wildfire disaster declarations," in DSS-90 Transactions, pp. 186-202.

1.2.3 Electric Utility Area

[65] GUNTER, A. and FROLICK, M. (1991). "The evolution of EIS at Georgia Power Company," Information Executive, 4(4), pp. 23-26.
[66] KALLMAN, E.A. and MCKINNON, W.P. (1989). "Case study: evaluating IS by using an executive information system," Journal of Information Systems Management, 6(4), pp. 58-68.
[67] KING, A.S. (1989). "Planning and implementation of an EIS," in On-line '89, pp. 102-104.
[68] RINEHART, G.D. (1986). "EIS in a public utility," in DSS-86 Transaction, pp. 65-69.
[69] WEINBERG, J. (1988). "The executive information system (EXEC-IS): a local area network application, " IEEE Transactions on Energy Conversion, 3(3), pp. 447-450.

1.2.4. Other Areas

[70] WATSON, H.J., BOSTROM, R.P., HUSEMAN, R.C. and GOPAL, A. (1990). "Georgia's end user computing research center: the Executive 2000 project," in 23rd HICSS, pp. 591 596.
[71] WHYMARK, G.K. (1991). "Development of the EIS concept and its implementation in the RAN," Australian Computer Journal, 23(3), pp. 110-118.
[72] WHYMARK, G.K. (1989). "Wessex Water has data on tap," Industrial Computing, Oct., pp. 26-27,29.

2. Theory

2.1 Conceptual Theme

2.1.1 Nature of System

[73] ALEXANDER, M. (1989). "Executive information systems catch on," Computerworld, February 27, pp. 31.
[74] ANDERSON, G. (1989). "The ESS revolution: decision support software

reaches the boardroom," Industrial Management and Data Systems, (7), pp. 3-8.

[75] BERGERON, F., RAYMOND, L. and LAFORGE, M. (1991). "Top managers evaluate the attributes of EIS," in DSS-91 Transactions, pp. 6-14.

[76] BETTS, K.S. (1990). "Executive support systems: the electronic facilitator for better decision making," Modern Office Technology, 35(6), pp. 88-89.

[77] BORBELY, J.(1985). "Executive decision support (EDS)," ON-LINE, July, pp. 70-72.

[78] BROOKS, N.A.L. (1990) "Executive information systems," Bank Management, 66(9), pp. 54,56,58,60.

[79] CHEN, H.W. (1991). "Executive computing usage, payoff and satisfaction: summary results of an end-user survey," in DSS-91 Transactions, pp. 16-27.

[80] DAVIS, S.G. (1989). "Can stand-alone EISs stand up?" Datamation, 35(13), pp. 41-42,44.

[81] FRIEND, D. (1988). "EIS 1987: a status report from the field," in NCGA '88, pp. 211-245.

[82] FRIEND, D. (1986). "Executive information systems: success, failure, insights and misconceptions," in DSS-86 Transactions, pp. 35-40.

[83] FRIEND, D. (1986). "Executive information systems: success, failure, insights And misconceptions," Journal of Information System Management, (Fall), pp. 31-36.

[84] FRIEND, D. (1986). "Helping corporate executives wade through data to find information (executive information systems)," Data Communications, 5(10), pp. 283-288.

[85] FRIEND, D. (1986). "Forging the executive information system link," Information Strategy: The Executive's Journal, 2(4), pp. 24-26.

[86] FRIEND, D. (1985). "Distilling executive information," Information Center, I(8), pp. 36-40.

[87] HOLLAND, I. (1991). "Executive edge," Network, June, pp. 70-72,75.

[88] KATZ, M.S. (1986). "Executive support systems: the unfinished job," Insights, (15), pp. 3-6.

[89] JONES, K. (1989). "Executive support systems come of age," Modern Office Technology, 34(10), pp. 78-79,82.

[90] KELLY, J.N. (1988). "Executive information systems," Patricia Seybold's Office Computing Report, 11(12), pp. 1,3-9.

[91] KNUTTON, P. (1992). "Executive information systems coming your way, wherever you sit," Engineering Computers, 11(3), pp. 18-21.

[92] LEIBS, S. (1989). "EIS: it's all down hill from here," Information Week, May, pp. 44-46.

[93] MCLEOD, R.J. and JONES, J.W. (1990). "Executive information systems: where have we been, where are we now, and where are we going?" in 23rd

HICSS, pp. 153-159.
[94] MCNAMARA, B., DANZIGER, G. and BARTON, E. (1990). "An appraisal of executive information and decision support systems," Journal of Systems Management, 41(5), pp. 14-18.
[95] MCNURLIN, B.C. (1987). "Executive information systems," EDP Analyzer, 25(4), pp. 1-16.
[96] MENKUS, B. (1987). "It's executive management system (EIS)," Business Month, 129(3), pp. 64-75.
[97] MILLET, I. and MAWHINNEY, C.H. (1992). "Executive information systems: a critical perspective," Information and Management, 23(2), pp. 83-92.
[98] MILLET, I. and MAWHINNEY, C.H. (1990). "EIS versusIS: a choice perspective," in 23rd HICSS, pp. 202-209.
[99] PARKER, J. (1992). "Taking the raw out of data (executive information systems)," Information Week, (358), pp. 36,38.
[100] RECK, R.H. and HALL, J.R. (1986). "Executive information systems: an overview of development," Journal of Information Systems Management, 3(4), pp. 25-30.
[101] RINALDI, D. and JASTRZEMSKI, T. (1986). "Executive information systems: the golden opportunities," Computerworld Focus, July 9, pp. 28-34.
[102] SCHMIDHAUSLER, F.J. (1989). "Dedicated computer assistance for managers at all levels," Office Management, 37(10), pp. 64-70.
[103] SCHWARTZ, R.M. (1986). "Executive support systems: closing a loop," Insights, (15), pp. 1-3.
[104] SHOOR, R. (1985). "Executive computing: still a long way to go," Infosystems, December, pp. 51-52.
[105] STAMEN, J.P. (1990). "The evolution of EIS," in DSS-90 Transactions, pp. 16-17.
[106] STECKLOW, S. (1989). "The new executive information systems," Lotus, April, pp. 51-55.
[107] TURBAN, E. and SCHAEFFER, D.M. (1987). "A comparative study of executive information systems," in DSS-87 Transactions, pp. 139-148.
[108] WALLACE,S. (1991). "Everybody's system: executive information systems are no longer reserved for the corporate elite," Information Week, (333), pp. 21-23.
[109] WOHL, A.D. (1990). "Executive information systems give you the big picture," Today's Office, 24(11), pp. 55-59.
[110] WOHL, A.D. (1990). Executive Information Systems. Wharton Report (No. 158), pp. 1-7.
[111] WOHL, A.D. (1986). "Executive report: executive information systems," Computerworld, October 27, pp. 37-51.

2.1.2 Impact

[112] BARROW. C.S. (1989). "Executive information systems: political realities and organizational impact," in LOMA's Systems Forum '89, pp. 35-39.

[113] BENFORD, T.J. (1991) "Motivating the organization-executive information systems," IEEE 1991 National Aerospace and Electronic Conference, pp. 886-892.

[114] DRUCKMAN, H. (1989). "Helping hands (executive information systems)," Canadian Business, 62(7), pp. 57-59.

[115] FORSYTHE, J. (1989). "Developing an ESS for unhelpful executives," Information Week, (208), pp. 35-36.

[116] FRIEND, D. (1990). "After the thrill is gone: how to keep your EIS growing," in DSS-90 Transactions, pp. 4-10.

[117] FRIEND, D. (1990). "EIS and the collapse of the information pyramid.," Information Center, 6(3), pp. 22-28.

[118] GUNNER, H. (1986). "Executive information systems: the real payoff is in improving the link between information and management process," in DSS-86 Transactions, pp. 55-59.

[119] HAMALAINEN, P. (1990). "Developing an executive information system: people dynamics," Information Services & Use, 10(5), pp. 275-280.

[120] JORDAN, M.L. (1988). "Executive information systems make life easy for the lucky few," Computerworld, 22(9), pp. 51-57.

[121] MAWBY, S. (1990). "EIS: more than just a pretty interface?" Financial Director, July, pp. 47-51.

[122] MCCLATCHY, W. (1989). "EIS powers executives," Information Week, (240), pp. 65,69,73,76,77.

[123] MCGILL, P. (1990). "Executive support systems," Business Quarterly, 55(1), pp. 85-89.

[124] MEALL, L. (1990). "EIS: sharpening the executive's competitive edge'?" Accountancy, 106(1165), pp. 125-128.

[125] MORRELL, P. (1991). "Executive information systems," PC Business Software, 16(3), pp. 9-11.

[126] MORRELL, P. (1991). "How to get up to date on the company data (EISs)," ICL Today, 6(13), pp. 22,24,26.

[127] NULTY, P. (1983). "How personal computers change manager's lives," Fortune, September 3, pp. 38-48.

[128] REES-EVANS, H. (1989). "Top management transformed as EIS arrives," Accoutancy, 103(1148), pp. 143-144.

[129] ROCKART, J.F. and DE LONG, D.W. (1988). "Moments of executive enlightenment (executive support systems)," Information Strategy: The Executive's Journal, 5(1), pp. 21-27.

[130] RYAN, A.J. (1989). "Cost of EIS: a big deal for most firms," Computerworld, July 24, pp. 46.

[131] TANG, V. (1991). "The organizational implications of an EIS implementation," Journal of Systems Management, 42(11), pp. 10-12.

[132] WALLIS, L. (1989). "Power computing at the top," Across the Board, 26(1-2), pp 42-51.
[133] WESTLAND, J.C. (1990). "High entropy ESS," in 23rd HICSS, pp. 186-194.
[134] ZMUD, R.W. (1986). "Supporting senior executives through decision support technologies: a review and directions for future research," in Decision Support Systems: A Decade in Perspective, McLean, E.R. and Sol, H.G. (ed.), North-Holland, Amsterdam, BV: Elsevier Science Publishers, pp. 87-101.
[135] ZMUD, R.W. (1987). "EIS Explosion," Computerworld Focus, September 9, pp. 13.

2.1.3 Nature of User and His/Her Work

[136] AGOR, W.H. (1986). "The logic of intuition: how top executives make important decisions," Organizational Decisions, 14(3), pp 5-18.
[137] BALL, G.L. (1987). "User expectations-the CEO's perspective," Executive Information Systems: Emergence, Development, Impact (H.J. Watson, ed.), pp. 71-76.
[138] BITTLESTONE, R. (1990). "Executive information: learning more from less," in Computers in the City 90, pp. 175-206.
[139] BUCKNALL, C. (1991). "A manager's guide to executive information systems," Industrial Management and Data Systems, 91(3), pp. 6-7.
[140] DAVIS, D. (1984). "Computers in top management," Sloan Management Review, Spring, pp. 63-67.
[141] DEARDEN, J. (1983). "SMR forum: will the computer change the job of top management?" Sloan Management Review, July, pp. 57-60.
[142] DE LONG, D. (1988). "Serving top execs: politics can be deadly," Computerworld, July 27, pp. 93.
[143] DOCK,V. T. (1985). "Executive computer use is doomed without five key properties," Data Management, December, pp. 27-30.
[144] FERSKO-WEISS, H. (1985). "Personal computing at the top," Personal Computing, March, pp. 68-79.
[145] ISENBERG, D.J. (1984). "How senior managers think," Harvard Business Review, 62(6), pp. 81-90.
[146] KEOGH, G. (1990). "View from the top (executive information systems)," Management Computing, 13(10), pp. 44-46.
[147] KIECHEL, W. III (1983). "Why executives don't compute," Fortune, November 14, pp. 241-246.
[148] KULL, D. (1984). "Matching workstations to executive styles," Computer Decisions, October, pp. 212-225.
[149] LARSEN, T.J. (1991). "Managers' use of computers: end-user computing in perspective," in 24th HICSS, pp. 145-152.
[150] MAIN, J. (1989). "At last, software CEOs can use," Fortune, 119(6), pp.

77-83.
[151] MANHEIM, M.L (1989). "Toward true executive support: managerial and theoretical perspectives," in DSS-89 Transactions, pp. 12-21.
[152] MITTMAN, B.S. and MOORE, J.M. (1984). "Senior management computer use: implications for DSS designs and goals," in DSS-84 Transactions, pp. 42-49.
[153] ROMAN, D. (1983). "Executives who love their personal computers," Computer Decisions, January, pp. 142-158, 177.
[154] RUNGE, L. (1988). "On the executive's desk," Information Center, 4(6), pp. 34-38.
[155] SALERNO, L.M. (1985). "What happened to the computer revolution?" Harvard Business Review, 63(6), pp. 129-138.
[156] TOBIAS, A.J. (1988). "Today's executives in a state of readiness," Software Magazine, 8(13), pp. 55-66.
[157] WATSON, H.J. and RAINER, R.K., Jr. (1991). "A manager's guide to executive support systems," Business Horizons, 34(2), pp. 44-50.
[158] WHITESIDE, D. (1983). "Computers invade the executive suite," International Management, 38(8), pp. 12-18.

2.1.4 Factors for Success or Failure

[159] ARMSTRONG, D. (1990). "The people factor in EIS success," Datamation, 36(7), pp. 73-79.
[160] BARROW, C.S. (1990). "How to keep your EIS up and running," in DSS-90 Transactions, pp. 13-14.
[161] BOWEN, W. (1986). "The puny payoff from office computers," Fortune, 113(11), pp. 20-24.
[162] BRENNER, E. (1990). "Executive information systems (EIS)," Monitor, (113), pp. 7-10.
[163] BURKAN, W.C. (1988). "Making EIS work," in DSS-88 Transactions, pp. 121 - 136.
[164] DE LONG, D.W. and ROCHART, J.F. (1986). "Identifying the attribute of successful executive support system implementation," in DSS-86 Transactions, pp. 41-54.
[165] KOGAN, J. (1986). "Information for motivation: a key to executive information systems that translate strategy into results for management," in DSS-86 Transactions, pp. 6-13.
[166] MCLEOD, R. Jr. and JONES, J.W. (1986). "Making executive information systems more effective," Business Horizons, 29(5), pp. 29-37.
[167] PALLER, A.(1990). "Executive information systems carve new paths through the information forest," Bulletin of the American Society for Information Science, 16(4), pp. 28-29.
[168] WATSON, H. and GLOVER, H. (1989). "Common and avoidable causes of EIS

failure," Computerworld, December 4, pp. 90-91.
[169] WATSON, H.J. (1990). "Avoiding hidden EIS pitfalls," Computerworld, June 25, pp. 87-91.
[170] YOUSTRA, R.E. (1989). "Executive information systems directions for future research," in SEAS, pp. 307-329.

2.1.5 Strategic Utilization

[171] EL SAWY, O.A. (1985). "Personal information systems for strategic scanning in turbulent environments: can the CEO go on-line?" MIS Quarterly, 9(1), pp. 53-60.
[172] KARIMI, J. and KONSYNSKI, B.R. (1991). "Globalization and information management strategies," Journal of MIS, 7(4), pp. 7-26.
[173] KOLODZIEJ, S. (1989). "EIS is a prestigious 'Strategic Weapon'," Software Magazine, July, pp. 58-64.
[174] MUSOKO, M.M., NAIM, M.M. and DAVIES, A. (1990). "Strategic business advantage from a computer based executive information system," 2nd International Conference on Factory 2001 - Integrating Information and Management, pp. 154-159.
[175] PREEDY, D. (1990). "The theory and practical use of executive information systems," International Journal of Information Management, 10(2), pp. 96-104.
[176] RINALDI, D. and JASTRZEMSKI, T. (1986). "Executive information systems: put strategic data at your CEO's fingertip," Computerworld, October 27, pp. 37-50.
[177] STEPHENSON, B.Y. (1986). "Information: a strategic business weapon," in DSS-86 Transactions, pp. 24-34.
[178] VOLONINO, L. and WATSON, H.J (1990-1991). "The strategic business objectives method for guiding executive information systems development," Journal of MIS, 7(3), pp. 27-39.
[179] VOLONINO, L. and WATSON, H.J (1990). "The strategic business functions (SBF) approach to EIS planning and design," in 23rd HICSS, pp. 170-177.
[180] WANG, P. and TURBAN, E. (1991). "Filtering strategic environmental information processing using EIS," in 24th HICSS, pp. 126-134.

2.2 Development and Implementation Methodology

2.2.1 Overall Framework

[181] ANDERSON, E.E. and YU-MIN CHEN (1991). "Toward a more general theory of corporate strategy: the integration of information and its technologies," Methods and Models of Operation Research, 35(1), pp. 15-25.
[182] BAILEY, A.D., Jr., YIHWA KIANG, KUIPERS, B. and WHINSTON, A.B. (1991). "A

theoretical framework for modeling executive support systems- a qualitative and causal reasoning approach," in IMACS International Workshop, pp. 269-274.

[183] BURKAN, W. (1989). "Wringing every last dollar from your DSS/EIS investment," in DSS-89 Transactions, pp. 5 10.

[184] CARLSSON, S.A. and WIDMEYER, G.R. (1990). "Toward a theory of executive information systems," in 23rd HICSS, pp. 195-201.

[185] FRIEND, D. and NORMENT, P.(1991). "A new methodology for successful EIS implementation," Information Executive, 4(4), Fall, pp. 38-40.

[186] MILLET, I., MAWHINNEY, C.H. and KALLMAN, E.A. (1991). "Alternative paths to EIS," in DSS-91 Transactions, pp. 50-61.

[187] PALLER, A. (1991). "Eleven questions every EIS implementor should be able to answer," in NCGA '91, pp. 273-283.

[188] PALLER, A. (1990). "Eleven questions every EIS implementor should be able to answer," in NCGA '90, pp. 77-84.

[189] PALLER, A. (1989). "Ten questions every EIS implementor should be able to answer," in NCGA '89, pp. 110-120.

[190] SCHNEIDER, C. (1986). "Developing a practical executive information system," in DSS-86 Transactions, pp. 70-76.

[191] WATSON, H.J., RAINER, R.K., Jr. and .KOH, C.E. (1991). "Executive information systems: a framework for development and a survey of current practices," MIS Quarterly, 15(1), pp. 13-30.

[192] WILLIAMS, K. and ZMUD, R. (1990). "Executive team support: an illustration of the difficulties that can arise in achieving a 'fit' between organizational and technical environment," in IFIP WG 8.3, pp. 13-28.

2.2.2 Design

[193] BARROW, C. (1990). "Implementing an executive information system: seven steps for success," Journal of Information Systems Management, 7(2), pp. 41-46.

[194] BHASKER, S. and KUMARASWAMY, A. (1991). "Graphical techniques in debiasing: an exploratory study," in 24th HICSS, pp. 117-125.

[195] BOYNTON, A.C., SHANK, M.E. and ZMUD, R.W. (1985). "Critical success factor analysis as a methodology for MIS planning," MIS Quarterly, 9(2), pp. 121-129.

[196] FIREWORKER, R.B. and ZIRKEL, W. (1990). "Designing an EIS in a multidivisional environment," Journal of Systems Management, 41(2), pp. 25-31.

[197] LIBERATORE, M.J., TITUS, G.J., VARANO, M.W. and DIXON, P.W. (1989). "An experimental investigation of the effects of some information system design variables on performance, preference, and learning," Information

Processing & Management, 25(5), pp. 563-577.
[198] MARCUS, A. (1991). "Designing effective information graphics for decision support," in NCGA '91, pp. 225-248.
[199] O'SHEA, T.J. (1989). "Low-cost approaches to executive information systems," Journal of Information Systems Management, 6(2), pp. 34-41.
[200] STEPHENSON, R.C. (1990). "Designing DSS and EIS applications to fit executive user needs," Computers in Healthcare, 11(12), pp. 28-30.
[201] WATSON, R.T. (1990). "A design for an infrastructure to support organizational decision-making," in 23rd HICSS, pp. 111-119.
[202] WESTLAND, J.C. and WALLS, J.G. (1991). "Theoretical foundations for the design of executive information systems in equivocal environments," in 24th HICSS, pp. 135-144.

2.2.3 Integrating with other IS

[203] EL SAWY, O.A. (1989). "How to make DSS/EIS ready," in DSS-89 Transactions, pp. 57-59.
[204] GEORGE, F.H. (1990). "Expert systems and executive information systems," Systems Research and Information Science, 3(4), pp. 209-222.
[205] KING, D. (1989). "The role of intelligent agents in executive and decision support," in DSS-89 Transactions, pp. 60-73.
[206] NUNAMAKER, J.F., Jr. WEBER, E.S. and CHEN, M. (1989). "The use of integrated organization and information systems models in building and delivering business application systems," IEEE Transactions on Knowledge and Data Engineering, 1(3), pp. 406-409.
[207] TURBAN, E. and WATSON, H.J. (1989). "Integrating expert systems, executive information systems, and decision support systems," in DSS-89 Transactions, pp. 74-82.
[208] VOGEL, D. (1988). Integrating executive information systems and group support system: visual support implications. in NCGA '88, pp. 262-270.
[209] WESTLAND, J.C. (1992). "Self-organizing executive information networks," Decision Support Systems, 8(1), pp. 41-53.

2.2.4 Architecture

[210] FRIEND, D. (1989). "Executive information systems: key elements of successful architecture," in LOMA's Systems Forum '89, pp. 30-34.
[211] ONES, J.W. and MCLEOD, R. Jr. (1986). "The structure of executive information systems: an exploratory analysis," Decision Sciences, 17(2), pp. 220-249.
[212] KAHLE, B., MORRIS, H., DAVIS, F., TIENE, K., HART, C. and PALMER, R. (1992). "Wide area information services: an executive information system

for unstructured files," Electronic Networking: Research, Application and Policy, 2(1), pp. 59 68.
[213] SUTCLIFFE, R. (1988). "Executive decisions (data presentation)," Systems International, 16(10), pp. 85-86.

2.2.5 Requirement Analysis

[214] GULDEN, G.K. and EWERS, D.E. (1989). "Is your ESS meeting the need?" Computerworld, 23(28), pp. 85-91.
[215] SANDERS, D.F. (1992). "Determining information requirements of senior management: toward a methodology," Canadian Journal of Information Science, 17(1), pp. 1-23.
[216] WATSON, H.J. and FROLICK, M. (1992). "Executive information systems: determining information requirements," Information Systems Management, 9(2), pp. 37-43.
[217] WETHERBE, J.C. (1991). "Executive information requirements: getting it right," MIS Quarterly, 15(1), pp. 51-65.

3. EIS Package

[218] BARTH, C. (1991). "ExecuMate II (accounting software)," Management Accounting, 73(1), pp. 16-17.
[219] CARLISLE, J.P. and ALAMEDDINE, K.D. (1990). "A study evaluating existing executive information systems products," in 23rd HICSS, pp. 160-169.
[220] CARLSON, E., SULLIVAN-TRAINOR, M.L., and PIZZANO, R. "Product spotlight on EIS," in Executive Information Systems: Emergence, Development, Impact (H.J. Watson, ed.), pp. 211-236
[221] FRENKEL, K.A. (1990). "The war for the executive desktop," Personal Computing, 14(4), pp. 55-64.
[222] HAVEN, N. (1991). "Pin-striped suite (executive information system software)," Personal Computer Magazine, September, pp. 104-110.
[223] HEALY, P. (1989). "Resolve (executive information systems for the board room)," Which Computer?, February, pp. 103-106.
[224] MILLER,R. (1989). "Executive information systems help you conduct your business," Today's Office, 23(11), pp. 16 24.
[225] RAINER, R.K., SNYDER, C.A., and WATSON, H.J. (1992). "The evolution of executive information system software," Decision Support Systems, 8(4), pp. 333-341.
[226] WILLIAMSON, M. (1989). "Tools for ESS development (executive support systems)," Patricia Seybold's Office Computing Report, 12(9), pp. 3-12.
[227] WILLIAMSON, M. (1990). "Executive information systems (EIS)," Monitor, (112), pp. 6-9.

Table 1: Classification of papers based on their topics

Topics	No. of Papers
I. Case Study (72/227)	
1.1 Profit Oriented Organization (45/227)	
1.1.1 Finance Area	9
1.1.2 Machinery Area	7
1.1.3 Chemical Area	6
1.1.4 Electronics Area	6
1.1.5 Telecommunication Area	3
1.1.6 Transportation Area	3
1.1.7 Other Areas	11
1.2 Non-Profit Oriented Organization (27/227)	
1.2.1 Healthcare Area	12
1.2.2 Government	7
1.2.3 Electric Utility Area	5
1.2.4. Other Areas	3
II. Theory (145/227)	
2.1 Conceptual Theme (108/227)	
2.1.1 Nature of System	39
2.1.2 Impact	24
2.1.3 Nature of User and His/Her Works	23
2.1.4 Factors for Success or Failure	12
2.1.5 Strategic Utilization	10
2.2 Development and Implementation Methodology (37/227)	
2.2.1 Overall Framework	12
2.2.2 Design	10
2.2.3 Integrating with Other IS	7
2.2.4 Architecture	4
2.2.5 Requirement Analysis	4
III. EIS Package (10/227)	

Table 2: Classification of papers based on journal or conference

Journal or Conference	No. of papers
Conference (71/227)	
DSS-xx Transactions	41
HICSS	13
NCGA	7
Others	10
Journal (156/227)	
Computerworld	15
MIS Quarterly	8
Computers in Healthcare	8
Information week	6
Journal of Information Systems Management	50
Others	114

DSS-xx: International Conference on Decision Support Systems
HICSS : Hawaii International Conference on System Sciences
NCGA : Annual Conference and Exposition Dedicated to Computer Graphics of National Computer Graphics Association