EVALUATING INFORMATION SYSTEMS DOCUMENTATION TECHNIQUES

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ABSTRACT: Should all business students be taught information systems (IS) documentation techniques? If IS documentation are taught which one is preferable? Current textbooks used in the core management information systems (MIS) course includes material on IS documentation techniques. The majority of the students in the MIS class are non-computer majors. An exploratory study was conducted to evaluate different techniques of information systems (IS) documentation according to three ergonomic criteria. The subjects were business students (91 percent non-computer majors) enrolled in upper division and graduate management information systems (MIS) core courses. Students answered questions about key characteristics of an information system that was documented with a narrative, data flow diagram, systems flow chart, and system component matrix. After answering these questions, the students evaluated the four techniques of IS documentation.

Results indicated a strong preference for narrative form of documentation. The relationship between the student's ability to recognize key characteristics of an information system, and their preference for narrative documentation showed direct statistical significance. The study results may suggest that simple techniques of narrative documentation maybe sufficient for use by predominantly non-computer majors in required MIS courses and as a method of communicating with business and managerial end-users.

KEYWORDS: Information System Documentation Techniques, Management Information Systems, End-user Communication

INTRODUCTION

IS documentation techniques are presented in MIS textbooks as a method of aiding end-user understanding of information systems [Awad, 1988, Burch & Grudnitski, 1989, Kroenke, 1992, Laudon & Laudon, 1988, Parker, 1989]. IS documentation techniques are also recommended as communication tools between analysts, managers, and end users, and as problem solving tools [Blanks &

Merritt, 1989, Kuehn & Fleck, 1990]. A survey of MIS textbooks found the following IS documentation techniques presented, usually in a chapter covering systems analysis and design: narrative descriptions, data flow diagrams, system flowcharts, and system component matrix. The presentation of most textbooks is on the construction or completion of the documentation and not on reading, interpreting, and understanding the IS.

Textbook coverage on how to construct IS documentation may not be appropriate if the intent in the MIS business core course is to increase the students' understanding of information systems. Coverage and exercises on reading understanding, and using IS documentation, to make future end-users a better consumer of IS, may be a more appropriate use of limited course time. For example, to properly teach construction of DFDs in the

MIS core course may require spending several weeks to document several systems. Spending this amount of time on only one documentation method seems questionable for the MIS course, but would be justified in system analysis and design courses for CIS/MIS majors, since they are expected to construct and use the techniques as a regular part of their future jobs.

THEORETICAL BASIS

If it is necessary to cover IS documentation techniques in the MIS core course it would be beneficial to discover the best IS documentation method(s) for future end-users. The literature on the best or preferred documentation tools for the more business end-user and managerial orientation of the MIS course is limited.

Palvia and Palvia (1989) surveyed CIS/MIS majors and graduate students on preferred documentation techniques. Students majoring in CIS/MIS preferred DFDs, system flow charts, and structured English to narrative descriptions and other techniques, such as HIPO charts and decision tables. O'Brien and VanLengen (1988) postulated that ''status models'' might be an aid for non-CIS/MIS majors in identifying status of components of an information system. The proposed status model is described in detail in O'Brien (1990).

The study compared student understanding of an information system by having the students construct a DFD and completing a system component matrix from a narrative case study. The results were generally favorable to the use of the system component matrix by non-CIS/MIS majors.

Involvement of most future end-users in new system development will be to read, understand, and evaluate, not construct, IS documentation. The end-user must be able to determine from the documentation whether the computer system professional has properly captured their needs. Assuming most future end-users are not creators of IS documentation, studies are needed to measure the ability to read and understand IS documentation. While measuring ability to read and understand

the documentation, data should be gathered on end-user opinions of the ease of use and understanding and satisfaction with the IS documentation techniques tested. This would give greater insight into the feelings of the end-users along with ability to read and understand the different IS documentation tools. The ability measure could then be correlated with the opinion data on the preferred IS documentation technique. If there was any significant correlation between the ability measure and preferred IS documentation technique it might indicate the preferred IS documentation to be used in the MIS course.

Another measure is how important the future end-users place on computers and information systems. Students who perform poorly on the ability measure and have little preference between the different IS documentation techniques may believe that computers and information systems are not important. If students rate computers and information systems as being important to their future, it should indicate that they took the study seriously.

THE RESEARCH STUDY

The study was designed to measure ability of students to use and student ranking of key ergonomic factors of several IS documentation techniques. The subjects

were students enrolled in the MIS course required of all business majors. An introduction to computer information systems course is a prerequisite for this MIS course. The study was conducted after IS documentation techniques were covered as part of the normal course content. Study instruments were distributed at the beginning of the class period. The students were given approximately thirty minutes to complete the ability to use and survey ranking the different IS techniques. Students were told that the results were not being used for determination of their course grade, but that it would be helpful in future course content decisions.

The survey was conducted at Northern Arizona University (school 1) during the fall semester 1990 with four sections of the upper division MIS course of all business majors. In the spring of 1991 the survey was conducted at a large southwestern university (school 2) in an MBA MIS class and at a small private undergraduate college (school 3). The selection of institutions and course sections was limited to faculty members who volunteered to allow the thirty minutes to conduct the survey. Subjects were self assigned in intact classes. The course sections surveyed were not under direct control of the researchers. Limited demographic data and no grade data were

Table 1: RESPONDENT DEMOGRAPHICS

School	Class Level			
	Junior	Senior	Graduate	Total
1	8	67	10	85
2	0	0	14	14
3	9	9	0	18
Totals	17	76	24	117

School	Major						
	Acc	CIS	Fin	Mgt	Mkt	Other	Totals
1	13	10	11	33	16	2	85
2	0	0	0	0	0	14	14
3	4	0	0	4	3	7	18
Totals	17	10	11	37	19	23	117

available to the researchers. Table 1 outlines the available demographics of the surveyed subjects.

Students were given descriptions of a computer-based information system of a business firm. The descriptions were in the form of narrative, completed data flow diagram, system flowchart, and system component matrix. Students were instructed to use the IS documentation to answer the questions on the key characteristics of the information system described.

The purpose of these questions was to obtain a measure of the students' ability to read, use, and understand the IS documentation. After answering the questions of the key characteristics of the information system the students were asked to rate the IS documentation techniques that were provided and used to answer the questions. The purpose of the rankings was to obtain opinion measures of the value of the different techniques and a measure of which technique was most widely used by the students.

To measure the importance students' placed on computers and information systems they were asked to provide their opinions on computers and information systems by using a Likert scale with 1 representing strongly agree and 6 representing strongly disagree, on the following statements:

A Computers are important to my future.

B. Information systems help businesses operate efficiently and effectively.

C. It is important for a business end-user to understand information systems documentation.

Values given to these questions should indicate the importance students place on the content of the MIS course. This measure may also indicate the importance the students gave to the study exercise.

A total of 117 business students taking the MIS course at three institutions completed the study instruments. From results of the 117 completed study

Table 2: MEANS AND STANDARD DEVIATIONS OF ERGONOMIC EVALUATIONS OF IS DOCUMENTATION TECHNIQUES

	Percent Used Tool	Ease of Use Mean	SD	Ease of Under-standing Mean	SD	Satisfaction Mean	SD
Narrative Description	78.6	2.44	1.28	2.21	1.25	2.12	1.07
System Flowchart	88.0	3.17	1.31	2.96	1.32	3.00	1.28
Data Flow Diagram	88.8	2.97	1.24	2.84	1.12	2.79	1.16
System Component Matrix	58.1	2.98	1.49	3.06	1.40	2.77	1.33

Table 3: CORRELATION COEFFICIENTS

	Ease of Use	Ease of Understanding	Satisfaction
Narr	-.3276***	-.2762**	-.2695***
Sys Flw	-.0943	-.1267	-.0579
DFD	.0853	.0261	.0666
Sys Mat	-.0268	.0550	.0246

*** significant at the 0.005 level
** significant at the 0.01 level

instruments a measure of students' ability to read, use, and understand the key characteristics of the information system documented and a measure of the preference of the different techniques was obtained.

Thirteen questions were asked on the key characteristics of the information system described. The questions were scored as correct or incorrect. Not giving the correct answer was viewed as a lack of understanding or inability to read the documentation. The mean score from the 117 responses was 9.233 or 71% correct. A Spearman rho correlation of ability score and rankings of ease of use, ease of understanding and satisfaction on the four IS documentation tools was performed. The purpose of the correlation was to determine if a preferred technique resulted in a higher number of correct responses.

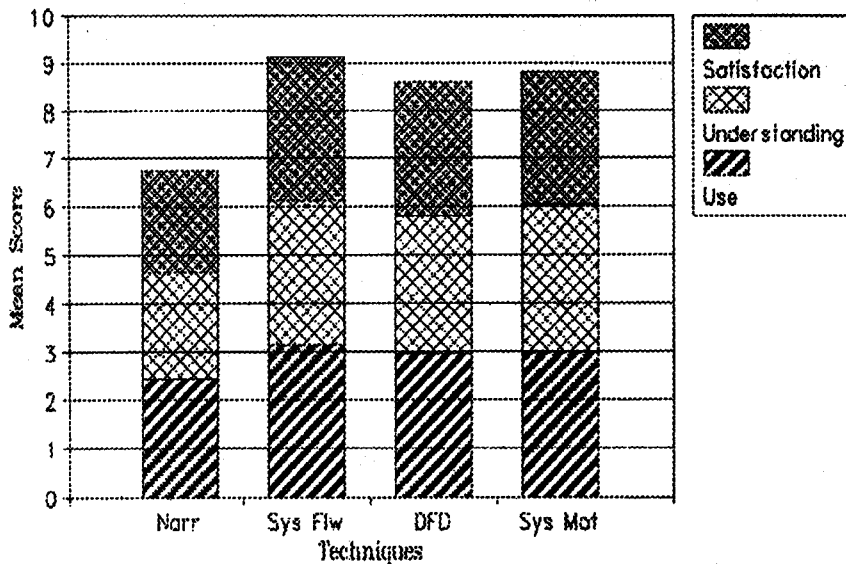**RESULTS OF EVALUATING OF IS DOCUMENTATION TECHNIQUES**

Business students taking the MIS course at the three institutions included in the study showed a preference for narrative description of the information system evaluated on measures of ease of use, ease of understanding, and satisfaction. Data flow diagrams followed next in student preference over all three of these criteria. The system component matrix was next in terms of ease of use and satisfaction, while the systems flowchart was the third choice in ease of understanding, but last in terms of ease of use and satisfaction. See Table 2 and Figure 1.

Table 3 shows that the correlation of the ability measures and student ranking of the ease of use, ease of understanding and satisfaction with the four IS documentation

Table 4: FREQUENCIES OF STUDENT IS VIEWS

	Strongly Agree					Strongly Disagree
	1	2	3	4	5	6
A	70	37	4	3	3	0
B	60	48	4	2	3	0
C	34	46	29	4	4	0

Figure 1: STUDENT EVALUATION OF IS DOMENTATION METHODS

documentation techniques in the introductory computer literacy and MIS courses, it would not be unusual for the students to not feel comfortable in using the graphical techniques.

Data flow diagrams finished second. The authors assume this reflects the simplicity of data flow diagrams with only four required symbols used to represent the system. The systems component matrix finished third in terms of ease of use and user satisfaction. This may indicate some validity in its ability to emphasize the resources and activities of an information system. However, the complexity of the matrix may hinder understanding with a limited amount of coverage. Last place finish of systems flowcharts may be from the large number of symbols that are required to represent an information system.

This study highlighted the problem of teaching IS documentation techniques in the MIS course required of all business majors. Coverage of IS documentation in most MIS textbooks is on construction, not reading and understanding of the documentation. Students preferred a narrative description to the graphical IS documentation techniques. The results may indicate that the limited amount of class time, spent teaching graphical IS documentation techniques in the MIS course required of all business majors, is not effective. If it is important to teach the graphical IS documentation techniques alternative presentation methods may be needed.

Future studies might attempt to create comparable groups by random selection and assignment. Approval should be obtained to gather data that might be used as covariates, which were not available for this study. These improvements would allow for different treatments, application of different statistical techniques, and greater generalizability of the results. More work should be done to validate and improve measurement instruments. Different teaching strategies, content presentation, and varying the amount time spent on teaching the graphical techniques might be tried to improve the use and understanding of the graphical techniques.

tools showed a significant difference for the narrative documentation. The scale of the rankings for ease of use and understanding and satisfaction was from 1 to 6, with 1 representing easy or satisfied and a 6 representing hard or unsatisfied. A 1 representing easy or satisfied and a high score on the ability measure results in a negative correlation statistic when students had a high achievement score and they rated the technique as easy or satisfied.

Ease of use and satisfaction were significant at the 0.005 level and ease of understanding was significant at the 0.01 level. No significant differences were found between the three institutions, graduate or undergraduate, or between the different majors, including the limited number of CIS majors.

Table 4 indicates the results of the importance of computers and information systems showing agreement with all three statements. Mean values (with 1 representing strongly agree and 6 representing strongly disagree) were 1.564 for "computers are important to my future career", 1.632 for "information systems help businesses operate efficiently and effectively", and 2.128 for "it is important for a business end-user to understand information systems documentation."

CONCLUSIONS

Significant results were obtained in favor of use and understanding of narrative IS documentation. Preference for narrative might be explained as a fallback position by the students. With only limited course time spent on teaching graphical IS

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Exhibit A: INFORMATION SYSTEMS DOCUMENTATION SURVEY

The purpose of this survey is to evaluate the ease of use and understanding of different types of system documentation. Please answer the following questions completely.

Name: _____

1. Student ID#: _____

2. College Major: Pre-Bus ACC   Bus Eco CIS   FIN   MGT   MKT   Other_____ (circle one)

3. Year in College

   Freshman   Sophomore   Junior   Senior   Graduate

4. Computers are important to my future career?

   Strongly Agree   Strongly Disagree
   1   2   3   4   5   6

5. Information systems help businesses operate efficiently and effectively.

   Strongly Agree   Strongly Disagree
   1   2   3   4   5   6

6. It is important for a business end-user to understand information system documentation.

   Strongly Agree   Strongly Disagree
   1   2   3   4   5   6

Circle the information systems documentation techniques covered in your course.

7. Narrative Description

8. System Flowchart

9. Data Flow Diagram

10. System Component Matrix

Answer the following questions about the ABC AUTO PARTS case:
(Use the four IS documentation techniques provided.)

11. What device is used for the capture of data about a sales transaction?

12. In what form can management receive responses to ad hoc inquiries?

13. What is the major software resource that controls the update of sales records?

14. What software resource provides for the reporting and inquiry of sales information?

15. What is the major form of storage media for the system?

16. To whom are sales analysis results provided?

17. Who performs the input function?

18. Who handles errors in sales transactions?

19. How are errors in sales transactions handled?

20. What is the purpose of the sales receipt?

21. How are errors in data entry revealed in this system?

22. What major data resource is used to provide sales performance information to management?

23. What types of sales transaction data are entered into the system?

Exhibit A: INFORMATION SYSTEMS DOCUMENTATION SURVEY, continued:

Rate the information systems documentation techniques used in answering questions 11 through 23.
Rate them on their ease of use.

24.   Narrative Description

Easy					Hard
1	2	3	4	5	6

25.   System Flowchart

Easy					Hard
1	2	3	4	5	6

28.   Data Flow

Easy					Hard
1	2	3	4	5	6

29.   System Component Matrix

Easy					Hard
1	2	3	4	5	6

Rate them on their ease of understanding.

30.   Narrative Description

Easy					Hard
1	2	3	4	5	6

31.   System Flowchart

Easy					Hard
1	2	3	4	5	6

32.   Data Flow

Easy					Hard
1	2	3	4	5	6

33.   System Component Matrix

Easy					Hard
1	2	3	4	5	6

Rate them on your overall satisfaction with them.

34.   Narrative Description

Satisfied					Unsatisfied
1	2	3	4	5	6

35.   System Flowchart

Satisfied					Unsatisfied
1	2	3	4	5	6

36.   Data Flow

Satisfied					Unsatisfied
1	2	3	4	5	6

37.   System Component Matrix

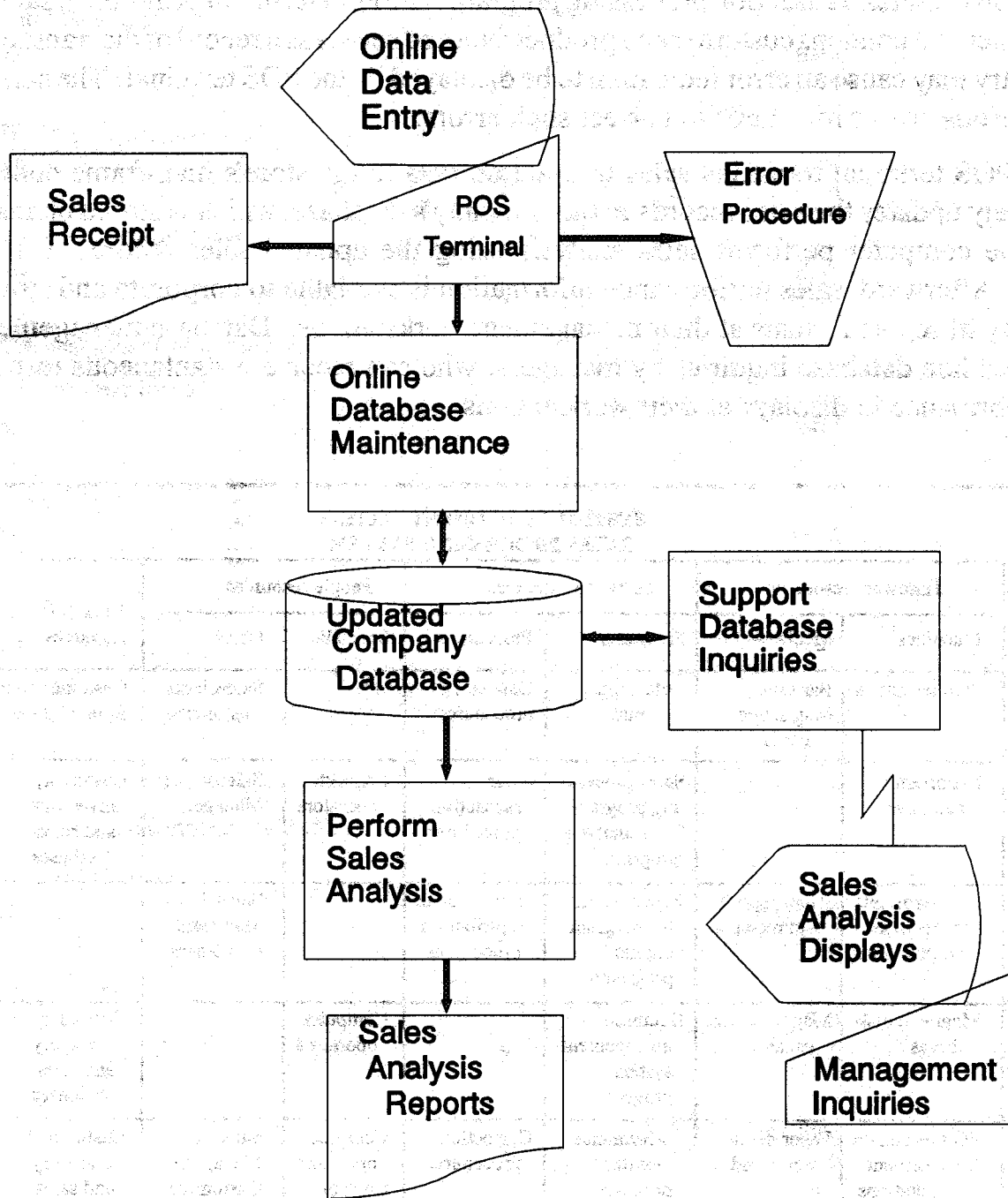| Satisfied					Unsatisfied
1	2	3	4	5	6

Exhibit B: NARRATIVE DESCRIPTION OF ABC AUTO PARTS

When a customer wishes to buy an auto part, the salesclerk enters customer and product data using an online POS terminal. The POS terminal has a keyboard for data entry and a video screen for display of input data, as well as data entry menus, prompts, and messages. POS terminals are connected in a telecommunications network to the store's mainframe computer, which uses a comprehensive sales transaction processing program. The POS terminal prints out a sales receipt for the customer that contains customer and product data and serves as a record of the transaction. Errors in data entry may cause an error indication to be displayed by the POS terminal. The salesclerk must follow various error procedures to correct such errors.
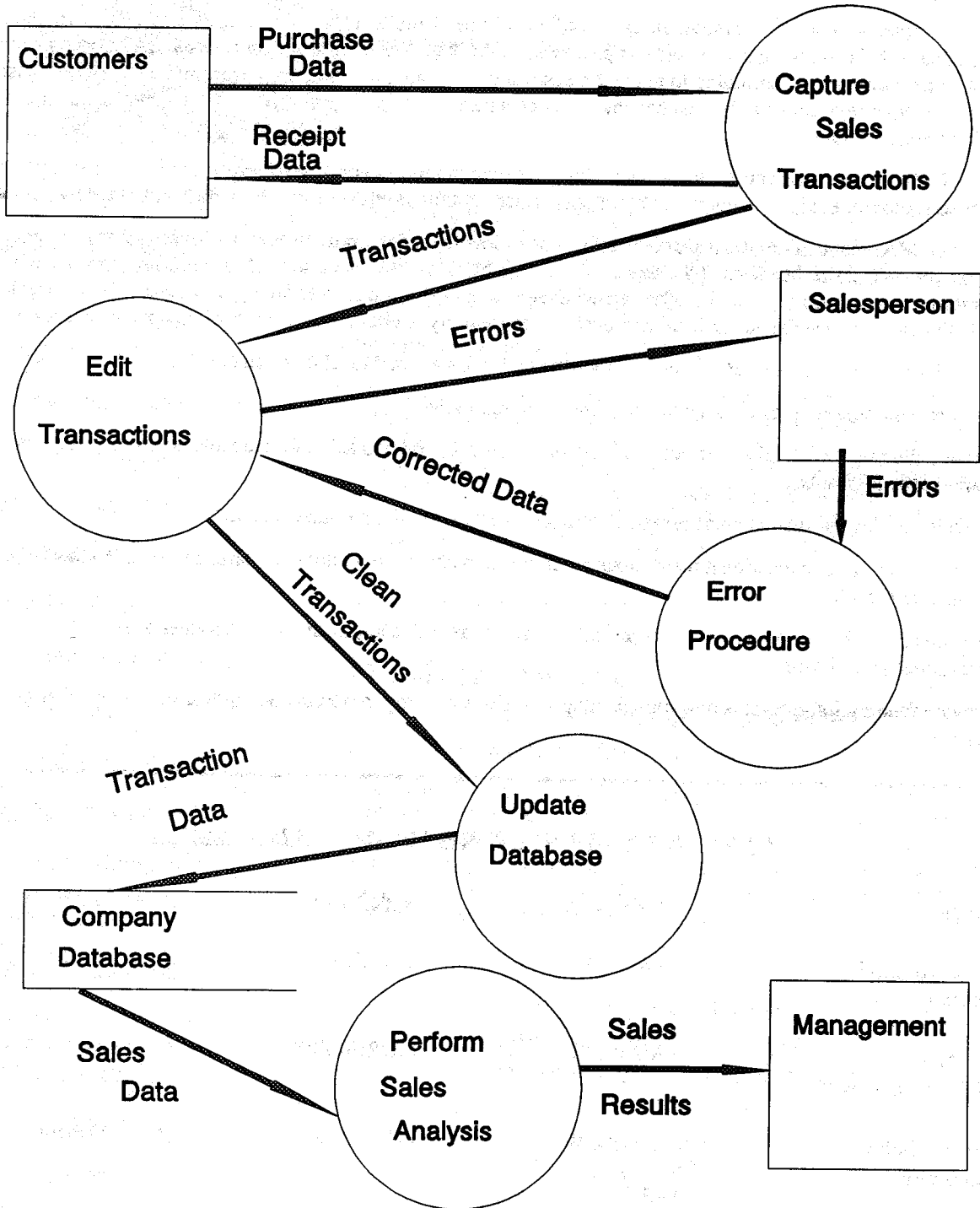
The POS terminal transmits sales transaction data to the store's mainframe computer. This immediately updates the sales records in the company's database, which is stored on magnetic disk units. The computer performs sales analysis using the updated sales records in the company database. Afterward, sales performance information is available to corporate and store managers in a variety of report formats at their management workstations. Database management software supports ad hoc database inquiries by managers, who can receive instantaneous responses about sales performance in displays at their workstations.

SYSTEM COMPONENT MATRIX SALES PROCESSING SYSTEM							
Information system activities	Hardware resources		Software resources		People resources		Data resources	Information products
	Machines	Media	Programs	Procedures	Specialists	Users		
Input	POS terminals	Bar tags Mag stripe cards	Data entry program	Data entry procedures		Salesclerks Customers	Customer data Product data	Data entry displays
Processing	Mainframe computer		Sales processing program Sales analysis program	Sales transaction procedures	Computer operators	Salesclerks Managers	Customer, inventory, and sales databases	Processing status displays
Output	POS terminals Management workstations	Paper reports and receipts	Report generator program Graphic programs	Output use & distribution procedures		Salesclerks Managers Customers		Sales receipts Sales analysis reports and displays
Storage	Magnetic disk drives	Magnetic disk packs	Database management system program		Computer operators		Customer, inventory, and sales databases	
Control	POS terminals Management workstations	Paper documents and control reports	Performance monitor program Security monitor program	Correction procedures	Computer operators Control clerks	Salesclerks Managers Customers	Customer, inventory, and sales databases	Data entry displays Sales receipts Error displays and signals

SYSTEM FLOW CHART
SALES PROCESSING SYSTEM

Online
Data
Entry

Sales
Receipt

POS
Terminal

Error
Procedure

Online
Database
Maintenance

Updated
Company
Database

Support
Database
Inquiries

Perform
Sales
Analysis

Sales
Analysis
Displays

Sales
Analysis
Reports

Management
Inquiries

DATA FLOW DIAGRAM
SALES PROCESSING SYSTEM

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