

FROM MANUAL TO COMPUTERISATION: A CASE STUDY OF EXPENDITURE CYCLE AT BRAINY BOOKSTORE

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ABSTRACT

Brainy Book Store (BBS) had been operating successfully for over twenty nine years and had become a major text books provider in Alor Setar. The company had been selling books to nearby universities and college market. Its book lines included general books, academic books and library books. The company has only one retail outlet located in Malaysia Entrepreneur University campus, and employs twenty eight permanent staffs, five contract workers and ten student workers. For more than twenty years the company had enjoyed record profits. But during the last three financial years, the company has recorded net loss. Although market reaction to BBB had been positive from years to years, the overall profitability and efficiency of the company had fallen sharply since 2009, with the recording of an annual trading loss in the year 2012. As the General Manager, Danial feels that he should take immediate action in order to save the company from further losses. Based on his preliminary study, he discovers that there is something wrong with the company purchasing cycle. For the year ended 31 December 2012, it was found that approximately 95% of the books on consignment were not returned and the company had to bear huge 'badstocks' problems. Therefore, the management appointed a consultant to review its current purchasing and cash disbursement system as well as to propose a fully computerized purchasing system with the possibility of a web-based purchasing protocol linked to selected suppliers and cash disbursement system. From the investigation, the consultant reveals some flaws in the BBS expenditure cycle. Internal control weaknesses such as no segregation of duties, poor regulation enforcement and incomplete records need to be restored immediately so that the BBS could improve their financial performance in forging for a good profit again.

Introduction

On February 22, 2013, Danial, the General Manager for Brainy Book Store (BBS) was anxiously awaiting for his meeting with the business research firm. He felt findings from the business research firm would help him to solve the problems faced by BBS regarding the declining profit and the losses recorded in the past few years. He believed that the current purchasing and cash disbursement systems at BBS had some weaknesses. To date, the BBS had maintained a manual system for all its purchasing and cash disbursement transactions. He hoped that the outcome of the discussions would help him to understand the system's drawbacks, and would in turn, spark the need for change from the manual system in place now to a computerized system. Danial intended for the consultant to design a computerized purchasing and cash disbursement system that will match the requirements of the BBS.

Company Background

Since its establishment on 30 July 1985 by Syahed, Brainy Book Store had been operating successfully for approximately twenty eight years and had become a major textbook provider in Alor Setar. The company had been selling books and stationeries by catering to markets from the nearby universities and colleges. Its lines of books included general books, academic books and library books. The academic books were primarily text books in the area of accounting, business, economic, marketing and management. BBS has one retail outlet located in the Malaysia Entrepreneur University campus, which currently employs twenty eight permanent staffs, five contract workers and ten student workers. The organizational structure for BBS is as shown in *Exhibit 1*. In terms of market, being the only bookstore on campus, BBS has its own guaranteed customers i.e. the university students. BBS also supplied books to lecturers, the university library as well as to other nearby government agencies. The company enjoyed hefty profits for almost twenty years, for instance, from year 2000 to 2008, the recorded profits were around RM300, 000 annually (See *Exhibit 2*).

At BBS, text books were sold using the consignment method. The cycle began with lecturers from each faculty placing order for textbooks. This activity was usually done three months before the upcoming academic session. After they received the orders, BBS sorted the orders according to subject area and contacted the related suppliers. Right before the academic session starts, suppliers shipped the orders to BBS

and upon receipt of the books, BBS distributed the books to the lecturers accordingly. At the beginning of a new academic semester, students have the options whether to buy their textbooks from their respective lecturers or to buy them straight from the shelf of the BBS. Each book sold would be recorded as a sale and commission will be paid by the suppliers to the BBS. On the other hand, unsold books will have to be returned to the supplier within three months after the receipt of the order. In the event where BBS failed to return within the stipulated three month period, the books would be non-returnable anymore and would be treated as a sale and the cost would be borne by BBS.

Financial Distress

During the year ending 31 December 2010 BBS had an annual sale of RM5, 271,502 and has recorded a net loss of approximately RM681, 208. In 2010, BBS's purchases were RM4, 210,916. From the previous twenty financial years BBS has made average annual purchases of approximately RM5,000,000 and average annual profits of approximately RM300,000. All purchases were made from the Malaysian suppliers. Although market reaction had been positive towards BBS from year to year, however, its overall profitability and efficiency had fallen sharply since the year 2009, and this trend persisted until 2010 where an annual trading loss was recorded (See *Exhibit 2*).

In the past few years, BBS has been facing a problem to collect the unsold books from lecturers due to the weakness of their internal control system (i.e. they did not have proper system or name list to track back to whom they gave the books). This problem has resulted in a complication to the BBS where they could not return the consignment to the suppliers back. Due to this, the suppliers charged BBS for the unreturned consignments. The extra liabilities that BBS has to bear were affecting their bottom line. The manager of BBS, Danial illustrated,

"For the year ended 31 December 2010, approximately 95% of the books on consignment were not returned within the specified period and this has resulted in losses to the BBS. In fact, the BBS had to bear huge 'bad stocks' problems due to the unreturned books. The value of the books that were not returned to the supplier was RM173, 284."

As the General Manager, Danial felt that immediate action should be taken in order to save BBS from further losses. He thought that he needed to find the causes of the problems which he believed was highly

related to the company purchasing and cash disbursement systems. He believes that the manual systems adopted by the company are flawed due to incomplete recording and thus the company was unable to detect unreturned books. In turn, the company had to suffer from losses. Therefore, Danial is currently reviewing the BBS purchasing and cash disbursement systems and is considering introducing a computerized purchasing system with the possibility of a web-based purchasing protocol linked to selected suppliers and cash disbursement system. Hopefully, computerized purchasing and cash disbursement systems will promote proper recording thus improving the company's internal control system.

On February 2013, at a recent management meeting, the management of BBS appointed a business research firm, as an external consultant to identify the reasons for such a fall in the company's fortunes. Danial required all the existing purchasing processes as well as the cash disbursement procedures be thoroughly studied in order to identify possible problems that had weakened the company expenditure cycle. Danial also requested for the consultant to propose a new computerized purchasing and cash disbursement systems, expected to be operational within the next three months. The consultant's report was highly critical, suggesting the core problems experienced by BBS.

Expenditure Cycle At Brainy Book Store

The focus of the expenditure cycle at BBS was on the purchase and payment for books. The primary purpose of the expenditure cycle was to facilitate the exchange of cash with suppliers for the purchase of books. In other words, the primary objective of the expenditure cycles at BBS was to minimize the total cost of acquiring and maintaining book inventories.

The expenditure cycle at BBS encompassed activities and events from the point at which a need for books was identified until the time at which payment was disbursed for the acquired books. There were six basic activities in the expenditure cycle at BBS:

- Identifying the needs for books;
- Selecting of vendors;
- Ordering and approving for purchase of books;
- Receiving, verifying and storing of books;
- Selecting and approving vendor invoices due for payment; and
- Preparing and approving payment for books.

Activities (1) to (4) were performed by the purchasing system and activities (5) and (6) were performed by the cash disbursement system. BBS used manual purchasing and cash disbursement systems. Eight staffs were involved in the purchasing and cash disbursement processes as follows:

Functions	
1 Book Manager	Approved the purchases of books and the payment vouchers.
2 General Manager	Reviewed the payment voucher and the cheques.
3 Accounts Executive	Reviewed the payment voucher and the cheques
4 Executive Book/Shop Executive	Supervised books activity.
5 Storekeeper	Received books and prepared receiving report.
6 Book Clerk	Prepared and kept purchase order.
7 Administrative Clerk	Produced and kept the reports about the purchasing of books.
8 Accounts Clerk	Prepared payment voucher, prepared and printed cheques and mailed the signed cheques to the suppliers.

The documents involved in the expenditure cycle at BBS were purchased orders, receiving reports, suppliers' invoices, credit notes (if any), payment vouchers, and cheques.

At BBS, control was perceived to be important in purchasing and cash disbursement systems. If unnecessary books were purchased or excessive prices were charged for the books received, BBS felt that organizational resources would be wasted. As cash itself was very liquid, payments of cash for books received would be carefully guarded. To evaluate the internal control strengths and weaknesses at BBS, the processes involved in the purchasing and cash disbursement systems must be known.

Purchasing System

The first process in purchasing system was to identify what, when, and how many books to purchase. The purchasing process at BBS began with a verbal order from a lecturer for a specific title of a book to be used as a reference book. This took place after a routine discussion with the

book manager before the start of a new academic semester. Through a discussion with the lecturers, information on the book title, the author, publisher, edition or year of published and estimated students' enrollment were obtained. A free copy of the book will be provided to the respective lecturer together with the instructor's manual, set of questions and the solution manual.

The second process was to choose from which suppliers to purchase the desired books. The selection of suppliers at BBS was based on the information gathered from the first process. From the information given, the publisher was identified. Normally lecturers give a specific book title, author and the publishing company when placing the order for the book. The publisher information varied depending on the courses taught by the lecturers. It was the book manager who had to choose from the many publishers to order for the books.

The third process was to get approval for the purchase of books and to place orders for the books. A purchase order (PO) would be prepared by the book clerk based on the information from the book manager from the second process. Orders would then be placed with the book's publisher to fulfil the demand from students in the new coming semester. The PO was then sent to the book manager for review and approval. The PO was prepared in three copies, and the original copy was scanned and emailed to the respective publishers. This would be regarded as official placement of orders and would be later followed by mail orders. The second copy of the PO was submitted to the accounts department and the last copy was documented in the purchase order file with the book clerk.

The fourth process was to receive, to verify and to store the books. At BBS, the books together with the supplier's invoice were received by the storekeeper from the publisher. The book manager would review and verify the quantity of the books' received, the authors and the title of the books received as per supplier's invoices and compares to the PO kept by the book clerk. Storekeeper recorded the quantity of the books received in the receiving report and kept the books in the store. Receiving report was prepared in two copies. The original copy was kept by the book clerk as a reference in a receiving report file. The second copy of the receiving report was sent to the accounts clerk for verification of payment. The supplier's invoice was kept by date in the supplier's invoice file.

A report about the purchasing of books was produced and kept by the administrative clerk. A report consisting of title, publisher, author, ISBN

number, purchase price and selling price was kept to facilitate information of the books business activity. The shop executive would supervise the books purchasing activities. When asked about the rationale behind the shop executive supervising the book purchasing activities, the book manager justified,

“Before this, the supervision of books purchasing activities was done by the book executive but when he was on medical leave since a year ago, the task was taken over by the shop executive.”

Cash Disbursement System

The cash disbursement process at BBS began when a book manager periodically, usually monthly, reviewed invoices from suppliers for payment by searching for accounts payable that were coming due from suppliers' invoice file to determine if they should be paid. The book manager would select the invoices that were to be paid and asked the store keeper to compare the suppliers' invoices with the third copy of purchase order (PO), receiving report (RR), and credit note (CN). Once all of the documents were matched, the book manager would approve the invoices for payment. The storekeeper would send the approved invoices to the accounts clerk.

Upon receipt of the approved invoices from the storekeeper, the accounts clerk matched the approved invoices with the second copy of the PO and receiving report as well as credit note and prepared a pre-numbered payment voucher (PV). Accounts clerk then signed the PV as a prepared and sent the PV with all the supporting documents to the account executive or general manager. The account executive or the general manager would review the PV by comparing the PV with all the supporting documents and signed the PV as a reviewer. The account executive then prepared a payment summary report and filed the report in the payment summary report file. The PV would then be sent to the book manager for payment approval. After the signing of the PV, the book manager would send the approved PV to the accounts clerk.

Upon receipt of the approved PV from the book manager, the accounts clerk would prepare and print checks and send the checks and the approved PV to the account executive or the general manager for authorization. The account executive or the general manager would review the cheques with the supporting documents for consistency and accuracy. The cheques and the supporting documents were then sent to

the managing director and board of directors (BOD) for approval. Two of them, usually managing director and one of the BOD, were required to sign the cheques. The signed cheques and the supporting documents were sent back to accounts clerk for mailing the cheques to the suppliers. The accounts clerk would update the payments in the cash book which was a debit to the accounts payable and a credit to the cash at bank. The accounts clerk then would file the PV and the supporting documents by PV number to keep a record of payment. The file was kept on the accounts clerk's desk.

Conclusion

A bright future awaiting BBS in the books business activity was due to greater demand from the increasing number of students every semester. BBS management's intention is to see better performance from the next financial year end by providing surplus figures in the profit and loss accounts. BBS manager, Danial strongly believed that the company's problem was due to weaknesses in their internal control system. Thus, he felt that the company should seek help from a professional consultant to improve the situation. A good internal control is necessary to make sure that the company will start to gain profit again. Profit is an important indicator that the company is going in a correct direction in the books business activity. Shareholders had been waiting for a long time to get their dividends as usual before the company got the worst financial result few years ago. Shareholders attention is crucial since many of them sold their shares when the company started hitting the rock bottom few years back.

Exhibit 1

Brainy Book Store Organisational Structure

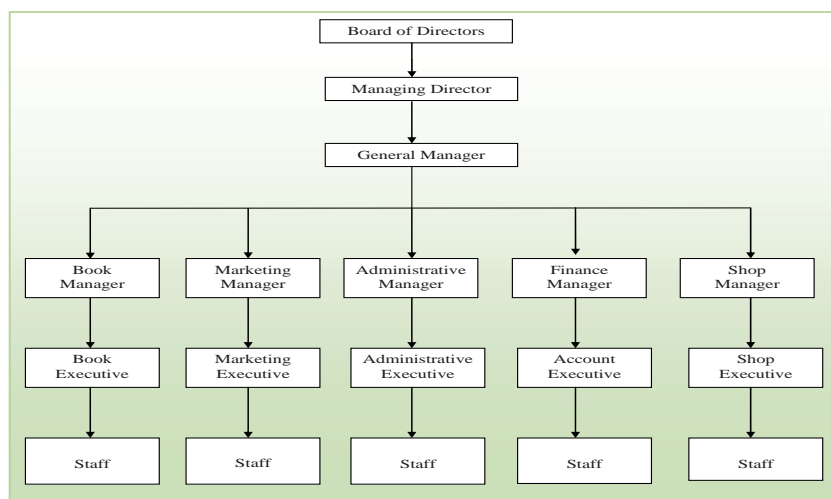


Exhibit 2

Brainy Book Store Income Statement For the Year Ended 31 December 2006 - 2011

	2011	2010	2009	2008	2007	2006
Sales revenue	3,336,784	5,271,502	8,931,563	11,406,166	11,344,584	10,872,834
Less: Costs of sales						
Beginning inventory	714,249	1,799,601	3,402,269	3,088,879	2,490,204	2,674,320
+ Purchases	3,228,007	4,210,916	6,227,101	10,216,930	10,548,804	9,172,767
	3,942,255	6,010,516	9,629,370	13,305,809	13,039,009	11,847,087
- Ending inventory	1,127,079	714,249	1,799,601	3,402,269	3,088,879	2,490,204
Costs of sales	2,815,176	5,296,268	7,829,770	9,903,540	9,950,130	9,356,883
Gross profit	521,608	-24,766	1,101,794	1,502,626	1,394,453	1,515,952
Add: Other income	455,903	616,097	458,003	296,570	309,669	268,749
Total income	977,511	591,330	1,559,796	1,799,196	1,704,123	1,784,700
Less: Expenses	955,395	1,272,539	1,432,809	1,432,735	1,371,662	1,419,645
Net profit/loss	22,116	-681,208	126,988	366,461	332,461	365,056

Exhibit 3

Brainy Book Store Income Statement For the Year Ended 31 December 2000 - 2005

	2005	2004	2003	2001	2000
Sales revenue	10,103,886	10,331,535	4,644,430	4,573,414	4,481,348
Less: Costs of sales					
Beginning inventory	1,972,055	2,908,180	1,749,911	1,162,428	762,480
+ Purchases	9,239,861	8,229,703	4,764,110	4,553,069	4,417,888
	11,211,916	11,137,883	6,514,021	5,715,497	5,180,368
- Ending inventory	2,674,320	1,972,055	2,463,582	1,698,650	1,162,428
Costs of sales	8,537,596	9,165,828	4,050,439	4,016,847	4,017,940
Gross profit	1,566,290	1,165,708	593,991	556,567	463,408
Add: Other income	156,469	135,696	108,958	90,654	105,871
Total income	1,722,759	1,301,404	702,950	647,221	569,279
Less: Expenses	1,252,740	987,626	485,901	411,115	334,099
Net profit/loss	470,019	313,778	217,049	236,106	235,180

* 2002 Not available (Net profit) because the company's copy had lost. We are in the process of getting the audited accounts from the company's auditor with permission from the company.

Teaching Note

Expenditure Cycle At Brainy Book Store From Manual To Computerisation

Context

Brainy Book Store (BBS) had been operating successfully for over twenty nine years and had become a major text books provider in Alor Setar. The company had been selling books to nearby universities and college market. Its book lines included general books, academic books and library books. The company has only one retail outlet located in Malaysia Entrepreneur University campus, and employs twenty eight permanent staffs, five contract workers and ten student workers. For more than twenty years the company had enjoyed record profits. But during the last three financial years, the company has recorded net loss. Although market reaction to BBB had been positive from years to years, the overall profitability and efficiency of the company had fallen sharply since 2009, with the recording of an annual trading loss in the year 2012. As the General Manager, Danial feels that he should take immediate action in

order to save the company from further losses. Based on his preliminary study, he discovers that there is something wrong with the company purchasing cycle. For the year ended 31 December 2012, it was found that approximately 95% of the books on consignment were not returned and the company had to bear huge 'bad stocks' problems. Therefore, the management appointed a consultant to review its current purchasing system as well as to propose a fully computerized purchasing system with the possibility of a web-based purchasing protocol linked to selected suppliers.

Learning Outcome

At the end of the class discussion of the case, students should be able to:

1. Analyze the weaknesses in the purchasing and cash disbursement systems.
2. Recommend ways to improve the purchasing and cash disbursement systems.
3. Prepare a table of entities and activities for the cash disbursement system.
4. Draw the context diagram and the physical data flow diagram for the cash disbursement system.
5. Identify the suitable system development methodology for purchasing and cash disbursement systems.
6. Choose the appropriate data gathering technique to determine user requirement for both purchasing and cash disbursement systems.

Target Group

Undergraduate students taking Accounting Information Systems and Accounting Systems Analysis and Design.

Prerequisites: Introduction to Accounting

Teaching Strategies

1. The students will be given the case a week before and to update themselves on the following topics:
 - a) Expenditure cycle – especially on business processes and internal control measures.
 - b) Purchasing and Cash Disbursement - manual and computerized processes.

- c) Control issues – how to achieve a sound and reliable purchasing and cash disbursement cycle.
- 2. The class is to be divided into groups of five people.
- 3. The suggested class plan:
 - a) Students need to discuss in small groups before coming to class and prepare a report on their analysis.
 - b) Class discussion begins with the case synopsis by the instructor to increase students' understanding of the case.
 - c) The focus of discussion then moves to analyzing the key/leading questions provided.
 - d) Conclude the session with closing remarks.

Discussion Questions

The instructor may wish to distribute key questions in advance for the students to have their learning group discussion.

- 1. For purchasing system, identify five (5) weaknesses and suggest an improvement for each weakness.
- 2. For cash disbursement system:
 - a) Prepare a table of entities and activities.
 - b) Draw a context diagram.
 - c) Draw a physical data flow diagram.

Using the following format, answer question (i) and (ii) below:

No	Weaknesses (I)	Improvement suggestions (II)
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- a) Identify four (4) weaknesses in the cash disbursement processes.
- b) Provide a recommendation to improve each of the weaknesses as identified in question (I).
- 3. Assume that you are chosen by BBS as a consultant in developing a new computerized system, you are required to:
 - a) Identify a system development methodology that is suitable for BBS.
 - b) Suggest the appropriate data gathering technique to determine user requirement for both purchasing and cash disbursement systems.

Answers Keys

Question 1:

Weakness and Improvements

No	Weaknesses	Improvement
1	No segregation of functions Review and approval of PO by book manager.	Should be a different person doing these two jobs.
2	No segregation of functions Check and verify the books received by book manager.	<ul style="list-style-type: none"> - The job should be done by another person. - Book manager should not involve in many roles in the purchase process. - Appoint more staff to involve in the purchase process.
3	Lack of accounting records No supplier delivery order (DO) is being received.	<ul style="list-style-type: none"> - Should ask the supplier to send DO or packing list instead of sending an invoice directly to the storekeeper. - Storekeeper should not know the book's purchase price. - The invoice should send separately to the accounts department.
4	Admin clerk is producing books business activity	<ul style="list-style-type: none"> - Admin clerk is not the right person to involve in books business activities. - Book executive should do the job.
5	Lack of supervision Supervision done by shop executive	<ul style="list-style-type: none"> - Supervisory role should be made by the general manager. - Shop executive should focus on sales/marketing rather than involves in the purchase process.

Question 2:

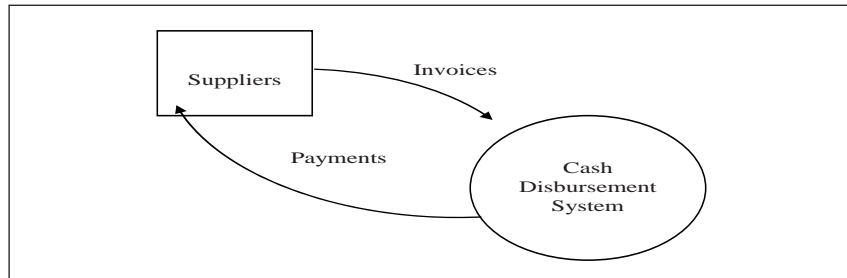
Entities and activities

Entities	Para	Activities
Book Manager	1	Review invoices from suppliers for payment by searching for accounts payable that are coming due from accounts payable subsidiary ledger to determine if they should be paid.
Book Manager	1	Select invoices that are to be paid
Storekeeper	1	Compare the suppliers' invoices with the third copy of purchase order, receiving reports, and credit note.

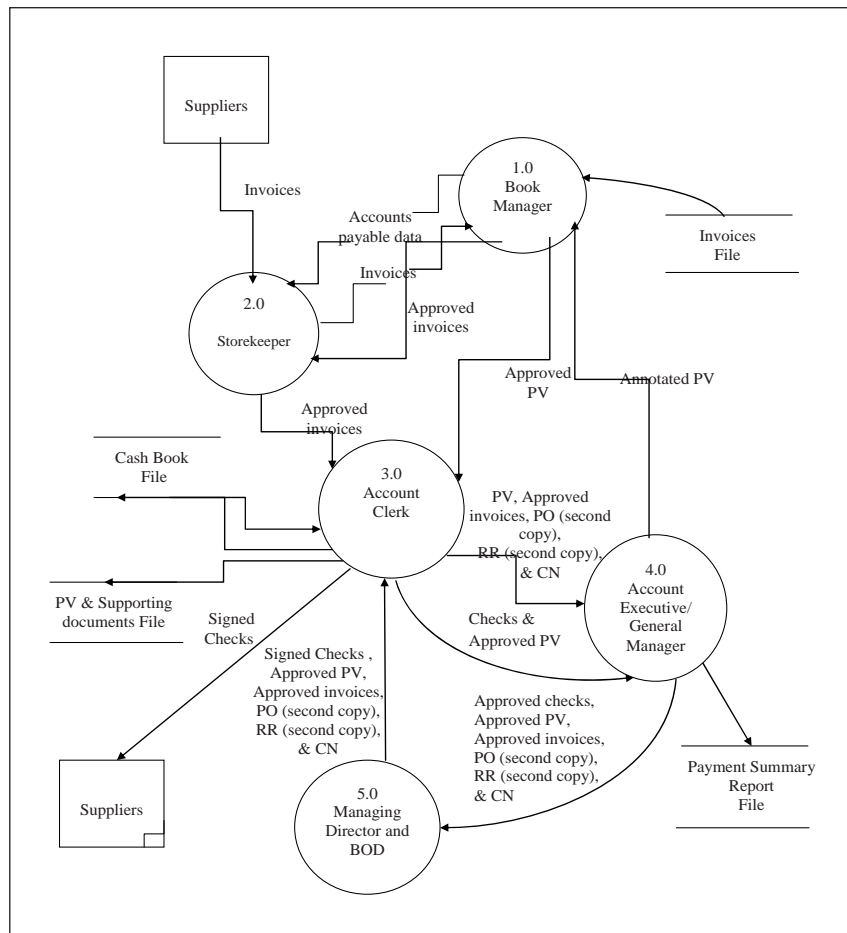
(continued)

Entities	Para	Activities
Book Manager	1	Approve the invoices for payment.
Storekeeper	1	Send the approved invoices to Account Clerk.
Account Clerk	2	Receive the approved invoices from Storekeeper.
Account Clerk	2	Match the approved invoices with the second copy of PO and receiving report as well as a credit note.
Account Clerk	2	Prepare a pre-numbered PV
Account Clerk	2	Sign the PV as a Preparer.
Account Clerk	2	Send the PV with all the supporting documents to Account Executive or General Manager
Account Executive/ General Manager	2	Review the PV by comparing the PV with all the supporting documents.
Account Executive/ General Manager	2	Sign the PV as a reviewer.
Account Executive	2	Prepare a cash payment list.
Account Executive	2	File the list in the payment list file.
Account Executive	2	Send the PV to Book Manager for approval of payment.
Book Manager	2	Sign the PV.
Book Manager	2	Send the approved PV to Account Clerk.
Account Clerk	3	Receive the approved PV from Book Manager.
Account Clerk	3	Prepare and print checks.
Account Clerk	3	Send checks and supporting documents to Account Executive/General Manager for authorization.
Account Executive/ General Manager	3	Review the checks with supporting documents for consistency and accuracy.
Account Executive/ General Manager	3	Send checks and the supporting documents to the Managing Director and Board of Directors for approval.
Managing Director and one of the BOD	3	Sign the checks.
Managing Director	3	Send the signed checks to Account Clerk.
Account Clerk	3	Mail the check to suppliers.
Account Clerk	3	Update the payments in the cash book.
Account Clerk	3	File the PV and the supporting documents by PV number to keep a record of payment.

(b) Context diagram



(c) Physical data flow diagram



(d) (I) and (II)

No	Weaknesses (I)	Improvement suggestions (II)
1.	No segregation of functions Too many responsibilities are given to Book Manager. Book Manager approves the purchases of books, reviews invoices from suppliers that are coming due, approves the invoices for payment and approves the payment voucher.	The task of approving the invoices for payment and approving the payment voucher need to be done by different persons.
2.	Lack of transaction authorization Book manager approves the payment voucher.	Account Executive reviews the payment voucher and General manager rather than Book Manager should approve the payment voucher.
3.	No segregation of functions Account clerk prepares payment voucher, prepares and prints checks and mails the signed checks to the suppliers.	The functions of preparing and printing checks and mailing the signed checks to suppliers should be done by two different persons instead of all being done by the Account Clerk.
4.	Lack of accounting records Accounts department did not prepare a check register	A check register should be prepared.
5.	Lack of Access Control The PV and supporting documents file are kept at Account Clerk's desk.	The PV and supporting documents file should be kept in locked drawer and can only be accessed by authorized person.

Question 3:

Methodologies, techniques, and tools help ensure the quality and appropriateness of the system being built. Following a systems methodology, applying techniques, and using appropriate tools provides structure to the systems development process, since they have been tested and perfected by others. The traditional systems development life cycle methodology that addresses is known as waterfall methodology. In addition, the BBS has alternative to other modern methodologies such

as Computer-Aided Systems Engineering (CASE), Joint Application Design (JAD), Rapid Application Development (RAD), Agile and Object Oriented Systems Analysis and Design (OOSAD). Students may suggest, compare and contrast the methodologies by looking into the advantages and limitations of these methods. Students need to be rational and logic in choosing the suitable method.

(a) **Traditional Waterfall**

The traditional Waterfall consists of the major SDLC phases which include planning, analysis, design, implementation, and maintenance. Planning is the first phase of the SDLC in which an organization's total information system needs are identified, analyzed, prioritized, and arranged. Analysis is the second phase of the SDLC in which system requirements are studied and structured. During the third phase, the design phase, a description of the recommended solution is converted into logical and then physical system specifications. Implementation is the fourth phase of the SDLC in which the information system is coded, tested, installed, and supported in the organization. Maintenance is the fifth and final phase of the SDLC in which an information system is systematically repaired and improved.

(b) **Computer-aided Systems Engineering (CASE)**

CASE tools or software to provide automated support for some portion of the systems development life cycle. CASE tools are built around a repository that contains all of the metadata (such as data names, format, uses and location) for data elements as well as the system specifications. CASE tools automate the repository for easier updating. Included in the CASE tools is diagramming tools to produce dataflow diagrams, entity-relationship diagrams, screen and report designs. CASE tools automate routine tasks to help programmers and analysts do their jobs better. Many also allow for code and Data Definition Language (DDL) generation and implementation, making them fully support the entire SDLC. Depending on the CASE product, CASE may provide security features, version control, import and export facilities, and facilities for backup and recovery, user account management, and usage accounting. The repository is likely the most important component of a comprehensive CASE system because it provides the mechanism through which tool and activity integration can occur and can be utilized by all project team members, promoting a single view of the project.

(c) **Joint Application Design (JAD)**

Joint Application Design (JAD) is a structured process in which users, managers, and analysts work together for several days in a series of intensive meetings to specify or review system requirements. JAD is better than traditional techniques because you have all key personnel in one place at one time, saving everyone time and resulting in high levels of system ownership as more people have more of a role in the development process. Weaknesses include the level of commitment necessary to make the JAD work, the high degree of required planning, and the typical lack of computer support.

(d) **Rapid Application Development (RAD)**

RAD (Rapid Application Development) is a systems development methodology created to decrease the time needed to design and implement an information system. One of the hallmarks of RAD is extensive user involvement through traditional JAD (Joint Application Design) sessions as well as evaluation of prototypes. RAD also includes integrated CASE tools and code generators.

(e) **Agile Methodology**

Agile Methodologies promote a self-adaptive software development process. While other methodologies focus on roles that individuals play in a project team, Agile Methodologies focus more on the individual. As software is developed, the process used to develop it is refined and improved through a review process done by the development team. Agile Methodologies differ from traditional system development methodologies in that there is less focus on process and more focus on the people involved in the project. Agile methods would be more likely to be employed instead of a more engineering-based approach when the project or team is relatively small; when the products are not critical or safety oriented, and design is relatively simple with relatively minimal documentation necessary; when agile-experts are continuously available in a critical mass; and in environments where the culture is one in which people thrive on chaos and are comfortable with several degrees of freedom.

(f) **Object Oriented Systems Analysis and Design (OOSAD)**

Object-oriented analysis and design is a set of systems development methodologies and techniques based on objects, which combine data description (attributes) and activities (methods) rather than the traditional

data description (data analysis) separate from processes (programming). The object-oriented approach combines data and processes in single entities, whereas the traditional approach is either data-oriented or process-oriented. The object-oriented approach also takes advantage of inheritance, through the use of object classes. This is not available in the traditional approach. While OOSAD is iterative, the iterations are within each phase.

Question 4:

Traditional techniques for data gathering include interviewing individuals, interviewing groups, observing users, and document and procedure analysis. The modern data gathering techniques include Joint Application Design (JAD), Nominal Group Technique (NGT), CASE tools and Prototyping. Business Process Reengineering (BPR) is a radical method for determining system requirements.

Students may suggest one or more techniques based on the nature of the company.

(a) Interview

Interviewing involves speaking with users individually or as a group to discover their views about the current and target systems; it also involves carefully preparing an interview outline and guide before conducting the interview. Interviews are best done when only a few people are involved, when you use open-ended questions or the questions vary from individual to individual, or when a more personal method is needed.

(b) Observation

Directly observing users involves watching how people work in order to uncover information. Direct observation is best when detailed or complicated procedures must be documented, when you do not want people to know they are giving you the information you need, when only a few people are involved, and observational data are representative of all situations.

(c) Document Analysis

Analyzing procedures and other documents involves identifying and collecting written procedures, forms, reports, and other relevant documents in order to identify better data and processes that would be

part of the current and target systems. Analyzing documents are the best technique when documents are complete and unbiased, when other forms of requirements determination are too obtrusive, and when history must be studied and people do not have firsthand data about history.

(d) **Joint Application Design (JAD)**

JAD is a structured process in which users, managers, and analysts work together for several days in a series of intensive meetings to specify or review system requirements. JAD is better than traditional techniques because you have all key personnel in one place at one time, saving everyone time and resulting in high levels of system ownership as more people have more of a role in the development process. Weaknesses include the level of commitment necessary to make the JAD work, the high degree of required planning, and the typical lack of computer support.

(e) **The Nominal Group Technique (NGT)**

NGT is a facilitated process that supports idea generation by groups. NGT encourages individuals to identify and prioritize problems with an existing system or requirements for a new system.

(f) **Computer aided Software Engineering (CASE)**

CASE tools can support requirements determination by supporting JAD and prototyping with diagramming, form and report design, repository access, and prototyping tools. Case tools appropriate for requirements determination include use case modeling, diagramming, prototyping and form and report generators.

(g) **Prototyping**

Prototyping is used to collect user requirements and present them in the form of a working system prototype. Users can look at, play with, and compare the prototype to their system requirements. Analysts can then adjust the prototype to better fit what the users have in mind. Prototyping is better than traditional methods where system requirements are not well understood, where few users that are stakeholders are involved, where designs may be complex, where there have been past communication problems, and where the necessary tools are readily available. Prototyping may be worse than traditional methods where formal requirements are

not documented, where prototypes become idiosyncratic to the initial user, where issues of data sharing and integration with other systems are ignored, and where SDLC checks are bypassed.

(h) **Business Process Reengineering (BPR)**

As part of the BPR effort, key business processes should be identified. Key business processes are the structured, measured set of activities designed to produce a specific output for a particular customer or market. Once these key business processes have been identified, activities that can be radically improved should be identified. Primary candidates include activities that are viewed as important, changeable, or dysfunctional. BPR benefits include radical improvements in speed, quality, and customer satisfaction.

Additional Readings

George, V., & Hoffer (2012). *Essentials of Systems Analysis and Design*, 5th Edition, New Jersey: Pearson Education (Prentice Hall).

Hoffer, J. A., George, J. F., & Valacich, J. S. (2011). *Modern Systems Analysis And Design*, 6th Edition, New Jersey: Pearson Education. (Main Reference)

Kendall., & Kendall. (2011). *Systems Analysis And Design*, 8th Edition, New Jersey: Pearson Education (Prentice Hall).

Shelly., & Rosenblatt. (2012). *Analysis and Design for Systems*, 9th Edition, Cengage Learning.