ASIA PACIFIC UNIVERSITY

OF TECHNOLOGY & INNOVATION

GROUP ASSIGNMENT

TECHNOLOGY PARK MALAYSIA

Systems Analysis and Design (CT026-3-1)

APU1-UC1F1911CGD-CS-CS(CYB)-CS(DA)-CS(DF)-CS(IS)-IT-IT(IOT)-MMT-SE

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1.0 INTRODUCTION

Introduction to MAHD Company

Figure 1: MAHD Company logo

MAHD compony is one of the companies that design and develop system bases on the SDLC information system. Mahd company started two years ago and achieved its aims very fast. Founders of Mahd company are five people, who are; Marsad, Azman, Haroon, Hassan, and Devdat. The logo is base on the name of the founders. The company headquarter's is based in Sheffield, UK. The vision of the company is to make a powerful and qualified program to satisfy the clients and Increase the Efficiency of the client company. Our mission is to inquire about the needs and issues of the clients' companies and provide them with a functional application to make their life more comfortable and achieve their "aims and dreams". We are focusing on our client's needs and desire to improve their productivity.

Overview of the comic book shop

The new project is about a comic book shop on Flat Street. Matthew is the business owner, and his job is to buy and loan second-hand comic books. At the moment he has a private library that loan comic books to local people. The owner decided to run a website for the purpose of buying comic books from people online. The people who have comic books to sell will upload the book on the website. The owner of the comic book shop will then decide to buy the book or not. If he has four copies of the book then he might buy the book at low price or not buy at all. Otherwise, if he does not have the book, he will buy the book at a reasonable price based on

condition of the book and rate.The owners have employed, Mahd Company to give them an information system in two months within the budget of 10,000RM.

2.0 PROBLEMS AND PROPOSED SOLUTIONS

At the moment, the most significant issue in the comic book shop, Matthew is facing problem to supply the second-hand comic book from the local people. So the population of local people is not that much, and in another hand populations of those people use comic book is decreasing. It is decreasing because people can easily use the internet to read books or they use pirety website. Those problems are only base on the lack of supplying second-handbook. The other problem is Matthew using a manual system to register and loan comic book, and there is no income for him cause registration fee(RM 100) will back to the member after unregistering. Other than those issue in loaning system, there is not any limitation for borrow comic book from the comic book shop. Also, for finding or search people activity and comic book in this system, it takes time and lots of space for storing them. The other issue is that Matthew does not know how many books are available for loan.

Mahd Company decided to a make information system combine automated database system for resolving Matthew problem. This database system made from different entities. One of them is a comic book database, and this entity includes; ISB number, book id, book name, number of copy of a book, the price per copy. With this entity, Matthew could decide which book need to buy second hand or which book he does not need to buy. Next entity is about customer details (check member). This entity will resolve Identifying members and searching about them. This entity includes; name, gender, date of birth, address, registration date, phone number. Next entity is about the issued book; this would solve the problem of the number of books available, numbers of books not available for loan, and the total number of books in the shop. Last entity is the transaction database; this helped to check the transactions and the fees by the customer and sellers. However, Matthew has to think about the new fee system for loaning book because the loaning system at the moment is just the registration fee for a lifetime. Mahd

company just put extra option in this area if in the future he changed his mind he can easily change the fee roles He has to consider monthly/weekly or yearly subscription fee.
Finally, with this information system and automated system, Mahd company easily can set up the website and boost Matthew business(local comic shop) and lead him to success with the system they decide to design. After designing website Matthew problem for supplying second-hand will solved.

Aim and objectives of the proposed system

The principal aim of this project is to solve Matthew problem with the lack of supply second-hand comic book because his business is a local shop. Nowadays, people start reading books and comic books online, so the market is not very power full like old-time. So he asks Mahd Company to help him to make his business more profitable and popular. Moreover, Mahd company want to design system to help him when a customer enters to shop, everything will be automated and no need to write anything on the paper, so every registration, comic book transaction such as loaning and returning, buying second-hand comic books will easily record in the information system made by Mahd company. On the other hand, the other aim and object of the project to make a website to ask people to upload and put the comic book details to give the offer to Matthew to buy or not buy the comic book. Finally, the whole aim and objective of this project to prevent and save comic book shop from bankruptcy.

3.0 PROJECT PLANNING

The comic book shop in the given case study has two sites. First the comic book shop itself and secondly the private library. As explained in the case study, comic book shop is maintained by Matthew, whereas the private library is maintained by Will. Both are to be put under a one system. The proposed system for this project is an "Automated Database System". This system will contain the list of books available at both sites, along with the list of members of the comic book shop too. The system will allow easy user access and modular implementations, so that it can be upgraded upon in the future.

As a system has been set; creating, implementing, and maintaining the system all falls under the project planning. This will determine and explain how and in which order will the tasks be fulfilled according to the requirements of the client. Usually for project planning IT specialists use SDLC (System Development Life Cycle). SDLC is a process followed for software projects. It contains detailed plans on how the system is to be developed and maintained. It also defines a methodology that improves the quality of the software and development process.

For every project, a structured analysis should be conducted. This analysis comprises of traditional development techniques, use of specific phases of SDLC and uses process models to describe a system graphically.

SDLC Phases:

There are five phases in SDLC. These are:

a) Systems Planning
b) Systems Analysis
c) Systems Design
d) Systems Implementation
e) Systems Security and Support

Systems Planning:

Currently, for the system being used, the registration of the members and loans are most probably file based, along with the acquisition for second-hand comic books. One of the main opportunities for the system would be the website to be setup by Will. According to the case study, a database is also to be made containing the books currently available in the comic book shop and library, along with the current registered members. A preliminary investigation report is to be made according to these findings with further details on the project pertaining the number of customers averaged by the comic book shop.

Systems Analysis:

Here the system requirements are set. Due top the proposed system, surveys are to be conducted. First survey is for the employees of the comic book shop and library, asking about what features they would want in the new system. The second survey is for the customers, asking their borrowing preferences and the frequency of visits to the store itself. This will determine the target demographic of the comic book shop. It will help the system to cater for the customers too, for example: recommending titles according to what is popular currently and certain preferences of the customer. A system requirements document is created from this.

System Design:

A logical model of the system is to be created here. The basic model of the system would be that two databases (one for the comic book shop and another for the library) contain the list of books and comic books available. Another customer database is also required, containing the current members of the store.

1. When a customer tries to borrow a book, the system checks if the customer is already a member or not. If the customer is not a member then, the system prompts them to register and pay the initial member fee.
2. If a member tries to cease membership, the initial member fee is repaid considering if the books borrowed are returned in good condition
3. When someone offers to sell a comic book on their website, the system checks if it has any copies of the book already in the database. If there are less than four copies, then it checks the price paid for the other copies and accepts the offer it is the same or lower price compared to the one in the database.
4. If there are four copies of the book already, a prompt is issued to Will; asking if he would like to decline or offer a reduced price.
5. A receipt is printed for every transaction (buying and renting of books) and a log is also created.
6. The system does routine backups at the end of every month.

The system design specifications are made according to these inputs, outputs and processes.

Systems Implementation:

Finally, the new system is implemented in this phase. The base program for the system is to be setup and the website is created and hosted. The system is to be implemented in phases; this is known as phased implementation. The website is first tested and documented, then the customer registration system is implemented. After that, the recommendation and backup system are implemented, insuring full system functionality. This ensures the system being fully functional and thoroughly documented.

Systems Security and Support:

As the system, built upon a core program and each extension is a part of the base itself, the system becomes very modular. This allows the system to be secure, reliable, easily maintainable, and scalable for future expansion. The system being modular is very helpful as this means that if any part of the system is affected, the other parts can keep on working without any problems. This allows system upgrades to be delivered and installed with ease. Regular maintenance of the system is to be kept too (expected annually).

Gantt Chart:

Task	Description	Time allotted	Dependencies
A	Initial planning & Team Briefing	7 Days	…
B	Investigation/Planning Report	2 Days	...
C	Conducting Employee Survey	7 Days	B
D	Conducting Customer Survey	7 Days	B
E	System Requirement Document	1 Day	C, D
F	Creating logical model of the proposed system	7 Days	E
G	System Design Specification Document	2 Days	F
H	The proposed system is created	21 Days	G
I	Phased implementation of the system in the business	7 Days	H
J	Creation of the User Manual for the system	2 Days	I
K	Final System overview and check	4 Days	J

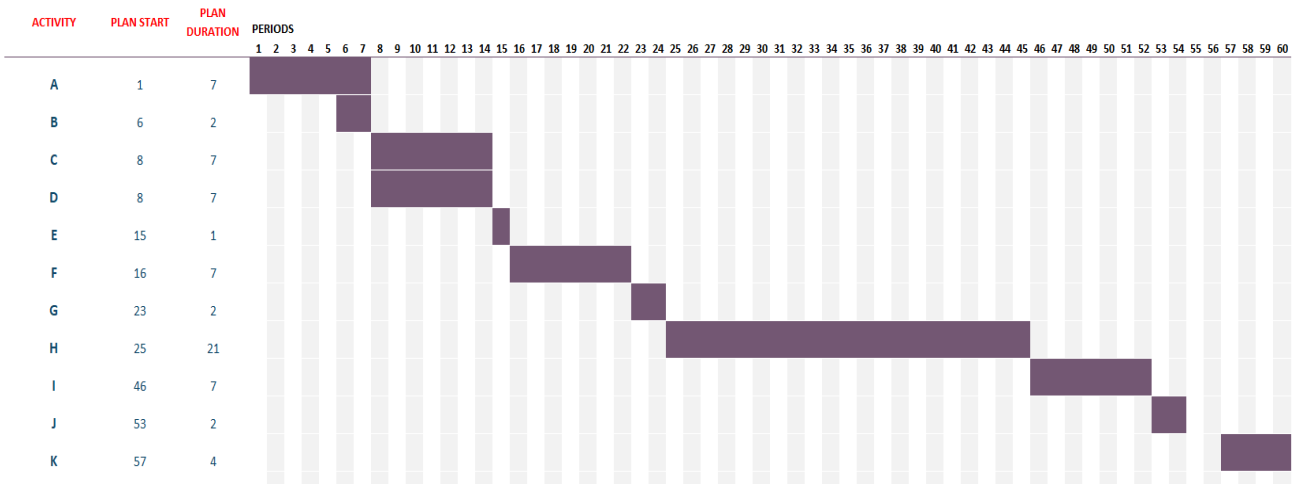

Figure 2: gantt chart 2 days break has been given between Task J and Task K.

4.0 FEASIBILITY STUDY

To decide whether or not the project is feasible, research goals and project results must consider. It is not essential for small projects, as the scale of the project is easily understood. For big projects, it is possible to do so, either in the informal context or because there is no time for formal training or because the project needs to complete one way or the other.

When a feasibility study is carrying out, four areas: "scientific, financial, organisational, and ethical" must be addressed in four key fields. The feasibility report is a simplified version of a total review and design of structures. User specifications and several business options evaluating to some degree, and specific technical details provide on Implementation. The outcome of this stage is the feasibility of the documents

TECHNICAL FEASIBILITY

A technical feasibility study evaluates the way the customers are suppli with the product or service; this includes material, labour, transport and the technology needed to bring all this together, where the business can locate.

PC (RM 1,786) X2

PC for recording and sending data of the customer to a database, with the devices including a mouse, keyboard, CPU case and monitor used to place customer data into the system. If a system problem occurs, the data is sending to the storage that has previously stored.

HP Elite Desk 800G1

Specs:

- Processor: Intel Core i7 6th
- Gigabyte B450M S2H Motherboard by Default
- 4GB DDR4 3200MHz RAM (up to 128GB)
- 2 TB HDD

- 500W Bronze (up to 1200W)
- Steel Frame with Front Mesh Panel
- Magnetic Front Panel & Hinged Tempered Glass
- 3 Year Warranty with Lifetime Technical Support

Monitor: Hp 20 inch Monitor (RM 190)

Keyboard and A4Tech Kr-8520D Combo Mouse And Keyboard Black (RM 55)

Barcode scanner: Barcode Scanner Handheld Scanner with Stand Holder Automatic Bar Code Reader Auto Scanning POS Scan for Inventory (RM 60)

Server (RM 6,154)

ThinkStation P520c Workstation (RM 5,365)

extra HDD driver 5400 RPM SATA 6Gb/s 64MB Cache 3.5 Inch (RM 789)

- Processor: Intel Xeon W-2223 Processor(8.25MB Cache,3.60GHz)
- Memory :8GB DDR4 2933MHz ECC RDIMM
- Graphics: NVIDIA Quadro P620 2GB (4xMini DP) High Profile
- Storage:1TB Hard Drive, 7200RPM, 3.5", SATA3
- Warranty: 3 Year On-site
- Mother board: P520C MB Intel Basin Falls
- Second Video Adapter: None
- Network Card: Integrated Ethernet
- Form Factor: Tower 92% Power 500W

HP OFFICEJET PRINTER (RM 200)

- HP Officejet pro scanner + Printer all in one
- A4 Color Ink Printer, Perfect for Business
- Print, Scan, Copy and Fax, ADF, Duplex
- Print speed up to 20 ppm (black) and 10 ppm (color)
- Ethernet, Wi-Fi, 1 RJ-11 Fax

Operational Cost	Cost (RM)
HP Elite Desk 800G1 with mouses, keyboards, and monitors	1786 X 2
server	6,154
HP Officejet printer+Scanner	200
TOTAL	9,926 RM

Economic Feasibility

Economic Feasibility is crucial for proceeding to the next process, with the aim to analyse and calculate every incurring cost and ensure the benefits of purchased goods for the project.
These are the lists of some items that have been purchased and is required for the project to be used later in the new system.

Tangible cost

Tangible cost can be outlined and project a monetary value specifically. Examples of tangible costs are equipment costs, such as hardware and software, office supply, and employee pay.

Software , hardware, and employees trained to perform software operations will have costs for the Comic book shop. For the printing of receipts and other reports, office supplies such as the HP OfficeJet printer is required.

Intangible cost

These costs are difficult, unforeseen and can not be accurately calculated or estimated.Customer dissatisfaction, lower employee morale and improper decision-making can be included as inaccessible information is available.The system innovation proposed must be structured and developed to meet the specifications of the user demand. The software must be accessible and format the data into useful information that the health club can use to make decisions that are relevant to the goals of the organisation.

Tangible benefits

Tangible benefits are the measurable benefits of a software system that facilitate an enterprise. They include improved and faster access to information, increased workflows, time spent in improved workflow, reduced number of employees performing a number of tasks / processes.

Intangible benefits

They are the benefits that are otherwise difficult or near impossible to measure. They are improved decision-making process, enhanced accuracy, competitive customer service, increased job satisfaction, improved business image etc..

As an effective way to build a software for the pacific health club, Innove will need to consider the cost and benefit, implicitly or explicitly implicated with the long-term progress of the organisation. As a result, this will improve both companies' credibility.

Operational Feasibility (PIECES framework for Operational feasibility)

Operational feasibility is the way to determine to what extent a new program addresses or uses business opportunities. The operability of a program is applicable to customers and successfully utilised by the customer in order to achieve the company goals.

Performance

Does the current operating mode provide sufficient time for response and throughput?

There are two types of performance, the operational feasibility of the process and the response time. Firstly , the data is the amount which the system can perform over a period of time. Looking at the comics book store of Matthew, it's still outdated without any technology, everything is done manually using a piece of paper and a pencil. It can now solve these problems by the customer with the new computer-based 16 system, compiling weekly sales, managing clients, etc.

Information

Is the current mode a timely , accurate and useful formatting for end-users and managers?

All the information in the comic bookshop of Matthew is still done physically without the use of a computer system. Therefore, problems such as losing records or error in calculating sales by man, particularly when sales are high. Now, with use of a database system, these problems are easily avoided and all input information is compiled and saved by computer. Sales and reporting of installations from saved records will also be automatically calculated. The computer also makes every single time the data is backed up to prevent any risk of data loss.

In addition, files are deleted which are not used to reduce the hard disk load to make the computer work smoothly and efficiently.

Economic

Does the current operating mode provide business with cost-effective information services?

The analysis is conducted at this stage to determine if the financial and cost systems of a company are appropriate. This is very important because the amount of costs involved also affects a system. If we are able to base our case studies on the possibility of improving the comic book shop in Matthew. It is also necessary for a higher cost if the system develops well. But the company must also analyse all costs incurred in developing a system in addition to that. In order to make the system more efficient for Matthew.

Control

Is there effective controls available in the current operational mode to safeguard against fraud and guarantee data and information accuracy and safety?

It is the monitoring of data and data flows in the control section of this analysis when security and control is too weak to make the use of data and information by parties unauthorised to use data and information vulnerable. Also, if data and information flow security or control is too close to burden the system with security or monitoring processes. Based on the case study namely that of Matthew's Comic Book Shop, company safety controls, such as the lack of excessive and weak controls, must be considered by the system. The comic book shop system of Matthew must be controlled for example, so that crime against data is not committed, to protect system security.

Efficiency

Does the existing mode of operation maximise the use of the resources available, including people, time and form flow?

The current operating mode does not seem ineffective because, in order to improve and develop membership registration, a PC is still in use for staff to record new members more easily, since the current system still uses the old method of registering members as membership by logging information on books available in the bookshop. The new method also saves more time, because the staff fills the data with a PC, which is easier to complete and safer than a book.

Services

Is there reliable service in the present mode of operation? Is it flexible and flexible?

If we talk about current services, this method cannot be said to be a flexible and expandable operation, because the service takes more time and energy, for example if there are members who want to join the operation, of course there are many things that must be done by the staff, then if there are members who want to renew their membership, they must wait so that the staff can find the data themselves that have been previously recorded, of course this takes a lot of time and energy is quite tired for the staff, rather than that to complete all the current problem is better to use a newer and flexible system by reducing paper or book records systems. The advantage is that it is easier to use and time-efficient because using a PC with technology is certainly faster looking for information than using a book. And also the information entered is neater and faster because it uses a typing system rather than a system of notes that takes quite a long time.

Schedule Feasibility

Schedule feasibility recognises the possible timeframe and completion dates of all major tasks that the project manager can accomplish and do. The project manager should ensure that the work required to be done is carried out first and that the other activities are continued to achieve the goal of the organisation. The new system can be implemented effectively and efficiently by the organisation and resolve problems that the organisation has been faced with for 2 months and 1 week. The project has several divisions and is discussed below with reference of the Gantt Chart.

For the initial planning and briefing it will take 7 days and 2 more days for the Planning report to be produced. After that, estimated 14 days will be required in order to complete the customer and employee surveying . Upon completion, 1 day will be needed to create a system requirement document and around 7 more days for creating a logical model for the proposed system.

System design specification document is one of the important documents needed to be produced for which 2 days are needed.

The hardest part is the creating the system upon finishing the designs because the system needs to be perfect and up and running so it will take the longest, estimated 21 days to be done with the task.

Another crucial task is the phased Implementation of the system which will take around 7 days to test the system and ensure that problems do not exist. Furthermore, the last 6 days will be needed for the creation of user manual in the system and further overviewing the system to make sure that everything is in place.

5.0 SYSTEM ANALYSIS

System analysis is the process of gathering and describing facts, finding the problems and presenting the system as its base components. It is done to study a system and to identify its objectives that it fulfils. This is a problem-solving technique that ensures all the components of the system works correctly/accurately and efficiently according to the objectives accomplished.

According to the proposed system for the given case study, some requirements need to be fulfilled for the smooth operation of the system. These requirements are:

i) Interview

ii) Documentation Review

iii) Sampling

iv) Observation

v) Questionnaire

These requirements need to be fulfilled for the preliminary investigation of the system. Requirements gathering is done during this phase. This determines the base components of the system itself and the important data to be collected for the objectives completed by the system.

There are two types of requirements, Functional and Non-Functional. Functional requirements define what the system must accomplish, whereas Non-Functional requirements do not affect the features of the system itself. In hindsight the requirements of this system are:

Functional:

a) An operational system that fulfils that base objectives
b) Backup functionalities
c) Keep transaction logs of every transaction
d) Different access control for administrators and users
e) Ability of users to order, register and do basic transactions
f) Capability of the system to run perfectly on the recommended hardware specifications and utilise projected amount of software resources efficiently

Non-Functional:

a) Usability of the user interface of the system. Creating an efficient and impressive UI design
b) Producing a system which is available throughout the year. 24/7/365.
c) Creating a modular design for the system to increase scalability and future expansions
d) Maintaining high/consistent performance throughout the lifespan of the system
e) Provide regular support to the system, to ensure consistent functionality and useability
f) Include basic security features and update them according to industry standards regularly

After the Functional and Non-Functional requirements are stated, they are commonly written in a Requirements Specifications document, but can be written in different ways too.

6.0 DESIGN DIAGRAM

Context Diagram

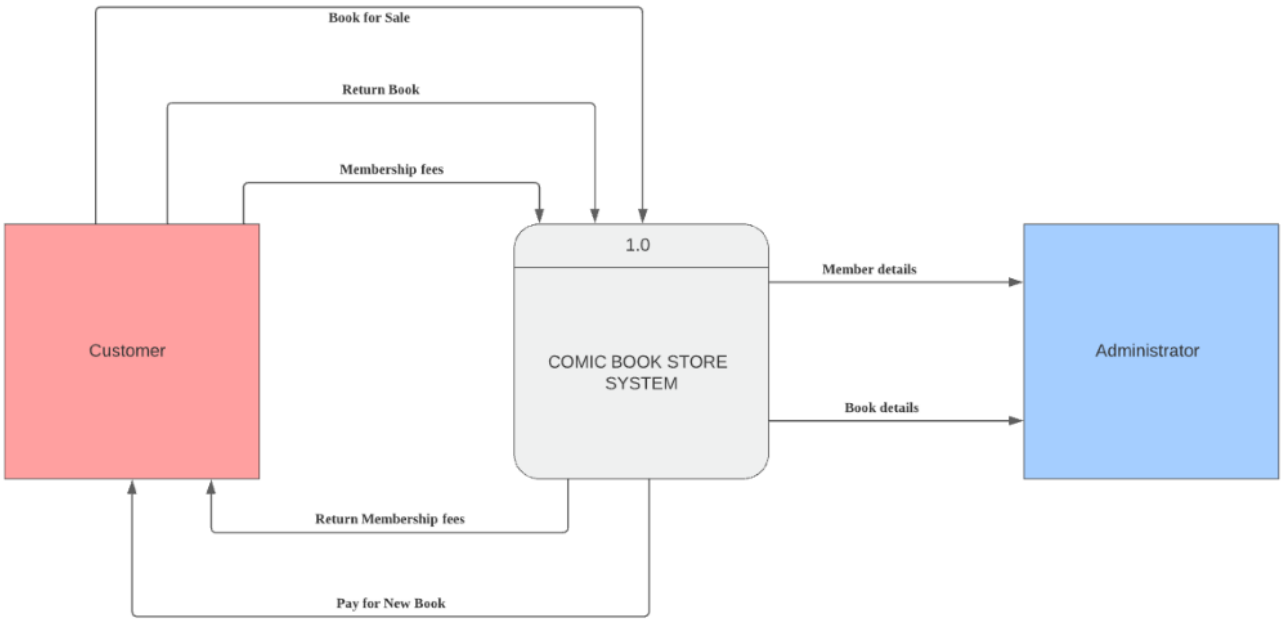

Figure 3: Context Diagram

Customer can pay the membership fees, returnbook,and Sale book at the comic book Store.

Comic book Store returns membership fees and Pay for new book.

Mathew the Administrator can access the member details and Book details.

Level-0 DFD:

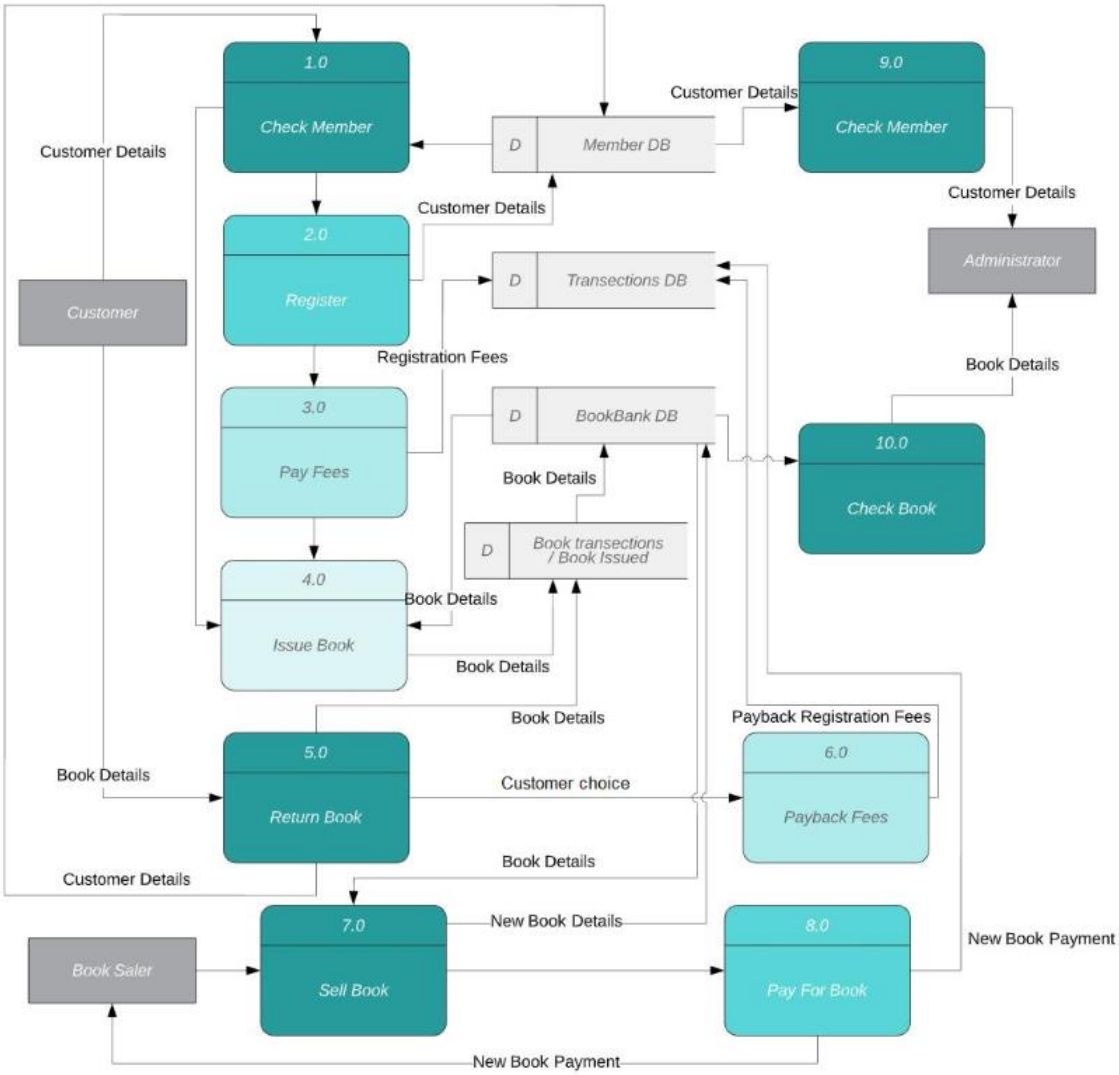

Figure 4: show level 0 DFD (data flow diagram) with attributes.

First, the customer is checked if he is a member or not, if he is not a member then he should register first by giving customer details: customer id and name, then he should pay membership fees then he is issued a book. Or if he is already a member then he is issued a book without registering again. Customer data is saved in the member database, and membership payment is saved transactional database.

To issue a book, it is checked in the Book Bank database, if the book is available, then it is issued to the customer, book details, and customer details are saved in Book transactions / Book Issued database. Further Book bank database is updated that book is issued, so decrease a copy from the number of copies.

If a book is returned, the details of the book are updated in Book transaction / Book Issued, and further Book bank database is also updated that book is back so increase a copy in the number of copies.

To return cease the membership, the customer must return all the books, books are updated in Book transaction / Book Issued, further Book bank database is also updated. The customer is paid back his membership fees and it is updated in the transactional database since he is no longer a member, so the member database is updated by removing his name.

To buy a book from any seller, the data of book in Book bank database is checked, what is the price of previous copies and how many copies of that book are available, if there are less than four copies then buy it from the seller. Update the data of the new book directly to book bank database, then pay for the new book to the seller and update the transaction database too for the money paid to the seller. Administrators can check the data of members from the member database and can also check books data from the Book bank database.

Entity Relationship Diagram (ERD)

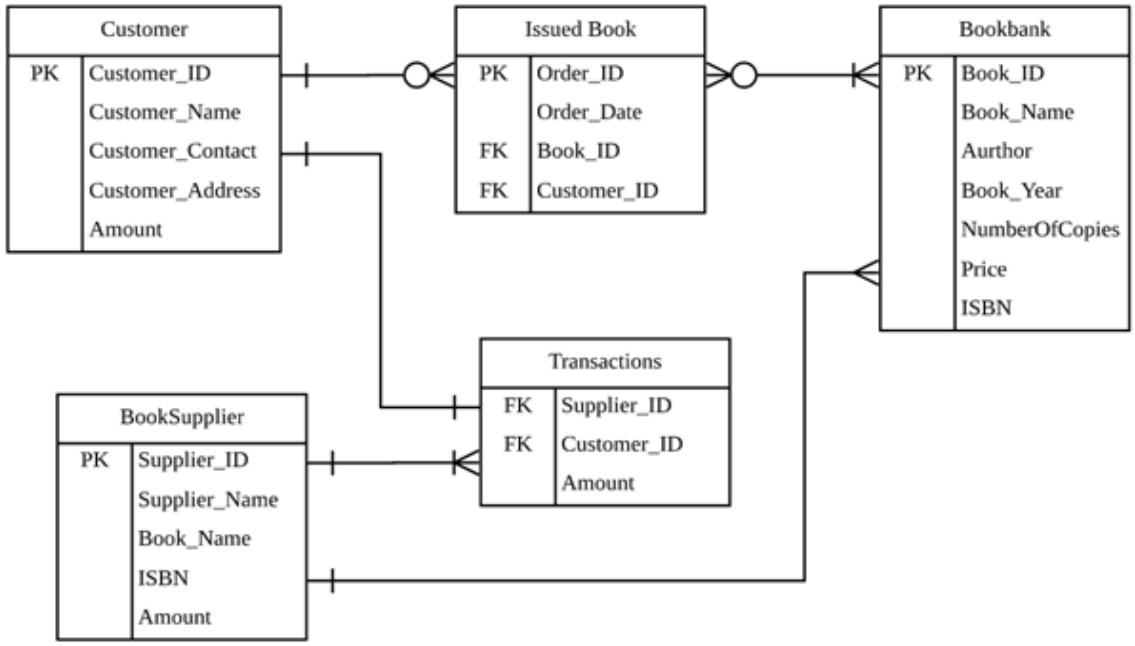

Figure 5: Entity Relationship Diagram for the Comic Book Shop

This ERD (Entity-relationship Diagram) contains five tables, and each table has its primary key: unique attribute which cannot be repeated. Moreover, foreign key: the primary key of the other table can be repeated in other tables.

The cardinality between the customer and the issued book is zero to many, a customer can have zero book or many books, and an issued book can have only one customer at a time, so the cardinality is one to one only. The cardinality between Issued Book and Book bank is one to many, an order can have one order as a minimum at a time, but also can have many orders too. Book bank can have zero books issued at a time but also can have many books issued too so, it is null to many, cardinality.

A customer can pay once, and a transaction can have one person at a time, so it is a one to one cardinality, A book supplier can have one transaction at a time, but there can be one or many transactions, so it is a one to many, cardinality.

One book supplier can have can one or many books at a time it is a one to many, cardinality, but book bank can register only one Supplier at a time, so it is a one to one cardinality.

7.0 INTERFACE DESIGN

Prototype Design

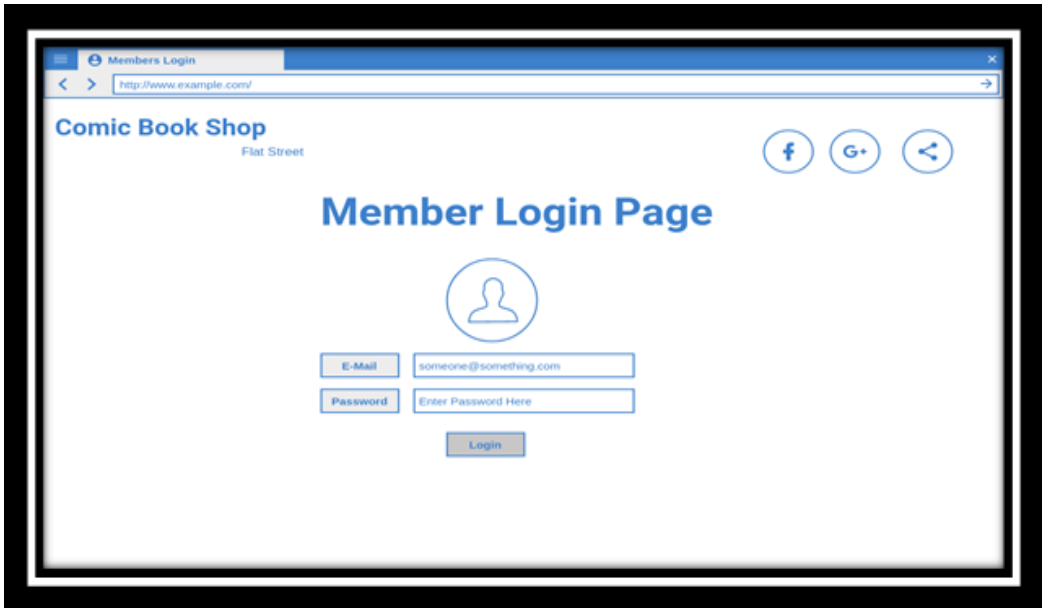

Figure 6

The image above shows the login page for the shop's website. Users need to login to the website to access features and services provided by the shop. After filling in the details and pressing login user is transported to the next page, the main menu.

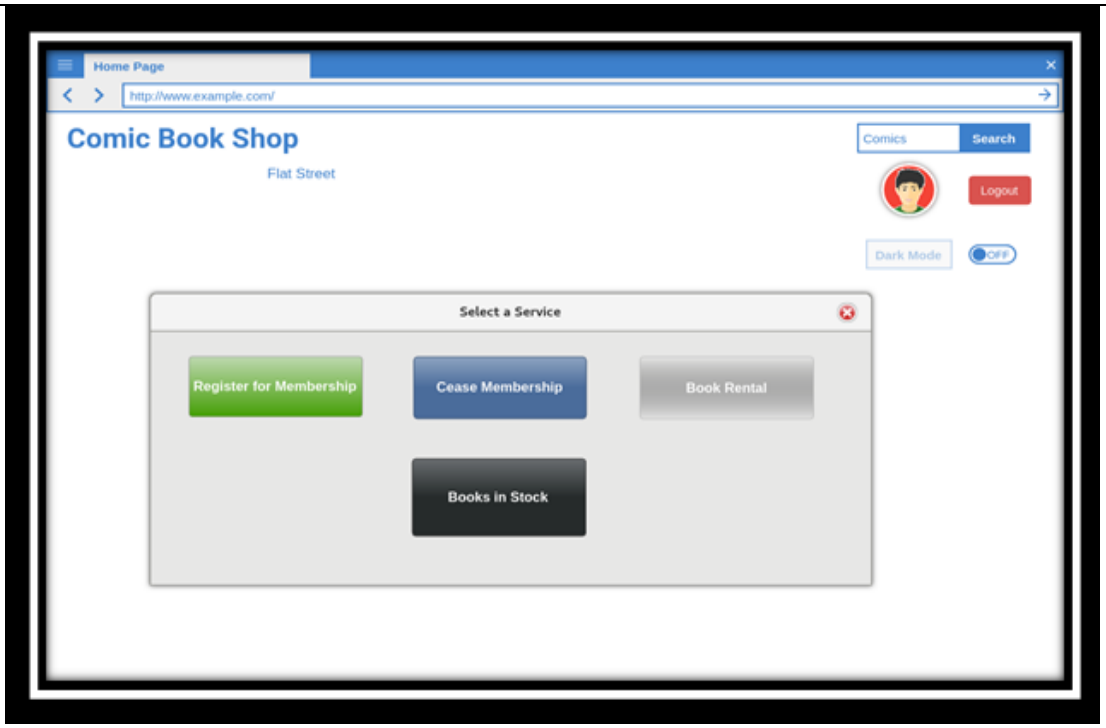

Figure 7

The image above shows the main menu that is displayed after logging in to the website. This page displays all the services provided by the shop's website. Here the user can register for membership, cancel their membership, rent a book or check the books that are currently in stock. Users can also search for any book using the search bar on top right-hand side. Users can also logout from their as well.

Figure 8

The image above shows the member registration page. In this page a form is displayed that the user must fill in properly to register with the comic book shop, The I.D is generated automatically. After filling in the form the user must select the payment method as the shop only accepts cash or credit/debit card. After submitting the form, the user is transported back to the main page.

Figure 9

The image above shows the Cease Membership page. On this page the user can enter their details in the space shown above and submit the form to end their membership with the comic book shop, the user must enter the auto generated I.D number. After submission of form the user's membership is revoked promptly.

Figure 10

The image above shows the Book Rental page. In this page a Rent a Book form is shown to the user. The user must enter the book title and then select relevant book from the drop-down menu. Afterwards the Book I.D is automatically shown. The user then must enter the start of the rental date, the rental end date is then calculated automatically. The rental fee is also calculated automatically. After confirming the data entered the user must press on the confirm selection radio button which will complete the process and take the user back to the homepage.

Figure 11

The Image above shows the Book Stock page. On this page the user can look at the current stock of the books available in the comic book shop. Users can view the number of books individually as well as the cumulative size of the total books. Users also have access to the More Details radio button that shows more details about the individual book categories. There is also a Back to Home Page radio button that takes the user back to the Home Page.

Design Concepts

1. Consistency

   All the pages created for the website are concise and to the point. There is no extra information or anything that might distract the user. All pages look the same and don't use different color schemes.

2. Easy to Use

   The whole website is created in a single-color scheme and has large radio buttons to help the user in understanding the interface. All the subpages eventually lead the user back to the main page.

3. Accurate

   The website has provided all useful features like search for comic books on every page on the top right-hand side. All forms are shown in a separate window inside the same page so that users are not confused.

Individual Component

Name:	Hassan HassanzadehAliabdi
TP No.	TP055097

Interview

The interview is a conversation between two people conducted from interviewer and interviewee. It could be face to face and also at the moment because of the pandemic crisis; it is better to do an online interview or telephone interview. The objective of doing an interview is to collect information for investigating or researching to give solutions for solving the problem or find a way to reduce them; This is investigation is only used for marketing research or project planning. There are different type of interview such as; Employment, crime, Psychology.

The information would be helpful if implement with a large number of people. It would be beneficial for the small number of people cause in information gathering we have to consider time. The interviewer should have skills for doing the interview cause if the interviewer does not ask the right questions and ask personal questions or sensitive questions; it would lead the interview to the disaster; on the other hands, it is essential to classify questions, and how to take notes from answers. So, the best option for the interview is face to face; the interviewer will ask questions with more confident and understandable. The same thing will happen for the interviewee because he/she will understand easier and will not get confused. The interviewer must be friendly, polite, and respectful with the interview.

Advantages of interview

- Accurate answer: interview has more reliable and truthful information rather than surveys. For example, during the interviewing person can not say lie about his gender, name, age, race, but in the survey, it is possible to put the wrong information. Also, the interview is an action activity rather than surveys because surveys is an interaction information gathering. So, answers have more details.

- Understandable answer: if the interviewee does not understand one of the answers, he/she ask the answer again or ask about more detail and explain the answer.

- Focusing on the subject: another positive thing about interviews is, both side in the interview has more concentration. However, in the survey, the person is doing an online survey can distract easily by text, call or anything else.

- Qualify interviewees: when research is searching about something or asking about some topic is very important to ask to from the right person. In our case study, we have to interview with the young generation because most of the Matthew customers are young generations. However, in the surveys, it is hard to find the right people for that topic.

- Face emotion and body language: when interviewee answering the question, interviewer scan person emotion, behaviour and, body languages. However, in the survey, it is impossible to understand the feeling and emotion behind the word.

Disadvantages of interview

- Cost: most significant issues with the interview are cost because for conduct an interview, it needs to run by professional and personnel worker. So, for a better result in the interview, the company have to spend money.

- Dependence to the interviewer: the other issues are if the interviewer does not be professional the answer would be not useful, and he/she can not control the interview for better performance and more detailed answered.

- Manual data entry: the other problem is if the interviewer enters the answers on the paper, later they have to scan or enter information into the information system, os it would take time and money. However, an online survey will directly enter the data to the system.

How to conduct an interview

There are some steps to conducting an interview:

1. Announce and invite people for interview: in this step, Mahd company will send a message or email to the customer and seller and determine the time for conducting the interview and invite. People can choose randomly or based on the activity. Mahd company have two option places for interviewees; comic book shop, and Mahd Company central branch.

2. Interview objective field: next Mahd company must choose the field for questions and let the interviewer know about the base, so the interviewer can decide to make proper questions.

3. Question making: after interviewer understands the objective and scope of the interview, he/she will start making questions for that area. In this case study, we have two types of interviewees; the customer(Members: those people borrow the book from the comic book shop), and those people are selling the comic book to Matthew. We have another type of people; staff.

    - Staff

        Which system do you prefer to work?

        What change system needs to reduce time-wasting and increase income?

        What is the problem with the old system?

        What is the benefit of the new system? And why?

        Which option is bolder than other option in the proposed system?

        Which design is better for new system?

    - Customer (Members)

        Who are you? (this question is not about the system just helping the interviewer to make the interview more comfort)

        What is your favourite genre? (this question is not about the system just helping to Matteh to understand which genre have more market)

        What do you think about the old loan system?

        What do you think about the new loan system?

        Which system do you prefer to use(old or new)? Why?

        Which system is more comfortable if you consider the time to work with it?

        How is the userfriendly of the new system?

        what new system need to add to it? And why?

- Seller

  Which system is more comfortable to sell the book to the comic book shop?

  What do you think about the site interface?

  What do you think about the new selling system?

  where you prefer to sell the second-hand book to Matthew? (face to face or online)

  what new system need to add to it? And why?

4. Preparing for the interview: after making questions and analysing questions, it is time to announce the final time and place of the interview to staff, Costumer, and seller by sending a message, email, or call.

5. Conducting the interview: In this step, the interviewers' team start to meet interviewees on the suggested place. Time of interview is between 10 to 15 minutes. Sessions can record by a video recorder, voice recorder, or enter the information into a paper. For using a video recorder, and voice recorder interviewer must ask for permission from the interviewee.

6. Documenting interview: interviewer must do documentation per interview after finishing every meeting because if he/she does not do that, it will cause missing information and wrong data. The document includes interviewee name, interviewee type, date, agenda, answers, and interviewer can explain about interviewee emotion and body language.

7. Interview result: the final step is interviewer give the answers for analysing and deciding how to implement the new system.

Data dictionary

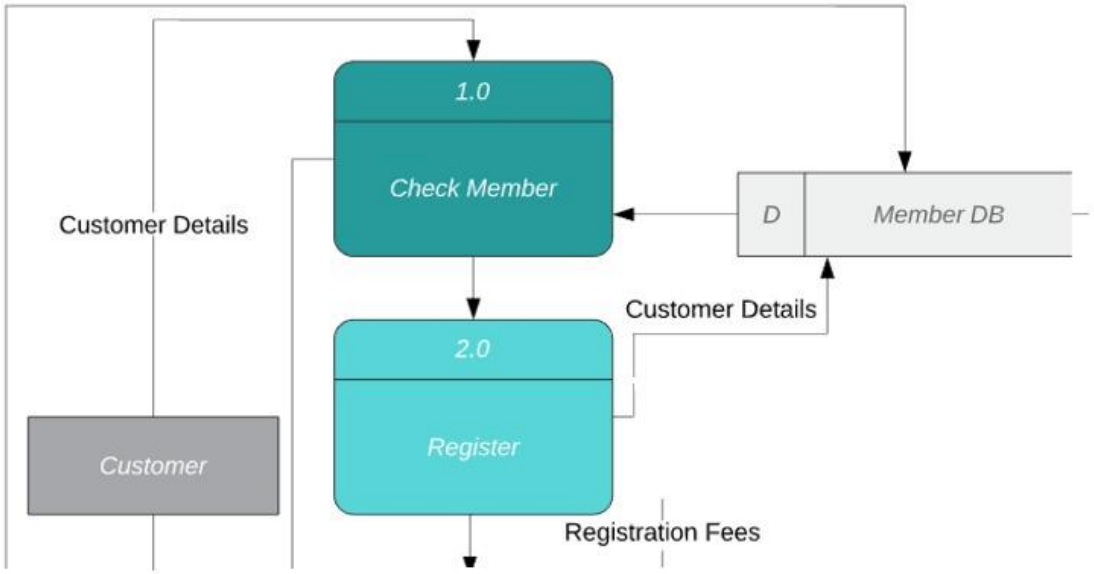

Figure 12: DFD level 0 for Check Members and Register data dictionary

Process of Check Members

Name: 1.0 Check Members

Description: The process checks the customer's data if that person is a member or not.

Input: member id, name

Data Flows: it checks the customer is a member or not. If the person is a member system, let continue work for issuing book. If the person is not a member system, go to the registering process.

Output: member id, name, member or not member.

Process of registration

Name: 2.0 register

Description: The process register the customer does not have a membership.

Input: member id, name, address, contact, age, gender.

Data Flows: it saves customer details in the Member database.

Output: customer details

DFD level 1

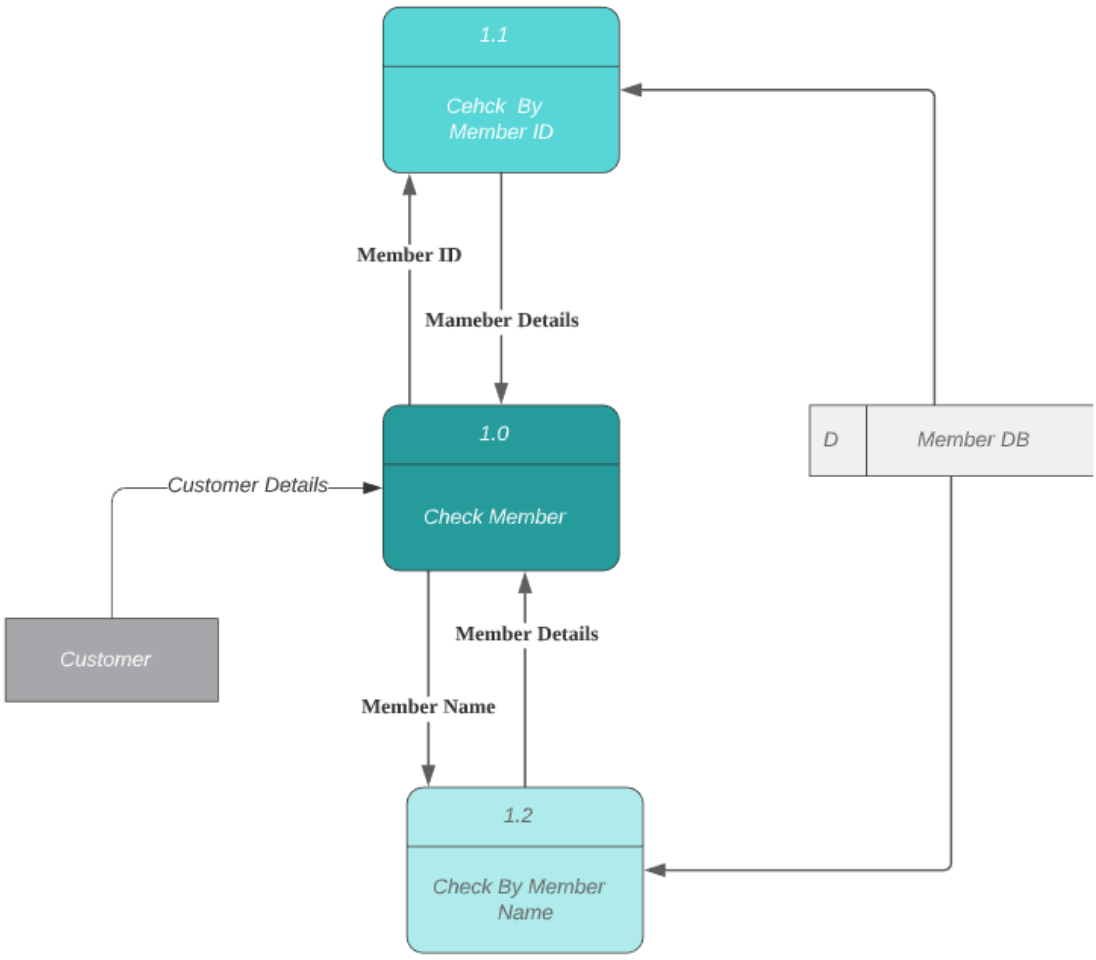

Figure 13: DFD level 1 for check member

The DFD level 1 show member for checking they must give the name or member id and then member details will check by Member database.

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TP No.	TP058340

Document Review

Analysing existing documents is a best and an advantageous technique in requirement gathering and Document reviewing, not only for itself but for other techniques too.

Collect the data from data files, reports, documents and other written artefacts to make information of it, and review the document to compare it with the current system, which helps the analyst understand the process of the system and its current condition.

Document review used in situations where background information gathered to understand the history and the function of the program being evaluated to abstract the future program operations better than the current strategies. Document review can also use for developing other data or information collection tools such as making questions for interviews and questionnaires and help answer questions related to the number and type of books, number and type of customers and program costs.

Like other requirement gathering methods, Document reviewing has its pros and cons., how the available information in the researched documents is "separately verifiable", suggesting that a third party has verified and confirmed its claims, is considered as an advantage. This method is also reasonably priced since one does not have to go out on their way to collect the data. Document review is also able to provide a closer look at the program which may not be directly visible to the public, which can be of great help when reviewing the system, a little closer.

The information available in the documents may not always match the needs of the project is a disadvantage in information gathering; First, confirm what is written in the document and with the needs of the project requirement. Lots of information gathered from the source; however, that does not mean that information will necessarily match the needs of the project. One cannot control the quality of the data collected if relied on the documents and information from the written artefacts provided and therefore deal with the instability of the

sources. It will be an exceedingly time-consuming process if the information collected by making it from data.

Document review as a requirement gathering will be very insightful regarding finding and designing the optimal management system for the comic book shop. From the previous system of management, the paper-based management, one can observe what kind of information they prefer to keep, and what their shortcomings were. With our philosophy in mind (minimalism and productivity), we can design and document a management system that they would not have trouble in shifting from their previous management system to a new fully digitalised system which can be backup too.

Conducting Document Review

Collect Existing Documents

To conduct a successful document review, find out the type of documentation is available for evaluation, then determine the ones that would help with the evaluation conducted. The comic book shop has a paper-based system to manage everything in their shop, from registration of members and giving receipts, In this case, the information that needs to be collected is the method of the registered member and type of book they borrow, and often they borrow a book.

Secure Access to the Documents Identified Through Assessment & Ensure Confidentiality

Permission may be required by the higher-ups to review the document before reviewing and analysing the document. One may need to work with legal experts in the company to understand certain limitations for reviewing the documents, and they can also help one access the documents for the evaluation. Confidentiality is an essential consideration while collecting sensitive information for evaluation. If one needs to review said documents, then a system should be developed to handle them, which can help in securing access to sensitive and confidential. Since information on members and staffs is highly confidential, permission is required to be taken from the Management team of the comic book shop and can be accessed once approved.

Registration forms naturally contain sensitive information regarding individuals, at least one member from the management team overlooks the evaluation.

Compile the documents relevant to the evaluation

After securing the documents, start the evaluation process by answering the questions needed for it. It is essential to limit the documents to only those who would help with the evaluation process. Upon reviewing the documents, it has been determined that registration forms member and the invoices/ receipts are going to be used for this evaluation (both empty and filled).

Understand how and why the documents were produced & determine the accuracy of said documents

Communication with the staff members in the management team is needed to understand the context of the documentation better on how the former system was built. The documents also need to be compared to other documents containing related information and other data collected before ensuring the accuracy of the data from the document. After the compilation of the forms necessary, an appointment is to be booked to understand the context of how the system was earlier built. After collecting the insight, data is to be crosschecked from the initial research on the system.

Summarise information from document reviewed

Finally, summarise and compile the information gathered from the research.

The comic book shop uses the old paper-based system for their management. What also needs to be considered is that every form over there is filled with a pen by hand. The comic book shop uses three different but similar-looking registration pages for member registration, receipt and book issued a receipt. As for the invoices, default payment slips are filled up by hand, and the reason of payment is filled according to its type. All these forms were then later kept in several files, which were then later presented in monthly meetings. Upon reviewing these

materials, the apparent inefficacy is the fact that it is a paper-based system. Having this system means that the number of papers used is substantial, which poses a problem both financially and environmentally. Using these many papers have proposed a massive number in costs monthly and yearly, and in this manner, it is also harming the planet. Another issue is on how the forms were filled up by hand. There is a risk of having a spelling error and having illegible handwriting, which can pose a huge problem, especially when these documents are reviewed in the meetings later. Looking closer at form there was much unnecessary information being asked and kept, such as nationality, race, and religious views. Keeping unnecessary information takes up unnecessary space, which can be avoided very easily. The registration forms are also very redundant since they all use the same information. The other forms also create redundant information and are at risk of getting lost.

Existing documentation will provide the analyst with the customer Details: customer's id, name, address and contact; then staff details, book collection details, transaction details; This helps the analyst to formulate questions for which customer is leasing how many books, what staff member is working efficiently, what type of book lease more, what specific book lease, which book is buying worth it.

Questions

Question could be considered are:

What is the information about?

how the information is collected?

How to securely access it?

What customer is taking what books?

What type of books are borrowed more?

What specific book is borrowed more?

Data Dictionary

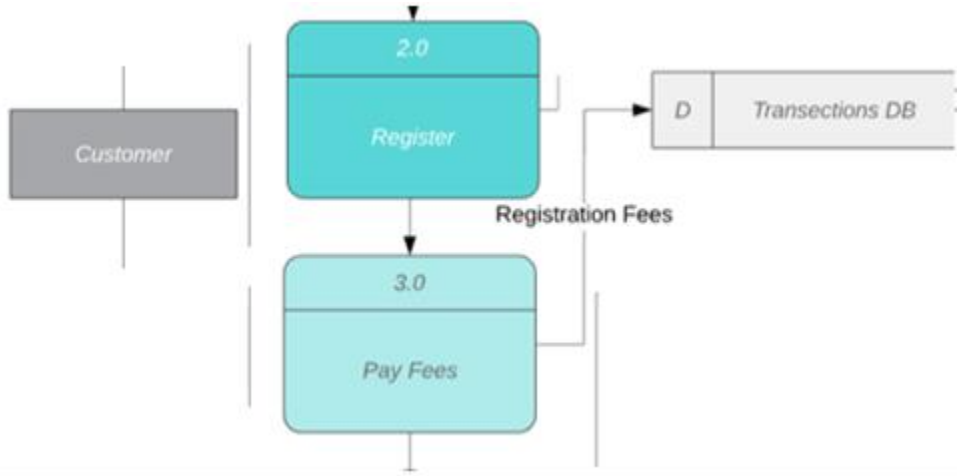

Figure 14: DFD level 0 for pay fees data dictionary

Process Name: 3.0 Pay Fees

Description: Receives data from the second task check member and asks to pay Membership Fees at this third task.

Input: Member ID, Member Name, and the amount for membership.

Process: Once a Customer is Registered, ask him to pay for membership fees, which is saved in transaction database with Member id, verifying that customer has paid for membership fees and print the Fees receipt to him.

Output Data Flow: Membership Fees Receipt.

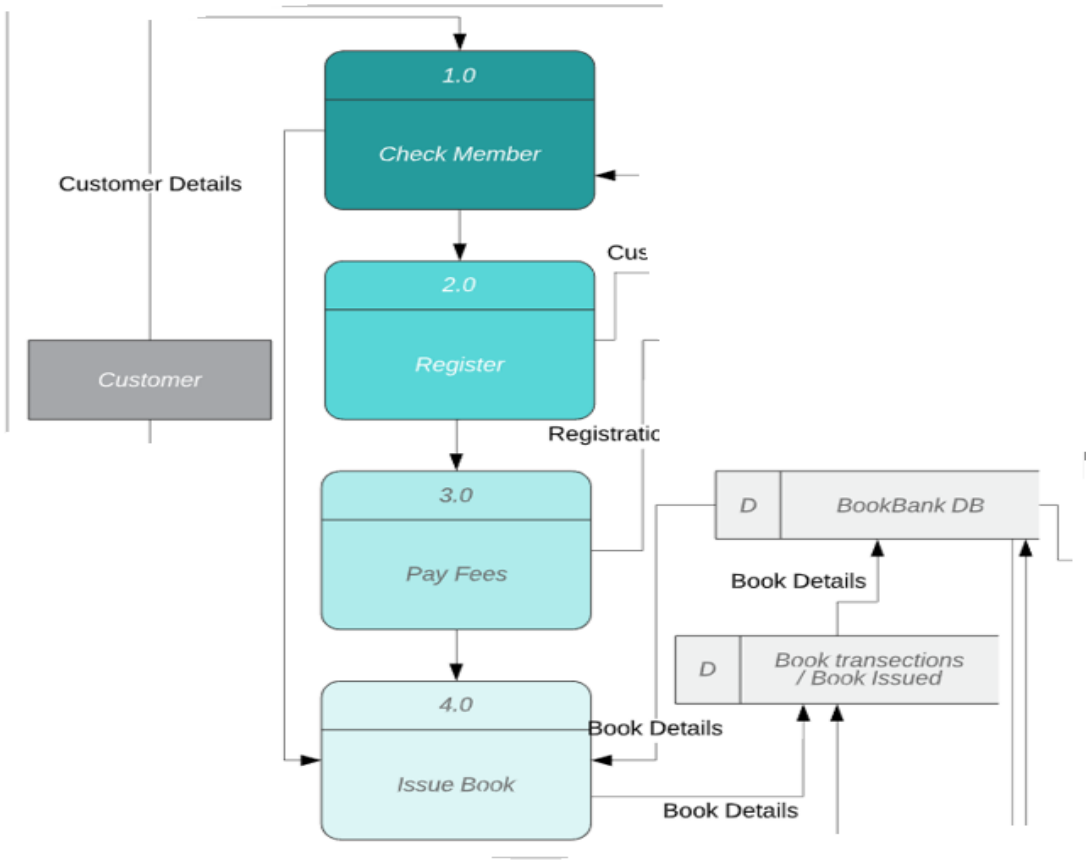

Figure 15: DFD level 0 to Issue Book data dictionary

Process Name: 4.0 Issue Book

Description: Customer is issued a book, and his details with books details are updated in the database.

Input: Member ID, Member Name, Book details.

Process: If a customer is a member, he is issued a book; else he registers first, then he is issued the book. Book availability in the book bank database is checked, and the book and customer details are updated in the book transaction/book issued database and further updated in the book bank database.

Output Data Flow: Book, book Receipt.

DFD Level 1

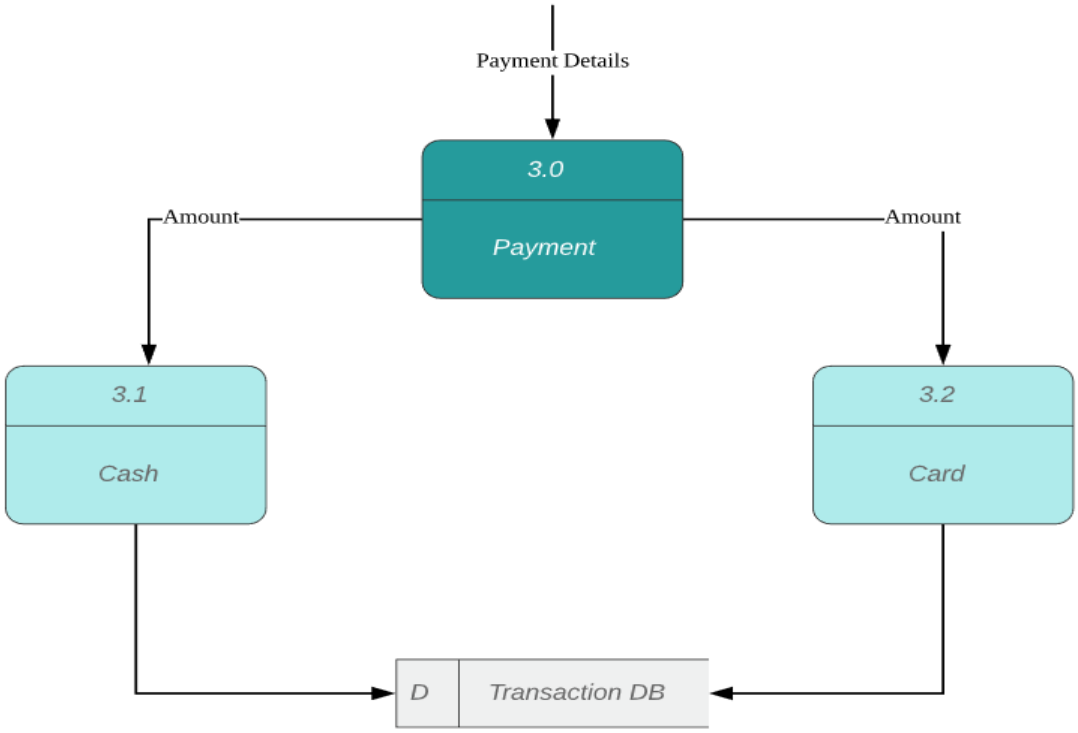

Figure 16: DFD level for payment

Payment Details are received by process 3.0 Payment, and the customer has options to pay through cash process 3.1 and card process 3.2, once the customer pays the amount it is saved in Transaction DB.

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Requirement Gathering Method chose: Sampling

Sampling is a process that is used to conduct analysis on several observations done on: a number of customers, portion of a larger population, company employees etc. Sampling has different methods that can be used; the method that is to be used depending on the specific type of data that is to be analysed/sampled. The three main methods of sampling are:

i) **Systematic Sampling**
ii) **Stratified Sampling**
iii) **Random Sampling**

The main objective of sampling is to ensure the correct/accurate presentation of the sampling body. In this case, it would be the customers. The system that is to be built for the case study is highly dependent on the types of customers that visit the shop and their purchasing patterns. Knowing such information would allow more fabulous sales for the shop itself and increase customer satisfaction; this could, in turn, also increase the number of customers that frequent the shop too.

There are many requirement gathering methods, and each of these methods have their benefits and drawbacks. As sampling is a requirement gathering method, it shares the same attributes.

Benefits and Drawbacks:

Sampling is a method where its advantages outweigh its disadvantages in almost any situation for requirement gathering purposes**.** It has quite a lot of advantages; one of them being "Low Cost". This is a low-cost method as it does not require many resources to conduct. Other advantages include:

i) **Scope is high:** the investigation of large consumer bases is very time-consuming. There is a high possibility that while investigating, the general consumer base would have changed. Sampling allows us to take a portion of the consumer base and come to a logical conclusion, thus taking less time to reach a more accurate result.

ii) **Accuracy of Data:** there is a high accuracy of data because there are only a few operations conducted. As there are limited operations, not much is needed to determine the stability of the data achieved.

iii) **Suitable in Limited Resources:** An organisation can have limited resources. It is not possible to conduct an analysis of the population of the whole world. Thus, sampling is used to come to an accurate conclusion faster with the use of lower resources, saving time and money.

iv) **Very convenient:** It is effortless to conduct in an organisation.

As said before, sampling has its drawbacks too; the most notable being that it depends on the method chosen. If the appropriate method of sampling is not chosen for the purpose, then the time consumed, resources spent, and the result achieved will be inaccurate and useless. Other drawbacks of sampling include:

i) **Biased selections:** One of the glaring problems is that the result will be erroneous if the selection of data is biased. This happens when the method of selection is flawed/faulty.

ii) **Difficulties in Drawing accurate Samples:** It is very hard to select a sample which represents the data correctly.

iii) **Inadequate Knowledge:** When the researcher/investigator does not have enough/adequate knowledge about sampling, then usually the method chosen is wrong.

Investigation Method:

For the chosen case study, Systematic Sampling was taken, where the employees and the customers that come to the shop on a regular basis is queried. Infrequent customers and owners of the establishment is not a part of the sample.

The way the preliminary investigation and the data of the sample will be carried out; is at first conducting Interviews on the employees of the shop and adding surveys with questionnaires for the customers visiting the shop on a regular basis. The interviews are conducted face to face in the shop, whereas the surveys and questionnaires are done in the shop and the surrounding area. Pamphlets will also be distributed around the addresses of regular customers. An online survey/feedback system is also to be placed on the website that is required for any purchase/transaction on the site.

Questions to be used in the investigation:

For the interview of the employees, questions regarding job safety, security and satisfaction are to be included. Questions about the certain features that employees want on the system is also to be asked. For example, the question can be:

a) Are you satisfied with this job?
b) Do you feel insure about your job?
c) Are you acquainted with the frequent customers of the shop? If so, name at least one frequent customer:
d) How many hours do you work in a week?
e) What features would you want on the new system that is going to be implemented?
f) Do you think you will lose your job after the system is introduced?

For the questionnaire and survey for the customers, questions about their experience in the shop and the service obtained are to be asked. Other questions considering their tastes in books can be asked too. Questions to be asked can be:

a) What is your full Name and Age?
b) Can you please specify your address? (Optional)
c) How long have you been coming to the book shop?
d) What kind of books do you like?
e) Do you like the selection of books offered by the shop?
f) Should there be a greater variety of books in the shop?
g) What do you think of an automated ordering system in the shop?
h) Do you buy books online often?
i) Would you like to buy books offered by the shop online?

Data Dictionary:

The processes that are chosen process 5.0 – Return Book and 6.0 – Payback Fees

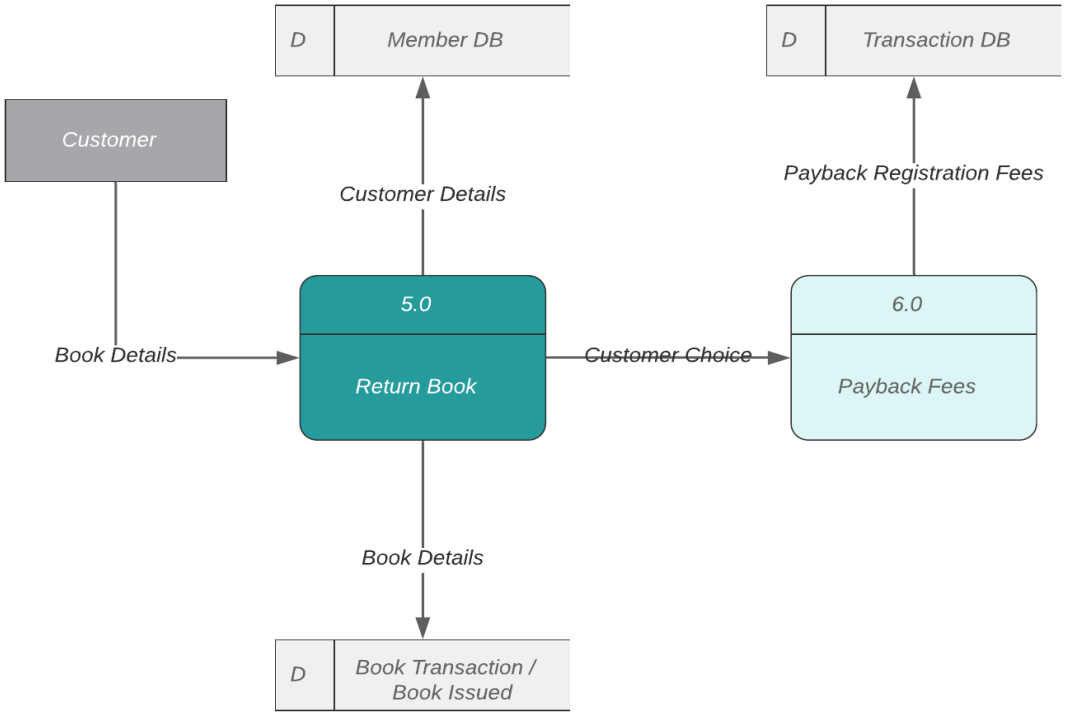

Figure 17: Process 5.0 & 6.0 Level 0 DFD

A data dictionary is metadata which is compiled by System Analysts; this is also known as the data repository. It is a document which is used to collect and coordinate certain data terms in the organisation. The data dictionary is used to provide documentation, eliminate redundancy, determine contents stored in files and develop the logic for DFD (Data Flow Diagram) processes.

According to the DFD given above the data dictionary is:

External Entity:

Name: Customer

Description:

Customer book details to obtain details such as Book Name, Book ID, etc.

Output Data Flows: Book Details

Processes:

Name: 5.0 Return Book

Description:

Checks book details and updates/adds them to the Book Transactions DB. Also adds a tag to the specific customer in the Members DB. Checks if the

member wants to cease membership too. If so, then proceeds to process 6.0 Payback Fees

Input Data Flows: Book Details

Output Data Flows: Customer Details & Book Details

Process: DO & IF

Name: 6.0 Payback Fees

Description:

If a member ceases their membership, then sends a tag to the Transaction DB, confirming that the membership registration fees have been paid back.

Input Data Flows: N/A

Output Data Flows: Payback Registration Fees

Process: DO

Data Store:

Name: Member DB

Description:

Stores member registration details and provide updated member details.

Input Data Flows: Customer Details

Data Structure: Member ID, Name, Address, Books Borrowed, Phone, Email

Name: Transaction DB

Description: Stores details of transactions of the shop

Input Data Flows: Payback Registration Fees

Data Structure: Transaction ID, Transaction Type, Transaction Amount…

Name: Book Transaction / Book Issued

Description: Stores details of transactions of the books in the shop

Input Data Flows: Book Details

Data Structure:

Book ID, Book Name, Author, Number of Copies, Times Borrowed…

DFD Level 1

The process chosen for Level 1 DFD is 5.0 Return Book.

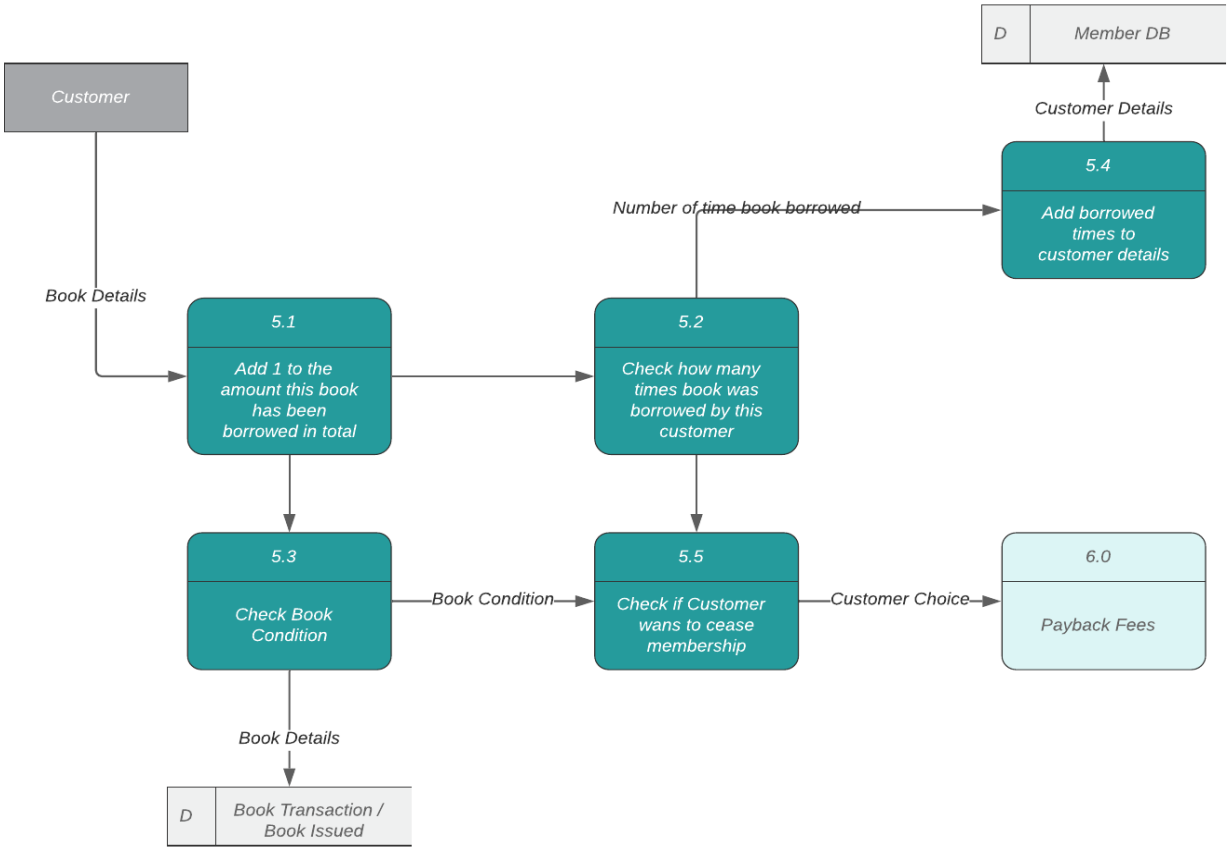

Figure 18: Process 5.0 Return Book Level 1 DFD

Name:	Marsad Kibria
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Observation

Observation is the finding of facts that enable users to find relevant information and to learn about the system by participating, following up, and observing the system.

Approaches to Observation

1. The first advantage is that all data and information from observations are valid and accurate because without a mediator providing false or invalid data, the analyser observes the process itself.

2. Researchers may explain and examine how the environment affects the system.

3. The process of events can be explained, and everything can be measured in real conditions about the system's quality.

4. The symptoms may not be clear sometimes.

5. There is no reproduction of the experiment.

6. The chronology of events must be consistently mapped.

7. Equipment and technologies are continuously recorded.

8. Approaches should be combined, observations and other approaches.

9. The lacking in observations is not a major issue in the processing of information. Once users learn that researchers track the system's actions, users may do so differently or unnaturally, impacting the data obtained.

10. Any activity during monitoring can not be detected because specific duties, events or situational events can not be conducted. The failure of the test often implies that the effects of an experimental procedure take a long time to achieve. Then it is difficult to actually track a system that takes a long time and thus cannot be done directly.

11. Observation is reliable; the date extracted of other techniques is confirmed and validated. It is easier for users to demonstrate what they do and how they proceed than it is to explain. In order to obtain specific insights from the behaviour, it allows the analyst to make working measurements. Biased information is also avoided.

Question

The observation position will be done in the same Matthew comic book shop itself. The communication between researchers and users will be limited. The Researcher's role is to be neutral on system observation. For example: try not to criticise or praise the process of the system. During the observation, several questions will be asked to the users. To give an example:

Questions for staff:

1. How do employees store and collect information about their customers and employees, and how does it work?

2. What do the employees think about the system? Do you think the system personnel are good enough? Give your answer!

3. How to change the system in future if it is not good enough? What do system employees believe should be changed?

4. How many customer types are using this system? And what are they?

5. How does the staff record customer information that they register as Matthew Comics Shop members?

6. How do employees track or record inventory, access comics, record or store data for customers who have or want to purchase comics? Does that work?

Questions for customers:

1. What do the customers think about the current system? Does the present system have a negative impact on the customer? If so then how do they affect it?

2. What will the customer do if they look for the availability of the blank comics the customer is looking for?

3. If he wants to buy a comic, what will the customer do?

Data Dictionary

Figure 19: DFD level 0 for the pay for book

Input Data Flow: Amount

Output Data Flow: Invoice

Process: Matthew makes payment to the Supplier for the book, and the amount is updated in the transaction database, and an invoice is produced.

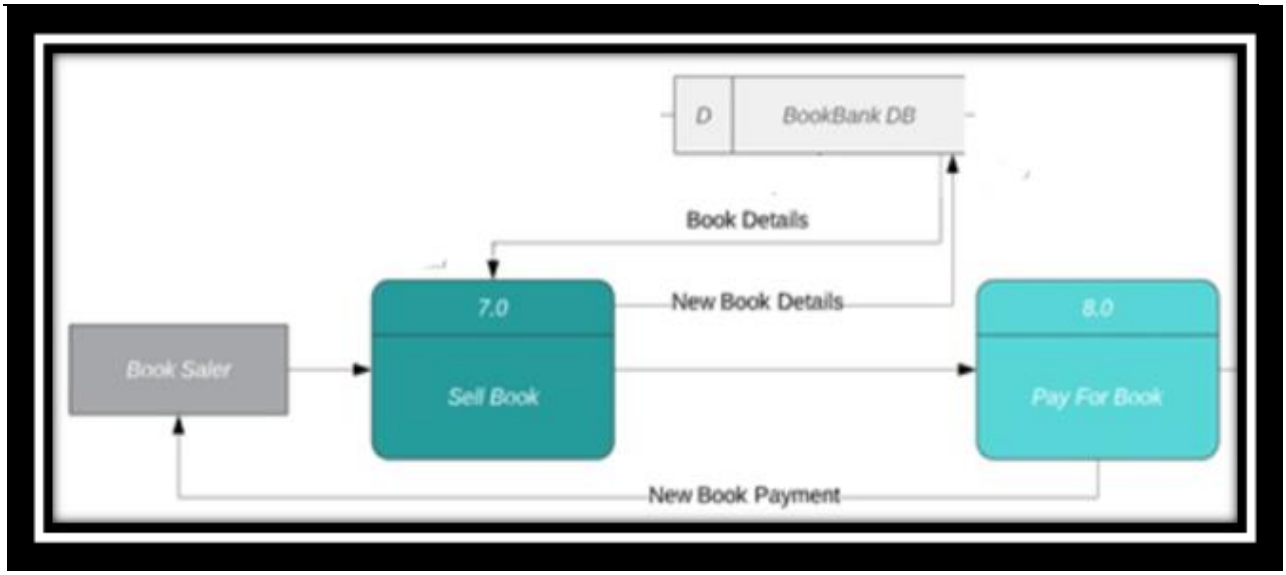

Figure 20: DFD level 0 for sell book

Input: Book details

Process: A book is checked in the book bank database whether the number of copies is less than 4, then the book will be purchased and updated in the book bank database, and the seller is paid.

Output: Amount of the new book

DFD level 1

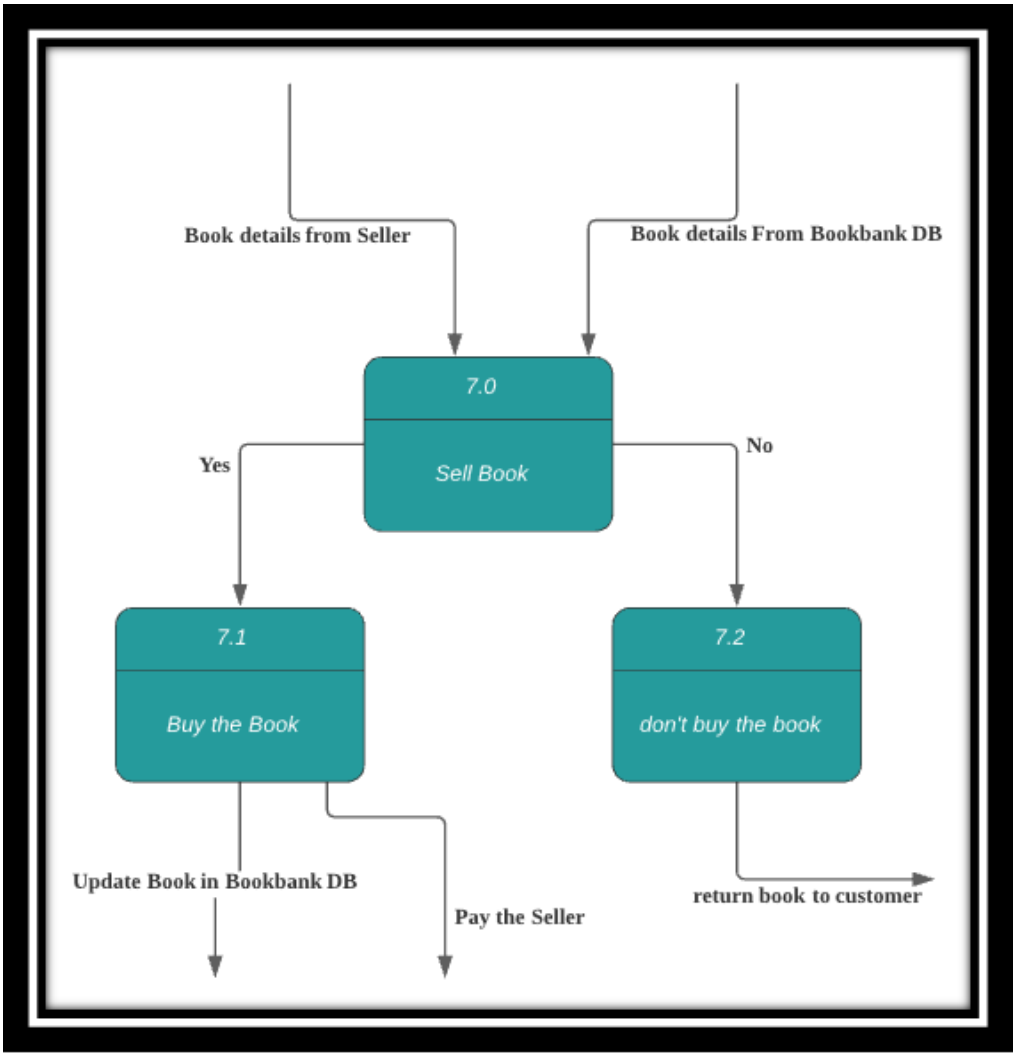

Figure 21: DFD level 1 for sell book

A seller comes to sell a book, and book details are checked in the book bank database.

In **process 7.1**, if the numbers of copies of the books are less than 4, then the price of the previous copies which were bought, is checked.

The similar amount is paid to the bookseller for the book, and the book details are updated in the book bank database.

In **process 7.2**, if there are more than four books, then the book is returned to the seller.

Name:	Haroon Gilani
TP No.	TP058413

Questionnaire

The questionnaire can be a powerful method to evaluate device specifications for a project that needs feedback from many people. A questionnaire is a document that includes a few basic questions that can be forwarded to other people. Questionnaires may be used to collect task information, reports obtained, volumes of transactions performed, types of job duties, challenges and opinions on how the job should be accomplished. Selecting the right group of people to send out the questionnaire is critical. The category will have to be a representative sample of all system users.

Advantages:

Questionnaires are most useful when used for specific purposes rather than for more general information gathering. Questionnaires can be given to many people at a time. Questionnaires are less expensive and less time-consuming.

Disadvantages:

Questionnaires are a rigidly structured means answers to pre-selected inquiries can only be obtained. There is no flexibility when it comes to answering questionnaires. Answers are usually in the form of yes or no, open-ended questions; on the other hand, can be quite time-consuming in case the sample size is big.

Questions:

For the questionnaires, two different sets of questions will be prepared. One set shall be for the customers whereas the other set will be for the staff working at the comic book shop. Also, the analyst will need to be neutral when getting the questionnaires filled out; they cannot interfere with the process in any way that can be considered as biased. There can be no feedback, positive or negative from the analyst's side whilst conducting the questionnaire.

Questions for the Staff at Comic Book Shop:

1. How many customers and what type of customers come through the facility per day? Members or Non-Members
2. How does the staff make records of customers who register for membership?
3. How does the staff keep record of all the comics in the shop? (Inventory)
4. What are the caveats according to you in the current system of the shop?

Questions for the customers of the Comic Book Shop:

1. What is your opinion of the current system implemented at the shop? Is it fast? Are you able to find what you are looking for?
2. How is the process to register for membership? Is it streamlined or not?
3. What changes would you like to see in the comic book shops system?

Data Dictionary

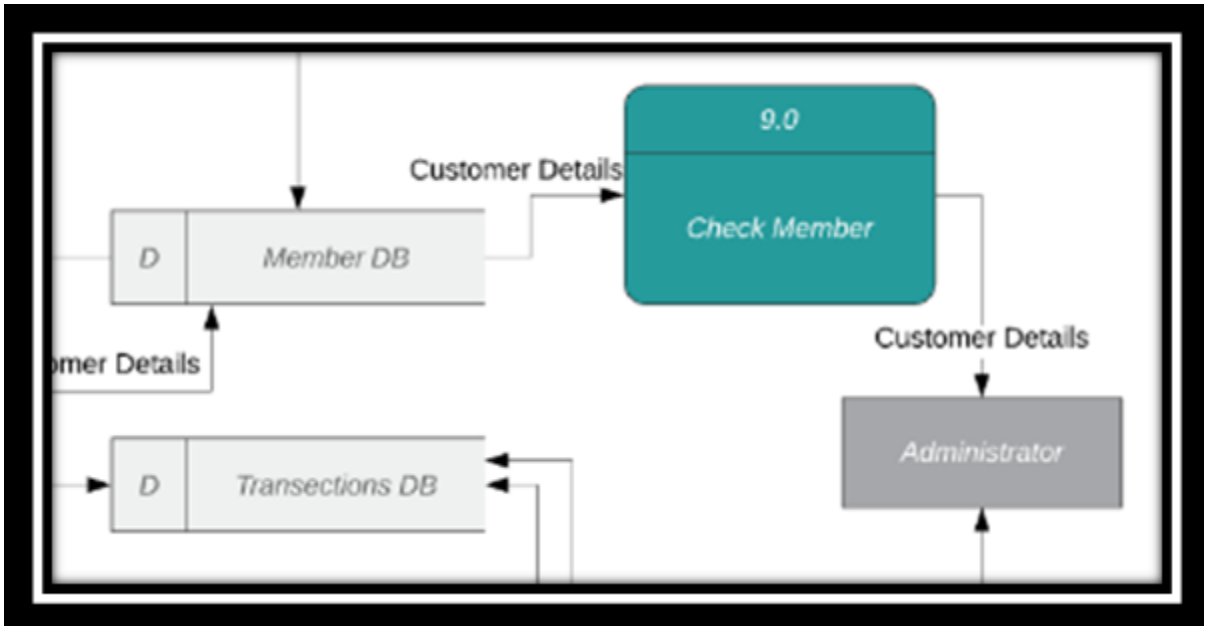

Figure 22: DFD level 0 for check member

Process

Name: 9.0 Check Member

Description: Receive Customer Details from Member DB

Input Data Flow: Customer Details

Output Data Flow: Customer Details

Process: Rereviewing Customer Data from Member DB and passing it on to Administrator.

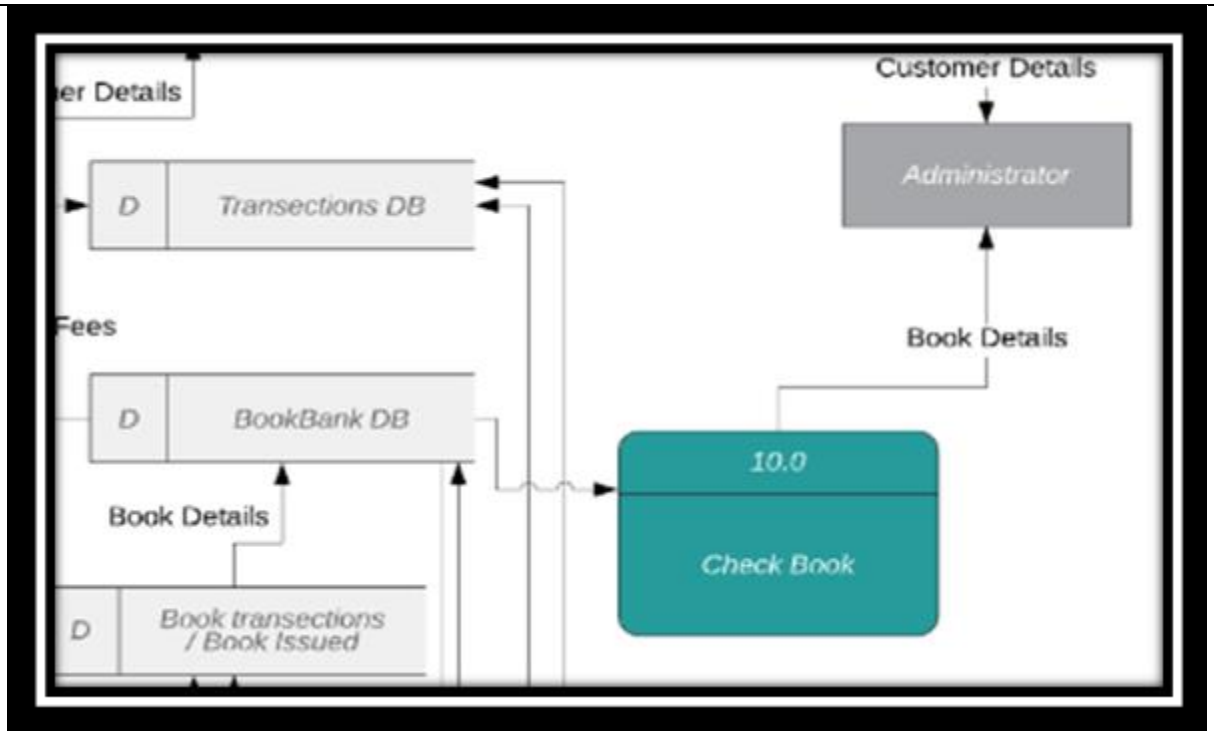

Figure 23: DFD level 0 for checking book

Process

Name: 10.0 Check Book

Description: Receive Book details from BookBank DB.

Input Data Flow: Book Details

Output Data Flow: Book Details

Process: Retrieving book details from BookBank DB and passing it on to Administrator.

DFD Level 1

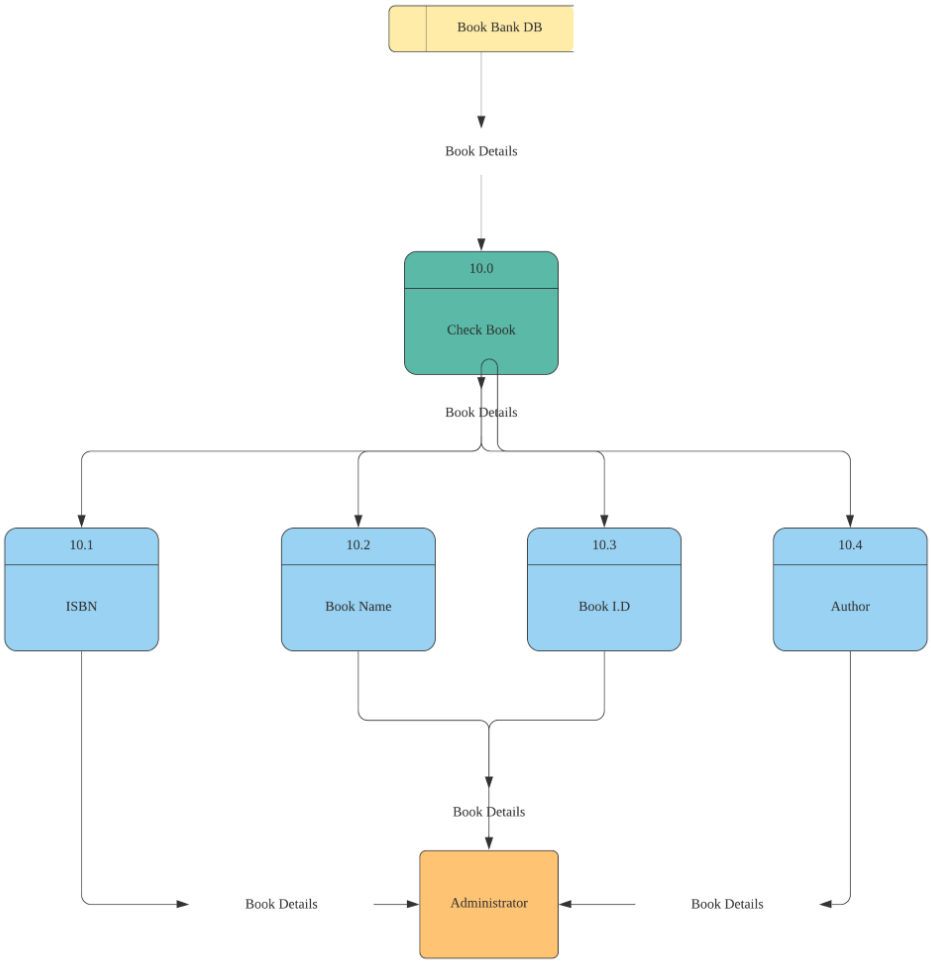

Figure 24: DFD level 1 for check book

Book Details are received by 10.0 Check Book process. Book Details can be in various forms. Various Book details can be in ISBN or Book I.D form etc. Book Details are then passed on to Administrator.

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Workload matrix

Members	Azman Islam Shadhen	Devdat Kumar	Marsad Kibria	Hassan HassanzadehAliabadi	Haroon Gilani
TP Number	TP058079	TP058340	TP058327	TP055097	TP058413
Group Contribution (Parts 1 - 7)	3. Project Planning 5. System Analysis	6. Design Diagram	4. Feasibility Study	1. Introduction 2. Problems & Proposed Solution	7. Interface Design
Percentage Contribution	20%	20%	20%	20%	20%
Total Time of Meeting	16 hours (Face to Face), 5 hours (Online)				
Total Project Time	21 Days				
Online Communication Tools Used	Microsoft Teams, WhatsApp				