iRestaurant Requirements Specification

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● Executive Summary

○ *Project Overview*

The “Restaurant Automation System” is created to reduce the manual work and enhance the accuracy of work in a restaurant. The project is focused on making the restaurant fully automated such that it is easier to coordinate various work activities that go on inside a restaurant. The idea initially was focused on Bar - Restaurant “Brilant”, but later on was developed as a system for a typical restaurant. This system manages and maintains the record of employees’ daily routines which will be controlled and organized by the administrator or the manager. The manager controls information of his workers, hours worked also their payrolls also conducts “business” in an easy way with all the suppliers. By achieving this concept which was designed with full consideration to help the users in an easy manner without any unnecessary wastage of time, it will lead in an increase of profits by reducing operating costs also a raise of revenues by increasing efficiency.

In this paper we will try to explain in detail, our thoughts and ideas we had in order to put this project together. The methods we used to implement it, how we managed to design it and what makes our practice one of the best.

Keywords: Restaurant, automation, employees, manager, admin, operations.

○ *Purpose and Scope of this Specification*

The purpose of this software application is to automate some crucial services of restaurants into one application. The software will be used by almost all the actors operating a restaurant, from the owner, manager to employees.The current system that the restaurant uses is desktop system for daily operations, although, the desktop system is not-up-to date enough to cover the existing needs. The restaurants uses software programs such as MS-Excel for recording the employee data, that is when new employee is hired, his/ her information have to be filled in the computerized work contract form that contains personal details of employee including age, name, sex, date, address etc.

Then this information is kept computerized that is present in the hired office and the necessary details are recorded in the other computers later on. However this is not frequently used in the digitalized world.

The new System makes it easier to manage the employees effectively. However, the restaurant automation system that is computer-based application will provide a working environment that will be flexible, efficient by affording easy of work with significant reduction of time. In a computer platform that many remote clients can access. The manager of the system will be capable to give different privileges and permissions to the users of the system, and all the permissions will be monitored from him.

Users:

- Manager

The manager will have access to all data of the application, including financial statements, employees management(accounts, salaries based on clock in/out), management of suppliers and inventory, access to all the bills. The managers interface will allow him to open and edit the accounts of all the employees he want to add or remove from his business with their names and id’s and provide

them with their certain payment for each category of employees he has based on the hours they work which will be calculated from when they check in and out when they open their accounts. It will allow him to add suppliers he wants for different products the restaurant will provide with the respective prices he can get from them. This will allow the manager to add the items he wants in its inventory and also provide the price he will sell this items for in his restaurant. A benefit to this is that the software will calculate by itself the profits the company will have from deducting the buying price from suppliers to the price the restaurant sells the products. He will also have access to all the bills to provide him the opportunity to see how much work he has during the day or the week or the month, or also see the progress of the servers he has to see which of them will bring him the most profit so he can implement any policy to reward the one who has worked harder.

- Servers

The servers can daily deduct the inventory by selling good each time they print a recipe. Each recipe will be assigned to a certain table that the server will choose. When there are less then needed items in inventory an alert will be sent to the manager so he can order goods to the suppliers to replace the goods sold. He may even choose to automate the requests sent to the suppliers when the inventory reaches a certain level. Each server will have to clock in when they arrive to work and clock out when they leave the work , this way their wage will be calculated.

- Bar tender

The Bar tender will receive the receipt sent out by the server concerning to drinks and snacks. He will be able to see them so that he can prepare the orders in the order they are sent and alert the server when the order is ready

The software will also have the ability to create some basic financial statements like income statements and the cash flow.

● Product/Service Description

○ *Product Context*

Our software will be distributed firstly at “Restaurant Brilant“.It will be used by the servers, bartenders, managers and admin. The purpose of this software application is to automate some crucial services of restaurants into one application. The software will be used by almost all the actors operating a restaurant, from the owner, manager to employees.

○ *User Characteristics*

● *Manager*

The manager will have access to all data of the application, including financial statements, employees management (accounts, salaries based on clock in/out), management of suppliers and inventory, access to all the bills. The managers interface will allow him to open and edit the accounts of all the employees he want to add or remove from his business with their names and id’s and provide them with their certain payment for each category of employees he has based on the hours they work which will be calculated from when they check in and out when they open their accounts. It will allow him to add suppliers he wants for different products the restaurant will provide with the respective prices he can get from them. This will allow the manager to add the items he wants in its inventory and also provide the price he will sell this items for in his restaurant. A benefit to this is that the software will calculate by itself the profits the company will have from deducting the buying price from suppliers to

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○ *Constraints*

- The project should be affirmed by an accounting audit. He will examine if the bar's financial statements are accurate.
- The program is constrained by an external government audit, to include taxes and other details.
- Each major operation should be secured by a password that only the user specified for that action can know.
- We may encounter further constraints
- We should try to Keep It Simple, in order for the program to be easy to use but also include all the requirements.

○ *Dependencies*

- This new product will require internet service to work.
- You will need a pc to run this web based program.

● Requirements

The aim of this project is to develop a restaurant automation system, that would help the restaurant manager to manage the restaurant more effectively and efficiently by computerizing orders, bills and inventory control. Restaurant automation system can store all the data relates to the employees. It will remove the manual operations that are done by pen and paper. The automation system will make better coordination of the activities, by making the restaurant fully automated. It will save time for both the customer and restaurant management team. The main features of the project are:

* Coordinating work activities of the various actors – Manager, Waiter, Bartender etc.

* Keeping record of the working hours for each worker

* Increasing profits by reducing operating costs

* Increasing efficiency by minimizing the time between placing the order and getting the order

* System will effectively manage the inventor

* Software can track and monitor the sales of the day per each employee

Problems with Previous Systems

The traditional system is a manual system which keeps data in the restaurant with pen and paper. It spends a lot of for the waiter to get the orders and to calculate bills. Also, the manager has it difficult to coordinate all the works in the restaurant and to keep track of the working hours for each worker, in order to calculate their payments. This takes some time and reduces efficiency.

Our Software Solution

We are suggesting a software system that would remove all the above problems. Our Restaurant Automation system is focused on making the restaurant fully automated, in order to facilitate the coordination of different work activities. The employees in the moment that start work will make check in in the system and check out when they left work. This is done to calculate their wage depending on the working hours. Each employee would have its profile in the system, which is managed by the manager. Manager can create and modify profiles, can view the amount of money that each worker has done daily. Also, the system keep data about the suppliers and products that they offer. The main features of our software are:

* To increase efficiency by minimizing time between an order is placed and the billing.

* By increasing efficiency, the restaurant will have higher revenues.

* Another benefit of the system will be higher profits because various operating costs will be reduced.

* It will make easier the coordination of work activities for manager, waiters, bartender etc.

* To keep track of the information and hours worked for each of them

● *Functional Requirements*

The restaurant owners would be very interested in this system because it immediately affects their business and they want to improve efficiency and customer satisfaction. In our system there are several types of stakeholders, starting from the manger that controls the entire system and employees like the waiter, bartender etc who have access to one part of the system.They will be directly utilizing the system in order to automate periodic tasks. Customers are stakeholders who do not directly have access to the system, but they benefit from the system since the system reduces their time of waiting for the order. In our system, the manager, waiters, bartenders are all involved in the daily functions performed by the system.

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
BR_01	Register the restaurant name on the database	Enter restaurants details.	3	31/03.2019	
BR_02	Handle multiple account types	Based on the user status, each will have their own view of the system	1	31/03.2019	
BR_03	There can only be many admins, and many users	The system can have many users with admin rights, and many others as servers		31/03/2019	
BR_04	Each account should be secured with passwords	The password should fulfill the regular expression rule	1	31/03/2019	
BR_05	Handle the unregistered users	The system should be able to handle unregistered users, giving limited info	2	31/03.2019	
BR_06	Registering new employees or editing information's of old ones.	The administrator should be able to register new employees	2	31/03/2019	
BR_07	Keeping track of servers/bartenders actions	The admin should be able to keep track of the checked bills from the bartenders, when they start their shifts, or edit their info etc.	1	31/03/2019	
BR_08	Handle suppliers	Admin can add and edit suppliers.	1	31/03/2019	
BR_09	Be able to buy products from suppliers	Admin should be able to buy new products from the suppliers	1	31/03/2019	
BR_10	Add a new category, to add a new product and to edit the information about a product.	The admin can change the information about an old supplier or register new ones	2	31/03/2019	

BR_11	Admin will put the wage of waiters	This wage will be later calculated along with the bonuses	3	1/04/2019	
BR_12	System should show inventory dashboard	Admin can see the initial and the selling price of a product and how much of each product is left.	2	1/04/2019	
BR_13	Be able to watch the revenue, and number of the bills.	The administrator should be able to watch the revenue raised till the moment he checks and also the number of the bills that have been checked so far.	2	1/04/2019	
BR_14	Able to watch the time of the employees per shift and the respective wages	The administrator can watch the working hours of each employee, and the payment they should get	1	1/04/2019	
BR_15	Staff payroll and bonus management	The administrator calculates payrolls based on working hours	1	1/04/2019	
BR_16	Handle employee payments	The system should show the employees that should be paid and the ones that are already paid	1	1/04/2019	
BR_17	Able to watch the current cash flows.	Administrator rights	1	1/04/2019	
BR_18	Able to view revenue, expenses, net profit and net loss.	Administrator rights.	2	1/04/2019	
BR_19	Able to view all cash flows	Administrator rights.	2	1/04/2019	
BR_20	Able to view the starting date, ending date of each cash flow , revenue, expenses and net profit.	Administrator rights.	2	1/04/2019	

BR_21	Each waiter has its own account in the system	The waiter can not view other users information	3	1/04/2019	
BR_22	Waiters can not edit products info	They have only view access to the price and quantity	3	1/04/2019	
BR_23	Waiter can check quantity	Enter the system and checking the available items and their quantity left.	2	1/04/2019	
BR_24	Modify the tab of the table	Waiter can add or delete products from the tab	3	1/04/2019	
BR_25	Waiters can clock in and out of their shift	The system will keep track of working hours the waiter has made in his shift	1	1/04/2019	
BR_26	Waiters can select an item from the categories	The system will automatically calculate how much each order costs, his item will be automatically subtracted from the quantity left	1	1/04/2019	
BR_27	When checking out an order the system should apply the VAT automatically	Before printing the receipt the VAT (20%) will be calculated and displayed	1	1/04/2019	
BR_28	Close the tab of a customer	When a customer is ready to pay, the waiter should be able to charge payment	3	2/04/2019	
BR_29	View the tables and select from them	Waiter will make the order with the table number in the order tab	2	2/04/2019	
BR_30	Be able to watch the number of tables he has served	The waiters orders will have the date, id, number and the total price of each.	2	2/04/2019	

- ***Non-Functional Requirements***

  Non-functional requirements are also very essential in system development. There is not a significant distinction between functional and non-functional requirements. Non-functional requirements relate to the superficial conditions needed for the system, such as number of clicks needed to complete a task for individual actors.

- The menu and categories should be easy to read and understand.
- The table of suppliers and employees should contain detailed information about each of them.
- Managerial tasks should be limited to the manager's user interface to prevent potential security breaches
- In product the category should be included for a faster usability.
- Inventory should keep detailed track of the remaining items.
- There should be a reminder for Clocking In and Out.
- In the bill there should be also written the VAT value, for the customers to be clearer.

●.○.1 User Interface Requirements

The main goal of the interface is to be very simple and fast to use so that little time is wasted while inputting orders or doing other tasks. The most part of the interface will be

with html and CSS. A majority of the choice menus will be dropdown so that waiter will not spend time to type them.

All users of the system will be presented with a Login page into which they will log in in order to have access in their responsible pages. This page will also serve as the Sign-In for payroll purposes. Every employee will also have a button to clock in and clock out of their shift. Both of these buttons will create records in order to calculate hours worked that will help to calculate their payments in the end.

●.○.2 Usability

The system's user interface will be very simple and understandable for the users. The servers will use touch-screen tables which are very comfortable to move around while taking orders and are nowadays a trend. They are very easy to adapt to and use. The server

can simply select the items he wants in the tablet and the bill will be processed. Meanwhile the administrator can also use the system from a browser in computer. This will better since he will have in his control many functions of the system like employees, products, suppliers, inventory etc that will be better managed by a computer screen. However, this does not mean the administrator cannot use a tablet for managing this restaurant

●.○.3 Performance

The system will be used by the administrator and the servers of the restaurant and can work without any error or bug. But for this to happen the employees have to use the system correctly. For example, the servers should not forget to Clock in when they begin their shift and Clock out when they finish their shift. In this way the system can calculate the amount of time they have worked for day and their salary at the end of the week.

However, they can log in and log out of the system as many times as they need. The administrator and the servers should keep in mind their login credentials in order not to create any delays during their work. It is important to be provided high speed wireless connection in the restaurant for the administrator and servers to be able to use the system.

We would suggest that each person that uses our system should provide a tablet and this is necessary for the servers that need to take the orders in different tables around the restaurant. They can use different web browsers for operating in the Restaurant Automation System. That's why we highlight the need of high speed wireless connection that will not create any problem.

●.○.3.1 Capacity

The web application will work at the same time for both the admin and waiters. While the waiters are serving tables and adding receipts the admin, in real time, can check inventory changes, tables occupied and revenues.

●.○.3.2 Availability

Availability requirements will form a users perspective of functional capabilities that are implemented via processes. The solution on our restaurant will be available during the whole day and each server can use it during their working hours. In case of any problem, the admin will send a message to the servers about the availability of the program during that day.
The application is available to everyone who has a computer or tablet connected to the Internet, so they can access their data anywhere

Manageability/Maintainability

●.○.3.3 Monitoring

Include any requirements for product or service health monitoring, failure conditions, error detection, logging, and correction.

●.○.3.4 Maintenance

Our system will use a central database to store and manage all data. We decided to do the relational database model. All our data will be separated into tables, organized appropriately based on a set of rows and columns. Each column consists of data attributes, with each row storing different data. It provides easy access for our system to retrieve data and all operations on data will simply be implemented on the tables. Also, it is important to emphasize that each data separated into smaller pieces is related to one another in one form or another. Our software application act as the clients to the server and do not have to deal with the manipulation of the database directly. Their only task is to make requests for the server to perform the assigned operations. This holds several advantages as supposed to a database built without a server. Having a database with a built-in server allows the server to maintain a backup of the data and add sophisticated features.

●.○.3.5 Operations

The system function is separated into admin and server panel.

- Admin keeps track of information about employees, suppliers, products, inventory, orders and cash flow.The admin or manager can add, sort, delete the menu. He also can register new employees or editing information. While the server can select tables and categories and checkout bills.
- Server Panel includes tables, cold drinks, express, hot drinks, meat, ice cream, desserts and any type of categories the admin has included in the system with their respective products.

●.○.3.6 Network and Hardware Interfaces

The system will be distributed to a workgroup (restaurant) and won't be distributed online.It will be installed on 2 or 3 points of sale in order to share the areas and to avoid queues between orders and servers.

●.○.3.7 Systems Interfaces

The admin will have access to four different functions and each will have its associated page. There will be buttons for:

* Add/Edit/Remove Employees

* Add Category/Add Product/Edit/Delete

* Manage Inventory

* Add/Edit/Remove Suppliers

* Report orders

* Reports Screen

●.○.4 Security

The system requires username and password authentication as a measure of security, although some basic rules still apply.

- Robust access-control system
- Column and row-level security

●.○.4.1 Protection

- The system will include a register function on the login screen for the manager and servers.
- If an employee/server wants to change his username, the manager must be notified
- The password will be encrypted at the time of registration

●.○.4.2 Authorization and Authentication

- Users will be authenticated with a username and a password.
- If a user tries to login with a username which is not found in the database, the user must not be logged in, and he shall be alerted for the login failure.

●.○.1 Data Management

➔ **Employee Information**

-can be accessed upon login

-admin has access of user views

-uniquely represented by id

-name, surname, address, telephone number required when registered

➔ **Product Information**

-accessible from each employee: admin can register new products and buy products from the suppliers, whereas the server can check bills in order to sell the products and earn revenue.

-uniquely represented by id

-product name

➔ **Tabs/Receipts**

-accessed after closing each tab and saving it

-accessible from each employee

-date and time

-active employee name

-products list

-total

➔ **Cash flows**

-can be accessed by admin only

-dynamically change as the receipts are checked and other revenues are earned.

●.○.2 Standards Compliance

The system calculates and prints the receipt with the total amount and also the VAT.This is a must for each business so the software includes it such that it can also give information to the customer about the percentage of VAT.

●.○.3 Portability

The system will be developed with PHP which offers many portability opportunities. The team has decided to develop a Web based system, so it can be easily accessed from different devices such as pc, mobile phone etc..

●.○.4 Other Non-Functional Requirements

Please provide all necessary non-functional requirements, similar to the requirements explained in the lesson slides or in the textbook.

- ***Domain Requirements***

Everything related to the domain that might be needed in the project shall be mentioned in here. Sometimes the domain Requirements might be thought as part of either functional or non-functional requirements.

In our software that maintains records of a restaurant, the functionality of being able to access the list of receipt, orders, or taken tables, is a domain requirement.

● User Scenarios/Use Cases

Provide a summary of the major functions that the product will perform. Organize the functions to be understandable to the customer or a first time reader. Include use cases and business scenarios, or provide a link to a separate document (or documents). A business scenario:

- Describes a significant business need
- Identifies, documents, and ranks the problem that is driving the scenario
- Describes the business and technical environment that will resolve the problem
- States the desired objectives
- Shows the “Actors” and where they fit in the business model
- Is specific, and measurable, and uses clear metrics for success

APPENDIX

The appendixes are not always considered part of the actual Requirements Specification and are not always necessary. They may include

- Sample input/output formats, descriptions of cost analysis studies, or results of user surveys;
- Supporting or background information that can help the readers of the Requirements Specification;
- A description of the problems to be solved by the system;
- Special packaging instructions for the code and the media to meet security, export, initial loading, or other requirements.

When appendixes are included, the Requirements Specification should explicitly state whether or not the appendixes are to be considered part of the requirements.

Appendix A. Definitions, Acronyms, and Abbreviations

Define all terms, acronyms, and abbreviations used in this document.

Appendix B. References

List all the documents and other materials referenced in this document.

Appendix C. Requirements Traceability Matrix

The following trace matrix examples show one possible use of naming standards for deliverables (FunctionalArea-DocType-NN). The number has no other meaning than to keep the documents unique. For example, the Bargaining Unit Assignment Process Flow would be BUA-PF-01.

For example (1):

Business Requirement	Area	Deliverables	Status
BR_LR_01 The system should validate the relationship between Bargaining Unit/Location and Job Class.---Comments: Business Process = "Assigning a Bargaining Unit to an Appointment" (Priority 1)	BUA	BUA-CD-01 Assign BU Conceptual Design	Accepted
		BUA-PF-01 Derive Bargaining Unit-Process Flow Diagram	Accepted
		BUA-PF-01 Derive Bargaining Unit-Process Flow Diagram	Accepted
BR_LR_09 The system should provide the capability for the Labor Relations Office to maintain the job class/union relationship.---Comments: Business Process = "Maintenance" (Priority 1)	BUA	BUA-CD-01 Assign BU Conceptual Design	Accepted
		BUA-PF-02 BU Assignment Rules Maint Process Flow Diagram	ReadyForReview

For example (2):

BizReqID	Pri	Major Area	DevTstItems DelivID	Deliv Name	Status
BR_LR_01	1	BUA	BUA-CD-01	Assign BU Conceptual Design	Accepted
BR_LR_01	1	BUA	BUA-DS-02	Bargaining Unit Assignment DB Modification Description	Accepted
BR_LR_01	1	BUA	BUA-PF-01	Derive Bargaining Unit-Process Flow Diagram	Accepted
BR_LR_01	1	BUA	BUA-UCD-01	BU Assign LR UseCase Diagram	ReadyForReview

BR_LR_01	1	BUA	BUA-UCT-001	BU Assignment by PC UseCase - Add Appointment and Derive UBU	Reviewed
BR_LR_01	1	BUA	BUA-UCT-002	BU Assignment by PC UseCase - Add Appointment (UBU Not Found)	Reviewed
BR_LR_01	1	BUA	BUA-UCT-006	BU Assignment by PC UseCase - Modify Appointment (Removed UBU)	Reviewed
BR_LR_09	1	BUA	BUA-CD-01	Assign BU Conceptual Design	Accepted
BR_LR_09	1	BUA	BUA-DS-02	Bargaining Unit Assignment DB Modification Description	Accepted
BR_LR_09	1	BUA	BUA-PF-02	BU Assignment Rules Maint Process Flow Diagram	Accepted
BR_LR_09	1	BUA	BUA-UCD-03	BU Assign Rules Maint UseCase Diagram	Reviewed
BR_LR_09	1	BUA	BUA-UCT-045	BU Assignment Rules Maint: Successfully Add New Assignment Rule	Reviewed
BR_LR_09	1	BUA	BUA-UCT-051	BU Assignment Rules MaintUseCase: Modify Rule	Reviewed
BR_LR_09	1	BUA	BUA-UCT-053	BU Assignment Rules MaintUseCase - Review Assignment Rules	Reviewed
BR_LR_09	1	BUA	BUA-UCT-057	BU Assignment Rules MaintUseCase: Inactivate Last Rule for a BU	Reviewed
BR_LR_09	1	BUA	BUA-UI-02	BU AssignRules Maint UI Mockups	ReadyForReview
BR_LR_09	1	BUA	BUA-TC-021	BU Assignment Rules Maint TestCase: Add New Rule (Associated Job Class Does Not Exist) - Success	ReadyForReview
BR_LR_09	1	BUA	BUA-TC-027	BU Assignment Rules Maint TestCase: Modify Rule - Success	ReadyForReview
BR_LR_09	1	BUA	BUA-TC-035	BU Assignment Rules Maint TestCase: Add New Rule (Associated Job Class Does Not Exist) - Error Condition	ReadyForReview
BR_LR_09	1	BUA	BUA-TC-049	BU Assignment Rules Maint TestCase: Modify Rule - Error Condition	ReadyForReview

For example (3):

BizReqID	CD01	CD02	CD03	CD04	UI01	UI02	UCT01	UCT02	UCT03	TC01	TC02	TC03	TC04
BR_LR_01			X		X		X			X		X	
BR_LR_09	X			X		X			X		X		X
BR_LR_10	X			X					X		X		
BR_LR_11		X											

Appendix D.

Organizing the Requirements

This section is for information only as an aid in preparing the requirements document.

Detailed requirements tend to be extensive. Give careful consideration to your organization scheme. Some examples of organization schemes are described below:

By System Mode
Some systems behave quite differently depending on the mode of operation. For example, a control system may have different sets of functions depending on its mode: training, normal, or emergency.

By User Class
Some systems provide different sets of functions to different classes of users. For example, an elevator control system presents different capabilities to passengers, maintenance workers, and fire fighters.

By Objects
Objects are real-world entities that have a counterpart within the system. For example, in a patient monitoring system, objects include patients, sensors, nurses, rooms, physicians, medicines, etc. Associated with each object is a set of attributes (of that object) and functions (performed by that object). These functions are also called services, methods, or processes. Note that sets of objects may share attributes and services. These are grouped together as classes.

By Feature
A feature is an externally desired service by the system that may require a sequence of inputs to affect the desired result. For example, in a telephone system, features include local call, call forwarding, and conference call. Each feature is generally described in a sequence of stimulus-response pairs, and may include validity checks on inputs, exact sequencing of operations, responses to abnormal situations, including error handling and recovery, effects of parameters, relationships of inputs to outputs, including input/output sequences and formulas for input to output.

By Stimulus
Some systems can be best organized by describing their functions in terms of stimuli. For example, the functions of an automatic aircraft landing system may be organized into sections for loss of power, wind shear, sudden change in roll, vertical velocity excessive, etc.

By Response
Some systems can be best organized by describing all the functions in support of the generation of a response. For example, the functions of a personnel system may be organized into sections corresponding to all functions associated with generating paychecks, all functions associated with generating a current list of employees, etc.

By Functional Hierarchy
When none of the above organizational schemes prove helpful, the overall functionality can be organized into a hierarchy of functions organized by common inputs, common outputs, or common internal data access. Data flow diagrams and data dictionaries can be used to show the relationships between and among the functions and data.

Additional Comments
Whenever a new Requirements Specification is contemplated, more than one of the organizational techniques given above may be appropriate. In such cases, organize the specific requirements for multiple hierarchies tailored to the specific needs of the system under specification.

There are many notations, methods, and automated support tools available to aid in the documentation of requirements. For the most part, their usefulness is a function of organization. For example, when organizing by mode, finite state machines or state charts may prove helpful; when organizing by object, object-oriented analysis may prove helpful; when organizing by feature, stimulus-response sequences

may prove helpful; and when organizing by functional hierarchy, data flow diagrams and data dictionaries may prove helpful.