

## **Executive Summary**

A study was conducted for the EU-Rent Car Rentals to evaluate the performance of their current information system and suggest a plan of action towards improving it. The system's limitations and shortcomings were reviewed, establishing a need for improvement. Design factors and constraints were outlined, and a suitable alternative was presented. This alternative was evaluated using a set of quantitative criteria, which led to it being recommended.

It was recommended that the current Microsoft Access 2000 database system be upgraded to a web application consisting of an SQL Server 2000 database and a web site. It was suggested that a user interface be designed to maintain data integrity. Finally, it was concluded that these changes would be immediately utilized and the benefits of having a computerized information system would be immense.

## **Table of Contents**

<b>1. Executive Summary.....</b>	<b>0</b>
<b>2. Introduction.....</b>	<b>3</b>
<b>3. Decision Environment.....</b>	<b>3</b>
➤ <b>Overview of Organization</b>	
➤ <b>Current System</b>	
<b>4. The Problems with the Current System.....</b>	<b>5</b>
<b>5. Objectives of Proposed System.....</b>	<b>6</b>
<b>6. Scope of Problem.....</b>	<b>7</b>
<b>7. Criteria Specification &amp; Imposed Constraints.....</b>	<b>7</b>
<b>8. Proposed Alternative System.....</b>	<b>7</b>
<b>9. A More Detailed Look at the Proposed     Alternative System's Processes and     Capabilities.....</b>	<b>8</b>
<b>10. Analysis of Proposed Alternative.....</b>	<b>8</b>
➤ <b>Platform Comparison</b>	
➤ <b>Hardware Requirements</b>	
➤ <b>Software Requirements</b>	
➤ <b>Price Comparison</b>	
➤ <b>Features Comparison</b>	
➤ <b>SQL Server 2000 and Access 2000 Limits</b>	

<b>11. Recommendations.....</b>	<b>13</b>
<b>12. Implementation Plan.....</b>	<b>14</b>
<b>13. Appendix 1.....</b>	<b>15</b>
<b>14 . Appendix 2.....</b>	<b>16</b>
<b>15. Appendix 3.....</b>	<b>17</b>
<b>16. Appendix 4.....</b>	<b>18</b>
<b>17. Contact Information.....</b>	<b>19</b>

## **Introduction**

Open Minded Solutions, O.M.S., is Justus Alcindor, Marcus Antoine, Johan Blanchard, Shannon Ferdinand, Myrna Hanley, and Genevie Noel. We are all Social Science students who spent our first year off campus at Community Colleges in our respective islands.

Through the information provided by the Department of Management Studies, O.M.S. was able to attain an understanding of how day-to-day operations were carried out, the problems that existed and with the current system, and what needed to be done about these problems. The following report introduces the system, analyzes the problem, evaluates a number of solutions, and suggests a course of action.

## **Decision Environment**

### **Overview of the Organization**

Being one of the several car rentals in the Caribbean Region, EU-Rent Car Rentals is trying to maximize business profits by providing tourists and other customers with the highest quality vehicles by "Keeping You Moving".

The current system for EU-Rent Car Rentals comprises a database system which uses Microsoft Access 2000 and is still partially paper-based. All branches follow the same system and there exists a manager for each branch. The current rental system consists of the following departments or portions:

1. Customer Service Representatives

These persons are responsible for collection and distribution of vehicle keys, and the handing out of brochures and contracts to customers. They are also responsible for taking customer reservations. Reservations can be made either on the phone or in person. Customers have the option to pay with cash or by credit card.

2. Maintenance Technicians

These persons are responsible for the servicing, inspection and maintenance of vehicles at the service depots which serve several branches.

3. Accounts

These persons are responsible for calculating the totals due on customer's reservations and totaling cash receipts for the day, as well as verifying customer credit card information. They also keep an account of the loyalty incentive schemes and the purchase and sale of vehicles.

4. Management

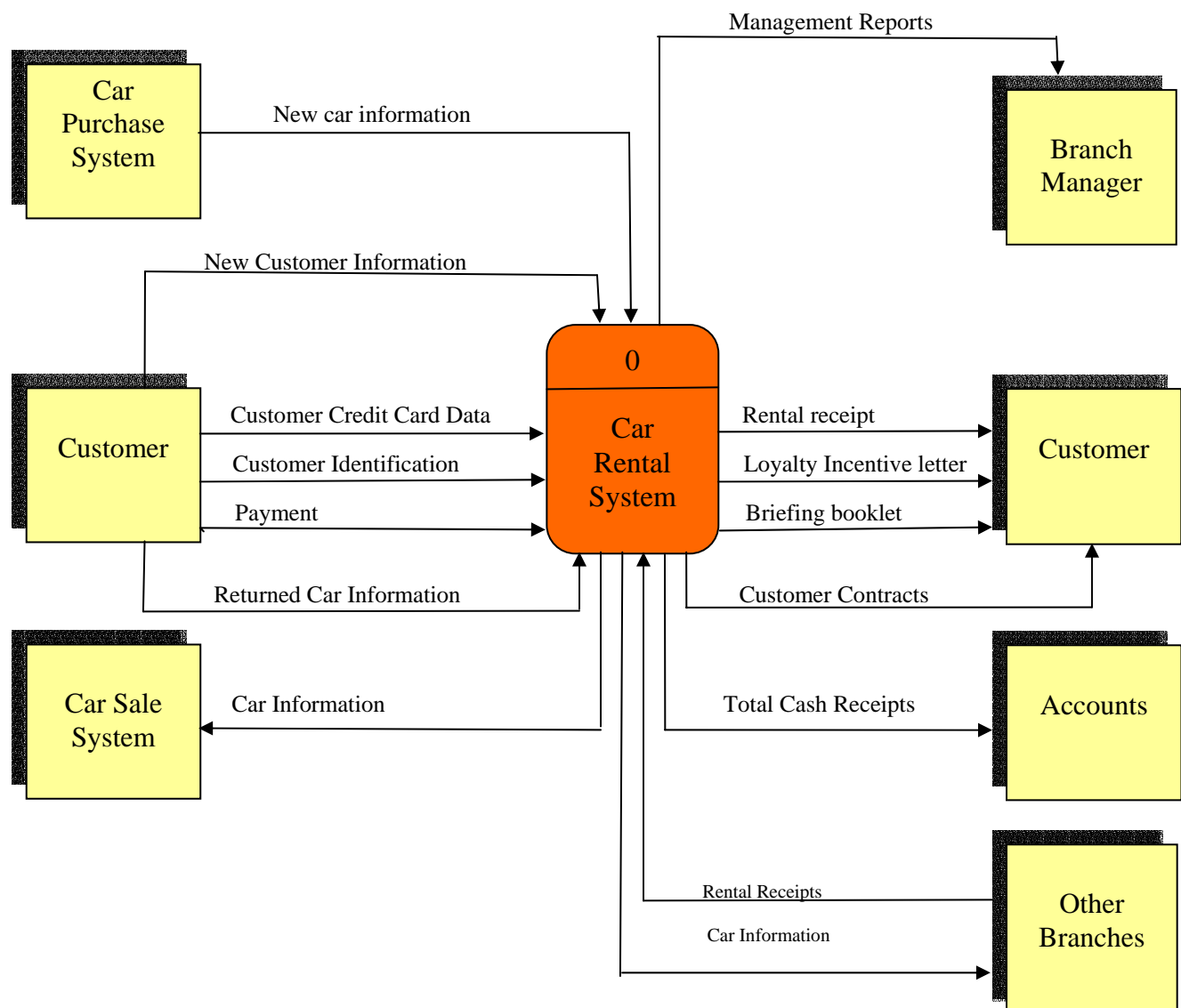
Management can consist of one or more people, depending on the size of the branch. Managers are responsible for the planning, organizing and coordinating of activities on a daily, weekly, monthly, quarterly and annual basis.

## The Current System

The process begins when customers make reservations for vehicles. These reservations can be made over the phone or when customers walk in. When customers call any branch, Customer Service Representatives input customer information into the system which includes basic information about the customer as well as credit card information and a valid driver's license number. When customers walk in, on the other hand, and have the intention of renting a car at once, the customer service representative takes the relevant information from the them as well as a cash or a credit reservation equivalent to the estimated rental cost against the guaranteeing credit card. A contract must also be signed after the customers are briefed by the customer service representative on the conditions and rules under which the vehicle is being rented to them. This procedure is also followed when customer who made advanced reservations come to collect their vehicle. A brochure with the conditions and rules in addition to a due date stamp is given to all customers before they leave with their vehicles.

## EU Car Rentals

Context Level dataflow diagram for new system.



When customers decide to return vehicles to EU-Rent Car Rental, they can do so at any of the 1000 branches. A small fee is charged to customers though, if they decide to return to a different branch than the one where they originally borrowed the vehicle. Upon return, customers must pay by cash or a valid credit card other than the one used to guarantee receipt of the vehicle. The company inspects the vehicles thoroughly when they are returned to the branches. If a car is returned early, the rental charge is calculated at the rate appropriate to the actual period of rental; e.g. the daily rate rather than the weekly rate. If the car is returned late an hourly charge is calculated up for up to 6 hours of lateness. After 6 hours, a whole day is charged.

See Appendix 1: Diagram 0 for Current System

If the vehicle has been damaged the customers' credit card company must be notified of the pending charge.

The EU Company has a loyalty incentive scheme designed to maintain their customer base as well as attract new customers. Once a year, the company examines their records for customers who have made four rentals within the year. Each paid rental in the scheme (including the 4 qualifying rentals) earns points that may be used to buy free rentals.

## **The Problems with the Current System**

The **PIECES** Framework for Identifying Problems provides a good outline of the nature and range of the problems associated with the current system.

**P**erformance - Does the current mode of operation provide adequate throughput and response time?

No. When customers are making reservations the customer service representatives do not have spur of the moment information on all cars available for rental. That may cause the reservations process to be unnecessarily long because they might have to make many calls to check for the specific model of vehicle that the customer wants if the specific model is not readily available at the branch at the time.

**I**nformation – Does the current mode provide end users and managers with timely, pertinent, accurate and usefully formatted information?

No. It usually takes time for customer service representatives to know when cars are returned by renters because of the fact that cars are returned to any branch. That makes it difficult to allot cars available for rental.

**E**conomy – Does the current mode of operation provide cost-effective information services to the business?

Customer Service Representatives allot much of their time to getting information on cars available for rental. Since they are paid \$10.00 per hour, this is a waste of productive hours.

Could there be a reduction in costs and/or an increase in benefits?

Yes, cost can be reduced by an improved system that makes customer service representatives aware of which cars are available instantaneously. The major benefit is a reduction in time-wasting telephone calls in order to find out which cars are available.

**C**ontrol – Does the current mode of operation offer effective controls to protect against fraud and to guarantee accuracy and security of data and information?

No. The system of collecting payment after cars are returned is a loop hole, allowing fraud to take place. The low security features of the present system allow intruders into the system making data insecure.

**E**fficiency – Does the current mode of operation make maximum use of available resources, including people, time, and flow of forms?

No. In terms of time, much time is wasted getting information on cars available for rental. Human resources are overused in a system that can easily be further computerized. Staff can be rotated to other more important duties.

**S**ervices – Does the current mode of operation provide reliable service?

No. The present system, cannot be relied upon since it might be impossible for a customer to obtain a certain grade of vehicle because of it's unavailability at that branch.

Is it flexible and expandable?

No, because immediate demand of customers cannot always be met.

Through this analysis, we are able to summarize the problems as follows:

1. Branches operate as a separate business units.
2. There is no online reservations system.

### **Objectives for the Proposed System**

After determining what the problems were through the use of the data already provided by the Department of Management Studies, a concise list of goals was derived for a new system. The new system should:

- Allow customer service representatives to have immediate information on vehicles available for rental.
- Allow managers to have accurate information on vehicles so that allocations for reservations could be made efficiently.
- Make vehicles easy to locate for all users (i.e. no time or money)
- Prevent fraud and make the system data more secure from intruders.
- Make better use of time and human resources.
- Meet the immediate demand of customers.

## **Scope of Problem**

Our analysis of the current system showed that there was a definite need for improvement. However due to time and budget constraints, it was determined that any proposed system would only deal generally with the car rental system. Therefore, the new system would create little or no change with respect to linking the car rental with EU-Fly and EU-Stay, since it is beyond our scope.

## **Criteria Specification and Imposed Constraints**

As with all projects, the best solution may not be feasible for all companies. The system to be created must meet numerous requirements.

- a) Developmental Costs – The costs associated with designing and implementing the solution must be minimal because management does not have a significant budget to manipulate.
- b) Implementation Time – The requirement for this solution must be before the beginning EU-Rent Car Rental's next fiscal year. (January 2004) Important contracts are being negotiated and it is imperative that this new system be tested and properly in place by that time.
- c) Interface/Usability – The proposed solution must have a standard interface form which information can be readily accessed and added or queried by users.
- d) Data Accuracy – The new system must be capable of achieving a high accuracy rate. Reliability must be maintained from the recording of data to the storage and maintenance of it.
- e) Training – The solution must be user-friendly in operation. A maximum time of one week per user has been allocated for training.
- f) Security – Security must be appropriately controlled, all data is strictly business confidential.
- g) Maintenance costs should be minimal; the proposed solution must be modular in design, with full documentation on usage and troubleshooting details.

## **Proposed Alternative System**

Based on the above criteria our design team brainstormed and came up with an alternative system. We made sure the alternative took into consideration the objectives of management determined earlier. We then used the constraints established earlier to help us narrow down our list to the following alternative system, which proved to be an improvement over the current system.

This alternative involves:

1. Develop a web application based on an SQL Server 2000 database which integrates all the branch databases.
2. The construction of a professional web site that can be seen as two major parts:

- a. The vehicle reservations section
- b. The graphics interface (to be designed by a third party contractor)

### **A More Detailed Look at the Proposed Alternative System's Processes and Capabilities**

The creation of a web site will allow customers to input their personal information and become members of the site so that they can personalize their EU-Rent Car Rental experience. The web site will also allow advertisement to EU-Rent's target audience in a cost effective manner, for example via weekly emails to registered web site users. Moreover, the trends and stats generated by web site visits will be studied to develop marketing strategies. The web site will permit customers to make reservations for vehicles online in real time. The interface will include rate and availability information, automated processing of new reservations, reservation modifications and cancellations. The web site will also be linked to the other subsidiaries of the EU-Corporation, EU-Fly and EU-Stay.

EU-Rent will be able to retain full control of their content and minimize time spent on day-to-day operations through simple web-based updating through the browser. Customer Service Representatives will no longer have to call various locations to check for availability of particular makes and models of cars. They can simply query the central database which contains car availability information for all locations. This will go a long way in improving efficiency and customer satisfaction.

See Appendix 2: Context Level Dataflow diagram for New System

EU-Rent Car Rental will roll out broadband wireless Wide Area Networks (WANs) at the 1000 car rental locations to speed up customer check-in and car returns. The high-speed wireless WANs will allow the capture of digital signatures from customers in real time and the transmission of the signed documents directly to the company's central database. This will support an increasingly mobile workforce with mobile applications that tie into enterprise systems.

See Appendix 3: Diagram 0 for new system

The system will provide the company with a complete wireless infrastructure that will extend beyond check-in and check out. It will also support maintenance, repairs and training. An external source will provide the company with handheld terminals running Microsoft Corp.'s Windows CE 3.0 operating system. A terminal that is flexible, programmable and can be easily enhanced is necessary since it wouldn't be wise for the company to be locked into something that cannot be changed. With the handheld terminals, billing information is transmitted via the wireless WAN to branch-based SQL Server CE databases, which in turn feeds into the company's central SQL Server 2000 database.

The web application will be linked to the company's central SQL Server 2000 database. It will allow the flow of information between all the branches, linking each branch and coordinating activities as a single unit, instead of as separate units. The new system will be scalable, secure and robust. It will support atomic transactions, and will also guarantee that all the changes performed within a transaction boundary are committed or rolled back. The new database will allow restoration to the point of failure and will integrate with Windows security to ensure data protection. The database will be consistently updated, by adding new customer records and keeping track of customer loyalty incentive schemes.

## **Analysis of Proposed Alternative System**

### **Platform comparison**

SQL Server 2000 only works on Windows-based platforms, including Windows 9x, Windows NT, Windows 2000 and Windows CE.

Microsoft Access 2000 can be installed under the following operating systems: Microsoft Windows 95, Windows 98, Windows 98 Second Edition, Windows Millennium Edition (Windows Me), Windows NT 4.0 with Service Pack 6 (SP6), Windows 2000, or Windows XP or later.

### **Hardware requirements**

To install SQL Server 2000, the Intel or compatible platforms and the following hardware are required:

Hardware	Requirements
Processor	Pentium 166 MHz or higher
Memory	32 MB RAM (minimum for Desktop Engine), 64 MB RAM (minimum for all other editions), 128 MB RAM or more recommended
Hard disk space	270 MB (full installation), 250 MB (typical), 95 MB (minimum), Desktop Engine: 44 MB Analysis Services: 50 MB minimum and 130 MB typical English Query: 80 MB

Table 1: Hardware Requirements of SQL Server 2000

Microsoft Access 2000 is included in the Professional and Developer Editions of Microsoft Office 2000, but can be purchased separately, as well. If you install Access 2000 with other Office 2000 products, the hardware requirement can be increased in comparison with the single Access 2000 installation. To install Microsoft Access 2000, you should have the following hardware:

Hardware	Requirements
Processor	Pentium 75 MHz or higher
Memory	8 MB of RAM required for Access 2000, plus 4 MB of RAM for each application running simultaneously, plus memory for the operation system:  16 MB of RAM for Windows 95 or Windows 98 32 MB of RAM for Windows Me or Windows NT 64 MB of RAM for Windows 2000 128 MB of RAM for Windows XP
Hard disk space	Access 2000 requires over 30 MB of hard disk space

Table 2: Hardware Requirements of Access 2000

### Software requirements

SQL Server 2000 comes in six editions: Enterprise, Standard, Personal, Developer, Desktop Engine and SQL Server CE (a compatible version for Windows CE) and requires the following software:

Operating System	Enterprise Edition	Standard Edition	Personal Edition	Developer Edition	Desktop Engine	SQL Server CE
Windows CE	No	No	No	No	No	Yes
Windows 9x	No	No	Yes	No	Yes	No
Windows NT 4.0 Workstation with Service Pack 5	No	No	Yes	Yes	Yes	No
Windows NT 4.0 Server with Service Pack 5	Yes	Yes	Yes	Yes	Yes	No
Windows NT 4.0 Server Enterprise Edition with Service Pack 5	Yes	Yes	Yes	Yes	Yes	No
Windows 2000 Professional	No	No	Yes	Yes	Yes	No
Windows 2000 Server	Yes	Yes	Yes	Yes	Yes	No
Windows	Yes	Yes	Yes	Yes	Yes	No

<b>2000 Advanced Server</b>						
<b>Windows 2000 Data Center</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>No</b>
<b>Windows XP Professional</b>	<b>No</b>	<b>No</b>	<b>Yes</b>	<b>Yes</b>	<b>Yes</b>	<b>No</b>

Table 3: Software Requirements of SQL Server

In comparison with SQL Server 2000, Microsoft Access 2000 does not have any editions. Access 2000 can be installed under the following operation systems: Microsoft Windows 95, Windows 98, Windows 98 Second Edition, Windows Millennium Edition (Windows Me), Windows NT 4.0 with Service Pack 6 (SP6), Windows 2000, or Windows XP or later.

### Price comparison

SQL Server 2000 is currently available under two licensing options:

- Processor license.
- Server/per-seat client access license (CAL).

The processor license requires a single license for each CPU in the computer running SQL Server 2000 and includes unlimited client access. You can buy this license when you do not know the number of the clients (for example, if your users will connect to SQL Server 2000 through the internet). This license usually is cheaper than Server/Per-Seat CAL when there are many users connected to SQL Server databases.

The Server/per-seat client access license (CAL) requires a license for the server and the licenses for each client device. You can use this licensing option when the customers do not need access beyond the firewall and the number of clients is low (for example, 10-20 users for SQL Server 2000 Standard Edition or 30-40 users for SQL Server 2000 Enterprise Edition).

<b>Licensing Options</b>	<b>SQL Server 2000 Standard Edition</b>	<b>SQL Server 2000 Enterprise Edition</b>
<b>Processor</b>	<b>\$4,999 per processor</b>	<b>\$19,999 per processor</b>
<b>Server/Per-Seat CAL</b>	<b>with 5 CALs - \$1,489 with 10 CALs - \$2,249</b>	<b>with 25 CALs - \$11,099</b>

Table 4: SQL Server 2000 Standard Edition and Enterprise Edition Cost Comparison

Microsoft Access 2000 like Office 2000 is no longer available at retail for individual purchases. Microsoft Access 2002 and Office XP can be purchased now. The process of obtaining a previous version of a Microsoft product is called "downgrading." Downgrade rights apply to volume license customers only.

This is the current price for Microsoft Access 2002. Because Access 2002 is included in the Professional and Developer Editions of Microsoft Office XP, the prices of the Office XP Professional Edition and Office XP Developer Edition are also included.

Products	New User Price	Upgrade Price
Microsoft Access 2002	\$339	\$109
Office XP Professional Edition	\$579	\$329
Office XP Developer Edition	\$799	\$549

Table 5: Microsoft Access 2002 Current Prices

### Features comparison

Microsoft Access 2000 falls into the desktop category and works best for individuals and workgroups managing megabytes of data. In comparison with SQL Server 2000, Access uses file-server architecture, rather than client-server architecture. Access 2000 has many restrictions in comparison with SQL Server 2000 and cannot be used in the case where you want to build a stable and efficient system with many concurrent users.

Some SQL Server 2000 and Access 2000 restrictions:

Feature	Access 2000	SQL Server 2000
SMP support	Not Supported	Supported
Tables	Relational tables	Relational tables, Temporary tables
Triggers	Not Supported	AFTER triggers, INSTEAD OF triggers
Procedures	Not Supported	Microsoft T-SQL statements
User-defined functions	Not Supported	Scalar functions, Inline table-valued functions, Multi statement table-valued functions
Views	Not Supported	Supported
Transaction logging	Not Supported	Supported
Recovery	Recovery to last backup	Recovery to last backup, recovery to the point of failure, recovery to a specific point in time
Integration with Windows NT security	Not Supported	Supported

Table 6: Comparison of SQL Server 2000 and Access 2000 Features

### SQL Server 2000 and Access 2000 limits

Feature	SQL Server 2000	Access 2000
database size	1,048,516 TB	2 GB plus linked tables size
objects in a database	2,147,483,647	32,768
user name length	128	20

password length	128	14
table name length	128	64
column name length	128	64
index name length	128	64
Number of concurrent users	limited by available memory	255
columns per table	1024	255
table size	limited by available storage	1 GB
number of indexes in a table	250	32
number of columns in an index	16	10
bytes per row	8060	2000
number of tables in a query	256	32
columns per SELECT statement	4096	255
nested sub queries	32	50
number of enforced relationships	253	32
SQL statement size	65,536 * Network packet size (4 KB, by default)	approximately 64,000

Table 7: Limits of SQL Server 2000 and Access 2000

## **Recommendations**

Through the evaluation of the alternative system we showed that the development of a web application based on an SQL Server 2000 database and the construction of a professional web site which queries this central database is the right course of action and should be implemented to replace the current system.

Not only is the proposed system feasible, but it also meets all the objectives determined by management. Therefore we recommend that the current system be replaced by a “web application based on an SQL Server 2000 database and a professional web site”.

## **Implementation Plan**

Hardware acquisition:

- Obtain Quotations
- Examine Quotations/Make Award
- Place Orders
- Await arrival
- Clear equipment from customs
- Examine equipment for compliance

Software acquisition

Installation and Testing

Personnel Training:

- Customer Service Representative Training
- Accounts Clerk Training
- Management Training / Orientation

Export Microsoft Access 2000 data

Import Data into SQL Server 2000

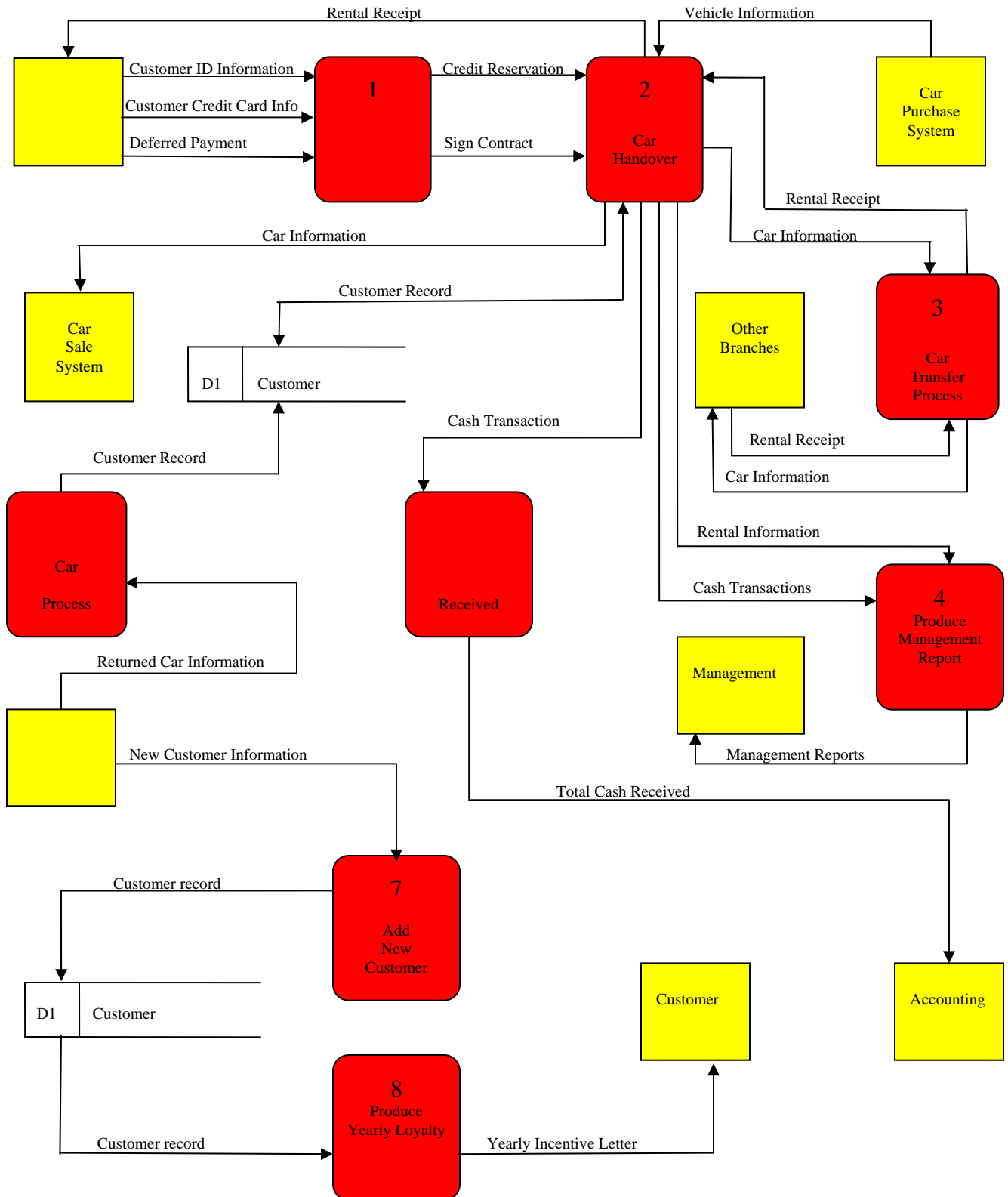
Pilot Test

Changeover

See Appendix 4: Gantt chart Showing Implementation Plan and Status Report

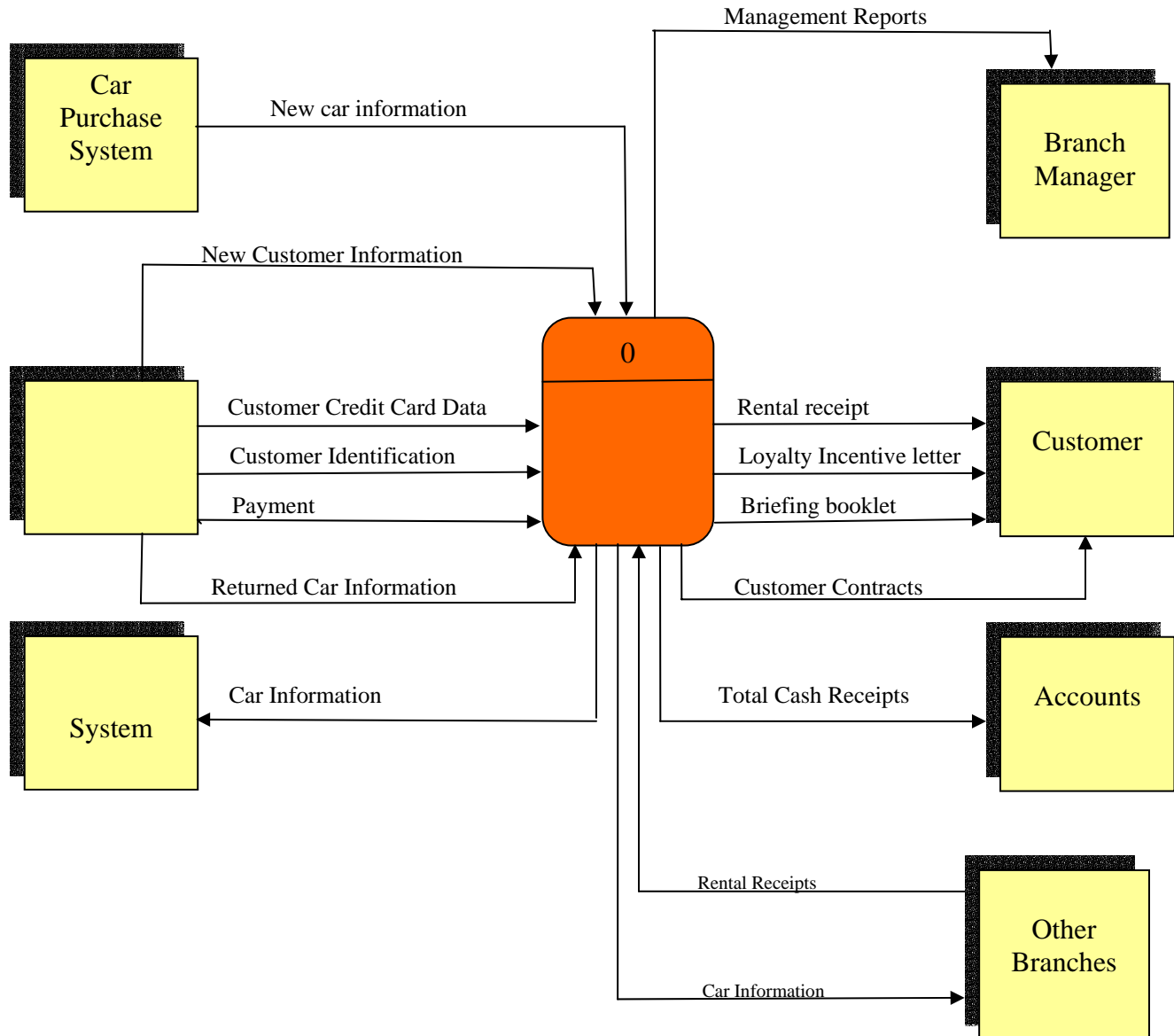
## Appendix 1

### Diagram 0 for the Current System



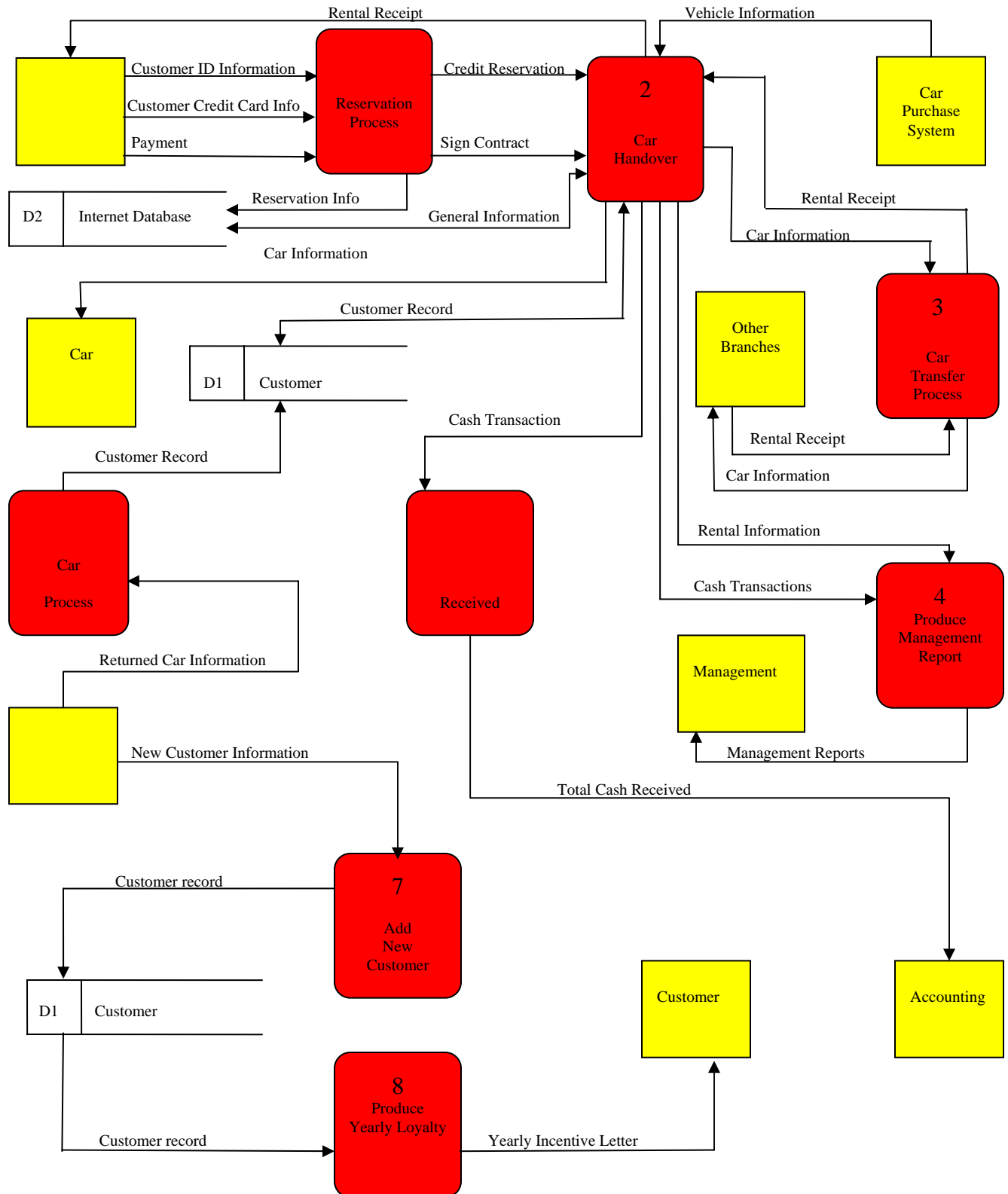
## Appendix 2

Context Level diagram for the New System.



### Appendix 3

#### Diagram 0 for the New System



## Appendix 4

**GANTT CHART SHOWING IMPLEMENTATION PLAN AND STATUS REPORT**

ACTIVITY	PERIOD ENDING (Weeks)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Hardware Acquisition:																								
Obtain Quotations																								
Examine Quotations/Make Award			.....																					
Place Orders			.....																					
Await Arrival																								
Clear equipment from customs								.....																
Examine equipment for compliance								.....																
Software acquisition																								
Installation and Testing										.....														
Personnel Training:																								
Customer Service Rep. Training									.....															
Accounts Clerk Training																								
Management Training / Orientation												.....												
Export Microsoft Access 2000 Data												.....												
Import Data Into SQL Server 2000												.....												
Pilot Test																								
Changeover																								.....

N.B. These activities take days

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IMPLEMENTATION PLAN AND STATUS REPORT					
	NUMBER OF DAYS				
<b>ACTIVITY</b>	1	2	3	4	5
Examine Quotations/Make Award					
Place Orders					
Clear equipment from customs					
Examine equipment for compliance					
Installation and Testing					
Customer Service Rep Training					
Accounts Clerk Training					
Management Orientation/Training					
Export Microsoft Access 2000 data					
Import Access data into SQL Server 2000					
Changeover					

# Open Minded Solutions

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