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**PROFESSOR** : Eric Svaan

**STUDENT** : Jai Rupani

**TITLE** : An application of logistics software to the courier industry

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**An Application of  
Logistics Software to the Courier Industry**

by

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A research paper submitted in fulfillment of the requirements for 1 credits,  
UNDERGRADUATE INDEPENDENT RESEARCH PROJECT Fall Term 1997,  
Professor Eric Svaan, Faculty Supervisor.

## **An Application of Logistics Software to the Courier Industry.**

This independent research project by Mr. Jai Rupani (OM 399) had 3 academic objectives:

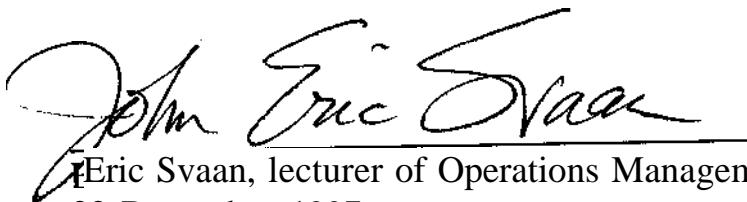
- 1 Understand the scholarly issues associated with the vehicle routing problem^
- 2 Understand the practical issues presented by real-life businesses which which make their money through provision of regular pickup/delivery services.
3. Explore the role of intelligent software systems in helping these businesses reduce cost and acheive better service levels.

According to my reading, the paper which follows demonstrates accomplishment of these objectives. Mr. Rupani describes his understanding of vehicle routing, demonstrating that he has learned the basics of this rather advanced and classic operations research problem. He then addresses the second and third points above by his account of a client engagement in which he was a participant during the course of his summer employment with Sadler and Associates.

It is clear to me that the summer employment was a critical factor in accomplishing the academic progress displayed here. Only through hands-on usage could Mr. Rupani gain access to the business context required to attain mastery of the software which is so obvious.

While I am satisfied overall with this work, it could have been improved. For example, claims made in the table (p. 13) and exhibits lack support of primary data. While confidentiality issues certainly exist, the fact that the client company is disguised should have allowed use of actual (or transformed) data.

I grade this work at A- (A-minus), for 1 hour of undergraduate credit.



Eric Svaan, lecturer of Operations Management  
22 December 1997

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### **Executive Summary:**

This paper describes an experience the author had over the summer of 1997 while working for Sadler and Associates, Inc. a technology consulting firm in Michigan. This summer experience exposed him to the intricacies of the Logistics Industry. This paper provides a look into the industry, its problems and complex issues in the form of a client implementation. The author uses one of his experiences in the courier industry to illustrate the diversity of issues involved. This consulting engagement gave the author the opportunity to learn, use and implement a powerful logistics software tool in the Courier Industry.

The paper is organized as follows. First, a brief overview of the Courier Industry is provided, identifying its driving forces and the wide spread use of technological tools to improve productivity. Second, the author describes the software tool employed and the benefits that it provides. Third, the client's environment is described in detail providing an insider look at the Courier Industry. The specific goals and constraints the client faces and its current operations are explored in depth. Fourth, the importance of client operation knowledge is examined in a discussion of pre-implementation requirements. Fifth, the implementation process is broken into three manageable steps:

- Database Setup: Development and Understanding
- Benchmarking and Testing: Importance and Uses
- Training: Process and Goals.

Sixth, the paper presents the efficiency gains of implementing the software. Finally, the author provides exhibits enabling readers to better understand the software tool and its powers in solving the problems in the courier industry.

### **Overview of the Courier Industry:**

The existence of Economic rent has led to an increase in the number of the players in the Courier Industry. The Big players such as Fedex, UPS and Airborne Express have gained a market reputation, controlling a large segment of the courier market. By contrast, smaller courier companies who provide localized services in major metropolitan areas have established a niche market. However, irrespective of size of operation, there are common problems in the courier industry. The problems can be categorized as the following:

- Assignment: Who does what?
- Sequencing: Who does what when?
- Routing: Who does what when and how?
- Resources/Vehicles: How many are Used/Needed?

When courier companies think of cutting costs they think of reducing labor, purchasing cheaper vehicles, leasing equipment rather than purchasing and so forth. They forget the most integral part of their business is the routing of their vehicles along roads. Efficient routing requires skill and experience, which follows the "learning by doing" rule of thumb. Bringing on new drivers and training them is a challenging task which involves a large resource and time commitment on the part of the company.

Due to the complexity of the routing process, most large courier companies have computerized their routing process. Computerization transfers the expertise from the companies' people to the software. The software provides driving directions and route maps for the drivers, which dramatically increases the slope of their learning curve(Exhibit 1). Additionally, the software creates time utility for the people in the organization, so they can focus on other aspects of the business. Thus, computerization of the routing process creates considerable savings.

However, there are certain requirements before a company can invest in the software. Large companies need to computerize their routing process to compete in the

marketplace. On the other hand, for small companies computerization provides a competitive advantage. The software increases efficiency of the operation a, different levels, thereby reducing overall costs of courier service, This cos. reduction, provides them a competitive advantage over the other players in the local market.

**The Tool: RiMMS (Resources in Motion Management System) made by the Lightstone Group, Inc.:**

*"We do not know when exactly we can deliver your parcel Mr. Doe, but it will be there between 9 am and 5 p. m. " -*

Any customer who has ever heard this response from a courier company, knows what I am referring to. Not having a specified delivery time can be frustrating and even infuriating at times. Imagine the customer satisfaction and therefore competitive advantage that could be gained by a courier company who could narrow the delivery period to a two hour bracket! This is where the RiMMS logistics software becomes useful. RiMMS is a software program designed to help manage staff and resources in the field of trucking, delivery, field service, courier, health care, and medical laboratory field RiMMS is an easy-to-use program which helps in making decisions about who goes where to do what job. The rules are set by the Client (for example customer hours vehicle capacity or staff skills). RiMMS' powerful mathematical tools, combined with the knowledge of the client's best people, gives clear, fast answers, and helps set up the most effects schedules and routes. Routes, which are displayed visually and in outline form, and can be customized to the clients' needs.

RiMMS provides many efficiency benefits, which can be summarized as follows:

- It helps new drivers learn their routes faster by providing maps and driving directions
- It acts as an expert system, ensuring continuity even in the absence of the main supervisor.
- Being a computerized program, it is less labor-intensive in setting routes.

- It handles ever-changing route environments, providing new routes in minutes.
- It can adjust the workload on the basis of the number of vehicles the firm has available on that particular day, ensuring that an optimization is reached.
- It ensures that customer time constraints are met in industry segments such as Medical Labs and Banking.

To function effectively, RiMMS requires certain operation and equipment conditions. Operationally, for RiMMS to provide successful results, the operation needs at least four vehicles. Any number of vehicles below this could lead to longer time to get a return on investment. The equipment requirements can be broken into hardware and software. The minimum hardware requirements for satisfactory performance are as follows:

- Pentium Pro 266 MHz computer.
- 128 MB of RAM- Random Access Memory.
- Ethernet card for networking capabilities.

The minimum software requirements:

- Windows 95 or preferably Windows NT software platform.
- Remote Access software such as PGAnywhere.
- Notepad or similar text editor.
- Crystal Reports Professional for the creation of Route sheets.

#### The Client: Widget Courier Co:<sup>1</sup>

Widget Courier Co. operates in a metropolitan area in the Midwestern United States. Widget provides Medical Lab Courier and General Courier services to its parent corporation. Although, it does not compete with the other players in the market, its services could be outsourced if its costs of operation are not competitive.

The name of the client has been changed to preserve confidentiality.



Together both segments had the following specifics:

***Specifics of Widget's Operations:***

Resources/Vehicles: 24.

Customers/Stops: 430

Pickups/Drop-offs: 950 Jobs

The reason for the disparity in the number of Stops and Pickups/Drop-offs is due to the fact there can be many customers in the same building and thus the truck has to make only one stop for five pickups sometimes.

**The Lab segment of Widget:**

This segment includes the collection of medical samples (such as blood) and the delivery of reports or samples to the customer. The routes for the Lab operations have both fixed and variable features. Certain routes are fixed routes (for example, every Wednesday there is a pickup from Dr. Rosh's Clinic). The variable aspect of the route stems from the feature called the Will Call (W/C). W/C is where the customer will call on the pickup day if anything has to be picked up for the Medical Lab. W/C presents a vexing problem in the Medical Lab business, since clients' call all day at different times with pickup requests. The dispatcher at Widget is in charge of handling the W/C's as they come in. With a manual routing system, the dispatcher would assign the pickup to the truck that handled that particular zone. He would page the driver with the W/C account number of the client to be picked up. Often, the dispatcher did not know accurately which truck was the closest to the client at the time of the W/C, leading to back tracking by the drivers. The lack of accurate information resulted in route disruptions, time delays, wasted resources, and damage to customer satisfaction. Since a substantial portion of their business was derived from W/C's, Widget was determined to find a solution to this problem.

### The General Courier segment of Widget:

This segment involves the movement of supplies, parcels and letters to and from different departments of the corporation around the metropolitan area. This segment also has fixed and variable features. For example, there are certain routes for regular pickups/ deliveries of mail and supplies according to a timetable. On the other hand, some routes were developed on an adhoc basis to satisfy irregular needs in the organization, such as the movement of equipment or furniture. Widget was having a problem trying to route the adhoc routes efficiently.

As seen above, Widget Courier has a large business operation with the "*traveling salesman problem (Taha, 1971)*" The problem can be best described as, Widget needs to make 'n' stops a day from a starting point, visit each stop once and return to base. The objective is to minimize total travel time. Thus, Widget has to find the route sequence that leads to the lowest travel time given the customer time windows. This salesman problem and others specific to their industry (W/C's), show the need of a system that can create routes in minutes and also provide accurate location of the trucks in a particular time frame.

The implementation is broken into two phases: Pre-implementation and Implementation.

### **Pre-Implementation of RiMMS:**

Due to the versatility of the RiMMS software across the Logistics Industry, it is important to understand how the client intends to use the product before implementation. This involves the pre-implementation phase analyzing the client's current internal and external operations thoroughly and looking for areas of inefficiency which could be remedied by the use of the software. *Internal* operations consist of the information flow between departments such as customer service and accounting. Questions to consider include: What are their existing database structures? Does an interface have to be built for the new database? How does the RiMMS database fit into their information environment? It is

critical to understand if all the departments use the same database for customers and which department is in charge of updating and upgrading the database.

Understanding the *external* operations involves learning how the routes are made and how the drivers get the information, what the capacity of the operation is, how their operation is different from any other courier's, or, in short, understanding how the operation is run from start to finish. After analyzing the operations, the client's expectations are examined to ensure that these expectations are realistic.

At Widget the author learned the importance of pre-implementation analysis while working with the software for three weeks with the principal. This rigorous analysis ensures that all the inefficiencies of the operation are known before hand, making implementation easier. Since Widget intended to use the product for long-term route planning as well as day to day route scheduling, it was important to consider issues such as excess or under capacity for the future. Additionally, since their division operated independent from the corporation there was no database interface issues, eliminating the need to create an interface during implementation.

### **Implementation of RiMMS:**

Once a basic understanding of the client's environment is gained, the following three steps make for an effective implementation of the Logistics Software:

- Database Setup
- Benchmarking and Testing
- Training

The first two steps are done at the home office, while training is either done at the client site or at the home office.

### *Database Setup*

This involves creating a flat-file database of the client's customer's addresses, stops and Identification codes (ID's) for RiMMS to read from. Widget Courier had their Customer and Job/Stops databases in Microsoft Access. It was necessary to import their data from MS-Access to the flat-file database format required for RiMMS. The flat-file database simply consisted of four fields:

- The Depot
- The Customers
- The Jobs
- The Resources(Trucks, cars etc.)

Due to the overlapping nature of the Lab and Courier databases, they were combined to facilitate ease of operation.

Another important task in setting up the database is specifying ID's. ID's can have important ramifications for finding and understanding information in the database. In specifying ID's, The following questions should be considered:

- Should the client ID and the client Job ID be the same?
- Should the ID's be numeric or alphabetical? Or a mix of both.

At Widget the ID included a part of the customer's name and the time of the pickup/drop-off. This information made it easy for Widget to understand who and at what time just by looking at an ID. For example - Pickup at Harper (Finance) at 8.00 am would have an ID -HAR-FIN-8.

### *Benchmarking and Testing*

After ensuring that RiMMS is reading the database accurately, the optimizer settings are identified. These settings provide different parameters by which an optimization can take place. Manipulation of these parameters affect the quality and the cycle time associated with optimization. Once set, these settings are rarely manipulated by the client. The

application optimizes the routing by first assigning the stops to the resources and then running intra and inter routing optimizations. Depending on the parameters set it took anywhere from .5 to 3 hours.

Understanding that Widget wants routes under two different conditions, two optimization settings were created. In one condition, quality was important but time was not an issue - when they create routes for the next day. On the other hand, when they want to route W/C's they need speed first and accuracy later. This is where information from the pre-implementation stage is helpful.

### ***Training***

After reaching optimal results from the software setup at the home office and rechecking it with the principal, training is the next phase in implementing the software. At Widget, two client representatives who were going to be using the software attended the client training session. To avoid interruptions and facilitate a learning environment, training occurred over a three day period at the home office. The training was structured as a combination of lecture and hands-on instruction. The *lecture section* enables the client to learn about the software and its features, thus developing a mental framework as to how the software can be implemented in their environment. The *hands-on section* allows the client to use the software with their data and apply the mental frameworks they established during the lecture. This method of learning enables the clients to get a thorough understanding of the software and its applications. A casual environment was maintained during training to keep the clients' at ease and to facilitate an environment of learning. Following is a brief description of the training sessions:

#### ***Day One:***

The goal of the first day of training was to provide a basic understanding of the logistics software package. The multi-functionality of the product across the different sectors in the logistics industry was described, including special functions that applied to Widget.

Clients sometimes find innovative ways of applying the special tools of RiMMS, which are generally not applied in their industry to their firm. After the two-hour presentation of the product features and capabilities, the client's goals of the training were noted and the rest of the training was done with those goals in perspective.

In the second part of the session, the client was introduced to RiMMS using their current data. The relationship between the different fields was explained: how the fields interact between one another, how the pickup points look on a map, and how the routes cover the local area(Exhibit 2) The main focus of this session was for the client to get a better understanding of the software and its application in their environment. Clients were encouraged to think about questions they wanted answered. Questions regarding the specific operations of the software were postponed to the next day sessions, where the client would gain hands-on experience using the software.

***Day Two:***

The focus of this day was to get the client working hands-on with the software, simulating real-life scenarios. After reviewing the basics from the previous session, we worked on daily tasks involving the software (adding a new customer or Job, establishing zones for the metropolitan area, etc.) Working with probable scenarios made Widget's representatives rethink their operating procedures and strengthened communication ties between them. Next, the optimization process was described to them focusing on how the manipulation of the different variables affected the results. The day concluded with a setup of sample optimization runs for Day Three.

***Day Three:***

The goal of this day was to have Widget's representatives operate the software on their own, with the trainers as support. Using the optimization output from the previous day, the client was explained how the main parameters could be manipulated to route under a time constraint. To make the client realize this was not foolproof software, they used the

map feature to check the consistency of the routes with the routesheet (Exhibit 3). Sometimes there are outlier stops on a route which can be clearly spotted, caused due to an incorrect address or a wrong latitude and so forth. This just proves the saying "Bad input give you bad output." It gave them the opportunity to learn how to ensure that the routes were correct. The client was also taught how to use the special feature of RiMMS, such as viewing the routes with specific time window for more accurate estimates of driver location (Exhibit 4). Also, clients were exposed to the driving directions feature of the software, which help increase the learning curve of the drivers. After understanding all the above features, the clients were allowed to explore and experiment with the software and ask questions or revisit something they didn't understand.

### **Results:**

Widget Courier Co. gained in the following ways:

- ***Faster route preparation:*** Earlier Widgets' employees manually set up routes for their drivers, which was a tedious process in an ever changing environment such as the Medical Labs. As operations increased, flawless manual route construction became impossible. RiMMS provided greater accuracy in routing in shorter time.
- ***Creation of an Expert System.*** Earlier routing depended on several individuals. Thus, the absence of an individual on a particular day strained the system. Since the RiMMS database contained all the necessary information required for routing, anyone sufficiently trained on its functions could look after the process of optimizing the latest jobs on the routes for the next day. The software acts as an expert system and, once set up, requires little change in the settings.
- ***Increased customer satisfaction:*** As mentioned earlier, the Medical Lab segment is a volatile and ever changing environment. Due to the lack of necessary routing tools, Widget often could not service customers at the last minute. With RiMMS, it could optimize the job on a route at the shortest notice. RiMMS provides snapshots of the routes on the maps as they are, in time intervals set by the user (Exhibit 4). Thus, Joe could check the system regarding which vehicle is going to be the closest to the

customer in the pickup time period and assign the job to it. Customer satisfaction improved and so did Widget's reputation in the market.

- ***Faster learning curve for drivers:*** Route sheets printed with detailed driving directions (Exhibit 5) and maps ensured that the drivers learned their routes more quickly and in considerably less time.
- ***Increased productivity:*** Planning more efficient routes for experienced drivers increased productivity.
- ***Reduced mileage and time for drivers:*** Efficient routes led drivers to drive fewer miles in less time for the same number of stops.
- ***Reduced costs:*** With the reduced route mileage and time, Widget harnessed cost savings of 30-40%. With such dramatic cost savings, Widget had a return on their investment within six months.

The results of all these efficiencies can be summarized in the following table:

<b>Variable</b>	<b>Before Implementation of RiMMS</b>	<b>[After Implementation of RiMMS</b>
Route preparation	Manually	Computerized
Ease of Operation	Laborious	User Friendly
Expert Knowledge	Drivers and Dispatcher	Expert System (Computer program))
Travel Time for Routes	Arbitrary	Reduced and known
Driving Directions	No	Yes
Map of the route	No	Yes
Truck Mileage	High due to back tracking	Reduced
Ability to route W/C's effectively	No	Yes
Costs of Operation	Moderate	Reduced by 30%
Productivity	Low due to high mileage and inefficient W/C handling	High due to low mileage, efficient drivers, and efficient W/C handling
Customer Satisfaction	Moderate	High



## References

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Resources in Motion Management System (RiMMS) Version 2 7 04 , Lightstone  
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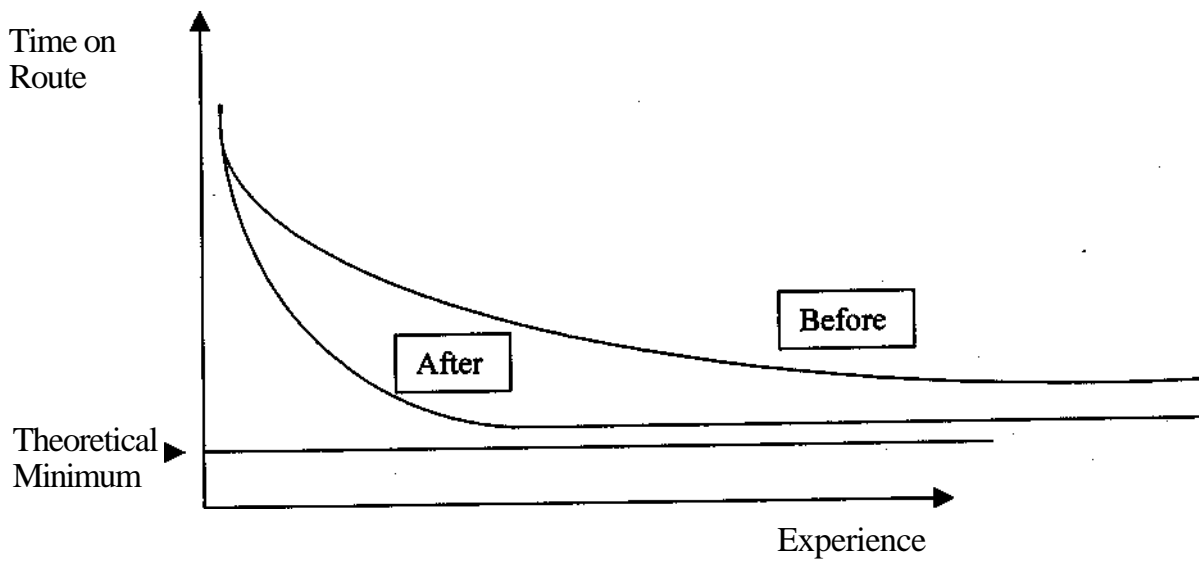
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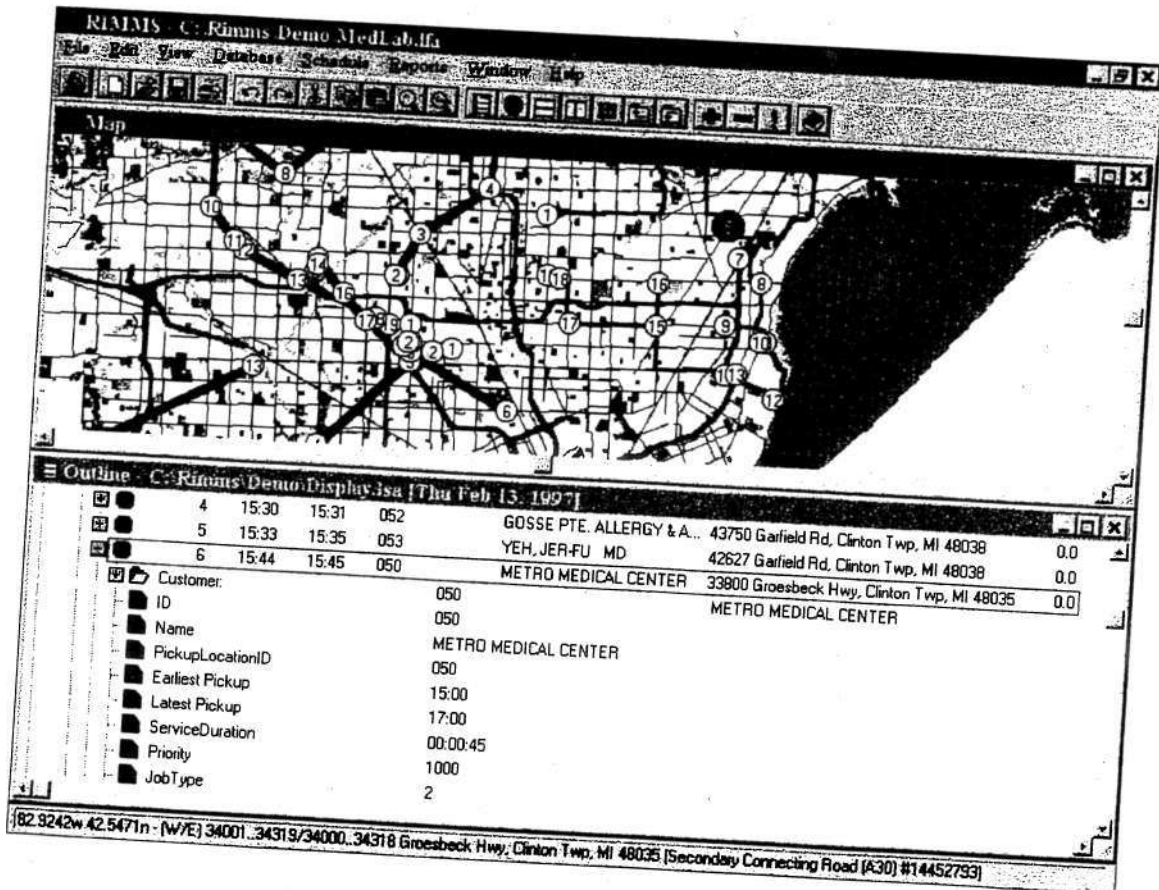
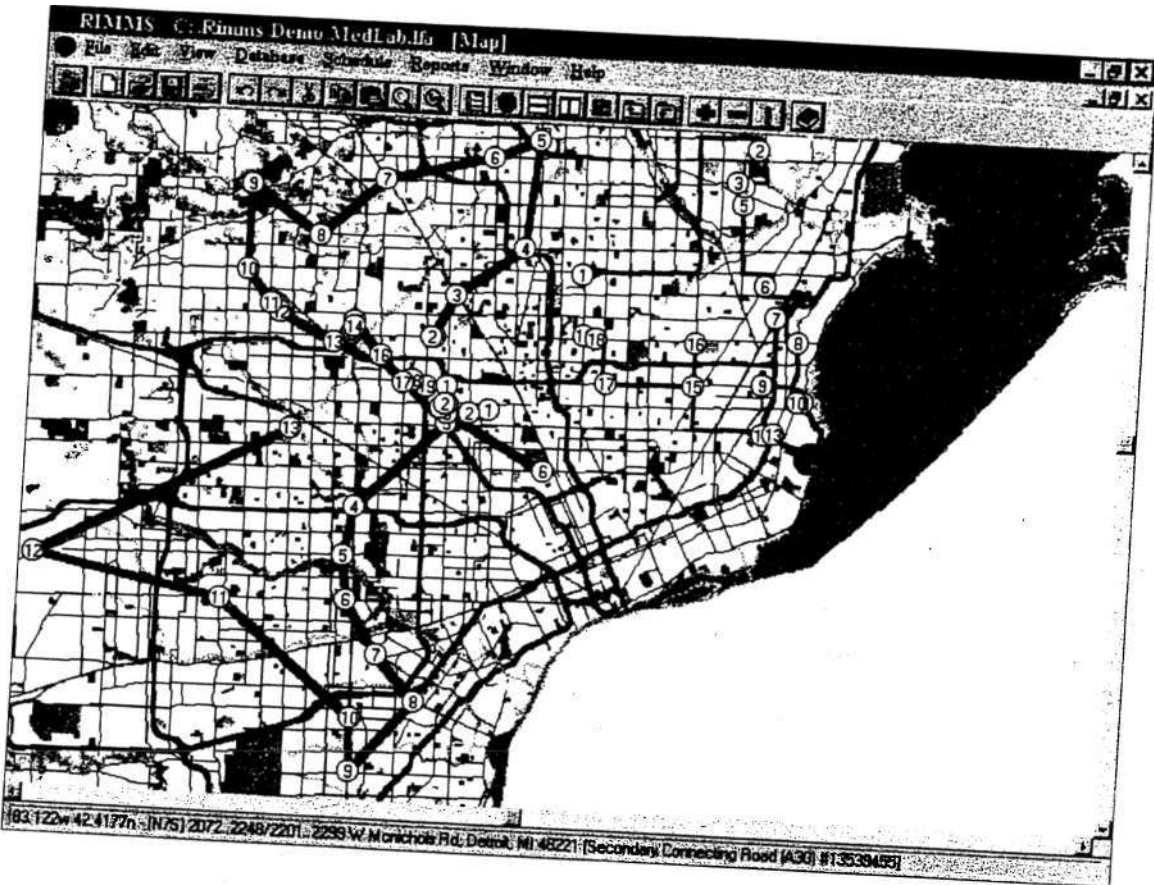
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**Joseph R. Sadler, Applying Technology to Today's Business Environment  
(Company brochure), Sadler & Associates, Inc. 1997.**

**Exhibit 1**

The change in the learning curve of the new drivers before and after the use of the Logistics Software:





# Route Manifest

# 1

**Courier Route: GR**

StOD	Name	Address / Phone	Tvo Piekuo Time	Soecimens	Deliveries	Comments:
16 GRA-CHEM-1	GRACE CHEMISTRY	6071 W OUTER Dr DETROIT 48235	SUITE: 3139664088	REG 15:43		Return empty tubs picked up - (Do this o
17 ORA-PHA-11	GRACE PHARMACY	6071 W OUTER Dr DETROIT 48235	SUITE: 139664088	REG 15:43		Return empty tubs picked up - (Do this  PRO BUILDING ENTRY CODE 532
18 1002179-12	GRACE FAMILY PRACTICE-OUTER DRIVE	6071 W OUTER Dr DETROIT 48235	SUITE: 400 3139661730	REG 15:43		
19 GRA-MED-i:	GRACE HOSPITAL - MEDICAL RECORDS	6071 W OUTER Dr DETROIT 48235	SUITE: 3139663155	REG 15:46		DROP OFF MAIL FROM OPERATIONAL PURCH
20 GRA-MR -13	GRACE HOSPITAL - MAIL ROOM	6071 W OUTER Dr DETROIT 48235	SUITE:	REG 15:46		DROP OFF MAIL FROM OPERATION AL PURCH
<b>DMC-COM ↗</b>	DMC - COMMUNICATIONS	3740 JOHN R St DETROIT 48201	SUITE: 102 3137455101	<b>W 16:01</b>		PICK UP BATTERIES
22 IIAR-ML -14,	HARPER (MAR, ROOM)	3990 JOHN R St DETROIT 48201	SUITE: 3134588310	REG 16:02		D FLOOR ACROSS FROM R  Located in the Cotton Wood Center 11950
23 DMC-CORP-1	DMC CORPORATE OFFICES	4201 STANTOINESt DETROIT 48201	SUITE: 3137455084	REG 16:02		Usually in a single envelope
24 10439 -15	GRACE AMBULATORY - SURGERY	27207 LAHSERRd SOUTHFIELD 48034	SUITE: 100 8103570880	REG 16:28		
26 GRA-MR -16	GRACE HOSPITAL - MAIL ROOM	6071 W OUTER Dr DETROIT 48235	SUITE:	REG 16:40		DROPOIIMAILIROM OPERATIONAL PURCH

**| rnpinietion of Cornier Route; CR**

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EXHIBIT 4  
TIME WINDOWS

