CSC 340 – Assignment 1

Feasibility Study on Behalf of:
TNT Canada Inc. – Toronto Branch

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Table of Contents

The Organization

TNT (Thomas Nationwide Transport) is a European-based leader in express distribution, logistics and international mail. TNT is one of the world's top four providers of global express distribution services. TNT specializes in fast, time-sensitive pick-up and delivery of all types of shipments to virtually anywhere in the world. TNT currently employs over 50,000 people in more than 200 countries and is headquartered in the city of Amsterdam located in The Netherlands.

The company processes 2.1 million consignments (shipments) weekly through its 969 depots and operates 17,000 vehicles and 40 aircraft. TNT has invested in state-of-the-art sorting facilities to provide the fastest, most secure processing of shipments in the industry.

TNT's operational networks are supported by sophisticated technology that provides customers with service reliability, automated proof-of-delivery and real-time on-line information on the status of their consignments. TNT operates one of the world's largest private communications networks, Global Link™, linking all TNT's depots and offices around the world, 24 hours a day, 365 days a year.

TNT is a global-based company, but for our intents and purposes, this study will focus only on the Toronto branch of TNT. Toronto branch, located across the street from Pearson International Airport, processes about 50,000 consignments weekly, and is one of the biggest depots in North America. About 40% of 50 000 are destined for the United States. Toronto branch uses UPS for any shipments made to the United States. TNT has recently removed itself from the United States due to lack of the market share.

Toronto branch is also the head office for the Canadian region of TNT and houses much of the administration for the entire country. Enhancing the performance of this particular branch would be very beneficial because this branch has the power to implement these enhancements to the branches under its administration (i.e., all other Canadian branches such as Vancouver, or Halifax). Also, because the volume of traffic is so high in Toronto branch (as compared to the rest of the Canadian branches), the benefits of a performance enhancement can be greater taken advantage of than if it was implemented at a smaller branch such as Saskatoon or Calgary. Hence, our analysis for this particular branch of TNT would aim to improve service quality for not only a large portion of the company, but also perhaps all of its branches spread throughout the entire country.

NOTE: From now on, whenever we refer to TNT, we are referring to the Toronto branch.

The Clients

The clients of TNT include a broad range of consumers with various needs. Such clients may be large international corporations such as banks sending important office documents overseas, or small individual customers such as a grandmother sending a gift to her niece. A large distribution warehouse may wish to send it's individual stores supplies for stock. Automobile manufacturers in Japan might wish to send car repair parts to North America. A student may wish to send his final exam for his correspondence (long-distance) course to his school for marking. TNT serves a large range of clients but mainly deals with bigger corporations and businesses in need of express delivery services.

Finding a System to Evaluate

In our search for a system to evaluate, we contacted the TNT Operations Manager, Tan Ahmed. Tan has been with the company for over 10 years and he's worked his way up from the ground. He's been through ever level of staff and has worked his way up to manager position; he knows just about every nook and cranny of the operations department. The operations department deals directly with the freight, from picking it up from the clients, to routing each package to its destination, to loading each package on the plane for delivery. After our first interview with him (as outlined in Appendix 1: Interview 1), he described a very serious problem within his department that was re-occurring and very costly.

Understanding the System

TNT offers an express delivery service to those in need of sending materials to another destination by a specific deadline. Shipments may include time-sensitive airplane tickets, important bank documents, machinery and equipment (such as fragile computer systems or TVs), or Christmas gifts. As one can see, time is an important factor in the express delivery service industry. A plane will not wait for you if you are not on board with your tickets before take-off, Christmas gifts should arrive before the 25th of December, and so on. A delayed shipment may mean that a shipment is being held in customs due to a problem. Bearing all this in mind, we decided to interview the manager (Tan Ahmed) about the current system in the hopes of finding where the problems are. The results from this interview would give us a rough idea of the scope of the problem and perhaps some insight as to how it may be fixed.

Outline of the Current System

When a client wants a shipment to be delivered, one first fills out a hard copy form known as a "TNT consignment note" or "con-note" for short (see Appendix 3: Blank Con-note). A con-note holds all relevant information about the package, namely, information about where the package is coming from, who is sending it, where it's going, how much it weighs, and what the package contains. Each con-note has its own unique 9-digit con-note number that identifies itself and every shipment must have a con-note attached to it.

Clients that use a program supplied by TNT called "Partnership" can print the same con-note. The program will allow the user (client) to fill in the necessary fields, and the fields of city, country, and postal number are all validated. Then con-note then is printed on the user's computer. The printout version serves as the con-note shown in appendix 3: Blank Con-note. However, only one third of the clients use the program. TNT does not know the reason(s) for the low usage rate.

After the form is properly filled out, one then signs it and attaches it to one's package, which is then brought to the branch warehouse by a TNT driver for processing by warehouse staff. When the package arrives at the warehouse, a copy of the con-note is separated and kept by TNT for its records. Then, information about the package's con-note number, weight, destination city and country is manually entered into TNT's Global Link system to produce a "routing label" denoting the con-note number, destination city, and country. This routing label is affixed to the package, which is then sorted according to this routing label and delivered to its flight at the airport where it will be flown to the TNT branch in that city and country. The package then finishes it's lifetime of travel when another driver delivers the package at the specified destination. The manual entry to the Global Link system is done so that TNT can keep a record of the shipment in its system. At any given time the information about the package needs to be retrieved, one simply logs onto the Global Link system from anywhere in the world, types in the unique con-note number, and all information about the package is instantly brought up on the screen allowing TNT to track its package.

When a package is destined for the United States, a similar but different procedure occurs. The information from the con-note is again manually entered into the UPS system. Recall that TNT uses UPS to send its packages to the United States. A different routing label (an UPS shipping label to be exact) is produced by the UPS system. The shipping label is then placed on the package and is sent to the UPS branch that is near the TNT branch in Toronto. The information entered into the UPS system is then uploaded to the Global Link system since we want to be able to track the package as it makes its way toward the destination.

Problems with the Current System

The second interview with operations manager Tan Ahmed (as outlined in Appendix 2: Interview 2) revealed to us that a disturbing amount of the shipments are sent to incorrect destinations, and some are not even arriving at their intended destinations at all, let alone on time (average of 340 packages per week which is 0.7% of total packages in one week). TNT deals mainly with larger corporations and

businesses, a misplaced or delayed shipment will likely mean that TNT's customer service department will have to deal with a large corporation terminating its contract with TNT and never shipping with them again rather than just having an angry grandmother wondering where her niece's gift is. This obviously results in great loss of revenue for TNT, especially if the client is aware of other courier companies available in the market (such as FedEx or UPS) who offer very competitive rates and services. Aside from losing a valued client, TNT undergoes a great cost to correct the problems of misplaced or delayed packages.

The above problems may be due to problems related with the hand-written forms that each client must fill out. Due to messy handwriting, it is sometimes very difficult to read vital information from the con-note; for example, it's destination city, country, address, or even the time it is to be delivered by are difficult to read. Because of this, many shipments are either sent to incorrect destinations, or they don't arrive at the time specified by the customer. For instance, as noted in the Appendix 3: Blank Con-note, a series of checkboxes at the bottom left of the con-note denote the time the shipment must be delivered by. One of these checkboxes must be checked off by the customer in order for TNT to deliver the package at the time desired by the customer. However, it is not uncommon for a customer to make a messy checkmark *between* two checkboxes rather than "*inside*" one. These problems also arise when the customer accidentally checks off more than one box (i.e., if "Next day by noon" and "To be delivered in 48 hours" are both checked off).

Another problem that arises from hand-written form is the correctness of the data. For example, in many cases, a certain zip code or postal code corresponds to every city. In Canada, each city has its own range of postal codes. Toronto postal codes for instance have been assigned to begin with the letter "M" (e.g., M5V 1A1). Canadian postal codes in general are 6 characters, 3 alphabetic characters, and 3 numeric digits in alternating pattern. If the customer enters a city that's not matched with its correct postal code, it is very difficult to distinguish where the package is going, especially if the name of the city is spelt wrong.

In some cases, the customer may fill out the con-note properly, the writing will be very neat and everything is filled out correctly, but manual data entry by TNT's staff is not 100% reliable. Typos often occur due to human error through either carelessness or negligence. Typos may include, any of the fields in the con-note, and the con-note's unique 9-digit number. In detrimental fields where the data quality has to be exact, if a typo occurs, the package may be recorded as being sent to the wrong street, or wrong apartment number, or wrong city, or the wrong country, or the time the package is to be delivered by is incorrect, or the contents of the package were not described properly. This may result in the misplaced or delayed package.

Aside from the human errors, the partnership software also has some problems. The database included with the software needs updating because the database (city, zip codes) of the United States is not correct. The head office in Europe has developed the software and they have not made the database be compatible to that of UPS. Thus when someone uses the software to print out the con-note and the package is destined for the United States, the package may be misplaced or delayed due to incompatible database of the Partnership and the UPS. Thus, when a client uses the software to print out the con-note, a data entry personnel needs to manually re-type the information in the UPS system using a database book that is supplied to them by UPS.

Lastly, due to the nature of the business, the drivers who does pickup goes to the major clients routinely, but there may be times when the client for that particular day may not have any package(s) to send. The drivers waste time by driving to clients that does not need any package picked up.

We will use the P.I.E.C.E.S. framework to list out the symptoms in more detail.

Performance – **Does the current mode of operation provide adequate throughput and response time?**

No, when a shipment is misplaced or delayed, it takes at least one business day to find the misplaced or delayed package (if it can be found) and send it to its proper destination by air or by land. This extra day often results in violating the delivery deadline specified by the customer since TNT mainly deals with express shipments that are to arrive by next day.

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

No, many con-notes filled out by hand contain ambiguous information about where the package is going, or what time it is to arrive at. The checkboxes for delivery time are perhaps confusing to the customer (thus they check off more than one box, or between two boxes). Human errors in data entry cause TNT's Global Link system to record data about packages inaccurately.

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

No, with the amount of data entry errors present in the current system, much time and money is spent locating lost packages and making special trips to personally deliver delayed shipments on time. In the week of January 24 to 31 of year 2001, a shipment was flown to Calgary instead of Edmonton. Nearly $400.00 (cdn) was spent on a TNT driver making a direct drive from Calgary to Edmonton just to deliver the package on time. A large portion of revenue is spent on data entry staff typing hand-written con-notes into the Global Link system and the UPS system.

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

Yes. If the percentage of misplaced or delayed packages can further be minimized, the cost will be further reduced. Ambiguity and messy handwriting of con-notes can be eliminated if the involvements of human are limited. The removal of data entry staff will result in further cost reduction.

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

No, since the con-notes are filled out by hand, it is easy for a customer to fill out incorrect information about where the package is coming from and who is sending it so that TNT cannot bill the correct customer. For example, Joe Blow might fill out his friend's information in the section containing information about who is sending the package. That way TNT bills his friend instead of Joe Blow but the package is still delivered properly. Also, accuracy of information cannot be guaranteed with the current system because manual data entry staff is prone to human error (i.e., typos).

Efficiency – **Does current mode of operation make maximum use of available resources, including people, time, flow of forms, etc?**

No, having a data entry staff entering information that the client filled out on the con-note is not using the maximum capability of these staff. The time to enter the con-notes into the Global Link/UPS systems can be time-consuming. Also, fixing the problem of mismatched city and postal number is further time-consuming. Thus, TNT is not maximizing its available resources.

Services – **Does current mode of operation provide reliable service?**

No, there is an average of 340 errors per week resulting in either misplaced or delayed shipments. This is wholly unacceptable considering each error can cost the company anywhere from $10 to $400, to even losing a customer forever.

Is it flexible and expandable?

No, the modification of any con-note cannot improve the messy handwriting of people. It also cannot improve clients from making a mistake of writing invalid city and postal number. Regardless of improvements to the con-notes, the problems of human error are too great.

The symptoms described in this P.I.E.C.E.S. framework all point to the fact that a lack of real-time error checking and human error cause a large portion of problems. In the current system, there is a lot of human intervention, and because of this, the system is very prone to human errors. Human error will always be a part of the system as long as humans are involved. Also, anything handwritten has no method of real-time error checking. A customer may fill out an improper postal code that does not match its city and there would be no way of telling if this was erroneous or not.

Objectives and Requirements

Upon discovery of this problem, we decided to try to eliminate it through the use of the following list of goals. In the new system, human intervention can be eliminated by:

- Electronically producing each con-note instead of having the customer fill it out by hand.
- Check the validity of the city, country, and postal number when the client is filling out the con-note.
- Directly transfer this electronically stored information into TNT's Global Link/UPS systems instead of having data entry staff manually entering it.
- Digitally read con-note numbers into the system instead of having to type them since the con-note number is vital to each con-note.

The Scope of the Problem

It is determined that many problems exist within TNT. Although not mentioned, errors of other types exist. For example, the transport system may have errors, or a natural disaster might occur, and so on. But for our purposes, we will simply deal with eliminating the involvement of human in the ordering process. This will most likely require automation of the process of data entry. The process of pickup and delivery will not be changed since it's out of our scope. Thus, we will focus our problem on the process of what the data entry staff does, and consequently, the removal of the data entry staff as a result of the new system.

Technological and Scheduling Constraints

With the objective and the scope in mind, we find that the technology out in the market can clearly solve our problem. The use of an e-commerce consulting company seems best fit.

The Toronto branch uses two main systems, Global Link and the UPS systems. Each is distinct and unique from each other and no correlation exists (Other than UPS system uploading information about the US shipment to the Global Link system). Network of computers are available to TNT.

As mentioned before, software called "Partnership" is already available. Although only about one third of the clients use the software, it still exists as an available technology.

TNT has a web site (www.tnt.com), which runs Flash and CGI scripts. The Toronto branch can also be reached via the web site. This stands as an available technology because many applications can be made useful.

TNT has in its possession many barcode readers that can digitally scan con-note numbers instead of data entry staff manually typing them into the Global Link system. Many other types of equipment exist that are essential to the carrying out of the daily routine.

Considering that TNT is still operating well, the need for urgency of a replacement is clearly not present. The project is geared towards improvement to the operational system of TNT. Thus, no time frame is present. The project is relatively "free" of both technical and schedule constraints.

Determining Alternatives

After gathering detailed information about TNT, its daily operations and its systems, the group met and brainstormed about possible solutions or alternatives. See appendix 4: <u>Alternative Ideas</u>. From all the ideas, we chose the best three (using constraints) to further examine the choices in detail. Here are the three alternatives which all seemed an improvement to the current system.

<u>Alternative #1: "Internet Online Processing System"</u>

Since a web site already exists on the Internet, we can take advantage of the available technology. We can have each client use the Internet to fill in the information that they would have normally done on the con-note, and using a database of valid city, country, and postal codes, the fields that the client inputs on the web can be verified in real-time. Thus, if the client's input is not valid (mismatched city/country/postal code), the client is notified immediately thereby getting rid of the problem of incorrect information. Also, the problem of handwriting is removed. Once the online order form has been filled, the same procedure of pickup and delivery is carried out. Using a database of the clients can maximize security; each customer will "log on" using a username and a password. The human involvement can be minimized or completely removed.

<u>Alternative #2: "FTP Client/Server Application System"</u>

Similar idea to Alternative #1 but uses its own FTP server. Clients will be given small application software (FTP client program), which will allow them to be connected to the FTP server of TNT. Again, the client will fill out the online con-note, and the server will verify information during the client's input. The problem of either the client or/and the data entry personnel making a mistake is removed completely. Once the online form has been filled and verified, the same procedure of pickup and delivery is carried out. TNT will require a very powerful server to be available, and new hardware and software are a must.

<u>Alternative #3: "Upgrade the Existing Partnership Software"</u>

Instead of developing a new system, we will update and enhance the existing "Partnership" software. This software was an initial step by TNT to maximize automation but has clearly failed. One solution is to upgrade the database of the software to correctly include UPS database. Note that UPS database is already known by a reference book supplied by UPS. TNT understands that about one third of the clients currently use Partnership software. They will need to focus on marketing and endorsing the use of the software. The newer, upgraded software can then be distributed on a CD. Again, the procedure of pickup and delivery will not change. The human involvement can be minimized and full automation of the data entry process can then be pursued.

Comparison Criteria

Given the alternatives mentioned above, criteria's must be established in order to determine the most attractive option. All these criteria are significant in helping comparing the alternatives.

1. Costs (Development & Operational): The development cost of the new system is a major determinate in choosing an alternative. The cost of the new system, include any hardware consisting of personal computers, Internet servers, monitors, and computer peripherals. Along with the hardware, the cost of software for the operating system, database system, server system, web development tools and other programming software should be considered. Operational costs include the employment costs. The new system will require expertise in fields of business analysts, senior architects, developers and web-page designers. These are human resources that TNT has to acquire to ensure a successful new system. Employment costs also takes into account the dismissal of current employees, including drivers, because of the new functions and efficiencies of the system. The cost of the operation also has to fall below the company's budget constraints.

2. Ease-of-use: The ease-of-use of the system is very vital to the clients. Clients will be more willing to adopt and accept the new system because of this factor. The system has to be user friendly, easy to understand and operate. Besides the clients, the staff also has to be comfortable with the new system. Maintenance of the system cannot be sophisticated for the staff.

3. Reliability: The system should be dependable at all times. These include problems with servers, connections, traffic, lengthy processing time and other uncontrollable difficulties. Reliability also includes the technology of the system implemented.

4. Security: Since the database contains personal information such as phone numbers and addresses, security is a major part of the evaluation of the alternatives. Security over the Internet or the FTP server is limited, as the possibility of intruders constantly exists.

5. Expandability / Ease of updates: Software systems often require updates to databases and patches to repair bugs. Updates that can be accomplished fast and economically are greatly desired.

6. Speed of operation: The speed that the order is processed should also be considered, as fast processing allows the company to be more productive. Also, a fast processing time for the clients will be greatly appreciated.

Analysis of Alternatives

All of the above criterions are used for further analysis and evaluation of the alternative systems later on. We will first visit the primary issue of cost VS. benefits for each alternative system, including the current system.

Operational Cost of the Current System

Using the cost benefit analysis, we can clearly see that staying with the current system is financially inefficient when it is compared to the alternatives. The analysis will only focus on specific operations, which will be affected if an alternative was chosen.

Table 1: Monetary Cost Analysis of Current System

Operation	Operational cost
Data Entry Staff salary	$ 375, 000
Drivers salary	$ 630,000
Technicians salary	$ 76,000
Truck operational cost	$ 270,000
Total cost	$ 1,351,000

* Please check appendix 5: Detail Cost Analysis of the Current System

Operational and Developmental Costs of the Alternatives vs. Current System

We have already evaluated the operational cost of the current system at $ 1,351,000. We propose to compare this number with the development and operational costs of the alternatives (see Appendix 6 – 8: <u>Detailed Cost Analysis</u>). These alternatives are:

- Internet Online Processing System
- FTP Client/Server Application system
- Upgrade the Existing Partnership Software

For each of the systems above, a detailed cost analysis was carried out. The development cost of the alternatives is a one-time cost to implement a new system or update the existing system. This detailed analysis gave us an approximation of the development and operational costs of the alternatives. These figures give us indication that an alternative system can decrease the operational costs of the company.

Table 2: Comparison of Developmental and Operational Cost of Alternatives.

Alternative System	Development Cost	Operational Cost	Total Cost	Cost Difference from Current System
Current system	$ 0	$ 1,351,000	$ 1,351,000	N/a
Internet Online Processing system	$ 156,750	$ 902,000	$ 1,058,750	$ 292,250 Less
FTP Client/Server Application system	$ 184,950	$ 902,000	$ 1,086,950	$ 264,050 Less
Upgrade Existing Partnership Software	$ 125,000	$ 1,051,000	$ 1,176,000	$ 175,000 Less

It is clear that the total cost for development and operations for all the alternative systems are considerably less than the operational costs of the current system. Therefore, from the cost analysis view, TNT would be able to save money by adopting one of the alternative systems. The savings alone can allow TNT to make the decision of changing its current system but cost alone is not the only factor in making an important decision. The next table will clearly outline the monetary, tangible, and intangible benefits for each of the alternative systems.

Table 3: Monetary, Tangible, and Intangible Benefits of the Alternatives.

Benefit	Internet Online processing System	FTP Client/Server Application System	Upgrade Existing Partnership Software
Monetary	- Development cost of $156,750 - Rank: 2nd - Operational cost of $902,000 - Rank: 1st	- Development cost of $184,950 - Rank: 3rd - Operation cost of $ 902,000 - Rank: 1st	- Development cost of $125,000 - Rank: 1st - Operational cost of $1,051,000 - Rank: 3rd
Tangible	- Reduces time to input shipping data into the system. - Eliminates drivers driving to corporations picking up orders if there is no package. - Reduces the amount of trucks needed in the daily operation. - Eliminates the data entry staff. - Further upgrades are possible with minimal cost.	- Reduces time to input shipping data into the system. - Eliminates drivers driving to corporations picking up orders if there is no package. - Reduces the amount of trucks needed in the daily operation. - Eliminates the data entry staff.	- Reduces time to input shipping data into the system
Intangible	- Using new technology gives the company a better reputation. - Gives the employees more confidence in the company. - Future for the future thus brightens up.	- Using new technology gives the company a better reputation. - Gives the employees more confidence in the company. - Future for the future thus brightens up.	- Improves a program that the company has already spent a lot of money on. - Gives the employees more confidence in the company.

Looking at Table 3 tells us many important features of each of the alternative systems. For example, we find that both the Internet and the FTP solutions will make TNT a leading courier company due to adoption of new technology. That can also give confidence to the employees.

More specifically, Internet and the FTP solution are very similar with costs, tangible, and intangible benefits. However, one further advantage exists for the Internet solution. Internet solution will allow TNT to expand, upgrade, and modify with minimal costs. A FTP solution will require new and more advance hardware/software combinations that may cost TNT a fortune in the future. Thus, we can safely assume that the FTP solution is a one-time solution.

To decide on which of the alternative is best, we will use the table found below to assist us with our recommendation. Table 4: <u>Analyzing the Alternatives Using Criteria for Comparison</u>, uses the comparison criteria to compare and "score" each of the criteria. The alternative with the highest total will determine the selection of the alternative system. NOTE: The figures are out of 4 where 4 is the best choice.

Table 4: Analyzing the Alternatives Using Criteria for Comparison.

Alternatives	Cost (Development & Operational)	Ease-of-use	Reliability	Security	Expandability / Ease of Updates	Speed of Operation	Total
Current System	1	1	1	1	1	1	5
Internet Online Processing System	4	4	4	3	4	4	23
FTP Client/Server Application System	3	2	4	4	2	4	19
Upgrade Existing Partnership Software	2	2	4	4	3	1	16

Summary of Findings

Current System:

We have already evaluated the current system, and we can clearly see from Table 4 that the system needs a change. The operational cost of the current system is far too expensive. The current manual data entry system is clearly not efficient for reasons mentioned in the problems section. Thus, inefficiency ties in with the reliability criteria. Security is minimal since data entry personnel can access vital and important information of the clients. Clearly the current system is not easy to update or replace due to the costs involved. But it is interesting however that the total cost of any of the alternatives is still cheaper than the operational cost of the current system. Speed of operation is very slow since drivers can make inappropriate drives to the clients.

Alternative #1: Internet Online Processing System:

This alternative has the highest total out of all the alternatives and the current system. It's the cheapest because the cost/benefit analysis clearly shows this. The development and the operational cost is the cheapest out of all the alternatives. Now that it's the 21st century, almost everybody knows how to use the Internet. Thus, the ease-of-use criterion has 4. The Internet is very reliable and clients can completely trust the services provided on the Internet. The security issue on the Internet is still improving and it will take many more years before the security level of the Internet reaches comfort zone of many clients. Expanding and updating the services provided on the Internet is very easy and simple to do. It does not cost a fortune to update the site when desired. Since the drivers are now aware of where to go and pick

up the packages, they will not waste valuable time by driving to the client (regular client who failed to call the branch to notify the drivers) who does not have a package to give them.

Alternative #2: FTP Client/Server Application System:

The cost of this alternative is just below the cost of alternative #1. We found that the FTP solution costs more than the Internet solution because of new hardware/software. The clients of TNT will need to adjust to the new FTP client program that they must now use. Although the developers of the software will try their best to make it as simple as possible, the clients will nevertheless require time and patience to get completely comfortable with the new software. Like the Internet solution, the FTP solution is also very reliable. The principle introduced in alternative #1 is the same as this alternative. The FTP server is more secure from possible hackers because the server can acquire a high-tolerance Firewall to block unwanted users. However, expanding and updating will be quite expensive to do since newer hardware/software combinations will be required. On the bright side, speed of operation will be much better for the same reason as alternative #1. Drivers will no longer waste time of going to clients that does not require TNT service on a particular day.

Alternative #3: Upgrade Existing Partnership Software:

The cost of this alternative is the most expensive among the alternatives. One reason is due to the re-distribution of the newer version of the Partnership program. This will cost TNT a great sum of money and Table 4 clearly shows us that. It is clear that the current version of Partnership is not being used very much (recall that only one third of the clients use it). This lack of use may be due to the difficulty of installing/using the software. We believe that even with the newer version of the software, the clients will be reluctant to using the newer one because of the problems they encountered from the previous version. Reliability and security will both improve due to the newer database included in the software. The only "outsider" is the driver and problems with drivers are out of our scope. We feel that updating the software is always costly, especially because the software is large in size. Remember that the software incorporates the database included with the CD. This means that the software will be large in size and anytime a new update is made, the cost to do so can be excruciating on TNT. The speed of operation will not change; drivers will still drive to the clients without the need of TNT's service on a particular day. Recall that this is what is happening with the current system.

The Best Alternative

From the evaluation above (from Table 4), the best alternative is alternative #1: "Internet Online Processing System". The cost, both development and operational, is by far the smallest, and the clients can easily adopt the new technology quickly because Internet is a mature technology. Reliability is by far the best due to the continuing growth of e-commerce. The service of online form is simple to update. The speed of operation will definitely improve. Considering how many corporations of other interests use the Internet technology to do business, a large corporation such as TNT should simply jump on the bandwagon. Considering how the other alternatives are about equal in both tangible and intangible benefits, the cost and the criteria of comparison will be the best tool for sound judgments. Again, Table 4 shows us that alternative #1 is by far the most superior choice.

Recommendations and Conclusion

The IT department of the TNT branch should determine which of the many e-solution company would work on the project. Another way would be to simply hire individual consultants to do the work required. Many are already available in the market.

Considering how the project is not urgent, a good preparation is a good choice. The central headquarter should be notified of the planned project and get their approval. The current web site will need to advertise the upcoming change. All of the clients will be continuously notified of the upcoming changes. The key to the success of the Internet solution is that the clients have to adopt the new

technology. Although we feel confident of the ease-of-use criterion, we will still need to be careful in our decisions.

The internal infrastructure of employees will undergo a change; almost all, except few, will be removed from the branch. This change must be carefully coordinated; otherwise, the employees may be bothered. The employees and the clients will all require simple guidance and training. The project may take up to one complete year before the technology is fully in use. The developing process however may take less time.

Again, the Internet Online Processing System is by far the best solution to the current system's problem at TNT for the following reasons.

- The human involvements with the consignment notes (con-notes) are completely replaced by an online consignment note.
- Removes the data entry staff that was far too inefficient, which had records of human mistakes.
- Eliminates the chance of clients making a mistake with city, country, and postal codes.
- Drivers will no longer make their "regular routes", but instead will know exactly where the pickup is needed.
- The overall cost (both development and operational costs put together) is by far a lot less than the current operational cost.

Truly, a new system will definitely be an asset to TNT, and the Internet Online Processing System is by far the best choice available given all the resources and constraints.