Order and Delivery Times Simulation

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Abstract: - It is clearly known that one of the big problems of production companies is not to deliver orders on time. When it happens, companies would have to pay a penalty fee and lose their reliability and so their customers. For that reason, companies have to have good plans or schedules about receiving and delivering times of orders. In this work, as a case study, simulation program of order and delivery times of a computer company where ordered computers are constructed according to costumer preferences and delivered to costumers by the via of cargo is described and simulation model is shown with an example. In this way, it is shown that with a simple simulation program, companies can solve their big problems effectively on order and deliver times.

Key-Words: - Order, Delivery Time, Simulation, Modeling.

1 Introduction

The most typical feature of our period is the rapid changing of societies. The most evident factors that speed the changing in societies are seen in information, technology, communication and economy fields. In our period called as information era, the information society concept has appeared. The information in information society is an important and basic source. The individuals and societies compete to gain that basic source.

The information technologies that mark the following century recreate the contemporary human profile. In the rapidly changing and developing world of today, it is not expected from individuals to find information from a single source and then memorize it, in contrary it is aimed to grow individuals who know how to access to and use information, and are able to establish solution methods against problems by using the information they get. To design effective and interactive learning environments compatible with the information technologies is very important for getting such features.

For this reason, in order the Information Technologies studies that are considered important also in our country and academically began to be institutionalized can be effectively continued in other universities of our country, the knowledge and experience on the subject must be transferred, in other words, must be shared. Especially, in respect to competition with other countries in the world, the information society must take significant steps regarding to software sector for purpose of being in line with our era. So, computers and software are inevitable supplies for society. Sometimes, with a simple program written for special purposes big problems can be solved easily. Customers usually wish to procure their orders in the shortest possible time and find delays quite unfavorable. If an organization is unable to return an order and if its customer rejects to wait during the time it takes to procure the order, the organization will lose and therefore will not have any earnings. The situation was such that some days the marketing department had serious difficulties working due to complaints such as "I gave my order to your representative selling your equipment here, and I also made the payment but I still haven't received my order." Customers had to be put on waiting lists, and most of these customers were lost because they chose other brands instead of waiting. Also, the high rate of inventory cycle speed, and the fact that the cost for giving orders had increased, brought the idea "Are we doing something wrong in this business?" to the executives' minds. Hereby, they started using the Economic Order Model to determine the most appropriate amount and the goal is to prevent losing customers, who may turn towards alternative sources for procuring their unsatisfied needs. Many authors share the same idea on order model that not delivering the orders on time, without scheduling order-delivery system, or without inventory policies, companies lose many things economically [1-9]. To solve their problems companies generally pay big amount of money to buy simulation software. However, they can solve their problems with a simple program as it will be stated in this work.

In this work, working system of a simulation program, written for a construct and sell computer company and can be easily used by the others, is represented and phases of simulation, system design and improvement studies are all explained. After the program is introduced, its main sections, working logic, user orientations and sample practices are defined.

2 Simulation Program Details

The most important matter in a simulation project is to adjust and program the inputs of application effectively and in conformity to purpose. In this way, the results of simulated event can be getting in healthier way. In this program, that point is cared much. It is known that the quality of a simulation is measured with its reliability degree.

In this work, it is designed by taking consider almost all the details from receiving an order to delivery in a computer company. The technical feature choices, number of employees in technical service, their daily working periods and some important standards that are the most important factors in preparing an order are formulized. This simulation program is written by using Microsoft Visual Basic for Windows95/98 Nt Professional 6.0 [10, 11, 12]. The detailed working logic of the program is as follows;

- The user is asked to make changes with many variables according to his/her requirements. In that phase, it is necessary to have a very flexible structure.
- Everything is in hands of the program. All the variable choices are formulized by pressing a button and with a small scale animation show; the final desired result is displayed.
- Though the result is rather simple and plain, the calculations and formulas made on the background are very intensive.

2.1 Main Menu

After clicking on "kutulu.exe" or "kutusuz.exe", main menu screen appears as in Fig.1. On this menu, there are six buttons; "New Simulation Start", Database Control Panel", "Statistics", "About Project", Help" and "Exit"
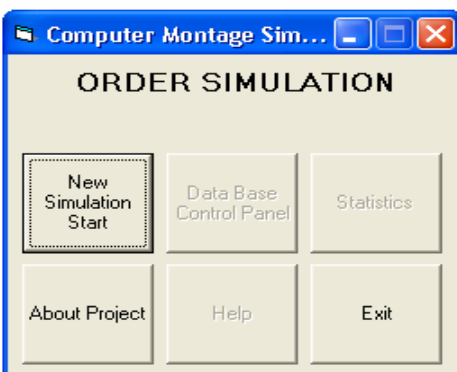

Fig.1 Simulation Program Main Menu View

By clicking on the "New Simulation Start" button, the "order form" is opened and the desired application is made.

By clicking on the, "Database" button, database can be seen. A code structure that has modularity very suitable for adding of database exists. As in the code pages of program there exist notes about modifications that must be made for database entries, the development potential of program in future is high.

By clicking on the "Statistics" button, results can be seen in text and graphical form. For this program, statistics of all working station in the system were collected and statistical distributions were found. Then, related distributions of each work station were coded in database.

By clicking on the "About Project" button, information on project can be obtained.

By clicking on the "Help" button, detailed information about the program can be obtained.

By clicking on the "Exit" button, program is closed.

The program consists of 4 master parts. The first one is the main menu, and the second one is the "order form" window. The other two parts are the parts where the formulas are calculated.

2.2 The Order Form Window

In the "order form" window, the user makes all the changes he/she desires and marks the preferences most suitable and closer to the given order.
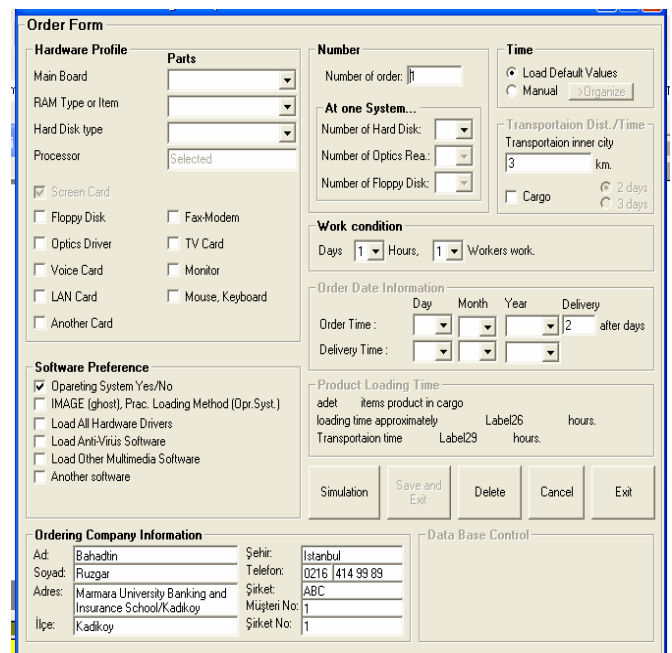

Fig.2 "Order Form" window

Firstly, all the selected values are collected in a form called "periods" and if desired, can be displayed in detail. Then, such values are used in the animation window and a small scale animation is realized. Meanwhile, the delivery period found as a result of formulas is displayed in a box. The important matter here is the reality and reliability of the result. The animation is in the second order and this is useful to understand the procedure of work. The program must be easy and simple and this is cared about in that program.

2.2.1 Hardware Preferences

In that area, the most suitable choices according to the desire of order giver are made and changing of settings on the background is enabled. There is not possibility to select main parts of a computer. For this reason, only various kinds of such parts can be selected. However, as other multimedia cards can be changed upon desire, it is made selectable with a check box. Besides, the number of floppy disk driver, optic driver and hard disk can be selected.

If you make selection with VGA card in the main card combo box, the "display card" confirmation box will disappear. As a result of this, the mounting period of the display card shall not be added in the formula. Besides, also "ram" and "hard disk" kinds affect the formula as necessary. "If no selection is made, the program will select the standard settings as default values. Such settings are necessary for combo box, in other words for master card, ram and hard disk (the first choice is selected).

2.2.2 Number

In this section, the piece number of received order and number of hard disk, optic driver and disk driver in a single system are selected. If the optic driver and disk driver is not preferred in the section of "Hardware Preferences", the number choices here remain passive. In each combo box, there exist 4 choices in form of 1, 2, 3 and 4.

2.2.3 Software Preferences

As in the hardware preferences, the replies of questions such as whether the operation system will be installed, if yes, which method will be used and whether the hardware and software adjustments will be made after the installation of the operation system are determined. If the operation system will not be installed, all the other choices become passive. In this way, user can not make preferences by mistake.

2.2.4 Period Settings

In this section, the mounting period of hardware parts, software installing period and periods of other proceedings (for instance packing, cargo period) are determined manually or as standard.

Here, with the "default values" choice, all the period choices are determined as standard and these choices are used throughout the program simulation. Default values, loaded into database, are produced at background according to corresponding statistical distributions which were found after a long term measured data of each work station. However, if "enter manually" is selected, a new window is opened and the choices and preferences made here are transferred to variables where manual settings will be held.

2.2.5 Transportation Distance /Period

This section is designed in a modular structure that will affect the formula and its variables are prepared. As it can be understood, it will ensure more accurate estimations for the orders to be transported under different conditions and in different periods.

2.2.6 Working Conditions

The working conditions mean to determine the number of employees in a day and their working hours. In a regular and systematic company, such choices may be rather sufficient. However, they may be detailed in future. For instance, by adding variables such as free days of some employees or their extra working hours, more sensitive measurements can be made.

2.2.7 Order Estimation Information

In this section, one can make preferences on form and enter the order period estimated by the user and the order delivery date. At the end of simulation, the estimations of user are compared to the result and by considering the difference, the reality of estimation or the reality of simulation value is determined. This section is also usable for testing of simulation. As after an order is received, the order receiving date and order delivery date is known, the results obtained in real life are compared. In this way, whether the simulation is realistic or accurate for the user is determined.

2.2.8 Product Loading Period

Here, a small scale application of simulation is realized without pressing any button. When the user changes related settings, a calculation is made and the results of choices are displayed for the user. This area proportions the related to cargo and order number and determine the transportation and loading periods of product. In other words, there are other simulation parts giving small scale information inside the main simulation.

2.2.9 Information on Order Giver and Institution

In this section, the person who will give the order to be simulated is written. It is not necessary information to realize the simulation but when a database is added in future, such information will be required to trace the records of simulation. For this reason, the areas where such information will be entered are designed.

2.2.10 Data Base Control

The program is designed in structure completely suitable for integration of a data base. A data base in suitable structure will enable the user to control the order form page wholly and call and set the records.

2.2.11 Buttons

With the "Simulate" button, all the preferences and

choices in window are realized. All the information is transferred to variables and there they are formulated. Meanwhile, an animation window is opened. In this way, the choices are animated with a small animation display. This animation window has also a report qualification, because, at the bottom of window, information on simulation results is continuously given in writing. All the changes made with the "Clear" button are reset and the order form is cleared and renewed as if the window is opened new. With "Cancel" button, it is returned to main menu. With "Exit" button, it is completely exited from the program.

2.3 Manual Window

As it is described before, the manual window is opened automatically by clicking the "Enter manually" option in the "order form" (Fig.3). With opening this window, all the periods become manually selectable. If "cancel" is clicked, all the changes are cancelled and the window is closed as if it never opened. All the default values are automatically restored.
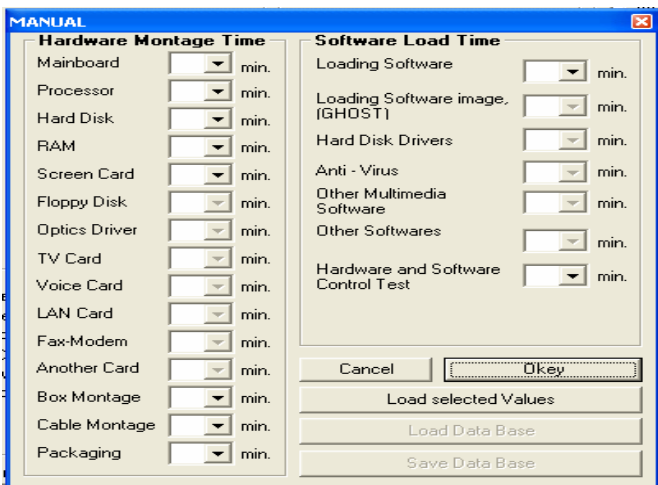

Fig.3 Manual Window

2.4 Simulation, Animation and Report Window

Though this window seems the most complex and important part of the program, in fact is has a structure that operates under a rather simple logic and the results of all choices are displayed here. With graphical and animated display of many choices placed as standard, the preparation phases of an order can be followed with the assistance of status indicator below. Near the card pictures and other hardware on the left side, confirmation or rejection boxes appear after the choices are evaluated. As the fixed parts at the top that must exist in every system will be installed definitely, each time their mounting periods are calculated automatically and they are formulated. In some choices having a basic meaning, this window is displayed graphically. To obtain the simulation result immediately, the result

button can be clicked. Or without waiting the result, by pressing on the main menu or cancel buttons, the simulation can be stopped (Fig.4).
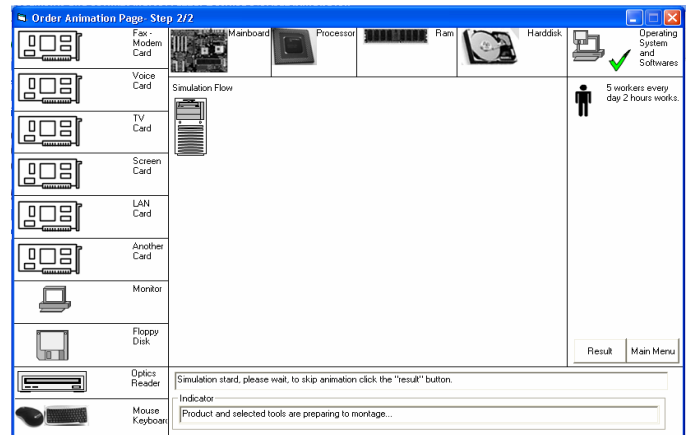

Fig.4 Order Animation, Simulation and Report Window

The working logic here is as follows;
When the "simulate" button is clicked in the order form, all the choices are transferred to variables and formulated. In fact, at that moment, simulation is completed and results become definite. However, in order the simulation can be more realistic and useful; a small scale animation show is displayed.
This show mostly depends on formula. In other words, instead of applying a procedure by heart, it is designed in more realistic structure. All these animation procedures can be stopped at any time and the result can be directly displayed. In the example below, the animation is stopped (Fig.5).
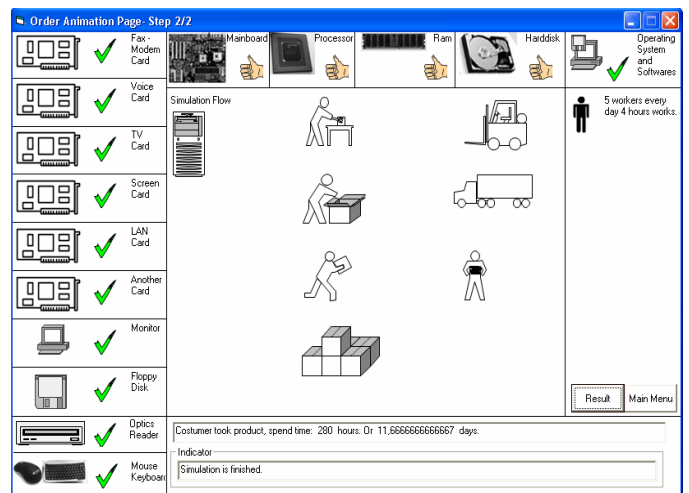

Fig. 5 Animation, Simulation and Report Window

As it is seen, the animation has been realized and the result been informed. The confirmation and rejection marks are added according to the changes made on the order form. Then, various phases of product are considered and symbolized individually in graphic form.

3 Conclusion

If it is examined in whole, the purpose of program has been realized in many respects. In other words, all the basic features of an order received by a computer company have been formulated and simulated.

The basic features are;

- Hardware preferences
- Software preferences
- Order number
- Employee number and their daily working periods.

The user is enabled to change the periods in all these phases at any time. In this manner, not only one standard is depended on but applications are made under different mediums.

After that phase of program, the simulation window is opened and the choices of user are animated in graphical form. So, more effective and simpler program is established.

As in this section, the most important thing is the result of simulation; the result can be displayed immediately with the help of a button.

The point where that program has reached to within the whole project period is positive as the infrastructure and logic of program is beautiful and simple. In time, other variables and interactions will be added to obtain a healthier structure. Besides, by making studies on report presentations, the effects of choices made by user on results can be observed by using graphics and the comparisons in different phases.

In this work, a simulation program, written by using coding system of Visual Basic, about order and delivery times for a computer company is represented and it is shown that with a simple simulation program, companies can solve their big problems effectively on order and delivery times.

References

[1] Aggarwal, S. P., Jaggi, C. K., *Ordering policies of deteriorating items under permissible delay in payments,* Journal of Operational Research Society, 46: 658-662, 1995.

[2] Arcelus, F. J., Shah, N. H., Srinivasan, G. *Retailer's pricing, credit and inventory policies for deteriorating items in response to temporary price/credit incentives*, International Journal of Production Economics, 81: 153-162, 2003.

[3] Chand, S., Ward, J., *A note on economic order quantity under conditions of permissible delay in payments*, Journal of the Operational Research Society, 38: 83-84, 1987.

[4] Chang, H. J., Dye, C. Y., *An inventory model for deteriorating items with partial backlogging and permissible delay in payments*, International Journal of Systems Science, 32: 345-352, 2001.

[5] Chang, H. J., Hung, C. H., Dye, C. Y., *An inventory model for deteriorating items with linear trend demand under the condition of permissible delay in payments*, Production Planning and Control, 12: 274-282, 2001.

[6] Chen, M. S., Chuang, C. C., *An analysis of light buyer's economic order model under trade credit*, Asia-Pacific Journal of Operational Research, 16: 23-34, 1999.

[7] Cheng, C. E., *An economic order quantity model with demand-dependent unit production cost and imperfect production processes*, IIE Transactions, 23: 23-28, 1991.

[8] Chu, P., Chung, K. J., Lan, S. P., *Economic order quantity of deteriorating items under permissible delay in payments*, Computers and Operations Research, 25: 817-824, 1998.

[9] Goyal, S. K., *Economic order quantity under conditions of permissible delay in payments*, Journal of the Operational Research Society, 36: 335-338, 1985.

[10] http://www.kentmerkezi.com/ebook.htm (Retrieved 2006 June)

[11] Yanik, M., *Microsoft Visual Basic for Windows95/98 Nt Profesyonel Surum 6.0*, Beta Yayin, Istanbul, 1999.

[12] Yarci, K., *Visual Basic*, Yuce Yayim, Istanbul, 2000.