Fuzzy Systems and Soft Computing
ISSN : 1819-4362

TIME AND DISTANCE ANALYSIS FOR FOOD VENDORS

Vicky Gouda, Kartikeswar Mohanty, Dr. Satya Ranjan Pattanaik, Computer Science and EngineeringGandhi Institute for Technology, India vicky.gouda2020@gift.edu.in ,

ABSTRACT -
The purpose of this project is to devlop and online food ordering system. It is a system that enable customer to place their food order online at any time at any place. The reason to develop this system is due to the issue facing by food industry. These issue are such as peak hour-long queue issues, increase of take away than visitors, speed major request of food management, limited promotion and quality control of food management. Therefore, this system enhance the speed and standardization of taking order from the cutomer and supply it to the staff in the kitchen accordingly. Beside that it provide user friendly web pages and effective advertising medium to the new product of the online food ordering restaurant to the customer at reasonable price.

1. INTRODUCTION

In the dynamic landscape of the food industry, efficiency and customer satisfaction are paramount to success. Food vendors, whether operating stationary stalls or mobile trucks, are constantly challenged to optimize their operations to meet these demands. Central to this optimization is the understanding and management of time and distance factors, which profoundly influence everything from location selection to delivery logistics. Developing optimized delivery routes to minimize travel time, fuel consumption, and operational costs, while maximizing service coverage and responsiveness. Ensuring timely delivery and service by strategically positioning vendors and deploying resources in alignment with peak demand periods and customer preferences. The food industry is a vital sector that plays a significant role in the economic and social fabric of any society. Food vendors, in particular, are a crucial part of this ecosystem, providing a wide range of products to consumers. However, the success of these vendors is heavily influenced by various factors, including the time and distance they take to deliver their products to customers. This project aims to analyze the time and distance dynamics of food vendors to identify areas of improvement and optimize their operations for enhanced customer satisfaction and increased profitability.

2. OBJECTIVE

In analyzing time and distance for a food vendor project, you're likely focusing on optimizing the efficiency of operations, minimizing costs, and maximizing customer satisfaction. Here are some potential objectives for such an analysis: It is required to keep the computerized data, as it is difficult to do manually and is also fast as it takes less time. Purpose to computerize its data is to overcome from hazard of manual system. This web portal is developed as to deliver food to everyone in more efficient and effective. Develop efficient routes for food delivery or mobile vending to minimize travel time and fuel costs. This could involve using algorithms like the Traveling Salesman Problem to find the shortest paths. Minimize food waste and stockouts by optimizing inventory levels based on demand forecasts and delivery schedules. Analyze customer feedback and complaints related to delivery times or service locations to identify areas for improvement. Identify opportunities to reduce transportation costs, such as by consolidating deliveries or optimizing vehicle routes. Evaluate the feasibility of expanding into new markets by analyzing the time and distance to potential locations and estimating demand. Benchmark against competitors to understand their service areas, delivery times, and customer satisfaction levels to identify areas for differentiation and improvement.

3.Literature Review

1. **Food Vendor Operations**: Start with understanding the typical operations of food vendors. Look for literature that discusses their strategies, challenges, and key performance indicators (KPIs). This can include studies on food truck operations, street food vendors, and market stalls.
2. **Time Management**: Explore literature on time management strategies for businesses, especially those in the food industry. Look for research on efficient scheduling, optimizing service

times, and reducing waiting times for customers. This could involve examining queuing theory and its application to food service.

3. **Distance Analysis**: Investigate studies on location analysis and site selection for food vendors. Look for research that discusses factors influencing the choice of location, such as foot traffic, proximity to complementary businesses, and demographic characteristics of the area.
4. **Technology and Innovation**: Explore how technology is being used to optimize time and distance for food vendors. This could include studies on mobile apps for route planning, GPS tracking for real-time location data, and online ordering systems for streamlining operations.
5. **Customer Behavior**: Look into research on customer behavior in relation to food vendors. This could involve studies on consumer preferences, willingness to travel for food, and the impact of convenience on purchasing decisions.
6. **Regulatory Considerations**: Investigate literature on regulations and policies affecting food vendors, particularly those related to location zoning, permits, and health and safety standards. Understanding regulatory requirements is crucial for conducting time and distance analysis within legal frameworks.
7. **Case Studies and Best Practices**: Look for case studies and examples of successful food vendor operations that have effectively managed time and distance considerations. Identify best practices that can be adapted to your project.
8. **Future Trends**: Lastly, explore literature discussing emerging trends and future directions in the food vendor industry. This could include topics such as the rise of delivery-only kitchens (ghost kitchens), the impact of sustainability initiatives, and the integration of automation technologies.

4. SYSTEM ANALYSIS

Software Requirement Specification

A software requirements specification (SRS) is a detailed description of a software system to be developed with its functional and non-functional requirements. The SRS is developed based the agreement between customer and contractors. It may include the use cases of how user is going to interact with software system. The software requirement specification document consistent of all necessary requirements required for project development. To develop the software system we should have clear understanding of Software system. To achieve this we need to continuous communication with customers to gather all requirements.

Model:-

Pandas :-

1. Pandas is a Python library that provides easy-to-use data structures and data analysis tools.
2. It's particularly handy for working with structured data, like tables, spreadsheets, or databases. With Pandas, you can load data from various file formats, manipulate it, clean it, analyze it, and visualize it.
3. It's widely used in data science and analysis because it simplifies many common tasks, allowing you to focus more on exploring and understanding your data.
4. **Importing a Pandas :-**

```
import pandas as pd
```

 NumPy :-

1. NumPy is a fundamental Python library for numerical computing.
2. It provides support for large, multi-dimensional arrays and matrices, along with a collection of mathematical functions to operate on these arrays efficiently.
3. NumPy is widely used in scientific computing, data analysis, machine learning, and other domains where numerical operations are common.
4. **Importing a NumPy :-**

```
import  numpy as np
```

 Matplotlib :-

1. Matplotlib is a Python library used for creating visualizations, such as graphs, charts, plots, and more.

2. It provides a wide variety of functions and tools for generating high-quality, publication-ready visual representations of data.
3. You can create various types of plots, including line plots, scatter plots, bar charts, histograms, pie charts, and even 3D plots.
4. It offers a high degree of customization, allowing users to control aspects such as colors, labels, axes, fonts, sizes, and more.
5. **Importing a Matplotlib :-**

Data Gathering

Data Gathering is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes. The data collection component of research is common to all fields of study including physical and social sciences, humanities, business, etc. Data gathering techniques used in the (Software Development Lifecycle) SDLC.

Feasibility Study

The measure of how beneficial or practical the development of informant system will be to an organization. along this topic feasibility is measured. So far taking the feasibility study and feasibility analysis during the development of the project food Ordering system we have studied on the following four major categories of feasibility study

Operational feasibility :

Operational feasibility is the measure of how well a proposed system solves the problems, and takes advantage of the opportunities identified during scope definition and how it satisfies the requirements identified in the requirements analysis phase of system development.

Technical feasibility:

A technical feasibility study assesses the details of how you intend to deliver a product or service to customers. Think materials, labour, transportation, where your business will be located, and the technology that will be necessary to bring all this together.

Schedule Feasibility :

Schedule Feasibility is defined as the probability of a project to be completed within its scheduled time limits, by a planned due date. If a project has a high probability to be completed on-time, then its schedule feasibility is appraised as high.

Economic feasibility :

The degree to which the economic advantages of something to be made, done, or achieved are greater than the economic costs: The state commissioned a report on the economic feasibility of a single-payer health system. During the development of food Ordering system . we have tried to address all these feasibility analysis phases seriously . That‟s why we think ,our project will succeed properly.

Software Process Model :

A waterfall model under the software development life cycle (SDLC) is the methodology used to produce the food ordering system and the customer self ordering system. It is used by system developers to produce or alter information systems or software. It divides the development process into several stages or processes. After the completion of one stage, it will logically move to another stage. Sometimes moving back to the previous stage is necessary due to failure that occurs in current stage.

SOFTWARE REQUIREMENT

Operating System : Windows (Vista/7 or above) Web Browser: IE 10 or above, Mozilla FF 31 and above or Google Chrome Notepad or xampp

Justification of Selection of Technology Xampp:

XAMPP is a free and open-source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages.

Languages :

Html:

Hypertext Markup Language is the standard markup language for documents designed to be displayed in a web browser. It can be assisted technologies such as Cascading Style Sheets and scripting languages such as JavaScript.

Css:

Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language like HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.

Bootstrap:

Bootstrap is a free and open-source CSS framework directed at responsive, mobile-first frontend web development. It contains CSS and JavaScript-based design templates for typography, forms, buttons, modals navigation, and other interface components.

JavaScript:

JavaScript is a programming language that conforms to the ECMA Script specification. JavaScript is high-level, often just-in-time compiled, and multiparadigm. Curly bracket syntax, dynamic typing, prototype-based object-orientation, and first-class functions.

Php:

Php is a server-side scripting language. that is used to develop Static websites or Dynamic websites or Web applications. PHP stands for Hypertext Pre-processor, that earlier stood for Personal Home Pages. PHP scripts can only be interpreted on a server that has PHP installed.

Mysql :

MySQL is an open-source relational database management system. Its name is a combination of "My", the name of co-founder Michael Widenius's daughter, and "SQL", the abbreviation for Structured Query Language. This application is widely used for purposes, including data warehousing, e-commerce and logging applications. The data in MySQL databases are stored in the form of tables. It helps the admins to collect the data in an easy way. One of the reasons MySQL is the world's most popular open source database is that it provides comprehensive support for every application development need. ... MySQL also provides connectors and drivers (ODBC, JDBC, etc.) that allow all forms of applications to make use of MySQL as a preferred data management

Notepad :

- A straightforward text editor for Windows is called **Notepad**. It makes document creation possible for computer users. It is a basic text editing program available in Windows. Since the release of Windows 1.0 in 1985, it has been a part of every edition of Microsoft Windows. Typically, the resultant files are stored with the .txt extension. You are only responsible to your operating system for how you organise, copy, and back up your notes while using Notepad to store them (as text files) at the precise location you choose. By accessing your notes in any app that can read text files, you may move them to another app. On the Windows operating systems, **Notepad** is a very simple textediting tool that is preinstalled. For producing brief documents that you wish to keep in plain text, Notepad is fantastic. There are some other essential functions of **Notepad** that you may use as well. Images, however, are incompatible with **Notepad** because it is only a text editor. Notepad is a very basic text writing and editing program that comes preloaded on Windows operating systems.
- It is used to create **computer notes that are typed in English.**
- The notepad file extension is .txt.
- The Status bar, Menu bar, and Title bar are the three bars on Notepad.
- File, Edit, and Format tabs are located on the menu bar

Data Dictionary

A data dictionary, or metadata repository, as defined in the IBM Dictionary of Computing, is a "centralized repository of information about data such as meaning, relationships to other data, origin, usage, and format". Oracle defines it as a collection of tables with metadata.

admin table Structure: This table store the login details of admin

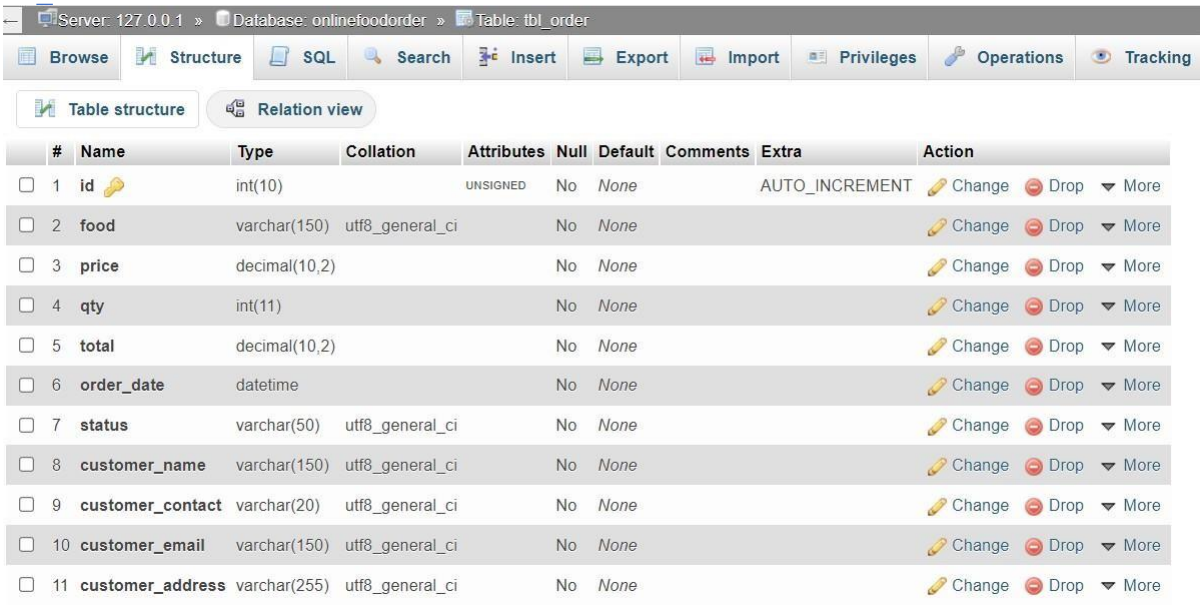

Server: 127.0.0.1 » Database: onlinefoodorder » Table: tbl_admin

Browse | Structure | SQL | Search | Insert | Export | Import | Privileges | Operations

Table structure | Relation view

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	int(10)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	full_name	varchar(100)	utf8_general_ci		No	None			Change Drop More
3	username	varchar(100)	utf8_general_ci		No	None			Change Drop More
4	password	varchar(255)	utf8_general_ci		No	None			Change Drop More

tbl_order table Structure : This table stores the details of order.


Server: 127.0.0.1 » Database: onlinefoodorder » Table: tbl_order

Browse | Structure | SQL | Search | Insert | Export | Import | Privileges | Operations | Tracking

Table structure | Relation view

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	int(10)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	food	varchar(150)	utf8_general_ci		No	None			Change Drop More
3	price	decimal(10,2)			No	None			Change Drop More
4	qty	int(11)			No	None			Change Drop More
5	total	decimal(10,2)			No	None			Change Drop More
6	order_date	datetime			No	None			Change Drop More
7	status	varchar(50)	utf8_general_ci		No	None			Change Drop More
8	customer_name	varchar(150)	utf8_general_ci		No	None			Change Drop More
9	customer_contact	varchar(20)	utf8_general_ci		No	None			Change Drop More
10	customer_email	varchar(150)	utf8_general_ci		No	None			Change Drop More
11	customer_address	varchar(255)	utf8_general_ci		No	None			Change Drop More

Database :-

- XL file
- CSV file

Client Specification :-

- Operating System : Microsoft Windows 10 or above
- Processor : 11th Gen Intel(R) Core(TM) i3-1115G4
- Hard Disk : 1TB
- RAM : 2.00 GB or above
- Display Resolution : 1366 x 768(1920 x 1080 Recommended)

Server Specification :-

IBM System X3550 M5 1U Rack Servers

- FORM FACTOR- 1U rack server
- PROCESSOR series Intel Xeon E5-2600 v3
- MAX RAM -384 GB
- HARD DISK -8 TB
- PROCESSOR SPEED -1.8GHz

Client :-

TKinter :-

- It is a Python binding to the Tk GUI toolkit.
- It is the standard Python interface to the Tk GUI toolkit, and is Python's de facto standard GUI.
- Tkinter is included with standard Linux, Microsoft Windows and macOS installs of Python. License. Python license.
- **Importing a tkinter :**

```
Import tkinter
```

Process Flow :-

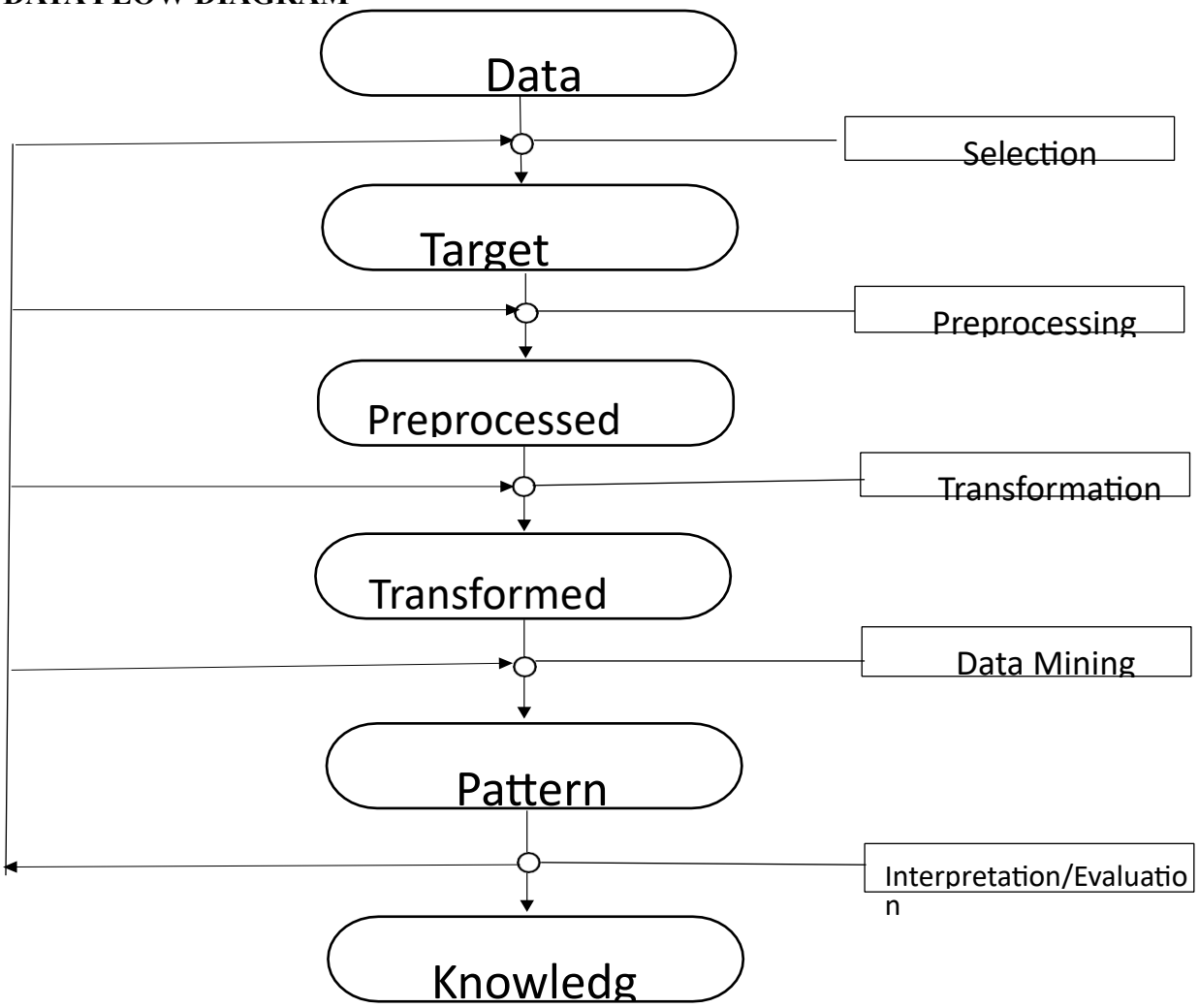
- We are using a process called KDD (Knowledge discovery in databases) process.
- **KDD process :-**

The KDD process stands for Knowledge Discovery in Databases. It's a multi- step process for extracting useful knowledge or patterns from large datasets.

The steps typically include :-

1. **Selection:** This step involves selecting the relevant data sources and defining the target data set.
2. **Preprocessing:** This step involves cleaning and transforming the data into a suitable format for analysis. This may include removing missing or irrelevant data, dealing with outliers, and transforming variables.
3. **Transformation:** This step involves converting the preprocessed data into a form that is suitable for data mining algorithms. This may include feature engineering, normalization, and aggregation.
4. **Data Mining:** This step involves applying data mining algorithms to the transformed data to discover patterns and relationships. This may include clustering, classification, and regression.
5. **Interpretation/Evaluation:** This step involves interpreting the results of the data mining algorithms and evaluating their performance. This may include visualizing the results, calculating metrics, and validating the results.
6. **Patterns:** This step involves identifying the patterns and relationships that have been discovered in the data.
7. **Knowledge:** This step involves using the patterns and relationships to gain insights and make decisions.

DATA FLOW DIAGRAM



Data flow diagram symbol Data Flow –

Data flow are pipelines through the packets of information flow.

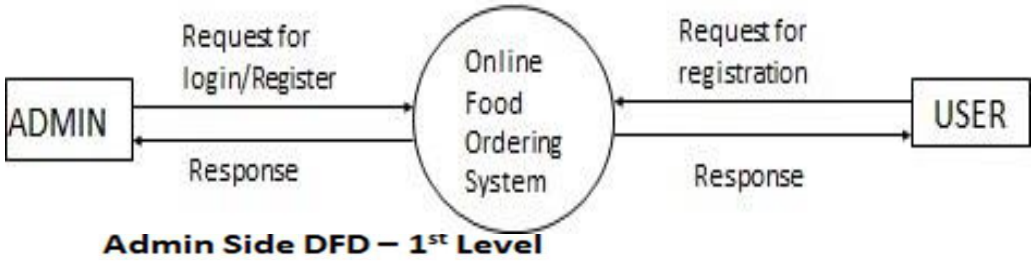
Process - A Process or task performed by the system.

data of a system.

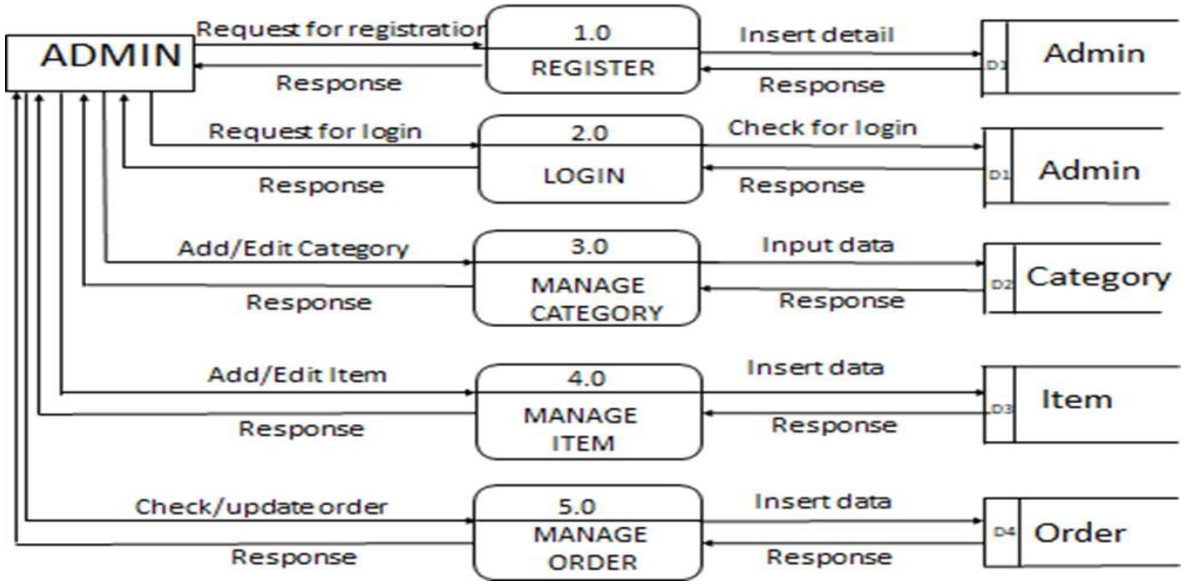
Entity - Entity are object of the system. A source or destination

Data Store - A place where data to be stored.

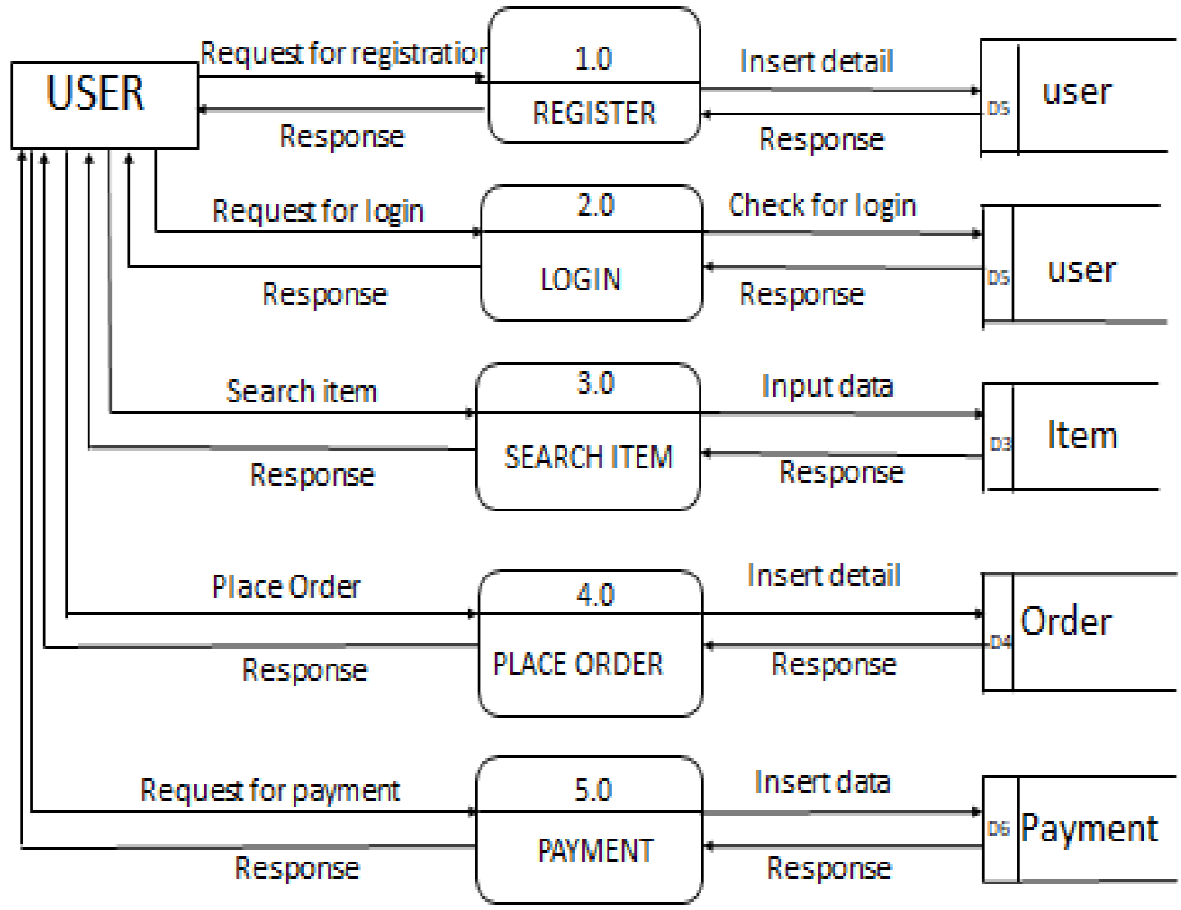
LEVEL 0 DATAFLOW DIAGRAM



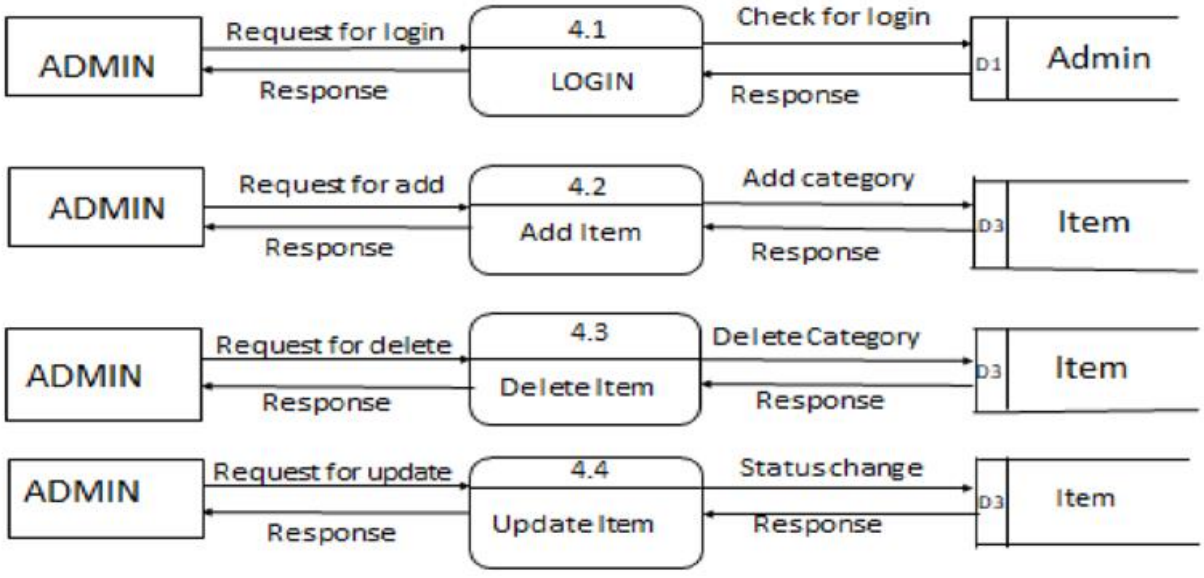
Admin Side DFD – 1st Level



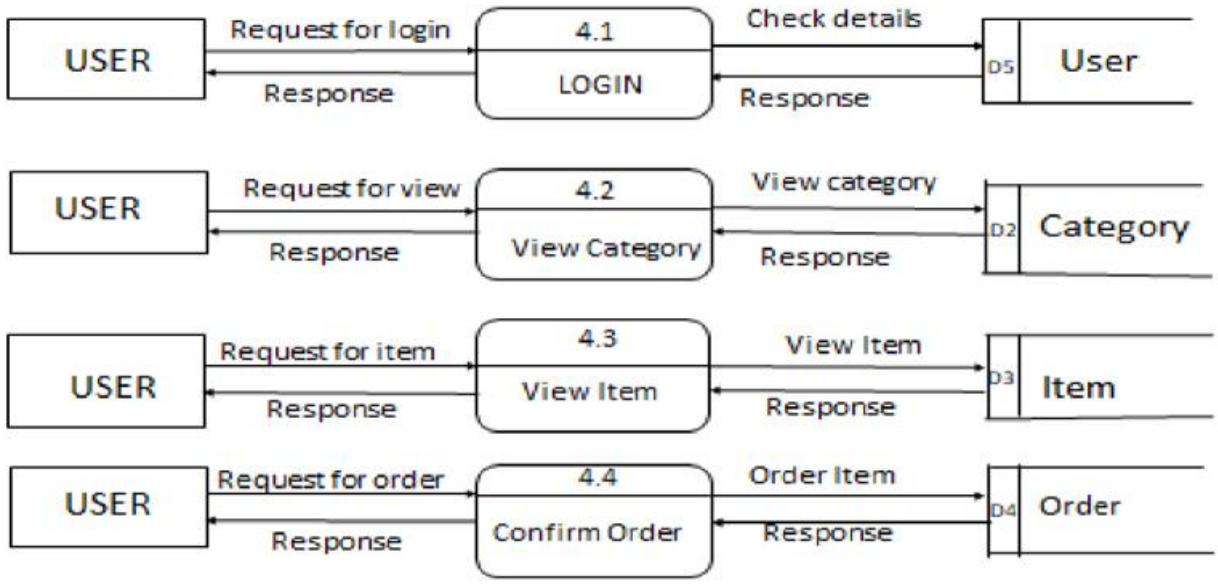
User Side DFD – 1st Level



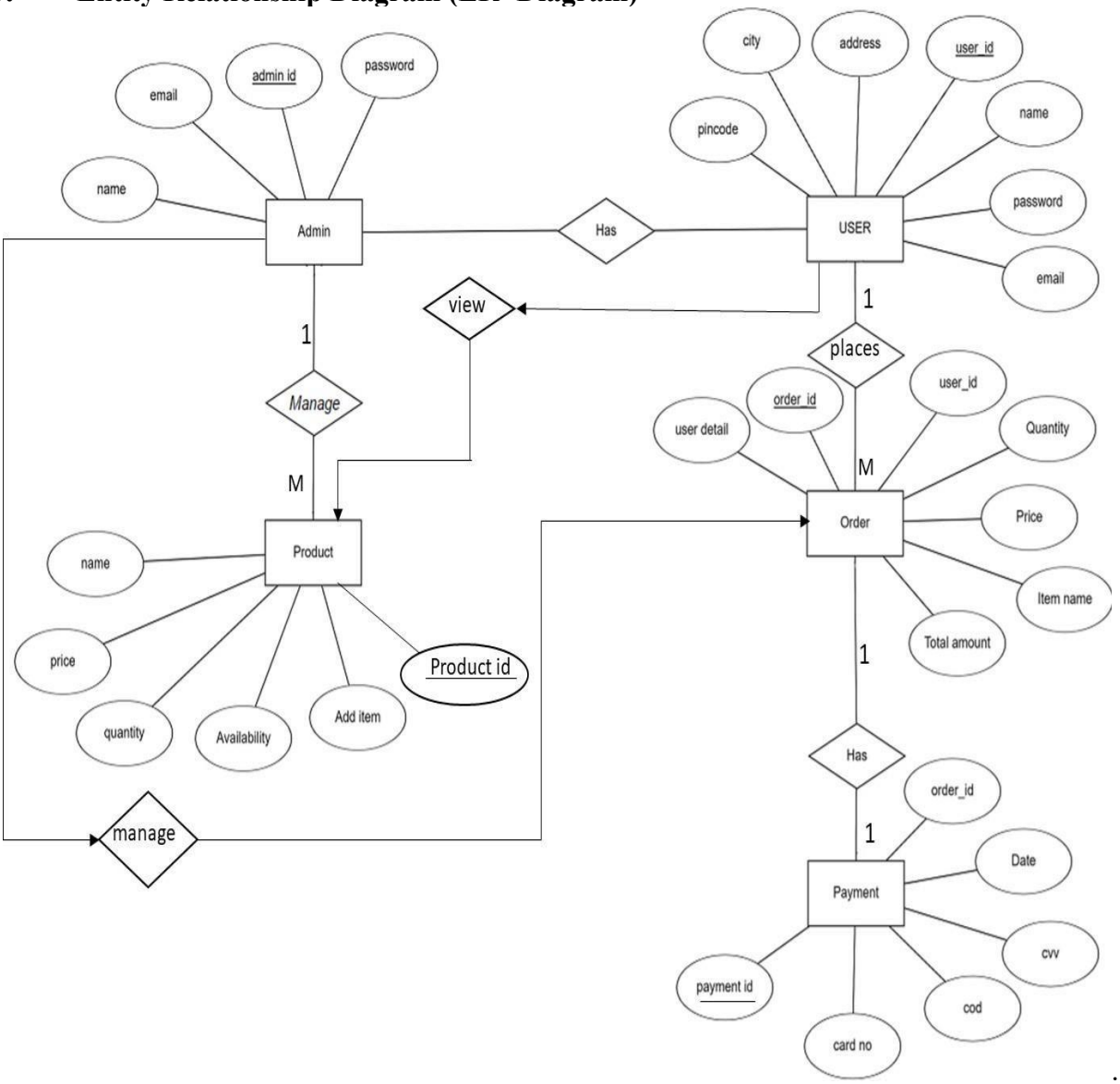
Admin Side DFD – 2nd Level



User Side DFD – 2nd Level

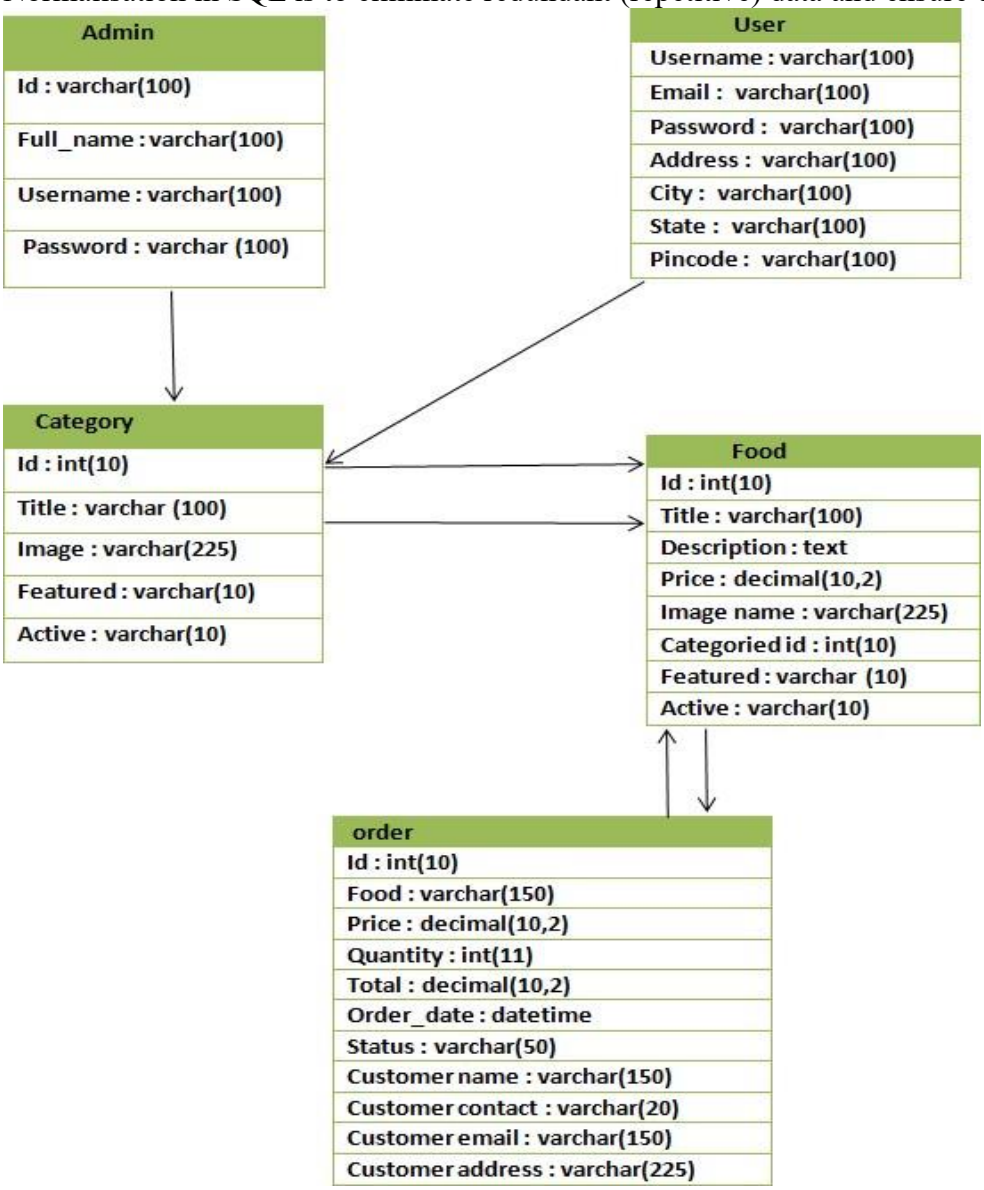


5. Entity Relationship Diagram (ER- Diagram)



6. Database Normalization

Normalization is a database design technique that reduces data redundancy and eliminates undesirable characteristics like Insertion, Update and Deletion Anomalies. Normalization rules divides larger tables into smaller tables and links them using relationships. The purpose of Normalisation in SQL is to eliminate redundant (repetitive) data and ensure data is stored logically.



7. Conclusion

At last we have concluded that our time and distance analysis project for food vendors has provided valuable insights into optimizing their operations and enhancing customer satisfaction. Through comprehensive data collection, analysis, and visualization, we have identified key areas where improvements can be made to streamline processes, reduce delivery times, and increase overall efficiency.By analyzing factors such as delivery routes, traffic patterns, and customer demand, we have been able to pinpoint opportunities for route optimization and scheduling adjustments. Our findings indicate that by implementing these optimizations, food vendors can significantly reduce delivery times and operational costs while simultaneously improving the overall customer experience. Overall, our time and distance analysis project serve as a strategic roadmap for food vendors seeking to optimize their delivery operations and elevate the customer experience. By leveraging data-driven insights and technology solutions, food vendors can position themselves for long-term success in an increasingly dynamic and competitive marketplace. The project has emphasized the importance of incorporating sustainability considerations into the operations of food

vendors, highlighting the potential impact on the overall environmental and social impact of the food industry. By addressing these key points, the conclusion of the project "Time and Distance Analysis for Food Vendors" can provide a comprehensive summary of the project's impact and the potential for its findings to optimize the operations of food vendors, promote sustainability, and enhance the overall efficiency and profitability of the food industry.

Limitation

1. **Data Availability**: One of the primary limitations of our project was the availability and quality of data. While we made efforts to collect comprehensive data on delivery routes, traffic patterns, and customer demand, there may have been limitations in the scope and accuracy of the data sources. In some cases, data may have been incomplete or outdated, potentially leading to inaccuracies in our analysis.
2. **Assumptions and Simplifications**: Our analysis involved several assumptions and simplifications to model complex real-world scenarios. For example, we assumed uniform traffic conditions and consistent customer demand throughout the analysis period. However, in reality, traffic patterns can vary significantly based on time of day, weather conditions, and other factors, which may impact the accuracy of our findings.
3. **Limited Scope**: While we focused on optimizing delivery routes and scheduling for food vendors, our analysis may not have addressed all aspects of their operations. Factors such as inventory management, staffing, and marketing strategies were not explicitly considered in our analysis but may play a significant role in overall business performance.
4. **Geographical Specificity**: Our analysis was conducted within a specific geographical area, and the findings may not be directly applicable to food vendors operating in different regions with distinct traffic patterns and infrastructure. Local regulations, road conditions, and cultural factors can vary widely between different locations, which may influence the effectiveness of our recommendations.
5. **Dynamic Nature of the Environment**: The food delivery industry is highly dynamic, with constantly evolving consumer preferences, market trends, and competitive landscape.

Future scope

1. **Integration of Real-Time Data**: Future research could focus on integrating real-time data sources, such as traffic updates, weather conditions, and customer order volumes, into the analysis framework. By leveraging live data feeds, food vendors can dynamically adjust delivery routes and schedules to optimize efficiency and responsiveness to changing conditions.
2. **Advanced Predictive Analytics**: Incorporating predictive analytics techniques, such as machine learning algorithms, can enable food vendors to anticipate demand patterns, optimize inventory management, and proactively allocate resources for peak periods. By analyzing historical data and external factors, predictive models can help food vendors make more informed decisions and improve operational efficiency.
3. **Multimodal Delivery Solutions**: With the rise of alternative transportation modes such as drones, autonomous vehicles, and electric bicycles, there is potential to explore multimodal delivery solutions for food vendors. Future research could investigate the feasibility and effectiveness of integrating these technologies into existing delivery operations to enhance speed, reliability, and sustainability.
4. **Customer Experience Enhancement**: Going beyond operational efficiency, future studies could focus on enhancing the overall customer experience through personalized delivery services, real-time order tracking, and seamless communication channels. By prioritizing convenience and satisfaction, food vendors can foster customer loyalty and differentiate themselves in a competitive market landscape.
5. **Sustainability and Environmental Impact**: As sustainability becomes increasingly important in the food delivery industry, future research could explore strategies for minimizing the environmental impact of delivery operations. This could involve optimizing delivery routes to reduce

fuel consumption, transitioning to eco-friendly vehicles, or implementing packaging solutions that minimize waste.

6. **Global Expansion and Localization**: Expanding the scope of analysis to encompass diverse geographical regions and cultural contexts can provide valuable insights into the unique challenges and opportunities faced by food vendors worldwide. By tailoring strategies to local preferences and infrastructure, food vendors can optimize operations for maximum efficiency and effectiveness.

8. References

[1] Barro N., Bello A.R., Aly S., Ouattara C.A.T., Ilboudo A.J., Traoré A.S.; 2006. Hygienic status and assessment of dishwashing waters, utensils, hands, and pieces of money from street food processing sites in Ouagadougou (Burkina Faso). African Journal of Biotechnology 5 (11): 1107-1112. | | [2] Barro N., Bello A.R., Itsiembou Y., Savadogo A., Owattara CAT, Nikiema P, De SC, Traore AS 2007, Street vended foods Improvement: Contamination Mechanism and Application of food safety objective strategy: Critical Review. Pakistan Journal of Nutrition 6(1) | [3] Bhaskar J., Usman M., Smitha S., Bhat G.K.; 2004, Bacteriological profile of street foods in Mangalore.
Indian Journal of Medical Microbiology. 22: 97-197. | | [4] Biswas S., Parvez MAK.,
Shafiquzzaman M., Nahar S., Rahman M.N.;2010. Isolation and characterization of
Escherichia coli in ready-to-eat foods vended in islamic university, kushtia: J. bio-sci.
18. 99-103, 2010 | s | [5] Black R.E., Lopez de Romana, K.H.G., Brrown N. B., Bazalar O.G. and Kanashiro, H.C. 1989. The incidence and etiology of infantile diarrhea and major routes of transmission in Huascar, Peru. American Journal of Epidemiology 189: 785-799. | | [6] Choudhury, M., Mahanta, L., Goswami, J., Mazumder, M., Pegoo, B.; 2011,Socio-economic profile and food safety knowledge and practice of street food vendors in the city of Guwahati, Assam, India. Food Control 22: 196-203. | | [7] Čolarić
M., Veberič R., Štampar F., Hudina M. 2005. Evaluation of peach and nectarine fruit quality and correlations between sensory and chemical attributes. Journal of the Science of Food and Agriculture, 85: 2611-2616. Génève, Switzerland: International Organization for Standardization, Copyright Office. | | [8] FAO, 1997. Street foods. FAO report, Rome.1-4. | | [9] Ghosh M., Wahi S., Ganguli K.M. 2007, Prevalence of enterotoxigenic Staphylococcus aureus and Shigella spp. In some raw street vended Indian foods, Int. J Environ Health Res. 17(2), 151-6 | | [10] Gwande, H.A., Mishra, A.A., Shukla, R.N., and Jain, Jyoti.; 2013, Socio economic profile of street food vendors and quality evaluation of samosa and panipuri in Allahabad city, (U.P.), India. International Journal of Agriculture and Food Science Technology. Volume 4, Number 3 pp. 275-280 | | | [10] Hanoshiro A., Morita M., Matte G.R., Matte M.H., Torres EAFS.;2004, Microbiological quality of selected foods from a restricted area of Sao
Paulo city, Brazil, 439-444 | | [11] ISO (2004a). Sensory Analysis – Methodology –
Duo-trio Test, ISO Standard 10399. | | [14] Lucca A, Torres EAFS.; 2002, Condições de higiene de "cachorro-quente" comercializado em vias públicas. Rev Saúde Pública; 36:350-2. | | [15] Meilgaard, M., Civille, G. V., & Carr, B. T. 2006. Sensory evaluation techniques (4th ed.). Boca Raton, Florida: CRC Press. | | [16] Feglo, P. and Sakyi, K.; 2012, Bacterial contamination of street vending food in Kumasi, Ghana, Journal of Medical and Biomedical Sciences 1(1): 1-8 0 | | [17] Paulson, DS.; 1994. A comparative evaluation of different hand cleansers. Dairy Food Environ. Sanit.14: 524-528. | | [18] World Health Organization;2002b.Food safety and food borne illness, Fact Sheet, n-237, 7p. | [19] World Health Organization; 1996, Essential Safety Requirements For Street-Vended Foods (Revised Edition) Unit, Division of Food and
Nutrition, DIST.: GENERAL. WHO/FNU/FOS/96.7, WHO, Geneva |