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MODELING OF A MANAGEMENT INFORMATION SYSTEM FOR TURKISH TEXTILE AND APPAREL INDUSTRIES

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Title of the Thesis: **MODELING OF A MANAGEMENT INFORMATION SYSTEM FOR TURKISH TEXTILE AND APPAREL INDUSTRIES**

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ABSTRACT

MODELING OF A MANAGEMENT INFORMATION SYSTEM FOR TURKISH TEXTILE AND APPAREL INDUSTRIES

Mert ÜLKÜ

M.Sc. Business Administration

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Currently, improvement of technology is one of the factors that increases competition among firms. In order to adapt this competition, businesses must constantly renew themselves and have to keep up with the times. The importance of accessing and using the information is steadily emerging in World markets where competition is uniquely difficult. As a result of this, management information systems which display integrated data from different sources have been developed in the aim of efficient usage of, and timely access to correct information and support decision making processes.

Each day, it gets harder to adopt in local and global competition in textile and apparel industries. One of the ways of coping with competitive pressure is the introduction of information systems which provide market monitoring for decision makers to shape their decisions with updated information.

The aim of this study is to design a system that supports decision making processes of managers in two significant industries being as textile and apparel. In this respect, a database of selected market data was designed and retrieved information from the database was presented to decision makers through various interfaces. At the end of the study, the outputs of the designed management information system and results simulated data have been analyzed and their contribution to related markets have been discussed.

Keywords: Management Information Systems, Decision-making, Data

ÖZET

TÜRK TEKSTİL VE HAZIR GİYİM SANAYİLERİ İÇİN YÖNETİM BİLGİ SİSTEMİ MODELLEMESİ

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Teknolojinin gelişmesi, günümüzde işletmeler arası rekabeti artıran bir faktördür. Bu rekabete ayak uydurmak için işletmeler sürekli olarak kendilerini yenilemeli ve çağa ayak uydurmak zorundadırlar. Rekabet etmenin özellikle zor olduğu Dünya piyasalarında bilgiye ulaşımın ve bilgiyi kullanmanın önemi gittikçe artmaktadır. Bunun bir sonucu olarak, doğru bilginin etkin kullanılması, zamanında ulaşılması ve karar verme süreçlerini desteklemek için farklı kaynaklardan bütünleşik bir veriyi ortaya çıkartan yönetim bilgi sistemleri geliştirilmiştir

Tekstil ve hazır giyim sektörlerinde, hem yerel hem de dünya pazarında rekabet koşullarına uyum sağlamak her geçen gün daha da zorlaşmaktadır. Rekabet baskısı ile başa çıkabilmek için izlenebilecek bir yol da yöneticilere piyasaları izleyip, güncel bilgi ile kararların şekillendirebilecekleri bilgi sistemlerinin sunulmasıdır.

Çalışmanın amacı, tekstil ve hazır giyim gibi önemli iki piyasa için yöneticilerin karar verme süreçlerine destek olabilecek bir sistem tasarlanmasıdır. Bu yönde, seçilen bazı piyasa verilerinin olduğu bir veritabanı tasarlanmış ve buradan alınan bilgiler çeşitli arayüzler aracılığı ile karar vericilere sunulmuştur. Çalışmanın sonunda simüle edilen bazı verilerin sonuçları ve tasarlanmış olan bu yönetim bilgi sistemi'nin çıktıları analiz edilmiş ve ilgili piyasalara yapacakları katkılar tartışılmıştır

Anahtar Kelimeler: Yönetim Bilgi Sistemi, Karar Verme Noktası, Bütünleşik Veri

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LIST OF ABBREVIATIONS

MIS	Management Information System
BI	Business Intelligence
EU	European Union
WTO	World Trade Organization
GATT	General Agreement on Tariffs and Trade
FTA	Free Trade Agreement
CU	Customs Union
MFA	Multi Fibre Arrangement
ATC	Agreement on Textiles and Clothing
NIE	Newly Industrialized Economies
ASEAN	Association of Southeast Asian Nations
IT	Information Technology
USD	United States Dollar
GDP	Gross Domestic Product
R&D	Research and Development
ODM	Original Design Manufacturer
DBMS	Database Management Systems
DDL	Data Definition Language
DML	Data Manipulation Language
SQL	Structured Query Language
OLTP	Online Transaction Processing
OLAP	Online Analytical Processing
ETL	Extract, Transform and Load
DW	Data Warehouse
TUIK	Turkish Statistical Institute
ITKIB	The General Secreteriat of Istanbul Textile & Apparel Exporters' Associations
RPD	Oracle Repository
TUTSIS	Textile Employers' Association of Turkey

CHAPTER ONE

1. IMPORTANCE OF MANAGEMENT INFORMATION SYSTEM AND TURKISH TEXTILE AND APPAREL INDUSTRIES OVERVIEW

1.1 Introduction

The textile industry is a business section which primarly works on design, manufacturing and distribution of clothings. Textile industry also mainly serves as a raw material resource for the apparel industry which is creating and selling fashionable clothing.

Although the textile processes are now mechanized, the textile products were being generated at homes in the early stages. Relying on the era and location, main raw materials were flax or cotton (Surhone and Marseken, 2010).

Regarding the historical timeline, textile production goes back in ancient eras. The European's were mostly using clothes made by leather, wool and linen in Roman times. The use of cotton shifted towards Asia and America by the end of 16th century. The production of textiles made with wool from the large sheep-farming areas was at the beginning of 18th century in Britain. The textile industry grew out of the industrial revolution in the 18th century as mass production of clothing became a mainstream industry. By 20th century, the industry has developed a bad reputation due to involving immigrants in illegal working on textile manufacturing and sewing machines (Surhone and Marseken, 2010).

Similarly, the history of textile production in Turkey origines from the Ottoman Empire period. Especially, in the 16th and 17th centuries, it was at the peak period of its time. Ottoman Empire's econonomy was heavily relied on textile and it was at an advanced level (ITKIB, 2011).

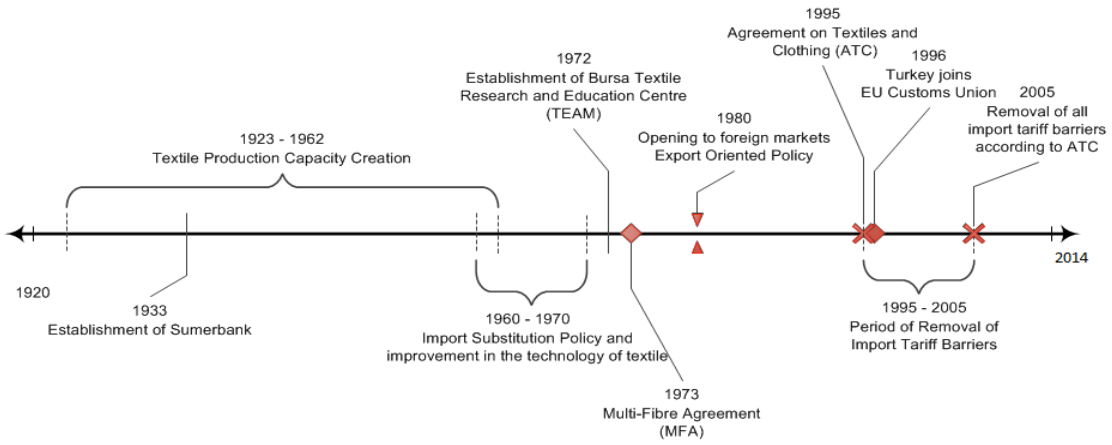


Figure 1: History of Turkish Textile Sector

Source: Turkey's Textiles and Apparel Cluster Microeconomics of Competitiveness

In the 20th century, beginning from 1923 the date when Turkish Republic is established, a great development in textile industry had occured. In 1933, all textile fabrics and small work places were gathered under the umbrella of Sumerbank. It was a great power resource by helping education of new workers for the industry and investing for the industry. After the establishment of Bursa Textile Research and Education Center in 1972, the sector has become more powerful. In the 1990's the share of textile industry in comparison to other sectors in the Turkish economy extremely increased. By the help of export orientations in 1995, such as Agreement on Textile and Clothing and joining Customs Union, Turkish textile industry started to play an important role. Nowadays, Turkey is one of the big players in the industry. Turkey was the EU's second largest supplier of textiles and clothing, after China, with a 13.3% share of the EU import market in 2010, according to data from Eurostat (Official Blog, TCP, 2011). It is also possible to observe various Turkish brands in the global market, respected by many countries. On the other hand, there are so many Turkish producer for the big global brands such as H&M, Zara, or United Colours of Benetton.

Accordingly, Textile and Apparel industries make a significant contribution on the Turkish economy. According to 2014 statistics it constitutes about 7,1% and 3,9% of the exports respectively, whereas both industries together provide around 10% of the GNP. Both sectors also constitutes of 40% in industrial production, 30% of manufacturing labor force and 35% of exports earning (ITKIB, 2014). Similarly,

the share in country's total exports has been between 33-39% since year 1990. Hence, these industries have been denominated as one of the locomotive industries for years still demonstrating a potential to be developed (ITKIB, 2014). Moreover, textile industry holds an important place in Turkey at the same time open to penetration of advanced Technologies and related investments. According to ITMF (Switzerland-based International Textile Manufacturers Federation), at 1990-2009, Turkey ranked second in the world in investments. Primarily the investments were:

- large circular knitting machinery
- open-end rotors
- long-staple spindles
- fourth in short-staple spindles
- shuttleless looms.

Turkey invested greater amount of textile machinery in 2010 compared to 2009. (ITMSS, 2010) Especially in spinning machinery. Imports of some increased machinery can be seen below:

- False-twist spindles: 633%
- Long-staple spindles: 607%
- Open-end rotors: 587%
- Short-staple spindles: 234%
- large-diameter circular knitting machinery: 348%
- flat-knitting machinery: 192%
- Shuttless looms: 284%

Meanwhile, by the end of 2023, Turkey is trying to achieve $500 billion in total exports and rank in the top 10 economies worldwide (DEIK, 2011). The textile and apparel industry is anticipated to be a key industry for Turkey for achieving this goal since the industry has invested more than $100 billion in advanced Technologies until 2012 which is 25% of its export revenue and 11% of national gross income. The industry employment provides more than 2 million people according to TÜTSI'S president HalitNarin reports. In the same context, Turkey plans to achieve $80 billion in exports by the end of 2023. For textiles $20 billion is expected and for apparel $60 billion is expected.

In Turkey, one of the significant features of the textile industry, is the priority of machinery investments. However, in order to create high quality products and compete in the sector, firms generally continue upgrading their machinery time to

time. But, the technological investments are mostly about creating products and not managerial (Özyazgan, 2012).

To support this mechanization automation of the decision making can be addressed as a contributing factor (Certified International Journal of Engineering and Innovative Technology, 2013). At this point, integration of Information Technology systems in decision making processes could be useful in order to win not by only good quality products but also by giving right decisions. In this context systems designed to analyze and make faster, timely and precise decisions might help gain informational and decisional advantage. Considering the fact that some of the textile producers in Turkey are professionalized, integration of business intelligence (BI) systems in the context of Management Information Systems (MIS) in the industry could be considered an asset in order to do that.

In order to compete and maintain the current position of an organization where the competitive conditions in the economic system are difficult, the correct and timely decisions are essential. In general terms, MIS are the mechanisms which take into account the constraints such as business and economic parameters, profit/purpose and which collects and provides data on the fastest and most accurate way to decision-makers (Boğday, 2006).

Because of the wide variety of opinions expressed on this subject, there is no single definition of the subject (Merih, 2000). MIS does not have one embraced and constructed definition. Anyone who works in this area can bring a different definition. When we take into account each work that creates the MIS, we can see that these terms are newly developing three abstract words. So it is hard to make a clear definition that consists of such three words. Any meaningful discussion about MIS can be done before agreeing on some basic terms and frames.

By taking into action the definitions for these three words and relating to the applications, below definitions are listed:

“Operating a system which obtains and transmits past and present information in an organization” (Korenke and Hatch, 1994).

“An integrated system which enables the optimum level of information flow between all levels of the organization” (Long, 1989).

“The combination of people, information processing devices, input/output terminals and communication. This system is providing the managers of businesses and staff to work with scheduled reports to run a business” (Merih, 2000).

”A cluster in an organization for decision-making, coordination, control and analyze” (Çimen ve Ates, 2000).

MIS helps firms to realize maximum benefit from investment in personnel, equipment and business processes. It is a people oriented field with an emphasis on service through technology. For example, almost every supermarket chain uses MIS to find out their profit for the upcoming months, how much each item will be sold and find the answers of what-if analyses. These markets simply find out the outcome of what-if, you change the place of an item in the store from point A to point B.

MIS supports long term plans by providing every aspect of the enterprise. It does not only indicates how things are going, but also why performance is failing to meet the requirements. Since the system is almost real-time system, the organization or individual can take action depending on the reports at any time.

The relation between MIS and BI is mostly technical. BI is a collection of applications and technologies for gathering, storing, analyzing and providing access to valuable data to help users make more efficient and timely decisions. BI systems are mostly used by government to keep track of the citizens. For example, government keeps track of the citizen’s lawsuit by using the data of individuals UYAP (National Judicial Network Information System). Some of these applications and technologies can be seen below;

Table 1: Some applications and technologies for Business Intelligence

	Microsoft	Oracle	SAP	IBM	Business Objects
Source Data	SQL Server, Access	Oracle 11g		DB2	
ETL, Data IntegrationWarehousing	Integration Services *aka*SSIS (formerly known as DTS)	Warehouse Builder	SAP BW	DB2 Data Warehouse, Warehouse ManagerWebSphereData Stage (ETL) IBM Information Server	Business Objects XI R2: Data Integrator (ETL) Data Federator (virtualization) Rapid Marts (standard platform data marts)
Query and Analysis	SQL Server Analysis Services, Access, Excel	Warehouse Builder, Oracle Hyperion Essbase	Netweaver BI	Various	Business Objects XI R2: Web Intelligence (query tool) Voyager (OLAP) Desktop Intelligence (query tool)
Reporting, Information	SQL Server Reporting Services, Access	BI Suite Enterprise & Standard Editions: query, analysis, reporting, Siebel Answers, Interactive Dashboards	Netweaver BI	BIRT, Design Studio, Alphablox	Crystal Reports
Other Front-End Tools	Excel Pivot Tables, Performance Point 2007 (enterprise scorecarding)	Oracle Data Mining	Netweaver BI	IBM Intelligent Miner (data mining)	Crystal Xcelsius (visualization tools), Crystal Vision (dashboard), InfoView (BI portal)
Specialty Apps	MS Sharepoint Server 2007 (report distribution)	Business domain operational analytics applications, Hyperion System 9 Financial Management, Financial Planning	ERP Software, Financial Analytics (formerly Outlooksoft)	Websphere Content Discovery (unstructured search)	Information OnDemand (hosted BI solutions), Performance Management (Formerly Cartesis)

In order to integrate business intelligence to the company, the BI system must be accepted by the users to add value to the organization. The system must be user friendly in other words, easy to use by the end-user because the users may become uninterested and spend time to learn how the system may work and discuss the necessity of the system. At this token, BI techniques mostly empower MIS

functionality. Therefore, an effective MIS framework requires an efficient BI architecture.

As its significance mentioned above, Turkish textile and apparel businesses must produce goods with international standards in order to compete in this era. These industries can achieve their goal by producing high quality products at reasonable prices with mass production techniques. But in Turkey, certain firms in these industries are not organized and could not reach the desired level of efficiency (Bulgun and Bozkurt, 2000:17). In order to improve efficiency and manage businesses in a good way, MIS can be estimated as potential contributors. The need for MIS for both industries is summarized by (Boğday, 2006:47).

- The usage of MIS in Turkey is currently yet in development stage. By observing the current situation, organizations can not compete with advanced enterprises.
- The organizations regarded as SME's in Turkey has poorer infrastructure compared to advanced enterprises. The market lacks of a competitive weapon such as finding new markets in the World and not access information to give correct decisions.
- Athough they use information withv computer based softwares for accounting, personnel and payroll, sales and invoicing, they do not have and get benefit from decision support systems and management information systems.
- It is observed that businesses, particularly SME's do not have adequate information regarding electronic data interchange and electronic commerce.

Therefore, one of the main problems in textile and apparel industries is the lack of intelligence and information systems that combine data collection and processing capabilities and consequently that enable the firms taking the right decisions at the right time. Furthermore, in order to compete globally, organizations should create the infrastructure for MIS which are also able to monitor market information effectively.

Accordingly, the goal of the thesis is to design MIS that would also specifically serve for local and international market monitoring purposes and which uses BI tools that will help and improve decision making processes in textile and

apparel industry for various firm scales. The system design is based on a well-known model known as “dimensional modelling” and is a web-based application which will include Dashboards, Key Performance Indicators, Scorecards, Filters and a Relational Database. Hence the system is estimated to be on a web page where authorized users can access and react depending on the information provided by dashboards. Furthermore, the application will have different visualization options depending on the data storage which will give best, worst and average cases for the user to decide.

The study is composed of six parts, following the introduction, second chapter includes theoretical background and both industries’ overview to signify their importance for Turkey. MIS and BI issues which are essential for system design are mentioned in the third part of the study. In the fourth part, system design methodology is introduced. Fifth part of the study mainly involves implications of the created system in which outputs and benefits are discussed. Final part concludes.

According to our research findings; considering the fact that similar market monitoring systems do seldom exist in Turkey, the importance of this study is mainly due to the system’s scope. The concerned system introduces analysis tools for which a variety of existing datasets can be used and processed by decision makers regardless of the firm scope. The system design is expected to contribute textile and apparel industries competitiveness mainly at the level of improvement of decision making capabilities by combining real time market information and firm specific data for semi-structured decisions. At this stage, one of the most focal function of BI’s including data collection and filtering, data processing, data customization and finally reorganization of the processed data in form of a key performance indicators, scorecards, filters and charts is expected to support sector experts' key decision making models. Considering the financial issues one of the most important constraints is the hardware requirements at the stage of system implementation whereas real-time data collection for specific purposes may be assumed another constraint of the study that might have shading efffects in the implementation phases.

CHAPTER TWO

2. RATIONAL BEHIND THE STUDY

2.1 Background, Theoretical Framework and Literature review

In this section, the general concepts and basic information related to MIS is described. To clarify and describe the position of textile and apparel industry, some preliminary information regarding softwares and applications are given.

2.1.1 Theoretical Framework and the Model for the Designed Architecture

The architecture designed and used for the textile and apparel sector project was based on the architecture of Ralph Kimball's The Data Warehouse Toolkit: The definitive Guide to Dimension Modeling. Ralph Kimble has been in the data warehouse and business intelligence industry for a long time and regarded as the leader on the dimensional approach. He has been the industry's best seller since 1996.

While building the business intelligence system, Ralph Kimballs DW/BI approach was referenced. The components were based on the Kimball architecture. The Kimball architecture and components can be seen below.

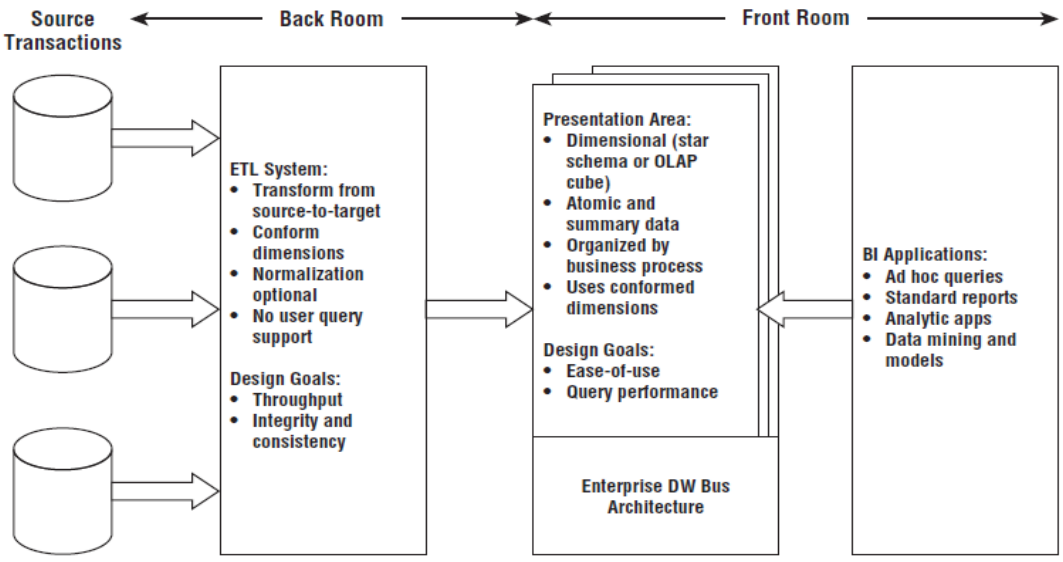


Figure 2: Core elements of the Kimball DW/BI architecture

Source: Kimball, 2013:19

Ralph Kimball's 10rchitecture consists of four core elements. These are:

- Source
- ETL System
- Data warehouse architecture
- BI Application

According to Ralph Kimble's architecture, first the extraction of the source takes place. Later, the transform step takes place, which consists of conform dimensions and normalization. After the transform stage ends, the transformed source gets loaded into the data warehouse. The BI applications are now ready to create reports from the established data warehouse. As stated by Ralph Kimble, ETL system is the core element between operational source and DW/BI area.

2.1.2 Literature review

In this section, we briefly cover the MIS literature some of which can be related to the tools and techniques that are used for the system design process. MIS was designed firstly by Joel D. Aron in 1969. His intention was to help decision makers by providing them with accurate data.

MIS is being accepted as a branch of applied science since 1970s. After being accepted by universities and other type of training institutions, MIS structure started being based of certain guidelines and scientific procedures (Keser, 2004).

There are more than 200 universities in USA that includes MIS in their curriculas. According to the statistics of ÖSYM's 2007 statistics, there are 8 universities that provide MIS education in Turkey (Soykök, 2009).

MIS's are being integrated and strengthened in public sector to provide control over all processes including decision making ones. From the perspective of our country, it can be stated that MIS is not yet popular and the research regarding this topic is not sufficient thus, private sector did not yet realize the importance of data based decision making (Polat, 2006).

The literature reviews regarding MIS was about designing such systems between 1970 and 1980. After 1980's it was about integration of system information and applications. After 1990's, it shifted to impact of information systems on

organizational structure and role of a manager in the information system (Nasir, 2005).

MIS technically belong to mutual interaction of computer, management and business administration. Towards improving MIS, the majority of thesis indicates the design of a system that creates reports and analysis for various purposes. In the case of MIS related topics to textile and similar industries different researches are also conducted. In this context, (Arslan 2002)'s study in which he generates a variety of software designs that will be needed for a garment manufacturer organization and Boğday (2006)'s study in which she creates a management information sub-system along with the related training program can be given as examples.

Moreover, in relation with the tools designed within the scope of our study, different aspects data warehousing can also be observed in the managerial literature. As an example (Düzgünoğlu, 2006)'s thesis study can be given. In this study data warehouse and online analytical processing (OLAP) are explained in detail and a tool for Hospital Management Information System to provide reports for decision makers is designed. The data in the system was organized in a data warehouse thus, fact and dimension tables were created in order to achive dimensional reports. The tools that were used for the project was Visual Studio.Net and MS SQL Server. Different thesis studies which underline the relation between MIS and managerial issues can be given as below;

(Babaoğlu, 2001)'s thesis study, discusses the aspects and goal of MIS. He discusses why the top management in organizations needs MIS and explains the design process phases of MIS for Financial Reporting System.

(Keser, 2004)'s thesis study, explains a system about Library Information System. The system includes a data processing system wich was written in computer language PHP (Hypertext Preprocessor) and MS SQL Server was used as a database. The data processing system enables automation of data input.

(Tahtacı, 2006)'s thesis study, explains the design of a market-based MIS. As for a reporting software, ready-made software comparisons were described. Moreover, the relationship between reengineering and MIS were explained.

(Tuna, 2003)'s thesis study, describes a new type of MIS design which uses Excel documents as a source file.

(Çarkıt, 1997)' thesis study, discusses the computer-based decision support system in management processes. The creation of data warehouses and artificial intelligence was discussed in order to create successful MIS.

Hence, it can be observed various dimensions of MIS integration to different fields of management. In this context, the expected results of OLAP and dimensional modeling techniques that are applied for the concerned system design can also be assumed as another contribution to the literature.

2.2 Textile and Apparel Industries: Comparison between World and Turkey

In this section, we basically cover the current state of Turkish textile and apparel industries and its place in the global textile and apparel leagues. Recently, both industries yield a promising place among the important players such China, Egypt and Bangladesh and as we discover below European Union (EU) constitute biggest markets abroad.

2.2.1 Textile Industry in Turkey and in the World

2.2.1.1 Textile Industry Worldwide

In the early 20th Century Textile production was dominated by United States (US) and the European countries. Mostly, due to economic reasons, textile production shifted towards Japan in the mid 20th century. Afterwards, US limited quotas on Japanese cotton textiles to protect its domestic industry. While other nations were developing, their exports were rising to US. Accordingly, due to related employment losses; decided to make Short Term Arrangement in 1961. This arrangement limited specific import categories to protect domestic industry. Later on, this arrangement was replaced by the Long Term Arrangement (Nordas, 2004).

During 1960's and 1970's, worldwide increases occured in domestic production costs and labor shortages. So Japanese firms started to interest in Newly Industrialized Economies (NIE). NIE such as Korea, Hong Kong and Taiwan were used for outsourcing the production in 1970s. The main result of this outsource was cheap labor and improved quality of production. In this period, the wages of workers Japan were very high in comparison with outsourced countries and that was one of the reason which encouraged firms to shift towards "NIE" countries (Nordas, 2004).

Meanwhile, developed countries came up with a new trade restriction in 1974, known as the Multi Fibre Arrangement (MFA). The purpose of this agreement, for the developed countries point of view to adjust competition from developing countries. As a result, developed countries had more time to adjust the competition. According to the arrangement, member countries could maintain quotas established prior to the agreement, but were constrained from expanding these quotas by complicated restrictions (Nordas, 2004).

The imposing of quotas and rising labor costs, the NIE's interested in less developed countries of the era including Indonesia, Thailand, Pakistan, Sri Lanka and Vietman for accessing more quota holdings. The reason of this interest was low labour and production costs in less developed countries. As a result these countries were starting increased their competitiveness in textile production (Nordas, 2004).

Table 2: Share in economy's total merchandise exports

(Million dollars and percentage)

	Value					Share in economy's total merchandise exports	
	1990	**2000**	**2010**	**2011**	**2012**	**2005**	**2012 a**
World	**104354**	**154848**	**252221**	**294953**	**285668**	**2.0**	**1.6**
Argentina	158	258	263	300	222	0.5	0.3
Australia	153	347	239	274	257	0.3	0J_
Bangladesh b, c	343	393	1263	1590	1634	7.6	6.5
Belarus		410	615	745	727	3.0	16
Brazil	769	895	1094	1108	996	1.1	0.4
Canada	687	2204	1907	2024	2018	0.7	0.4
Chile	33	114	195	213	193	0.5	0.2
China d	7219	16135	76871	94411	95450	5.4	4.7
Colombia	133	268	414	486	454	1.7	0.8
Croatia		87	115	121	110	1.2	0.9
Dominican Republic c, d			274	331	349	0.5	3.8
Ecuador	3	40	200	165	119	0.5	0.5
Egypt	554	411 |	1292	1523	1365	2.1	4.6
El Salvador d	38	79	240	283	276	3.3	5.2
European Union (27)		56737	67881	76959	69366	1.7	1.2
extra-EU (27) exports		15603	20799	23811	22374	1.6	1.0
intra-EU (27) exports		41134	47082	53148	46992	1.8	1.3
Guatemala	34	53 |	258	278	247	3.3	2.5
Hong Kong, China	8213	13441	11307	11283	10546	4.7	2.1
domestic exports	2171	1174	251	203	186	3.0	0.8
re-exports	6042	12267	11056	11080	10360	4.9	2.2
India	2180	5593	12833	15340	15274	8.4	5.2
Indonesia	1241	3505	4144	4791	4541	3.9	2.4
Iran	510	766	993	939	1097	1.4	n
Israel	270	490	848	801	743	1.7	12
Japan	5871	6994	7086	8034	7819	1.2	1.0
Jordan c	31	43	71	72	71	1.0	0.9
Kenya	21	26	60	60	70	1.4	1.1
Korea, Republic of	6076	12710	10968	12369	11970	3.7	2.2
Lebanon		8	37	43	37	1.1	07
Macao, China	136	271	54	50	21	11.1	2.0
Malaysia d	343	1270	1671	2036	1786	1.0	0.8
Mauritius c, d	35	81	74	114	97	3.5	3.6
Mexico d	713	2571	1928	2140	2236	1.0	0.6
Morocco d	203	123	337	413	355	1.7	1.7
Nepal c	82	182	266	292	293	21.6	32.1
New Zealand	135	146	265	297	266	1.2	
Nigeria c		10	231	85	78		0.1
Norway	163	173	180	197	208	0.2	0.1
Pakistan	2663	4532	7848	9082	8705	44.2	35.4
Peru	221	128	288	374	488	0.9	n
Philippines d	132	297	170	184	170	0.7	0.3
Russian Federation		475	583	670	657	0.2	0.1
Serbia			95	125	132	1.2	12
Singapore	903	907	809	851	801	0.4	0.2
South Africa c	167	237	231	235	228	0.6	0.3
Sri Lanka c	25	244	172	198	226	2.1	2.4
Switzerland	2557	1503	1498	1638	1175	1.2	0.5
Syrian Arab Republic c	555	158	671	591	236	2.6	5.9
Chinese Taipei	6128	11891	9719	11016	10293	4.9	3.4
Tanzania c		11	116	115	133	1.8	2.4
Thailand	928	1958	3761	4072	3521	2.5	15
Tunisia c	112	154	446	468	456	3.1	2.7
Turkey	**1440**	**3672**	**8964**	**10772**	**11054**	**9.6**	**7.3**
Ukraine		127	192	224	232	0.7	0.3
United Arab Emirates c, e	6	1289	1812	1913	2218	1.2	0.6
United States	5039	10952	12169	13791	13485	1.4	0.9
Viet Nam c		299	3061	3770	4117	2.2	3.6

a Or nearest year. b Figures refer to fiscal year.c Includes Secretariat estimates.d Includes significant exports from processing zones.e. Mainly re-exports.

Source: WTO, 2013

Later on, MFA was replaced by ATC (Agreement on Textiles and Clothing) due to developing countries protests against quota restrictions in 1995 for phasing quotas. But this agreement lasted for only 10 years. During this time, all textile and apparel products were quota free between WTO nations, trade shifted to less developed countries and became as important exporters. The leading country was China because the trade increased from 12% to 20% while the world trade increased by 4.3% from $310 billion to $450 billion (WTO, 2012).

The effects of ATC agreement resulted in the beginning of liberalization and relaxed worldwide textile trade and more countries got into textile league such as Turkey, Mexico and South Asian countries. The ATC expired on December 31, 2004. Currently, textile and apparel trade is operating without quotas as of January 1, 2005. But although the quotas are eliminated, there are some regulations. There are some statistical monitoring systems which controls the imports of textiles and clothing's into the European Union. The system is for monitoring the trade and gather information regarding market disruptions (WTO, 2012).

Regarding the current state of the worldwide textile market, biggest winner is China in the United States market since the eliminations of quotas. The increase of exports of China were 36%. South Asian and ASEAN countries also grew by 20%. The export numbers of Morocco increased by 17% amongst EU countries. Honk Kong, Korea and Taiwan had a decline in global export market. But the biggest losers were Mexico and Turkey due to significant decline on their exports by 10% and 14%. CAFTA countries also declined on their exports by 6% due to US buyers headed towards Asia (WTO, 2012).

EU Market

European Union market is the most important geographical area for Turkey's export numbers. Due to the geographical proximity, Turkey exports %49 of its textile products to EU. Therefore, EU market must not be underestimated but on the other hand, as stated in the weaknesses, Turkey must get rid of EU dependence and must increase the export numbers globally (WTO, 2012).

The leader is as expected China in exports in the EU market. Vietnam also had an increase in exports by 27%. Other ASEAN countries had a rise on their exports except Philippines. India was the leading country amongst South Asian countries with an increase of export numbers by 19% followed by Bangladesh and

Sri Lanka. The major losers in European Union market was Korea and Philippines. While Turkey and Egypt earned momentous, Morocco and Tunisia had a turn down (WTO, 2012).

Increasing Investment in Asian Countries

The improving export numbers and shift reflected to the Asian countries to resulted on investments of textile machinery can be seen in Table 3. (International Journal of Management, IT and engineering, 2010).

Table 3: Share of World Shipments of Textile Machineries in Year 2010

	SHUTTLE-LESS LOOMS	CIRCULAR-KNITTING MACHINES	SHOT STAPLE SPINDLE	OPEN-END-ROOTS
China	61%	74%	73%	66%
India	9%	4%	1%	5%
Bangladesh	7%	3%	6%	-
Turkey	5%	3%	3%	5%
Pakistan	4%	-	10%	-
Rest	14%	14%	7%	14%

As seen from above table, there has been a noteworthy growth in investment of textile machineries in Asian countries. The investment in Asia was mostly contributed by China, India, Pakistan and Bangladesh on the other hand the investments on South America have declined. In European Union countries and North America investments made in textile machineries decreased. On the other hand South American countries invested in weaving and rotor spinning with a decline in short staple.

As a result, investments to textile machinery made after the quota phase out is mainly from Asian and South American countries with the production factories from USA and EU heading towards these places (International Journal of Management, IT and engineering, 2010).

Changing market dynamics in the global textiles

Most of the time, leading exporters of apparel have also been the leading exporters of textiles. The top growing exporters of textiles with a percentage gain in 2005-2011 were

- Egypt: 445%
- Vietnam: 420%
- China: 130%
- Bangladesh: 125%
- India: 80%
- Turkey: 52%

Except Egypt, top 10 of exporters worldwide came from Asia. See Table 4.

Table 4: Fastest growing exporters of textiles (2005-2011, USD million, current)

Country	2005	2011	Percentage gain
Egypt	272	1.485	446%
Viet Nam	725	3.772.00	420%
China	41.050	94.411	130%
Bangladesh	705	1.590	125%
India	8.331	15.016	80%
Turkey	7.076	10.772	52%
Malaysia	1.356	2.036	50%
Thailand	2.764	4.072	52%
Indonesia	3.353	4.791	43%
Pakistan	7.087	9.082	28%
WORLD TOTAL	202.000	294.000	45%
Swaziland	174.8	85.4	-51%
Togo	0.28	4.1	1362%
Zambia	3.8	0.38	-90%

Source: WTO, 2011

In order to protect the current status within the league of textiles, Turkey must follow the era of technology. High value-added products must be directed to. The development of textile industry which employs a high proportion of society has undeniable positive effects on social welfare. The geographical location of Turkey, and developing relations regarding economies with EU, Russia and the Turkic Republics is seen as a big opportunity for Turkey.

The strengths of Turkey that will allow to evaluate these opportunities are having a developed infrastructure, sufficient exprerience in the industry, international competition experience and adapting new technologies and fashion. As seen in the global textiles industry, for example China, the usage and investments on technology

proved and showed the success. Therefore, the machinery investments will surely have a positive effect for Turkey also in the global league.

2.2.1.2 Textile Industry in Turkey

i. Current state of the industry and firms' geographical dispersion

Textile industry plays a significant role in Turkish economy. Since 16th and 17th centuries, the textile industry has developed rapidly and greater number of production capacity was created. The most important raw material is cotton, which was being grown extensively in the country (Aegean, Çukurova and GAP region) and it has highly contributed to the development of the industry. The industry continued improving until 1972 and started opening to foreign markets after 1980.

The textile sector had a big role for the development of clothing industry. The share of textile industry has become 9.3% within the total Turkish exports during 1990 which was the higher rate. It has become one of the most important industry of Turkey by its export of 7.7 billion dollars in recent years. (ITKIB, 2013).

The production capacity of the industry increased in the 1990's due to the expectations of the formation of Customs Union with the European Union. According to the machinery capacity Turkey has;

- 3% of short staple spinning capacity of the world
- 5% of long staple spinning capacity of the world
- 7,3% of OE (Open-End) rotor capacity of the world
- 3,5% of shuttles weaving looms capacity of the world
- 1,9% of shuttle weaving looms capacity of the world
- 5,1% wool weaving looms capacity of the world by the year of 2013.

Most of the companies in the sector are medium scale. There are also some large scale companies with integrated production facilities. There are approximately 7500 textile manufacturers in Turkey (ITKIB, 2012). The geographical dispersion of the sector is shown in Figure 3.

Figure 3: Textile concentrated areas in Turkey

When we analyze employment numbers, numbers of textile companies and export figures of textile industry, there are basicly three areas that are leading Turkish textile industry: Marmara, Ege and Cukurova region. In the Marmara region Istanbul, Bursa and Tekirdağ lead the textile industry. Marmara region is the leader in industrialization in Turkey. This region consumes 56% of the total textile employment, 71% of total textile exports (Turkstat) of Turkey and 67 % of the total textile companies. (Ministry of Labor and Social Security Statistics, 2012).

In the Aegean region, Denizli and Izmir are the most important cities in this region. This region focuses on production of home textiles and towels. It has a share of 12% textile employment, 11% of total textile companies and 10% of the total textile exports. (Saba, 2012)

In Çukurova Region, Adana, Kahramanmaraş and Gaziantep are the most important cities in this region. There are important companies in this region that have ranked in the top 500 firms in Turkey as a whole. This region grows in terms of the textile exports, textile employment compared to others. (Kutluksaman, 2012: 18-20). This region is the 7th largest cotton producer in the World.

ii. Strengths and Weaknesses of the industry

Alike other industries, textile industry has its own strengths and weaknesses. When we begin by the strengths, it can be observed that one of them is related to the location of the producers in the markets. Because of the geographical proximity and short distance logistics time is consumed. Same situation is valid for foreign trade opportunities where, proximity to European countries as main buyers is also another

advantage. Customs Union agreement with EU and free trade agreements with other countries can also be assessed in the same context (ITKIB, 2014).

Second strenghts deals with the improvement of fabric design capabilities in recent years. Turkish entrepreneurs created their own trademarks and joined the textile competition worldwide. Production of the high value products at reasonable prices is one of the main philosophies of the entrepreneurs in the country (ITKIB, 2014).

Third group of strenghts is related to specific issues related with labor, technology and factors of production mainly with regard to other competitors such as China and India. Most populars are as follows;

- The cotton made in Aegean region is high quality. Regarding this case, Turkey is one of the leading cotton producer globally (ITKIB, 2014).
- Turkey is the sixth spun yarn manufacturer globally. Turkey produced about 5% of spun yarn in 2000 and kept increasing in the following years (ITKIB, 2014).

Turkey gets raw materials directly from the textiles which gives an important advantage compared to competitors. Turkey produced about 375 thousand tones of cotton by the year of 2014 and ranked seventh globally. Reference: Istanbul textile and apparel exporters Associations (ITKIB, 2014).

Another strength is related to labor costs in the industry. The costs of labor in Turkey are low and moreover employment is mostly set over one to six months. Labor cost in Turkey was 10% by the year of 2014. In other countries as you can see below it was much higher (ITKIB, 2014).

- Italy: 12%
- Portugal: 14%
- United States: 17%

The fourth strength is linked to advanced technology intensive production. The textile sector made an important step towards modernization since the implementation of the European Union-Turkey customs union. Turkey imported a large number of textile and apparel machinery in the last years. As a result, Turkey

has the largest capacity for the manufacturing of yearn, weaving and finishing in whole Europe.

Just like strengths, there are weaknesses in the textile industry. First of all, the lack of cooperation between public and private sector is considered as a problem in the sector.

Second weakness can be regarded as the lack of inventory and the unexplored roadmap. Moreover, the lack of coordination between sub-sectors can be considered as a failure (Sanayi Genel Müdürlüğü, 2010).

Third group of weaknesses is related to high costs of production such as employment taxes, VAT (value added tax), energy costs and social security financing. The imports of unfair goods to Turkey causes decline in the utilization rate and increase in fixed costs (Sanayi Genel Müdürlüğü, 2010).

Some other weaknesses are lack of R&D and training policies, dependence on foreign textile machinery, dependence on EU market, lack of branding activities and lack of promotion and marketing activities (Sanayi Genel Müdürlüğü, 2010).

iii. Foreign Trade

Turkey is the ninth largest supplier of textile and seventh largest supplier of clothes worldwide in 2011. Some developments over the last years improved Turkey's position in the worldwide textile market. In the domestic area, many local Turkish companies negotiate licensing contracts with companies abroad, in order to compete globally (U.S. International Trade Commission, 2004: 39-42).

Moreover, Turkey is one of the most dominant textile and clothing producer in the world because it has the production capacity to facilitate almost all of the raw materials.

Table 5: Top Textile and Raw Material Destinations

TOP TEXTILE AND RAW MATERIAL DESTINATIONS				
TOP 20 COUNTRIES (CURRENCY RANKED)				
Currency: US $				
Countries	2012 ANNUAL	2013 ANNUAL	2012/13 %CHANGE	SHARE IN TOTAL EXPORTS %
RUSSIAN FEDERATION	1.127.737.094	1.010.729.907	10	12,1
ITALY	676.855.030	836.577.090	24	10.0
GERMANY	406.078.295	444.362.771	9	5.3
ROMANIA	275.841.966	331.507.905	20	4.0
UNITED KINGDOM	293.820.004	321.776.679	10	3.8
USA	284.423.397	309.096.819	9	3.7
UKRAINE	203.370.906	306.093.462	51	3.7
BULGARIA	265.894.091	299.075.012	12	3.6
POLAND	256.740.630	273.530.714	7	3.3
EGYPT	224.830.069	252.950.857	13	3.0
IRAN	269.346.710	293.962.712	11	2.9
SPAIN	210.334.332	224.033.901	7	2.7
MOROCCO	203.012.827	217.118.019	7	2.6
CHINA	146.313.171	188.220.927	29	2.2
TUNISIA	159.315.265	185.632.507	17	2.2
NETHERLANDS	136.704.710	158.498.623	16	1.9
BELGIUM	130.075.597	153.523.358	18	1.8
FRANCE	147.088.617	147.941.634	1	1.6
PORTUGAL	125.643.258	133.524.911	6	1.6
GREECE	125.545.896	133.209.715	6	73.7
FIRST 20 COUNTRIES TOTAL	5.668.972.466	6.167.367.523	9	
TURKEY'S TOTAL TEXTILES AND RAW MATERIAL EXPORT	7.749.225.552	8.370.751.010	8	100.0
SHARE OF TOP 20 COUNTRIES IN TOTAL EXPORTS (%)	73	74		

Source: ITKIB, 2014

Turkish textile exports increased five times within the last 20 years and has reached 6.1 billion dollars by the end of 2013. Similarly, Turkey ranked seventh in the world with the share of 3.8% according to WTO statics for 2012 and second in the EU market with the share of 17.5% according to the Eurostat statics. Turkey exports 49% of textile goods to EU countries. Besides some of the EU countries (e.g. Romania, Germany, Italy and Poland) for which export progress is mainly due to geographical proximity, the countries such as Russian Federation, Ukraine, Uzbekistan and Azerbaijan are the most exported countries with a market share of 14% by the year of 2013.

In addition to geographical proximity advantage, Turkey has Customs Union (CU) agreement with the European Union. By this agreement, without paying any customs, industrial goods can move freely within the EU and Turkish borders. The import tariffs and other customs are decided by EU according to the rules of the international agreements. CU had a great impact on the imports. As well as imports, export numbers had also increased by 3.7% and totaled in $11.5 million. Moreover, export of Turkish Textile sector, also increased by 4.2% by the year of 2013.

EU countries always had an important role in the foreign trade of Turkey. Turkey had over 45% trade with EU countries. Due to the adoption of Turkish economy to EU's competition affects resulted in the production quality and improved the trade between Turkey and EU.

Turkey's trade liberalization has increased after the CU was put into force (Lohrmann, 2002). Before the formation of the CU, Turkish textile exports to the EU were subject to quota restrictions. As a result of the CU, quotas were eliminated regarding the textile products. (Togan, 2000). In his study Lohrmann, 2002 ranges Turkey's main export items to the EU market like the following:

- apparel and clothing
- electrical machinery and equipment
- boilers
- textile yarns

In recent years, high technology is being used in the textile manufacturing. This high technology enables the production of good quality products such as Cotton, fiber and yarn which constitute about 24% of total exports (Lohrmann, 2002). The primary exported materials are;

- Woven pile fabrics
- Knitted fabrics
- Cotton woven fabrics
- Synthetic filament yarns

Besides Customs Union, Turkey has free trade agreements with Israel, Romania, Bulgaria, Macedonia, Bosnia and Croatia.

2.2.2 Apparel Industry in Turkey and in the World

2.2.2.1 Apparel Industry Worldwide

Apparel industry is one of the first industry that adapts to global dimension and integrate developing countries to worldwide competition. The apparel industry has improved since 1970s and at the same time drawing developing countries into the value chain.

The industry provides employment to millions and is a billion dollar industry. (Datamonitor, 2009) Apparel sector is considered as jumping-point for economic development for developing countries and due to its low fixed costs, it is regarded as typical starter industry for countries occupied with export-oriented industrialization. (Gereffi & Memedovic, 2003) Developing countries now generates three quarters of global clothing exports. (ILO, 2005)

The worldwide expansion of apparel industry always has been driven by trade policies until the Agreement on Textiles and Clothing (ATC). The industry that was regulated by quotas was phased out by WTO and resulted in a flux in the worldwide economy and restructured firms that make apparel production and trade to compete in the new economic and political realities. (Gereffi & Frederick, 2010)

This agreement brought new factors in competitiveness such as labor costs, productivity and managerial competencies. Countries such as China, Bangladesh and India are leading in the low-cost segments of the value chain. On the other hand, countries such as Turkey and Sri Lanka are entering into higher-value segments. Turkey for example, is working on branding and designing which needs higher-quality human capital to maintain competitiveness. Therefore, in order to maintain their position, workforce skills is an important element in the worldwide apparel value chain.

The apparel industry is a typical example of buyer-driven economy. There are power asymmetries between buyers and suppliers. (Gereffi & Memedovic, 2003) The apparel production is determined by Global Firms and effects the production dimensions such as where, whom and price. Usually, leading firms decide and outsource the production in developing countries which offers the most suitable rates. The leading companies are located in Europe, Japan and United States. These companies perform designing and branding of products which is the most valuable

activity for the apparel value chain and most of the time outsource the manufacturing process in developing countries.

Lead Firm and Brand Types with Regional Examples

The leading companies in the apparel industry get used to sourcing models in 1970s and manufacturing has become the field of developing countries. But, the geographic shift has been influenced by trade agreements on quotas (Gereffi & Memedovic, 2003).

The history of quota started with Long-Term Arrangement in 1962 regarding International Trade in Cotton Textiles and Substitutes under the guidance of the General Agreement on Tariffs and Trade (GATT). Later on, this was extended to include other types of materials under the MFA which was implemented in 1974 (Gereffi & Memedovic, 2003). The MFA agreement controlled the world trade for the next 30 years and was put into place to protect developed countries from cheap imports (ILO, 2005). Some of the developing countries profited from this agreement since the low-cost competitors such as China could not compete with high quality imports.

This agreement ended in 2005 and textiles export was brought under WTO on textiles and clothing (ATC). Several trade agreements were made during the phase out period of MFA in order to ease the impact on least developed countries. These agreements helped small countries to compete in the worldwide apparel industry (WTO, 2014).

After the MFA period which is the beginning of ATC, countries such as Bangladesh, China, India and Vietnam have experienced growth in apparel industry. By the end of quotas, China increased its global market share by 37,8% in 2014 (WTO, 2014). Other countries also have increased their exports in the three major markets. (Japan, US, EU)

Several countries including Canada, EU-12, Hong Kong, Malaysia, Mexico, Morocco, South Korea, Taiwan, Thailand, and Tunisia have seen a continued drop off in their market share since the early 1990s (WTO, 2012).

Table 6: Leading apparel export by Countries

	Value	**Share in world exports/imports**				**Annual percentage change**			
	2011	**1980**	**1990**	**2000**	**2011**	**2005-11**	**2009**	**2010**	**2011**
Exporters									
China a	154	4.0	8.9	18.2	37.3	13	-11	21	18
European Union (27)	116	-	-	-	28.2	5	-15	2	16
Extra-EU (27) exports	28	-	-	6.6	6.8	7	-22	2	26
Hong Kong. China	25	-	-	-	-	-2	-18	5	2
Domestic exports	0	11.5	8.6	5.0	0,1	-39	-80	-28	-14
Re-exports	24	-	-	-	-	3	-11	6	2
Bangladesh b	20	0.0	0.6	2.6	4,8	19	15	25	27
India	14	1.7	2.3	3.0	3,5	9	9	-6	28
Turkey	**14**	**0.3**	**3.1**	**3.3**	**3,4**	**3**	**-15**	**10**	**9**
Viet Nam	13	-	-	0.9	3,2	19	-2	22	27
Indonesia	8	0.2	1.5	2.4	2,0	8	-6	15	18
United States	5	3.1	2.4	4.4	1,3	1	-6	12	12
Mexico a	5	0.0	0.5	4.4	1,1	-7	-16	6	6
Malaysia a	5	0.4	1.2	1.1	1,1	11	-14	24	18
Thailand	5	0.7	2.6	1.9	1,1	2	-12	15	6
Pakistan	5	0.3	0.9	1.1	1,1	4	-14	17	16
Sri Lanka b	4	0.3	0.6	1.4	1,0	7	-5	7	21
Cambodia b	4	-	-	0.5	1,0	11	-19	25	33
Above 15	**372**	**-**	**-**	**78.6**	**90.1**	**-**	**-**	**-**	**-**

Source: WTO, 2012.

Turkish firms moved into the design segment of the value chain as part of a broader strategy to establish the country as a fashion center, leveraging the country's OEM production model with short lead times (under four weeks). Industry associations and government organizations began working in collaboration to promote Istanbul as one of the world's top five fashion centers by 2023. In 2010, various industry groups collaborated to organize the third "Istanbul Fashion Week" to strengthen Turkey's competitiveness in fashion and design. Deep relationships with retailers such as M&S seeking additional services from their local suppliers also facilitated upgrading into design services. By 2007, firms in cities such as Denizli were designing about 10% of M&S garments manufactured in Turkey (Tokatli, 2008). In addition, some firms such as Yavuz Tekstil developed their own designs. Firms that added design as part of their offering as full package manufacturers are seeking out regional opportunities in the Middle East and Africa, where Turkish

ODMs (Original Design Manufacturer) offer a competitive advantage with unique designs that harmonize heritage and modern fashion (Greffi, 2011).

2.2.2.2 Apparel Industry in Turkey

Importance of Textile and Apparel Sectors for Turkey

Apparel and Textile industries are the most important industries of Turkey. These two industries consume about 7% of GDP by the year of 2013 and they are the core of Turkish Economy regarding in terms of GDP contribution (Ministry of Economy, 2013). Moreover, employment, manufacturing, investments and macroeconomic indicators also prove that these two sectors are leading Turkish economy. In total, these industries consumed 18.3% of total export in 2013. As stated by Social Security Institutions there are approximately 52.000 textile and clothing firms in Turkey with more than 918.000 employees. (Ministry of Economy, 2013)

Due to given employment, export numbers, high quality and fashionable goods and investments on high quality technologies, about Textile and Apparel industries which is ranked as one of the global top ten exporters, hence, the importance of these sectors must not be avoided and must be worked harder to become one of the global leaders

i. Current state of the industry and firms' geographical dispersion

Apparel industry is one of the locomotive sectors of Turkish economy. It has developed parallel to textile sector and the industrialization efforts is the main reason for the motivation of modern apparel industry in Turkey. In 1990's, Apparel Industry in Turkey had exceeded 20% of total export (ITKIB, 2011).

In 2011, total apparel exports were 15.7 billion US$. There are quality textile and apparel facilities and thousands of apparel producer and exporter in Turkey. More than 11.000 clothing manufacterers which includes small and medium enterprises exist. These facilities are intensified mostly in Marmara and Aegean regions. Especially the cities like İstanbul, Bursa, Tekirdağ, İzmir, Çorlu and Gaziantep take significant share in the apparel development (ITKIB, 2011).

One of the major advantages of the Turkish apparel industry is, that the technology used is high. Therefore, Turkey is ahead of many apparel producing countries (ITKIB, 2011).

ii. Strengths and Weaknesses of the industry

Similar to textile industry, apparel industry has its own strengths and weaknesses. When we begin by the strengths, it can be observed that one of them is related to the location of the producers to the markets. Because of the geographical proximity to the main markets and short distance logistics time is consumed. Same situation is valid for foreign trade opportunities where, proximity to European countries as main buyers is also another advantage. Customs Union agreement with EU and free trade agreements with other countries can also be assessed in the same context (Koçak, 2005).

Some more strengths can be referred as the elasticity in production, qualified human resources, ability to meet design and fashion needs and sufficient raw materials (Koçak, 2005).

On the other hand, the weaknesses on apparel sector is parallel to the ones in the textile sector. Labor costs and productivity effects the industry. Raw material and energy costs also has a huge impact on production. Moreover, the lack of study on the Design and Brand effects the industry in general. This weakness impact the brand image on Turkish goods (Koçak, 2005).

Political and economic instability is also referred as a weakness in the industry. It causes, complications on the determination of price fluctuations in raw material prices (Koçak, 2005).

In addition to the above weaknesses, the lack of strategic partnerships, lack of accurate statistical data, lack of public and private sector resources and the problems regarding marketing and distribution channel of companies are counted as weaknesses in the industry (Koçak, 2005).

iii. Foreign Trade

The result of geographical advantage can be seen from the number of exports. Turkey has made almost 80% of the exports to EU countries. The ability to meet the

requirements of these countries depending on quality fashion and design made it possible.

According to the WTO statistics in 2012;

- Turkey has a share of 3.8% in 2008 and is on 4th place worldwide.
- Second in European Union with a share of 12.1%.

Within 20 years, Turkey has increased seven times of its export. In 1990's export numbers were showing 2.9 billion US$ but in 2011 it is 15.7 billion US$.

The major export destinations are;

- Germany
- UK
- France
- Spain
- Italy

The top 10 markets contain 75% of the total export. (Table 6)

Table 7: Leading markets of clothing export of Turkey

Leading Markets for Clothing Export of Turkey					
	2010 1000 $	Share in Total %	2011 1000$	Share in Total %	2011/10 Change %
Germany	3.554.497	25,0	3.884.201	24,8	9,6
United Kingdom	2.019.263	14,2	2.036,605	13,0	0,9
Spain	1.122.276	7,9	1.347.896	8,6	20,1
France	1.162.015	8,2	1.254.151	8,0	7,9
Holland	704,722	5,0	856,436	5,5	21,5
Italy	700.398	4,9	817,868	5,2	16,8
Denmark	431,802	3,0	460,186	2,9	6,6
USA	414,834	2,9	429,389	2,7	3,5
Belgium	390.364	2,7	414,607	2,6	6,2
Russian Federation	258,929	1,8	2996,507	1,9	14,5
10 Countries Total	10.749.099	75,7	11.797.846	75,3	9,8
Other Markets	3.456.818	24,3	3.867.128	24,7	11,9
Total Clothing Exports	14.205.917	100,0	15.664.974	100,0	10,3

Source: Ministry of Economy, 2012

There are also worldwide famous brands that produce their products in Turkey. These products are being sold in Turkey and worldwide. On the other hand, there are many Turkish companies who created their own brands and developed in recent years. They have opened up to world markets and some of them gained reputation in the world.

2.2.3 Possibilities for Development of two Industries: Advantages of Management Information Systems

Current state of the textile and apparel industries provide some opportunities in both national and global markets for Turkish producers. In this context, we can summarize certain strengths that might provide new opportunities for the related industries.

Regarding the textile industry, one of the strengths is the location of Turkey towards global, especially EU markets. Technology intensive production and fabric design ability can be assumed as important advantages in EU market where Turkish textile and apparel products are widely acknowledged by the help of certain marketing initiatives (e.g. fashion week). Existence of the free trade arrangements can also be estimated as empowering factors in here. Increasing pattern of Turkish textile products and high quality raw material exports are the most significant issues that can further be improved in the context of the global markets. Especially when it is combined with the design capability and production elasticity, high quality cotton production have an indirect positive effect that can be deepened for Turkish apparel industry. Hence, these strengths can be used for the purpose of accessing an increasing amount of markets in the global field.

On the other hand, both industries have disadvantages we already stated including lack of cooperation between state and private actors, operational issues such as lack of inventory control, marketing ability and high production costs might have a shading effect on the production and marketing activities. Similar problems also exist for the apparel industry such as inaccurate statistical data, marketing problems, high raw material prices and specifically lack of effective design knowledge may jeopardize production quality and output level. Therefore effective monitoring of the markets and facilitation of the semi-structured decision making initiatives might be needed and this is in fact one of the most significant reason for the introduction of a MIS in the industry.

In order to explain the role of MIS for decision making, the following comparison can be given.

Imagine the role of heart in a human body. The heart supplies the body with blood and forwards it to the destinations. So the heart accomplishes its mission by supplying human body with blood.

One can say the same thing for management information systems. MIS can be referred as heart and information can be referred as blood. So, MIS accomplishes the same function in an organization. It collects and processes the sources and sends it to destinations. The systems must carry out the information requirements for managers. (Laudon and Laudon, 2011). Some important roles of MIS can be seen below;

- MIS meet the expectations of users by using systems such as Business Intelligence and Decision Support Systems. By using a Business Intelligence tool, managers can make plans and take decision on a situation that may happen in the future. The Business Intelligence tool can provide a knowledge base for everyone in the organization. As a result, the information and analysis that can be created by BI tools can save huge amount of valuable time (Laudon and Laudon, 2011).
- MIS provides data for managers in order to control, plan and manage organizations.
- By providing operational data, MIS helps managers at operational level.
- MIS helps managers at the middle level by providing short term planning.
- MIS helps to establish business plan, goal settings and strategic planning for top level managers.
- MIS helps to generate information for decision making. As a result, it has a significant function in administering and leading an organization.
- Gives overall picture of the company and the sector.
- Companies are able to find out their strengths and weaknesses due to the real-time reports on performance about any field.

Hence, MIS might help textile and apparel producers to better perform, function and improve productivity. Divisions of related organizations may work more efficiently. Finally, as intelligence systems they might help decision makers to keep track of marketing, finance, production and personnel, to improve the performance or abolish some of the problems we stated above.

CHAPTER THREE

3. FROM DATA TO MANAGEMENT INFORMATION SYSTEMS

3.1 From Data to Management Information System

In this section, we briefly mention the conceptual framework of the system that will be designed for textile and apparel industries. For this reason, we overview basic concepts such as data and information and then databases in which data is used in practical form. Then, we proceed by expressing the relationship between databases and MIS.

3.1.1 Distinction between Data and Information

Before explaining the aspects of a database, the distinction between data and information must be clearly understood. Therefore, we overview primary functions of data.

At first, computers require data and humans require information. As a computer concept, data can be referred as symbols that are input, stored and processed by a computer in order to create a useful information as output (Fricke, 2007). Data can be referred as the building block and information gives meaning and context. In theory, data is raw. It contains ones and zeros that except experts, no one is able to read. In this form, data has not yet been shaped or processed. After the data has been processed, it becomes the information which humans can read and interpret. Information can be defined as the conclusion of putting data into meaningful knowledge (Fricke, 2007). This processed form can be used for multiple purposes, in practice for example, decision making purposes in organizations.

Although the bigger picture is more complex, it makes it easier to understand what data means and the relationship between data and information. The relationship can be easily understand by referring a DIKW Pyramid. The DIKW Pyramid stands for Data, Information, Knowledge and Wisdom and it explains the connections between all four (Fricke, 2007).

The DIKW Pyramid identifies the collection of data, its processing, retention and interpretation. It describes whether it is applicable to businesses as it is to human brain.

In order to clearly understand the DIKW Pyramid by examples, the following table can be considered.

Table 8: DIKW Pyramid by examples

	Example	Explanation
Data	I have one item.	The data displays a 1, not a zero.
Information	It's a banana.	The item and its characteristics can be understood.
Knowledge	A banana is a fruit.	The patterns in the information can be understood and be applied to the item.
Wisdom	Banana is never added to a fruit salad.	There is an underlying commonly understood principle that governs the item's purpose.

The DIKW Pyramid describes the evolution of raw data to become understandable concept (Fricke, 2007).

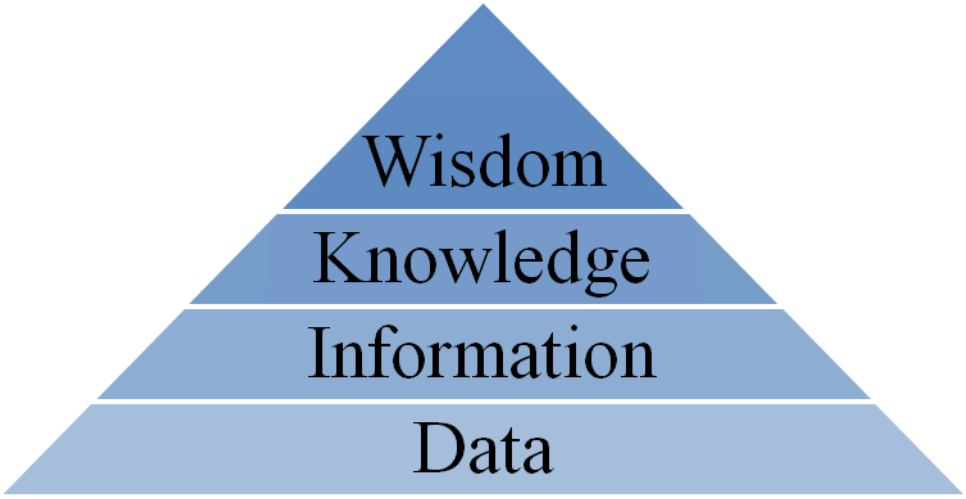


Figure 4: DIKW Pyramid

3.1.2 Practical Usage of Database in Organizations

Data is a key resource in any organization and a database is a requisite component in a MIS.

In order to process the data, a database which is an interrelated collection of data is a must. The data should be organized properly so that it could be accessible with different queries and a relatively easy way.

Databases are being used by lots of companies and must be used in order to compete in this modern era. Databases store information in cloud or electronic memories that can be searched, retrieved and organized easily compared to paperwork.

Databases save time in an organization. For example when we imagine searching for a record which may take some time when digging into paperwork, by using databases, the record can be found within seconds and few clicks that would same substantial amount of time.

By the help of databases, different perspectives can be established while sorting or looking for an answer in the data. A request for a list of item from database may take a minute or two minutes but on the contrary digging a record and combining different spreadsheets by hand may take huge amount of time.

Different sources can be linked together in order to find important things perhaps never have been noticed before about the organization.

Furthermore, social media can be monitored, customers can be tracked within a database and potential customers can be found.

As a result, the functions of database within an organization can be summarized below (Erickson, 2009);

- Handles data storage for use and for future developments
- Easy to use and obtain data whenever required
- Protects data against vandalism and other disorders
- Control data and make specific up to date changes

A database system consists of four components (Erickson, 2009);

- **Data**
- **DBMS (Database Management System):** The database management system software applications are designed to work and interact with the user and database itself. DBMS allows users to define, create, query, update and administer databases. Some examples for DBMS are: MySQL, PostgreSQL, Microsoft SQL Server, Oracle, SAP and IBM DB2.
- **DDL (Data Description Language):** The DDL is a language that is used to create and modify the objects in a database such as tables, views and schemas. Some example queries for DDL are: CREATE, ALTER and DROP.

- **DML (Data Manipulation Language):** The DML is a language that is used to manipulate data in a database such as database tables. The manipulation of data consists of deleting data and modifying existing data. Some example queries for DML are: SELECT, UPDATE, INSERT and DELETE.

The most widespread data manipulation language is called Structure Query Language (SQL), which allows users to manipulate and retrieve data within a relational database.

3.1.3 Mutual Interaction of Management Information System and Database

There is a fundamental distinguishment between data and information or MIS and data processing. In this context, data is the fact that are independent in nature and illimitable in number (Fuller, 2010).

For example, a motorcycle may have a number of data items such as its cost, year, model etc. By the help of these data, useful information such as cost per mile can be obtained. Consequently, information is always composed of data, but not all data engender paramount information.

The data of an organization needs to be inputted in the database by an employee via using excel tables or via a graphical user interface. If the organizations have their own application where they can input the parameters, those parameters may get loaded into database by itself which also mean the automatization of data input. Other type of entering data is, excel tables. Excel is the most commonly used tool worldwide by organizations. An employee can input the excel data to a database by using data transfer software.

The data that are inputted goes through some procedures such as extract, transform and load which is explained at 2.3.4 ETL title. After implementing those procedures, the data gets sent in data warehouse. The refined data which is located in DW is now ready for reporting purposes. By using reporting tools the data within data warehouse can be reported for managerial purposes.

Managers have a systematic way of developing information. Usually, the information is obtained by informal means. In order to use the information efficiently, a formal and systematic way of gathering information is very consequential for every manager.

The input of MIS is provided by data and the interactions of database with MIS at different levels can be listed below;

- Top Management
- Middle Management
- Operating Systems

Developing information depends on four main factors;

- Completeness: All parts of the information must be included.
- Timeliness: Information which is out of date has no help to the manager.
- Conciseness: The large amount of data must be summarized in order to make sense to the manager.
- Relevance: Management Information System must produce information that will engender action or provide insight.

3.2 Data Storage, Search, Processing and Retrieval

In order to establish the MIS, database is a must have. Without data, an information would not exist thus, management information system could not be established. Therefore, for this project database needs to be particularly focused.

Usually, a database needs at least one user to administrate. This user is called Database Administrator. For security reasons, no one can reach to the data except administrator if and only if the administrator does not give permissions to other database users to reach and query the data.

During the establishment of MIS, the data were stored in local computers hard disk storage. The data was protected by a password so that no one could easily reach the private data. This is the normal case for any kind of database, since no one would want someone else to acquire the data of his/her organization.

There were two databases in the MIS implementation. One is OLTP database which holds the raw data and the other one is data warehouse. Both were stored in the local hard disk and both were processed by using SQL queries. The data can be searched and retrieved by the administrator by using simple SQL queries.

3.2.1 Data Storage: Warehouses

A data warehouse is a centralized storage location for data generated by business processes where developers, business analysts, and executives can gather information about the company in question when they need to make key decisions. A data warehouse serves not only as a central location that's easily accessible, but also as the go to place for reliable, consistent on various business operations. The basic idea here is not only having good data but also knowing where to find the required data is (Fuller, 2010).

Data warehouse is a location where all the information needed is. Therefore it reduces the complexity of creating a report. In a business intelligence project, data warehouse is essential. Some advantages of data warehouses are;

- Data can be integrated from different sources.
- New types of analyses can be done.
- Reduces the cost of accessing historical data.
- Data can be shared and accessed easily.
- Standardized data across an organization.

3.2.2 Data Processing Issues from Databases: On-line Transaction Processing and On-line Analytical Processing

Online Transactional Processing, which can also be referred as OLTP are database structures where the relational data is kept and huge amount of data are inputted and updated. Simply, OLTP systems contain the organization data which is used in daily activities.

OLTP systems require immediate responds to users. For example, an automated teller machine (ATM) must answer users timely and process inputs and outputs in the database.

The must-have for an OLTP system are speed, concurrency and recoverability. Therefore, OLTP systems are the most used and required database systems globally.

Online Analytical Processing, which can be referred as OLAP was first renamed by E.F.Codd in 1994. It defines the systems that provides rapid access to the built-in multi-dimensional data.

The OLAP systems are adjusted for reporting rather than transactional processing. OLTP systems are considered as the source of OLAP databases. Moreover, OLAP structures' that are fed by OLTP systems are formed to provide information about the whole organization.

The most important feature for OLAP systems are the time dimensions. OLAP structures are derived from historical data that enables complicated analysis. Furthermore, OLAP databases are designed for analyzing data unlike storing or receiving.

There are two types of data regarding OLAP structure. These are:

- **Fact Tables:** Fact tables hold numeric data. The data may include aggregations, averages or any kind of mathematical value.
- **Dimension Tables:** Dimension tables hold categories depending on the fact tables. For example, time, category or any type of dimension depending on the data.

For example, if the OLTP database contains store purchases, by using OLAP structure the data can be sliced up into dimensions to create new types of analysis and find out new patterns for decision making purposes.

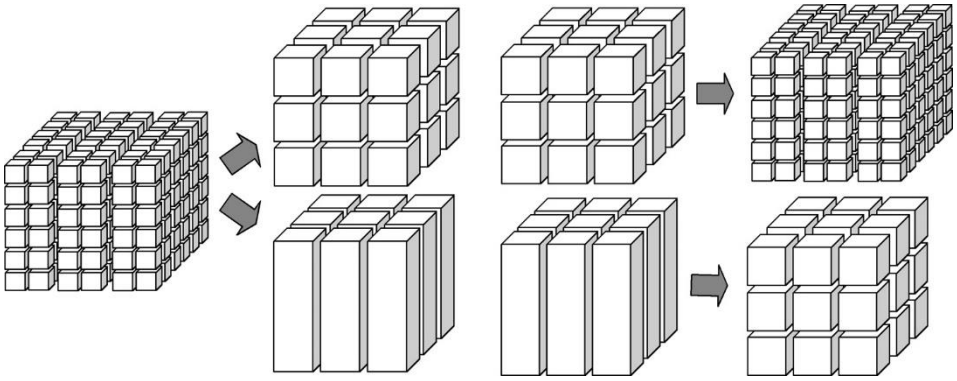


Figure 5: An example of an OLAP cube

When we compare OLTP and OLAP we can observe that OLTP database systems are best working on transactional data. They offer faster response times during read and write operations. On the other hand, OLAP database systems are best appropriate for analytical purposes and they offer only read operations.

OLTP systems are not suitable for giving important decisions regarding managers. They are not meant for slicing the data. They are optimized for real-time

read and write operations. They cannot be used for analytical purposes because the performance of the system would decrease. Of course, OLTP systems can also work with analytical purposes but simply they are not built for complex analysis.

3.2.3 Data Retrieval Issues: ETL Extract, Transform and Load

ETL is the process of pulling data out of source systems and delivering it in a central data warehouse.

Building ETL systems consumes about 70 percent of the resources needed for implementation and maintenance of a typical data warehouse (Kimball, 2013).

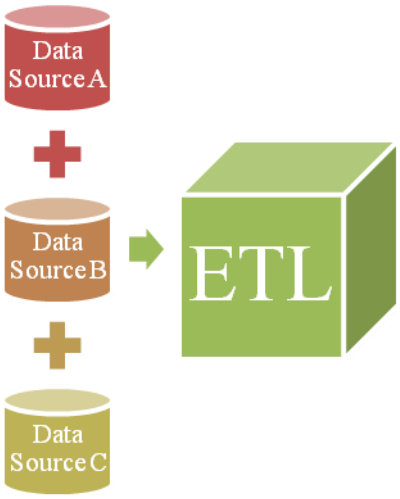


Figure 6: Process of extract, transform and load

- **Extract**

The first part of an ETL process involves extracting the data from the source systems. During extraction, data from a source system is extracted for further use in a data warehouse.

The data may be in excel files, access databases, simple text files and some other form of databases. The main goal of this step is to get all the required data from the source system with as little resources as possible. Extract stage should not be designed in a way that would negatively affect the source system in terms of performance and response time.

- **Transform**

The transformation stage is important due to getting useful information out of the mess. The data has to undergo some processes before being loaded to data

warehouse. This step requires joining data from several different sources, generating aggregates, sorting, deriving new calculated values and applying advanced rules (Kimball, 2013).

The “transform” stage includes few steps that have to be done. These stages are;

1. Cleansing
2. Summarization
3. Derivation
4. Aggregation
5. Integration

- **Cleansing:**

Cleansing is the first and most important step of transformation process where the source data violates the rules are determined and made consistent (Kimball, 2013). An example is the date formats in data source. They must be turned into same format to proceed. In order to do that, you have to determine a terminology and map all the different terms to that. Cleaning should perform some basic rules such as;

- Making unique identifiers
- Convert null values in a standardized form
- Validate address fields, convert them into proper naming

For example the data for sex categories can be Male/Female/Unknown and M/F/NULL. At this point the identifiers must be unique therefore at the stage of data cleansing the categories must be translated to a standard format.

- **Summarization:**

Values are summarized to obtain total which are calculated and stored at multiple levels as business fact in multidimensional fact tables.

- **Derivation:**

New data is created from existing source data during this process. Suppose that you need a variable that is not available in the data. For example calculating profit from income and expense items. The variable profit is now available to use in the dashboards for further usage.

- **Integration:**

  The expected result is to have unique data element known by one standard name with one standard definition. In the step, the data must be standardized.

- **Aggregation:**

  The step where all the data is brought together. Data elements may be aggregated from multiple source files and databases. For example a database table which has time dimension and profit fact table can be brought together in order to make sensible reports on the dashboard. The sequential flow is summarized in the figure below:

Figure 7: Operational Flow for Transform

- **Load**

  The loading phase is the final step of ETL process. The information from data sources for example database are loaded and stored in a form of tables into data warehouse. After the ETL processes, the newly designed fact and dimension tables gets delivered into the data warehouse for further usage.

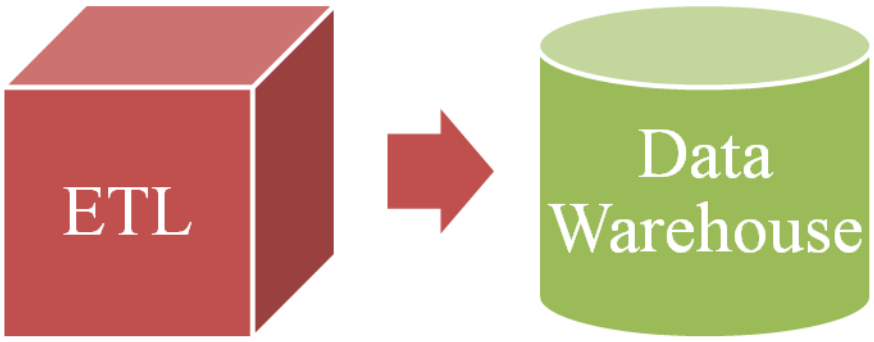


Figure 8: Delivering data into Data Warehouse

CHAPTER FOUR

4. SYSTEM DESIGN METHODOLOGY

4.1. Data Used

The Management Information Project that was developed, uses the data of ITKIB and Sample Textile Manufacturer database from Oracle. The data of ITKIB is mostly documents in MS Excel format and the following actions were taken care of:

Imagine an excel table as a data source which needs to be useful for the system in order to create successful reports. The reports that were prepared for the general overview about export and import numbers were generated by the data of WTO, ITKIB and TUIK. The data of excel tables can be seen below:

- 2012 and 2013 Turkey's raw material and textiles export numbers, share in total exports, changes from 2012 to 2013 and share of top 20 countries in total exports which can be found in Table 2.
- Textile exports and share in economy's total merchandise by countries and values for the years 1990,2000,2010,2011 and 2012 which can be found in Table 3.
- The values of Share of World Shipments of Textile Machineries in Year 2010.
- Fastest growing exporters of textiles by comparing the years 2005 and 2011 and the percentage gain by countries which can be found in Table 5.
- 2010 and 2011 Turkey's leading markets of clothing export. The share in total and 2010/2011 change can be compared.
- The values export numbers by countries can be found. The share in world exports/imports within 2011, 1980, 1990, 2000, 2011 and the annual percentage change within 2005-2011, 2009, 2010 and 2011.

The data from excel tables consists of Textile and Apparel export values. These values are dimensioned by countries and years in a way that the big picture in the industries can be seen with details, country comparisons per year can be made, and competitors can be observed to strengthen the current status for Turkish Textile and Apparel industries.

The reports of a Textile and Apparel manufacturer for decision making purposes were created from the Sample Textile Manufacturers database which was located at Oracle sample database developer tools.

The data in the sample textile manufacturers are:

- Raw Materials with time and price details.
- Financial statuses (invoice, cheque, bank accounts credit cards).
- Supplier data.
- Order data's and details for raw materials, apparel products.
- Creditor data.
- Current stock numbers.
- Sale and purchase data regarding industry products.
- Order numbers for industry products.
- Products which are located at the development center but not on branch offices.

The creation of fact and dimension tables from the sample data, needs high SQL tuning capabilities. The perfect data warehouse must be implemented, for the system to perform fast and efficient. So during this project, complex queries were written to join the data and create perfectly working fact and dimension tables.

After creating the fact and dimension tables, these tables must be filled with data. In order to fill the data for the tables, some procedures were written. The procedures are simply SQL queries that fill the data in definite time periods just like a database where the data gets loaded into data warehouse every night at 01:00 am where the work hours are over, procedures start working and load the data to the implemented tables. All SQL codes for creating fact and dimension tables and procedures can be found in APPENDIX A and APPENDIX B.

Table 9: The SQL codes for creating fact and dimension tables

ALIS_FIYAT_MALIYET	PURCHASE_PRICE_COST	APPENDIX A
BYT_CHECK_STATUS	DIM_CHECK_STATUS	APPENDIX A
BYT_FATURA_STATUS	DIM_BILL_STATUS	APPENDIX A
BYT_IRSALIYE_STATUS	DIM_WAYBILL_STATUS	APPENDIX A
BYT_KASA_STATUS	DIM_CASHDESK_STATUS	APPENDIX A
BYT_MUHASEBE_STATUS	DIM_ACCOUNTING_STATUS	APPENDIX A
BYT_ZAMAN	DIM_TIME	APPENDIX A
F_MERKEZDE_SUBEDE_DEIL	FACT_CENTER_BRANCH_NOT	APPENDIX A
F_SUBEDE_SATILMAYAN	FACT_BRANCH_NOT_SOLD	APPENDIX A
FACT_KREDI_KART_ODEME	FACT_CREDIT_CARD_PAYMENT	APPENDIX A
FACT_SATIS_ALIS_BIRIM	FACT_SALES_PURCHASE_UNIT	APPENDIX A
FACT_STOK_DURUM	FACT_STOCK_STATUS	APPENDIX A

Table 10: The procedures, that loads data into the fact and dimension tables

ALIS_MALIYET_OLUSTUR	PURCHASE_COST_CREATE	APPENDIX B
P_ALIS_MALIYET_INC_OLUS	P_PURCHASE_COST_CREATE	APPENDIX B
P_FACT_SATIS_BIRIM_REFRESH	P_FACT_PURCHASE_UNIT_REFRESH	APPENDIX B
V_BYT_PRODUCT_MV_REFRESH	V_DIM_PRODUCT_MV_REFRESH	APPENDIX B
V_FACT_K_K_OD_MV_REFRESH	V_FACT_K_K_OD_MV_REFRESH	APPENDIX B
V_FACT_STOK_MV_DURUM_REFRESH	V_FACT_STOK_MV_STATUS_REFRESH	APPENDIX B

All of the fact and dimension tables were created by using SQL queries. The list of fact and dimension tables renamed after the data warehouse was created for better understanding to a decision maker as below:

Table 11: Dimension Tables – Fact Tables

Dimension Tables	Fact Tables
➢ Product	➢ Stock Status
➢ Time	➢ Checks
➢ Fatura İşlem Tipi	➢ Sale Purchase
➢ Invoice Transaction type	➢ Payments
➢ Accounts	➢ Orders
➢ Supplier	
➢ Branch Departments	
➢ Credit Card	
➢ Order	

Dimension Tables

Product: This dimension gives the raw materials and apparel products names. The manufacturer name and stock name are also in this given dimension.

Time: By using "zaman" dimension, any data (e.g. raw material price) can be categorized by time. The time values consist of 2014 and 2015 in the sample database that was collected from sample textile manufacturer's database. But for excel tables, the time dimension goes back to 1990 until 2014.

Invoice transaction type: This dimension gives information about financial status. For example it gives information about export bills, income bills and purchase invoice.

Check Status: This dimension gives information about cheques. The information behind it is whether the cheque is unrequited, return or charged.

Accounts: This dimension gives information about bank names, branch names and International Bank Account Numbers (IBAN).

Supplier: This dimension gives information about supplier firm names and addresses.

Branch Departments: This dimension gives information about branch name and department names for a textile and apparel manufacturer. For example, in order to find out the profit regarding departments and branches, this dimension can be used.

Credit Card: This dimension gives the information about credit cards for the firm. The manager can see the credit card statuses, limits and whether the cards are active or passive

Order: This dimension gives information about order date. It gives the current status for orders and units.

Fact Tables

Stock Status: This fact table gives the numbers for current stock numbers, input and outputs and the amount of current stock.

Checks: This fact table gives information about the sum of checks.

Sale Purchase: This fact table gives the values of, current purchase and sale prices for apparel products and raw materials. The values can be with or without tax included. Furthermore, it gives unit purchase and sale prices where unit profitability can be also calculated.

Payments: This fact table gives the information about disbursement and the status of payments.

Orders: This fact table gives information about order quantity, percentage of delivered orders and delivered order numbers.

4.2 System Architecture and Methodology

In our MIS, we can summarize our system architecture as follows and in sequential order as below;

a) First of all the sample data is being loaded to an OLTP database system by using simple SQL queries which will be explained in more details in Methodology section.

b) After the data is loaded, it is sent to the extract, transform and load stages in order to create a data warehouse. The first step within the established system until now is to extract the data from the source system.

c) Since the extracted data is not suitable yet for creating reports, transform stage is used to improve performance of the whole system and have a better quality data.

d) At the transform stage, first the cleaning of data is made. Some of the nonsense data's are omitted or fixed and NULL values are cleaned.

e) During the transform stage and summarization step, values are summarized to obtain total which are calculated and stored at multiple levels as business fact in multidimensional fact tables.

f) During the transform stage and the derivation step, new data is created from existing source. For example the profit is calculated from income and expense items. The variable profit is now available to use in the dashboards for further usage.

g) At the Integration stage, for example: At some points the data had 01/07/2012 and some had 2012-07-01. The date dimension must be set clearly in order to create reports regarding dates.

h) At the last stage of transform which is aggregation step, the data is combined. The dimension and fact tables are joint together in or to create a data warehouse. During this stage, for example a textile raw materials fact table and the date dimension are added the data warehouse.

i) At last the data is ready to load into data warehouse. The data warehouse is the central location where all the fact and dimension tables are held. So, in order to create reports, the data within warehouse is used by the reporting Interface.

j) Finally, to create a report for decision makers, all of the fact and dimension tables are ready. By simply dragging and dropping the column names and values a report can be created. Furthermore, filters, pivot tables and graphs can be added to ease the analysis of reports. This flow can be observed in Figure 10 as a whole.

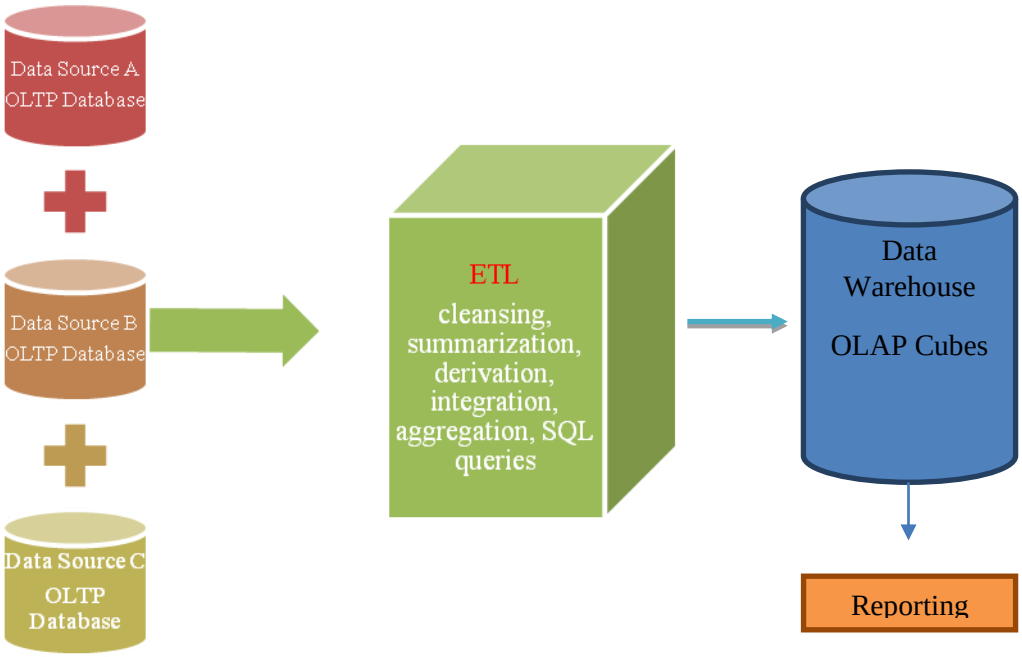


Figure 9: Management Information System Architecture

The data warehouse that was established for the study is the centralized storage where the fact and dimension tables are stored. The data warehouse consists

of three parts. The raw data, metadata and summary data. The raw data is simply the data itself. If the data is “1” then the raw data is “1”. Metadata is the description of raw data. For example if the raw data is “1”, that means male else if it is “0” that means female. Summary data is one of the major advantage for data warehouse. Summary data is the data at different level of summarization. For example, the retrieval of apparel product sales can be summarized by weeks, months or years. As long as the data allows, more levels can be added to summarization within data warehouse. Main logic behind our data warehouse design can be observed in Figure 9.

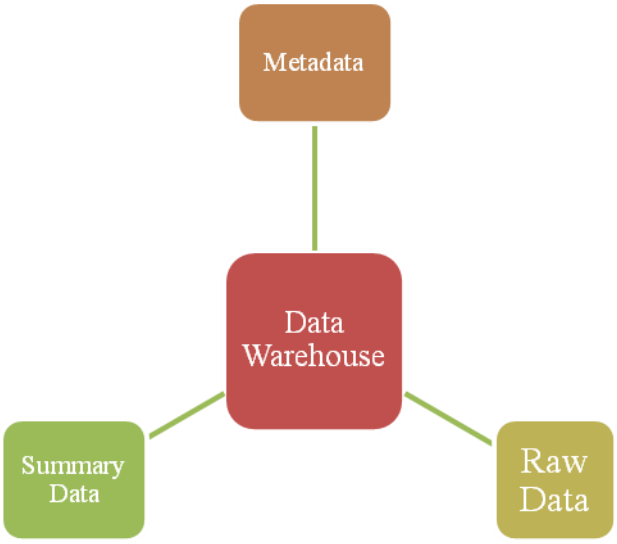


Figure 10: Components of Data Warehouse

In our design that is developed for textile and apparel industries, by using advanced SQL queries, a report is generated to find out for example the number of an item that can be sold in a period of time. In this case, for example the number of apparel products that will be sold next year can be calculated from the previous year’s outcome. So the model must be built in a way that it should calculate the previous year’s output and then analyze the average of items that was sold. Finally by joining the time dimension and the output that was created by the analysis, the result can be deployed to the reporting services.

Our MIS conception mainly involves use the OLTP database that we already mentioned because, the data which is used for the project cannot be directly converted to OLAP cubes and the OLTP systems are best suited for storing valuable

data. OLAP cubes are created by OLTP databases and later on used a source of data warehouse. Therefore, the data needs to be loaded into OLTP database and then by using high-level sql queries, it can be transferred into data warehouses.

The OLAP conversion from OLTP can be explained for our project with an example as follows. For example the data of OLTP consists of raw materials and their prices or the numbers in stock with time dimensions. If we try to report based on OLTP data, it would take a huge amount of time and perhaps fail to report because, the system will try to query all of the data which is not aggregated/summarized and search for the data on each row and also the time values which is located on a different table in the database. Furthermore, the query will scan for every transactional detail record for past years in the database. Therefore, this would not be a good approach for reporting. While converting the OLTP data to OLAP where the SQL code can be found in APPENDIX A, the tables of raw material stock values and prices were summarized, which means the foreign and primary keys of database tables were combined in order to create a dimensional model. As a result, the data is now summarized and reporting can be done on the new dimensioned OLAP cube. Considering the fact that OLTP/OLAP conversion is ETL process in other words, our explanation on ETL process can be found in Appendix C in detailed terms.

The OLAP and ETL are the key parts of the MIS system. Without creating a data warehouse system, a MIS project cannot perform and give effective outputs to users. Since the data used is getting larger and larger day by day, a well-structured data warehouse system must be established.

The MIS is prepared and installed on the below settings:

- Windows Server 2008 platform.
- A virtual machine is prepared and used for the business intelligence products.
- 4 GB ram (memory) and 4 cores were used.
- 100 GB hard disk was used.

The above resources can be found on any laptop which means that this project does not need thousands of dollars to invest. However, given our arbitrary cost amount, it should also not be forgotten that, in case of data increase, cost augment in a parallel manner.

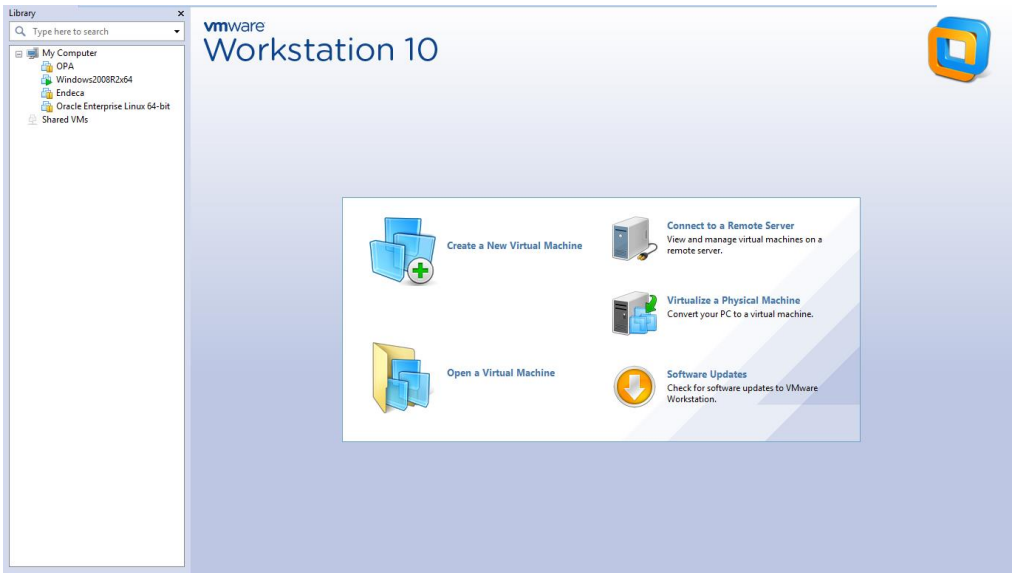


Figure 11: Example of a Virtual Machine Interface

A virtual machine is an application where operating systems can be installed without interfering the running operating system of a PC. By using a virtual machine, the resources of a project can be set as required.

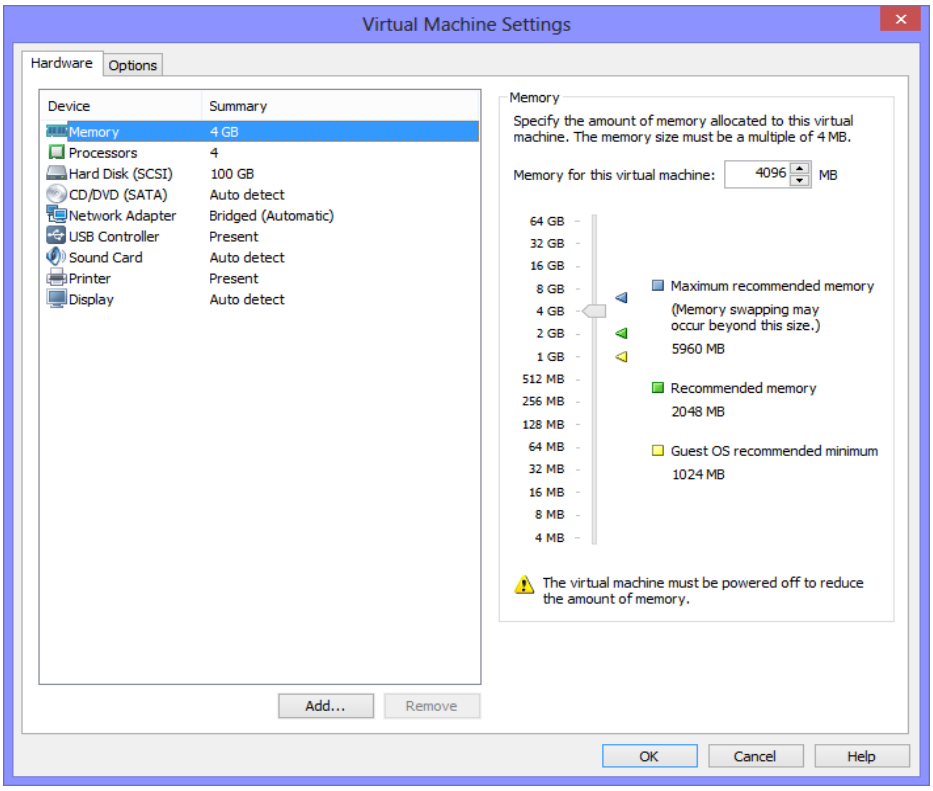


Figure 12: Settings of the systems Virtual Machine

As you may see from the screenshot above, the settings for example, ram or hard disk can be set to any value any time. So if the resources given for a project is not enough, the user may change the settings anytime.

The tools that were used can be seen below:

- Oracle Database Express Edition 11g
- Oracle Business Intelligence Publisher Trial Edition 11g
- Oracle Repository (RPD)
- Toad for Oracle

Oracle Database Express Edition 11g

Oracle Database 11g Express Edition is a **free** to use database. It is simple to administer and deploy for production purposes. There are many free databases in the sector that could be used but the performance, security and speed of Oracle Database is found adequate for our study. Therefore, for the system, Oracle Database Express Edition 11g was preferred. (http://www.oracle.com/technetwork/database/database-technologies/express-edition/overview/index.html).

Oracle Business Intelligence

The Management Information System project that was developed for the textile and apparel industries runs on Oracle BI Publisher Trial Edition.

Oracle Business Intelligence provides capabilities which allows to:

- Collect up-to-date data.
- Present the data in understandable formats.
- Deliver data to the employees in your organization.

These features helps organizations to:

- Make better decisions.
- Take informed actions.
- Implement more efficient business processes (Fuller, 2010).

Oracle Repository (RPD)

For the ETL purposes, Oracle Repository was used. The reason for using Oracle RPD was the exact reason why Oracle Database Express Edition 11g used. Since the database used is a product of Oracle, the ETL tool would perform better with the Oracle family products.

Toad for Oracle

Toad is a tool for SQL developers. During the implementation of this project, all of the SQL queries were written, compiled and executed by using this tool. SQL queries can be written on hundreds of compilers but the main reason why TOAD was used is clear. Because, for better performance, Oracle family products were preferred.

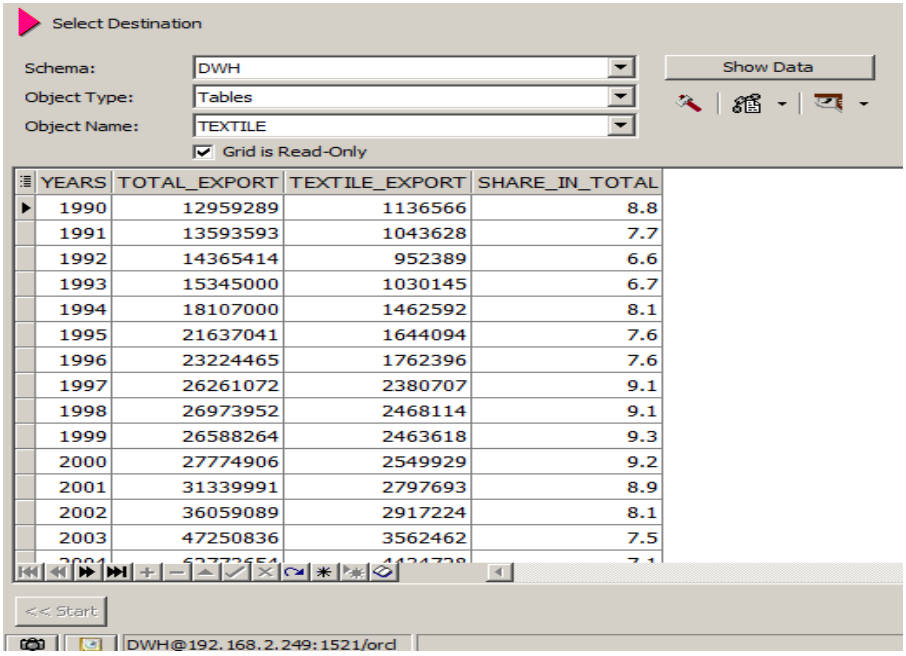
Steps of the Developed Model for the Management Information System

1) While loading the data to the OLTP database two procedures were used.

1. First, for the excel data, the column names were created in the database. After creating the column names, the data for the specified table were imported by using TOAD.

SQL code for creating a table:

CREATE TABLE TEXTILE (years integer, total_export number, textile_export number, share_of_textile number);



YEARS	TOTAL_EXPORT	TEXTILE_EXPORT	SHARE_IN_TOTAL
1990	12959289	1136566	8.8
1991	13593593	1043628	7.7
1992	14365414	952389	6.6
1993	15345000	1030145	6.7
1994	18107000	1462592	8.1
1995	21637041	1644094	7.6
1996	23224465	1762396	7.6
1997	26261072	2380707	9.1
1998	26973952	2468114	9.1
1999	26588264	2463618	9.3
2000	27774906	2549929	9.2
2001	31339991	2797693	8.9
2002	36059089	2917224	8.1
2003	47250836	3562462	7.5

Figure 13: Importing excel table by using TOAD

2. Second procedure was importing the Sample Textile Manufacturers database. For this implementation, first of all there must be a user created in order to administer the database. Then, the user must be granted with admin rights and finally the import can be done via using SQL commands.

SQL code for creating and granting admin rights to a user:

create user <username> identified by <password>

grant connect, create session, imp_full_database to <username>

impdp <username>/<password> directory=my_dir dumpfile=textile_dmp logfile=textile.log

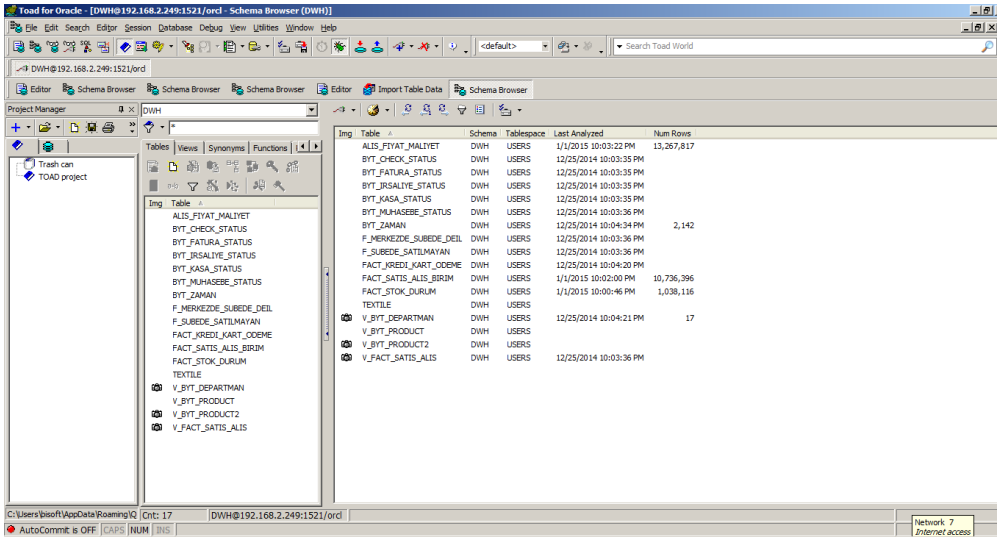


Figure 14: Example of imported database tables

The definitions and overview of b,c,d,e,f,g,h steps can be found in 2.2.5 ETL Heading

2) The data extraction takes places in this step. For extracting the data, a tool called RPD (Repository) was used. The RPD tool consists of 3 sections. These sections are:

- Physical Layer
- Business Model and Mapping
- Presentation Layer

These 3 sections take part in different phases of the ETL process but for extraction, only the physical layer takes place. At the physical layer, a connection pool was created to create a link between database and extracted source. All of the created tables gets imported to the physical layer for further operations which is transformation stage.

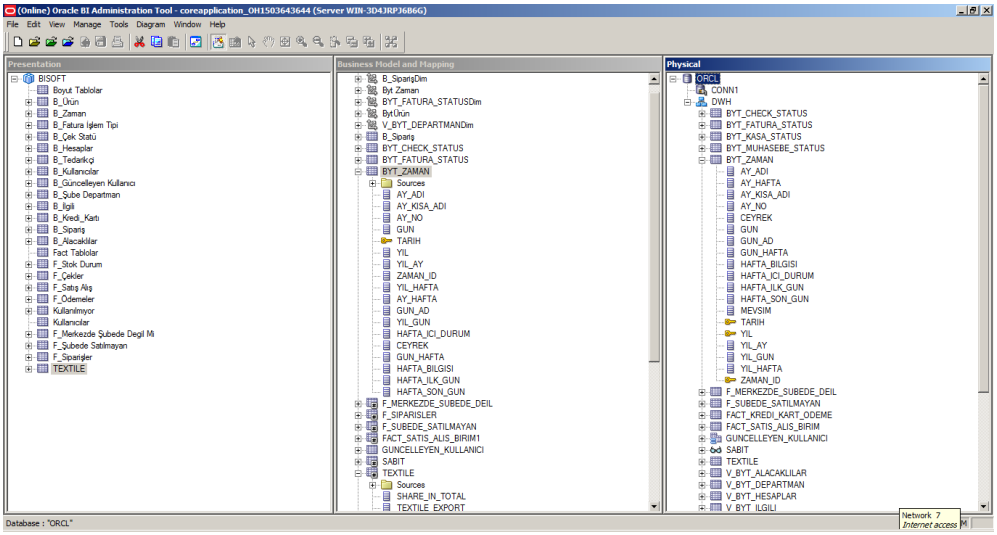


Figure 15: Overview of RPD

c,d,e,f,g,h) The transform stage is where most of the data manipulations takes place. At this stage which is Business Model and Mapping layer, cleansing, summarization, derivation, integration and aggregation steps takes place as The primary and foreign keys were joint together in order to create relationship between fact and dimension tables. Moreover, the total and average values were calculated and new columns were created. Null and abnormal values were cleaned.

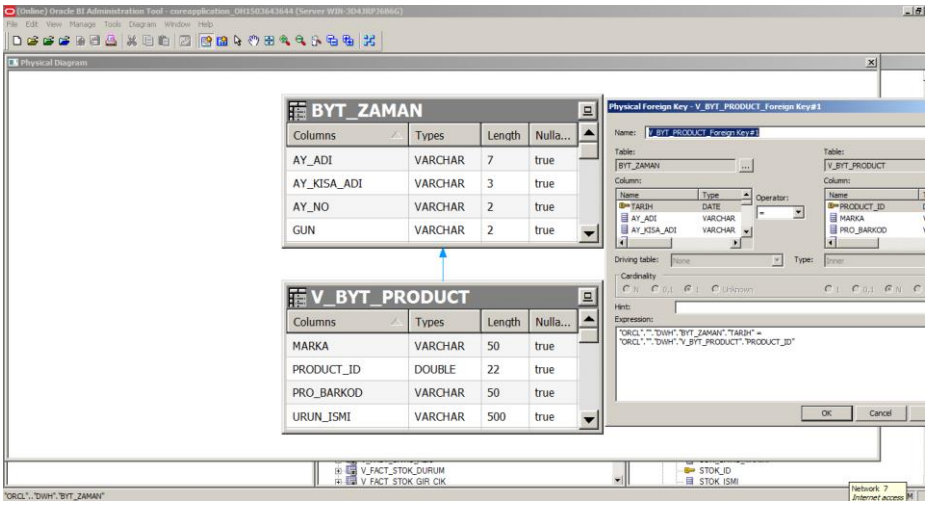


Figure 16: Example of Business Modelling at the Transformation stage

i) Finally after transforming the data, loading stage takes place. At this stage, the modelled data gets transferred to the presentation layer. The data at the presentation layer gets loaded to Oracle Business Intelligence software. But the key point about this layer is that the table names on this layer get loaded directly to the

browser. So for decision making purposes, to ease the use of the dashboards, renaming each column and table for decision maker's knowledge is a key subject. For example while developing the system the name of any column cannot get a blank space. So the names look like ANA_GRUP, ALIS_KDV or GUNCEL_STOK_DEPO. As one may presume, these column names are understandable but not clean enough to understand what happens inside. Therefore renaming the names as, Ana Grup, KDV'li fiyat or Güncel Stok may help for reporting purposes.

j) Finally, everything is ready to create statistical and managerial reports for decision makers. By simply dragging and dropping the fact and dimension tables, dashboard can be generated. An example of creating a dashboard can be see below:

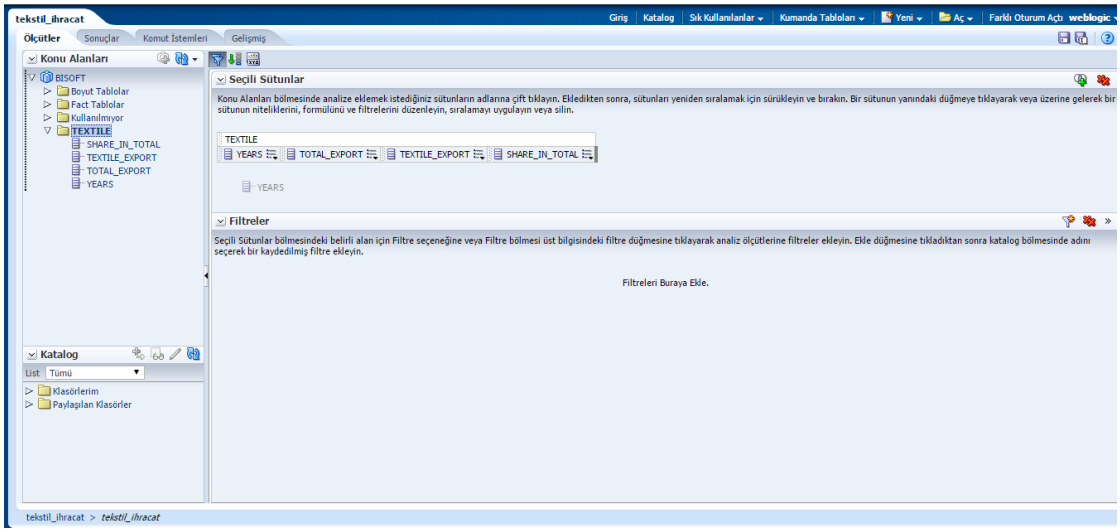


Figure 17: Example of creating a dashboard by simple drag and drop

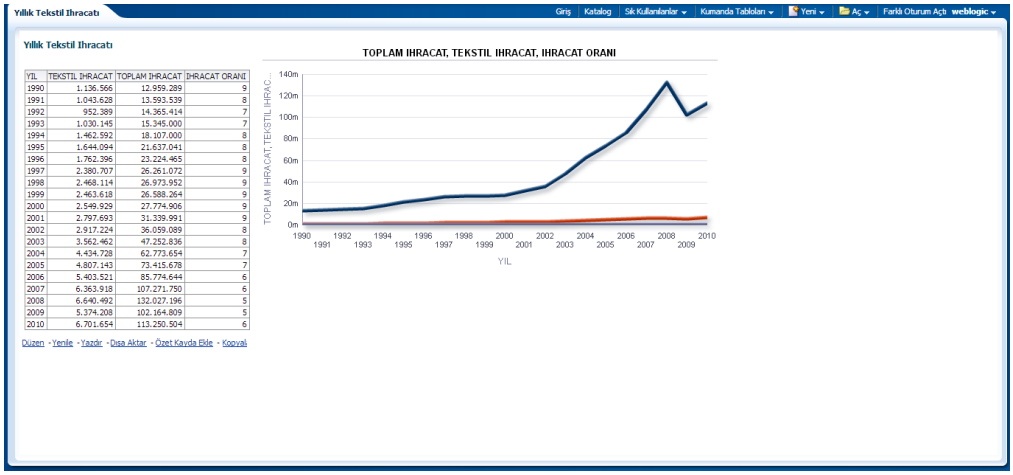


Figure 18: Example of a dashboard

4.3 Interview with Sector Firms

To assess system's potential contribution to the end users, interviews with 13 firms were conducted. As the system is in the development stage and not yet recognized by the end users, such as textile and apparel firms, to discover firm intentions, mainly a qualitative sampling methodology has been selected. Accordingly, homogenous sampling (Patton, 1990) methodology was chosen and as a result of interviewed firms were selected in a way that they would involve similar characteristics. Interview results table can be found in Appendix D whereas the results were analyzed at the end of discussion section.

CHAPTER FIVE

5. SYSTEM OUTPUTS AND IMPLICATIONS OF THE SYSTEM FOR DECISION MAKING

In this section, we basically follow a logical sequence for better evaluation of the outputs and discussion of the results for textile and apparel industries. In the first sub-heading, we take both industries into account in a separate way regarding the fact that our data can be distinguished. Hence first and second group of outputs are displayed at separate industry basis depending on data constraints. Then, for effective decision making purposes third group of outputs combine both industry data and discuss related issues. This grouping is done under following topics: foreign trade, financial reports, market performance and reports related to strategic issues. Then we discuss potential contribution of the outputs in the second sub-heading. Some of the output screenshots are provided under the first sub-heading. Data sources are separately shown under respective headings. Finally under this section our main goal is to display the operability of the system architecture for different purposes. The charts we use under different headings are pie charts, pivot tables, line charts, radar charts and bar charts. Chart selection is based on in a way that is more explanatory for decision maker. Brief definition of the chart types are as follows;

Pivot Table: A pivot table is used for processing multi-dimensional data. It can be regarded as a table element which is able to sort, group and summarize data. The dimensions in a pivot table can be changed via drag & drop so that visualization of a pivot table can be observed from different perspectives.

Line Chart: A line chart is mostly used for visualizing values/data by using lines in a graph. Mostly, it is used to represent fluctuations of series of values to indicate changes.

Bar Chart: This chart is one of the most commonly used type of chart. It is primarily used for representing value activates over a given period of time.

Area Chart: This type of chart emphasizes a change in values/data by filling beneath the line connecting data points.

Radar Chart: The radar chart can be referred as multi-dimensional chart which serves for comparing values/data. It is able to show series of values over multiple dimensions.

5.1 Outputs for both Industries

There are three groups of outputs which are grouped in a similar way. The first group of outputs deals with foreign trade performance, destinations and shares. Second group of reports are related to financial issues such as raw materials, stock movements, profit and expenditures. Final group of data for both industries concerns sales performance and figures on item basis.

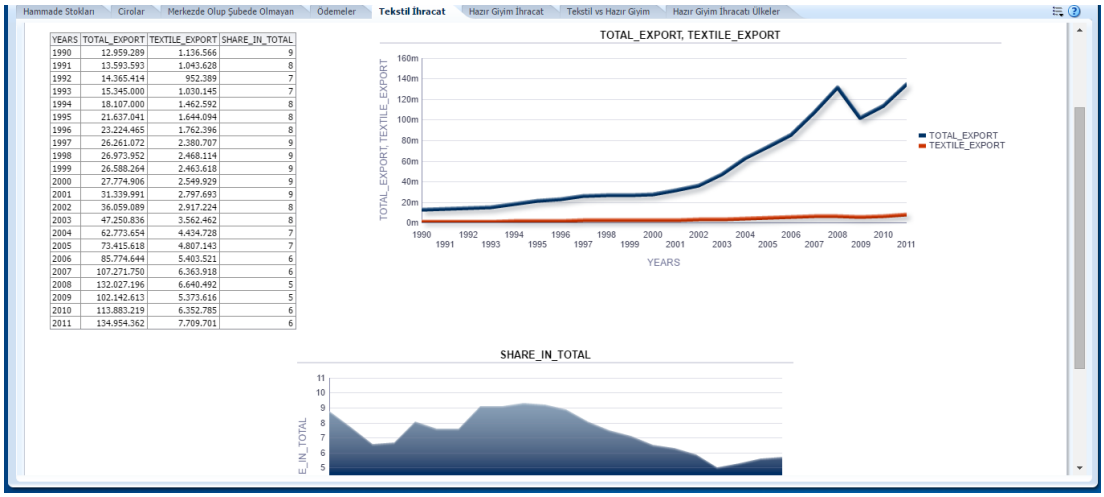
a) Foreign Trade

Global Reports for both Industries

This section mainly consists of outputs regarding the global dimension of the industrial activities. Under foreign trade heading, we use ITKIB export data to reach the aggregate outputs which has been specified in the previous section. All values are in USD currency basis.

Report 1– Textile export numbers in comparison with total exports

This report consists of a year filter, line chart, area chart and pivot table. Depending on the filter, the total and textile export values gets drawn. The charts within the report can be dimensioned by the years between 1990-2011. In this report, a decision maker can see the general overview of textile exports per year and analyze the share of textile exports within total exports. The current status of the textile industry can be seen in the global league.



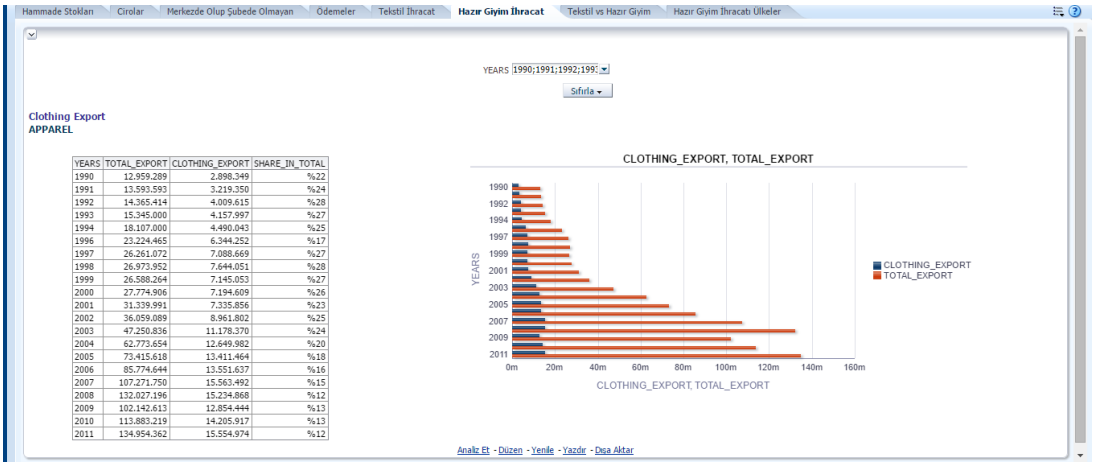
YEARS	TOTAL_EXPORT	TEXTILE_EXPORT	SHARE_IN_TOTAL
1990	12.959.289	1.136.566	9
1991	13.593.593	1.043.628	8
1992	14.365.414	952.389	7
1993	15.345.000	1.030.145	7
1994	18.107.000	1.462.592	8
1995	21.637.041	1.644.094	8
1996	23.224.465	1.762.396	8
1997	26.261.072	2.380.707	9
1998	26.973.952	2.468.114	9
1999	26.588.264	2.463.618	9
2000	27.774.906	2.549.929	9
2001	31.339.991	2.797.693	9
2002	36.059.089	2.917.224	8
2003	47.250.836	3.562.462	8
2004	62.773.654	4.434.728	7
2005	73.415.618	4.807.143	7
2006	85.774.644	5.403.521	6
2007	107.271.750	6.363.918	6
2008	132.027.196	6.640.492	5
2009	102.142.613	5.373.616	5
2010	113.883.219	6.352.785	6
2011	134.954.362	7.709.701	6

Figure 19: General overview of textile exports

For the line chart, y axis are the values for total export and textile export and the x axis is years. For the area chart, the x axis is years and the y axis is the percentage of share of textile export within total export.

Report 2– Apparel export numbers in comparison with total exports

This report consists of a year filter, line chart, area chart and pivot table. Depending on the filter, the total and textile export values gets drawn. The charts within the report can be dimensioned by the years between 1990-2011. In this report, a decision maker can see the general overview of apparel exports per year and analyze the share of apparel exports within total exports. Data provides information on the current ranking of the apparel industry in the context of import market within the globe.



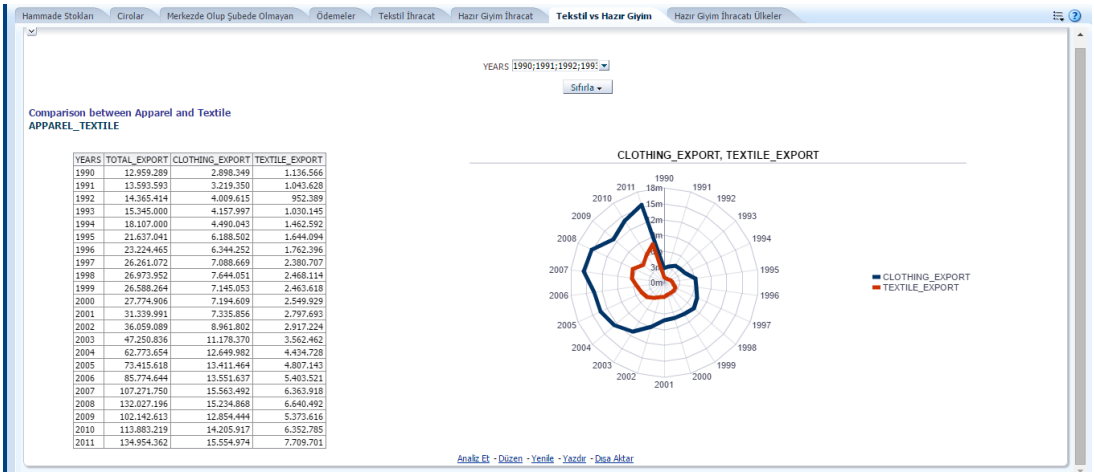
YEARS	TOTAL_EXPORT	CLOTHING_EXPORT	SHARE_IN_TOTAL
1990	12.959.289	2.898.349	%22
1991	13.593.593	3.219.350	%24
1992	14.365.414	4.009.615	%28
1993	15.345.000	4.157.997	%27
1994	18.107.000	4.490.043	%25
1996	23.224.465	6.344.252	%17
1997	26.261.072	7.088.669	%27
1998	26.973.952	7.644.051	%28
1999	26.588.264	7.145.053	%27
2000	27.774.906	7.194.609	%26
2001	31.339.991	7.335.856	%23
2002	36.059.089	8.961.802	%25
2003	47.250.836	11.178.370	%24
2004	62.773.654	12.649.982	%20
2005	73.415.618	13.411.464	%18
2006	85.774.644	13.551.637	%16
2007	107.271.750	15.563.492	%15
2008	132.027.196	15.234.868	%12
2009	102.142.613	12.854.444	%13
2010	113.883.219	14.205.917	%13
2011	134.954.362	15.554.974	%12

Figure 20: General overview of apparel exports

For the line chart, y axis are the values for total export and apparel export and the x axis is years. For the area chart, the x axis is years and the y axis is the percentage of share of apparel export within total export.

Report 3– Export value comparison

In this report, comparison between textile and apparel Industries considering export values is made. This report consists of a year filter, radar chart and pivot table. Depending on the filter, the total export, textile export and apparel export values gets drawn. The charts within the report can be dimensioned by the years between 1990-2011. In this report, a decision maker can see the comparison between textile and apparel industries per year.



YEARS	TOTAL_EXPORT	CLOTHING_EXPORT	TEXTILE_EXPORT
1990	12.959.289	2.898.349	1.136.566
1991	13.593.593	3.219.350	1.043.628
1992	14.365.414	4.009.615	952.389
1993	15.345.000	4.157.997	1.030.145
1994	18.107.000	4.490.043	1.462.592
1995	21.637.041	6.188.502	1.644.094
1996	23.224.465	6.344.252	1.762.396
1997	26.261.072	7.088.669	2.380.707
1998	26.973.952	7.644.051	2.468.114
1999	26.588.264	7.145.053	2.463.618
2000	27.774.906	7.194.609	2.549.929
2001	31.339.991	7.335.856	2.797.693
2002	36.059.089	8.961.802	2.917.224
2003	47.250.836	11.178.370	3.562.462
2004	62.773.654	12.649.982	4.434.728
2005	73.415.618	13.411.464	4.807.143
2006	85.774.644	13.551.637	5.403.521
2007	107.271.750	15.563.492	6.363.918
2008	132.027.196	15.234.868	6.640.492
2009	102.142.613	12.854.444	5.373.616
2010	113.883.219	14.205.917	6.352.785
2011	134.954.362	15.554.974	7.709.701

Figure 21: Comparison between textile and apparel industries

The radar chart can be referred as two-dimensional chart which serves for comparing the values of textile and apparel industries based on time period. In this case, it is designed to show series of values over multiple time variables.

Report 4– Leading Markets for Turkish Apparel Industry

This report consists of a line chart, pivot table and pie charts. The total apparel export values specifically for 2010 and 2011 can be seen. Depending on the filter, the total and textile export values gets drawn. In this report, a decision maker can see the leading textile exported countries for Turkey and analyze the rise between 2010 and 2011 per country.

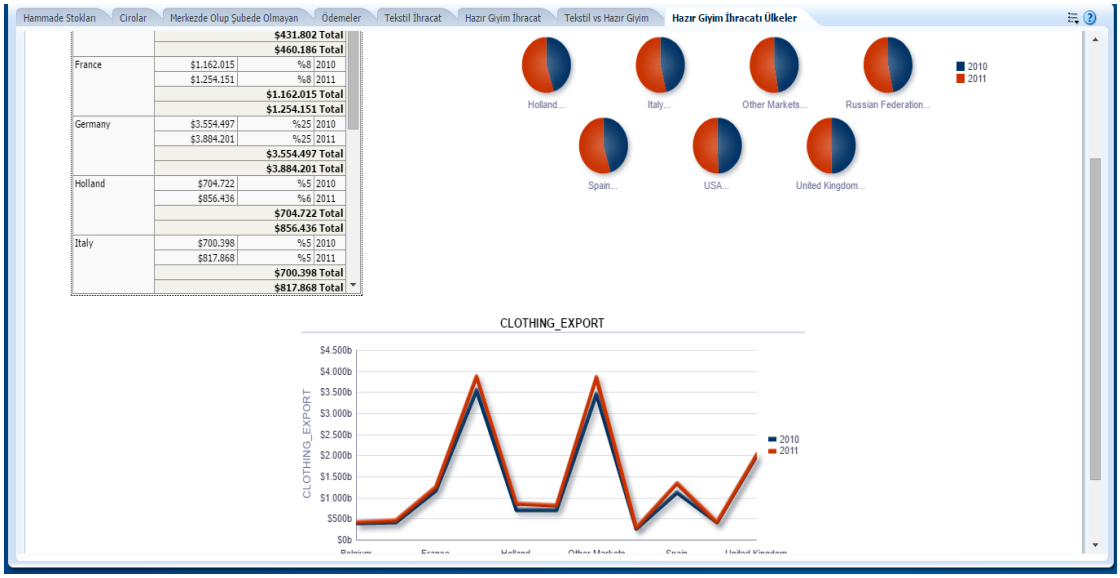


Figure 22: Leading markets for Turkish Apparel Industry

The pie charts shows the difference of export values between 2010 and 2011 per country. On the other hand, the line chart also shows the values between 2010 and 2011 but shows another detail which is the comparison between countries. The x axis of line chart is countries and the y axis is export values.

b) <u>Financial Reports</u>

Reports under this heading mainly consists of the ones that are related with raw material purchases, stock movements, profit overview and a detailed tablet that contains various expenses. We used sample data under this heading.

Report 1– Net purchase amounts for raw material for textile industry

This report consists of a bar chart and a filter. Depending on the filter, the net purchase amount for a raw material gets drawn. Also, the chart can be dimensioned per years and months.

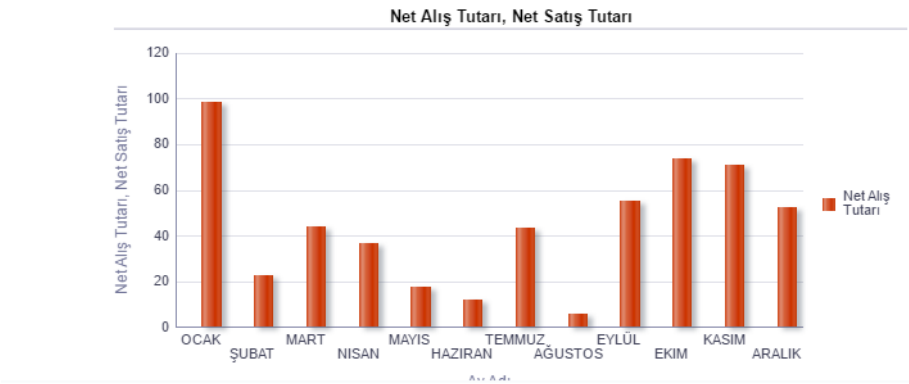
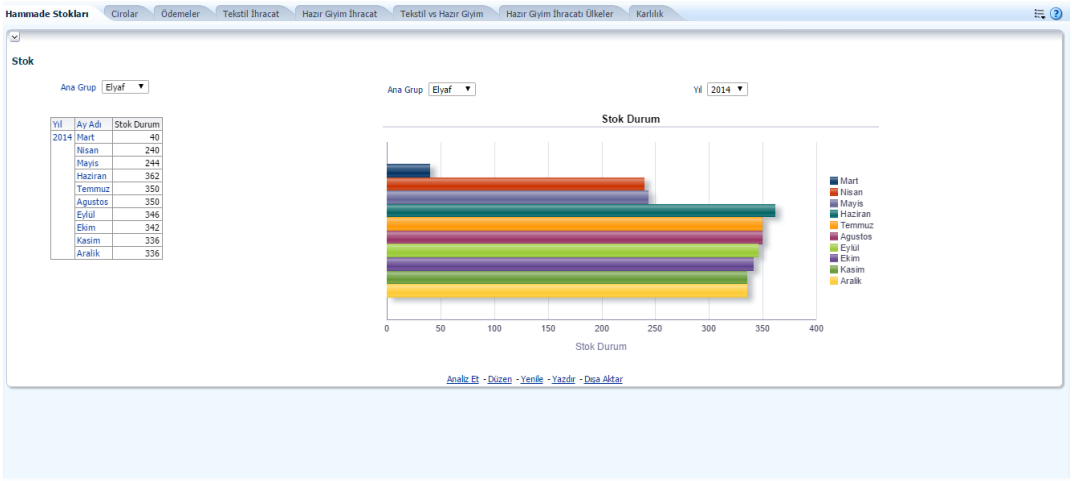


Figure 23: Net Purchase Amounts for Raw Materials

The x axis are the months within a year and the y axis is the net purchase amounts.

Report 2 – Stock Movements for textile and apparel industries

This report which can be displayed separately whenever required for both industries consists of multi-dimensional pivot tables. The number of items that are sold versus the number of items in the stock can be compared in monthly basis.



Yıl	Ay Adı	Stok Durum
2014	Mart	40
	Nisan	240
	Mayis	244
	Haziran	362
	Temmuz	350
	Agustos	350
	Eylül	346
	Ekim	342
	Kasim	336
	Aralik	336

Figure 24: Stock Movements for Textile and Apparel Industries

Report 3 – Profit

This report just for apparel industry consists of a pivot table. It shows the apparel products production cost and sale price at product basis. It compares and evaluates the profit within the time dimension of year 2014. The pivot table estimates whether a product is profitable or non-profitable.

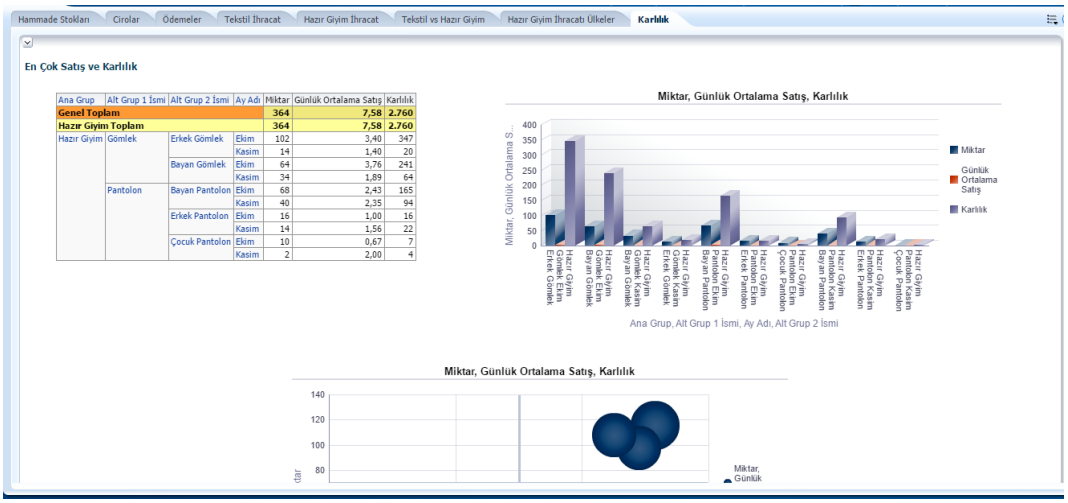


Figure 25: Profit results for Apparel Industry

Report 4 – The expenditures dashboard to keep track of the finance of a firm

This report consists of multi-dimensional pivot tables can be formed for any industry as it provides firm-based information. Here, a pivot table is mostly used to summarize data in decision support systems. The most important attribute of a pivot table is, the summarized data can be sorted, give total and the average values for the specified column. **.** The paid or unpaid taxes, expenditures such as salaries of the employers, advertisements, and even more can be calculated and observed by the decision maker.

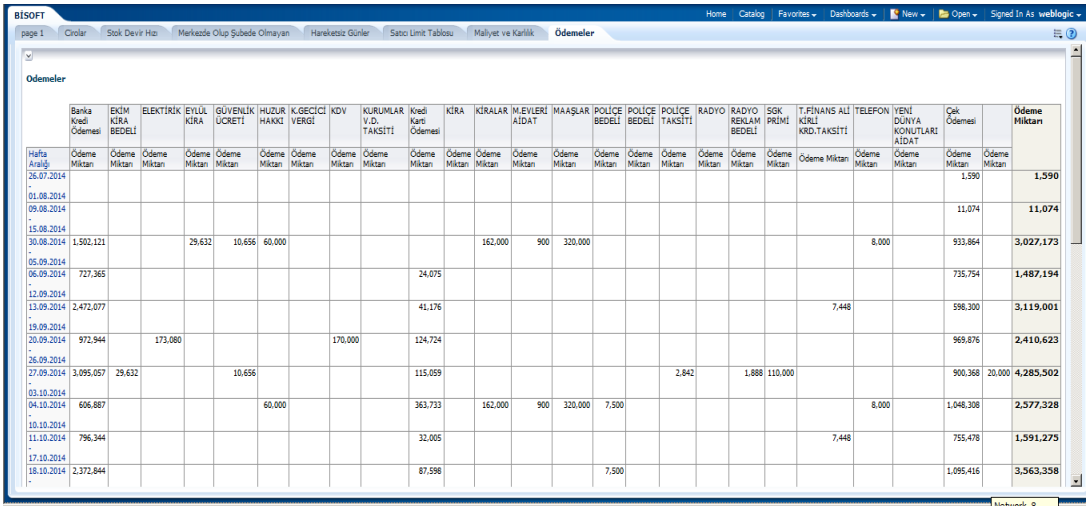


Figure 26: The values of expenditures – taxes

c) Market Reports

Report 1 – The number of items that can be sold in a given timeline

This report for apparel industry consists of a bar chart with filters of product and time. The evaluation is prepared by the previous year's data. The system calculates the number of items sold from the previous years and estimates the number of items that can be sold at a given period of time. The bar chart below shows the number of units that can be sold in a period of time on each day dimension.

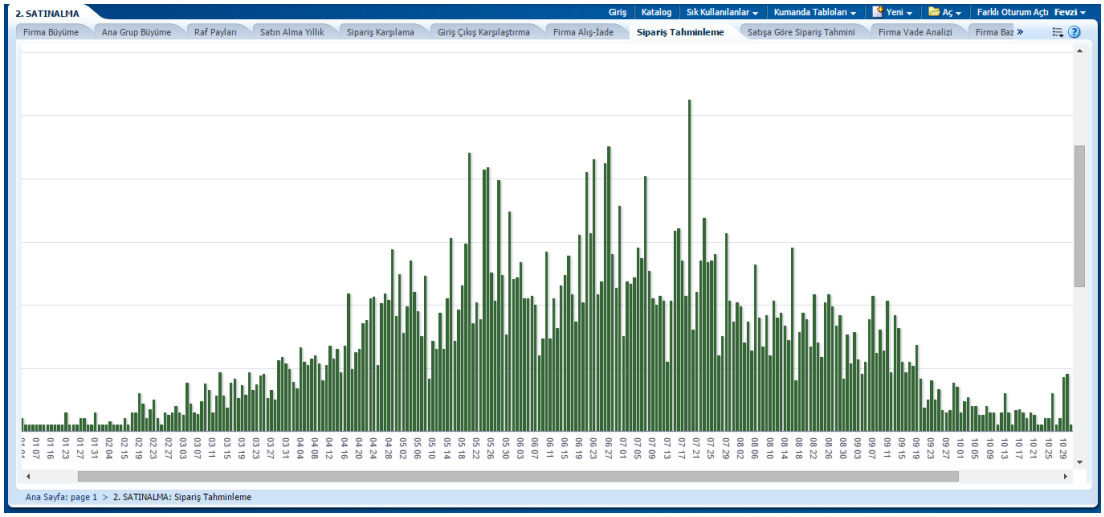


Figure 27: The number of items that can be sold in a given timeline

5.2 Discussion: Potential Benefits of Market Monitoring for Decision Making and firms' intentions as end users towards the system

In this section we discuss system outputs' potential contribution for decision makers. We follow the same sequence for the topics we introduced in the previous section. Under this heading, we discuss related issues in two dimensions. As the first dimension, we evaluate the results in a way that they would provide facility in the decision making process in the scope of an individual firm. As the second dimension we mention the output content in a way that they would provide information in industry basis. We have to mention that in this section effect of branding and firm-based marketing policies for apparel industry is ignored and that the data is basically is market information.

We begin by first group of outputs which are related to foreign trade. When a firm which deals with trade activities with countries abroad, three different outputs might provide practical results. When textile export figure outputs are considered, by Report 1 and 2 might provide information on various topics. Keeping in mind that foreign trade opportunity is a strength for the textile industry itself, for example, besides general status of the industry, both global and local economic environment's effect on textile and apparel price fluctuations can be visualized in holistic frame. Then, for the firms which aim to get involved in exporting activities, output also reveals results on potential pattern of the sector on foreign currency basis unless an extraordinary event such as new quotas or economic crises in export destinations for textile industry and tax policies or export regime changes for apparel industry. We can also imagine a similar figure as the potential presence of international opportunities in case of export trend shows an increasing pattern. This potential presence issue is especially important for the firms which are active in apparel industries regarding the fact that firm policies might be dominant when compared with textile industries. Accordingly new firm strategies, investments can be planned. Provided outputs may also provide insights for decision makers when they need to evaluate effects of certain agreements as the ones that were mentioned in previous sections. Same theory also holds for the effect of certain export incentives. Finally, the export figures also provides insights on the demand pattern for apparel industry products in foreign countries.

Report 3 mainly compares both industries. It can be visualized from Report 3 the export pattern of both industries together. In case of vertical integration decisions, keeping in mind that both industries are interrelated in the context of raw material procuration, it can be benefited from report 3 while selecting which of the industries to invest for export purposes. Otherwise this report omits policy setting purposes due to the effect of branding and marketing activities worldwide. In fact, Report 4 can be more efficiently used to which country to route the exporting activities as it provides yearly and country based comparative information for apparel industry. This information can especially useful for the apparel firms who want to expand their businesses abroad for selecting target markets. Moreover, decisions depending on export policy regimes can also be seen in this report in country basis, which might have an empowering effect on target country selection. Appearance of

the values in this report may also be indirectly useful for making profitability decisions.

In the financial section, first report provides information about raw material prices for textile industry. As previously mentioned one of the problems in the textile industry is the raw material price fluctuations. In this report, a decision maker may observe and compare the raw material prices year by year and even day by day. As a result, the decision maker can decide and foresee when to buy or what to buy. As a market information, this might serve for selection of the suppliers being local or international ones. As an apparel firm, this information can also be useful for adjusting purchasing policies considering again the fact that textile industry outputs act as raw materials for apparel industries.

Financial report 2 provides information on stock level versus sold products. This information is especially useful when a decision maker would think about demand patterns for both industries. This report also presents information that can be used for solving one of the weaknesses of the industry which is the lack of inventory. In this way, again, report 2 output can be used for creating possible solutions to this problem by decision maker or serve for related policy design issues.

Being a proof of dimensional modeling Report 3 also informs the decision maker on the profitability of the apparel products. Moreover both reports can also be useful while decisions about stock costs are to be made as they do display the stock numbers in the market. For managerial purposes, the number of items left in the stock may affect the decisions regarding unit prices and sales for the items. Report 3 also includes production and sales costs and sales prices of the related apparel item. It can concluded report 4 might enable a group of strategic decisions including, marketing and production.

It can be found information on various expenses such as general administrative expenses, marketing, selling and delivery and financial expenses in report 4 of finance section for both industries. Alike report 3, decisions in a wider context can be made based on the related information, which might mainly be the ones concerning financial strategies. Here we assume that the information provided by report 5 would mainly be vital for the SMEs. This output is especially important when certain issues concerning weaknesses that are mentioned in the second part of the study are taken into account. Recalling the fact that labor, energy and tax expenses seem as significant weaknesses of the textile and apparel industries,

tracking the financial status is crucial for the decision makers. Hence, displayed outputs might also indirectly effect solution activities for diminishing those weaknesses.

Based on the market report, a decision maker may foresee the number of items that can be sold in the future time. So, he/she can take action according to this results in the table and reset stock decisions (e.g. Increase or decrease the number of items in their stock). The selection of the time period may contribute decisions for prior items to be sold in a specific period of time which might have an enabling effect on the evaluation of market fluctuations regarding certain apparel items.

As previously mentioned system design targets facilitate decision making process for selected domains in the study. Mainly, the decisions are made in an environment for which certain strengths and weaknesses were present for both industries. With a general approach, it is possible that the system outputs can be used in a way to empower decision making processes for leveraging strengths and find solutions in case of weaknesses depending the data we covered for the study. Hence in this sub-section we begin by recalling some of strengths and weaknesses we presented in the second part of the study. We select related strengths and weaknesses that could be matched with our output content.

Especially Kimball's Dimensional modelling approach that has been used to generate outputs for apparel industry in this section, added number of dimensions (unlimited number of dimensions can be added depending on the requirements) enable users visualize multiple dimensions for only one item. In this way, a more detailed observation can be made and more detailed analysis opportunities can be created. This is especially important for structuring the decisions to be made and Kimball's Dimensional model enables the system designers create robust systems in which required number of dimensions can be added for different purposes.

Finally, we can also consider system functions' potential contribution in the framework of its MIS capabilities. Inclusion of unlimited number of dimensions and real-time visualization opportunities provide completeness and timeliness of the information for the decision makers. Moreover, being as one of the main targets of the system, conciseness and relevance characteristics of a MIS are also expected to be confirmed by the system regarding the fact that it provides possibility to include unlimited quantity of data for introducing decision makers insights based on semi-structured information. With the inclusion multiple dimensions whenever required

this information system can be used at different levels of an organization for different purposes being either controlling, planning, forecasting etc. including the ones that could be used for strategic planning as it also provides an overall picture of the industries concerned. We should also note that system permits generation of customized report in timely manner as requested by decision makers.

In fact, in this context considering that the textile and apparel firms' intentions as an indicator, interviews with 13 firms were conducted to discover potential reactions. The answers of the interviews can be found in APPENDIX D.

Interview included 8 questions, however for clarifying the results, by subdividing 6th question into two; findings are discussed the under nine headings. These questions were about the extent of current data usage by the firms, the locations where the information is gathered, profile of the information needed, extent of the offered system usage and extension of the system to different levels in the organization, system benefits for the daily workflow, potential system acceptance, potential benefits of the system functions to organization and recommendations for system improvement.

The results of the first question which is about the firms 'current data usage display the sufficiency of the used data level but it can also be considered that the ouputs of system designed might still serve for the improvement of business processes.

By evaluating the results of the second question on information gathering locations, it can be observed that information is currently generated from different resources where, majority of the firms work with the research companies. Accordingly, it can be inferred that implementation of the system design may offer various advantages in the context of 3rd party dependence issues.

The third question was intended to find out the profile of the needed information. Results reveal that, the firms need information related to production, profitability and stock which was established by the MIS for textile and apparel industries. Hence, it can be deduced that, our system design mainly covers almost all of the topics that firms require and provides different tools for required solutions.

The fourth question investigates the extent of the offered system usage and extension of the system in different levels of an organization. The answers indicate that the ease of use of the system that is designed can be extended into multiple levels in the organization. Especially, the web access opportunity to the system and

simplicity of report creation tools might be utilized by anyone who has intermediate computer knowledge in an organization.

The fifth question is on the system benefits for the continuum of the daily workflow. The results of the question prove that our system tools including risk analysis, personnel tracking and monitoring stock numbers may provide efficient solutions for the undertaking of the daily operations.

The sixth question was on the acceptance level of a similar system by the organizations. According to the answers provided, the majority of the firms stated that they would use such a system and they would benefit from it. In this case, it can also be inferred a potential positive demand pattern by the end users for the system designed in our study.

The seventh question which is connected with the sixth question shows the reasons for the potential system acceptance. The majority of the firms stated that, creating customized reports and analysis of own reports would be beneficial for them. The main reason that proves this result is because of the fact and dimension tables that was design in the MIS. Within the scope of our system, the fact and dimension tables enable joining different types of data, which is not supported by simple OLTP databases enable the abolishment of current constraints which simply means that it is possible to create a type of report in a small amount of time and according to decision makers' requirements.

The eighth question was about the potential benefits of the system functions to firms. The answers indicate that the firms would benefit from such a system by having an easy graphical user interface, easy access, creating custom reports and analysis of different data sources and subjects. The firms also stated that similar applications lets decision makers view the analysis only on one computer but in the MIS we developed, the analysis can be viewed from any computer by only using a web browser and hence provides an extra ease of use.

The last question was about recommendations for the system improvement. The majority of the firms indicated that the system must be more flexible while adding new data thus, they advised to create a graphical user interface to simplify inclusion of new data. Furthermore, creating instant mobile reports and simplification of report process would be useful for the usage of the system.

Based on the interview responses, most of the firms stated that the system could contribute on monitoring stock numbers, staff, production and profitability related issues so that they can improve the current business processes. The majority of decision makers in the interviewed firms also stated that the system can be beneficial for key decision making, and suggested some improvements to ease the process of reporting and analyzing. As a result, it can be deducted that system which has been designed can be useful for textile and apparel industry firms that competes both locally and globally.

CHAPTER SIX

6. CONCLUSION

Our study was about creating a MIS which mainly deals to analyze market information for textile and apparel industries in Turkey. The increasing competition among businesses requires them constantly renew themselves and keep up with the latest technology in order to compete both locally and globally. One of the most popular technology tools that companies focus is data gathering and information evaluation tools in which firms mainly prefer a systematic approach. Accordingly, in our study, we aimed to create a tool for market monitoring purposes and ease the process of decision making processes for experts in textile and apparel industries. The benefits and use of system in the context of MIS were evaluated and, analysis and the contribution to the both industries were discussed in the light of generated outputs.

As its significance mentioned during the study, Turkish textile and apparel businesses' ability of producing goods with international standards ought to be improved in order to compete locally and globally. In order to achieve their goal, both industries have to produce high quality products with reasonable prices. But according to sources mentioned during this thesis, Turkish firms are not organized and could not reach the desired level of efficiency. In this framework, processing of market information can be estimated as a potential contributor in order to increase efficiency and manage businesses for both sectors. Some of the reasons why specifically these industries selected were; the usage of MIS in both industries are currently in the development stage thus, enterprises cannot compete with advanced enterprises in the world, the SME's in Turkey lacks of a comparative weapon such as not accessing data and information to give correct and timely decisions, and finally businesses does not have enough information regarding electronic data interchange. Therefore, it can be stated that textile and apparel industries in Turkey lacks of intelligence and information systems in general terms, and in order to compete both

in local and global markets and to solve this issue organizations should create the infrastructure for MIS which enables to monitor market information effectively. In other words, although selected industries have a promising future, existence of certain problems such as inventory, cost associated raises a need for market monitoring and intelligence system as was intended by our study.

The architecture used for this project was based on the approach of Ralph Kimball's The Data Warehouse Toolkit: The Definitive Guide to Dimension Modeling. The reason for selecting this approach was, the dimensional approach is regarded as a leading approach in the data warehouse subject hence, Ralph Kimball's methodology has become the best seller in the industry since 1996. Therefore, while building the BI architecture for our study, Ralph Kimball's DW/BI approach was referenced to create sample reports. The usage of Kimball's approach created a superior advantage such as fast response time, multi-dimensional responsive charts and newly derived and summarized information. As a result, the designed system enabled monitoring the information and navigation within the data.

It seems that for both industries, the created system might help finding solutions to some the main issues and provide firms with solutions in order to improve decision making quality in multiple fields. Based on our research, seldomness of similar systems in Turkey and absence of a MIS that also act for market monitoring purposes in a similar dimension for concerned industries underlines potential contribution of the study.

As a constraint, working with the market data, firms who have different types of profiles and different types of business environments in both at industrial, local and international levels can be considered as a limitation for the system created. Moreover, another constraint can imagined as the interconnection between textile and apparel industries hence, different kinds of system specifications or requirements they might have. Finally, increasing the number and type of this data used or creation of related firm specific module which aims to address mixed market data and company information can be assumed as further areas of research.

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EDUCATION

Degree	Institution	Year
MS	Çankaya University / Business Administration	2015
BS	Hamburg University of Applied Sciences / Computer Engineering	2010
High School	Özel Bİlkent Lisesi	2004

WORK EXPERIENCE

Year	Place	Enrollment
2013-2015	BiSoft Bilgi Teknolojileri	Pre-sales Engineer
2012-2013	4S Bilgi Teknolojileri	Computer Engineer
2008-2009	Pavo Tasarım	Software Engineer

FOREIGN LANGUAGES

Advanced English and Advanced German

HOBBIES

Bowling, Football, Swimming

APPENDIX A

ALIS_FIYAT_MALIYET

```
DROP TABLE DWH.ALIS_FIYAT_MALIYET CASCADE CONSTRAINTS;

CREATE TABLE DWH.ALIS_FIYAT_MALIYET
(
  STOK_ID                        NUMBER(38),
  PRODUCT_ID                     NUMBER(38),
  TARIH                          DATE,
  OZEL_MIN_ALIS_KDV_FIY_1        NUMBER,
  OZEL_MIN_ALIS_FIY_1            NUMBER,
  FIYAT_STAND_MIN_ALIS_KDVLI_2   NUMBER,
  FIYAT_STAND_MIN_ALIS_2         NUMBER,
  AKTIF_FIYAT_KDV_3              NUMBER,
  AKTIF_FIYAT_3                  NUMBER,
  OZEL_SATIS_FIY_1               NUMBER,
  OZEL_SATIS_KDV_FIY_1           NUMBER,
  STAND_FIYAT_SATIS_2            NUMBER,
  STAND_FIYAT_SATIS_KDVLI_2      NUMBER,
  AKTIF_SATIS_FIYAT_3            NUMBER,
  AKTIF_SATIS_FIYAT_KDV_3        NUMBER
)
TABLESPACE USERS
PCTUSED    0
PCTFREE    10
INITRANS   1
MAXTRANS   255
STORAGE    (
            INITIAL          64K
            NEXT             1M
            MINEXTENTS       1
            MAXEXTENTS       UNLIMITED
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

BYT_CHECK_STATUS

```
DROP TABLE DWH.BYT_CHECK_STATUS CASCADE CONSTRAINTS;

CREATE TABLE DWH.BYT_CHECK_STATUS
(
  CHECK_STATUS_ID  NUMBER,
  CEK_DURUMU       VARCHAR2(100 BYTE)
)
TABLESPACE USERS
PCTUSED    0
PCTFREE    10
INITRANS   1
MAXTRANS   255
STORAGE    (
```

```
            INITIAL          64K
            NEXT             1M
            MINEXTENTS       1
            MAXEXTENTS       UNLIMITED
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

BYT_FATURA_STATUS

```
DROP TABLE DWH.BYT_FATURA_STATUS CASCADE CONSTRAINTS;

CREATE TABLE DWH.BYT_FATURA_STATUS
(
  FATURA_ID     NUMBER,
  ACIKLAMA      VARCHAR2(100 BYTE),
  STOK_HAR_YAP  VARCHAR2(1 BYTE),
  MUHASEBE_FIS  VARCHAR2(100 BYTE),
  E_FATURA      VARCHAR2(100 BYTE),
  ISLEM_GRUBU   VARCHAR2(100 BYTE)
)
TABLESPACE USERS
PCTUSED    0
PCTFREE    10
INITRANS   1
MAXTRANS   255
STORAGE    (
            INITIAL          64K
            NEXT             1M
            MINEXTENTS       1
            MAXEXTENTS       UNLIMITED
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

BYT_IRSALIYE_STATUS

```
DROP TABLE DWH.BYT_IRSALIYE_STATUS CASCADE CONSTRAINTS;

CREATE TABLE DWH.BYT_IRSALIYE_STATUS
(
  IRSALIYE_ID   NUMBER,
  ACIKLAMA      VARCHAR2(100 BYTE),
  STOK_HAR_YAP  VARCHAR2(1 BYTE),
  MUHASEBE_FIS  VARCHAR2(100 BYTE),
  E_FATURA      VARCHAR2(100 BYTE),
  ISLEM_GRUBU   VARCHAR2(100 BYTE)
)
TABLESPACE USERS
PCTUSED    0
```

```
PCTFREE    10
INITRANS   1
MAXTRANS   255
STORAGE    (
            INITIAL          64K
            NEXT             1M
            MINEXTENTS       1
            MAXEXTENTS       UNLIMITED
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

BYT_KASA_STATUS

```
DROP TABLE DWH.BYT_KASA_STATUS CASCADE CONSTRAINTS;

CREATE TABLE DWH.BYT_KASA_STATUS
(
  KASA_ID       NUMBER,
  ACIKLAMA      VARCHAR2(100 BYTE),
  MUHASEBE_FIS  VARCHAR2(100 BYTE)
)
TABLESPACE USERS
PCTUSED    0
PCTFREE    10
INITRANS   1
MAXTRANS   255
STORAGE    (
            INITIAL          64K
            NEXT             1M
            MINEXTENTS       1
            MAXEXTENTS       UNLIMITED
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

BYT_MUHASEBE_STATUS

```
DROP TABLE DWH.BYT_MUHASEBE_STATUS CASCADE CONSTRAINTS;

CREATE TABLE DWH.BYT_MUHASEBE_STATUS
(
  MUHASEBE_ID   NUMBER,
  ACIKLAMA      VARCHAR2(50 BYTE),
  MUHASEBE_FIS  VARCHAR2(10 BYTE)
)
TABLESPACE USERS
PCTUSED    0
PCTFREE    10
INITRANS   1
```

```
MAXTRANS   255
STORAGE    (
            INITIAL          64K
            NEXT             1M
            MINEXTENTS       1
            MAXEXTENTS       UNLIMITED
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

BYT_ZAMAN

```
DROP TABLE DWH.BYT_ZAMAN CASCADE CONSTRAINTS;

CREATE TABLE DWH.BYT_ZAMAN
(
  YIL              VARCHAR2(4 BYTE),
  MEVSIM           VARCHAR2(9 BYTE),
  AY_NO            VARCHAR2(2 BYTE),
  YIL_AY           VARCHAR2(6 BYTE),
  AY_KISA_ADI      VARCHAR2(3 BYTE),
  AY_ADI           VARCHAR2(7 BYTE),
  GUN              VARCHAR2(2 BYTE),
  TARIH            DATE,
  ZAMAN_ID         NUMBER,
  AY_HAFTA         VARCHAR2(2 BYTE),
  YIL_HAFTA        VARCHAR2(2 BYTE),
  YIL_GUN          VARCHAR2(3 BYTE),
  GUN_AD           VARCHAR2(10 BYTE),
  HAFTA_ICI_DURUM  VARCHAR2(11 BYTE),
  CEYREK           VARCHAR2(9 BYTE),
  GUN_HAFTA        VARCHAR2(10 BYTE),
  HAFTA_ILK_GUN    DATE,
  HAFTA_SON_GUN    DATE,
  HAFTA_BILGISI    VARCHAR2(21 BYTE)
)
TABLESPACE USERS
PCTUSED    0
PCTFREE    10
INITRANS   1
MAXTRANS   255
STORAGE    (
            INITIAL          64K
            NEXT             1M
            MINEXTENTS       1
            MAXEXTENTS       UNLIMITED
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

F_MERKEZDE_SUBEDE_DEIL

```
DROP TABLE DWH.F_MERKEZDE_SUBEDE_DEIL CASCADE CONSTRAINTS;

CREATE TABLE DWH.F_MERKEZDE_SUBEDE_DEIL
(
  TARIH                    DATE,
  SUBE_DEPARTMAN_ID        NUMBER(38),
  STOCK_ID                 NUMBER(38),
  PRODUCT_ID               NUMBER(38),
  MERKEZDE_SUBEDE_DEILMI   CHAR(1 BYTE)
)
TABLESPACE USERS
PCTUSED    0
PCTFREE    10
INITRANS   1
MAXTRANS   255
STORAGE    (
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

F_SUBEDE_SATILMAYAN

```
DROP TABLE DWH.F_SUBEDE_SATILMAYAN CASCADE CONSTRAINTS;

CREATE TABLE DWH.F_SUBEDE_SATILMAYAN
(
  TARIH               DATE,
  STORE               NUMBER(38),
  STOCK_ID            NUMBER(38),
  PRODUCT_ID          NUMBER(38),
  SUBEDE_SATILMAYAN   CHAR(1 BYTE)
)
TABLESPACE USERS
PCTUSED    0
PCTFREE    10
INITRANS   1
MAXTRANS   255
STORAGE    (
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

FACT_KREDI_KART_ODEME

```
DROP TABLE DWH.FACT_KREDI_KART_ODEME CASCADE CONSTRAINTS;

CREATE TABLE DWH.FACT_KREDI_KART_ODEME
```

```
(
  ODENECEK_TUTAR  NUMBER,
  TAKSIT_BILGISI  NUMBER,
  ODEME_ZAMAN_ID  NUMBER,
  ACCOUNT_ID      NUMBER,
  CREDITCARD_ID   NUMBER,
  BANKA           VARCHAR2(103 BYTE)
)
TABLESPACE USERS
PCTUSED    0
PCTFREE    10
INITRANS   1
MAXTRANS   255
STORAGE    (
            INITIAL          64K
            NEXT             1M
            MINEXTENTS       1
            MAXEXTENTS       UNLIMITED
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

FACT_SATIS_ALIS_BIRIM

```
DROP TABLE DWH.FACT_SATIS_ALIS_BIRIM CASCADE CONSTRAINTS;

CREATE TABLE DWH.FACT_SATIS_ALIS_BIRIM
(
  PRODUCT_ID         NUMBER(38),
  STOK_ID            NUMBER(38),
  TARIH              DATE,
  BIRIM_ALIS_FIYAT   NUMBER,
  BIRIM_SATIS_FIYAT  NUMBER
)
TABLESPACE USERS
PCTUSED    0
PCTFREE    10
INITRANS   1
MAXTRANS   255
STORAGE    (
            INITIAL          64K
            NEXT             1M
            MINEXTENTS       1
            MAXEXTENTS       UNLIMITED
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

FACT_STOK_DURUM

```
DROP TABLE DWH.FACT_STOK_DURUM CASCADE CONSTRAINTS;

CREATE TABLE DWH.FACT_STOK_DURUM
(
  BAS_TAR           DATE,
  BIT_TAR           DATE,
  STOCK_ID          NUMBER(38),
  PRODUCT_ID        NUMBER(38),
  STORE             NUMBER(38),
  STOCK_IN          NUMBER(30,8),
  STOCK_OUT         NUMBER(30,8),
  KUMULATIF_INPUT   NUMBER,
  KUMULATIF_OUTPUT  NUMBER,
  STOK_DURUM        NUMBER,
  COMPANY_ID        NUMBER(38),
  GUNCEL_STOK_MU    VARCHAR2(1 BYTE),
  ISLEM_TIPI        NUMBER(10,2)
)
TABLESPACE USERS
PCTUSED    0
PCTFREE    10
INITRANS   1
MAXTRANS   255
STORAGE    (
            INITIAL          64K
            NEXT             1M
            MINEXTENTS       1
            MAXEXTENTS       UNLIMITED
            PCTINCREASE      0
            BUFFER_POOL      DEFAULT
           )
LOGGING
NOCOMPRESS
NOCACHE
NOPARALLEL
MONITORING;
```

APPENDIX B

ALIS_MALIYET_OLUSTUR

```
CREATE OR REPLACE PROCEDURE DWH.ALIS_MALIYET_OLUSTUR AS
    V_SQL CLOB ;
BEGIN
    EXECUTE IMMEDIATE 'TRUNCATE TABLE DWH.ALIS_FIYAT_MALIYET';
    FOR E IN (SELECT DISTINCT  YIL,AY_NO AS AY FROM DWH.BYT_ZAMAN
WHERE ZAMAN_ID >20140901 ORDER BY 1,2)
    LOOP
        V_SQL:='
        INSERT /*+APPEND NOLOGGING*/ INTO DWH.ALIS_FIYAT_MALIYET
(STOK_ID, PRODUCT_ID, TARIH, OZEL_MIN_ALIS_KDV_FIY_1,
        OZEL_MIN_ALIS_FIY_1, FIYAT_STAND_MIN_ALIS_KDVLI_2,
FIYAT_STAND_MIN_ALIS_2, AKTIF_FIYAT_KDV_3,
AKTIF_FIYAT_3,OZEL_SATIS_FIY_1,
        OZEL_SATIS_KDV_FIY_1,
        STAND_FIYAT_SATIS_2,
```

```
        STAND_FIYAT_SATIS_KDVLI_2,
        AKTIF_SATIS_FIYAT_3,
        AKTIF_SATIS_FIYAT_KDV_3)
        with PZ as (
            SELECT /*+MATEARILEZE PARALLEL*/
            STOK_ID,PRODUCT_ID,TARIH
            FROM DWH.V_BYT_PRODUCT , DWH.BYT_ZAMAN z
            WHERE  YIL='''||E.YIL||'''
            AND AY_NO='''||E.AY||'''
        ),
         OZF_SATIS as (
            select  /*+ materialize  PARALLEL*/
PZ.*,MAX(NEW_PRICE_KDV)  AS OZEL_SATIS_KDV_FIY_1,MAX(NEW_PRICE) AS
OZEL_SATIS_FIY_1
            from PZ , ODS_GULGEN.PRICE_TABLE PT
            where PZ.PRODUCT_ID = PT.PRODUCT_ID
            AND  PZ.TARIH  BETWEEN PT.P_STARTDATE  AND
PT.P_FINISHDATE -1
            and pt.IS_ACTIVE_S =1
            and pt.NEW_PRICE_KDV is not null
            group by STOK_ID,PZ.PRODUCT_ID,TARIH
        ),
        OZF as (
            select  /*+  materialize  PARALLEL*/
PZ.*,MIN(NEW_ALIS_KDV)  AS OZEL_MIN_ALIS_KDV_FIY_1,MIN(NEW_ALIS) AS
OZEL_MIN_ALIS_FIY_1
            from PZ , ODS_GULGEN.PRICE_TABLE PT
            where PZ.PRODUCT_ID = PT.PRODUCT_ID
            AND  PZ.TARIH  BETWEEN PT.P_STARTDATE  AND
PT.P_FINISHDATE -1
            and pt.IS_ACTIVE_P =1
            and pt.NEW_ALIS_KDV is not null
            group by STOK_ID,PZ.PRODUCT_ID,TARIH
        ),
        SFIY_SATIS as (
            SELECT /*+ materialize  PARALLEL*/  pz.*,
            MAX(A.READ_FIRST_SATIS_PRICE_KDV)  AS
STAND_FIYAT_SATIS_KDVLI_2,MAX(A.READ_FIRST_SATIS_PRICE) AS
STAND_FIYAT_SATIS_2   --ILGILI GUN STANDART ALIS FIYATI
            FROM PZ , ODS_GULGEN.PRICE_TABLE_STANDART A
            WHERE A.STD_P_STARTDATE<= PZ.TARIH
            and PZ.PRODUCT_ID = A.PRODUCT_ID
            group by PZ.STOK_ID,PZ.PRODUCT_ID,PZ.TARIH
        ),SFIY as (
            SELECT /*+ materialize  PARALLEL*/  pz.*,
            MIN(A.STANDART_ALIS_KDVLI)  AS
FIYAT_STAND_MIN_ALIS_KDVLI_2,MIN(A.STANDART_ALIS_LISTE) AS
FIYAT_STAND_MIN_ALIS_2   --ILGILI GUN STANDART ALIS FIYATI
            FROM PZ , ODS_GULGEN.PRICE_TABLE_STANDART A
            WHERE A.STD_P_STARTDATE<= PZ.TARIH
            and PZ.PRODUCT_ID = A.PRODUCT_ID
            group by PZ.STOK_ID,PZ.PRODUCT_ID,PZ.TARIH
        ),
        FIY_SATIS AS (
            SELECT /*+ materialize  PARALLEL*/  pz.*,
            MAX(PRICE_KDV) AS AKTIF_SATIS_FIYAT_KDV_3,MAX(PRICE) AS
AKTIF_SATIS_FIYAT_3   --USTTEKI 2 SINDEN FIYAT GELMEZSE BURAYA
BAKILIR
            FROM PZ , ODS_GULGEN.PRICE_STANDART A
            WHERE A.START_DATE<= PZ.TARIH(+)
            and PZ.PRODUCT_ID(+) = A.PRODUCT_ID
```

```
            AND A.PURCHASESALES=1
            group by PZ.STOK_ID,PZ.PRODUCT_ID,PZ.TARIH
        ) ,FIY AS (
            SELECT /*+ materialize  PARALLEL*/  pz.*,
            MIN(PRICE_KDV) AS AKTIF_FIYAT_KDV_3,MIN(PRICE) AS
AKTIF_FIYAT_3   --USTTEKI 2 SINDEN FIYAT GELMEZSE BURAYA BAKILIR
            FROM PZ , ODS_GULGEN.PRICE_STANDART A
            WHERE A.START_DATE<= PZ.TARIH(+)
            and PZ.PRODUCT_ID(+) = A.PRODUCT_ID
            AND A.PURCHASESALES=0
            group by PZ.STOK_ID,PZ.PRODUCT_ID,PZ.TARIH
        )  , alis as (
        select DISTINCT FIY.STOK_ID,FIY.PRODUCT_ID,FIY.TARIH,
        OZF.OZEL_MIN_ALIS_KDV_FIY_1,
        OZF.OZEL_MIN_ALIS_FIY_1,
        SFIY.FIYAT_STAND_MIN_ALIS_KDVLI_2,
        SFIY.FIYAT_STAND_MIN_ALIS_2,
        FIY.AKTIF_FIYAT_KDV_3,
        FIY.AKTIF_FIYAT_3
        from FIY, SFIY,OZF
        WHERE  SFIY.PRODUCT_ID(+)=FIY.PRODUCT_ID
        and SFIY.TARIH(+)  = FIY.TARIH
        and OZF.TARIH(+) = FIY.TARIH
        AND OZF.PRODUCT_ID(+)=FIY.PRODUCT_ID
        ),
        satis as (
        select DISTINCT
FIY_SATIS.STOK_ID,FIY_SATIS.PRODUCT_ID,FIY_SATIS.TARIH,
        OZEL_SATIS_FIY_1,
        OZEL_SATIS_KDV_FIY_1,
        STAND_FIYAT_SATIS_2,
        STAND_FIYAT_SATIS_KDVLI_2,
        AKTIF_SATIS_FIYAT_3,
        AKTIF_SATIS_FIYAT_KDV_3
        from FIY_SATIS, SFIY_SATIS, OZF_SATIS
        WHERE  SFIY_SATIS.PRODUCT_ID(+)=FIY_SATIS.PRODUCT_ID
        and SFIY_SATIS.TARIH(+)  = FIY_SATIS.TARIH
        and OZF_SATIS.TARIH(+) = FIY_SATIS.TARIH
        AND OZF_SATIS.PRODUCT_ID(+)=FIY_SATIS.PRODUCT_ID
        )
        select alis.*,OZEL_SATIS_FIY_1,
        OZEL_SATIS_KDV_FIY_1,
        STAND_FIYAT_SATIS_2,
        STAND_FIYAT_SATIS_KDVLI_2,
        AKTIF_SATIS_FIYAT_3,
        AKTIF_SATIS_FIYAT_KDV_3 from alis ,satis
        where 1=1
        AND alis.STOK_ID = satis.STOK_ID(+)
        AND alis.TARIH = satis.TARIH(+)';
        EXECUTE IMMEDIATE V_SQL;
        COMMIT;
    END LOOP;
 END;
/
```

P_ALIS_MALIYET_INC_OLUS

```
CREATE OR REPLACE procedure DWH.p_alis_maliyet_inc_olus
as
 begin
          /*   begin
                 execute immediate  'alter table
DWH.ALIS_FIYAT_MALIYET  truncate partition for ( to_date ( '''||
            to_char(sysdate,'DD.MM.YYYY') ||''' ,''DD.MM.YYYY'' ))'
;
            exception when others then null; end; */

            delete from DWH.ALIS_FIYAT_MALIYET where trunc(tarih)
=trunc(sysdate);

        INSERT /*+APPEND NOLOGGING*/ INTO DWH.ALIS_FIYAT_MALIYET
(STOK_ID, PRODUCT_ID, TARIH, OZEL_MIN_ALIS_KDV_FIY_1,
        OZEL_MIN_ALIS_FIY_1, FIYAT_STAND_MIN_ALIS_KDVLI_2,
FIYAT_STAND_MIN_ALIS_2, AKTIF_FIYAT_KDV_3,
AKTIF_FIYAT_3,OZEL_SATIS_FIY_1,
        OZEL_SATIS_KDV_FIY_1,
        STAND_FIYAT_SATIS_2,
        STAND_FIYAT_SATIS_KDVLI_2,
        AKTIF_SATIS_FIYAT_3,
        AKTIF_SATIS_FIYAT_KDV_3)
       with PZ as (
            SELECT /*+materialize  PARALLEL*/
            STOK_ID,PRODUCT_ID,TARIH
            FROM DWH.V_BYT_PRODUCT , DWH.BYT_ZAMAN z
            WHERE   trunc(z.tarih) = trunc(sysdate)
        ),
         OZF_SATIS as (
            select  /*+ materialize  PARALLEL*/
PZ.*,MAX(NEW_PRICE_KDV)  AS OZEL_SATIS_KDV_FIY_1,MAX(NEW_PRICE) AS
OZEL_SATIS_FIY_1
            from PZ , ODS_GULGEN.PRICE_TABLE PT
            where PZ.PRODUCT_ID = PT.PRODUCT_ID
            AND  PZ.TARIH  BETWEEN PT.P_STARTDATE  AND
PT.P_FINISHDATE -1
            and pt.IS_ACTIVE_S =1
            and pt.NEW_PRICE_KDV is not null
            group by STOK_ID,PZ.PRODUCT_ID,TARIH
        ),
        OZF as (
            select  /*+  materialize  PARALLEL*/
PZ.*,MIN(NEW_ALIS_KDV)  AS OZEL_MIN_ALIS_KDV_FIY_1,MIN(NEW_ALIS) AS
OZEL_MIN_ALIS_FIY_1
            from PZ , ODS_GULGEN.PRICE_TABLE PT
            where PZ.PRODUCT_ID = PT.PRODUCT_ID
            AND  PZ.TARIH  BETWEEN PT.P_STARTDATE  AND
PT.P_FINISHDATE -1
            and pt.IS_ACTIVE_P =1
            and pt.NEW_ALIS_KDV is not null
            group by STOK_ID,PZ.PRODUCT_ID,TARIH
        ),
        SFIY_SATIS as (
            SELECT /*+ materialize  PARALLEL*/  pz.*,
            MAX(A.READ_FIRST_SATIS_PRICE_KDV)  AS
STAND_FIYAT_SATIS_KDVLI_2,MAX(A.READ_FIRST_SATIS_PRICE) AS
STAND_FIYAT_SATIS_2   --ILGILI GUN STANDART ALIS FIYATI
            FROM PZ , ODS_GULGEN.PRICE_TABLE_STANDART A
```

```
            WHERE A.STD_P_STARTDATE<= PZ.TARIH
            and PZ.PRODUCT_ID = A.PRODUCT_ID
            group by PZ.STOK_ID,PZ.PRODUCT_ID,PZ.TARIH
        ),SFIY as (
            SELECT /*+ materialize  PARALLEL*/  pz.*,
            MIN(A.STANDART_ALIS_KDVLI)  AS
FIYAT_STAND_MIN_ALIS_KDVLI_2,MIN(A.STANDART_ALIS_LISTE) AS
FIYAT_STAND_MIN_ALIS_2   --ILGILI GUN STANDART ALIS FIYATI
            FROM PZ , ODS_GULGEN.PRICE_TABLE_STANDART A
            WHERE A.STD_P_STARTDATE<= PZ.TARIH
            and PZ.PRODUCT_ID = A.PRODUCT_ID
            group by PZ.STOK_ID,PZ.PRODUCT_ID,PZ.TARIH
        ),
        FIY_SATIS AS (
            SELECT /*+ materialize  PARALLEL*/  pz.*,
            MAX(PRICE_KDV) AS AKTIF_SATIS_FIYAT_KDV_3,MAX(PRICE) AS
AKTIF_SATIS_FIYAT_3   --USTTEKI 2 SINDEN FIYAT GELMEZSE BURAYA
BAKILIR
            FROM PZ , ODS_GULGEN.PRICE_STANDART A
            WHERE A.START_DATE<= PZ.TARIH(+)
            and PZ.PRODUCT_ID(+) = A.PRODUCT_ID
            AND A.PURCHASESALES=1
            group by PZ.STOK_ID,PZ.PRODUCT_ID,PZ.TARIH
        ) ,FIY AS (
            SELECT /*+ materialize  PARALLEL*/  pz.*,
            MIN(PRICE_KDV) AS AKTIF_FIYAT_KDV_3,MIN(PRICE) AS
AKTIF_FIYAT_3   --USTTEKI 2 SINDEN FIYAT GELMEZSE BURAYA BAKILIR
            FROM PZ , ODS_GULGEN.PRICE_STANDART A
            WHERE A.START_DATE<= PZ.TARIH(+)
            and PZ.PRODUCT_ID(+) = A.PRODUCT_ID
            AND A.PURCHASESALES=0
            group by PZ.STOK_ID,PZ.PRODUCT_ID,PZ.TARIH
        )  , alis as (
        select DISTINCT FIY.STOK_ID,FIY.PRODUCT_ID,FIY.TARIH,
        OZF.OZEL_MIN_ALIS_KDV_FIY_1,
        OZF.OZEL_MIN_ALIS_FIY_1,
        SFIY.FIYAT_STAND_MIN_ALIS_KDVLI_2,
        SFIY.FIYAT_STAND_MIN_ALIS_2,
        FIY.AKTIF_FIYAT_KDV_3,
        FIY.AKTIF_FIYAT_3
        from FIY, SFIY,OZF
        WHERE  SFIY.PRODUCT_ID(+)=FIY.PRODUCT_ID
        and SFIY.TARIH(+)  = FIY.TARIH
        and OZF.TARIH(+) = FIY.TARIH
        AND OZF.PRODUCT_ID(+)=FIY.PRODUCT_ID
        ),
        satis as (
        select DISTINCT
FIY_SATIS.STOK_ID,FIY_SATIS.PRODUCT_ID,FIY_SATIS.TARIH,
        OZEL_SATIS_FIY_1,
        OZEL_SATIS_KDV_FIY_1,
        STAND_FIYAT_SATIS_2,
        STAND_FIYAT_SATIS_KDVLI_2,
        AKTIF_SATIS_FIYAT_3,
        AKTIF_SATIS_FIYAT_KDV_3
        from FIY_SATIS, SFIY_SATIS, OZF_SATIS
        WHERE  SFIY_SATIS.PRODUCT_ID(+)=FIY_SATIS.PRODUCT_ID
        and SFIY_SATIS.TARIH(+)  = FIY_SATIS.TARIH
        and OZF_SATIS.TARIH(+) = FIY_SATIS.TARIH
        AND OZF_SATIS.PRODUCT_ID(+)=FIY_SATIS.PRODUCT_ID
        )
```

```
        select alis.*,OZEL_SATIS_FIY_1,
        OZEL_SATIS_KDV_FIY_1,
        STAND_FIYAT_SATIS_2,
        STAND_FIYAT_SATIS_KDVLI_2,
        AKTIF_SATIS_FIYAT_3,
        AKTIF_SATIS_FIYAT_KDV_3 from alis ,satis
        where 1=1
        AND alis.STOK_ID = satis.STOK_ID(+)
        AND alis.TARIH = satis.TARIH(+);
        commit;
        end;
/
```

P_FACT_SATIS_BIRIM_REFRESH

```
CREATE OR REPLACE PROCEDURE DWH.P_FACT_SATIS_BIRIM_REFRESH AS
BEGIN
        execute immediate 'TRUNCATE TABLE DWH.FACT_SATIS_ALIS_BIRIM'
;

        insert /*+ APPEND NOLOGGING */  into
DWH.FACT_SATIS_ALIS_BIRIM

       WITH urun_alis AS (SELECT *
                          FROM (SELECT stok_id,
                                       product_id,
                                       tarih,
                                       COALESCE
(ozel_min_alis_kdv_fiy_1,

fiyat_stand_min_alis_kdvli_2,
                                                aktif_fiyat_kdv_3)
                                          kdv_dahil_alis_fiyat,
                                       COALESCE (ozel_min_alis_fiy_1,

fiyat_stand_min_alis_2,
                                                aktif_fiyat_3)
                                          kdvsiz_alis_fiyat,
                                          COALESCE (OZEL_SATIS_FIY_1,

STAND_FIYAT_SATIS_2,

AKTIF_SATIS_FIYAT_3)
                                                    satis_fiyat_kdvsiz,
                                                COALESCE
(OZEL_SATIS_KDV_FIY_1,

STAND_FIYAT_SATIS_KDVLI_2,

AKTIF_SATIS_FIYAT_KDV_3)
                                                    satis_fiyat_kdvli,
                                       ROW_NUMBER ()
                                       OVER (PARTITION BY product_id,
tarih
                                             ORDER BY stok_id)
                                          sira
                                  FROM dwh.alis_fiyat_maliyet)
                         WHERE sira = 1)
   SELECT product_id,
          stok_id,
```

```
          tarih,
          urun_alis.kdv_dahil_alis_fiyat birim_alis_fiyat,
          urun_alis.satis_fiyat_kdvli birim_satis_fiyat
     FROM    urun_alis;
     commit;
END;
/
```

V_BYT_PRODUCT_MV_REFRESH

```
CREATE OR REPLACE PROCEDURE DWH.V_BYT_PRODUCT_MV_REFRESH AS
BEGIN
     DBMS_SNAPSHOT.REFRESH(
        LIST                 => 'DWH.V_BYT_PRODUCT'
       ,PUSH_DEFERRED_RPC    => TRUE
       ,REFRESH_AFTER_ERRORS => FALSE
       ,PURGE_OPTION         => 1
       ,PARALLELISM          => 0
       ,ATOMIC_REFRESH       => FALSE
       ,NESTED               => FALSE);
     END;
/
```

V_FACT_K_K_OD_MV_REFRESH

```
CREATE OR REPLACE PROCEDURE DWH.V_FACT_K_K_OD_MV_REFRESH AS
BEGIN
      null;
      execute immediate 'truncate table dwh.fact_kredi_kart_odeme';
      insert /*+ APPEND NOLOGGING */ INTO dwh.fact_kredi_kart_odeme
      select *
      from dwh.fact_kredi_kart_odeme;
      commit;
     END;
/
```

V_FACT_STOK_MV_DURUM_REFRESH

```
CREATE OR REPLACE PROCEDURE DWH.V_FACT_STOK_MV_DURUM_REFRESH AS
BEGIN

       execute immediate 'TRUNCATE TABLE DWH.FACT_STOK_DURUM' ;


       insert /*+ APPEND NOLOGGING */  into DWH.FACT_STOK_DURUM
SELECT tarih bas_tar,
       NVL
          (LEAD (tarih) OVER (PARTITION BY stock_id, product_id,
STORE ORDER BY tarih),
           SYSDATE + 1
          ) bit_tar,
       stock_id, product_id, STORE, stock_in, stock_out,
kumulatif_input,
       kumulatif_output, kumulatif_input - kumulatif_output AS
stok_durum,
       company_id,
       nvl2 ( LEAD (tarih) OVER (PARTITION BY stock_id, product_id,
STORE ORDER BY tarih),
```

```
              'H',
              'E' ) guncel_stok_mu, process_type
  FROM (SELECT distinct TRUNC (r.process_date) tarih, r.stock_id,
r.product_id,
               r.STORE, sum( r.stock_in)  OVER (PARTITION BY
r.stock_id, r.product_id, r.STORE ,trunc(r.process_Date)) stock_in ,
                        sum(r.stock_out) OVER (PARTITION BY
r.stock_id, r.product_id, r.STORE ,trunc(r.process_Date)) stock_out,
               trunc(SUM (r.stock_in) OVER (PARTITION BY r.stock_id,
r.product_id, r.STORE ORDER BY TRUNC
                                                  (r.process_date)))

kumulatif_input,
               trunc(SUM (r.stock_out) OVER (PARTITION BY
r.stock_id, r.product_id, r.STORE ORDER BY TRUNC
                                                 (r.process_date)))

kumulatif_output,
               s.company_id,
               r.process_type
          FROM ods_gulgen.stocks_row r JOIN ods_gulgen.stocks s ON
(r.stock_id = s.stock_id
                                                              )
         WHERE process_date IS NOT NULL);
    commit;
    END;
/
```

APPENDIX C

The extract, transform and load processes can be explained for our project with an example as follows. The data source in our case OLTP data gets exctracted from the database. For example, the raw data of raw material names, prices, stock values and expenses gets extracted to a temporary place in the hard disk. The data of raw material prices, values and names gets cleaned. NULL values gets omitted, price and stock values gets set in an understandable structure and abnormal values gets cleaned. Raw material prices and stock values gets summarized. New columns were derived within the data. In this case, the profit was derived from income and expense items. Later on, the new derived items gets standardized. A unique column name was given such as profit. Finally, all of the data gets aggregated which means joint together with the time dimension.

As a result, the new data which is dimensional and ready to report gets loaded and stored in form of tables into data warehouse.

APPENDIX D

The extent of current data usage by the firm	#
Sufficient	9
Not sufficient	1

The location from where the information is gathered	#
Experience/heuristically	2
Internet sources	2
Chambers	1
Research firm	5
Magazines/Newspapers	3

Profile of the information needed	#
Production Improvement	7
Personnel/time efficiency	2
Product/time amount	2
Profitability	7
General firm status	2
Sales analysis	2
Investment planning	1
Seasonal transition periods	3
Stock movements and planning	5
Logistics Improvement	5
Competitor price analysis	1
Other	1

Extent of the offered system usage and extension of the system to different levels in the organization	#
Ease of use (incl.multiple levels in the organization)	6
Simplicity of analyzes and access	1
Use by stakeholders	1
Web access opportunity to the system	2
Anybody who is responsible of decision making	1

System benefits for the daily workflow	#
Drilling down to details	2
Rapid access to reports	2
Monitoring firms	1
Risk analysis and personnel tracking	4
Monitoring production numbers	1
Monitoring stock numbers	7

Potential system acceptance	#
Yes	9
No	1

Reasons for system acceptance	#
Creation of customized reports	7
Analysis of own reports	5
Abolishment of current constraints	1

Potential benefits of the system functions to organization	#
Easy graphical user interface	7
Easy access	7
Creating custom reports	7
Good performance	7
Analysis of different data sources and subjects	7
Stock monitoring	1
Sales monitoring	1
Firm status monitoring	1

Recommendations for system improvement	#
Additional data inclusion for flexibility	3
Creation of instant mobile reports	2
Report process simplification	2
Live social media analysis	1