

**BPR STUDY IN A PROCESS TYPE
MANUFACTURING ENVIRONMENT
BY USING AN ERP PACKAGE**

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**PROSES TİPİ ÜRETİM ORTAMINDA ERP PAKETİ
KULLANARAK BPR ÇALIŞMASI**

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ABBREVIATIONS

ERP	: Enterprise Resource Planning
MRP	: Material Requirements Planning
MRP II	: Manufacturing Resource Planning
JIT	: Just-in-Time
OPT	: Optimum Production Technique
TQM	: Total Quality Management
BPR	: Business Process Reengineering
CIM	: Computer Integrated Manufacturing
RDBMS	: Relational Database Management Systems
GUI	: Graphical User Interface
FCS	: Finite Capacity Scheduling
MES	: Manufacturing Execution Systems
COMMS	: Customer Oriented Manufacturing Management Systems
PDM	: Product Data Management
RMR	: Requirements Mapping Report
IT	: Information Technology
POS	: Project Organization Structure
HR	: Human Resources
IFS	: Industrial & Financial Systems
BOM	: Bill Of Material
ROI	: Return On Investment
Y2K	: Year 2000
SISP	: Strategic Information Systems Plan
IS	: Information Services
APICS	: American Production and Inventory Control Society
R&D	: Research and Development
PC	: Personal Computer
TCO	: Total Cost of Ownership
VAT	: Value Added Tax
FIFO	: First In First Out
LIFO	: Last In First Out
EDI	: Electronic Data Interchange
MS	: Master Scheduling

TABLE LIST

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BPR STUDY IN A PROCESS TYPE MANUFACTURING ENVIRONMENT BY USING AN ERP PACKAGE

SUMMARY

In the Process Industry, the focus of competitive companies is on quality, time, and cost across the whole supply chain. Companies that provide customers with quality products and services faster than the competition and at lower cost are the ones that gain the competitive edge. And companies with the ability to quickly reshape the supply chain based on anticipated or actual changes in customer demands are the ones that will maintain the competitive edge.

To achieve competitiveness through response to change requires speed, flexibility, and the sharing of information across the supply chain. It requires the ability to dynamically model and dynamically change a company's supply chain, and have those changes reflected immediately. Reshaping the supply chain to respond to change also requires reshaping the organization, its business practises, its services, and all too often, its products.

To meet the challenges brought about by change, companies require powerful information technology designed to deliver continuous improvements and innovation. Companies need extremely flexible enterprise applications that support the current supply chain processes and guarantee a strong foundation for change.

In this study, Business Process Reengineering (BPR) by using an Enterprise Resource Planning (ERP) Package subject, which is very popular in the last years, is told, and Şişecam's BPR Study and ERP Implementation is selected as the application. Since many companies in Turkey had BPR and ERP Projects, or some of them still have, and since the projects' costs are very high, the subject is very important. The purpose of this study is to understand the relationship between BPR and ERP, to analyze success and failure points of BPR and ERP projects and to create a source for the future implementations.

BPR is a procedure that involves the fundamental rethinking and radical redesign of business processes to achieve dramatic organizational improvements in such critical measures of performance as cost, quality, service, and speed. Any BPR activity is distinguished by its emphasis on process rather than functions and products and the customers for the processes.

ERP is an accounting oriented information system for identifying and planning the enterprisewide resources needed to take, make, ship, and account for customer orders. An ERP system differs from the typical MRP II system in technical requirements such as graphical user interface, relational database, use of fourth-generation language, and computer-aided software engineering tools in development, client/server architecture, and open-system portability.

In this study literature survey on BPR and ERP is made, a brief information about the company is given, workflow of the company is analysed for BPR study, some of the processes are reengineered, brief information about the implemented ERP Modules is given, project organization is analysed, results of BPR Study are showed on ERP Package, statuses of the company before and after the project are compared, success and failure points of the project are given and recommendations for a successful BPR and ERP Project are made at the end.



PROSES TİPİ ÜRETİM ORTAMINDA ERP PAKETİ KULLANARAK BPR ÇALIŞMASI

ÖZET

Günümüzde şirketlerin rekabeti son derece artmış ve şirketler kalite, zaman ve maliyet kriterlerine odaklanmak zorunda kalmışlardır. Müşterilerine kaliteli ürünü ve servisi diğer rakiplerden daha ucuza ve daha hızlı verebilenler, yarışta bir adım öne geçmişlerdir. Ancak müşteriden gelen taleplere göre kendini yenileyebilen şirketler bu yarışta önde kalacaktır.

Rekabetçi piyasada değişikliklere anında tepki verebilmek için, hızlı, çevik olmak ve bilgiyi işletmenin tüm birimlerinde paylaşmak gereklidir. Piyasa koşullarındaki değişikliğe tepki, şirket organizasyonunda, ürünlerinde, hizmetlerinde veya iş süreçlerinde değişikliği gerektirebilir. Böyle değişiklikleri yapabilmek için şirketlerin çok güçlü, gelişmelere açık, kolay uyarlanabilir bilgi sistemlerine ihtiyaçları vardır.

Bu çalışmada, son yıllarda popüler hale gelen Kurumsal Kaynak Planlaması (ERP) Paketi kullanarak İş Süreçlerinin Yeniden Yapılandırılması (BPR) konusu anlatılmış, uygulama olarak Şişecam BPR çalışması ve ERP implementasyonu incelenmiştir. Türkiye’de birçok şirkette BPR ve ERP projelerinin yapılmış ve yapılıyor olması, ayrıca proje maliyetlerinin çok yüksek olması nedeniyle, bu konu çok özel bir konum kazanmıştır. Bazı projelerde çok yüksek paralar harcanmış olmasına rağmen, istenilen sonuçlar alınamamıştır. Halbuki, belli adımlar takip edildiğinde BPR ve ERP projelerinin başarıyla sonuçlandığı ve yeni kurulan bilgi sistemlerinin şirketlere çok büyük katkısı olduğu görülmüştür. Bu açıdan dolayı, yapılan çalışma, bundan sonraki BPR ve ERP projelerine iyi bir rehber olacaktır.

İş süreçlerinin yeniden yapılandırılması (BPR), işletmenin performans değerleri olan maliyet, kalite, servis ve hız kriterlerinde dramatik gelişme gösterebilmek için, işin yapılma biçiminin temelden yeniden düşünülmesi ve radikal olarak değiştirilmesidir. BPR çalışmasının temel noktası, fonksiyonlar veya ürünler yerine, iş süreçlerine ve müşterilere odaklı olmasıdır.

Kurumsal Kaynak Planlaması (ERP) ise, müşteri siparişlerini doğru alabilmek, sevk edebilmek ve faturalayabilmek için işletmenin tüm kaynak ihtiyacını belirleyen ve planlayan muhasebe bazlı bilgi sistemidir. ERP’yi tipik MRP II sisteminden ayıran başlıca teknik özellikler, grafiksel arabirim kullanması, ilişkisel veri tabanına sahip olması, dördüncü kuşak dil kullanması, istemci/sunucu düzeninde çalışması ve açık sistem olmasıdır.

Bu çalışmada konu hakkında literatür incelenmiş, örnek projenin gerçekleştiği şirket olan Şişecam hakkında bilgi verilmiş, proje dahilindeki iş süreçleri incelenmiş, bazı iş süreçleri yeniden yapılandırılmış, ilgili ERP paketinin proje kapsamındaki modüllerinin genel çalışma mantığı hakkında bilgi verilmiş, Şişecam BPR ve ERP

projesi organizasyonu incelenmiş, incelenen Şişecam iş süreçleri ERP paketi üzerinde gösterilmiş, şirketin proje öncesi ve sonrasındaki durumu karşılaştırılmış, projenin başarı ve başarısızlık yönleri çıkarılmış ve genel olarak BPR çalışmalarında ve ERP uygulamalarında dikkat edilmesi gereken noktalar vurgulanmıştır.



1. INTRODUCTION

It is becoming extremely critical to implement major changes in the core business processes and then maintain continuous process improvement strategies for gaining competitive advantage and sustaining it, in today's dynamic global economy and competitive market. The twenty-first century business strategy calls for a dynamic network of customer focused processes, product designs, people organization, and systems to satisfy the demand for product varieties with immediate deliveries.

One of the requirements of any successful reengineering effort is that the entire organization must see the real need to change and be motivated to change. Reengineering requires the ability to use insight and imagination, willingness to challenge the rules and the assumptions behind them. When practiced correctly, reengineering challenges the rules of an entire business, not just those of a functional department. It is process-oriented, not functionally oriented.

Target of a reengineering project is to close the gap, either real or received, between what the targeted processes can deliver and what the targeted processes should deliver. This gap can be either internally generated, which is generally the result of a change in corporate strategy, or externally generated, which is due to reactions to changes taken outside of the firm.

The increasingly rapid trend toward a global market presents producers with tremendous opportunities and challenges. One such challenge is the ability to produce and deliver products and services around the clock on short notice, while maintaining quality levels. Success rests almost entirely on effective logistics. With the support of an effective information solution, customers can be drawn closer, fewer employees will manage larger volumes, and time and money will be used more effectively.

Enterprise Resource Planning (ERP) is such an information system. ERP has become the latest buzzword that many organizations are rushing toward. ERP system is a very powerful computer tool, and organizations can gain a lot of competitive advantage by implementing an ERP system. Unfortunately, it is observed that many ERP projects have not been effective and hence unable to achieve the results envisaged.

As the cost of an ERP implementation project is very high, it is critical for an organization to make the project a success and start deriving benefits out of it as fast as possible. But what is it that makes an ERP implementation project successful?

The purpose of this study is to understand the relationship between BPR and ERP, to analyze success and failure points of BPR and ERP projects and to create a source for the future implementations. The writer has successfully taken several projects from initial stages through customer delivery and collected his own experience in the field of ERP implementation, which is more than 3 years, in this study.

In this study, Şişecam's BPR & ERP Project is selected as the application and IFS Applications is used as the ERP package. Distribution modules, namely Inventory, Customer Orders, Purchasing, Invoicing, Customer Scheduling; and Manufacturing Module, Master Scheduling are selected to be implemented in the Şişecam's ERP Project.

The writer worked in the plants and headquarter of Şişecam and documented the work flow in the group. He made suggestions for the reengineered processes. The statuses of the company before the project and after the project are compared by the writer. The success and failure points of the project are given at the end of the study.

2. THEORY OF BPR

In the past decade the business environment has changed dramatically. The world has become a small and very dynamic marketplace. Organizations today confront new markets, new competition and increasing customer expectations. This has put a tremendous demand on manufacturers to

- Lower total costs in the complete supply chain,
- Shorten throughput times,
- Reduce stock to a minimum,
- Enlarge product assortment,
- Improve Product quality,
- Provide more reliable delivery dates and higher service to the customer,
- Efficiently coordinate global demand, supply and production.

Thus today's organizations have to constantly reengineer their business practices and procedures to be more and more responsive to customers and competition. In the 1990's Information Technology and Business Process Reengineering, used in conjunction with each other, have emerged as important tools which give organisations the leading edge.

Throughout the literature survey conducted, the main focus was on two categories of articles, which were related with the BPR and MRP, MRP II, ERP. The articles in the former category mainly investigate case studies and applications of BPR in various fields of businesses, where importance was given to manufacturing industry applications of BPR. The latter category includes various papers, where the subjects of interest were the

evolution of MRP, MRP II, ERP systems, the application of ERP systems to businesses and problems confronted during implementation, the evaluation of ERP systems together with JIT, OPT, TQM philosophies as well as the application of ERP by reengineering study.

2.1 The Nature Of Business Process Reengineering

Rickabaugh (1994) describes reengineering as looking at better ways of running a business that delivers more return to the bottom line. Hales and Savoie (1994) defines business process reengineering as a team-based approach to dramatic performance improvements. Parker (1993) defines business process reengineering as the use of evolutionary tools and techniques to provide an explosive mix to make dramatic change throughout the organization and to deliver what the customer requires. The evolutionary tools include time and motion techniques to statistical 'what if' analysis. Explosive mix is used to express the effect on the existing organizational structure and the pain to be suffered while going through the implementation phase. A dramatic change will be observed because BPR does not act in an incremental fashion, redesigning of the whole business is made. The customer referred to is both the internal and the external customer, which should be provided excellent service/product. Business Process Redesign is the analysis and design of workflows and processes within and between organizations. Malhotra (1998) defines BPR as the critical analysis and radical redesign of existing business processes to achieve breakthrough improvements in performance measures. Hammer and Champy (1993), the management experts who head the reengineering movement give a comprehensive definition in their work, which led to an increasing involvement to BPR: 'The fundamental rethinking and radical design of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed. The key words in this definition are fundamental, radical, dramatic and process. Fundamental questions are to be asked to find out value adding, efficient and effective activities, radical changes are to be made from the root, reinvention of the process rather than improvements, dramatic effects are observed since the old system is totally wiped out, and the system should be process

oriented, which means an integration of the main tasks, human resources and technology is to be achieved.

The concept of reengineering has been around for nearly two decades and was implemented in a piecemeal fashion in organizations. Production organizations have been in the vanguard without knowing it. They have undertaken reengineering by implementing concurrent engineering, lean production, cellular manufacturing, group technology, and pull-type production systems. These represent fundamental rethinking of the manufacturing process. Manufacturers generally made significant improvements in their internal operations during the 1980s. But excellence in manufacturing has not always translated to superior sustainable results in the marketplace. More recently, the focus appears to have shifted out of the manufacturing process to other interfunctional and interorganizational and customer-based processes. Rapid advances in information technology and its applications have been a major enabler of BPR in services. Global interest in BPR has grown rapidly. Though Japanese companies do not typically use the term reengineering to describe radical process change, they are very interested in developing new processes using information technology.

A further and important statement is made by the examination of an early application of BPR in Ford Motor Co, by the benchmarking with Japanese competitors, which simply states that automation of inefficient processes does not improve the efficiency of the business. The evolution of BPR is divided into two epochs by Cypress (1994). In the first period BPR is used as response to two main problems: The TQM results do not achieve performance improvements and the investments made on information technology do not yield satisfactory results. There was increasing post process design realized by automation (which proved the early statement made by Hammer and Champy (1993) 'the automation of inefficient processes does not improve the efficiency of the business') and this lead to the concept of process management, human resources and information technology should be integrated into the design of the process from the beginning. In the second epochs the focus is on utilizing more operation tools and techniques. The reasons for failure of TQM philosophy in many companies are listed by Tatikonda and

Tatikonda (1996), and the ten issues listed are what BPR changes in the organization: vision, customer focus, management commitment, training, organizational structure.

From the definitions made and the evolution of BPR, it can be concluded that the common keyword to BPR is change. What changes does BPR make in the system and how does it change the system is examined by various articles. Parker (1993) states that BPR changes the core processes in such a way that the processes are taken under control. It changes people, the traditional functional based, hierarchical multi-layered management structures to team-based environment. Reduction of work specialization is made possible through the development of Information Technology. It changes the technology, the key trends in technology enable the flexibility for the radical change that BPR brings. Bambarger (1994) states the change in the processes are in the form of completely reinventing the process rather than eliminating the non-value added steps. Technology is the enabler of improvements in business processes, and information systems does not have the answers before we know the questions. The changes in the processes are done by figuring out what exactly the process is, and to do this understanding complaints and problems is important. Dales and Savoie (1994) argues radical changes must be done in business processes, organizations and supporting information systems, and suggest the combination of industrial engineering tools and application of advanced information technology should be employed. Rickabaugh (1994) suggests to examine the key processes that conduct business, reveals that in reengineering, we think of improving, replacing, eliminating and controlling key processes. The concept of continuous improvement should exist not only for products but for the processes as well. The major change to be made is delivery time, as customers are looking for shorter delivery times, and time is a function of the process. He explains the concept of configuration management, where configuration is referred to as the arrangement of a product, service, facility and its processes. Management of configuration requires that you should know and control the product. In BPR to select the right change you need to know what you are changing from and what you are changing to. How engineering changes are managed in order to obtain shorter lead times

(providing greater speed of delivery, which is the main requirement of the customers) are described by Reidelbach (1991) in detail.

The methodologies used in BPR and the results of BPR studies are further discussed in detail. Bambarger (1994) stresses the usage of established methodologies in redesigning the process, as the organization has already accepted these and it is easier to get across management and other departments. An example study in Corning Asahi Video Products Company is presented with the comparison of situations before and after the study. Hales and Savoie (1994) list four key phases of reengineering study:

1.Orientation

2.Overall planning

3.Detailed Design

4.Implementation.

The critical phase of BPR study is addressed as the orientation phase, for which ten important items are listed. A successful BPR study will then result in breakthroughs in cycle time, quality and cost. Parker (1993) describes the results of BPR: the existing change mechanisms which provide incremental change are taken over, and all parts of the business are affected. Administration is eliminated, organization is flattened, functional structure moves to process oriented structure, processes become simpler, improved and cross-functional, staff is empowered, they become 'case-based' workers, managers coach and own business processes. Information technology is the enabling tool by which reengineering occurs. Ligeti (1994) examines the impact of information automation on reengineering. The benefits of information automation are described as sharing data as company-wide and enterprise-wide, to see the overall view of the company and to improve distribution and logistics, respectively. Ligus (1994) points out the problems that could be faced during implementation of 'radical change' by examining the 'quick-fix' solutions implemented by U.S. manufacturing companies, and were they unsuccessful. The answer he founds is the organizational inertia that resists to

change, and the failure to reinvent the processes. At the end he lists the reasons why some companies have gone through the change successfully, which are mainly related with the human resources and the management of the organization.

Reengineering effects are assessed by various criteria at the end of the applications. Application of BPR in REDA, a pumping systems manufacturer, resulted in cutting the MRP run time in half. In another application with Textron Systems Division, a defense and commercial contractor that develops real-time business controls, sensor-fused munitions, and precision approach and landing systems. The financial results were 15% increase in the year reengineering began compared to a 5% increase the year before. Discussions of implementations in various aspects exist in literature. Davenport (1995) describes the stages entailed by a BPR program that was initiated by Schlage Lock Co. He explains the contents of a strategic information systems plan which regards BPR as a necessary element to make SISP work. He discusses the hardware and networking technologies employed to reach the information systems goals. Bambarger (1994) describes the BPR plan of Mellon Bank Corp.'s Master Trust Services, explains how information technology enabled the plan.

2.2 Difference Of BPR From TQM

Teng notes that in recent years, increased attention to business processes is largely due to the TQM (Total Quality Management). He concludes that TQM and BPR share a cross-functional orientation. Davenport (1995) observed that quality specialists tend to focus on incremental change and gradual improvement of processes, while proponents of reengineering often seek radical redesign and drastic improvement of processes.

Davenport (1995) notes that quality management, often referred to as total quality management (TQM) or continuous improvement, refers to programs and initiatives that emphasize incremental improvement in work processes and outputs over an open-ended period of time. In contrast, Reengineering, also known as business process redesign or process innovation, refers to discrete initiatives that are intended to achieve radically

redesigned and improved work processes in a bounded time frame. Contrast between the two is provided by Davenport (1995) in Table 2.1 :

Table 2. 1 Process Improvement (TQM) versus Process Innovation (BPR)

	<u>Improvement</u>	<u>Innovation</u>
Level of Change	Incremental	Radical
Starting Point	Existing Process	Clean Slate
Frequency of Change	One-time/Continuous	One-time
Time Required	Short	Long
Participation	Bottom-Up	Top-Down
Typical Scope	Narrow, within functions	Broad, cross-functional
Risk	Moderate	High
Primary Enabler	Statistical Control	Information Technology
Type of Change	Cultural	Cultural/Structural

Another article by Krieter (1996) examines the perceived difference TQM and BPR, from the perspective of both the businesspeople and the academicians. The results of the study revealed that most respondents agreed that TQM is a subset of BPR. Hansen (1994) states BPR, as usually practiced today relies on techniques from the total quality management and continuous process improvement movements, however, these techniques are people oriented and focused on a small scale organizational change, while BPR is supposed to focus on large scale change. He also gives reasons for the failure of TQM to analyze business processes: Techniques employed by TQM and continuous improvement are non-analytical and not enough to deal with business processes that are

complex. Allender (1994) compares BPR and TQM from management level perspective to find out whether reengineering is compatible with TQM, and concludes that BPR can be incorporated as a valuable tool within the TQM framework of management. However, Whitman argues that reengineering is not equivalent to continuous quality improvement in the sense that the latter can operate in effectively stable environment whereas the former is generally employed in unstable environment or areas undergoing major changes.

2.3 Business Process

Short (1995) defines business process as a set of logically related tasks performed to achieve a defined business outcome. A process is a structured, measured set of activities designed to produce a specified output for a particular customer or market. It implies a strong emphasis on how work is done within an organization. In their view processes have two important characteristics:

- They have customers (internal or external)
- They cross organizational boundaries, i.e., they occur across or between organizational subunits.

Processes are generally identified in terms of beginning and end points, interfaces, and organization units involved, particularly the customer unit. High Impact processes should have process owners. Examples of processes include, developing a new product, ordering goods from a supplier, creating a marketing plan and processing and paying an insurance claim.

Processes may be defined based on three dimensions:

- Entities: Processes take place between organizational entities. They could be interorganizational, interfunctional or interpersonal.

- **Objects:** Processes result in manipulation of objects. These objects could be Physical or Informational.
- **Activities:** Processes could involve two types of activities: Managerial (e.g. develop a budget) and Operational (e.g. fill a customer order).

2.4 Relation Between BPR & Information Technology

Hammer (1993) considers IT as the key enabler of BPR which he considers as 'radical change.' He prescribes the use of IT to challenge the assumptions inherent in the work processes that have existed since long before the advent of modern computer and communications technology. He argues that at the heart of reengineering is the notion of discontinuous thinking or recognizing and breaking away from the outdated rules and fundamental assumptions underlying operations. These rules of work design are based on assumptions about technology, people, and organizational goals that no longer hold. He suggests the following principles of reengineering:

- Organize around outcomes, not tasks
- Have those who use the output of the process perform the process
- Subsume information processing work into the real work that produces the information
- Treat geographically dispersed resources as though they were centralized
- Link parallel activities instead of integrating their results
- Put the decision point where the work is performed, and build control into the process
- Capture information once and at the source.

Short argues that BPR requires taking a broader view of both IT and business activity, and of the relationships between them. IT should be viewed as more than an automating or mechanizing force, to fundamentally reshape the way business is done.

Business activities should be viewed as more than a collection of individual or even functional tasks, in a process view for maximizing effectiveness. IT and BPR have recursive relationship. IT capabilities should support business processes, and business processes should be in terms of the capabilities IT can provide. Short (1995) refers to this broadened, recursive view of IT and BPR as the new industrial engineering.

Business processes represent a new approach to coordination across the firm; IT's promise and its ultimate impact is to be the most powerful tool for reducing the costs of coordination. Short (1995) outlines the following capabilities that reflect the roles that IT can play in BPR: Transactional, Geographical, Automatical, Analytical, Informational, Sequential, Knowledge Management, Tracking, and Disintermediation.

2.5 The Reasons of BPR Project Failures

Biggest obstacles that reengineering faces are

- Lack of sustained management commitment and leadership
- Unrealistic scope and expectations
- Resistance to Change.

Based on the BPR consultants' interviews, Grover (1995) outlines the positive preconditions for BPR success as: Senior Management Commitment and Sponsorship, Realistic Expectations, Empowered and Collaborative Workers, Strategic Context of Growth and Expansion, Shared Vision, Sound Management Practices, Appropriate People Participating Full-Time and Sufficient Budget. They also identify negative preconditions related to BPR as: The Wrong Sponsor, A 'Do It to Me' Attitude, Cost-Cutting Focus, and Narrow Technical Focus. The negative preconditions relating to the

organization include: Unsound Financial Condition, Too Many Projects Under Way, Fear and Lack of Optimism, and Animosity Toward and By IS and HR Specialists. To turn around negative conditions, firms should: Do Something Smaller First, Conduct Personal Transformation, and Get IS and HR Involved.

King views the primary reason of BPR failure as overemphasis on the tactical aspects and the strategic dimensions being compromised. He notes that most failures of reengineering are attributable to the process being viewed and applied at a tactical, rather than strategic, levels. He discusses that there are important strategic dimensions to BPR, notably, Developing and Prioritizing Objectives, Defining the Process Structure and Assumptions, Identifying Trade-Offs Between Processes, Identifying New Product and Market Opportunities, Coordinating the Reengineering Effort, and Developing a Human Resources Strategy. He concludes that the ultimate success of BPR depends on the people who do it and on how well they can be motivated to be creative and to apply their detailed knowledge to the redesign of business processes.

2.6 BPR Methodology

The methodology to be employed must include all the elements stated above, and again referring to the literature survey a rapid BPR has to include five basic stages listed below (Sheer, 1994):

1. Preparation
2. Identification
3. Vision
4. Solution
5. Transformation

Preparation includes the recognition of the need, formation of a reengineering team, and includes a basic arrangement involving the top management and all the employees. The

company should know why they are reengineering. It should be noted that, in any kind of implementation of a management technique, management support is necessary, and especially in reengineering, because of its radical and rapid application, more pain will have to be gone through, and without management support, no methodology can overcome this and offer success at the end. This is one of the main critical success factors of such a study.

Identification includes the examination of each and every business process, determination of the value adding processes, selecting the business process to reengineer, and the sequence in which they are to be reengineered.

Vision stage penetrates into the process analysis, examines primary sub-processes involved, the information and work flow within the selected processes, improvement opportunities for the processes, and statement of vision and strategy change. This is where a solution to finding better ways of conducting the business is searched, and the key starting point for technical solution to be offered for the current business situation.

Solution stage proposes descriptions of technology, standards, procedures and systems to be employed to achieve the re-changes stated by the vision stage.

Transformation is the point where all reengineering effort is started to be implemented on the actual business processes, the design of how such a system could be achieved.

3. THEORY OF ERP

The second area of literature survey is the MRP, MRP II , ERP systems in conjunction with the management philosophies employed.

3.1 Introduction to ERP

Enterprise Resource Planning (ERP) is a systematic method of dynamically balancing and optimizing the resources of a company. When used effectively it can enable a company to achieve world-class results in growth, profitability, and product and service development. It works within the paradigm that every business is uniquely similar.

One of the unique facets of an event as broad-scoped and encompassing as an ERP system implementation is that it provides the opportunity required to overcome the inertial resistance of years of evolution - a chance to make a quantum leap forward, establishing the company as the industry leader, and devastating the competition.

Enterprise Resource Planning, or ERP, attempts to integrate all departments and functions across a company onto a single computer system that can serve all those different departments' particular needs. That is a tall order, building a single software program that serves the needs of people in finance as well as it does the people in human resources and in the warehouse. Each of those departments typically has its own computer system, each optimized for the particular ways that the department does its work. But ERP combines them all together into a single, integrated software program that runs off a single database so that the various departments can more easily share information and communicate with each other.

That integrated approach can have a tremendous payback if companies install the software correctly. Take a customer order, for example. Typically, when a customer

places an order, that order begins a mostly paper-based journey from in-basket to in-basket around the company, often being keyed and re-keyed into different departments' computer systems along the way. All that lounging around in in-baskets causes delays and lost orders, and all the keying into different computer systems invites errors. Meanwhile, no one in the company truly knows what the status of the order is at any given point because there is no way for the finance department, for example, to get into the warehouse's computer system to see whether the item has been shipped. 'You'll have to call the warehouse,' is the familiar refrain heard by frustrated customers.

ERP is a necessity for manufacturers today, say three experts who have just written new books on the subject. However, all agree ERP still has a long evolution ahead of it, and the systems of the next decade will differ from today's in many significant respects. For example they will be built on total cross-functional interconnectability that will integrate all aspects of the enterprise, including design, finance, manufacturing, sales, and supply chain management. They will empower middle managers to make key decisions based on the best choices for the entire company-not just a single department or workgroup-driving decision making down as far in the organization as possible to make it more responsive to customer requests. They will be Web-enabled, permitting field sales people to consider the impact of new orders on the entire company and give customers realistic answers about delivery schedules and other key issues. They will be more modular and more responsive to change-whether a simple change in an order or late delivery from a supplier or the opening of a new market. Ultimately, they will be based on open standards, enabling users to mix best-of-breed modules from different vendors to create the best system for their needs (Latamore, 1999).

Enterprise Resources Planning's ability to collect all relevant data in a manufacturing organization and, potentially, provide that data to everyone who needs it throughout the enterprise is the key to improved management, says Ptak (1999), President of APICS. However, it must first evolve into more modular, less monolithic architecture with greater flexibility to adapt to rapidly changing business environments. ERP systems provide competitive advantage to manufacturers, but users must look beyond the

technology. ERP must be used as a tool to leverage the company's business strategy to allow it to be more agile and responsive to the customer. That means that decisions have to be driven down to the lowest possible level in the corporation. But to make good decisions these lower-level managers must have good information. ERP provides that access to company information, so they can make appropriate company decisions. But ERP does not replace good management. It empowers managers to make better decisions. If the management of the company is delegated to the computer, the company can go into big trouble. This is one of the primary reasons ERP systems fail.

ERP Applications are designed to optimize an organization's underlying business processes primarily accounting/financial, manufacturing, and distribution, says McDermott (1999). Today's ERP solutions must offer even more. Many vendors have begun to enhance their offerings with extended supply chain applications in an effort to create seamless, integrated information flow from suppliers, through manufacturing and through distribution.

Ideally, BPR should define the solutions that can be implemented, the how of it is governed by the ERP package, tells Tulapurkar (1998). In this relationship, ERP acts as a technological enabler for the new business model or in other words an ERP package is a technological implication of a BPR exercise. If the dynamics of the business environment forces an organization to reengineer its business model on a continuous basis, the organization must have an IT model that is capable of easy and quick modification. ERP packages fit this bill, they provide a solid and consistent IT infrastructure to an organization.

The ERP packages come with a repository of options for various business processes. With hundreds of man-year efforts and experience gained from studying organizations from almost all industries across the world, the ERP vendors have acquired the expertise to encode the best practices for various business processes. The user organization has the choice of selecting the most suitable option for each of their business processes.

ERP is a comprehensive planning and control framework that has evolved over a thirty year period, says Blevins (1999). During this time, trial and error and creative thinking by innovators slowly but progressively developed the framework as it is today. Three ancestors of ERP serve as milestones: Material Requirements Planning (MRP), Closed Loop MRP II and Manufacturing Resource Planning (MRP II).

During the eighties two philosophies joined MRP II on the center stage: Just-In Time (JIT) and Computer Integrated Manufacturing (CIM). Also new segments of manufacturing industry, most notably firms that produced and managed on a project basis, started to investigate and enhance MRP II. Consistent with the experience with MRP II's forefathers (MRP and Closed Loop MRP), it absorbed the new techniques proven to produce business benefit, this time from JIT, CIM and project oriented environments.

Each of ERP, JIT and CIM philosophies complement each other and multiply the benefit each can offer if the others are also in place. The synergy between each is easier to understand if you identify the root purposes of each. In the case of MRP II the value adding capabilities are an integrated framework covering most of a manufacturing enterprise. Also it is superb at inventory management.

ERP consists of MRP II as a base, and extensions to the original body of knowledge significantly influenced by JIT, CIM and Project Oriented Manufacturing; the leveraging of cost effective computing technology particularly in the areas of worker empowerment and human engineering. ERP is the latest tool in the battle to gain competitive advantage and is influenced by and complementary to MRP II and JIT, CIM among others.

ERP allows to look at the company and objectively assess its competitive capability. ERP is based on time tested good business practice and represents a model of such. Since ERP touches virtually every department within a company, the implementation of it provides an opportunity to examine current and new methods, approaches, habits and perspectives. ERP is a catalyst for change.

ERP is a descendent of MRP, Closed Loop MRP and MRP II. Also it reflects the influences of JIT and CIM as well as taking advantage of the latest IT technologies. Since it is based on proven good business practice, its implementation is an opportunity to reexamine and compare an enterprise in terms of competitiveness and world class performance.

Benefits of ERP are as follows, according to Blevins (1999):

- Improved customer service
- The ability to grow without proportional cost increase
- Reduced management expediting, more time to plan
- Improved product quality, less rework
- The ability to maintain accurate records for government regulations
- An improved quality of life, employee morale and job satisfaction
- Improved accuracy of management information

Enterprise Resource Planning is the end result of thirty years of trial and error, innovative thinking and leveraging of computer technology. The business concepts embedded in it have and will continue to produce tremendous competitive advantage and economic benefit to the manufacturing industry. ERP is the right tool for the challenging years, concludes Blevins (1999).

3.2 Evolution Of ERP Systems

The focus of manufacturing systems in the 1960's was on Inventory control. Most of the software packages were designed to handle inventory based on traditional inventory concepts. Inventors were looking for a better method of ordering material and parts, and

they found it in MRP. The logic of material requirements planning asks the following questions:

- What are we going to make?
- What does it take to make it?
- What do we have?
- What do we have to get?

MRP translated the Master Schedule built for the end items into time-phased net requirements for the sub-assemblies, components and raw materials planning and procurement.

Ho (1995) called MRP, the universal manufacturing equation. He pointed out that its logic applies wherever things are being produced. It uses the master production schedule (What are we going to make?), the bill of material (What does it take to make it?), and inventory records (What do we have?) to determine future requirements (What do we have to get?).

It quickly evolved, however, into something more than merely an ordering tool. Early users soon found that material requirements planning contained capabilities far greater than merely giving better signals for reordering. They learned this technique could help to keep order due dates valid after the orders had been released to production or to suppliers. MRP could also detect when the due date of an order (when it's scheduled to arrive) was out of phase with its need date (when it's required).

This was a breakthrough. For the first time ever in manufacturing, there was a formal mechanism for keeping priorities valid in a changing manufacturing environment.

In manufacturing, conditions change constantly. Change is not simply a possibility or even a probability. It's a certainty, the only constant, the only sure thing. The function of keeping order due dates valid and synchronized with these changes is known as priority

planning, or scheduling. Did this breakthrough solve all the problems? Was this all that was needed? In manufacturing, the issue of priority is only half the battle. Another factor, capacity, represents an equally challenging problem.

Techniques for helping plan capacity requirements were tied in with material requirements planning. Further, tools were developed to support the planning like aggregate sales and production levels (sales & operations planning), the development of the specific build schedule (master production scheduling), forecasting, sales planning and customer-order promising (demand management), and high-level resource analysis (rough-cut capacity planning). Systems to aid in executing the plan were tied in various plant scheduling techniques for the inside factory and supplier scheduling for the outside factory, the suppliers. These developments resulted in the next step in this evolution, closed-loop MRP.

Closed-loop MRP has a number of important characteristics:

- It's a series of functions, not merely material requirements planning.
- It contains tools to address both priority and capacity, and to support both planning and execution.
- It has provisions for feedback from the execution functions back to the planning functions. Plans can then be altered when necessary, thereby keeping priorities valid as conditions change.

In the 1980's the concept of MRP-II (Manufacturing Resources Planning) evolved which was an extension of MRP to shop floor and Distribution management activities. A direct outgrowth and extension of closed-loop MRP, it involves two additional elements:

- Finance-the ability to translate the operating plan (in pieces, pounds, gallons, or other units) into financial terms (dollars).
- Simulation- the ability to ask what-if questions and to obtain comprehensive, detailed, actionable answers – in both units and dollars.

In the early 1990's, MRP-II was further extended to cover areas like Engineering, Finance, Human Resources and Projects Management that are the complete gamut of activities within any business enterprise. Hence, the term ERP (Enterprise Resource Planning) was coined.

In addition to system requirements, ERP addresses technology aspects like client/server distributed architecture, RDBMS and object oriented programming. ERP Systems, Bandwidth ERP solutions address broad areas within any business like Manufacturing, Distribution, Finance, Project Management, Service, Maintenance, Transportation and Human Resources. A seamless integration is essential to provide visibility and consistency across the enterprise.

An ERP system should be sufficiently versatile to support different manufacturing environments like make-to-stock, assemble-to-order and engineer-to-order. The customer order decoupling point should be flexible enough to allow the co-existence of these manufacturing environments within the same system.

The system should be complete enough to support both Discrete as well as Process manufacturing scenarios. The efficiency of an enterprise depends on the quick flow of information across the complete supply chain i.e. from the customer to manufacturers to supplier. This places demands on the ERP system to have rich functionality across all areas like sales, accounts receivable, engineering, planning, inventory management, production, purchase, accounts payable, quality management, production, distribution planning and external transportation. Electronic Data Interchange is an important tool in speeding up communications with trading partners.

More and more companies are becoming global and focusing on down-sizing and decentralizing their business. For these companies to manage their business efficiently, ERP systems need to have extensive multi-site management capabilities. The complete financial accounting and management accounting requirements of the organization should be addressed. It is necessary to have centralized or de-centralized accounting functions with complete flexibility to consolidate corporate information.

For companies undertaking large scale and complex projects, tools should be available for cost-effective project management, project planning and project control. After-sales service should be streamlined and managed efficiently. A strong Enterprise Information System with extensive drill down capabilities should be available for the top management to get a birds eye view of the health of their organisation and help them to analyze performance in key areas.

3.3 Relationships Between MRP, MRP II, OPT, JIT & CIM

Spencer (1991) seeks the solution to the problem of successfully implementing an MRP system in using another production system called OPT. He bases the concepts of OPT on the book called 'The Goal' and tries to incorporate the principles stated in this book to MRP system. He describes the trend in JIT implementation in 80's , and arising of OPT as offering a similar result to JIT, but by different means. He asks the question of how to implement OPT concepts without abandoning MRP systems and losing benefits from JIT. He answers the question by the evolution of synchronous manufacturing, which meant 'an all-encompassing manufacturing management philosophy that includes a consistent set of principles, procedures and techniques where every action is evaluated in terms of common global goal of the organization'. He finds the solution to implement synchronous manufacturing to an MRP environment by changing the basic management philosophy. Carol (1991) tries to figure out the relationship between MRP, MRP II, OPT, JIT, CIM. MRP is a logical planning system that nets gross requirements for dependent demand. The big step it brought to inventory control was the time phasing of deliveries. The pitfalls are: It is not an execution tool, it does not check the feasibility of the master schedule and it is capacity insensitive.

MRP II provided the control loop in manufacturing and materials planning. Implementation of MRP II yielded dramatic results, but did not achieve the popularity and visibility of JIT implementation. JIT philosophy is described as total elimination of waste and respect for people. Materials planning for JIT production is suggested to be

accomplished through MRP planning work orders but not turning planned orders to firm decisions.

OPT basically identifies and eliminates the bottlenecks in the operation, which takes MRP II and JIT one step further. CIM is viewed as culmination of MRP and MRP II, and supports JIT by reducing the setup times. As the result of these examination, the author states in which processes of business do each of these systems make major changes.

There are papers which examine the implementation phase of an MRP system, alone as well as integrated with other systems like JIT. Sheldon defines MRP II as discipline/performance measurement. He suggests six steps for the implementation of an MRP system, which are Education, Common Goal, Fitness for Use, Accountability, Performance Measurement and Systems/Tools.

The real meaning of MRP II is to teach organization to measure results, learning from the measures to eliminate badness, and trusting each other to be accountable.

Wasco and friends (1991) present the evaluation, implementation, and results of a highly successful improvement program based on the concepts of JIT and MRP II. First, MRP II and JIT impacts on the existing system are analyzed. The two techniques were combined to benefit from the dynamic features of JIT to drive continuous improvements and the discipline of MRP II to close the loop between the shop floor and the medium and the long range planning processes. During the implementation phase, checklists were used as a means for establishing performance baseline and for tracking progress. Checklist categories are also presented as tables in the paper. The results achieved are summarized as follows:

- MRP II concepts provided closed-loop business that was lacking.
- Reduced lead times
- Cellular operations
- Increase machine and space utilization

- Continuous improvement.

Bregman (1991) addresses a more specific problem faced during the implementation of an MRP system. He argues that MRP is most pronounced in environments where there are more levels of bill of materials. Planning horizon for purchased components is extremely limited in actual applications. The best environments for MRP implementation result in extremely difficult operating environment for purchasing managers, because they must determine appropriate order quantities in environments with highly variable requirements and limited planning horizons. In addition their analysis is often further complicated by the potential for quantity discounts. The paper describes the experiment conducted to test the effect of the length of planning horizon to the alternative ordering procedures.

Gilman (1995) states a problem arising from the difference in the structure of BOM, and tells that the companies that most benefit MRP has deep BOM, and they work in make-to-stock environment, whereas for companies producing more to customer requirements than to stock need visibility of the capacity that is needed to make realistic delivery commitments. He lists three problems with the visibility of MRP systems:

- 1.MRP plans items, decoupling customer orders form shop orders, tracking of a customer order is not possible,
- 2.MRP uses fixed lead times, no automatic adjustment is made based on the limitations of shop floor capacity,
- 3.MRP does not recognize work completed.

3.4 Integration Of MRP II Systems With Other Production Technologies

The practical application of MRP II and the literature on the topic concentrates on the integration of MRP II systems with other production technologies. Enterprise Resource Planning has evolved as a result of the development of technology, specifically information technology. Gumaer (1996) lists the enabler technologies as relational

database management systems, (RDBMS), the use of graphical user interface (GUI), open systems and a client/server architecture. He describes the assumptions of the MRP model, and the need to develop Finite Capacity Scheduling (FCS) and Manufacturing Execution Systems (MES). He argues that theoretically, ERP applications encompass both MES and FCS capabilities, but the solutions provided by vendors focused solely on this area are better than the broad scope of ERP. He points out that the solution will be employing an open systems strategy that uses best-of-breed components in order to obtain the functionality needed to run their businesses properly. The next generation solution will be Optimized Planning, supporting a broad range of business issues such as supply chain modeling, mixed-model scheduling, line balancing, and the optimization of specific manufacturing operations.

Benner (1995) told about Manufacturing Execution Systems (MES) that can help enterprise resource planning live up to its potential. He mentioned the importance of the adequate visibility of all the factors affecting achievement of the plan, at the time of production, so that manufacturers would be better equipped to meet their service, inventory and efficiency goals. Real-time visibility allows manufacturing to guide operations and respond dynamically to events as they occur, preventing waste. Visibility of true activity costs helps businesses address the operations that have the greatest impact on product cost. MES integrated with manufacturing planning provide this real-time visibility and control, closing the execution gap. ERP can download orders to MES at the start of the week or of the day. MES, in turn, can perform production order processing and operation dispatching, and update ERP with material and order data.

Bartuli and Bourke (1995) continue the discussion on the technique of coexistence of PDM and MRP II. The two end choices are integration meaning they will share common data and processes and interface like bolting two applications together, as a simple interface of ASCII file transfer. MRP II concentrates on schedule whereas PDM concentrates on management of physical files and the design and distribution data relevant to those files. However, it must be kept in mind that both of the systems are enablers, and the benefits of effective coexistence of PDM and MRP II systems will

accrue to those companies that reengineer the processes before utilizing the information technology enablers.

3.5 Effects of ERP to the Improvement of Business Performance

ERP automates the tasks involved in performing a business process such as order fulfillment, which involves taking an order from a customer, shipping it and billing for it. With ERP, when a customer service representative takes an order from a customer, he or she has all the information necessary to complete the order like the customer's credit rating and order history, the company's inventory levels and the shipping dock's trucking schedule. Everyone else in the company sees the same computer screen and has access to the single database that holds the customer's new order. When one department finishes with the order it is automatically routed via the ERP system to the next department. To find out where the order is at any point, one need only log into the ERP system and track it down. With luck, the order process moves like a bolt of lightning through the organization, and customers get their orders faster and with fewer orders than before. ERP can apply that same magic to the other major business processes, such as employee benefits or financial reporting.

3.6 Duration Of An ERP Project

Companies that install ERP do not have an easy time of it. To do ERP right, the ways you do business will need to change and the ways people do their jobs will need to change too. And that kind of change doesn't come without pain. Unless, of course, your ways of doing business are working extremely well like orders all shipped on time, productivity higher than all your competitors, customers completely satisfied, in which case there is no reason to even consider ERP.

The important thing is not to focus on how long it will take, real transformational ERP efforts usually run between one to three years on average, but rather to understand why you need it and how you will use it to improve your business.

3.7 Evaluation Criteria Of An ERP Software

Some important points to be kept in mind while evaluating an ERP software include:

- Functional fit with the company's business processes
- Degree of integration between the various components of the ERP system
- Flexibility and scalability
- Complexity, user friendliness
- Quick implementation, shortened ROI period
- Ability to support multi-site planning and control
- Technology, client/server capabilities, database independence, security
- Availability of regular upgrades
- Amount of customization required
- Local support infrastructure
- Availability of reference sites
- Total costs, including cost of license, training, implementation, maintenance, customization and hardware requirements.

3.8 Implementation Of ERP Systems

The success of an ERP solution depends on how quick the benefits can be reaped from it. This necessitates rapid implementations which lead to shortened ROI (Return on Investment) periods.

Comprehensive Implementation Scenario:

Here the focus is more on business improvement than on technical improvement during the implementation. This approach is suitable when:

- Improvements in business processes are required
- Customizations are necessary
- Different alternative strategies need to be evaluated
- High level of integration with other systems are required
- Multiple Sites have to be implemented

Compact Implementation Scenario:

Here the focus is on technical migration during the implementation with enhanced business improvements coming at a later stage. This approach is suitable when

- Improvements in business processes are not required immediately
- Change-minded organization with firm decision making process
- Company operating according to common business practices
- Single site has to be implemented

3.8.1 Careful planning, accountability

Implementing an ERP system is, by its very nature, an iterative process. Knowing how to implement successfully requires knowing what to do and when to do it. Then carefully plan to install, initialize and test one functional layer at a time. First the core functionality, using representative data, is installed, initialized and tested. Then additional layers of functionality are processed using representative data. Finally, the entire system is tested using larger samples of real, historical data with known results.

Only an implementation model based on the discipline to make consistent, iterative progress will carry the company to success.

Defined objectives specify what to do and when to do it. The defined objectives are derived from the desired functionality and reports analysis. They are developed as building blocks, one layer at a time, until top management's strategic needs are underpinned by middle management's tactical needs, which are then underpinned by line management's operational needs. The final result is a complete description of what the system must do, an 'information plan.' It shows what information users require before the implementation can be a success. It is also a hierarchical plan with dependencies, so it can be scheduled. Establishing the defined objectives is best done bottom up to ensure being grounded in reality.

Scheduling the defined objectives provides the when. Taking the beginning and ending dates for the schedule provided by top management, plus the information plan, with the help of the appropriate vendors and consultants, a baseline schedule can be created and then evaluated for a 'reality quotient.' Since some activities can only be done sequentially, while others can be done in parallel, the schedule can be evaluated not only for whether it is achievable in an absolute, objective sense, but also within the budgetary constraints set by management. It can also be evaluated for optimization opportunities.

3.8.2 Being on schedule, on budget

The key to being on schedule and on budget is to start with a baseline schedule and budget grounded in reality. The next step is to consult with vendors to see how resources for consulting, education and technical support align with the baseline schedule and budget. The process iterates until both the baseline schedule and budget are finalized. Get written commitments from the vendor, and any other outside consultants, to adhere to the defined objectives in the baseline schedule. Remember, there is no substitute for having commitments in the contract.

This is not the time for selling a politically acceptable baseline schedule or budget. If the appropriate commitment of resources from management or the vendors are not made,

achieving accountability through a project review cycle becomes impossible, and being over-budget and behind schedule is virtually guaranteed. Once the baseline schedule is finalized, enforcing a project review cycle becomes paramount.

Having invested the time and effort to create the baseline schedule, a realistic budget enables the final key to success, creating ownership and accountability. From here on, enforcing responsibility through rewards or discipline is done at project review meetings. Maintaining the project review cycle becomes paramount. The implementation team must know that time is critical, if the integration takes too long the business benefits from ERP are lost. The team has a realistic baseline schedule and budget to use as a road map, but successfully completing the project is its responsibility.

3.8.3 Defining, documenting and reengineering the business

Many companies buy ERP systems and end up worse off than when they started. What makes the difference? The toughest decision of the implementation is whether to 'shape the software' or 'shape the business.' It is critical to selecting the right software. It makes all the difference. It is vitally important, and often misunderstood. It can be a source of incredible pain, or incredible gain, and the correct decision can't be made accidentally because of the human factor. Because ERP systems are so complicated, it is usually cheaper to change people's workflow than to change the way the system works. What that means is, if the implementation is going to be required to shape the software in any significant way, the database technology and its tools become more mission critical than the out-of-the-can functionality. However, the reverse is true also.

One of the unique facets of an event as broad-scoped and encompassing as an ERP system implementation is that it provides the opportunity to overcome the inertial resistance of years of evolution, a very real chance to make a quantum leap forward.

To facilitate system implementation, defining and documenting the current processes is required. Luckily, it can be done painlessly using a rather simple methodology. After that making the decision whether to shape the software or shape the business can be done

effectively. Evaluate system choices against your process flowchart, regular or optimized. Make your decision wisely.

3.8.4 Selecting the right system

The key for selecting the right system is using the global perspective of optimizing the resources of the company. What is most significant are the interrelationships of all the needs and resources. Bringing those relationships into balance allows the company to achieve world-class results in growth, profitability, and product and service development. It is also how the implementation achieves the world-class quality desired.

Koch (1999) says, 'Manufacturers need to focus on empowering users to make decisions that bring greater value to the organization through better information.' However, better information is not the same thing as more data. In many cases, applications need more emphasis on fulfilling functional needs.

If the decision is made to shape the business, ensuring that the system has the required functionality is absolutely critical because the implementation will entail selling organizational and operational change to a greater degree. If the decision is made to shape the software, ensuring that the system has powerful database technology and tools is essential because the implementation will entail much more challenging technical development. No system should be seriously considered if it is significantly deficient in either, but the relative strengths need to fit the shaping decision.

3.8.5 Assembling the right team

Implementing an ERP system is nearly as daunting a task, and yet, many companies turn the task over to new hires or existing personnel on a part-time basis, and then wonder why the effort fails. This is clearly not a part-time effort. It is a full-time mission-critical effort. The implementation will fair better with four full-time people than with 23 adding it to their existing responsibilities, i.e., part-time. You may need one team for a small implementation, or multiple teams in parallel for a large implementation, but the full-time rule still applies. Senior management must realize and support the major time

commitment the user community makes during the system selection process and implementation period. They must communicate that understanding and support through regular rewards, especially as the pain index is rising.

But who should be on the team? Since ERP will cross many of the traditional and artificial boundaries that users have established, the team must be willing to look beyond what is in place and challenge organizational norms. In order to be effective in implementing the system, the team must include well-established employees who have a strong grasp of the business, who are opinion makers, who understand the unique opportunity a system implementation provides and who are passionate about making things happen. They need to be willing, and able, to delegate all of their current duties, in order to make a commitment to the implementation as their new full-time responsibility. And they need to commit to being the owners of the system when the implementation is complete.

It should be a cross-functional group with a designated project leader. Experience has shown that they should be physically relocated together into a work group, so that everyone else in the company is put on notice, non-verbally, that the team has accepted a new, mission-critical role.

3.8.6 Successfully launching the system

What should management expect? Management expectations should start with themselves. Management should expect leadership, vision, resources, unflinching honesty and expectations limited to well-grounded reality, from themselves first.

Then, they should expect the team to take ownership. The team must prove it first, launch it second. To prove that the system has been thoroughly tested and is operationally reliable, they must fulfil the requirements of the information plan completely. To launch it they must have a realistic plan for system roll-out that includes generous training opportunities for the user community.

During the implementation period, management should expect the team to provide accurate feedback on progress during the review cycle, using demonstrable examples such as reports actually run in the system with representative data, and to have concrete action plans for managing obstacles as they are encountered. Final approval should only occur when the team can present actual reports and documents as outlined in the information plan, using a large sample of historical data with known results, that are validated by a full reconciliation.

3.9 The Subjects ERP Fix In The Business

There are three major reasons why companies undertake ERP:

To integrate financial data

As the top managers try to understand the company's overall performance, they may find many different versions of the truth. Finance has its own set of revenue numbers, sales has another version, and the different business units may each have their own versions of how much they contributed to revenues. ERP creates a single version of the truth that cannot be questioned because everyone is using the same system.

To standardize manufacturing processes

Manufacturing companies especially those with an appetite for mergers and acquisitions, often find that multiple business units across the company make the same widget using different methods and computer systems. Standardizing those processes and using a single, integrated computer system can save time, increase productivity and reduce headcount.

To standardize HR information.

Especially in companies with multiple business units, HR may not have a unified, simple method for tracking employee time and communicating with them about benefits and services. ERP can fix that.

3.10 Will ERP Fit The Ways Doing Business?

It's critical for companies to figure out if their ways of doing business will fit within a standard ERP package before the checks are signed and the implementation begins. The most common reason that companies walk away from multimillion dollar ERP projects is that they discover that the software does not support one of their important business processes. At that point there are two things they can do: They can change the business process to accommodate the software, which will mean deep changes in long-established ways of doing business (that often provide competitive advantage) and shake up important peoples' roles and responsibilities. Or they can modify the software to fit the process, which will slow down the project, introduce dangerous bugs into the system and make upgrading the software to the ERP vendor's next release excruciatingly difficult, because the customizations will need to be torn apart and rewritten to fit with the new version.

3.11 ERP Project's Cost

Meta Group recently did a study looking at the Total Cost of Ownership (TCO) of ERP, including hardware, software, professional services, and internal staff costs. The TCO numbers include getting the software installed and the two years afterward, which is when the real costs of maintaining, upgrading and optimizing the system for your business are felt. Among the 63 companies surveyed—including small, medium and large companies in a range of industries—the average TCO was \$15 million (the highest was \$300 million and lowest was \$400,000). While it's hard to draw a solid number from that kind of a range of companies and ERP efforts, Meta came up with one statistic that proves that ERP is expensive no matter what kind of company is using it (Koch, 1999).

3.11.1 ERP paybacks its cost

ERP is a navel gazing exercise that focuses on optimizing the way things are done internally rather than with customers, suppliers or partners. Yet the navel gazing has a

pretty good payback if you're willing to wait for it, a Meta group study of 63 companies found that it took eight months after the new system was in (31 months total) to see any benefits. But the median annual savings from the new ERP system was \$1.6 million per year.

3.11.2 The hidden costs of ERP

Although different companies will find different land mines in the budgeting process, those who have implemented ERP packages agree that certain costs are more commonly overlooked or underestimated than others. Armed with insights from across the business, ERP pros vote the following areas as most likely to result in budget overrun.

- **Training**

Training is the near-unanimous choice of experienced ERP implementers as the most elusive budget item. It's not so much that this cost is completely overlooked as it is consistently underestimated. Training expenses are high because workers almost invariably have to learn a new set of processes, not just a new software interface.

- **Integration and Testing**

Testing the links between ERP packages and other corporate software links that have to be built on a case-by-case basis is another often underestimated cost. A typical manufacturing company may have add-on applications for logistics, tax, production planning and bar coding. If this laundry list also includes customization of the core ERP package, expect the cost of integrating, testing and maintaining the system to skyrocket.

As with training, testing ERP integration has to be done from a process oriented perspective. Instead of plugging in dummy data and moving it from one application to the next, veterans recommend running a real purchase order through the system, from order entry through shipping and receipt of payment the whole order-to-cash cycle, preferably with the participation of the employees who will eventually do those jobs.

- **Data conversion**

It costs money to move corporate information, such as customer and supplier records, product design data and the like, from old systems to new ERP homes. Companies often deny their data is dirty until they actually have to move it to the new client/server setups that popular ERP packages require. Consequently, those companies are more likely to underestimate the cost of the move. But even clean data may demand some overhaul to match process modifications necessitated by the ERP implementation.

- **Data analysis**

Often, the data from the ERP system must be combined with data from external systems for analysis purposes. Users with heavy analysis needs should include the cost of a data warehouse in the ERP budget and they should expect to do quite a bit of work to make it run smoothly. Users are in a pickle here: Refreshing all the ERP data in a big corporate data warehouse daily is difficult, and ERP systems do a poor job of indicating which information has changed from day to day, making selective warehouse updates tough. One expensive solution is custom programming. The upshot is that the wise will check all their data analysis needs before signing off on the budget.

- **Consultants Ad Infinitum**

When users fail to plan for disengagement, consulting fees run wild. To avoid this, companies should identify objectives for which its consulting partners must aim when training internal staff. Include metrics in the consultants' contract, for example a specific number of the user company's staff should be able to pass a project-management leadership test, similar to what Big Five consultants have to pass to lead an ERP engagement.

- **Replacing Your Best and Brightest**

It is accepted wisdom that ERP success depends on staffing the project with the best and brightest from the business and IS. The software is too complex and the business

changes too dramatic to trust the project to just anyone. The bad news is, a company must be prepared to replace many of those people when the project is over. Though the ERP market is not as hot as it once was, consulting firms and other companies that have lost their best people will be hounding yours with higher salaries and bonus offers than you can afford, or that your HR policies permit. Huddle with HR early on to develop a retention bonus program and to create new salary strata for ERP veterans. If you let them go, you'll wind up hiring them, or someone like them, back as consultants for twice what you paid them in salaries.

- **Implementation Teams Can Never Stop**

Most companies intend to treat their ERP implementations as they would any other software project. Once the software is installed, they figure the team will be scuttled and everyone will go back to his or her day job. But after ERP, project team can't go home again. They are too valuable. Because they have worked intimately with ERP, they know more about the sales process than the salespeople do and more about the manufacturing process than the manufacturing people do. Companies can't afford to send their project people back into the business because there's so much to do after the ERP software is installed. Just writing reports to pull information out of the new ERP system will keep the project team busy for a year at least. And it is in analysis and, one hopes, insight that companies make their money back on an ERP implementation. Unfortunately, few IS departments plan for the frenzy of post ERP installation activity, and fewer still build it into their budgets when they start their ERP projects. Many are forced to beg for more money and staff immediately after the go-live date, long before the ERP project has demonstrated any benefit.

- **Waiting for ROI**

One of the most misleading legacies of traditional software project management is that the company expects to gain value from the application as soon as it is installed, the project team expects a break, and maybe a pat on the back. Neither expectation applies to ERP. Most don't reveal their value until after companies have had them running for

some time and can concentrate on making improvements in the business processes that are affected by the system. And the project team is not going to be rewarded until their efforts pay off.

- **Post-ERP Depression**

ERP systems often wreak havoc in the companies that install them. In a recent Deloitte Consulting survey of 64 Fortune 500 companies, one in four admitted that they suffered a drop in performance when their ERP systems went live. The true percentage is undoubtedly much higher. The most common reason for the performance problems is that everything looks and works differently from the way it did before. When people can't do their jobs in the familiar way and haven't yet mastered the new way, they panic, and the business goes into spasms.

3.12 Configuration Of ERP Softwares

The packages are built from database tables, thousands of them, that IS programmers and end users must set to match their business processes, each table has a decision switch that leads the software down one decision path or another. By presenting only one way for the company to do each task, a company's individual operating units and far-flung divisions are integrated under one system. But figuring out precisely how to set all the switches in the tables requires a deep understanding of the existing processes being used to operate the business. As the table settings are decided, these business processes are reengineered, ERP's way. Most ERP systems are not shipped as a shell system in which customers must determine at the minutia level how all the functional procedures should be set, making thousands of decisions that affect how their system behaves in line with their own business activities. Most ERP systems are preconfigured, allowing just hundreds-rather than thousands-of procedural settings to be made by the customer.

3.13 Organization Of ERP Projects

Based on the observations, there are three commonly used ways of installing ERP (Koch, 1999).

3.13.1 The Big Bang

In this, the most ambitious and difficult of approaches to ERP implementation, companies cast off all their legacy systems at once and implement a single ERP system across the entire company.

Though this method dominated early ERP implementations, few companies dare to attempt it anymore because it calls for the entire company to mobilize and change at once. Most of the ERP implementation horror stories from the late '90s warn about companies that used this strategy. Getting everyone to cooperate and accept a new software system at the same time is a tremendous effort, largely because the new system will not have any advocates. No one within the company has any experience using it, so no one is sure whether it will work. Also, ERP inevitably involves compromises. Many departments have computer systems that have been honed to match the ways they work. In most cases, ERP offers neither the range of functionality, nor the comfort of familiarity that a custom legacy system can offer. In many cases, the speed of the new system may suffer because it is serving the entire company rather than a single department.

3.13.2 Franchising Strategy

This approach suits large or diverse companies that do not share many common processes across business units. Independent ERP systems are installed in each unit, while linking common processes, such as financial book keeping, across the enterprise.

This has emerged as the most common way of implementing ERP. In most cases, the business units each have their own instances of ERP, that is, a separate system and database. The systems link together only to share the information necessary for the corporation to get a performance big picture across all the business, or for processes that

don't vary much from business unit to business unit. Usually, these implementations begin with a demonstration or pilot installation in a particularly open-minded and patient business unit where the core business of the corporation will not be disrupted if something goes wrong. Once the project team gets the system up and running and works out all the bugs, the team begins selling other units on ERP, using the first implementation as a kind of in-house customer reference. Plan for this strategy to take a long time.

3.13.3 Slam-Dunk

ERP dictates the process design in this method, where the focus is on just a few key processes, such as those contained in an ERP system's financials module. The slam-dunk is generally for smaller companies expecting to grow into ERP.

The goal here is to get ERP up and running quickly and to ditch the fancy reengineering in favor of the ERP system's canned processes. Few companies that have approached ERP this way can claim much payback from the new system. Most use it as an infrastructure to support more diligent installation efforts down the road. Yet many discover that a slammed in ERP system is little better than a legacy system, because it doesn't force employees to change any of their old habits. In fact, doing the hard work of process reengineering after the system is in can be more challenging than if there had been no system at all, because at that point few people in the company will have felt much benefit.

3.14 ERP and Electronic Commerce

After all of that work inventing, perfecting and selling ERP to the world, the major ERP vendors are having a hard time shifting gears from making the applications that streamline business practices inside a company to those that face outward to the rest of the world. These days, the hottest areas for outward-looking, that is Internet, post-ERP work are electronic commerce, planning and managing the supply chain, and tracking and serving customers. Most ERP vendors have been slow to develop offerings for these

areas, and they face stiff competition from niche vendors. ERP vendors have the advantage of a huge installed base of customers and a virtual stranglehold on the back office functions, such as order fulfilment. Recently ERP vendors have begun to shrink their ambitions and focus on being the back-office engine that powers electronic commerce, rather than trying to own all the software niches that are necessary for a good electronic commerce web site.

3.15 The Future of ERP Systems

The Internet represents the next major technology enabler which allows rapid supply chain management between multiple operations and trading partners. Most ERP systems are enhancing their products to become 'Internet Enabled' so that customers worldwide can have direct to the supplier's ERP system. ERP systems are building in the Workflow Management functionality which provides a mechanism to manage and control the flow of work by monitoring logistic aspects like workload, capacity, throughout times, work queue lengths and processing times.

4. INFORMATION ABOUT THE COMPANY

Türkiye Şişe ve Cam Fabrikaları A.Ş. generally known as 'Şişecam' established by İşbank, a leading Turkish commercial bank, on M.Kemal Atatürk's initiative, in 1935 to pioneer in hand-made glassware & container glass production under the Paşabahçe brand name.

Today it is one of the few integrated industries and most rapidly developing sector in Turkey.

4.1 Chronology of the Şişecam Group

- 1934-The Turkish Glass Industry came into being in Paşabahçe-İstanbul
- 1935-Production commenced at Paşabahçe Plant
- 1935-The company name registered as Türkiye Şişe ve Cam Fabrikaları A.S.
- 1936-Production reached 3000 tpa
- 1957-A marketing company for glassware established under the name Paşabahçe Ticaret Ltd. Sti. (Name changed as Paşabahçe Cam Sanayii ve Ticaret A.Ş. in 1996)
- 1961-Flat glass (Sheet glass, patterned & horticultural glass) production started at Çayırova Cam Sanayii A.Ş.
- 1968-Teknik Cam Sanayii A.Ş. began to manufacture heat resistant glassware and laboratory equipment
- 1969-Topkapı Şişe Sanayii A.Ş. took over bottle production from Paşabahçe Plant.

- 1970-Production of moulds, machinery & spare parts for the manufacture of glass containers and glassware started at Camiř Makina ve Kalıp Sanayii A.ř.
- 1973-Ferro Döküm Sanayii ve Ticaret A.ř., the producer of castings for glass and automotive industries acquired
- 1974-Cam İşleme Sanayii A.ř. was established to manufacture insulating glass, safety & security glass and mirror
- 1974-Cam Elyaf Sanayii A.ř. started to manufacture glass fibre reinforcements (mat, rovings, chopped strand), polyester, gel-coat
- 1975-Production of soda ash, the major raw material for glass commenced at Soda Sanayii A.ř. in Mersin, on southern coast of Turkey.
- 1975- The adjacent Kromsan Plant undertook production of chromium chemicals.
- 1975- Anadolu Cam Sanayii A.ř., the manufacturer of glass containers and bottles located in Mersin, acquired
- 1975- Rastař Reform Ambalaj Sanayii ve Ticaret A.ř. manufacturer of metal closure for glass containers acquired (Name changed as White Cap Ambalaj Sanayii ve Ticaret A.ř. in 1995. Left the Group in 1996)
- 1976- Cam Pazarlama A.ř. set up as a foreign trade company
- 1978- Trakya Cam Plant came into operation to manufacture float glass under the licence of Pilkington. Supplemented by a second float line in 1990
- 1978- Bursa Otocam Sanayii A.ř., the automotive glass manufacturer acquired.
- 1978- İstanbul Porselen Sanayii A.ř., the fine porcelain manufacturer established. Closed in 1990
- 1980- Sinop Cam Sanayii A.ř., established to manufacture hand-made crystal ware. Closed in 1993
- 1981- Pařabahçe Perakende Satışlar Ltd. řti. the retail sales company for glassware formed. Currently runs 35 retail shops throughout the country

- 1984- Kırklareli Cam Sanayii A.Ş. came into operation to produce mechanical glassware.
- 1984- Caminter Internationale Handelsgesellschaft GmbH, the subsidiary office in Germany opened. Replaced by a Frankfurt Representative in 1995
- 1985- Camiş Menkul Değerler A.Ş. established as a securities company
- 1985- Derya Dış Ticaret A.Ş., the forwarding company established. Merged with Cam Pazarlama A.Ş. in 1994
- 1987- Camiş Ambalaj Sanayii A.Ş. set up to provide cardboard and paper packaging especially for glassware products
- 1988- International Glass Ltd. Established to conduct trade with the Far East
- 1988- Camiş Madencilik A.Ş., the Group's supplier of raw materials started to operate
- 1989- Camiş Sigorta Hizmetleri A.Ş., the Group's insurance agency established
- 1990- Camsar Sanayi Ara Malları Pazarlama A.Ş. established as a marketing company for soda ash & chromium chemicals
- 1990- The Flat Glass Business instituted Camtaş Düzcam Pazarlama A.Ş. as the marketing company
- 1993- Trakya Otocam Plant became operational to manufacture automotive glass
- 1993- Intercam Kaplamalı Camlar Sanayii A.Ş. established as a partnership with German Interpane to manufacture solar control & climate control glass. Shares transferred to Şişecam in 1996. Renamed as Kaplanmış Camlar İşletmesi
- 1993- Tezsan Takım Tezgahları Sanayii ve Ticaret A.Ş., CNC machine tools manufacturer acquired
- 1993- Subsequently, Tezsan Pazarlama A.Ş., the marketing company for CNC machine tools formed
- 1994- Denizli Cam Sanayii ve Ticaret A.Ş., the hand-made glassware manufacturer acquired

- 1995- Camiř Elektrik Üretimi Otoprodüktör Grubu A.ř. established to co-generate electricity and heat for glass companies
- 1995- Topkapı Çayırova Plant formed to manufacture green bottles
- 1996- Trakya Mersin Plant, the third float line came into operation
- 1996- Pařabahçe Mersin Plant, started as a manufacturer of glassware
- 1996- The Chemicals Business established Oxyvit Kimya Sanayii A.ř. to produce specialty chemicals for animal feed
- 1997- The Ksani Container Glass Plant in Tbilisi / Georgia acquired
- 1997- A JV formed with Mitras of Germany to produce Glass Reinforced Plastics
- 1997- řiřecam Bulgaria Ltd. set up as a representative office of Chemicals Business
- 1998- řiřecam-Egypt company is established
- 1998- Madencilik Sanayii ve Ticaret Ltd. is started to operate
- 1998- Chromic Acid production is started in Soda Sanayii A.S.
- 1998- Casting production capacity of Ferro Döküm company is increased 30.000 tons/year with the establishment of a new plant
- 1998- Schott Pasabahce GmbH the sales and marketing company for glassware formed

4.2 Vision and Achievements

Despite hard conditions of crisis, Şişecam has accomplished its investments successfully.

During period of crisis, glass prices sank to their lowest level in 30 years. However Şişecam has expanded its production targets 3% more compared to last year. Financial targets have also been closer to the working programs.

Şişecam's Vision 2000, " Leading glass producer of the critical geography. "

Şişecam's success is rooted, among other things, in the basic approach that attaches due significance not only to quantitative growth, but also to qualitative development.

Special effort towards the development of systems devoted that will maximize benefits to all, including shareholders, employees, customers and suppliers.

Major achievements of 1997, other than those mentioned above, may be summarized as follows:

- The modernization of existing plants and the installation of new ones increased the output by approximately 200 thousand tons, from 1,214,000 tons in 1996 to 1,400,000 tons.
- The production of industrial raw materials rose to 1,275,000 tons.
- The capacity expansion project, that was initiated in 1996 to increase the soda ash output from 613,000 tons to 750,000 tons, is mostly completed.
- The Trakya co-generation plant was put into operation so that the power-intensive Şişecam Group may not be critically affected by the serious problem of power shortages in the country. Generating 250 million kWh of electric power and 108 thousand tons of steam, this plant will safeguard the four units located in the area against energy failures.

Similar investment is made in regional power stations in Topkapi and Çayirova. The projects being largely completed in 1997, these two plants will become operational in the first half of 1998.

- The capacity of Ferro Döküm was increased to 30 thousand tons at \$ 22 million in investment.
- The total sales rose from \$ 1 billion in 1996 to \$ 1.1 billion in 1997. Meanwhile, export targets were achieved, with foreign exchange earnings totaling \$ 3350 million.
- 1997 was marked by further emphasis on institutional R&D operations, employing a 250-member staff. The Şişecam Group allocated 1% of its turnover to R& D.
- In satisfying the needs of the domestic market, Şişecam seeks to meet highest standards of quality and service. This will also help maintain and enhance the international competitiveness and serve the long-term interests. As for the investments in the neighbor region, major undertakings in 1997 included the Solvay-Soda and Pasabahçe-Schott joint ventures and the acquisition of the Mina (Ksani Glass Packaging plant) in Georgia.
- The commitment to creating wealth by taking full and prompt advantage of all opportunities, that may arise across the world, in the immediate region or in Turkey, remains as strong as ever. The efforts to better serve the common interests of the shareholders, employees, consumers and suppliers, on the other hand, are further strengthened by the support of İşbank, the parent company.

4.3 Focal Points

The Şişecam Group met its targets in 1997, in the face of persistently high domestic inflation and political instability.

It continued with acquisitions, joint ventures and strategic partnerships, in full awareness of the fact that an international market presence is commensurate with scale.

Technological Innovation ... New items were introduced into the range of coated glass products. These new products, characterized by increased light transmission and increased solar control, were developed at the Thin Film Laboratory. They were then manufactured on a commercial scale and found their way into the market.

Technology Transfer ... Şişecam exports technology, transferring its furnace and glass technology know-how. The process started with the technical agreement signed with the Egyptian firm MEG in 1996. It was followed in 1997 by the modernization project at Mina (Ksani Glass Packaging plant) in Georgia.

Environment ... No industry can afford to be environmentally indifferent in the face of worldwide increase in environmental awareness. The glass industry, by its very nature, is friendly to the environment. Glass packaging, in particular, is best suited to take full advantage of "recycling economies" because of the specific nature of glass. Over its 62 years in business, the Şişecam Group has devoted a great deal of effort, much time and extensive resources to the recycling of glass. It now has its recycling system largely in place. Through this system, 410,000 tons of broken and refuse glass were collected and recycled in the past five years, saving energy worth TL 272 billion. In 1986, Şişecam introduced "bottle banks", adopting one of the most modern methods in recycling glass packaging. The practice was continued in six provinces in 1997, and the numbers of "bottle banks" reached 1,100. Installed in pairs for green and transparent glass, the system allows color sorting at the source, enjoys popular support and, donates all revenue to charity.

The Trakya co-generation plant is now generating power. It is to supply energy to Şişecam's plant in Thrace. Construction of Topkapi and Çayirova Cogeneration plants is underway. These started operating in 1998.

Capacity expansion and improvements were completed at the No. 1 float line furnace of Trakya Cam and No. 10 furnace of Anadolu Cam, the latter company manufacturing glass packaging. Both units are operational.

The first stage of a two-stage expansion project to increase the annual soda ash production capacity of Soda Sanayii by 200,000 tons was completed and put into operation. The ongoing second stage completed in 1998.

The brand new paper-cardboard packaging plant of Camiř Ambalaj started operating in the Eskiřehir Industrial Region in the second half of 1997.

The Pasabahe-Schott company, which Pasabahe co-founded in 50/50 partnership with the German firm Schott, is building a new plant in Eskiřehir, with a view to supplying glassware to the international HoReCa (Hotel, Restaurant and Catering) market. Planned to go into production in early 1999, the plant will be exclusively export-oriented.

řiřecam performed well also in investments abroad. This was particularly significant in view of its implications for řiřecam's continued strength in regional and international terms.

By acquiring the Sodi plant in Bulgaria in partnership with Solvay, Soda Sanayii not only increased its soda ash production capacity, but it also got an opportunity to enter new markets.

An equity investment with a share of 76% in the Mina (Ksani plant) in Georgia provided the Group with an opportunity to benefit from the regional demand for glass packaging. řiřecam strives to turn its "Vision 2000" into reality.

In addition to these large-scale projects, řiřecam plans further investments in capacity expansion, technological modernization and logistical infrastructure, as well as in mining ventures abroad so as to meet raw material requirements of the glass industry.

5. PREPERATIONS TO ERP & BPR STUDY IN THE COMPANY

5.1 Targets and Elements Of The Study

Improvement of the overall performance of the organization, requires to emphasize on production and the actual industrial activity data. In order to improve the decision making process and the operations control, the company has decided to look for new information system(s).

The BPR Study and ERP Implementation is aiming to supply Şişecam with a comprehensive and integrated information system to cover the manufacturing and distribution activities and to interface direct to the managerial systems.

The targets of the organization to be supported by the new system are:

- Improve efficiency.
- Improve quality.
- Improve equipment utilization.
- Improve company and products image.
- Improving management tools.
- Improve competitiveness.
- Implement “On going improvement” policy.
- Reduce costs.
- Assist in planning and marketing.
- Connect manufacturing systems to management systems

- Cover all aspects of manufacturing and distribution activities.
- Get the information “from the source”.
- Collect all data as soon and it occurs, make it available to users immediately.
- Rely mostly on automated data rather on manual, use strongest data collection tools.
- Build the basis for the organization for “On going improvement” policy.
- Make the system a tool, to be used by all levels of users in the organization.
- Make it flexible enough to support technical and commercial changes.
- Build a system to utilize the most updated information technology, and to allow adopting new options when they become available.

The project elements are:

- Design and planning.
- Communication infrastructure.
- Hardware.
- Portable and barcode equipment.
- Software products (packages).
- Software modifications and development.
- Implementation and training.

The Environment of the installation is based on the Windows NT operating system, Client/Server method, PC's as users stations, and WINDOWS as the user interface.

Based on benefits expected from the new setup, ROI is expected to be achieved in less than 3 years.

5.2 Status Of Şişecam Before The Project

Şişecam was using inhouse written program in its plants and headquarters. This program was written by using Cobol language and its technology was old. First of all the software and the hardwares which the software runs on had Y2K Problem and trying to solve this problem was another expensive project.

The inventory system was not capable of handling the type of products the company is making. Information flow from the plants to the headquarters was not good enough and was not on time. Because of this, inventory control could not be done and sometimes sales was exceeding inventory or although customer needs the product, since the sales representatives do not have true inventory level, sales could not be made.

The catalogue number was complicated. This was due, possibly, to the poor inventory system. The catalog number was used only for administrative purposes. The departments used replacements in their ongoing task.

Some of the data entered twice, some transactions made twice by two departments.

The inventory system hold general quantities of the products, not in the packages that are the marketing units. No automated connection existed between inventory and shipments. Shipping documents and invoices were not automatically connected to the finance system. Although barcode labels were attached to boxes, manual data entry was made at the shipping point.

No marketing system was available, and no methodical way to analyze the market trends, and the current customers activities.

The relationships between Şişecam and the hardware/software suppliers was not formal enough, to guaranty performance.

5.3 Selection of the ERP Package

In 1997, responsables of Şişecam decided to implement an Enterprise Resources Planning (ERP) Solution. Şişecam selected a five-person team to examine ways to redress current problems, like missing of true inventory information, customer confidence, distribution, etc. Two team members were from the factory, one was from Research & Development, one was the ERP Project Manager, and the fifth was the sponsor (Vice-President of the Flat Glass Group) of the project. The team began work, educating staff and forming groups to address key issues. Three factories and the headquarter were selected as pilot sites. The team identified key issues like forecasting demand, maintaining accurate stock records, and having a clearly defined inventory policy. Meanwhile, at the factories, separate project teams were formed to address the priorities in distribution.

Enterprise Resources Planning (ERP) software was a key requirement in improving distribution operations. The company's IT department reviewed 6 ERP packages before short-listing 4 and then studying two in depth. IFS Applications software was ultimately selected.

5.4 BPR & ERP Project Organization of Şişecam

A good project organization structure is a key enabler for effective ERP Implementation.

Defining a Project Organization Structure (POS) forms the first step in an ERP implementation project. The POS is the human framework within which all project objectives must be achieved. Development of the organization structure takes into account project objectives and deliverables, and also factors related to project control, risk, and quality. An ERP implementation project typically involves top management and representatives from all departments of the organization, software vendors, hardware vendors, and the implementation consultants. This heterogeneous mix of people associated with the project makes the development of correct POS an activity of paramount importance.

The structure for Şişecam Project consisted of various roles which are told below:

5.4.1 Project sponsor

The role of the project sponsor is the most critical within the project organization, and no ERP project should be undertaken without a clear project sponsor. The project sponsor is generally the person who is committed to change and improvement in the functioning of his organization and is convinced that an ERP system implementation is the best and the only way to achieve it. He should have the political authority and organizational power to initiate the project and sustain it through to implementation. The CEO of the organization can be the project sponsor. In Şişecam Project, Vice President of Flat Glass Division was the project sponsor. The responsibilities of the project sponsor include:

- Promoting the benefits of ERP to the organization
- Smoothing out internal problems
- Maintaining support for the project at senior level
- Being ultimately accountable for the project's success or failure.

5.4.2 Steering committee

The steering committee consists of representatives from each business area significantly affected by the project. Committee members should be those who clearly understand the impact of project-related changes and those with authority over allocation and management of user resources. Project sponsor chaired the steering committee. A senior representative from the consulting team was also part of the committee. The steering committee provided direction and decision-making support to the project and met regularly to serve as a communication link between the project team and senior management of the organization. The tasks and responsibilities of the steering committee included:

- Reaching an agreement over the overall scope of the project

- Selecting members of the project team
- Considerations, approval, and authorization of resources (staff, computer facilities etc.), project plans, and revisions to plans as appropriate
- Reviewing and approval of quality plan and risk management plan
- Monitoring the overall progress of the project
- Assisting in clearing any bottlenecks that may arise due to conflicts in priorities or approaches within the project team
- Monitoring risk analyses and cost/benefit assessments
- Approving trade-offs in cost versus schedule versus business benefit. This scenario can occur when the ERP system being implemented is not able to deliver some functionality and new software programs have to be written
- Assisting the project team by ensuring that quality assurance is carried out in a timely and efficient manner.
- Ensuring advertised project benefits are realized
- Authorizing project closure.

5.4.3 Project manager

The project manager was appointed by the steering committee on the basis of administrative skills and exposure to business functions within the organization. The project manager can be a senior manager in the organization or can also be a senior experienced member of the consulting team. Ideally, for large implementation projects, two project managers – one from the organization and one from the consulting team – are appointed. That was the case in Şişecam Project, there were two project managers, one was the manager of IT Department and the other one was the manager of the consulting team. The principal areas of responsibility for the project managers were:

Iterative:

- Develop / update the project plan
- Establish realistic schedules that reflect not only the technical ability to deliver, but also the ability of users to participate in the project
- Develop and/or review detailed project work plans
- Establish / enhance reporting mechanisms
- Ensure that realistic project status reports are produced and distributed on a regular basis
- Conduct regular status meetings
- Present regular high-level reports to the steering committee.

Continuous:

- Ensure project objectives and business expectations are met
- Monitor and control project progress
- Implement proactive measures when the project deviates from its plan
- Monitor the quality assurance, deliverable acceptance, and sign-off processes
- Oversee the project change control and issue resolution processes
- Ensure that strong project sponsorship is maintained
- Monitor project risk
- Maintain continuous communication with the project teams.

Human Resource:

- Determine skill requirements and identify required resources
- Monitor and manage user (customer) expectations
- Review and modify the project organization structure as the project progresses
- Delegate responsibilities to team leaders, as appropriate
- Manage project staff
- Manage relationships with ERP software vendor, computer hardware vendor, and other external vendors of resources
- Identify and manage resistance
- Management of change

As Needed:

- Coordinate milestone deliverable sign-off
- Implement appropriate corrective actions when progress deviates from plan
- Evolve an extensive ERP policy and procedure manual.

5.4.4 Functional team

The functional team was the most important component of the POS and formed the interface between the ERP system and end-users during project stage. It had representation from every function within the organization, like inventory, purchase, planning, production, finance, costing, marketing, sales, etc. These team members were selected by the steering committee based on their exposure to respective business areas and their ability to manage change in operational procedures. Collectively they were responsible for:

- Conducting a detailed requirement analysis. A Definition of Requirements Report made based on this analysis.
- Development of prototype ERP model of the organization. They assured themselves of the effectiveness of the new business procedures which get framed during the course of prototyping.
- Developed a Requirements Mapping Report (RMR), which compared in detail the procedures which were followed in the old system and those to be used in the ERP environment. Elimination of old processes, which were of no use in the changed setup, was appropriately justified in the RMR.
- Functionalities which are not supported by the ERP system were also mentioned in the RMR along with their relative importance (e.g. essential, desired, nice-to-have, etc.). The steering committee discussed these functionalities in detail and decided if additional programs have to be developed to accommodate them
- Design of user-defined reports and screens
- Conduct a parallel run in which the new ERP system was operated along with the old system
- Conduct acceptance testing in which ERP system data was compared with the old system. A partial evaluation of the ERP implementation was done at this stage by the team in terms of simplicity of procedures, data accuracy, and cycle times
- Customizing user documentation
- Training and education to end-users
- Planning handover
- Post-implementation support to end-users

5.4.5 Implementation consultants

The functional team was assisted by a team of implementation consultants. Using their knowledge of process integration and experience in applying proven techniques, the implementation consultants simplified and expedited the implementation process. Some members of this consulting team, who possess specialist knowledge and experience in implementation of ERP systems in the specific functional area, were appointed team leaders for that function. The team leader coordinated the activities of his team and ensured that team milestones were achieved within budgeted time. In addition to assisting the functional team in all the activities mentioned above, the implementation consultants were also involved in:

- Providing an overview of ERP to the top management in the organization
- Training the project team members in the ERP system
- Ensuring that vendor-supplied training material, alongwith company-specific data, was extensively used for the training
- Providing a fresh, unbiased perspective on the way of doing business, sometimes even challenging the status quo
- Conducting an extensive post-implementation audit. (All the procedures which have undergone changes after ERP implementation were documented in detail alongwith their impact on the overall functioning of the business in this report. The report was discussed in the steering committee meeting alongwith the project leader's comment and the committee members' individual observations, before the final sign-off of the project.)
- Conducting a post-implementation review after the system was fully implemented and the entire staff was familiar with the system. (It provided a formal review point to measure the success of the project and the system against the original objectives and identified ways in which further benefit can be gained by better use of the system or by further development work.)

- Alongwith functional consultants, the team also consisted of one or two IT specialists who assisted the client IS team in issues such as system administration, security, network management etc.

5.4.6 Information Services (IS) team:

The IS team consisted of the members from the EDP department of the organization. The team had a good mix of expertise in operating systems, networking, and database administration. The IT specialist, from the consulting team, was responsible for training members of the IS team in technical aspects of ERP systems (i.e. operating environments, database administration, and security etc.) alongwith a functional overview of the ERP system. The IS team was involved in every activity of the project, like requirements study, selection, installation of hardware and software, prototyping, data migration, parallel run, and the cut-off to live.

The role of the IS Team was of particular importance in data migration activity when data from old systems has to be loaded on to the new system with suitable modifications. In case new functionalities had to be developed, the IS team was responsible for providing the technical specifications to the programmers. Also, the IS team was responsible for incorporating vendor-supplied updates in the ERP software after the completion of the project.

5.4.7 Hardware vendor

The hardware vendor was responsible for installing all the computer hardware and related peripherals like printers and networking equipment. Since Şişecam was a multi-location implementation alongwith a local area network, a wide area network also needed to be set up using leased lines. The hardware vendor is also responsible for maintenance of the computer systems throughout the course of the project and beyond.

5.4.8 Software vendor team

Members from the software vendor organization were responsible for installing the ERP software. Also, the software vendor provided the organization with regular updates to the software for bug fixation or feature enhancements. In case the steering committee decides to develop new programs to accommodate the functionalities not supported by the system, the software vendor assisted the development team in understanding the technical details of the ERP software and thus help achieve integration of the new modules with the package.

The project organization structure discussed above was the Şişecam's ERP implementation project structure. But the structure may change, depending on organization size and scope of the project. Also, project organization is dynamic, and it is observed that, as a project progresses, the project organization generally evolves.

5.5 Strategy of the Implementation

Şişecam opted for a cautious strategy: It would implement the package on a state-by-state basis. Four people with order entry and inventory roles in the headquarter were trained as trainers. They helped write the training manuals, and when the rollout commenced, they became key resources. Beginning with Lüleburgaz Plant, employees were trained for several weeks. The company observed the process and then left a few staff to monitor and advise on progress. The same pattern was followed in Mersin and Çayırova Plants, too. When the ERP system being implemented was not able to deliver some functionality and new software programs have to be written, the following strategy that is in Figure 5.1 was used:

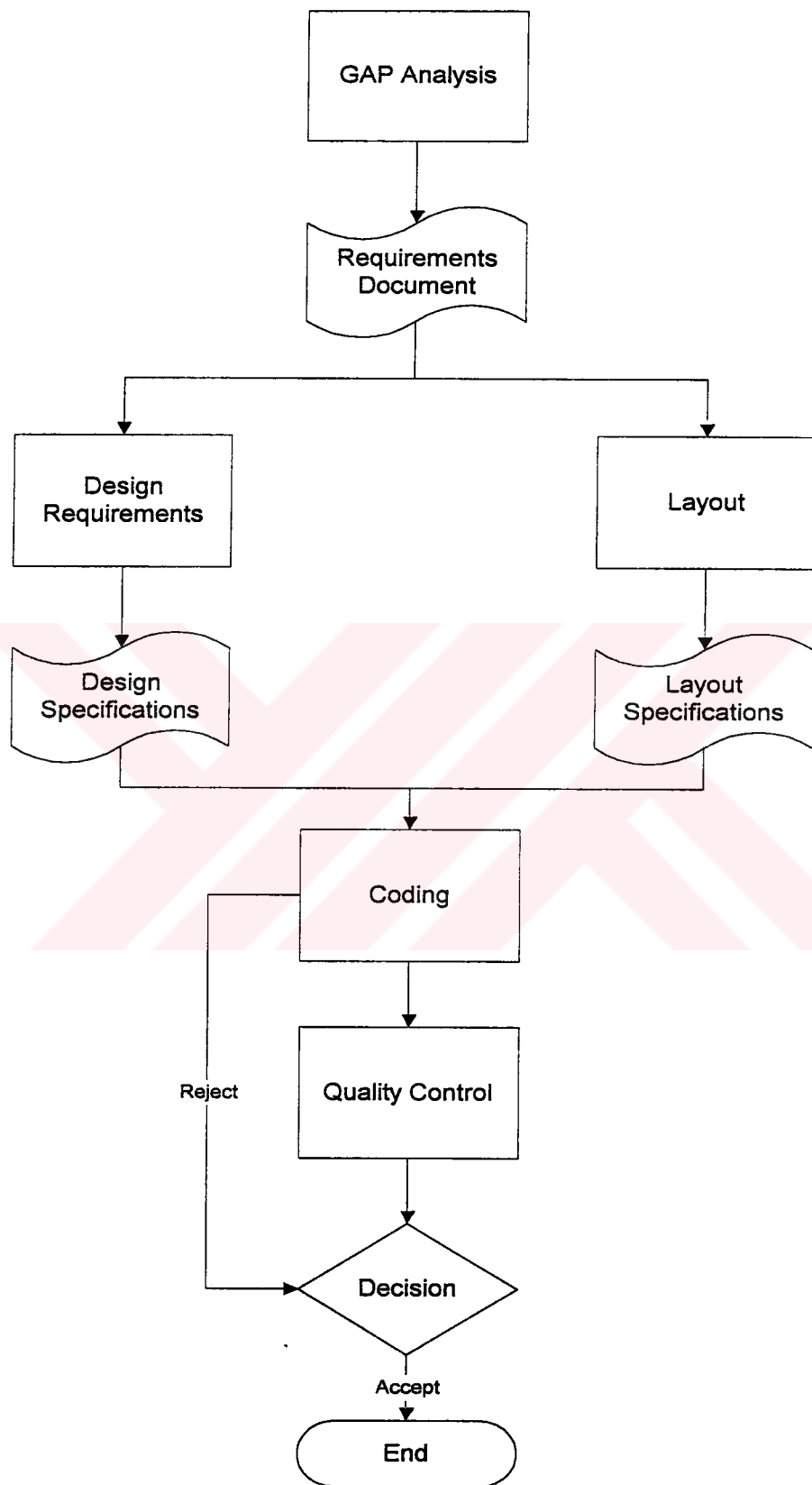


Figure 5.1 Development Strategy

6. ANALYSIS OF THE WORK FLOW FOR BPR STUDY

This project includes Sales, Purchasing and Inventory Processes of Şişecam. The processes are observed by the writer in the plants and headquarter of Şişecam and explained below in detail. Also a short information about the production in the plants is given by the writer, for the help to the readers, to make them better understand all the picture. Documentation of the processes can be considered as the base of Requirements Mapping Report.

6.1 Production in the Plants

6.1.1 The float process

The float process for manufacturing glass is recognized as the world standard for flat glass production. Today a new float line costs between \$80 and \$120 million dollars, and the operating life of a furnace, called a campaign, is from seven to ten years. At the end of the campaign, the float must be rebuilt and relined with new refractory materials. This rebuild costs between \$10 and \$15 million and takes three to four months to complete.

In the float process, a large gas-fired melting furnace, or tank, operating at temperatures near 2700 degrees Fahrenheit, melts a batch of raw materials, including silica, sand, limestone, soda ash, dolomite, cullet (which is crushed recycled glass), and additives to give the glass the appropriate color of bronze, gray, or blue-green.

A continuous ribbon of molten glass mixture floats from the tank over a bath of molten tin where its speed and temperature are computer monitored and controlled to give the finished glass its proper thickness and characteristics. There are three separate temperature zones in the bath. The first zone is the heating zone where irregularities in the glass surface are melted out and both surfaces become flat and parallel. The fire polishing zone is where the glass acquires its brilliant surfaces. The final zone is the

cooling zone, where the glass cools sufficiently for it to touch the rollers without spoiling the fire-polished surfaces.

The ribbon of glass then moves from the bath onto the annealing lehr where precise gradual cooling relieves stresses in the glass. Following cooling and a series of quality control inspections, the continuous ribbon enters the wareroom area where the glass is cut into sizes for storage, distribution, or fabrication into value-added products.

When the ribbon of glass enters the wareroom from the lehr, the ribbon is inspected by automatic inspection equipment for the presence of flaws. There are five quality levels of final product.

Once the product is separated from the ribbon, it automatically moves down the conveyor system to the destined packing station, where it is packed for storage or shipment. Some products are packed using automated packing equipment, while others are packed manually.

6.1.2 Operational issues at flat glass products

Planning operations at a flat glass plant is complicated by a number of factors, including the necessity to plan for approximately 205 different product types. The glass is produced in four different colors (clear, gray, bronze, and blue-green), 26 thicknesses, five quality levels, four packaging modes, two cutting classifications (cut-size and uncut), and a number of further fabrication options (tempered, coated, and so forth).

The single most important consideration in planning flat glass operations is the transition schedule, that is, the scheduling of production time for the four colors. Changing color from clear to a tint (bronze, gray, or blue-green) results in up to eight days production of off-color glass that can not be sold as finished product. Changing from one tint to another results in two to four days lost production. Because of these large transition losses, the plants naturally schedule long color runs that take as much as 10 months to complete a full color cycle. The sequence of colors at a plant is generally unalterable because of the inventory levels held from previous color cycles. However, deciding the

duration of color runs is critical since poor choices can result in stockouts in a color that may not be produced again for many months.

Another factor that is crucial in operating a flat glass plant is maintaining a high percentage of on-line cutting. Standard sized glass sheets are cut on-line in the wareroom as the glass is being produced. However, glass that is cut to customer order may be cut either on-line or off-line after a period of storage. On-line yields are higher for a number of reasons. However, some level of off-line cutting is mandatory. For example, if a customer orders a special size of, say, bronze glass while some other color is scheduled on the float, that order must be cut off-line from standard bronze sizes in inventory. Since customer orders for cut-sizes are rarely known more than a month in advance, most orders for cut-size products, other than clear, must be cut off-line.

A final important area of concern is inventory management. Because plants take so long to make transitions, their inventories can be very large. To manage inventory successfully, the plants must balance the risks of obsolescence against those of stock-outs. Managers specify minimum safety-stock levels in terms of equivalent days of sales. Furthermore, to cover demand for products of a particular color during the interval between successive occasions when the float is producing that color, plants maintain minimum cycle stocks. For a given product, this cycle stock must be sufficient to cover all demand for that product plus all demand for products cut off-line from the given product.

6.2 Sales Processes

6.2.1 Budget

At the beginning of every year sales department makes a monthly sales plan for the year. This is a very general plan for every company and used to see the future better and to plan the production accordingly. In this plan products are grouped into product families, amount of sales for the product families is estimated and by multiplying it with percentages each product's sales amount is calculated.

6.2.2 Domestic orders versus foreign orders

Workflow of Customer Orders in Şişecam changes according to the customer groups. Mainly there are 2 groups, which are foreign customers and domestic customers, but domestic customers can be divided into 2 groups, which are big ones (or special ones) and the others. First of all it should be mentioned that sales to the domestic customers made from stock, while foreign customers give their order first and then wait for the production. So production planning is very important for exports, but it is not so important for domestic sales, because generally Şişecam's production level is under customer demand.

The difference of the order flow between domestic customer orders come from the priority levels of the orders. Sometimes special customers of Şişecam who are buying in big amounts –these are generally dealers of Şişecam- do not want to wait much to receive their order, and sales personnel receive Priority Orders for these customers.

6.2.3 Order taking process

In the morning salesman receives inventory levels from the plant and they begin to speak with the customer. They enter the orders to the system and they continue this job until the inventory finishes. Generally phone speeches by customer and order taking process continue until 14:00 in the afternoon. Sometimes special customers call after 14:00 and give their orders. After the customer order taking process finishes and everything clears out for the sales personnel, they begin to release the orders. Releasing order means to approve it and after this process the customer order becomes definite. Releasing the order sends it to the other database, plant personnel see the order on their screens and they are informed of the orders taken in the morning. And preparation begins for delivery in the plant. But sometimes sales personnel do not enter the customer order immediately to the system, if the order is not urgent or if there is a problem in the computer systems, so after one or two days they enter the data for the past. For domestic customers all the order is delivered at once, it means some part of the order cannot be delivered late. For foreign customers backorder can be permitted.

If the order is from a foreign customer, production plan is made and production begins. Certainly necessary documents like letter of credit begins to be prepared, too.

6.2.4 Addresses and terms

There can be more than one address for a customer, for example warehouse of the customer can be in a different place. So goods are shipped to the warehouse address while invoice is sent to another address. Sometimes mail address of customer can be different, too.

Delivery terms of the goods, payment terms, carrier codes and ship via codes are defined in every customer order. But usually these terms are same for every order of one customer or there are very little changes. There are lead times for every address and ship via code. For example if the order is urgent, customer can want the delivery by plane and the lead time decreases to hours, but if the same customer wants the delivery by railroad then the lead time can increase to several days.

6.2.5 Vehicle information

Every customer has a vehicle information and when orders are taken from the customer, this vehicle information is used. Because usually customers have their own trucks and every kind of truck has a limited capacity to carry the goods. Salesman should consider the vehicle capacities and receive the orders accordingly. Salesmen try to make the order amount integer multiples of truck capacity.

6.2.6 Credit limit

Every customer in Şişecam has a credit limit. Sales Department manager determines the credit limits of customers according to their guarantee statement from bank and the customer's reputability. When receiving order from customer, salesmen have to take customer credit limit into consideration. Sometimes customers can have parent or child customers, and Şişecam considers these group of customers together. If a Corporate Credit Relationship exist the credit limit will also be used in determining the credit limit of the related Parent company and subsidiary. Salesman checks the sum of the new

customer order, the non-invoiced orders and the unpaid invoices and if this total amount exceeds the customer's credit limit, salesman cannot approve the order. Only if the customer is one of the reputable ones, not the salesman but chief or the manager of the sales department can approve the order.

6.2.7 Sales groups

Şişecam has groups for sales parts. Characteristics of the sales parts in one group are similar. These groups are used for price determination, when giving discounts to customers, or increasing the price. Also these groups are used for statistical reports.

6.2.8 Different names for inventory parts

Same inventory part can be sold with different names in Şişecam. For example one customer wants to see the name of the sales part as 'Mirror' on his invoice, while the other wants it as 'Reflection Glass'. This happens especially for foreign customers. On the other hand, sometimes as a supplier Şişecam does not want to express the internal name of the product to the public. Certainly the product name changes according to different languages, too.

6.2.9 Service sales

Not only products, but sometimes services can be sold to the customer. For example if transportation is made by Şişecam, the customer receives an invoice for that service. Or sometimes consulting can be given to internal customers and this is in fact a sale.

6.2.10 Price increments

Price increments are done usually in every three months. Price groups are determined, each sales part is connected to one of the groups and same amount or same percentage is used for the same group when making price increments. In domestic orders 17% VAT is used, in exports no VAT is used.

6.2.11 Bonus to the customers

Şişecam gives bonus to its customers according to their yearly quotas, if the customers reach or pass their targets. It means that the amount of sales of the parts to each customer contributes to the accumulated sales used as a base amount for calculating the bonus. The bonus level is based on the invoiced customer orders. Bonus is calculated as percentage of the net sales. Also Şişecam makes special discounts to its dealers or to some of its customers. This discount can be a percentage discount or an amount discount.

6.2.12 Geographical locations

Customers are divided into groups according to their geographical locations. Each salesman is responsible from a specific geographical location, so every salesman is connected to a group of customers. Some statistical sales reports can be taken according to geographical locations or salesman. In the past commission was given to sales personnel for their sales successes but now commission is not given.

6.2.13 Order series

Şişecam has many plants and in the headquarter sales personnel take orders for all of the plants. These orders are numbered according to their plants and customer groups. Mainly every plant has two order number series, one for the domestic orders and one for the exports. But some plants can have more than two number series, if the plant needs to group the orders according to the sales parts.

6.2.14 Order similarity

Usually one customer buys similar things, it means parts and quantity does not differ much between the customer orders. Sometimes the customer repeats his last order several times or gives the order by mentioning one of his past order number or the customer shows certain order types during a period, according to season for example.

6.2.15 Unit of measures

Inventory unit of measure, sales unit of measure and price unit of measure can be different for Şişecam's products. For example one type of product is counted by pieces in inventory, sold by pieces to customer but invoiced according to its square meter. This is a very crucial point for the work flow.

6.2.16 Currency

For domestic customers, orders are usually taken in Turkish Lira, but sometimes it can be in US Dollar, too. Invoice is always in TL in Turkey. For foreign customers, orders are usually taken in their original currency and invoices are in their original currency, too. But accounting is always done in TL for every customer. As a company policy, Şişecam wants to use a parallel currency in accounting between TL, which is USD, in the future.

6.2.17 Internal inventory movements

Inventory parts can move between warehouses or between plants of Şişecam. This is of course usual for every company. Sometimes a material can not be found in a plant and if the plant needs that material and if it is available in another plant, the material can be send from one plant to the other. Certainly this operation decreases the stock level of the sender plant and increases the stock level of the receiver plant.

6.2.18 Quality control and serial tracking

Another operation that decreases the stock level in a plant is scrapping. A reason is declared for every scrapping. Scrapping the inventory can be after quality control department's approve or without it. For example if the glass is broken, so there is no need for the approve. But after the production every product is checked by quality controllers. Meanwhile quality check points are in the production process, too. Tracking quality close to the event, could save waste or second quality products. Also serial tracking is made for products. A barcode machine is used for this process and after the

production, when the product is entering to the warehouse, this barcode machine gives the serial number to the product.

6.2.19 Return of order

Return of Customer Orders can happen if a problem exists during loading or transportation. Usually Şişecam does not receive the product back into stock, instead scraps it and receives credit invoice from the customer. As a policy Şişecam refuses to ship the order again for free.

6.2.20 Payment methods for exports of Şişecam

There are 4 types of payment methods for exports of Şişecam.

- Letter of Credit
- Draft
- Consignment
- Cash in Advance

The details of these methods are as follows:

Letter of Credit

Letter of Credit can be confirmed or unconfirmed.

Confirmed Letter Of Credit: This means, the agreement between the sides can not be cancelled. All the details of the agreement have to be obeyed. (Irrevocable Agreement.) No need for the correspondent bank to examine the documents for the payment. (Goods should be delivered before the payment.) It is a letter of credit issued by one bank and confirmed by another, obligating both banks to honor any drafts drawn in compliance.

Nonconfirmed Letter Of Credit: Correspondent bank examines the documents for the payment. It is the obligation of only the issuing bank.

Draft

A draft is an unconditional order in writing- usually signed by the exporter and addressed to the importer, ordering the importer to pay on demand, or at a fixed or determinable future date, the amount specified on its face. It is also known as a bill of exchange.

Supplier (Şişecam) makes an agreement directly with the customer. Banks are not in the agreement. When printing Pick List and Invoice, Şişecam prints the name of the sold good or any other details as the customer wants. For example a Sweden Customer wants to use Silvered Float on its documents instead of Mirror. Banks only control the exportation. No need to receive the sold good for the payment.

Consignment

Goods sent on consignment are shipped, but not sold to the importer. The exporter retains title to the goods until the importer has sold them to a third party.

Cash in Advance

Payment is received either before shipment or on arrival of the goods.

An example of Letter Of Credit Financing Of Şişecam Exports can be drawn as in Figure 6.1.

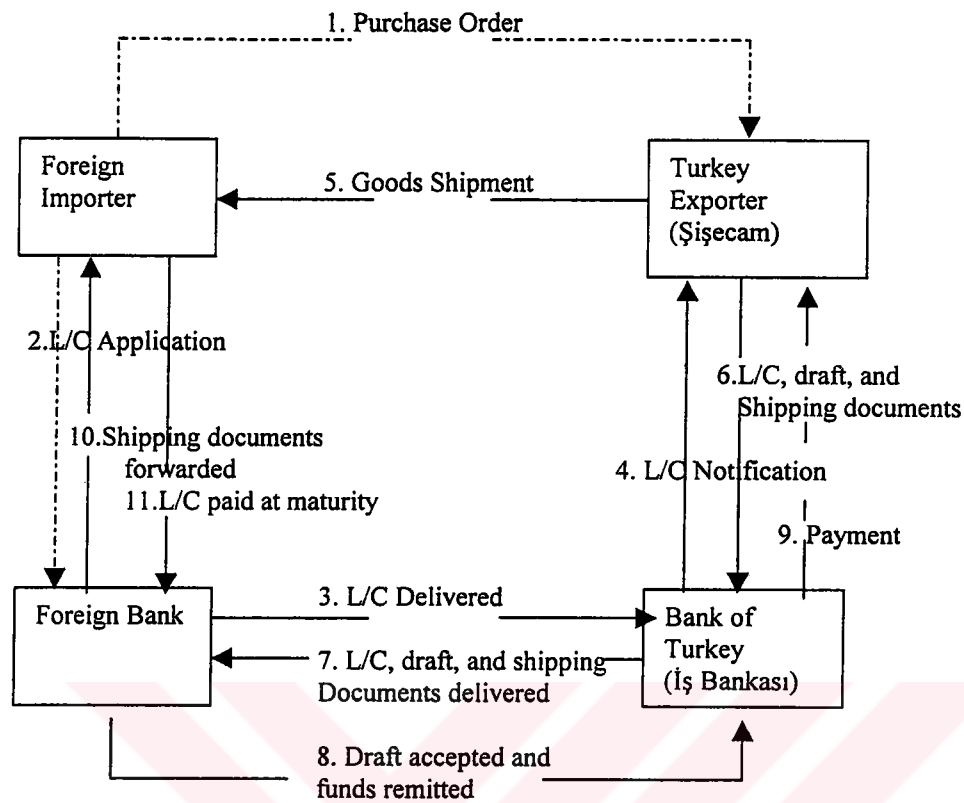


Figure 6.1 Example Of Letter Of Credit Financing Of Şişecam Exports

6.3 Purchasing Processes

6.3.1 Workflow in the purchasing department

Since glass production does not require too much raw material, purchasing department is small compared to other departments and it's job is very limited. In the head office usually orders for stationary materials are given to the suppliers. Certainly first of all a demand comes from a department or from a personnel and they try to supply it from stock. But if the stock level is not enough and if the chief or manager of the purchasing department approves the requisition, supplier is called and order is given. If it will be a big procurement, then market research can be made, proposals can be taken from the suppliers and according to price and other conditions, one proposal turns into order. Sometimes suppliers confirm the order, it means they declare that they will be able to deliver the quantities on the expected date for the entire purchase order. On the other

hand, sometimes suppliers want to make some modifications regarding to date or quantity.

Glass production uses Process Type -or Flow Type- Manufacturing. This is a continuous manufacturing, liquid flows from one workstation to another at a nearly constant rate and with no delays. There is some form of mechanical method of moving goods between workstations. In these types of manufacturing environments no purchase requisitions or purchase orders are created, supplier material plans and supplier schedules are used instead of them. In fact Şişecam has internal suppliers, from whom most of the raw materials are bought, for that reason market research is not made for price, quality or any other properties. Directly supplier schedules are formed and sent to the internal suppliers.

6.4 Inventory Processes

6.4.1 Material coding

Significant part numbering is decided to be used in Şişecam. With a significant part number, a part is seen as being nothing more than a series of key traits run together. The following format summarizes the coding scheme for parts:

`'$ $ $ $ _ $ _ $ $ $ _ $ $ $ _ $ $ $ _ $ $ $ _ $ _ $'`

In the above figure, #s represent numeric characters whereas \$s represent alphabetic ones, revealing the fact that the adopted part numbering scheme is of an 'alpha-numeric character. The first four characters identify the part's six properties, namely; product type, quality, color, coating, wire and pattern. For example F100 means, the part is float, clear, no coating, first quality, no pattern and wireless. The fifth \$ character represents the process type, the following four set of four #s represent the thickness, height, width and package quantity of the part, respectively. The last two \$s identify package code and interlayer code of the part. With this method, all the traits of the part are captured.

There are several things that make this approach very appealing. First, a search by part number can be made. Part number consists of segments that describe key traits. By searching on these traits, some form of control over parts can be imposed. With such an approach to part numbering, users now have the ability to search part databases to identify items that are identical or nearly identical.

Şişecam choosed significant part numbering because their production is stable. However, in a dynamic world, there are certain factors that work against such a scheme. For example, there is the problem of how to handle changes. What happens if there are one or more fields that are no longer needed? If these fields are dropped out of the part numbering scheme, then the risk of having numbers that are always changing appears. For most users who try to remember the part numbers for certain critical parts, this means that they are faced by one or two scenarios. The first is that they are continuously having to learn new part numbers. This does not make for happy workers. Alternatively, they remember one set of part numbers. This leads to confusion and frustration.

6.4.2 Serial number tracking

Every material that is produced in Şişecam has a serial number. Serial numbers are given by a barcode machine and a sticker is stucked on the product. When the product is moved in the warehouse, between the warehouses or delivered to the customer, always this serial number is used. If a specific part is reserved for an order, it can be issued after searching for the serial number.

6.4.3 Planners

There are planners in the plants and every planner has a responsibility for his parts availability. Reports are taken according to the planners, so materials should be grouped according to their planners, too.

6.4.4 Part status

If customers give order, new products can be produced, or once produced material may not be produced for long years. Parts have status that defines if they are active, inactive, experimental or whatever.

6.4.5 Product families

Products have families and generally production plans begin with product families.

6.4.6 Pallet handling

Şişecam's products or can be said glasses, are put into pallets. Every product has a special pallet made for it according to its dimensions.

6.4.7 Inventory counting

As usual, inventory is counted periodically in every plant of Şişecam. Counting is made to correct the stock levels, because there can be mistakes during operations. Parts are generally frozen during the counting process, it means they are stopped from any operation until the counting results have been reported.

6.4.8 Inventory valuation and reports

Managers need reports regarding inventory movements and monetary values of these transactions. This is a prerequisite for managing inventory efficiently. There should be many reports that will help managers to get the information necessary for proper inventory management. For the past years generally Weighted Average Method is used in Şişecam for inventory valuation, but this does not guarantee that the other methods like 'Fixed Standard Price', 'FIFO' or 'LIFO' will not be used in the future.

6.4.9 Inventory locations

Different location types are used in plants of Şişecam. These are Quality Assurance Locations, Manufacturing Cells, Floor Stocks, Picking Locations and Shipment Locations. Every type of location may not exist in all the plants, but generally plants

have most of these types of locations. Parts on all locations are included in the total inventory value. There is no limit to the quantity of parts which can be stored in most locations. Quality Assurance Locations are used for inspections of stored parts. A manufacturing Cell Location can be connected to a specific unit used in the manufacturing process. Because manufacturing operations can be divided into different units in order to decentralize and make all operations more efficient. Floor Stocks are used for storing parts to be used in the manufacturing process. These storage units are usually inside of the plant, near the manufacturing facilities. Picking locations can be used for storing purchased or manufacturing parts that, normally, are frequently consumed. Issued and packaged parts can be stored in a Shipment Location until they are shipped. Shipment Locations enable a general view of what is ready to be shipped. In Şişecam these are often used to group several customer orders for more efficient handling, especially when handling multiple orders on one transport vehicle.

Durability of products can be considered infinite, because expiration time for glass is too much.

During planning, inventory interest rate is used to calculate stock keeping costs. This represents a cost for lost opportunity, i.e., not being able to make other investments.

6.4.10 Characteristics

There may be some characteristics of parts that cannot be coded in the material code of the part. These characteristics can be numeric or alpha-numeric and they should be recognized with the part.

6.4.11 Part revisions

There may be more than one revision of a part and these can be active at the same time. Because product properties can change a little bit with time or according to the customer needs. These little changes do not cause the change of material code. New revisions of the part can be used instead of creating a new material code.

Density is used to convert volume and weight unit of measure into kilo. This is necessary for transportation. Trucks cannot be loaded more than their capacity.

6.4.12 Internal material usage

Internal demands can arise to goods and these demands can be fulfilled by issuing goods from inventory. For example a salesman is going to visit a prospect and would like to bring some samples of the product range. Samples may be returned or given away. Or sometimes materials can be used in the company. This is different from customer orders because of internal demand. Also this is different from purchase order, too. Because purchase orders are fulfilled by procurements. However, internal demands can result in the creation of purchase orders, for example if the part is not available in stock.

6.4.13 Safety stocks

Safety stock is used for some of the parts in the plants of Şişecam. The safety stock level is determined by the suggested probability of being able to cover a sudden change in demand. An order is created when the projected available balance is lower than the specified safety stock level. Plants of Şişecam use safety stock to minimize carrying costs and the cost of stock-outs. Stock-outs often result in backorder costs, lost sales and lost customers. The number of stock-outs per year that is considered tolerable is a management decision. The strategic importance of the article, competitors, and carrying costs are among the factors that are considered.

6.4.14 Replenishment level planning

Some parts are planned by replenishment level planning. Order points are defined for those parts and orders are created every time the inventory balance sinks below the re-order point. Usually order quantity is calculated using the maximum inventory level reduced by on-hand quantities at the time of the order, because storage space can be limited, for instance, fixed size carriers and pallets. In Şişecam, since make-to-stock planning method is used for domestic orders, the re-order point is used to trigger replenishment that will prevent the projected inventory balance from falling beneath the

safety stock level. The replenishment level system always order the parts needed to fill up the inventory storage space defined. But sometimes instead of using the replenishment level system, a predefined or calculated order quantity can be used. In Şişecam generally handling of replenishments are more expensive than the costs for carrying more inventory than necessary.

6.4.15 Scrapping

Scrapping is normally done when a part has become obsolete or faulty, its expiration date having been reached or exceeded.

6.4.16 Transport related safety information

For some products it can be necessary to use transport related safety information.

Domestic Sales, Delivery and Invoicing Process Flow of Şişecam can be drawn as in Figure 6.2.

DOMESTIC SALES, DELIVERY AND INVOICING PROCESS FLOW

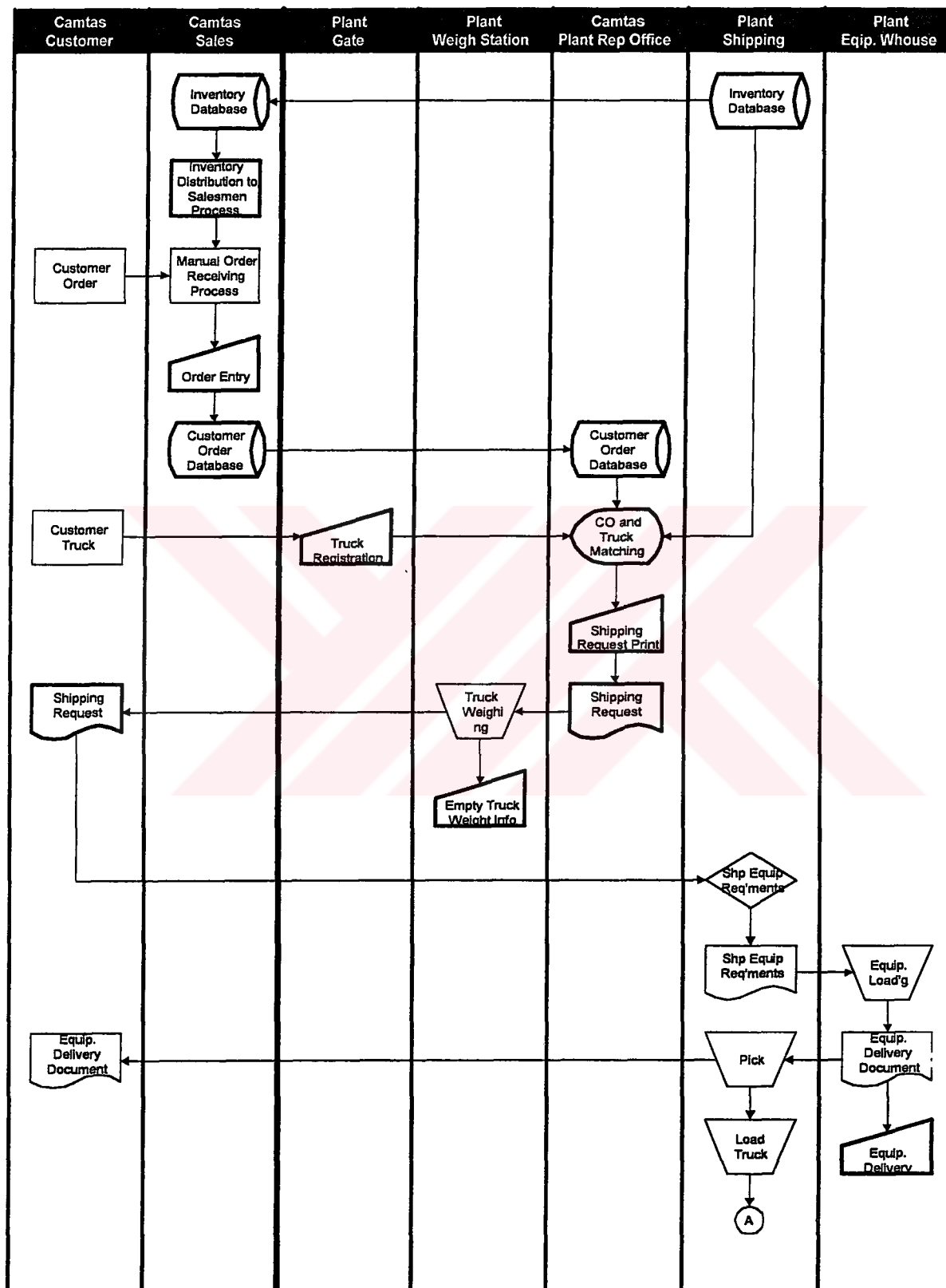


Figure 6.2 Domestic Sales, Delivery and Invoicing Process Flow

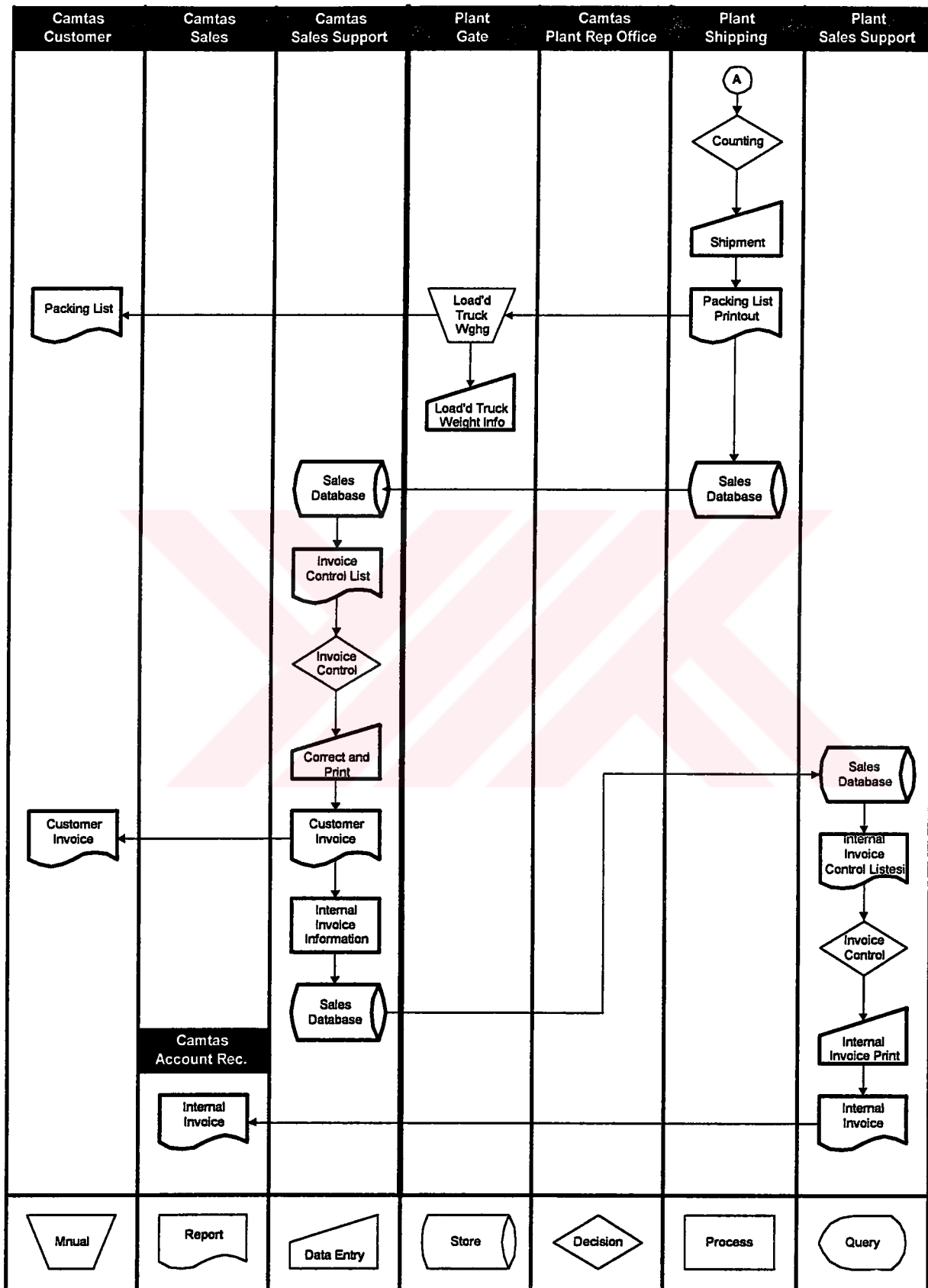


Figure 6.2 Domestic Sales, Delivery and Invoicing Process Flow (Continued)

7. BUSINESS PROCESS REENGINEERING STUDY

The detailed system analysis results were used in this stage to incorporate the BPR methodology in the study. Before going into the BPR methodology, a closer look to what we really mean by the term BPR will make further steps clearer.

7.1 Business Process Reengineering

There are various definitions given for the term 'reengineering', similar to each other. Reengineering is defined as the rapid and radical redesign of strategic, value-added business processes -and the systems, policies, and organizational structures that support them- to optimize the work flows and productivity in an organization. The words stress the key concepts of BPR. The aim of BPR is similar to other management techniques, however, the difference is created by what it mainly focuses, (the value-added processes) and how it accomplishes that task.

Since the key factor is value added processes, one should be able to define a process, and differentiate between value-added and non-value added process. A process is defined as a series of interrelated activities which convert business inputs into business outputs. Three primary types of activities are within a process, value-added activities are the ones that are important to customer, hand-off activities are the ones that move work flow between functions or departments, and control activities are the ones that control the flow. As a process moves more between functions or departments, it includes more non-value added activities. The main issue is to redesign the value-added ones.

Not only the processes are taken into account, the environment that they are performed is also important, namely the organization structure, the systems supporting the activities in the process. The scope of this project is mainly concerned with this part of the

reengineering work, as the systems supporting the business processes was to be redesigned within the framework of ERP. How the proposed system, ERP will support the business processes, in what aspects will it change the value-added processes, are taken into account.

After stating the points that BPR stresses, an identification of the points listed below is crucial to start such a reengineering effort.

- The breakthrough results expected from the study, namely the objective of the study,
- The business processes representing all the activities performed ,
- The processes that are important to the strategy and the customer,
- The supporting elements which enables performing the value-added business processes,
- Definition of a rapid and radical redesign.

7.2 BPR Methodology Implementation During the Study

In the methodology used throughout the study, the template methodology described in the previous section was used as a guideline. Each stage and the corresponding phases of the study are described below.

7.2.1 Preparation stage

The reengineering study did not arise by the recognition of a particular need by the company management. However, the initial phases of the study, namely, the examination of the current business was basically done for this purpose. The needs of the company were then set as follows:

- Decrease in inventory carrying costs.

- Decrease the cost of stock-outs. (Stock-outs often result in backorder costs, lost sales and lost customers.)
- Improved customer service and quality for an expansion in the market.

7.2.2 Identification stage

During this stage of the BPR implementation, the current system had to be analyzed, which was a preliminary step for the project, as we had to identify the need for reengineering study. The current business processes were analyzed, and the basic decision, what was to be improved was given at that stage.

An examination of the customer order processing revealed that the current process was incapable of adapting the changes in the information technology, so the process had to be redesigned considering the improvements that could be attained by employing new information technology to support the process.

As a second problem, the organizational structure could be functional or process oriented according to how the process is performed. In a functional structure one department is given the responsibility of all products, in product oriented approach, organizational units are formed for each product or product group. In this case a general analysis of the overall organization revealed that the structure was functional and the sales department was divided into two, domestic and export sales. To be more efficient, management decided to change the organizational structure from functional to process oriented. That means, the sales department should be divided into more groups, according to products.

On the other hand, information was coming too late to the head office from plants, and this caused many problems. For example stock information was coming one day late and sales personnel were receiving customer orders according to the previous day's inventory levels. Sometimes more and sometimes less sales were made than real stock levels, and that affected the profitability of the company very much. Certainly the information flow speed from the head office to the plants was not enough, too.

One very important remark to be made here is that the examination should be done for each business process in a reengineering study. For the scope of this project only the most important processes were selected for further examination.

7.2.3 Vision stage

At that stage, changes in the current system to improve the procedures which need to be reengineered were proposed. To control the product process flow, an identification must be kept all the time, keeping the information of the specific machines that this product went throughout the process. Every product should have a serial number, which defines its production date, the machine it is produced on and some other details. This will help in tracing back the origin of product, and to identify quality problems that may occur after sales made to a customer. Barcode machines should be bought and a program should be written to print the labels that will be stuck on the products.

Also the places to put the products on were chosen randomly in the warehouses and that caused many problems during delivery and inventory counts. For warehouse management, there were four basic functions, order picking, stock order data management, which deals with the creation and modification of stock orders as inventory levels are at certain levels, stock-in and stock-out functions which relate to the physical movements, warehouse monitoring in terms of locations and cycle counting. Warehouse control was under the production planning department, which had a section for warehouse management in general. The analysis showed that the control over warehouses were insufficient. To gain full control over the warehouses, tracking of movements is done on a location basis. Warehouses should be separated into numbered locations, or sometimes bays and rows if necessary, and every product should be put on a specific location only. It is also required that the movements are done regarding the serial numbers.

The organizational structure of sales department should be changed from functional to process oriented according to how the process is performed. This is because the analysis showed that there were too much transfer of data between various functions, and the

transfers were not made by the help of an information system, paper work was governing the information flow, which led to work burden.

To increase the information flow speed from plants to the headquarter and from the headquarter to the plants, an infrastructure investment has to be done and computer systems used, especially the ERP Package, should be designed accordingly. Şişecam rented leased lines from Turk Telekom for the safety of information flow between databases of plants and headquarter. Data that was received by fax before from plants, now became to be received by computer system in very close periods.

As the result of the system analysis, the processes were selected to design solutions, in the guidance of these findings:

1. A serial number tracking and a barcode system had to be established for the tracking of products to incorporate the changes in the activities described in the vision stage.
2. Warehouses should be separated into numbered locations, bays-rows-tiers should be used if needed.
3. For better customer service, customer order processing had to be redesigned to take advantage of the development in information systems.
4. An infrastructure investment has to be done to increase the information flow speed and safety.

7.2.4 Solution stage

The objective of the project was to reengineer the system within the framework of an ERP System, and throughout the literature survey conducted on ERP, it was seen that providing an accurate database to the system was crucial to gain full efficiency. During the implementation the purpose was to reduce the complexities arising from the interrelations between the organizational functions by designing the system in a process oriented manner. This way, data redundancy and inconsistency wanted to be reduced. Introduction to the implemented modules of IFS are made in the following section.

8. INTRODUCTION TO IMPLEMENTED ERP MODULES

8.1 IFS Distribution

In today's global business environment, the one thing a company can count on is the rapid pace of change - and the new opportunity and new challenge that change is sure to bring. New competition pushes every business to achieve higher levels of service, while evolving technology compresses product life cycles and demands that companies adopt new technology, or risk losing market share.

In this ever-changing environment, keeping a competitive edge means being able to anticipate and respond quickly to changing business conditions. To do this, a company needs solid information systems that support all aspects of the business with power and flexibility, systems that keep the company adaptable in every aspect, from business practices and organizational structures to logistics, project management, distribution, and transportation.

Proximity and the interaction between suppliers, distributors and customers are major competitive factors. When the total flow of goods grows and diversifies, there is an increased demand for speed, precision, cost-efficiency, and flexibility throughout the entire distribution network. The company that delivers the right product to the right place at exactly the right time and price always emerges as the winner. Moreover, if it can meet the changing conditions of the business world with creative solutions for logistics, it will retain its leading position.

IFS Distribution visualizes product flows and makes the system easy to use, make it easier to adapt to different distribution models and working methods, allow the system to

grow and to support change in the company, and facilitates communication with other factors in the order-to-delivery chain.

The accounting rules in IFS Applications allow all transactions to be checked and allocated correctly, regardless of where they are created, so minimizing the risk of errors, and time-consuming duplication of work. The accounting rules enable planning and follow-up on several dimensions, e.g. account, product, market, or department. When orders are received, obviously the same rules are used whether the order is received manually, via EDI, the Internet, or other subsystems.

Modern distribution models are based on a perfect balance between high delivery precision and low capital investment in inventory. IFS Distribution optimizes the inventory function at one or several locations, providing excellent opportunities for queries and stock analyses of, e.g. rate of turnover, slow-moving items, and balance development. Within each warehouse, inventory zones can be defined for pallet management, buffer stock and picking, among other things.

Just like customer orders, customer invoices are created automatically for simple, standard invoices, with efficient support for deviations. Invoices can be written directly on delivery or as collective invoices at specified time intervals. In addition, the customer returns function automatically creates a credit invoice report that is released on authorization.

The invoicing functions are closely linked to accounts receivable in the financial system, which controls the payment of invoices. Users can specify currency, with automatic conversion to the accounting currency. Routines for payment monitoring are linked to automatic generation of payment reminders and interest invoices according to pre-defined conditions.

8.2 Connections between IFS Distribution and the other products in IFS Applications

Communication between IFS Manufacturing and IFS Distribution is frequent since both products cooperate regarding purchase, inventory, manufacturing of different parts, and changing demand. For example, one customer order can generate a shop order if the ordered part is a manufactured part. Alternatively, a shop order can generate a purchase order if production requires parts that must be bought. IFS Manufacturing also uses the Inventory and Purchase modules when estimating manufacturing expenses or performing calculations.

All postings that arise in IFS Distribution are transferred to IFS Financials. Examples of posting events are issues and receipts from inventory. The accounting of payments made against customer invoices created in the Customer Order module occurs in IFS Financials. Similarly, supplier invoices are registered, posted, and paid in IFS Financials. Prior to payment, a supplier's invoices are verified in IFS Distribution against purchase orders and any applicable contracts.

8.3 IFS Inventory

IFS/Inventory is an extensive module which handles many inventory functions. Because it is used for several products, such as IFS Distribution and IFS Manufacturing, the module contains functions to generate order proposals in purchasing and to update parts statistics in manufacturing. Some of the functions in IFS Inventory are:

- Entering inventory parts
- Executing manual inventory transactions, such as issues and receipts of inventory parts
- Scrapping inventory parts
- Generating a Count by Count Report or per part

- Entering a material requisition
- Changing inventory location
- Executing different calculations such as ABC-analysis, turnover rate, purchase lead time etc.

Viewing different types of inventory transaction histories presented in overview and query windows, e.g., availability of inventory parts, inventory rate of turnover, and inventory transaction history per part.

8.3.1 Optimizing inventory investment

Reducing inventory reduces costs and increases flexibility, but it makes careful inventory management more important than ever. IFS Inventory module puts your company in total control of inventory operations by providing fast and accurate information when needed.

Inventory Module records all stock transactions as they occur, giving the company real-time information about inventory levels across the enterprise. To help the company always give customers accurate delivery dates, planned stock transactions for open orders are visible, and the system's extensive reporting capabilities allow full visibility of inventory at all sites.

The system provides the company with a variety of tools to give the latest information about the inventory, including analysis of fast-and slow-moving items and stock value. Because Inventory Module provides historical information, the company will be able to forecast trends accurately and adjust reordering points, safety stock, lead times for orders, and service levels accordingly.

8.3.2 Allocation management in IFS Distribution

IFS Distribution includes a very flexible allocation management process that can vary depending on the requirements for delivery assurance for different parts. Availability

checking is the fundamental aspect of allocation management. Every time a goods receipt or issue occurs, the on-hand balance and availability of the part changes.

The availability function checks the development of the available balance within the product's lead time. This means that the system determines if all orders can be delivered on the promised dates even after a change occurs. The change might be an order entry, an issue of some sort, or an allocation. Only changes within the part's lead time are considered, as the availability of the part outside the lead time is considered to be under control.

Availability checks are run on parts in these processes:

- Manual issues from inventory
- Scrapping from inventory
- Movement between sites
- Entry of customer orders
- Manual allocations for customer orders
- Pick planning
- Simulation of customer orders
- Allocation of material for shop orders

The availability check makes sure that the available balance does not become negative or that the issue or planned issue does not affect other orders so that they cannot be filled. If this is the case, the user receives a warning and information about how large an issue can be made without affecting other orders.

8.3.3 MRP order codes

When you register planning data for an inventory part, you must specify the MRP (Material Requirements Planning) order code that will govern the planning of new requirements for the part. These codes are used for material planning in IFS Manufacturing and in creation of order proposals for IFS Purchasing.

The following MRP order codes are used in Şişecam Project:

- B. Order Point System: The part is not affected by MRP. Order point and order quantity must be specified in the inventory part register. When the quantity on hand is less than the order point, a new order proposal is created, which is shown on the order proposal list. The order quantity registered determines the default order quantity. The process for creating order proposals is found in the Inventory module.
- C. Refill Level: The part is not affected by MRP. This code value functions in the same way as the function Order Point System. The only difference is that the quantity ordered is the order quantity minus the current quantity on hand, or the refill level. This code can be useful when the storage area for the part is limited, for example, in silo storage.

8.3.4 Internal inventory refillings

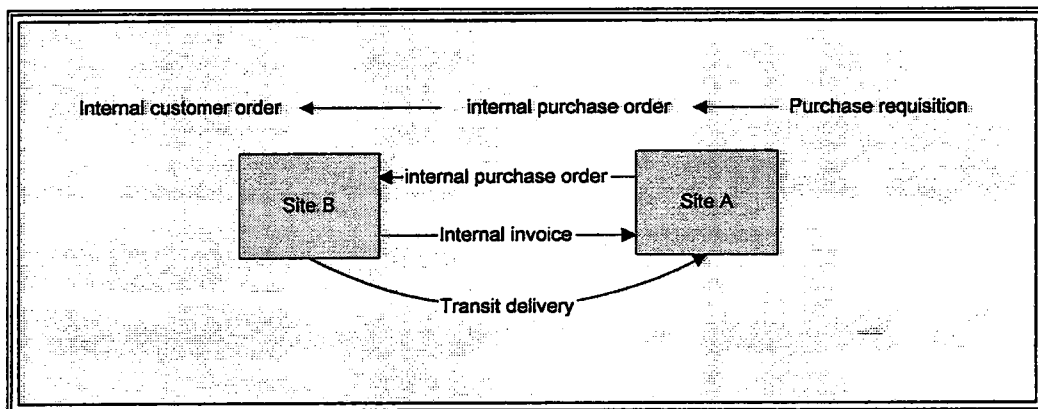


Figure 8.1 Inventory refilling between two sites

Using MRP order code B, Order Point System, and C, Refilling Level, you can create a process to automatically replenish the inventory at one site with inventory from another as in Figure 8.1.

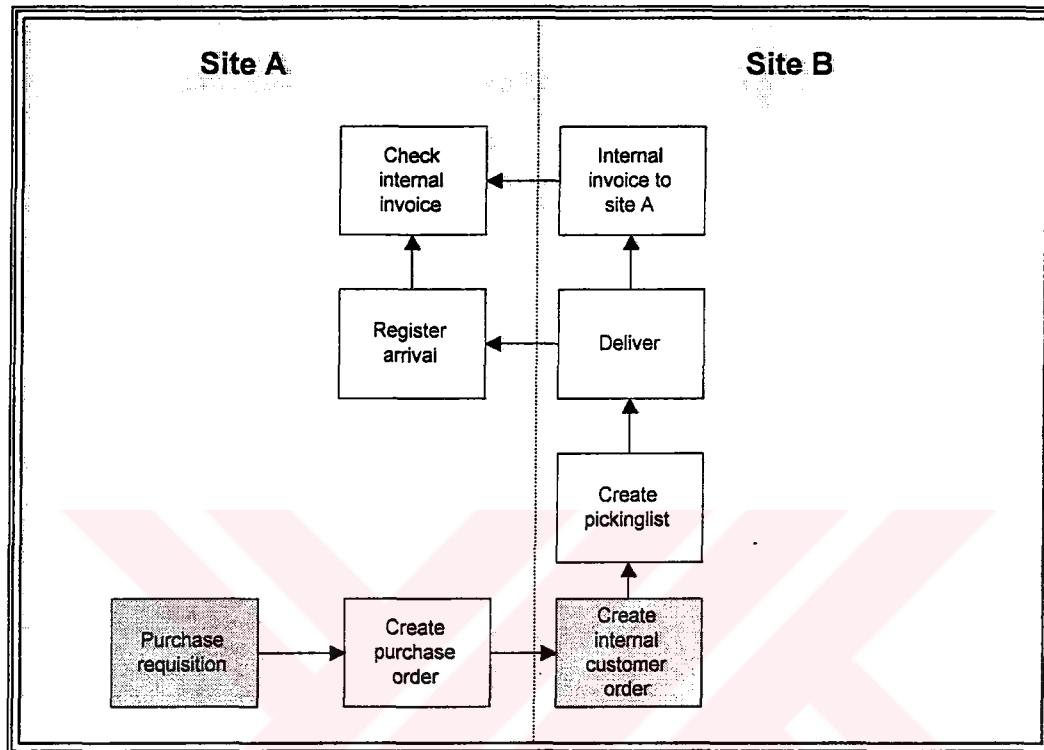


Figure 8.2 The flow at internal inventory refilling

Internal replenishment requires the receiving site to be identified as a customer (with a customer record) and the supplying site to be identified as a supplier (with a supplier record). When inventory at the receiving site is depleted to the specified level, an internal purchase requisition is automatically generated. The requisition is converted to an internal purchase order for the supply location. On satisfactory validation of the purchase order, the supply location creates a customer order on which delivery and documentation addresses are defaults taken from the receiving site's customer record. Activation of the customer order confirms the purchase order and causes a shop order or purchase requisition to be created, as applicable, for each line item, as in Figure 8.2.

8.3.5 Cost sets

Cost sets are used for maintaining different kinds of costs, and for providing figures for cost estimates. IFS/Inventory can process up to 99 cost sets. When the system is installed, three cost sets are created: cost set 1 (inventory value, also called level or standard costs), cost set 2 (last purchase or last actual costs), and cost set 3 (average costs per time period). Every inventory part has cost figures in all three resident cost sets. These cost sets are permanently resident, their numbers cannot be changed or deleted. This leaves 96 cost sets available for local purposes. The records for such cost sets must be created manually.

Current inventory value costs are used in real calculations of operating and production costs and in various other financial analyses. Last actual costs and average costs are taken from product structures and used for cost estimates and “what-if” scenarios.

Cost set 1 is updated by copying another cost set. Once it has been copied, the change of inventory value is booked. Cost sets 2 and 3 are updated by calculating the cost of acquisition. The calculation function primarily looks for an invoiced price. If that is not found, the calculation uses the price from the latest delivered purchase order line. Any additional cost and material burden are included in the cost of acquisition, but freight cost is excluded.

8.4 IFS Customer Orders Module

Customer Order module is used to manage customers and part sales and the flow of customer orders from order registrations to the dispatch of sales parts. You can put up a record for customer and part sales, register customer specific discounts and prices, reserve, picking report, dispatch and return ordered parts, register and invoice customer orders in that module. The Customer Order module in IFS Distribution makes it easy to manage sales operations efficiently. The system streamlines order-entry procedures and customizes them to meet the company’s specific needs, along with linking information from sales quotations, pricing agreements, and customer-specific projects.

Customer Order module also allows the company to track and evaluate sales quotations, and when they become orders, use quotation information to plan order schedules more efficiently.

The system tracks all the company's sales contracts to give full visibility of delivery and pricing agreements. Sales contracts can be used to create sales orders, to plan inventory, and to track revenue turnover.

Customer Order module helps the company evaluate the performance of sales activities through extensive report-building capabilities that easily retrieve information about orders, revenue, cancellations, and budgets. Both current and past information about all aspects of the company's sales operation is available in numerical or graphical format.

Tracking customer and supplier information is easy with Customer Order Module. The system checks stock availability, manufacturing capacity, and the status of sales orders and invoices. Customer Order Module helps the company manage stock shortages by allowing to generate purchase orders for direct delivery from the suppliers to the customers. In addition, the system can help the company calculate lead times, deliver from an alternative source, place back-orders, or generate a stock replenishment order.

8.4.1 Integration with the modules within IFS Distribution

The different modules within IFS Distribution are totally integrated but can to a certain extent be used separately, as shown in Figure 8.3.

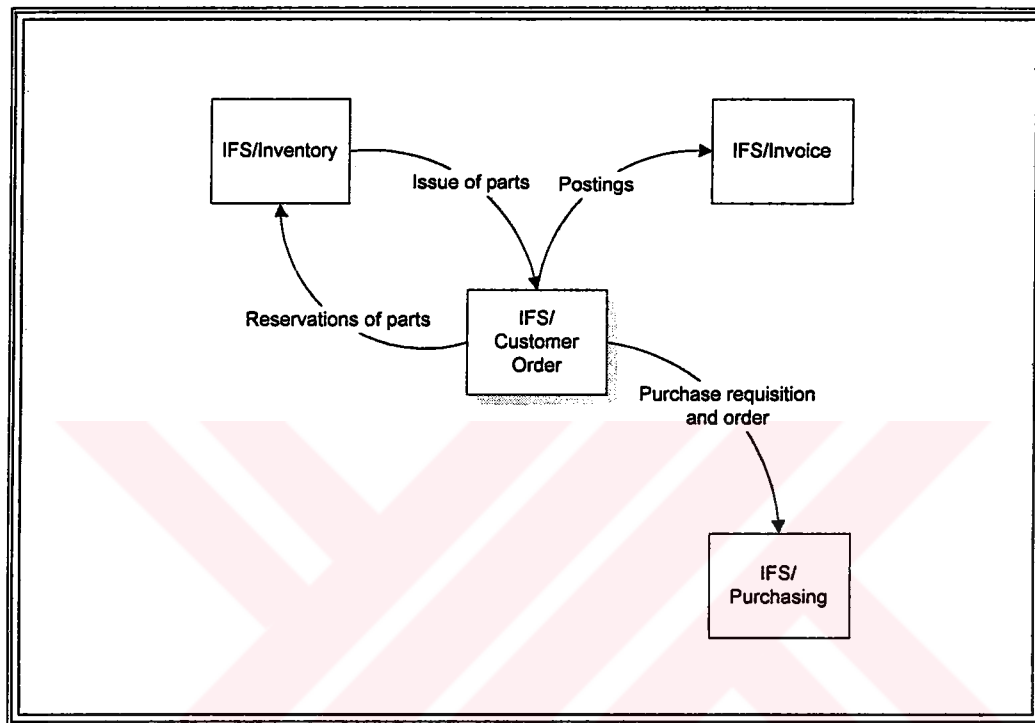


Figure 8.3 The different modules within IFS Distribution

The registration of a customer order is the origin for a number of transactions within IFS Distribution. If the ordered part is stored, it will be reserved, brought from inventory and delivered to a customer. If the part is not available or is alternatively procured via a purchase a purchase requisition or a purchase order is generated in the purchasing module. When the customer invoice is created and printed, the postings are dispatched to IFS/Invoice.

8.4.2 Customer orders

Customer orders are used to sell items to a customer according to certain terms and conditions. A sales order comprises a header and one or more order lines. The general order data - customer data, terms of payment and terms of delivery are contained in the

header, the data about the actual items to be supplied are entered on the order lines. This data includes price agreements and delivery dates.

8.4.3 Work in IFS/Customer Orders

The customer module can be viewed as a single flow that starts when a customer order is registered and that ends with the invoicing, as shown in Figure 8.4.

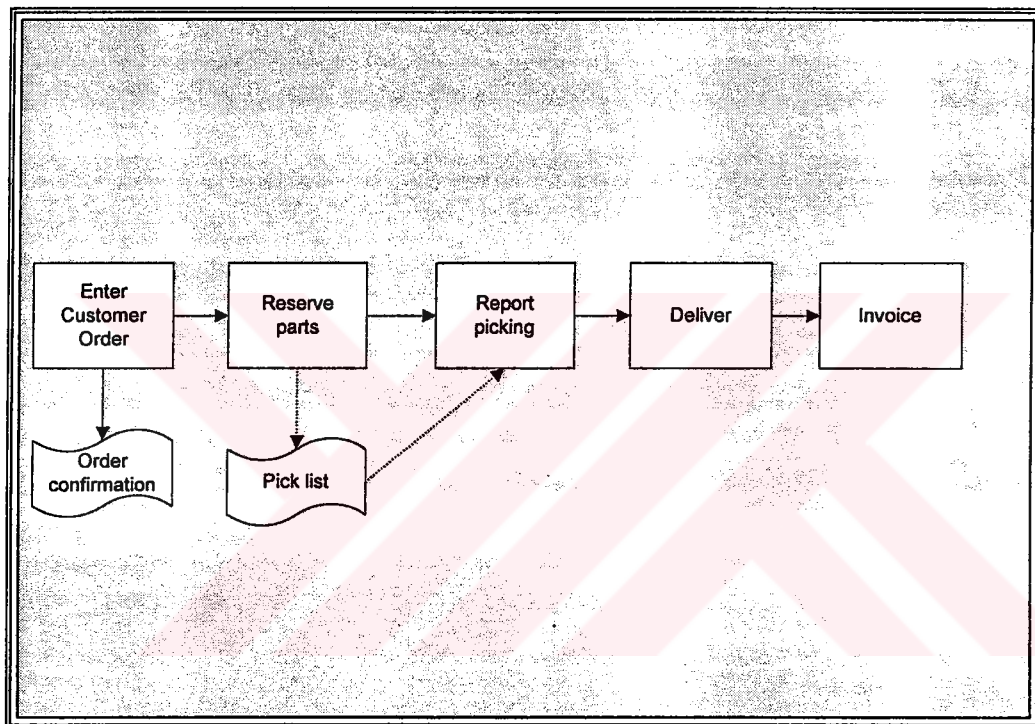


Figure 8.4 Customer Order Flow

The selection of the order type controls which functions are manually started for the customer and which are automatically started. Following is a description of the different functions that can be done for a customer order, without any regard to how the order types are defined. You can read more about order status and order types in the section for Order Types and Order Status.

The customer order procedure starts with the registration of the customer order. In connection with the registration of the order lines, you select how the part is procured. The acquisition can be effected by a shop order, purchase order, internal purchase order,

package and inventory order. The inventory order may also be reserved physically in stock, directly at the registration of the customer order. When the customer order and its order lines are registered, you release the same. With the release, a credit check of the customer is completed, if there is nothing else mentioned in the customer record. You can also print out an confirmation of order. For parts to be procured by means of a purchase order or shop order, the work will in this stage be transported to the purchasing module or the shop order module.

When it is time to reserve the customer order lines the order is credit checked a second time. Subsequently, you may reserve the customer order line manually or let the system control the function automatically. The reservation implies that the material on a specific inventory location is reserved for the order. You may also effect re-reservations of a reserved order, change the reservation location for the part and handle orders with backlog. When the reservation is satisfactory you may create a picking list. Upon printing the picking list, the reservations are blocked and can no longer be changed.

When the customer order is picked according to the picking list, it is pick reported and dispatched. You can deliver a customer order strictly according to the picking list or divergence deliver it with an over or under delivery. There is a special routine in IFS/Purchasing for parts procured with the acquisition mode purchase order direct delivery . If you use a shipping location, the parts may be handed-in to this before the dispatch is executed.

If the customer finds the parts defective or if there has been a incorrect delivery of the parts, they can be returned. When registering a customer return, the parts can be scrapped or returned to inventory. With reference to the return, the customer can also be credited.

Finally, invoicing is all that remains for the customer order. When you have created the invoice you may change, for example, the quantity or price and then print it and dispatch it to the customer.

8.4.4 Prices and discounts

When you enter a customer order line, the system lists the price and discounts valid for the indicated customer and part. It is important to know how the sales price is derived and calculated in the system.

8.4.5 Mode of acquisition

When you register a customer order line, you can specify how the part should be procured. What acquisition modes that are possible depend on what is stated in the sales part record. A stored sales part can be procured by an inventory order, purchase order, or shop order. A non-stored sales item, such as services, can be procured without an acquisition mode.

If a sales part record indicates that the part is supplied by a shop order, that acquisition mode is the default when you register a customer order. If the sales part record specifies acquisition by purchase order, that becomes the default. If the sales part record allows acquisition by shop or purchase orders or both, you then click on the Acquisition column, where you can choose either shop or purchase order.

Examples of non-stored sales items services and package parts. A package part is a sales part with incoming components. For this package part, the acquisition mode 'package' is displayed. If the non-stored part is a service item, the acquisition mode 'No acquisition' is displayed.

8.4.6 Order management between sites and companies

When using multiple sites and/or companies, internal orders can be handled in a simple way through the regular system, as illustrated below. To handle internal orders, two acquisition modes have been created:

1. Internal purchase order, direct.
2. Internal purchase order, transit.

These modes are specified at the time of customer order registration and account for the automatic generation of internal purchase and customer orders.

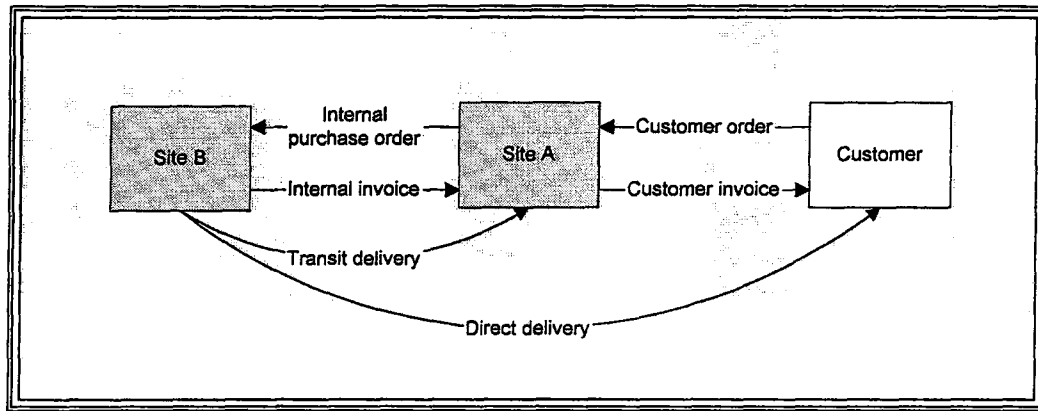


Figure 8.5 Internal Order Flow

When the customer places the order at site A, a customer order is registered in the system. If the parts are picked from another site (site B), an internal purchase order is automatically created to site B. The internal purchase order is the cause of a new customer order at site B. The internal customer order performs the mission and sends the parts either directly to the customer or to site A for group traffic, as in Figure 8.5.

The ordering site subsequently invoices the customer and the delivering site invoices the ordering location. If the sites belong to the same company, no internal invoice is created.

At the registration of a customer order line, the parts can be acquired from another site, irrespective of whether that site belongs to the same company or not. Since a site is linked to every order line, it is possible to have several different sites linked to the same customer order.

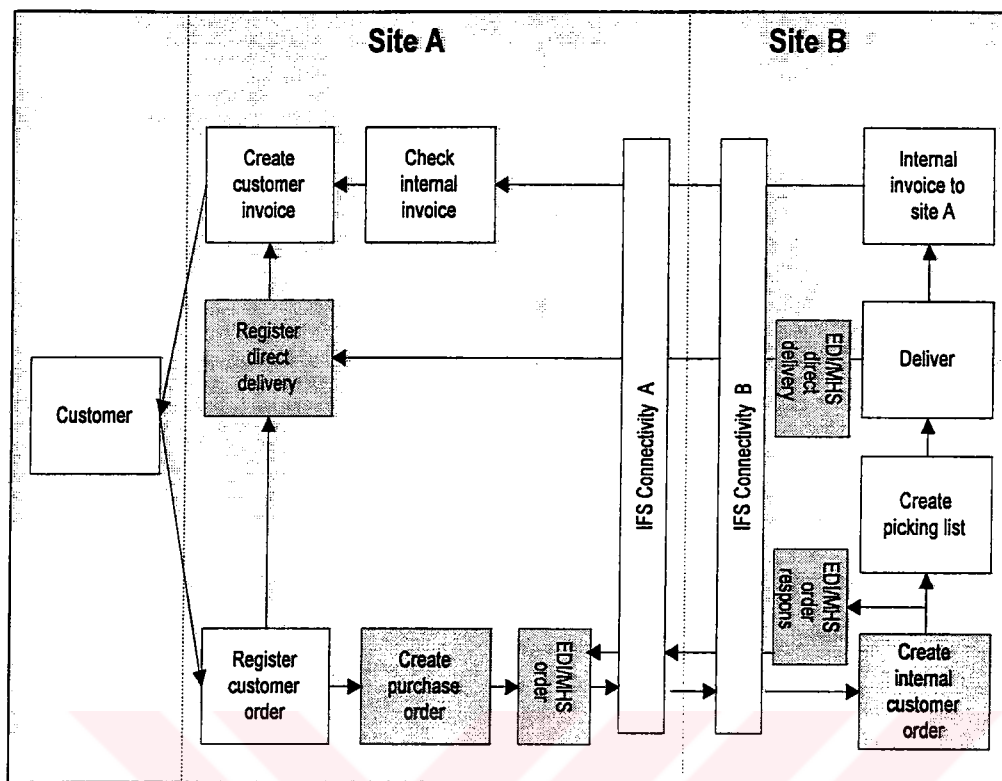


Figure 8.6 Order flow at delivery direct

The coordinator at site A creates and activates the customer order and invoices the customer. The system automatically manages the other steps in the flow. At site B, the internal customer order must be activated. Subsequently, the order type will control which steps in the order flow will be automatically execute just as for a general customer order. If the two sites belong to two different companies an invoice will be generated at the delivering site and send to the ordering site, as in Figure 8.6.

When the customer order in site A is activated, an internal purchase order is automatically created. The purchase order has status Released .

Due to the customer order in site A being activated and the internal purchase order created, a purchase order message is sent to site B via message function. The purchase order message generates the internal customer order in site B. However, this order must be manually activated. When the internal customer order is activated, an order confirmation message will be transferred and the purchase order will receive status Confirmed . The internal customer order states the customer delivery address, while the

documentation address belongs to site A. When the internal purchase order's consignee address is the customer delivery address, a temporary address can also be used. If the two sites belong to the same company, no internal invoice is created.

A delivery notification message is sent to site A, when site B has delivered the goods to the end customer. This enables site B to create an internal invoice. In order to make the order management functionality work, site A has to be registered as an internal customer at site B.

The delivery note is directly send from site B to the customer. The information printed on the delivery note is derived from the internal customer order. If the Customer PO number (Customer Purchase Order Number) field is filled in on the original customer order, it will is also be stated on the delivery note.

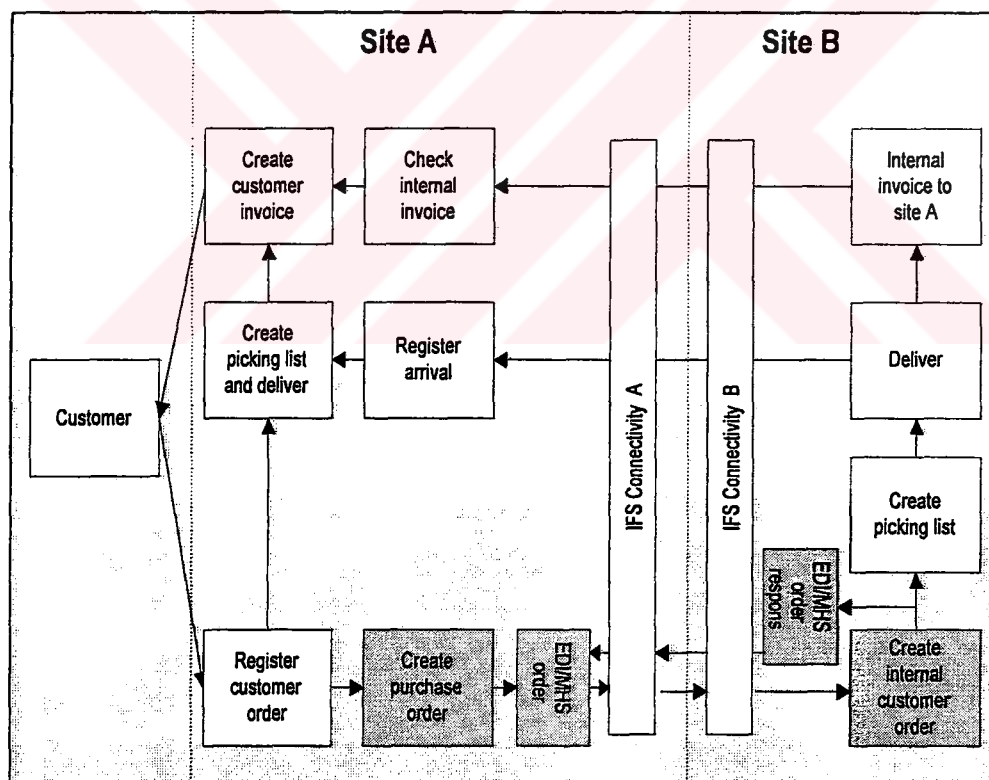


Figure 8.7 The Order Flow At Delivery Transit

The coordinator in site A creates and activates the customer order and invoices the customer, as in Figure 8.7. The system automatically handles the other steps in the flow.

In site B, the internal customer must be activated. Subsequently, the order type will control which steps in the order flow, will be executed automatically. If the two sites belong to two different companies an invoice will be generated at the delivering site and send to the ordering site. The difference between delivery direct and transit is that at a transit delivery, arrival of the parts must be registered manually. For a direct delivery, a delivery notification is sent via the message function.

When the customer order in site A is activated, an internal purchase order is automatically created. The purchase order has status Released.

When the customer order in site A is activated and the internal purchase order created, a purchase order message is sent to site B via the message function. The purchase order message generates the internal customer order in site B. The customer order however has to be manually activated. When the internal customer order is activated, an order confirmation message will be transferred and the purchase order will receive status Confirmed . The internal customer order shows, for a delivery address, the address registered as a default value in the customer order record, and the indicated documentation address. If the two sites belong to the same company, no internal invoice is created, but the address can be used for order confirmation.

Arrival of the transit delivery is manually registered in site A, when site B delivers to site A. This enables site B to create an internal invoice.

As long as the original customer order has not been activated, it can be changed without affecting the internal purchase and customer orders. If, however, the order is changed after the activation, the internal orders must be manually changed to correspond.

When activating the original customer order, one purchase order is created for each supplier. There can be as many purchase orders connected to the customer order as there are order lines.

If the two involved sites belong to the same company, no statistic is created over the inventory transactions for preventing a doubling of the statistic.

When using internal order, the parts are handled as if the two sites were an external customer and an external supplier, that is, sales, inventory and purchasing parts are entered. The part numbers need not be the same at the two sites, and non-inventory parts cannot be handled for the internal order.

When the order line is entered, the indicated supplier and linkage of the part to the supplier are validated. This means that the supplying site must exist in the ordering site's supplier record. Also, the ordering site must exist in the delivering site's customer record. In the record, the two sites must be identified as an internal supplier and internal customer, respectively.

Upon entry of the original customer order the current inventory balance is checked only if the customer order lines are picked at the ordering site.

8.4.7 IFS Invoicing Module

IFS/Invoice is used to manage customer and supplier invoices. Main parts of the module are Customer Invoices, Supplier Invoices and External Invoices.

The Customer Invoices part contains windows for entering, creating, and printing invoices. Instant invoices can be entered and printed. Another window used for printing invoices can also be used for invoices created in a different module belonging to IFS/Applications, e.g., IFS Distribution. In this folder there is also a query function that helps you find customer invoices. In the customer folder there is an underlying folder, General Customer. This folder gives you a general idea of the customers your company works with. It is in this folder that you enter new customers and associated basic data concerning invoicing.

There are functions for supplier invoices in the Supplier Invoices folder. The folder is used for preliminary entry and final entry of supplier invoices. You can also choose to enter invoices directly and set up a payment plan. In the supplier invoice folder there is an underlying folder, General Supplier. Here you will find entries for all the suppliers

your company works with, in general and in detail. New suppliers are entered in the supplier window with the general information that is normally due.

The External Invoices folder contains functions for updating IFS/Invoice with customer invoices created in an external system, i.e., a system not included in IFS Applications. The folder contains functions for adjusting, verifying, and transferring invoice information to the customer ledger in IFS/Invoice. The folder also contains functions for creating vouchers that are then transferred to the hold table in IFS/Accounting Rules.

8.5 IFS Purchasing

8.5.1 Making the right procurement decisions through purchase control

When a company's inventory level and lead times are reduced, choosing the right suppliers is critical to assuring high quality and reliable supply. IFS Purchasing Module gives the company the right information to make good purchasing decisions. Purchase Part Supplier information will help to select and work effectively with suppliers, and tell which suppliers can supply items with the right specifications the most quickly. The system also advises the company of the supplier's terms.

With IFS Purchasing, the company can also generate reliability and performance reports about suppliers to determine which ones are the most suitable for certain contracts.

The purchasing module manages suppliers, purchasing parts and the creation of the purchasing requisition, purchase order and delivery plans.

The functions within IFS/Purchasing are:

- Create register for suppliers and purchase parts
- Link purchase parts with one or more suppliers
- Enter supplier blankets
- Enter purchase requisitions and orders

- Print reminders of order confirmation and delay of delivery
- Create delivery plans for each supplier
- Enter the arrival of purchase parts and receive them into stock or to quality assurance location for inspection
- Enter the result of the quality control and return and, scrap the parts if necessary.
- Enter the delivery of the purchase parts delivered directly to the customer

8.5.2 Integration with the modules within IFS Distribution

The modules within IFS Distribution are totally integrated but can to an certain extent be used separately, as shown in Figure 8.8.

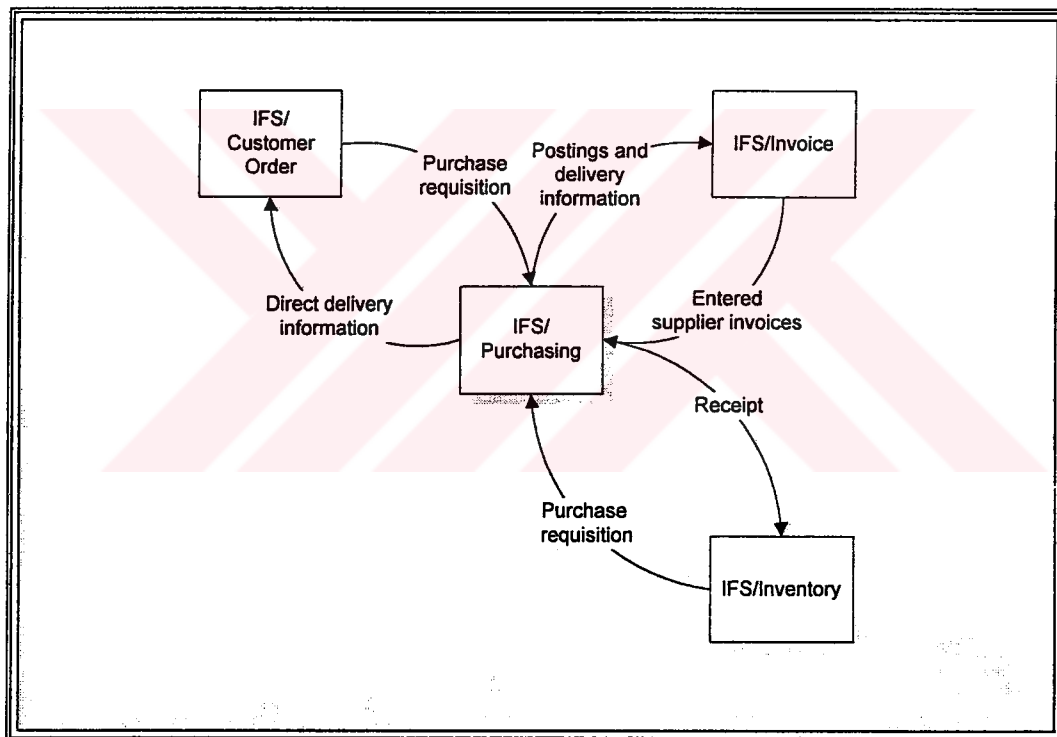


Figure 8.8 Integration of IFS Purchasing to the other Modules

In IFS/Inventory, parts are delivered into stock while the inventory module send the purchase requisition and order proposal are transferred to IFS/Purchasing.

Information is sent to IFS/Customer Orders when purchase parts are delivered directly to customer. From the Customer order module, purchase requisitions are sent when needed.

To the IFS/Invoice postings and delivery data from the suppliers and any connected blankets are send. From the invoice module data concerning supplier invoices are send to the purchasing module.

8.5.3 Purchase orders

Purchase orders are orders against which items are delivered by a supplier according to certain terms and conditions. A purchase order comprises a header and one or more order lines. The general order data - supplier data, terms of payment and terms of delivery are contained in the header, the data about the actual items to be delivered are entered on the order lines.

8.5.4 Work in IFS/Purchasing

There are three different ways to produce a purchasing order. The purchase order can be created from existing purchase requisitions. It is also possible to create a request for quotation and create a purchase order based on the most favorable quotation. The third way is to enter the purchase order directly.

The purchase requisition function exists to limit the number of users who can enter purchase orders without denying access to other users. From the Material Requirements Planning, the modules for customer order and proposal from inventory create an automatic purchasing requisition. Subsequently, the purchaser can produce a purchasing order from the requisition. It is also possible to use a request for quotation which can be entered directly or created from the purchase requisition. A purchase order can be created using the supplier data indicated in the quotation. The request for quotation can also be created for blankets and converted into a blanket order.

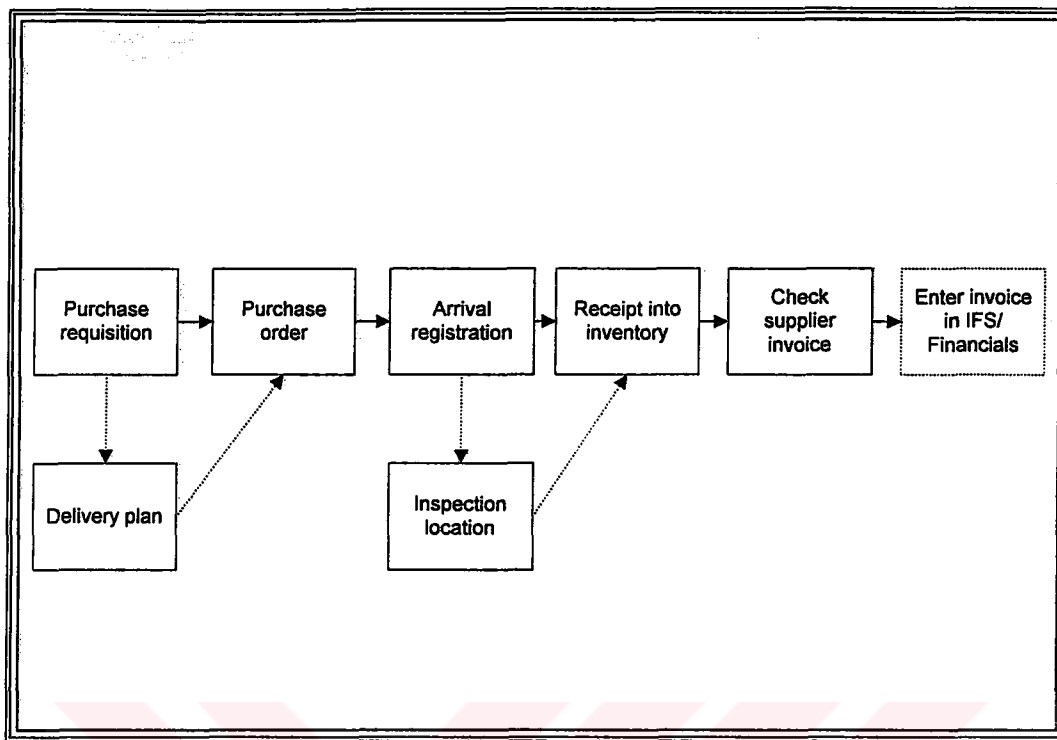


Figure 8.9 Purchasing Flow

You can create delivery plans from the purchasing requisitions entered. From the delivery plan, you can directly process the purchase order.

You can also directly enter the purchase order. Except when entering a new purchase order, you can alter purchase orders created from purchase requisitions. When the purchasing order is completed, release it by printing the order to the supplier.

When the supplier has delivered the ordered parts, the incoming delivery should be entered arrived. The entry for delivery is done per order line, and the total quantity of the ordered amount need not have arrived in order to enter it. You can also process several incoming deliveries per order line. This is the final step in the purchasing procedure for parts which are not kept in stock.

The next step is to register the control result for stored parts with a quality check condition. This function can also be used for any parts not having a quality check condition. The Purchasing Flow is shown in Figure 8.9.

8.5.5 Inspection codes and requirements

When you enter purchase parts, you can indicate an inspection code. The following inspection codes are available in the system:

- 0 = No inspection, delivery is executed directly into stock.
- 1 = No inspection, delivery is executed at a later occasion.
- 2 = All parts entered as arrived must be quality-checked to enable receipt of the parts into inventory. This indicates 100% quality control.
- 3 = A given percentage of the arrived parts must be quality-checked to enable receipt of the parts into inventory.
- 4 = A given quantity of the arrived parts must be quality-checked to enable receipt of the parts into inventory. If the quantity of parts arrived is less than the given quantity, all arrived parts have to be quality-checked in order to receive them into inventory.

8.6 IFS Manufacturing

The master scheduling (MS) module in IFS Manufacturing handles everything from planning parts on level 0 to forecasting parts at the manufacturing level. The purpose of MS is to allow long-term planning of parts and to optimize planning based on the resource demands that arise. MS means matching the company's expected sales - the sales forecast - to the company's available resources and capacity, in order to balance supply and demand.

The MS module in IFS Manufacturing also conveys input data to material requirement planning (MRP) and creates proposals to change existing orders and proposals for new orders to satisfy the demand for the part. This means that MS is integrated with a large part of IFS Manufacturing and IFS Distribution. The inventory module is the same for both systems.

9. RESULTS OF BPR STUDY ON ERP PACKAGE

9.1 Sales Processes

IFS Distribution can cope with very large order volumes. The system handles delivery schedules, orders, reservation of goods, picking, and distribution in both industrial and trading enterprises, with operations located at one or several sites. The combination of main flows and deviation reports makes the system easy to work with. Order types can be freely designed, making it possible to tailor order and procurement routines to suit company operations. For example, the system handles orders that are to be picked and delivered from several locations and companies, transit orders with automatic generation of purchasing orders, and orders for direct delivery from supplier to customer. Customer Order menu is shown in Figure 9.1.

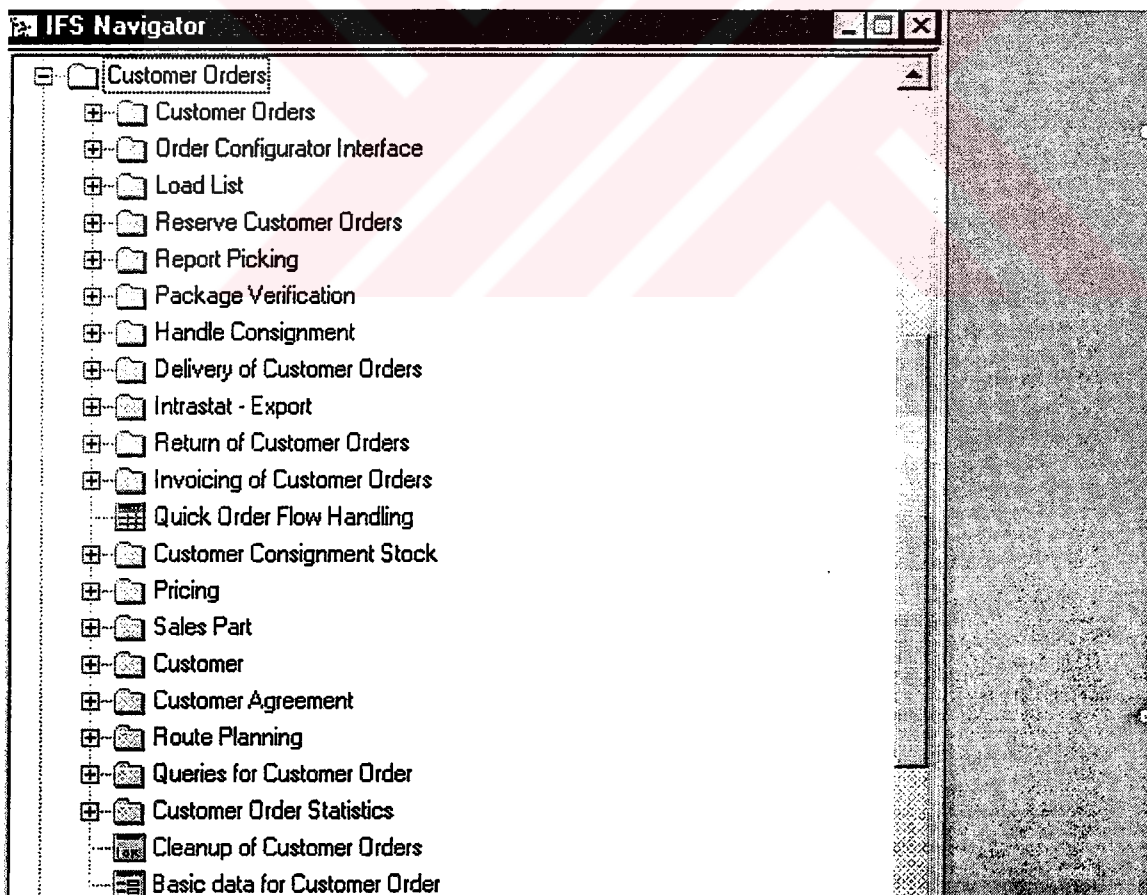


Figure 9.1 Customer Order Module

As soon as the order is registered, information is provided about the first possible delivery day, while, simultaneously, the system checks that the previously promised delivery date can be kept.

9.1.1 Sales part

This window is used to enter, revise, view, and remove sales part records. Parts must be entered in the sales part register before working with customer orders. The information registered for the part becomes default information. The three types of sales parts are inventory registered sales parts, services, i.e., non-stored parts, and package parts.

General tab window, which is shown in Figure 9.2, is used to enter general data for the sales part, such as unit of measure, sales group, and VAT code. For the stored sales part, how it should be acquired must also be stated.

Figure 9.2 Sales Part Screen

Freight Information window, shown in Figure 9.3, is used to enter details about packaging and the parts' weight and volume.

Weight and Volume	
Net Weight:	1012
Gross Weight:	1055
Volume:	

Figure 9.3 Freight Information

9.1.2 Customer

This window, shown in Figure 9.4, is used to register a new customer. Also some information such as language, country, company, address, communication methods, message setup etc. can be connected to the customer.

Identity:	Name:	Association No:
50006	Camglass Limited	

General	Address	Comm. Method	Message Setup	Invoice	Order															
Default Language: English Country: UNITED KINGDOM Creation Date: 24.03.2000 Our ID at Customer <table border="1"> <thead> <tr> <th></th> <th>Company</th> <th>Our ID</th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> </tbody> </table>							Company	Our ID												
	Company	Our ID																		

Figure 9.4 Customer Screen

This tab window is used to enter one or more addresses for a customer. For each address, sales personnel of Şişecam enter what type of address it is. Different types of addresses in the system are delivery, document, visit, and pay. Also different communication methods are chosen for each address entered. Second tab window, shown in Figure 9.5, is used to enter lead time, delivery mode, and terms.

Identity: 50006 Name: Camglass Limited Association No:

General Address Comm. Method Message Setup Invoice Order

Address Identity: 1

General Address Info Order Address Info

Name: Camglass Limited Contact: Mr. Brown

Del Terms: FOB Free on Board Region:

Ship Via: ST Sea Transport District:

Route Id: Load Seq No: Delivery Time:

Ship Via	Description	Site	Leadtime
RT	Road Transport	CT	1
ST	Sea Transport	CT	1

Figure 9.5 Customer Order Address Information

This tab window, shown in Figure 9.6, is used to link the customer to a company and to enter details to be used in the invoicing process.

Identity: 50006 Name: Camglass Limited Association No:

General Address Comm. Method Message Setup Invoice Order

Party Info

Company: 10 Vat Number:

Customer Type: External Currency: USD

Customer Group: 13 Yurtici Diger

Payment Term: 60 60 Gun Vadeli

VAT Code, Manual Customer Invoice: 0 No VAT

VAT Free VAT Code:

Customer Properties

Property Code	Description	Value
RESMI/OZEL	Resmi / Ozel	0
YURTICI/IHR	Yurtici / Ihracat	1

Expire date: ☒ VAT ☐ Invoice Fee ☐ Notes

Figure 9.6 Customer Invoice Information

This tab window, shown in Figure 9.7, is used to indicate statistical group, salesman, payer, price list, and discount class valid for the Customer Order component.

Identity:		Name:		Association No:	
50006		Camglass Limited			
General Address Comm. Method Message Setup Invoice Order					
General Misc Customer Info Pricelist per Price Group					
Cust Stat Grp:	09	YABANCI MUSTERILER			
Payer:					
Cust Price Grp:					
Reference:					
Salesman:	GB	Gul Bayrak			
Market:	EU	Europe			
Discount Class:	0	0.00	%		
Currency:	USD				
		Bonus			
		Bonus Class:		02	
		Bonus Sales:		100000.00 USD	
		Bonus Rate:		2.0	
		☒ Allow Backorder		☐ Notes	

Figure 9.7 Customer Order Information

9.1.3 Customer order

Customer Order window, shown in Figure 9.8, is used to register, process, and view information on the customer order. A customer order is built in two levels consisting of an order header and order lines.

Order Lines is used to state the parts and quantities the customer ordered. The desired date of delivery is indicated for every order line on the order. When an order line is registered, it receives the status Released if it is a general order and the Quotation status if it is a quotation. The status of the order header does not change.

Order No:	Order Type:	Coordinator:	Site:	Currency:	Status:				
A105	YD	YD	CT	USD	Planned				
Customer:	Customer Name:	Delivery Date/Time:							
50006	Camglass Limited	12.04.2000 00:00:00							
Reference:	Customer PO No:	☐ Note ☐ Document Text							
Delivery Address:	Delivery Address Name:	Document Address:	Document Address Name:						
1	Camglass Limited	2	Camglass Limited						
Order Lines Order Addresses Delivery Information Misc Order Info Document Information Order History DOP Info									
	Line No	Sales Part No	Sales Quantit	U/M	Price Quantit	U/M	Price/Bas	Acquisition	Sup
	1	F101Y0300321021000035FK	12	PCS	2832	m2	2,00	Int Purch Dir	TCM
	2	F102Y0300321021000035FK	3	PCS	708	m2	1,90	Int Purch Dir	TCM

Figure 9.8 Customer Order Entry

9.1.4 Releasing customer order

When released, the order status is updated from Planned to Released. This means that the customer order is available for other operations and can continue in the order flow prescribed for the order type.

According to the release, a credit check is executed for the order. First, the system checks whether the customer is credit blocked in the customer record. Then, the value of all order lines in status Released to Delivered, but not yet invoiced, (except cancelled orders) are totalled so that they do not exceed the customer's credit limit. When the status is Partially Delivered, the amount that is taken into consideration is for those lines that are still not invoiced. Any credit invoices are taken into consideration too. If IFS Financials is installed, all outstanding invoices are included as well. If the credit limit is exceeded, the order is credit blocked, acquires the status Credit Blocked, and is stopped in the order flow. The order can, however, be released manually in Release Credit Blocked Customer Orders.

When the customer order is activated, any needed purchase requisition or shop order requisition will be automatically created, as in Figure 9.9.

Order No:	Line No:	Del No:	Site:	Sales Part Type:
A105	1	1	CT	Inventory part

Date	Status	User	Text
08.04.2000	Released	IFSAPP	Internal purchase order 41 created
08.04.2000	Released	IFSAPP	Released

Figure 9.9 Automatically Created Purchase Order

9.1.5 Printing proforma invoice

Pro Forma Invoice is used in international sales. Foreign customers usually want to see the order's cost before shipment. A pro forma Invoice can be printed for a customer order at any time between release and invoicing of the order. The layout of the report is the same as the layout for a normal invoice. A pro forma invoice is always generated per order.

9.1.6 Internal purchase order

Şişecam uses Internal Order Direct Delivery Method. With this method, goods are directly delivered to the customers from plants. (In the other case, first Camtaş should receive the goods and then deliver to the customers.)

When the customer places the order at Camtaş Site, a customer order is registered in the Camtaş Database. Since the parts are picked from plants (another site and database), an internal purchase order is automatically created to the plant site, as in Figure 9.10. The internal purchase order is the cause of a new customer order at the plant site. The internal customer order performs the mission and sends the parts directly to the customer.

Order No:	Supplier:	Supplier Name:	Site:	Status:
41	TCM	Trakya Cam Mersin	CT	Released
Buyer:	Receiver:	Coordinator:	Receipt Date:	Currency:
*	ICD	YD	12.04.2000	TAL
		☒ Order Sent	☐ Chg Rec	
		☐ Printed	☐ Document	
		☐ Note		
Part Order Lines	No Part Order Lines	Misc Order Info	Delivery Address	Work Flow
Order History	DOP Info			
Line No	Part No	Part Description	Quantity	Purch U/M
1	F101Y0300321021000035FK	F-K1-RZ-Kaplamasiz-Telsiz-Desensiz	12	PCS
2	F102Y0300321021000035FK	F-K2-RZ-Kaplamasiz-Telsiz-Desensiz	3	PCS
				Price/C
				1.000

Figure 9.10 Internal Purchase Order Created To The Plant

9.1.7 Customer order at the other site

Due to the customer order in Camtaş Database being activated and the internal purchase order created, a purchase order message is sent to the Plant Site via message function. The purchase order message generates the internal customer order in Plant Database, as in Figure 9.11. However, this order must be manually activated. When the internal customer order is activated, an order confirmation message will be transferred and the purchase order will receive status Confirmed . The internal customer order states the customer delivery address, while the documentation address belongs to Camtaş Site.

Order No:	Order Type:	Coordinator:	Site:	Currency:	Status:
T106	GNL	YI	TM	TAL	Planned
Customer:	Customer Name:	Delivery Date/Time:			
CAMTAS	Camtas	11.04.2000 00:00:00			
Reference:	Customer PO No:		☐ Note		
			☐ Document Text		
Delivery Address:	Delivery Address Name:	Document Address:	Document Address Name:		
1	Camtas	1	Camtas		
Order Lines	Order Addresses	Delivery Information	Misc Order Info	Document Information	Order History
DOP Info					
Line No	Sales Part No	Sales Quantity	U/M	Price Quantity	U/M
1	F101Y0300321021000035FK	12	PCS	2832	m2
2	F102Y0300321021000035FK	3	PCS	708	m2
					Price/Bas
					1,95
					1,85
					Invent Order
					Invent Order

Figure 9.11 The Internal Customer Order In The Plant Database

A delivery notification message is sent to Camtaş Site, when Plant Site has delivered the goods to the end customer. This enables the Plant to create an internal invoice. In order to make the order management functionality work, Camtaş has to be registered as an internal customer at the Plant Site.

9.1.8 Reservation

This process reserves the stored sales parts for the particular order at the desired inventory location. Parts can be reserved in two ways: manually or via batch. The batch can either be initiated manually or it can be scheduled.

When reserving via batch the system will try to reserve the ordered quantity from the inventory location with the earliest expiration date or the earliest receipt date.

Reserving manually means that you manually decide how many parts and from what inventory location the parts will be picked, regardless of what is stated on the customer order.

In Şişecam, manual reservation is used.

9.1.9 Making manual reservations

Whenever you are selling stored sales parts, it is possible to reserve the parts manually, either upon entry of the customer order or just before due date. Reserving manually means that you manually decide how many parts and from which inventory location the parts will be picked, regardless of what is stated on the customer order. The advantage of reserving manually is that it ensures that the parts are available and reserved immediately. Parts can also be unreserved in this window, shown in Figure 9.12.

Order No:	Line No:	Del No:	Site:	Status:	Customer No:	Customer Name:			
T106	1	1	TM	Reserved	CAMTAS	Camtas			
Part Number:	Description:			U/M:					
F101Y030032102	F-K1-RZ-Kaplamasiz-Telsiz-Desensiz			PCS					
Route Id:	Description:			Qty Reserved:	Qty to Reserve:				
				12	12				
Planned Del Date/Time:	Promised Del Date/Time:		Planned Ship Date/Time:		Planned Ship Period:				
11.04.2000 00:00:00	11.04.2000 00:00:00		11.04.2000 00:00:00						
Single ☐ Pallet ☐									
Qty Reserved	Total Reserved	Qty Onhand	Location No	Warehouse	Bay	Row	Tier	Bin	Serial No
1	1	1	MA	MerkezAmba					10027
1	1	1	MA	MerkezAmba					10028
1	1	1	MA	MerkezAmba					10029
1	1	1	MA	MerkezAmba					10040
1	1	1	MA	MerkezAmba					10041
1	1	1	MA	MerkezAmba					10042
1	1	1	MA	MerkezAmba					10043

Figure 9.12 Manual Reservation of Parts

9.1.10 Creating pick list

When handling customer orders with stored sales parts, they need to be reserved and picked on a specific inventory location. Whenever the parts are reserved, a pick list needs to be created and printed in order to inform the packing staff of what and how much to pick for each specific order, as shown in Figure 9.13. If a part is pallet handled, one pick list is created for each pallet. No changes can be done to the reservation when the pick list is created.

Order No	Site	Status	Order Type	Customer No	Customer N
T106	TM	Reserved	GNL	CAMTAS	Camtas
Create Picklist					
Table					
Populate					

Figure 9.13 Creation of Pick List

9.1.11 Report on picking

When you handle customer orders with stored sales parts, they need to be reserved and picked on a specific inventory location. Whenever the parts are picked, the packing staff should enter what, how much, and from which inventory location they have picked the parts for each specific order, as in Figure 9.14.

In case the quantity or location of the parts differs from what is stated on the pick list, the report should be entered in Report Picking with Differences.

Order No	Pick List No	Site	Status	Order Type	Customer No	Ship
T106	17	TM	Reserved	GNL	CAMTAS	
Report Picking						
Report Picking with Differences...						

Figure 9.14 Report Picking

9.1.12 Delivering order

This window, shown in Figure 9.15, is used to report delivery of customer orders. Customer orders can be delivered with inventory parts and non-inventory parts. Inventory parts can be delivered as soon as they are reported as picked. Non-inventory parts with delivery date further on than today's date needs to be reserved via the reservation batch before they can be delivered. However, non-inventory parts with delivery date today or backward in time can be delivered directly after release is done. When the customer order is considered as delivered it acquires the status Delivered. The status can vary depending on the order type.

Order No	Site	Status	Order Type	Customer No	Customer Name	Coordinator
T106	TM	Picked	GNL	CAMTAS	Camtas	YI
Deliver						
Deliver with Differences...						

Figure 9.15 Delivery of Customer Order

9.1.13 Creating delivery note

When the ordered parts are ready for delivery it is possible to create and print a delivery note that can accompany the goods to the customer, as in Figure 9.16. The delivery note contains information about the ordered quantity, the remaining quantity if any deviation is present, the quantity delivered, and if the order is invoiced and closed.

Order No	Site	Status	Order Type	Customer No	Customer Name	C
T106	TM	Delivered	GNL	CAMTAS	Camtas	YI
Create Delivery Note						
Table						

Figure 9.16 Delivery Note

9.1.14 Creating customer order invoice

The invoices are created from the delivered customer orders entered in the system, as in Figure 9.17. When the invoices are created, they are processed and dispatched to the customer.

In order to create a customer invoice, the order either must have been delivered or partially delivered, i.e., the customer order must be in status Partial Delivered or Delivered. If an invoice is created for a customer order in which all the order lines are not delivered, only the delivered order lines are invoiced. Upon delivery of more order lines, you can progressively invoice until the entire order is invoiced. Also customer order lines can be partially invoiced for a package structure if partial delivery has been made.

During the operation, the amount of the invoice is calculated in the base currency from a recalculation of the indicated price according to the current exchange rate. Value-added tax is calculated according to the indicated extra charge of the order (originating from the customer) and on the sales part indicated value-added tax rate.

Order No	Site	Status	Order Type	Customer No	Customer Name	Coordinator	Salesman
T106	TM	Delivered	GNL	CAMTAS	Camtas	YI	
Create Invoice							
Table							

Figure 9.17 Creating Invoice

9.1.15 Customer payment

Customer Payment function is used to enter details of customers' payments through the various payment institutes. When a payment is entered, a voucher is generated automatically to the hold table in IFS/ Accounting Rules. This is updated to the general ledger in connection with the next update.

The Customer Payment window, shown in Figure 9.18, contains the tabs, General and Transactions.

Customer Payment/General tab contains general information about the customer payment, e.g., payment date, voucher date, user group, voucher type, payment currency, and amount. In the first part of the window, there are general details such as date and user group. In the second part, Payment Amount, there are details concerning the payment. In the last part of the window, Bank Fee, there are details of payment fees.

The screenshot shows the 'Customer Payment' window with the 'General' tab selected. The window contains a table with columns: New Pay on Account, Parked Payment, Pre Posting, Series Id, No, Customer Identity, Name, Amount, and Remaining Amount. A message dialog is displayed over the table, stating 'New payment has been created:' and showing the following details: Payment Series Id: CUPAY, Payment Id: 1006, Voucher Type: B, Accounting Year: 2000, and Voucher No: 5. An 'OK' button is visible in the message dialog.

New Pay on Account	Parked Payment	Pre Posting	Series Id	No	Customer Identity	Name	Amount	Remaining Amount
☐	☐	☐	CD	1	50006	Camglass Limited	8200,76	0,00

Message

New payment has been created:

Payment Series Id: CUPAY

Payment Id: 1006

Voucher Type: B

Accounting Year: 2000

Voucher No: 5

OK

Figure 9.18 Customer Payment

Customer Payment/Transactions tab is used to enter payment transactions for invoices or for entering new payments on account. It can also be used for entering offsets against invoices or existing payments on account and for entering new parked payments or

offsets against existing parked payments. The tab also contains transaction details including new payment on account, parked payment, series ID, number, customer identity, amount, due date, discount amount, discount date, and interest date.

9.1.16 Customer credit information

This activity is used for entry of customer credit information and corporate credit relation if this exists, in Figure 9.19. The information is used for customer credit management such as messaging to credit analysts and follow up on customer credit info in the Customer Credit Information process. Corporate credit association allows the creation of parent - child relationship for credit limit checking. As a result of this entry, messages to credit analyst can be produced. One type of message could be that the customer has the credit limit exceeded another is credit on hold.

Identity: 50006		Name: Camglass Limited		Association No:	
General Address Comm. Method Message Setup Invoice Payment Credit Info					
Company: 10		Credit Analyst:		Message Group:	
Note Text:					
Dun & Bradstreet Info D & B No:			Corporate Credit Relationship Info ☐ Credit Relation Exist		
Rating:			Relation Type:		
Pay Index:			Parent Company:		
			Parent Identity:		
			Credit		
			Credit Limit:		
			50000.00 USD ☐ Credit Blocked		
			Next Review Date:		

Figure 9.19 Customer Credit Limit

9.1.17 Service sales

A service, shown in Figure 9.20, is a non-inventory registered sales part. Not only products, but sometimes services can be sold to the customer. For example if transportation is made by Şişecam, the customer receives an invoice for that service.

Sales Part Number: **SERV1** Description: **Standard pay for Service work** Site: **CT**

General | Language Description | Characteristics

Units of Measure

Sales U/M: **HOUR** Sales Price Grp: **99** Diger

Price Conv Fact: **1** Sales Group: **90** Servis Satisfarlari

Price U/M: **HOUR** Discount Group:

Price: **70.00** USD VAT code: **4** %17 KDV

Cost: **40.00** USD EAN No:

Configuration: **No Export**

Close Tolerance %: **0** Created: **22.06.**

☐ Bonus Basis ☒ Active ☐ Document

☐ Bonus Value ☐ Taxable ☐ Notes

Figure 9.20 Service Part

9.1.18 Price increments

IFS Navigator

- Customer Consignment Stock
- Pricing
 - Sales Part Base Prices
 - Update Base Prices
 - Update Sales Price Lists from Base Prices
 - Update Unit Based Price Lists
- Overview
- Sales
- Report
- Copy
- Customer

Update Unit Based Price Lists

Update prices adding

Percentage Offset: **0**

Amount Offset: **0**

Valid From: **09.04.2000**

Execute

☐ Online

☒ Background job

Item	Value
Price List	%
Sales Price Group	%

OK Cancel List...

Figure 9.21 Price Increments

When prices are changed in general, either for special sales price lists or for a group of parts, then the sales price lists must be updated. The sales price lists can be updated with a percentage or amount offset, as in Figure 9.21. All prices on the sales price lists with corresponding conditions regarding price list and sales price groups entered are updated with the specified offset.

9.1.19 Order similarity

Usually one customer buys similar things, it means parts and quantity does not differ much between the customer orders. This window is used to enter customer order lines quickly from a predefined template. There are four different ways to use templates in the system. The user can choose to obtain the suggested customer order lines from a defined template, from the customer's latest order as in Figure 9.22, from what the customer has ordered during a period, from a specific order number

Order No:	Order Type:	Coordinator:	Site:	Currency:	Status:
A106	YD	YD	CT	USD	Planned
Customer:	Customer Name:	Delivery Date/Time:			
50006	Camglass Limited	12.04.2000 00:00:00			
Reference:	Customer Order Template - A106				
Delivery Address:	Method:				
1	☐ Defined Template ☒ Latest Order A105 Date: 08.04.2000 ☐ Period ☐ Order No Date:				
Order Lines:	Customer No: 50006 Name: Camglass Limited				
	Ordered Qty	Standard Qty	U/M	Site	Sales Part No
	12	12	PCS	CT	F101Y03003210
	3	3	PCS	CT	F102Y03003210

Figure 9.22 Customer Order Template

9.1.20 Internal inventory movements

This window, shown in Figure 9.23, is used to move parts from one inventory location to another. The reason for such a move could involve alterations in inventory locations, incorrect receipts, etc. Parts can either be moved to a location where there are already parts of this kind or moved to a new location. It is also possible to choose if the parts should be moved directly to an inventory location or if they should be moved to transit. While the parts are in transportation, they are not available for reservations.

Part No:	Part Description:	Site:	Qty Available:	U/M:				
F101Y03003210210	F-K1-RZ-Kaplamasiz-Telsiz-Desens	TM	1	PCS				
W/D/R No:	*	Expiration Date:						
Lot/Batch No:	*	EC:	2					
Serial No:	10055	☐ Default Location						
Location No:	Warehouse:	Bay:	Row:	Tier: B				
MA	MerkezAmbar							
Availability Control Id:	Availability Control Description:							
	Quantity Moved	Destination	Site	Expiration Date	Location no	Warehouse	Bay	Row
→	1	Move to inventory	TR		LMA	LMA		

Figure 9.23 Changing Inventory Part Location

9.1.21 Return of order

This window, shown in Figure 9.24, is used to return parts for a customer order when the customer has, for one reason or another, returned the parts received. Such cases for dissatisfaction can concern incorrect parts or receipt of goods not ordered. When the parts are returned and entered as returned into inventory, the customer can be credited (A Credit Invoice can be created). In Şişecam case, serial numbers are used and these are stated on the customer order in order to be returned to stock. Sometimes the reason for the return can concern defective parts. That time defective parts can be scrapped, too.

Order No:	Line No:	Del No:	Site:	Status:	Customer No:	Customer Name:
A104	1	1	CT	Delivered	50006	Camglass Limited
Sales Part:		Part Description:				
F101Y03003210210000		F-K1-RZ-Kaplamasiz-Telsiz-Desensiz				
Delivery and Invoicing Information						
Delivered Qty:	2	PCS	Tot Price/Curr:	944.00	Tot Price/Base Curr:	54.00
Invoiced Qty:	0	PCS	Tot Price/Curr:	0.00	Tot Price/Base Curr:	0.00
Qty Returned	U/M	Returned to Stock	U/M	Scrapped	U/M	Scrapping Cause
2	PCS	0	PCS	0	PCS	
Return into Inventory...						
Return and Scrap...						

Figure 9.24 Customer Order Returns

9.2 Purchasing

IFS Purchasing helps the purchaser to procure the right product from the right supplier at the right time. When goods and services are procured, the flow is handled from the time the delivery plan is processed, through order proposal, purchasing order and order monitoring to receipt, arrival monitoring and matching with supplier invoice. Order proposals for items, consumables, and services can be created automatically using the inventory and customer orders functionality, can be received from the production system, or registered automatically. The system also supports purchasing without item numbers.

During the whole process, the purchaser has a complete picture of what is needed, in addition to supplementary information on, e.g. alternative suppliers, prices, and purchasing history as support for purchasing decisions. The Purchasing Menu is shown in Figure 9.25.

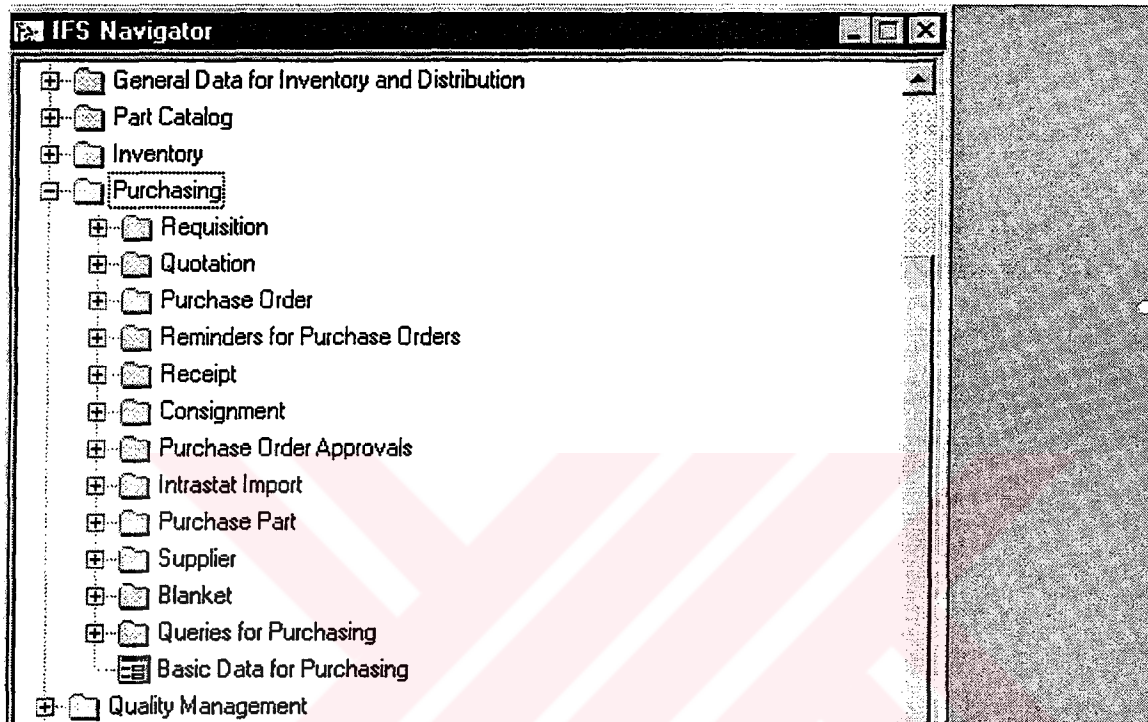


Figure 9.25 IFS Purchasing Module

9.2.1 Purchase part

There are two different types of purchase parts: inventory registered purchase parts and non-inventory registered purchase parts. For an inventory part with the part type Purchased, Purchased Raw, and Expense, a purchase part is automatically created. Inventory parts with other part types must be manually entered as purchase parts. The purchase part is automatically linked to the inventory part. A non-inventory registered purchase is usually used for a non-recurrent purchase.

This tab window, shown in Figure 9.26, is used to enter basic information for the purchase part, such as a default purchase unit of measure, a quality controller, and a purchaser. An order closing tolerance percentage can be specified and the over delivery check can be activated.

Part No:	Part Description:		Site:
1000-00001	A4 Paper		TM
General Characteristics Description Per Language Overview Suppliers Overview Blankets Supplier Split			
Created:	06.04.2000	☒ Inventory Part	
Default Purch U/M:	PCS	☐ Note	
Approved Quality Date:		☐ Document Text	
QC Analyst:		Standard Pack Size:	1
Buyer Id:			
Purchase Group:			
Order Proc Type:			
Order Closing ☒ Automatic Order Closing Close Tolerance %: 0		Over Delivery ☐ Perform Check Over Tolerance %:	

Figure 9.26 Purchase Part Definition

9.2.2 Supplier

This window, shown in Figure 9.27, is used to register a new supplier. Some information such as language, country, company, address, communication methods, message setup etc. can be connected to the supplier.

Identity:	Name:	Association No:										
70008	Altunay Ticaret											
General Address Comm. Method Message Setup Invoice Purchase												
Default Language: Turkish		Our ID at Supplier <table border="1"> <thead> <tr> <th>Company</th> <th>Our ID</th> </tr> </thead> <tbody> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </tbody> </table>	Company	Our ID								
Company	Our ID											
Country: TURKEY												
Creation Date: 06.04.2000												

Figure 9.27 Supplier Definition

Supplier Address

This tab window, shown in Figure 9.28, is used to enter one or more addresses for a supplier. For each address, type of address can also be entered. Different types of addresses in the system are delivery, document, visit, and pay. You can also choose to enter different communication methods for each address you enter.

Identity:	Name:	Association No:	
70008	Altunay Ticaret		
General Address Comm. Method Message Setup Invoice Purchase			
Address Identity: 1			
General Address Info Purchase Address Info			
Supplier Name:		Contact:	
Del Terms: FT		FABRIKA TESLIM	
Ship Via Code: KM		Kamyon	
Ship Via	Description	Leadtime	Internal Time
KM	Kamyon	1	0

Figure 9.28 Supplier Address Information

Supplier/Invoice

This tab window, in Figure 9.29, is used to enter supplier details to be used at invoice entry.

Identity:	Name:	Association No:
70008	Altunay Ticaret	
General Address Comm. Method Message Setup Invoice Purchase		
Company: 11		
General Properties		
Supplier Type:	Supplier Group:	EDI defaults
External	13	☐ Automatic
Currency:	Payment Term:	Approval User:
TRL	60	
Nat. Bank Code:	Preliminary Code:	Invoice Type:
VAT Number:	VAT Code:	
	4	
	KDV %17	

Figure 9.29 Supplier Invoice Information

Supplier/Purchase/General

This tab window, shown in Figure 9.30, is used to enter data such as supplier statistical group, purchaser, payment terms, and discount rate. Information about any quality certification and environmental approval that the supplier has acquired can also be stored.

Identity:	Name:	Association No:
70008	Altunay Ticaret	
General Address Comm. Method Message Setup Invoice Purchase		
General Misc Supplier Info		
Supp Stat Grp:	Dis Saticilar	Our Cust No:
11		☐ Note
Buyer:	IFS APPLICATIONS	Discount Rate:
*		
Addition:	TRL	Currency:
0		TRL
Payment Terms:	60 Gun Vadeli	Reference:
60		
Customer No:		
Quality	Environment	Credit
☐ Quality Approved	☐ Environmental Approved	☐ Credit Approved

Figure 9.30 Supplier Purchase Information

9.2.3 Requisition

This window, shown in Figure 9.31, is used to enter requisitions. Entering requisitions is a preliminary step to creating purchase orders and can be seen as a proposal to the purchaser for what is needed. In contrast to a purchase order, a requisition can be entered by any user. A requisition does not cause parts to be purchased; it is merely a proposal to a purchaser or coordinator when creating a purchase order. There are two different ways of working with a purchase requisition. You can either create a request for quotation from the requisition or you can create a purchase order directly.

The purchase requisition is built in two levels, consisting of a requisition header and one or several requisition lines. The first step in a new entry is to enter the purchase requisition header.

Entering purchase requisitions is a preliminary step in creating purchase orders and can be considered as a proposal to the buyer or coordinator for what is needed. The requisition number is system-assigned when saving; you cannot manually enter a requisition number.

When the requisition is created, it receives the status Planned. To continue the workflow, the requisition must be activated, i.e., released.

Requisition No:		29		Order Date:	06.04.2000	Status:	Planned
Requisitioner:		PUR		Department:		Phone:	
Order Code:		1	NORMAL	Receiver:			
Site:		TM	Trakya Mersin Fab.	Authorizer:			

Part Requisition Lines		No Part Requisition Lines		DOP Info			
Line No	Release No	Part No	Part Description	Status	Wanted Receipt Date	Quan	
1	1	1000-00001	A4 Paper	Planned	10.04.2000	5	PCS
2	1	1100-02000	Personal Computer 586 -2	Planned	10.04.2000	1	PCS

Figure 9.31 Purchase Requisition

9.2.4 Supplier for purchase part

This window, shown in Figure 9.32, is used to link the part to a supplier. Information on price, units, discount, etc are entered. In Şişecam for some materials, purchase part can be connected with the supplier's part number.

Part No:	1000-00001	Part Description:	A4 Paper	Site:	
Supplier:	70008	Supplier Name:	Altunay Ticaret	☐ Docu	
General Inspection Info Price Group Manufacturers Consignment					
Purchase Unit:	PCS	Status:	2	ACTIVE	
Inventory Unit:	PCS	Supplier Part No:			
Conv Factor:	1	Supplier Part Desc:			
Price:	1000000.00	Min Quantity:	0	☒ Primary Sup	
Price Unit:	PCS	Manufact Leadtime:	0	☐ Leadtime Ar	
Price Conv Factor:	1	Consignment:	No Consignment Stock		
Discount %:	0	Delivery Pattern Id:			
Addition Fixed:	0.00	Std Multiple Qty:	1		
EAN No:		Standard Pack Size:	1		

Figure 9.32 Supplier For Purchase Part

9.2.5 Purchase order

This window, shown in Figure 9.33, is used to work with the purchase order. You can register, process, and study the purchase order. You can register new purchase orders and work with purchase orders that were created from requisitions. A purchase order has two levels, an order head and order lines.

Release operation activates a planned purchase order, changing its status from Planned to Released. Once activated, the purchase order is available for other operations, such as printing the order and sending the order to the supplier.

Order No:	Supplier:	Supplier Name:		Site:	Status:	
40	70008	Altunay Ticaret		TM	Planned	
Buyer:	Receiver:	Coordinator:	Receipt Date:	Currency:	☐ Order Sent ☐ Chg Req	
*	A	YI	10.04.2000	TRL	☐ Printed ☐ Docume	
☐ Note						
Part Order Lines No Part Order Lines Misc Order Info Delivery Address Work Flow Order History DOP Info						
Line No	Part No	Part Description		Quantity	Purch U/M	Price/Curr
1	1000-00001	A4 Paper		5	PCS	1.000.000 PCS
2	1100-02000	Personal Computer 586 -2		1	PCS	6000000000.00 PCS

Figure 9.33 Purchase Order

9.2.6 Register purchase order arrivals

This window, shown in Figure 9.34, is used to register goods that have arrived from the supplier. Each line in this window corresponds to a purchase order number, a purchase order line, and a release number, i.e., each line on the purchase order is displayed separately. However, data can also be changed before accomplishing the arrival registration in one of the dialog boxes.

The arrival registration is performed in different dialog boxes depending on if the part is serial handled and if the serial numbers should be specified at the arrival registration or later on.

All receipt lines have to be registered as arrived. This includes both the orders concerning inventory registered purchase parts, non-inventory registered purchase parts, and parts without part number.

Order No	Line No	Release No	Purchase Qty Arrived	Purch U/M	Inventory Qty Arrived	Inventory U/M
40	1	1	5	PCS	5	PCS
40	2	1	1	PCS	1	PCS

Receive

Receiver: IFSAPP

Arrival Date: 07.04.2000 11:56:00

Receipt Reference:

☐ Print Arrival

Order No	Line No	Release No	Site	Part No	Purchase
40	1	1	TM	1000-00001	
40	2	1	TM	1100-02000	

Figure 9.34 Purchase Order Arrival

9.2.7 Purchase order receipt

This window, shown in Figure 9.35, is used to find the receipt line that you will continue to process. Each receipt line is displayed one by one.

Inspection results can be entered for inventory registered purchase parts, non-inventory registered purchase parts, and no-number parts. This must be done when the quantity to inspect is larger than zero. For inventory parts, you must register the inspection results before you are allowed to move the parts into a stock location. For non-inventory parts or no-number parts, the results must be registered in order to complete the receipt.

When entering the inspection results faulty parts can be scrapped, returned for rework, or returned for credit. To complete the registering of inspection results, the sum of the quantity approved and any quantities scrapped or returned should be the same as the quantity to inspect. Otherwise you have done a partial report of the inspection results. Any scrap or return can be undone. If this is performed you have to approve the quantity that is undone before they can proceed in the work flow.

Parts that, for example, have been found to be faulty after passing the inspection can be re-inspected. The recommended solution for re-inspection of parts that already are moved into a stock location is to move them back to an inspection location. The method for entering re-inspection results are the same as used for an ordinary inspection.

The inspection result is reported and the number of inspections is increased (+1) every time an inspection is performed. The combination of the quantity inspected and the number of inspections helps you when evaluating inspection/re-inspection for a receipt line. A receipt line with inventory registered purchase parts receives the status To be Received when the registering of inspection result is completed. This order is ready to proceed in the work flow.

When the inspection results are entered, faulty parts can be returned for credit. The return cause can, for example, be problems with the quality or a delivery made by mistake. The financial burden of returned parts is placed on the supplier, i.e., a credit invoice is required. A replacement order can be created for the returned parts.

A return for credit is normally entered per return cause in the appropriate tab when you enter the inspection results. You can specify several return causes for a receipt line.

When the inspection results are entered, faulty parts can be scrapped, too. The scrapping cause can, for example, be that the parts are damaged in Şişecam's warehouse. The financial burden of rejected parts is placed on Şişecam.

Order No:	Line No:	Release No:	Receipt No:	Site:	Status:	No of Insp
40	1	1	1	TM	Received	
Part No:	Part Description:	Qty Arrived:	Purch U/M:	Qty to Inspect:	Qty Inspect	
1000-00001	A4 Paper	5	PCS	0		
General Single Pallet Misc Scrap Return Receipt History						
Receiver:	IFSAPP	Supplier:	70008	Altunay Ticaret		
Receipt Reference:		Dim/Quality:				
Arrival Date:	07.04.2000 11:59:28	Type Designation:				
Qty Invoiced:	0	Receive Case:	Receive into Inventory			
Inspection Results/Purchase Units		QC Analyst:		☐ Analysis Available		
Qty Scrapped:	0	Inventory Units				
Qty Returned Credit:	0	Qty Arrived:	5	Analysis No:		
Qty Returned Rework:	0	U/M:	PCS	Qty Consignment:		

Figure 9.35 Purchase Order Receipt

9.2.8 Supplier invoice

This window, shown in Figure 9.36, is used for entering incoming supplier invoices. Accounting Department of Şişecam can enter preliminary invoices, make final entry of previously entered preliminary invoices, or can do a direct entry of invoices.

The screenshot displays the 'Supplier Invoice' window with the 'General' tab selected. The window contains various input fields for invoice details. At the top, there are fields for 'Vou. Date' (07.04.2000), 'Period' (2000), 'User Group' (AC), 'Vou. Type' (I), and 'Vou. No.'. Below these are fields for 'PD Reference', 'State', 'Gross Amount' (71), 'Supplier' (70008), 'Name' (Altunay Ticaret), 'Invoice Identity' (SI), 'Currency' (TRL), 'Net Amount' (61), and 'VAT Amount' (11). A tabbed interface at the bottom includes 'General', 'Postings', 'Lines', 'PrePosting', 'Payment Plan and Discounts', and 'Voucher'. The 'General' tab is active, showing fields for 'Invoice Date' (07.04.2000), 'Arrival Date' (07.04.2000), 'Payment Terms' (60), 'Due Date' (06.06.2000), 'PlanPayDate' (06.06.2000), 'Prelim Code', 'Deliv address', 'Invoice Ref', 'N. Bank Code', 'Invoice Type' (SUPPINV), 'Authorizer' (*), 'Currency Rate' (0.000172), 'Creator Reference', 'Voucher Type', 'Voucher No', 'Voucher Date', 'Period', and a 'Multi Company Invoice' checkbox.

Vou. Date:	07.04.2000	Period:	2000	4	User Group:	AC	Vou. Type:	I	Vou. No.:	
PD Reference:		State:		Gross Amount:	71					
Supplier:	70008	Name:	Altunay Ticaret	Invoice Identity:	SI	Currency:	TRL	Net Amount:	61	
				VAT Amount:	11					
General Postings Lines PrePosting Payment Plan and Discounts Voucher										
Invoice Date:	07.04.2000	Arrival Date:	07.04.2000	Payment Terms:	60	Due Date:	06.06.2000	PlanPayDate:	06.06.2000	
Prelim Code:		Deliv address:		Invoice Ref:		N. Bank Code:		Invoice Type:	SUPPINV	
Authorizer:	*	Currency Rate:	0.000172	Creator Reference:						
Voucher Type:		Voucher No:		Voucher Date:		Period:		Multi Company Invoice:	☐	

Figure 9.36 Supplier Invoice

Supplier Invoice/General tab is used to enter change or view information on supplier invoice date, payment terms, etc.

Supplier Invoice/Postings tab, shown in Figure 9.37, is used to enter one or more cost postings that represent the net amount. For each invoice entered, a voucher is created that is placed in the hold table pending to update IFS Accounting Records. A supplier invoice must be fully posted before it can be saved.

Vou. Date: 07.04.2000 Period: 2000 4 User Group: AC Vou. Type: I Vou. No:

Post from Purchase Order

PO Reference: Supplier: 70008 Supplier Name: Altunay Ticaret Invoice No: 10001 Currency: TRL Net Amount: 605000000,00 Matched: 605000000,00

General	Part	Matched	Order No	Part No	Part Description	Qty in Buy U/M	Qty in Pr
☒	☒	40	1000-00001	A4 Paper	5		
☒	☒	40	1100-02000	Personal Computer 586 -2	1		
☐	☐						
☐	☐						
☐	☐						
☐	☐						
☐	☐						

Figure 9.37 Supplier Invoice Posting

Supplier Invoice/Lines tab, Figure 9.38, is used to enter information on delivery type, VAT Percentages, gross amount, and net amount. Normally, an invoice contains only one line, but several lines are possible if, for example, the invoice has different VAT codes or delivery types.

Vou. Date: 07.04.2000 Period: 2000 4 User Group: AC Vou. Type: I Vou. No:

PO Reference: State: Gross Amount: 700000000,00

Supplier: 70008 Name: Altunay Ticaret Invoice Identity: SI 10001 Currency: TRL Net Amount: 605000000,00 VAT Amount: 102850000,00

☐ Notes

General | Postings | **Lines** | PrePosting | Payment Plan and Discounts | Voucher

Delivery Type Id	VAT Code	VAT Percent	Gross Amount	Net Amount	VAT Amount
→ 4	4	17,00	707850000,00	605000000,00	102850000,00

Figure 9.38 Supplier Invoice Lines

9.3 Inventory Module

Modern distribution models are based on a perfect balance between high delivery precision and low capital investment in inventory. IFS Distribution optimizes the inventory function at one or several locations, providing opportunities for queries and stock analyses of, e.g. rate of turnover, slow-moving items, and balance development.

The following Figure 9.39 is the standard IFS Inventory Module Menu:

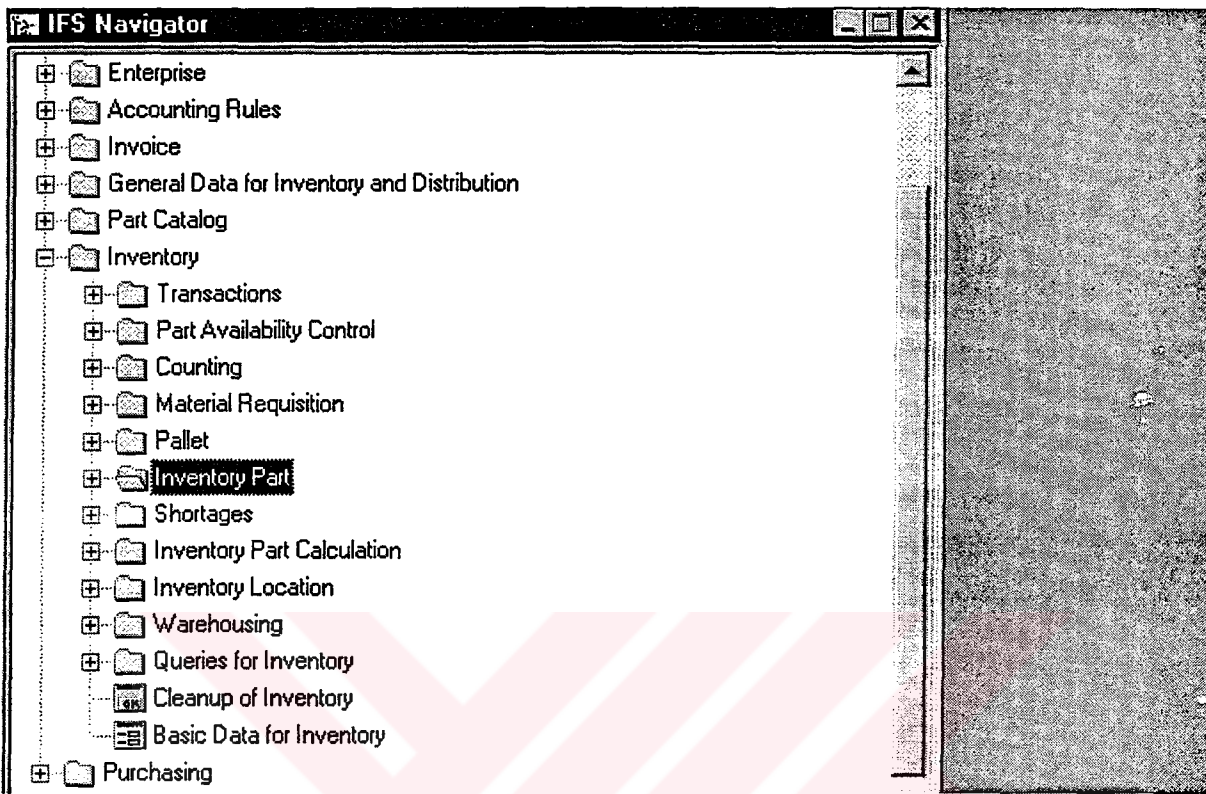


Figure 9.39 IFS Inventory Module Menu

9.3.1 Inventory part

This window, shown in Figure 9.40, is used either to enter a new inventory part or to display the inventory part that you want to revise, view, or remove. Parts must be registered here before working with the Inventory module. The data entered here for each part becomes the default data for that part in all other modules in IFS Distribution.

Inventory Part:		Part Description:		Site:	
F101Y0300321021000035FK		F-K1-RZ-Kaplamasiz-Telsiz-Desensiz		TM	
General Acquisition Misc Part Info Planning Data Default Locations Characteristics Revisions Manufacturing					
Part Type:	Manufactured		Accounting Group:		
Planner:	*		Product Code:		
U/M:	PCS	piece	Product Family:		
Comm. Group 1:			Type Designation:		
Comm. Group 2:			Dimension/Quality:		
Asset Class:	R	RESERVE	Net Weight:		☐ Note
Part Status:	A	ACTIVE	Quantity Onhand:	3	☐ Document
ABC-Code:	A	80,00	Created:	27.03.2000	
Safety Code:	YK	YUKLEME SIRASINDA KIRIL	Latest Change:	29.03.2000	

Figure 9.40 Inventory Part

The inventory part record can be called the basic record in IFS Distribution. With starting point from the part registered in inventory part record, you can enter sales and purchase parts as both inventory and non-inventory parts.

A single inventory part can have several corresponding sales part records. Inventory parts are also classified according to part type, commodity group, and asset class. These groups largely control how the inventory part is constructed and how it works in the system.

9.3.2 Receiving inventory part and serial number tracking

Receipts are often registered into inventory at other places than in the inventory module, for example when purchase orders or shop orders are processed. Sometimes, however, it might be needed to register receipts manually. The system checks that the following criteria are fulfilled for receiving an inventory part into inventory:

- It is not locked for counting.
- It has a standard cost (unless there is an override cost in the Inventory Part Register).

- Its current location is not an inspection location.

When receiving a material into inventory like in Figure 9.41, a serial number should be specified per part. In Şişecam, generally an interval is stated for several parts, but occasionally a serial number can be specified for each part received, too.

Part No:		Part Description:		Site:		U/M:	
F101Y0300321021000035FK		F-K1-RZ-Kaplamasiz-Telsiz-Desensiz		TM		PCS	
Inventory Value:		1		Note:			

Warehouse	Bay	Row	Tier	Bin	Location type	Lot/Batch No	Serial No	W/D/R No	Av
MerkezAmb					Picking	*	<VALUE>	*	
MerkezAmb									
→ MerkezAmb									

Serial No: Receive qty (1) at location no (MA)

Serial No
→ A10001

Figure 9.41 Receiving Inventory Part

This window is used to register receipts manually. In the upper part of the window, the part which is wanted to be received is queried. Before the receipt is made, it is also possible to change the inventory value and add a note for the transaction.

In the lower part of the window the information about the already existing part locations are displayed. Parts can be received into one of these locations or a new location can be added.

The dialog box is used to enter serial numbers valid for the received parts.

Serial Numbers are used for differentiation of goods from each other. Produced goods are put into stock and then shipped to the customer by using serial numbers. If the customer returns back the product, by using the serial number responsible persons can find when the product is produced, which machines are used, who worked in that shift, etc. Serial Tracking is also a requirement of ISO 9000 Certification.

In serial number tracking important points are:

For the material serial tracking is done, all receipts and all issues should be done by using serial numbers

And in reality serial number should be true, too. (Serial number on the label of product should be same with the number on the computer)

9.3.3 Part status

In this tab, shown in Figure 9.42, code values are entered for the different statuses that an inventory part can have. The part status controls the extent to which the part can be used in the system. Four status code values come with the system at installation: A; active, E; experimental, I; inactive, and O; obsolete. These values are resident in the system, however additional values can be created, too.

Part Status Code	Description	Quantity Onhand	Demand	Supplies
A	ACTIVE	Onhand Allowed	Demands Allowed	Supplies Allowed
I	INACTIVE	Onhand Not Allowed	Demands Not Allowed	Supplies Not Allowed
E	EXPERIMENTAL	Onhand Allowed	Demands Not Allowed	Supplies Not Allowed
O	OBSOLETE	Onhand Allowed	Demands Allowed	Supplies Not Allowed

Figure 9.42 Part Status

Note that when an inventory parts is phased out demand is allowed and supply is not allowed. If it is experimental for example, quantity onhand is allowed, but demands and supplies are not allowed.

9.3.4 Inventory counting

Before counting necessary information must be entered to the inventory part record. These information are Last Count Date, Next Count Date, Cycle Period and if inventory part will be Frozen For Count or not.

Create Count Report

Location:

Site:

From Warehouse: To Warehouse:

From Bay: To Bay:

Part No:

From: To:

Options:

☐ Only print parts with cyclic counting ☒ Freeze part while counting

Number of records to be processed: Max OnHand Qty:

Exclude parts counted since: Commodity Group 2:

OK Cancel List...

Figure 9.43 Inventory Counting

The upper dialog box, Figure 9.43, is used to print a count report to use for inventory counting. Inventory counting cannot be done for inspection, pallet delivery, and shipment locations.

Count Report Number: Site: Site Name: ☒ Show Only Uncounted

General | Pallets

Sequence	Counted Quant	Quantity Onhand	Unit Of Measure	Part Number	Part Description
1		1	PCS	F101Y0300321021000035FK	F-K1-RZ-Kaplamasiz-Telsiz
2		1	PCS	F101Y0300321021000035FK	F-K1-RZ-Kaplamasiz-Telsiz
3		1	PCS	F101Y0300321021000035FK	F-K1-RZ-Kaplamasiz-Telsiz

Figure 9.44 Count Report

The upper window, Figure 9.44, is used to display the count report.

If serial number tracking is made for the inventory part, counting must be done considering serial numbers.

In Şişecam Count Report is formed and real Counted Quantity is written on the report. If the real Counted Quantity is different from the system's quantity, the source of the difference is searched. When the difference is accepted, IFS creates an accounting record for the Counting Difference Accounts.

9.3.5 Characteristics

This tab window, Figure 9.45, is used to link a part to particular attributes of its characteristic template. This is done for searching parts with specific characteristics.

Inventory Part:		Part Description:		Site:	
F101Y0300321021000035FK		F-K1-RZ-Kaplamasiz-Telsiz-Desensiz		TM	
General	Acquisition	Misc Part Info	Planning Data	Default Locations	Characteristics
Characteristic Template:		CAM		Inventory U/M:	
		CAM		PCS	
	Characteristic Code	Characteristic Description	Attribute Value	U/M	Alpha/Num
→	01	Ergime Noktasi	-150	deg. C	Numeric
→	02	Ozgul Agirlik	7.95	kg/m3	Numeric

Figure 9.45 Characteristics

9.3.6 Revisions

In this tab, Figure 9.46, information about the different revisions of a part is entered and changed, the records of its different revisions are viewed, and data for new revisions are entered. Information entered about changed orders, engineering changes, and document revisions simplifies work with parts that change and develop structurally.

Multiple revisions of a part can be active simultaneously. Each revision of a part, whether active or not, is identified by an engineering change level number. At any time, any revision of a part is in a status of Active, Planned, or Not Decided. Only one revision can apply to a part at one time. Revisions are controlled by the from and to dates that define their individual life spans. Such periods cannot overlap.

Inventory Part:		Part Description:		Site:	
F101Y0300321021000035FK		F-K1-RZ-Kaplamasiz-Telsiz-Desensiz		TM	
General	Acquisition	Misc Part Info	Planning Data	Default Locations	Characteristics
Revisions	Manufacturing				
Revision	Phase In	Phase Out	Re	Produce Statu	Repair Status
1	27.03.2000	28.03.2000	1	Not In Effect	Not In Effect
2	29.03.2000		2	Not In Effect	Not In Effect
		Eng R		Eng Revision Desc	
		1		Sodium Carbonate Ratio is 2%	
		2		Sodium Carbonate Ratio is 3%	

Figure 9.46 Revisions

9.3.7 Internal material usage

Order No:	Status:	Site:	Site Description:
2	Released	TM	Trakya Mersin Fab.
Internal Customer:	Internal Customer Name:	Due Date:	Entered:
SATIS	Satis Departmani	30.03.2000	29.03.2000
Line No	Release No	Part No	Part Description
1	1	F101Y0300321021000035FK	F-K1-RZ-Kaplamasiz-Telsiz-Desensiz
		Qty Due	U/M
		2	PCS
Reserve			
Reserve manually...			

Figure 9.47 Internal Material Usage

This window, Figure 9.47, is used to create a material requisition. A material requisition can apply to an issue of parts for internal use.

9.3.8 Safety stocks and replenishment level planning

This tab window, Figure 9.48, is used to enter part planning data. Part planning data is used by the Material Requirements Planning (MRP) process and also in order proposal calculations in the Inventory module. MRP order code value must be entered for every inventory part.

Inventory Part:		Part Description:		Site:	
F101Y0300321021000035FK		F-K1-RZ-Kaplamasiz-Telsiz-Desensiz		TM	
General	Acquisition	Misc Part Info	Planning Data	Default Locations	Characteristics
Revisions	Manufacturing				
MRP Order Code:	C	Order up to planning. Handled by the order proposal report. Order point ne			
Min Lot Size:		Safety Stock:	5	Auto Update	
Max Lot Size:		Order Point:	8	☐ Safety Stock	
Multiple Lot Size:		Order Point Qty:	30	☐ Order Point	
				☐ Order Point Qty	

Figure 9.48 Part Planning Data

The safety stock level controls when new purchases of this part are planned, i.e., a new order is proposed when planned receipts and deliveries of the part place the quantity on hand below the safety stock level. If this should happen, but no new receipts or deliveries are planned, no order proposal is generated. This means that order proposals are not created just to fill the safety stock. The safety stock can be calculated automatically for all MRP order codes.

The order point is the lowest level the quantity on hand can reach before an order proposal is automatically created. Order point parts are not processed by MRP. Order point information is used by order point system and refill level. The order point can be calculated automatically for both of these order codes.

When the onhand quantity of a part reaches or falls below the order point, it is reordered in the order point quantity specified. The order quantity is used by order point system. The order quantity can be calculated automatically for this order code.

MRP does not process parts with MRP order code Order Point Planning and Replenishment Level.

9.3.9 Scrapping

Parts are often scrapped at the time of receipt of purchase parts or manufacturing parts. Sometimes, however, inventory may be wanted to manually scrapped. The part might be obsolete, faulty, or spoiled owing to its expiration date having been reached or exceeded. The system checks each part to see that:

- It is not locked for counting.
- It has a standard cost (unless there is an override cost in the Inventory Part Register).
- It is neither a blow-through nor phantom part.
- Its current location is not an inspection location.

Also pallets and parts on pallets can be scrapped, too. If the part is pallet-handled, the Pallet tab is displayed, in which pallet records for the part are displayed for the inventory locations at which the part is stocked. To scrap an entire pallet, parts that are on the pallet must be specified. To scrap individual parts, the desired quantity must be indicated, as in Figure 9.49.

Part No:	Part Description:	Site:	Site Description:
F101Y03003210210	F-K1-RZ-Kaplamasiz-Telsiz-Desensiz	TM	Trakya Mersin Fab.
Unit Of Measure:	PCS		
General	Pallets		

	Total Qty Available	Location No	Warehouse	Bay	Row	Tier	Bin	Expiration	Lot/Batch No	Serial No
Scrap...	1	MA	MerkezAmbar						*	<VALUE>
	1	MA	MerkezAmbar						*	A1
Table	1	MA	MerkezAmbar						*	A10001

Figure 9.49 Scrapping

10. CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusion of the Study

In this study, BPR by using an ERP Package subject, which is very popular in the last years, is told, and Şişecam's BPR Study and ERP Implementation is selected as the application. Since many companies in Turkey had BPR and ERP Projects, or some of them still have, and since the projects' costs are very high, the subject is very important. The purpose of this study is to understand the relationship between BPR and ERP, to analyze success and failure points of BPR and ERP projects and to create a source for the future implementations.

To conclude, ERP implementation project should not be viewed as simple process automation but as an exercise in business transformation which calls for integration of people, process, and technology. It is a people-driven activity and its success is very much dependent on the effective organization of the human resources associated with it. Therefore, a good project organization structure is a key enabler for effective implementation.

Şişecam used a team approach to implementation of its ERP solution, educating staff and getting employee buy-in. The company organized teams from the planning, financial, manufacturing, and distribution departments to study the IFS modules to determine how Şişecam could adapt its business processes to fit the demands of the ERP system. Wherever Şişecam's business practices did not meet the requirements of the software, the company did not try to adapt its practices to meet the software's requirements, they selected to make development according to the processes. But the priority should be to make as few changes to the new system as possible.

Şişecam implemented IFS Applications at 4 sites in 18 months. After the implementation, finished goods inventory dropped more than 30 percent. Today, more than 85 percent of Şişecam's deliveries are on time, increasing customer confidence.

Şişecam has rebuilt a delivery system that is now thoroughly reliable. Now Şişecam can make good on its promises to customers. Three years ago, the company had difficulty meeting promised delivery dates. Today, more than 85 percent of deliveries are on time. With Şişecam's real-time database, a customer from one part of Turkey can place an order to a factory in another geographic location, and that specific item is immediately listed as belonging to that customer and no longer available to others. This improved dependability and speed of service increases customer confidence.

An efficient delivery process, structural organizational change, easily visible and accessible information, and heightened customer satisfaction have all increased the competitive strength of Şişecam in glass industry. Now Şişecam is keeping an eye on e-commerce as the next possible frontier.

10.2 Failure Points of Şişecam Project

ERP is an excellent way to rejuvenate a business. However, Şişecam almost put such a system into place and may be underutilized the full potential of ERP to radically improve its business.

ERP software was a key requirement in improving distribution operations, but also should serve as a catalyst for corporate change.

Şişecam decided to map the organization's current processes onto the package. The emphasis was not on arriving at a 'to-be' process model as a result of the business vision and strategy. The willingness to change the processes was quite low.

Şişecam learned the pitfalls in modification of the ERP package late. As a policy, they didn't keep it to minimal level. They should have a clear policy which asks the users to change their processes and practices rather than tinker with the integrity of the package.

To reap all the benefits of an ERP solution, companies must commit to change management and continuous improvement.

Şişecam was not ready to go all out in this effort and conceded that they are able to utilize only 20-40 percent of the package's capability. ERP is an expensive proposition, especially if one adds to it the cost of establishing connectivity across the geographical spread of an organization. But unless the package is fully implemented and integration across the organization is complete, full rewards don't come. Şişecam took a step-wise approach to it. As a result, they take longer time to start extracting benefits to the full potential of the ERP.

The people in the company, especially order entry and sales people were not convinced the product would make their jobs easier, they were afraid of the new system at the beginning. For that reason they treated like they are in the opposite side of the project. This situation made the project team's work harder.

10.3 General Evaluation for Successful BPR & ERP Implementation

Companies need strong discipline to successfully run an ERP system and culture because tight rules dictate processes. The underlying importance of the software is more than simply its functionality and adaptability; it has the capacity to affect cultural change.

Verifying the objective is the first and most critical task that must be done. The objective is not to put in a system by a date or improve business processes. It is to reduce inventories by 25 percent or cycle time by 30 percent and reduce cash requirements by 40 percent. In other words, you need real business objectives that can be measured in money or time to accomplish something – objectives that, if they are met, get managers and executives bonuses; and if they are not met, people don't get bonuses and promotions. The key here is that the objectives are in writing and that everyone agrees on the objectives; and more important, everyone believes in them. If you don't have objectives, you don't have a chance in implementing a system.

If you have a clear business objective and effective senior management support, you then have to have competent project management that develops a detailed plan and schedule and manages it on a week-to-week basis. This management team also controls change requests and ensures that problems and issues identified by the team are quickly resolved. This area is basically technical – either you have qualified people who can manage a project or you don't.

Having senior management's support means more than executives sending memos to the organization telling everyone they support the project. Senior management support means the project has adequate budget – budget for enough people, facilities, training, and travel and expense money. The second area for senior management support is having the will to force change on the organization. Any ERP project that has ambitious goals will require change, and change generates opposition. If this opposition can slow the project down or change its direction, major problems will occur –schedule slippage, higher costs, etc. Senior management must deal with this problem by a combination of listening, communication, selling, and when else fails, firing. If senior management can't do this, the project will fail. The opposition will grind down the project team to an expensive crowd of people mingling around accomplishing nothing.

People should have a decent place to work, they should be led and managed as professional, they should see rewards –financial and career- if the project is successful. In today's competitive world, if you don't treat the people well, someone else will and the project will suffer.

Employees understand, accept and use the new system

Depending on the level of expertise a company has with computers and associated manufacturing principles, the use of a new system can be more frustrating. An introductory course on system use would include keyboard skills, screen navigation, software help functions, and an understanding of problem solving and reporting. Education of employees in manufacturing principles is crucial to their gaining confidence, knowledge and understanding of the reasons behind the implementation; why the use of

the software and processes are important; and how to perform their day-to-day job functions.

Gaining acceptance from employees can be difficult, but without it, implementations can take longer and post production resistance can lead to serious data inaccuracies and associated problems.

The third attribute, employees use the system, is crucial to maintaining the integrity of the system data. Problems with employees' use of the system can be rooted in lack of understanding and acceptance, availability, performance and ease of use. Proper use of the system can be facilitated by locating terminals close to employees and by having a system that is up and reliable and whose response time is acceptable. Also, simplification of transactions and menus improves employees' use of the system.

The system works as expected

One of the worst scenarios a company can get into is if the system does not perform as expected once it is in production. As expected means; data in the system is accurate, reports and information are correct, navigation with the screens and functions are as required and the system provides the information necessary to run the business.

Problems in these areas can wreak havoc after implementation. Avoiding them requires attention to detail in data conversion, customizations and testing. The data conversion and verification processes required of ERP implementation are significant and require a great deal of analysis and testing. Effective development and testing of customizations and tight control of the system configuration parameters both before and after implementation add to the control of expected results.

System Performance is Acceptable

Having managed the implementation of numerous manufacturing applications, the worst nightmare is a problem with the overall system speed or response time. In the day-to-day rush to produce parts, the last thing on an employee's to-do list is waiting for the system

to provide or accept information. Slow performance will undoubtedly contribute to problems of employees' acceptance and use of the system. From a technical perspective, system performance is difficult and time-consuming to achieve. It is especially critical once the system is in production. Depending on the size of the ERP implementation, it may be wise to test performance using a full-size test database and transaction simulated software.

Most of the organizations recognize the key role played by the consultants; especially in process selection and implementation: ERP packages can be very complex and vast. The consultants help the organization to scale the learning curve as quickly as possible. The consultants also bring in the experience from other similar implementations. The organizations see a point in being a pioneer and not in making the same mistakes that others have made. Also, it is extremely difficult for the people from an organization to think 'out-of-box'. Consultants, on the other hand, are free from any cultural or historical biases.

It is vital that management focuses on these key success factors throughout a software implementation. Identifying project activities which will eliminate or reduce these problems will greatly improve the project's success.

APPENDIXES

ŞİŞECAM BPR & ERP PROJECT PLAN					
No	İş Tanımı	Süre	İş	Başlama	Bitiş
0	ŞİŞECAM ERP PROJECT	3360,25 h	25.188,48 h	04.03.97 08:00	27.01.99 17:00
1	PLANNING PERIOD	3260,75 h	2.990 h	04.03.97 08:00	04.01.99 12:30
2	REENGINEERING MANAGEMENT PLAN	21 h	214 h	02.04.97 08:30	04.04.97 17:30
3	Reengineering Management Plan	21 h	214 h	02.04.97 08:30	04.04.97 17:30
4	PROJECT TEAM MEETINGS	2515,25 h	650,75 h	07.04.97 08:30	31.08.98 17:00
5	Project Team Meeting	7 h	99 h	07.04.97 08:30	07.04.97 16:30
6	Project Team Meeting	10 h	142 h	08.04.97 12:30	09.04.97 16:30
7	Project Team Meeting	7,5 h	120,5 h	20.05.97 08:15	20.05.97 16:45
8	Project Team Meeting	3,25 h	44,75 h	26.05.97 13:00	26.05.97 16:45
9	Project Team Meeting	4,25 h	66 h	30.05.97 11:30	30.05.97 17:30
10	IFS Foundation Introduction	5 h	73,5 h	24.11.97 08:00	24.11.97 14:00
11	Project Team Meeting	4 h	25 h	06.02.98 12:00	06.02.98 17:00
12	Project Team Meeting	5 h	10 h	10.02.98 08:00	10.02.98 14:00
13	Project Team Meeting	3 h	36 h	10.02.98 14:00	10.02.98 17:00
14	Project Team Meeting	3,5 h	34 h	31.08.98 13:30	31.08.98 17:00
15	PROJECT MANAGEMENT MEETINGS	1922,25 h	266 h	04.03.97 08:00	16.04.98 10:00
16	Project Management Meeting	15 h	23 h	04.03.97 08:00	05.03.97 15:00
17	Project Management Meeting	3,5 h	10,5 h	08.04.97 08:30	08.04.97 12:00
18	Project Management Meeting	5,5 h	17 h	25.04.97 15:00	28.04.97 13:00
19	Project Management Meeting	2,5 h	7,5 h	13.05.97 08:30	13.05.97 11:00
20	Project Management Meeting	4,5 h	13,5 h	29.05.97 13:30	30.05.97 09:30
21	Project Management Meeting	3,25 h	9,75 h	20.06.97 13:30	20.06.97 16:45
22	Project Management Meeting	8,75 h	26,75 h	10.07.97 08:15	11.07.97 09:30
23	Project Management Meeting	4,25 h	13,25 h	11.07.97 11:30	11.07.97 16:45
24	Project Management Meeting	3,25 h	16,75 h	19.08.97 13:00	19.08.97 16:45
25	Project Management Meeting	7,5 h	30,5 h	22.08.97 08:15	22.08.97 16:45
26	Project Management Meeting	8 h	36 h	01.09.97 08:00	01.09.97 17:00
27	Project Management Meeting	24 h	48 h	24.09.97 08:00	26.09.97 17:00
28	Project Management Meeting	30 m	1,5 h	03.11.97 11:00	03.11.97 11:30
29	Project Management Meeting	30 m	2 h	03.11.97 12:00	03.11.97 12:30
30	Project Management Meeting	2 h	10 h	16.04.98 08:00	16.04.98 10:00
31	STEERING COMMITTEE MEETINGS	3140,75 h	51,5 h	08.04.97 12:00	22.12.98 12:00
32	Project Introduction Meeting	0,5 h	8,5 h	08.04.97 12:00	08.04.97 12:30

ŞİŞECAM BPR & ERP PROJECT PLAN					
No	İş Tanımı	Süre	İş	Başlama	Bitiş
33	Steering Committee Meeting	6,25 h	17 h	30.05.97 09:30	30.05.97 17:30
34	Steering Committee Meeting	2 h	10 h	11.07.97 09:30	11.07.97 11:30
35	Steering Committee Meeting	1 h	8 h	05.09.97 09:30	05.09.97 10:30
36	Steering Committee Meeting	2 h	8 h	22.12.98 10:00	22.12.98 12:00
37	EVALUATION MEETINGS	1550 h	300 h	07.11.97 15:00	11.09.98 17:00
38	Evaluation Meeting	4 h	0 h	07.11.97 15:00	10.11.97 10:00
39	Evaluation Meeting	8 h	0 h	19.11.97 08:00	19.11.97 17:00
40	Evaluation Meeting	8 h	80 h	05.12.97 13:30	08.12.97 12:30
41	Evaluation Meeting	23,5 h	140 h	03.02.98 13:30	05.02.98 21:00
42	Evaluation Meeting	8 h	80 h	11.09.98 08:00	11.09.98 17:00
43	MMS COORDINATION MEETING	1382,75 h	176,25 h	07.05.97 10:00	03.02.98 17:00
44	MMS Coordination Meeting	2,5 h	7,5 h	07.05.97 10:00	07.05.97 12:30
45	MMS Coordination Meeting	3,25 h	20 h	28.05.97 13:00	28.05.97 16:45
46	MMS Coordination Meeting	3,25 h	48,75 h	18.07.97 13:30	18.07.97 16:45
47	MMS Coordination Meeting	8 h	100 h	03.02.98 08:00	03.02.98 17:00
48	CAM PAZARLAMA MEETINGS	8 h	112 h	15.12.97 08:00	15.12.97 17:00
49	Cam Pazarlama Integration Meeting	8 h	112 h	15.12.97 08:00	15.12.97 17:00
50	PLANT VISITS	752,25 h	40 h	21.03.97 08:00	11.09.97 17:00
51	Trakya Cam - Lüleburgaz Plant Visit	8 h	8 h	21.03.97 08:00	21.03.97 17:00
52	Trakya Cam - Lüleburgaz Plant Visit	8 h	32 h	11.09.97 08:00	11.09.97 17:00
53	PROJECT PLANNING AND CONTROL	2468,5 h	1.139,5 h	17.09.97 08:00	04.01.99 12:30
54	Project Planning and Control	2468,5 h	1.139,5 h	17.09.97 08:00	04.01.99 12:30
55	ANALYSIS STEP	1482,25 h	6.808,5 h	10.04.97 08:30	03.02.98 17:00
56	IFS BASIC CONCEPTS TRAINING	77 h	1.211 h	10.04.97 08:30	01.05.97 16:30
57	General ERP and Financial Concepts Training	7 h	113 h	10.04.97 08:30	10.04.97 16:30
58	General Ledger	7 h	99 h	11.04.97 08:30	11.04.97 16:30
59	BOM and Configurator	7 h	117 h	14.04.97 08:30	14.04.97 16:30
60	Inventory Control	7 h	113 h	15.04.97 08:30	15.04.97 16:30
61	Accounts Payable and Receivable	7 h	113 h	16.04.97 08:30	16.04.97 16:30
62	Customer Order, Delivery and Invoicing	4 h	64,5 h	24.04.97 08:30	24.04.97 13:00
63	Purchase Order	7 h	113 h	24.04.97 13:00	25.04.97 13:00
64	Inventory Control	3 h	48,5 h	28.04.97 13:00	28.04.97 16:30
65	Dynamic Order Processing	7 h	106 h	29.04.97 08:30	29.04.97 16:30
66	MS and MRP	14 h	256 h	30.04.97 08:30	01.05.97 16:30
67	CRP	4 h	68 h	01.05.97 08:30	01.05.97 12:30

ŞİŞECAM BPR & ERP PROJECT PLAN

No	İş Tanımı	Süre	İş	Başlama	Bitiş
68	SETUP – TEST SERVER	1405,25 h	3.150,75 h	02.05.97 08:30	03.02.98 17:00
69	Setup Techniques and Methods	14 h	212 h	02.05.97 08:30	05.05.97 16:30
70	System Defined Values	1 h	14 h	06.05.97 08:30	06.05.97 09:30
71	Currency Information	1 h	14 h	06.05.97 09:30	06.05.97 10:30
72	Company Structure	6,5 h	92 h	06.05.97 10:30	07.05.97 10:00
73	Inventory Basic Data Setup	3 h	40 h	07.05.97 12:30	07.05.97 16:30
74	Site Structure	4 h	53 h	08.05.97 08:30	08.05.97 13:30
75	AP and AR Basic Information	3 h	42 h	08.05.97 13:30	08.05.97 16:30
76	Company Setup	10,5 h	127 h	09.05.97 08:30	12.05.97 12:00
77	Other Financial Information	2 h	25 h	13.05.97 11:00	13.05.97 14:00
78	Banks and Banks' Accounts	0,5 h	6 h	13.05.97 14:00	13.05.97 14:30
79	Suppliers	2 h	24 h	13.05.97 14:30	13.05.97 16:30
80	Customers	4 h	53 h	14.05.97 08:30	14.05.97 13:30
81	Site Definitions	3 h	39 h	14.05.97 13:30	14.05.97 16:30
82	Material Coding Study	7 h	78 h	15.05.97 08:30	15.05.97 16:30
83	Other Inventory Information	2,75 h	35,75 h	16.05.97 08:15	16.05.97 11:00
84	Inventory Locations	1,5 h	19,5 h	16.05.97 11:00	16.05.97 12:30
85	Purchasing Basic Data	3,25 h	42,75 h	16.05.97 13:00	16.05.97 16:45
86	Sales Basic Data	7,5 h	113 h	21.05.97 08:15	21.05.97 16:45
87	Part Definitions	97,5 h	339,5 h	22.05.97 08:15	09.06.97 16:45
88	Inventory Part Definitions	7,5 h	113 h	22.05.97 08:15	22.05.97 16:45
89	Purchasing Part Definitions	7,5 h	98 h	23.05.97 08:15	23.05.97 16:45
90	Sales Part Definitions	7,5 h	128,5 h	09.06.97 08:15	09.06.97 16:45
91	Pricing Strategy	16 h	355 h	28.05.97 12:30	30.05.97 14:30
92	Price Lists	16 h	177,5 h	28.05.97 12:30	30.05.97 14:30
93	Discounts	16 h	177,5 h	28.05.97 12:30	30.05.97 14:30
94	Internal Direct Delivery to Customer	7,5 h	83 h	05.06.97 08:15	05.06.97 16:45
95	MS Basic Data	7,5 h	102 h	02.06.97 08:15	02.06.97 16:45
96	Master Scheduling	15 h	196 h	03.06.97 08:15	04.06.97 16:45
97	Budgeting	16 h	176 h	03.06.97 16:45	06.06.97 09:15
98	SETUP – TEST AND CONTROL	1215,25 h	869,25 h	10.06.97 08:15	03.02.98 17:00
99	Setup – Test and Control - I	1215,25 h	445 h	10.06.97 08:15	03.02.98 17:00
100	Customer Order Entry	7,5 h	113 h	10.06.97 08:15	10.06.97 16:45
101	Internal Customer Orders	7,5 h	113 h	11.06.97 08:15	11.06.97 16:45
102	General Evaluation Study	7,5 h	105,5 h	12.06.97 08:15	12.06.97 16:45

ŞİŞECAM BPR & ERP PROJECT PLAN

No	İş Tanımı	Süre	İş	Başlama	Bitiş
103	Detailed Order Entry Tests	1192,75 h	113,5 h	13.06.97 08:15	03.02.98 17:00
104	Setup – Test and Control - II	18,25 h	229,25 h	16.06.97 08:15	18.06.97 16:45
105	Detailed Order Entry Tests	7,5 h	98 h	16.06.97 08:15	16.06.97 16:45
106	Detailed Order Entry Tests	3,25 h	33,25 h	17.06.97 13:00	17.06.97 17:00
107	Detailed Order Entry Tests	7,5 h	98 h	18.06.97 08:15	18.06.97 16:45
108	IFS Translation	30 h	120 h	25.06.97 08:15	30.06.97 16:45
109	Dictionary Creation	30 h	120 h	25.06.97 08:15	30.06.97 16:45
110	Oracle Tools Training	15 h	75 h	26.06.97 08:15	27.06.97 16:45
111	Oracle Data Browser Eğitimi	7,5 h	37,5 h	26.06.97 08:15	26.06.97 16:45
112	Oracle Data Query Eğitimi	7,5 h	37,5 h	27.06.97 08:15	27.06.97 16:45
113	IFS GLASS MODEL STUDY	60 h	923 h	30.06.97 08:15	09.07.97 16:45
114	General Introduction	7,5 h	121 h	30.06.97 08:15	30.06.97 16:45
115	Model Examples	7,5 h	113,5 h	01.07.97 08:15	01.07.97 16:45
116	Basic Data Definitions	15 h	227 h	02.07.97 08:15	03.07.97 16:45
117	Order and Delivery Data	15 h	242 h	04.07.97 08:15	07.07.97 16:45
118	Production Scheduling	7,5 h	98,5 h	08.07.97 08:15	08.07.97 16:45
119	Analysis of Implementations in Sweden and Poland	7,5 h	121 h	09.07.97 08:15	09.07.97 16:45
120	GAP ANALYSIS — ŞİŞECAM x IFS GLASS MODEL	282,5 h	1.523,75 h	10.07.97 08:15	12.09.97 17:00
121	Gap Analysis - I	15 h	75 h	10.07.97 08:15	11.07.97 16:45
122	Gap Analysis - II	24,25 h	301,75 h	14.07.97 08:15	17.07.97 10:00
123	Gap Analysis - IIIa	3,25 h	42,75 h	17.07.97 13:00	17.07.97 16:45
124	Gap Analysis - IIIb	4,25 h	64,25 h	18.07.97 08:15	18.07.97 13:30
125	Gap Analysis - IIIc	37,5 h	315 h	04.08.97 08:15	08.08.97 16:45
126	Gap Analysis - IV	37,5 h	517,5 h	25.08.97 08:15	29.08.97 16:45
127	DEVELOPMENT REQUIREMENTS LIST PREPARATION	72 h	207,5 h	02.09.97 08:00	12.09.97 17:00
128	Development Requirements List Preparation	25,5 h	95,5 h	02.09.97 08:00	05.09.97 09:30
129	Development Requirements List Preparation	28 h	88 h	05.09.97 12:00	10.09.97 17:00
130	Development Requirements List Preparation	8 h	24 h	12.09.97 08:00	12.09.97 17:00
131	DESIGN AND DEVELOPMENT STEP	2396 h	5.330 h	09.10.97 12:00	13.01.99 17:00
1	MODIFICATIONS FOR ŞİŞECAM	2380h	3.131,5h	09.10.97 12:00	11.01.99 17:00
2	New Sales Part Definitions	952h	571,5h	30.04.98 08:00	06.11.98 17:00
3	New Sales Part Definition-Design&Layout	288h	223h	30.04.98 08:00	19.06.98 17:00
4	New Sales Part Definition-Development	712h	348,5h	12.06.98 08:00	06.11.98 17:00
5	Period Base Premiums	40h	46h	14.12.98 08:00	18.12.98 17:00
6	Period Base Premiums-Design	3,5h	14h	14.12.98 08:00	14.12.98 11:30

ŞİŞECAM BPR & ERP PROJECT PLAN

No	İş Tanımı	Süre	İş	Başlama	Bitiş
7	Period Base Premiums-Development	32h	32h	15.12.98 08:00	18.12.98 17:00
8	Campaign Definition	268,5h	319,5h	17.10.97 12:00	05.12.97 12:30
9	Campaign Definition-Design	44h	44h	17.10.97 12:00	24.10.97 17:00
10	Campaign Definition-Layout	12h	24h	27.10.97 08:00	28.10.97 12:00
11	Campaign Definition-Development	196,5h	251,5h	03.11.97 08:00	05.12.97 12:30
12	Customer Credit Management	504,5h	311h	08.12.97 13:30	11.03.98 09:00
13	Customer Credit Management-Design	504,5h	103h	08.12.97 13:30	11.03.98 09:00
14	Customer Credit Management-Layout	0h	0h	02.01.98 08:00	02.01.98 08:00
15	Customer Credit Management-Development	272h	208h	15.12.97 08:00	04.02.98 17:00
16	Customer Vehicle Follow-Up	736h	40h	14.10.97 08:00	25.02.98 17:00
17	Customer Vehicle Follow-Up-Design and Layout	707h	11h	14.10.97 08:00	20.02.98 11:00
18	Customer Vehicle Follow-Up-Development	29h	29h	20.02.98 11:00	25.02.98 17:00
19	Customer Pallet Handling	0h	0h	01.12.97 08:00	01.12.97 08:00
20	Customer Pallet Handling-Design and Layout	0h	0h	01.12.97 08:00	01.12.97 08:00
21	Customer Pallet Handling-Development	0h	0h	01.12.97 08:00	01.12.97 08:00
22	Inventory Assignments to Salesreps	240h	169h	09.10.97 12:00	21.11.97 17:00
23	Inventory Assignments to Salesreps-Design	12h	49h	09.10.97 12:00	10.10.97 17:00
24	Inventory Assignments to Salesreps-Layout	2h	8h	16.10.97 12:00	16.10.97 15:00
25	Inventory Assignments to Salesreps-Development	112h	112h	04.11.97 08:00	21.11.97 17:00
26	List For Delivery Plan	0h	0h	25.12.98 17:00	25.12.98 17:00
27	List For Delivery Plan-Design and Layout	0h	0h	25.12.98 17:00	25.12.98 17:00
28	List For Delivery Plan-Development	0h	0h	25.12.98 17:00	25.12.98 17:00
29	Delivery Note for Şişecam	1464h	160h	12.03.98 08:00	25.12.98 17:00
30	Delivery Note-Design	80h	56h	12.03.98 08:00	25.03.98 17:00
31	Delivery Note-Layout	8h	40h	26.03.98 08:00	26.03.98 17:00
32	Delivery Note-Development	168h	56h	20.04.98 08:00	20.05.98 17:00
33	Delivery Note-Development	8h	8h	25.12.98 08:00	25.12.98 17:00
34	Invoice for Şişecam	1536h	1.159,5h	09.03.98 08:00	05.01.99 17:00
35	Invoice for Domestic Sales-Design&Layout	48h	56h	09.03.98 08:00	17.03.98 08:00
36	Invoice for Domestic Sales-Development	1496h	498,5h	16.03.98 08:00	05.01.99 17:00
37	Invoice for Foreign Sales-Design&Layout	80h	161h	22.06.98 08:00	03.07.98 17:00
38	Invoice for Foreign Sales-Development	560h	444h	02.07.98 08:00	30.10.98 17:00
39	Invoice for Service Sales	0h	0h	07.12.98 08:00	07.12.98 08:00
40	Invoice for Service Sales-Design&Layout	0h	0h	07.12.98 08:00	07.12.98 08:00
41	Invoice for Service Sales-Development	0h	0h	07.12.98 08:00	07.12.98 08:00

ŞİŞECAM BPR & ERP PROJECT PLAN					
No	İş Tanımı	Süre	İş	Başlama	Bitiş
42	Interest Invoice	72h	40h	25.12.98 08:00	07.01.99 17:00
43	Interest Invoice-Design	8h	24h	25.12.98 08:00	25.12.98 17:00
44	Interest Invoice-Development	24h	16h	05.01.99 08:00	07.01.99 17:00
45	Export Documents	120h	120h	10.08.98 08:00	28.08.98 17:00
46	Export Documents-Design&Layout	24h	24h	10.08.98 08:00	12.08.98 17:00
47	Export Documents-Development	96h	96h	13.08.98 08:00	28.08.98 17:00
48	Letter Of Credit Follow-Up	52h	88h	20.10.97 08:00	28.10.97 17:00
49	Letter Of Credit-Design and Layout	52h	52h	20.10.97 08:00	28.10.97 12:00
50	Letter Of Credit-Development	36h	36h	22.10.97 08:00	28.10.97 17:00
51	Returns and Cancellations	944h	107h	09.07.98 08:00	11.01.99 17:00
52	Delivery Cancellation	24,5h	17h	17.12.98 16:30	22.12.98 17:00
53	Delivery Cancellation-Design	0,5h	1h	17.12.98 16:30	17.12.98 17:00
54	Delivery Cancellation-Development	16h	16h	21.12.98 08:00	22.12.98 17:00
55	Delivery Note Cancellation	56h	56h	09.07.98 08:00	17.07.98 17:00
56	Delivery Note Cancellation-Design	16h	16h	09.07.98 08:00	10.07.98 17:00
57	Delivery Note Cancellation-Development	40h	40h	13.07.98 00:00	17.07.98 17:00
58	Invoice Cancellation	166h	34h	11.12.98 10:00	11.01.99 17:00
59	Invoice Cancellation-Design	1h	2h	11.12.98 10:00	11.12.98 11:00
60	Invoice Cancellation-Development	32h	32h	06.01.99 08:00	11.01.99 17:00
61	DESIGN DOCUMENTS	568h	188,5h	16.10.97 12:00	27.01.98 17:00
62	Design Documents Preparation	568h	129,5h	16.10.97 12:00	27.01.98 17:00
63	Design Documents Preparation	43h	59h	03.11.97 08:00	10.11.97 11:00
64	DEVELOPMENT TESTS	2188h	1.311,5h	13.11.97 08:00	08.01.99 17:00
65	Development Tests	2188h	1.311,5h	13.11.97 08:00	08.01.99 17:00
66	REPORTS	2188h	570,5h	18.11.97 08:00	13.01.99 17:00
67	Design Of Reports That Will Be Used	128h	114,5h	18.11.97 08:00	09.12.97 17:00
68	Determination of Priorities of Reports	40h	40h	07.12.98 08:00	11.12.98 17:00
69	Development of Various Reports	424h	296h	20.04.98 08:00	03.07.98 17:00
70	Test of Official Documents' Print-Outs	24h	16h	06.01.99 08:00	08.01.99 17:00
71	Sales Reports	208h	104h	08.12.98 08:00	13.01.99 17:00
72	Sales Information per Customer Monthly/Yearly	8h	8h	09.12.98 08:00	09.12.98 17:00
73	Due Date Report	24h	24h	08.12.98 08:00	10.12.98 17:00
74	Interest Report	8h	8h	12.01.99 08:00	12.01.99 17:00
75	Payables/Receivables Report	8h	8h	25.12.98 08:00	25.12.98 17:00
76	Payment Report	8h	8h	13.01.99 08:00	13.01.99 17:00

ŞİŞECAM BPR & ERP PROJECT PLAN					
No	İş Tanımı	Süre	İş	Başlama	Bitiş
77	Alıcı Avans/Açık Borç Takibi Raporu	24h	16h	07.01.99 08:00	11.01.99 17:00
78	Checks and Notes Report	16h	32h	15.12.98 08:00	16.12.98 17:00
79	INTEGRATION PROJECTS	200h	128h	09.12.98 08:00	13.01.99 17:00
80	GENERAL ACCOUNTING INTEGRATION	72h	40h	14.12.98 08:00	24.12.98 17:00
81	General Accounting Integration-Design	24h	24h	14.12.98 08:00	16.12.98 17:00
82	General Accounting Integration-Development	32h	16h	21.12.98 08:00	24.12.98 17:00
83	MMS INTEGRATION	0h	0h	13.01.99 17:00	13.01.99 17:00
84	LISEC INTEGRATION	56h	88h	09.12.98 08:00	17.12.98 17:00
85	Lisec Customers Integration	32h	64h	09.12.98 08:00	14.12.98 17:00
86	ARRANGEMENT OF CUSTOMER AND SUPPLIER NUM	24h	24h	15.12.98 08:00	17.12.98 17:00
87	Arrangement of Customer and Supplier Numbers	24h	24h	15.12.98 08:00	17.12.98 17:00
88	CAM PAZARLAMA INTEGRATION	0h	0h	13.01.99 17:00	13.01.99 17:00
132	INFRASTRUCTURE CREATION STEP	3230,25 h	7.307,98 h	10.04.97 08:30	08.01.99 17:00
133	HARDWARE	2448 h	290 h	01.09.97 08:00	11.12.98 17:00
134	Servers	420 h	0 h	04.05.98 08:00	07.08.98 12:00
135	Hardware Selection - Server	20 h	0 h	04.05.98 08:00	06.05.98 12:00
136	Hardware Orders - Server	20 h	0 h	04.05.98 08:00	06.05.98 12:00
137	Hardware Setup- Server	20 h	0 h	17.07.98 08:00	07.08.98 12:00
138	Clients	2428 h	290 h	01.09.97 08:00	09.12.98 12:00
139	Hardware Requirement Study - Client	40 h	200 h	01.09.97 08:00	05.09.97 17:00
140	Hardware Requirement Analysis Study	20,5 h	90 h	17.09.97 08:00	19.09.97 12:30
141	Hardware Selection - Client	20 h	0 h	01.01.98 08:00	06.01.98 12:00
142	Hardware Orders - Client	20 h	0 h	01.01.98 08:00	06.01.98 12:00
143	Hardware Setup - Client	20 h	0 h	07.12.98 08:00	09.12.98 12:00
144	Network and Communication	2448 h	0 h	01.09.97 08:00	11.12.98 17:00
145	Network and Cable Requirement Study	40 h	0 h	01.09.97 08:00	05.09.97 17:00
146	Network and Cable Works	40 h	0 h	07.12.98 08:00	11.12.98 17:00
147	SOFTWARE	3230,25 h	4.484 h	10.04.97 08:30	08.01.99 17:00
148	HP test server setups	14 h	14 h	10.04.97 08:30	11.04.97 16:30
149	IFS Setup on HP test server	14 h	14 h	10.04.97 08:30	11.04.97 16:30
150	SUN test server setups	15 h	60 h	23.06.97 08:15	24.06.97 16:45
151	IFS Setup on Sun test server	15 h	60 h	23.06.97 08:15	24.06.97 16:45
152	IBM test server setups	115,75 h	90 h	06.06.97 08:15	27.06.97 16:45
153	IBM test server trial works	7,5 h	52,5 h	06.06.97 08:15	06.06.97 16:45
154	Oracle 7.3 setup on IBM test server	7,5 h	15 h	26.06.97 08:15	26.06.97 16:45

ŞİŞECAM BPR & ERP PROJECT PLAN

No	İş Tanımı	Süre	İş	Başlama	Bitiş
155	IFS setup on IBM test server	7,5 h	22,5 h	27.06.97 08:15	27.06.97 16:45
156	NCR Test Server setups	469,5 h	16 h	26.06.97 08:15	02.10.97 17:00
157	NCR test server trial works	8 h	8 h	02.10.97 08:00	02.10.97 17:00
158	Oracle 7.2.3 setup on main server	8 h	8 h	26.06.97 08:15	27.06.97 08:45
159	IFS Infrastructure Analysis	8 h	16 h	23.06.97 08:15	24.06.97 08:45
160	Documentation of IFS Table Structure	8 h	16 h	23.06.97 08:15	24.06.97 08:45
161	Technical Training	80 h	771 h	22.09.97 08:00	03.10.97 17:00
162	IFS and SQR Technical Training	64 h	723 h	22.09.97 08:00	01.10.97 17:00
163	SQR Trainings	16 h	48 h	02.10.97 08:00	03.10.97 17:00
164	Localization	1736 h	719 h	15.09.97 08:00	21.08.98 17:00
165	Work on Şişecam Terminology	16 h	200 h	15.09.97 08:00	16.09.97 17:00
166	Translation of IFS to Şişecam Terminology	40 h	243 h	10.10.97 08:00	16.10.97 17:00
167	Translation of Setup Codes	464 h	276 h	11.05.98 08:00	21.08.98 17:00
168	Determination of Development Strategy	24 h	88 h	09.10.97 08:00	13.10.97 17:00
169	Development Standards	8 h	32 h	09.10.97 08:00	09.10.97 17:00
170	Development Standards	16 h	56 h	10.10.97 08:00	13.10.97 17:00
171	Message Handling System	2296 h	1.743 h	29.09.97 08:00	14.12.98 17:00
172	Technical Requirements Search	24 h	24 h	29.09.97 08:00	01.10.97 17:00
173	Tests on MHS	5 h	4 h	03.11.97 09:00	03.11.97 15:00
174	Amtrix Analysis and Trainings	612 h	676 h	06.10.97 08:00	22.01.98 17:00
175	Amtrix setup and tests	80 h	0 h	06.10.97 08:00	17.10.97 17:00
176	Amtrix/Oracle demo	3,5 h	9,5 h	24.11.97 13:30	24.11.97 17:00
177	Amtrix Trainings	64 h	666,5 h	13.01.98 08:00	22.01.98 17:00
178	MHS Analysis Meetings	1012 h	326 h	30.10.97 08:00	07.05.98 17:00
179	MHS Analysis Meeting	16 h	236 h	30.10.97 08:00	31.10.97 17:00
180	MHS Analysis Meeting	8 h	90 h	07.05.98 08:00	07.05.98 17:00
181	Oracle Replication Tool	296 h	713 h	21.05.98 08:00	15.07.98 17:00
182	Oracle Replication Tool Analysis/Training	90,5 h	530 h	21.05.98 08:00	05.06.98 10:30
183	Oracle Replication Tool Analysis and Training	40 h	40 h	06.07.98 08:00	15.07.98 17:00
184	Analysis of IFS Tables which will be replicated	80 h	143 h	28.05.98 08:00	10.06.98 17:00
185	Creation of Data Transfer Infrastructure	8 h	0 h	14.12.98 08:00	14.12.98 17:00
186	SQR Setups	8 h	0 h	16.10.97 08:00	16.10.97 17:00
187	SQR Setups	8 h	0 h	16.10.97 08:00	16.10.97 17:00
188	Site Server Setup Configuration and Data Flow	432 h	152 h	16.02.98 08:00	08.05.98 17:00
189	Analysis of Internal Data Flow Between Sites	432 h	152 h	16.02.98 08:00	08.05.98 17:00

ŞİŞECAM BPR & ERP PROJECT PLAN

No	İş Tanımı	Süre	İş	Başlama	Bitiş
190	IFS 2000 Upgrade	40 h	40 h	07.12.98 08:00	11.12.98 17:00
191	IFS 2000 Tests	40 h	40 h	07.12.98 08:00	11.12.98 17:00
192	Replication System Design and Tests	728 h	775 h	01.06.98 08:00	27.10.98 17:00
193	Replication System Design	376 h	232 h	24.08.98 08:00	27.10.98 17:00
194	Replication System Tests	124,5 h	240 h	04.09.98 11:30	25.09.98 17:00
195	Replication tables Selection	40 h	303 h	01.06.98 08:00	05.06.98 17:00
196	Site Server Setups	72 h	0 h	27.12.98 15:45	08.01.99 17:00
197	Site Server OS Setups	16 h	0 h	27.12.98 15:45	29.12.98 17:00
198	Site Server Database Setups	16 h	0 h	30.12.98 08:00	31.12.98 17:00
199	Site Server IFS Setups	40 h	0 h	04.01.99 08:00	08.01.99 17:00
200	Site Server IFS Setups	40 h	0 h	04.01.99 08:00	08.01.99 17:00
201	Client setups	40 h	0 h	10.12.98 08:00	16.12.98 17:00
202	Client setups	40 h	0 h	10.12.98 08:00	16.12.98 17:00
203	SETUP DATA COLLECTION	32 h	32 h	11.12.98 08:00	16.12.98 17:00
204	Setup Data Collection, Preparation	32 h	32 h	11.12.98 08:00	16.12.98 17:00
205	DOCUMENTATION	2280 h	2.501,98 h	06.10.97 08:00	17.12.98 17:00
206	Preparation of Design Documentation Formats	7 h	12 h	06.10.97 08:00	06.10.97 16:00
207	Documentation Development Plan	8 h	19 h	06.11.97 08:00	06.11.97 17:00
208	Preparation of Help Files	2092 h	2.174,48 h	10.11.97 08:00	17.12.98 17:00
209	Preparation of Setup Guide	500 h	656,5 h	10.11.97 08:00	09.02.98 17:00
210	Preparation of Process Guide	1700 h	1.517,98 h	19.01.98 08:00	17.12.98 17:00
211	Preparation of Training Notes	425,02 h	296,5 h	24.08.98 08:00	06.11.98 09:01
212	GOING LIVE	648 h	2.079,5 h	28.09.98 08:00	27.01.99 17:00
213	USER PC TRAININGS	40 h	0 h	15.12.98 08:00	21.12.98 17:00
214	User PC Trainings — 4 site	40 h	0 h	15.12.98 08:00	21.12.98 17:00
215	IFS USER TRAININGS	648 h	2.079,5 h	28.09.98 08:00	27.01.99 17:00
216	IFS User Trainings Plan	40 h	40,5 h	28.09.98 08:00	02.10.98 19:30
217	Super User Trainings	246 h	1.119 h	05.10.98 08:00	17.11.98 15:00
218	Determination Of Users who will take training	24,5 h	16 h	13.10.98 08:00	16.10.98 08:30
219	Controlling of User Hardware Requirements	24 h	24 h	29.12.98 08:00	31.12.98 17:00
220	Setup of Training Database	40 h	40 h	25.11.98 08:00	01.12.98 17:00
221	Test of Training Database	40 h	40 h	17.12.98 08:00	23.12.98 17:00
222	IFS User Trainings-4 site	152 h	800 h	24.12.98 08:00	27.01.99 17:00
223	LIVE	40 h	26 h	04.01.99 08:00	08.01.99 17:00
224	USER SUPPORT AT SITES	40 h	26 h	04.01.99 08:00	08.01.99 17:00

REFERENCES

- Allender,H.D.**, September 1994. Is Reengineering Compatible with TQM, Industrial Engineering, 39-50.
- Bambarger, B.**, July 1994. Corning Asahi Video Products Co. Eliminates Cost Of Errors for \$2 Million Savings, Industrial Engineering, 43-49.
- Bambarger,B.**, May 1994. Mellon Trust Reengineers Workflow Management System For 401(K) Plan, Industrial Engineering, 61-64.
- Bartuli, B.**, February 1995. The World Of The Best, APICS, 20-22.
- Bartuli, B.**, March 1995. The World Of The Best:II, APICS, 20-22.
- Benner, J. ,** May 1995. Closing The Execution Gap, APICS, 6-8.
- Blanchard, D.**, ERP The Great Equalizer,
<http://www.lionhrtpub.com/ee/eespring98/erp.html>
- Blevins, P.**, 1999.Enterprise Resource Planning (ERP) – An Executive Perspective
- Bregman,R.**, 1991. Selecting Among MRP Lot Sizing Methods For Purchased Components When The Planning Horizon Is Limited, Production and Inventory Management Journal, Second Quarter, 45-56.
- Carol, A.P.**, 1991. MRP,MRP II, OPT, JIT and CIM:Succession, Evolution or Necessary Combination, Production and Inventory Management Journal, Second Quarter, 56-60.

- Cloud,J.,** June 1994. Changing Customer Demands Serve as Impetus for ,BPR at Schlage Lock Co., Industrial Engineering, 62-68.
- Cypress,H.L.,** February 1994. Reengineering OR/MS TODAY, 18-29.
- Davenport, T.H.,** 1995. Managing Information About Processes, Journal Of Management Information Systems, 12(1), 57-80.
- Gardiner,S.C., Blackstone,J.H.,** 1993. The Impact Of Lot -Sizing On The Financial Performance Of Dispatching Techniques In An MRP-planned Fabrication And Assembly Environment, International Journal Of Production Research, v31 , No7, 1595-1610.
- Gilman,** March 1995. APICS, p40.
- Graham, K.,** October 1995. Know What You Need, APICS, 30-32.
- Grover V.,** 1995. The Implementation Of BPR, Journal Of Management Information Systems, 12(1), 109-144.
- Gumaer,R.,** 1996. Beyond ERP and MRP II , IIE Solutions, September, 32.
- Gupta,S.M., Brennan,L.,** 1995. MRP Systems Under Supply And Process Uncertainty In An Integrated Shop Floor Control Environment, International Journal Of Production Research, v33, No1, 205-220.
- Hales, H., Savoie, B.,** August 1994. Building A Foundation For Successful Business Process Reengineering, Industrial Engineering, 43-53.
- Hammer and Champy,** 1993. Reengineering the Corporation:A Manifesto For Business Revolution, Harper Collins.
- Hansen,G.,** September 1994. Tools For Business Process Reengineering, IEEE Software, 18-29.

- Ho,C.J.,** 1994. Evaluating The Impact Of Frequent Engineering Changes On MRP System Performance, International Journal Of Production Research, v32 , No3, 619-641.
- Ho,C.J.,** 1995. Examining The Impact Of Demand Lumpiness On The Lot-Sizing Performance In MRP Systems, International Journal Of Production Research, v33, No9, 2579-2599.
- Hoy, A.,** June 1995. Client /Server Architecture in MRP Environment, 38.
- Kenworthy, Stephen M.,** 1996. Information Communication System and Planning Function Add Up To Total Customer Lead Time At Taylor Building Products, Production and Inventory Management Journal, APICS, 3rd Quarter, 62-68.
- Koch, Christopher,** 1995. The ABCs of ERP,
http://www.cio.com/forums/erp/edit/122299_erp
- Krieter, C.,** 1996. Total Quality Management versus Business Process Reengineering, Are Academicians Teaching What Businesses Are Practicing Production and Inventory Management Journal, Second Quarter, 51-58.
- Krupp,** 1984. Why MRP Systems Fail: Tarps To Avoid, Production and Inventory Management Journal, Third Quarter, 11-18.
- Latamore, G.Berton,** October, 1999. The Performance Advantage, APICS.
- Liget,M.,** August 1994. Corporate Reengineering Should Not Stop At Factory Door, Industrial Engineering, 17-25.
- Ligus,R.G.,** May 1994. Implementing The Radical Change:The Right Stuff, Industrial Engineering, 44-56.
- Malhotra, Y.,** 1998. Business Process Redesign: An Overview.

- McDermott, Ted**, November, 1999. The Performance Advantage, APICS.
- Melynk,S.A., Gonzales,R.F.**, 1985. MRP-II, The Early Returns Are In, Production and Inventory Management Journal, Volume 26, First Quarter, 29-35.
- Metzger,X**, 1984. MRP II, Practical Theory and Implementation, Production and Inventory Management Journal, Second Quarter, 29-41.
- Parker, J.**, May 1993. An ABC Guide to Business Process Reengineering, Industrial Engineering, 27-35.
- Ptak, C.**, October, 1999. The Performance Advantage, APICS.
- Reidelbach,M.**, 1991. Engineering Change Management For Long Lead Time Production Environments, Production and Inventory Management Journal, Second Quarter, 34-43.
- Rickabaugh**, August 1994. Configuration Management,The Hidden Friend in Business Reengineering, Industrial Engineering, 31-37.
- Scheer, August W.**,1994. Business Process Engineering, Springer Verlag, 2nd Edition.
- Shankarnarayanan, S**, ERP Systems – Using IT to gain a competitive advantage,
<http://www.expressindia.com/newads/bsl/advant.htm>
- Sheldon, D.**, 1993. MRP-What It Really Is.
- Short, J.E.**, 1995. Strategies For BPR: Evidence From Field Studies, Journal Of Management Information Systems, 12(1), 31-56.
- Spencer,M.**, 1991. Using The Goal in an MRP System, Production and Inventory Management Journal, Fourth Quarter, 19-23.
- Tatikonda.L, Tatikonda,R.**, 1996. Top Ten Reasons Your TQM Effort Is Failing To Improve Profit, Production and Inventory Management Journal, Third Quarter.

Tulapurkar, Harshawardhan, February, 1998. ERP Implementation: Strategic Issues, Dataquest.

Wallace, Thomas F., 1994. MRP 2: Making It Happen, Second Eddition, 5-8

Wasco,W.,Stonehocker,R.,Feldman,L., 1991. Success With JIT & MRP In A Service Organization, Production and Inventory Management Journal, Fourth Quarter, 45-50.

Whitman, A.R., March 1994. Virtual Reengineering, Industrial Engineering, 61-78.



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