Oracle E-Business Suite

High-Tech Semiconductor Industry Solutions

Key SCM Challenges and Oracle's Strategy/Response

An Oracle White Paper
February 2003

***Target Audience**: Senior Management in Semiconductor Industry involved in managing global manufacturing and supply chains.*

ORACLE

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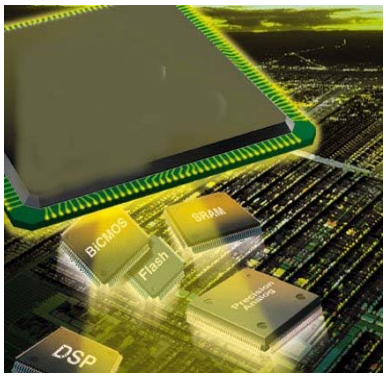
EXECUTIVE SUMMARY

According to SEMATECH the semiconductor industry has the goal to reduce the cost per chip function from 25% to 30% each year. This is necessary to remain competitive within this highly aggressive market where the product drivers are quickly changing traditional business practices. Increasing wafer sizes, maximization of yields and improving equipment productivity all contribute to this goal. But more importantly, even the role of the customer is enlarging. Shorter time-to-market, higher scheduling stability, better profit margins, higher number of products and product developments, and of course minimized costs together with top quality are essential. The successful semiconductor manufacturer has to accommodate these complex, sometimes opposed and contradictory, requirements to fulfill the customer demands as well as to ensure their own profitability. Thus the optimization of the wafer fab performance while enabling a highly flexible manufacturing and enterprise strategy plays a major role.

In view of this rapidly changing landscape in the semiconductor industry, many software systems today have become the biggest bottlenecks in manufacturing and related supply chain. Oracle's has responded to these challenges through the development of an exhaustive industry solution including an industry specific product – Oracle Shop Floor Management (OSFM). These industry specific solutions have been developed along with some of its key customers – Lucent Microelectronics (currently Agere Systems) and Level I (currently a division of Intel).

Today, more than 75 leading customers in semiconductor industry, worldwide use Oracle E-Business suite. Most of these customers are also active members of Oracle's customer advisory board and work as solution design partners with Oracle. Over the last 4 years, these design partnerships have resulted in significant enhancements to Oracle's offerings for the industry's key issues. As the industry adapts to 300 mm wafer manufacturing, additional enhancements continue to be made in line with the recommendations and prioritizations set by its annual Customer Advisory Board meetings.



Convergence of Customer responsiveness and Manufacturing Excellence as a key differentiator

Today's semiconductor industry is being revolutionized! But unlike other changes in the industry such as larger wafers or new lithography tools, this revolution is not only about technology but also about how companies will need to do business. Staying competitive will require that companies change both their business and operations practices. In addition, Market pressures are driving all companies to improve and streamline capital investment, operating expenses, and cost management. While such trends are not new, the new era in semiconductor business will be driven by greater customer intimacy, increasing product optimization and maintaining a global presence in the marketplace. Semiconductor firms are increasingly finding that they must be involved on a timely basis with not only their own business but their customer's business as well. IC companies must provide their products and services to customers quickly and with the highest quality while reducing the turnaround time between order and delivery. Lead times that were formally measured in days in the past will now be measured in hours. Customer responses are fast becoming real-time, and timely manufacturing and delivery becomes a worldwide concern.

Changing Product Mix

While established markets for commodity products such as memory and microprocessors are already reacting to the above referred changes, a greater impact is increasingly being felt on the ASIC or specialized IC market. These products are usually low volume (compared to memory or microprocessors), and built-to-order according to a customer's individual specifications. In addition customer market windows are relatively small and for them to be competitive makes time-to-market a critical issue. This puts additional requirements on the semiconductor maker or foundry to keep and maintain a close customer relationship by providing up-to-the-minute information on their product. Keeping a strategic relationship means access to sales, product, manufacturing, test, and supplier information is available on their respective products to customers in real time worldwide. This up-to-the-minute information channel gives customers what they need to run their own businesses improving their own profitability, customer relations, and product availability. This new approach in doing business is clearly making the semiconductor industry truly a customer-driven business for the first time.

Reducing dependence on the PC industry and higher demand for customized products

Another major change sweeping the semiconductor industry relates to its earlier dependence on the PC industry. This dependence on the PC-industry is declining as offerings for the communications, automotive, and consumer markets increase. Product leaders in memory and logic are therefore giving way to new markets dominated by customized parts required in these new emerging areas. Leading semiconductor manufacturers operating on a traditional make-to-plan model are facing customer demand for these new products that require faster manufacturing time, competitive costs, lower volume, and short product cycles. This forces the adoption of a make-to-order model in which aggressive supply-chain strategies linking the business and manufacturing levels dominate.

Need for better integration with stand alone/ local systems

In previous years where new changes were required such as the transition from 150mm to 200mm wafers, a company could add new tools, some additional automation and a new building, and continue on in the same make-to-plan environment with the existing business and manufacturing infrastructure. In this demand-driven model ERP, CIM, supply-chain, MES, and IT systems that were locally adapted to the manufacturing facility provided adequate solutions. However, systems that are home-grown, predominately stand-alone or highly customized are finding

difficulty in this new business environment supplying global, cross-functional services. A customer-driven semiconductor environment requires integrating order management, collaborative design processes along with agile manufacturing execution. Providing fast manufacturing turnaround to the customer must be done within a real-time system that looks worldwide at all possible sites for wafer capacity, assembly and test, and inventory/distribution, and link these, also in real-time, to global supply-chain planning. Few systems currently deliver such information for any of the major semiconductor manufacturers. Business enterprise and manufacturing operations remain predominately autonomous and site-specific. Moreover, neither one is coordinated with the supply chain on an "instantaneous" basis. Specialized software at each fab will always exist, but competition will force the adoption of a flexible, integrated information system that sees a company as a single entity worldwide.

This convergence of customer responsiveness along with manufacturing excellence will be an effective way to add new customers, build the revenue base, and increase throughput above and beyond heavy capital investment in new fabs and equipment. In reality, many new products can be manufactured in today's fabs on current technologies. But companies must remember that being the market leader is not just having the best technology. It is about having the technology *and* giving the customer what is needed to build their business. Successful companies will use this convergence of customer responsiveness and manufacturing excellence as a key differentiator by starting to provide functions and capabilities such as up-to-the minute (i.e. real-time) status information on orders, reduced lead time, improved inventory planning and other capabilities.

Industry Paradigm shift through ERP/MES integration

With more focus on customer needs and requirements, semiconductor firms are faced with a new set of challenges both internally and externally. Moving to real-time supply chain planning will affect the ways that companies do business and how these new business practices will become reality. Customer relations especially strategic ones should be able to handle an ever-increasing list of demands, access to real-time information, and keeping satisfaction levels high. IC houses, customers and suppliers now work in an environment where fast time-to-market is the norm driving business growth on all sides. In addition, systems must be in place that maximize productivity, communications, performance, and flow between order entry and manufacturing linking all sites.

Current State of the Industry

However, in today's market, such systems are mostly nonexistent. While business and manufacturing operations have improved their capabilities in these areas significantly over the last fifteen years, the reality is that existing systems are separate, equal, and frequently in opposition to each other. To this day, most semiconductor manufacturing sites down to the level of a single fabrication facility (or fab) remain largely autonomous even within the same company. Throughout the '80's and '90's wafer fab facilities were built to support different types of logic and memory products on different wafer sizes using a wide variety of equipment and software systems. New fabs were built with the current technologies available at the time while older ones continued to use older technology. Even if retrofit, each fab remained a closed system with its own manufacturing and business infrastructure. Around a MES, each fab built its own data collection systems such as that for yield and test data that were compatible with the equipment available, but became non-extendible (even to other fabs in the same company). As technology progressed, these systems not only became expensive to maintain but even more difficult to change. As time went on, most fabs perpetuated their individual manufacturing execution systems rarely sharing information with any other. Planned production, and data collection systems tailored for a single fab became traditional and a widespread practice. Even now, many senior managers must run several queries to obtain similar data from multiple sites.

Business systems followed a similar path. Order management consisted of taking orders predominately by telephone from field sales offices feeding into an office linked to the (often) one fab that produced that IC. Each fab or company would be sure that customer demand was met by the current or planned inventory for a particular product. Supply chain operations were also linked to the planned production for each fab, and often run independently from manufacturing operations. ERP systems like those of manufacturing became site-specific and were run on batch processes that had little or no direct integration with the fab. The chain of events from order entry through manufacturing and test was a sequence of independent systems with few common interfaces done in time-varying batch processes that left customer requirements estranged from the process. Whatever links existed were unique and tended to provide data that was adequate but in today's market would be inconsistent, often incorrect and most important too late.

Need for MES/ERP Integration

Thus, a traditional approach simply will not meet the requirements of a customer-driven semiconductor industry. Independent corporate and manufacturing solutions cannot supply what will be needed. Enterprise, supply-chain and manufacturing systems must be integrated to be customer-responsive, and represent the capability of an entire company not a single manufacturing or distribution site. Order acceptance cannot be tied only to planned production. ATP or CTP has to examine the capability of wafer starts and distribution at all suitable facilities across the world, and be able to re-assign an order if problems at a selected site severely impact delivery time. Semiconductor companies must cooperate and communicate instantaneously within their own facilities and with partners worldwide within a true real-time supply chain. As planned production gives way to fast, low-volume turnaround, the information support infrastructure must change with it.

An integrated ERP/MES environment merges multiple independent systems into one reducing the existing distance between customer order and fulfillment from weeks to days. Response to orders or change orders by customers themselves can be now achieved in real-time using instant access. But handling orders and finding capacity are only parts of the solution, and customer satisfaction will require significantly more. What the IC industry needs is a total supply-chain management system which forces paradigm shifts in all phases of business and manufacturing. Disparate, stand-alone systems must interact outside their immediate functions since both customers and managers want data that cuts across a wide variety of areas. Capacity planning, for example, must be updated with information from equipment on the fab floor to see if tool downtime will impact an expected delivery. Customers want to see parametric data from their product taken as soon as it is available for yield and quality tracking. Business enterprise systems must analyze inputs from fab systems to complete order fulfillment, product costing, and ATP. In short, good business strategies must rely on the timely leverage of manufacturing capabilities of an entire company to maintain key relationships and compete in a make-to-order world. This can only be realized through a tighter integration between the MES and the ERP across the semiconductor industry.

Necessity of Fab Management to Participate in the Enterprise's SCM efforts

Paradigm shifts, however, do not come easily, and making the transition from site-dependent, autonomous solutions to global, integrated ones will require new ways of doing business within the semiconductor industry. Few can afford the high cost of new fabs and leading-edge manufacturing technologies needed to support these products. When new fabs and 300mm wafer production are required, the number of firms that can afford their multi-billion dollar price tags is reduced significantly. Therefore to compete in the semiconductor marketplace, or to get profit from new fab investments, companies must adapt to a new approach to doing business.

While computer applications will remain important, communications and consumer products will dominate markets in the new

era. This new trend forces semiconductor management to rethink both its business and manufacturing operations. Unlike microprocessors and memory circuits, the new applications will not rely solely on digital technology. In addition, general use products such as those for the computer market will give way to specialized chips designed for a single purpose. Consumers will soon find that within the electronics they buy will be a host of ICs that will include logic (CPU) and memory but also functions such as DSP (digital signal processing) and ASIC (application-specific integrated circuits). ASIC chips themselves will embrace analog, RF, power, and video functionality. Other products will combine, or embed, logic and memory often on the same chip. For management, the production of these products will necessitate a change in the way chips are produced and sold, and that will in turn force a change in the way customers and information will be handled.

Adding analog, programmable logic, and RF functions to a chip, for example, does not require leading-edge semiconductor process technology. In general, these areas have lagged behind the pace set by advancements made in microprocessor and DRAM fabrication. Competitive products can be made with existing fab facilities. Today, many new companies and design houses entering these ASIC-type markets have no internal production capability at all, and instead shop their products to contract manufacturers (a.k.a. foundries) to make them. This development brings two important points to the fore. The first is that competition increases because a firm does not need its own fab to enter the market, and will respond to the manufacturer who can offer production services on a competitive basis. In addition, semiconductor companies faced with the high cost of making flagship products can participate in these new markets too but will be forced to change their methods to remain competitive. Profits can be made by making their own chips and offering their facilities to fabless semiconductor companies as well. In the new marketplace therefore, cost, manufacturing excellence, optimal turnaround on orders, and services will be the dominant factors that attract and keep customer loyalty not the latest process technology.

Both issues are driven by key factors representative of this ASIC market. New chips will encompass a wider variety of functionality than traditional mainstream chips, and be less process-intensive. However, not all companies or designers may offer the full range (RF, analog, power, digital, etc.) of capabilities. These circuits will become increasingly specialized for use in a particular product such as a cellular phone or home appliance. This puts the burden on the design team to tailor chips for specific customer requirements, and increases the use of cell libraries and intellectual property reuse. However, the volume of chips needed is relatively small since these are no longer commodity products. High premiums would therefore be placed on how quickly chips can be cycled through fabrication, assembly, and test. In summation, semiconductor management faces both internal and external pressures to quicken manufacturing response time, lower costs, keep quality high, and increase profits by reducing capital investments and operating expenses to build a strategic customer base. IC manufacturers must refocus on becoming global suppliers to get maximum business advantage.

This produces a series of dilemmas. The tendency for fabs to be single, self-contained entities where local production dominates makes it difficult to truly become a global supplier, and a global producer. Site-specific enterprise and manufacturing systems that distance customers from manufacturing through a chain of middlemen and batch systems does not support quick, real-time customer response. Local software systems and manufacturing practices that have become ingrained are hard to modify. Clearly, new practices must be adopted, and a new way of thinking must emerge since the price and philosophy of doing business have transformed.

Benefits

However, let us examine some benefits to management that come with the adoption of these changes. The high cost of building and maintaining wafer fabs is well known. It is also known that adding more equipment increases capacity but overcapacity usually results. Whether a company is considering the investment in a new 300mm production

facility or sustaining the daily requirements of an existing fab, the cost of utilization of manpower and equipment impacts profits. In the new ASIC era, management will be called on to produce a wider variety of products in each facility, and across the company as a whole. In previous times, fabs tended to produce a single chip, or family thereof. Now fabs will produce a greater diversity of products and manage a complex product mix. While this maximizes capital investment in equipment and facilities, production will shift to a large variety of chips with lower volumes and shortened cycle times. It also suggests that having more fabs capable of producing a customer's design greatly increases a company's ability to meet demand. But the challenge remains to increase capacity while keeping costs down. To be successful, management must concentrate on two areas:

1. Improving process control and maintaining high yield, and
2. Streamlining dispatching and execution in production.

The first area reduces defects lowering the cost of test wafers while the second speeds operations improving ROI. Streamlined capacity planning begins moving a company towards a "business in real-time basis" with sales, manufacturing, R&D, and supply-chain management following close behind. New schemes such as using partly finished wafers (i.e. die or wafer "banks") to lower process costs and quicken turnaround become attractive. Additionally, better coordination between sites and those firms that supply materials and services to each site globally is required. Having the ability to allocate demand to manufacturing and assembly with global supply chain planning and inventory improves throughput all the way down to a supplier level. The result is better customer response and improved cost management.

But these benefits cannot be achieved with yesterday's fab and business infrastructure. Local optimization cannot support the transition to plant-wide, company-wide, and worldwide production flow. As part of a broad strategy, the impact of implementing supply-chain planning and integrated ERP/MES systems will be felt on both existing and future facilities. While initial resistance to this approach from traditional, local factions is expected, companies and profits will see it as a healthy long-term investment. Success in this arena can lead to profits via improvement of information, diversity of installed systems, and plant management. And, it must begin with the customer. Decision points are quickly moving to a comprehensive, factory-enterprise level where semiconductor customer meets the semiconductor supplier and away from a local production-planning level. Achieving customer intimacy means getting closer in terms of time, location, performance, and alignment of mutual goals. The ERP/MES layer is now the catalyst to institute cultural and business changes, as the semiconductor industry becomes an internet-centered, make-to-demand business.

In reality, these needs have indicated that while semiconductor companies need to adapt new ideas to their individual corporations, they are ill advised to develop the software to do so. If each firm invests in creating their own integrated enterprise/ manufacturing systems it will only perpetuate the "localization" of software that currently exists. Customers will face a myriad of interfaces and software portals that will be confusing and difficult to use. It also puts a burden on the IC industry to focus on undertaking massive software development internally to maintain and upgrade these systems taking valuable resources and funds away from their mainline business. Thus it will be up to the commercial sector to produce a viable solution for integration of legacy, production and supply-chain information. Only when developers work closely with fab business and manufacturing experts will there be a standardized solution benefiting all participants. Even though leading groups like SEMI discourage general standards for the semiconductor sector, opportunity exists for vendors offering a viable product that coordinates system software across a company and across the industry.

How Oracle E-Business Suite Addresses these Challenges

Integration at the ERP/MES level is more than just joining these two information systems. There is a wealth of issues between different trading partners like customers,

suppliers, and semiconductor manufacturers to address. Manufacturers must find new ways to lower the costs of system maintenance, and make interfaces easy and transparent. In the fab, extraction, and analysis in a timely fashion of tetra byte-sized data blocks coming from wafer and equipment testers remains a major problem. Information flow between corporate and production shop floor is often not automated and requires custom, time-consuming queries. In addition, demands for data by management, R&D, fab personnel, account reps, and customers at the ERP/MES level is increasing far beyond the traditional need for general production inputs, and WIP costs. Previously, decision support and demand transaction functions had little interaction or dependence on lot tracking or yield data (and vice versa) but those days are rapidly becoming history. What is emerging is a complex environment that enables real-time access to business and manufacturing data resulting from the new focus on customer-driven applications. In the near future, customers may require factory automation, MES and ERP systems to integrate front-end wafer fabrication and back-end assembly to provide complete histories of how, where, and when chips are produced.

Integrated information systems combined with E-business are rapidly becoming the key factor in doing semiconductor business in the coming decade, and essential for a company's fiscal health. Creating and selling innovative products and services within short-term market opportunities while keeping (and building) customer/supplier relationships is now the prime directive for the semiconductor industry. The "four walls" methodology of old has become today's global supply-chain management. In response to this change within high technology, Oracle has developed a path paved with a suite of products for semiconductor companies interested in migrating in this new direction. Oracle's offerings include all the components required for current legacy/enterprise/CIM systems to expand and keep pace with customer and market demands.

Solution Design Partners

In this regard, Oracle Corporation has worked closely with its key customers - Lucent Microelectronics (currently Agere Systems) and Level I (currently Intel Corporation) to design a comprehensive solution for semiconductor manufacturing. Today, Oracle has more than 75 customers using this solution. Most of these customers are active members of its customer advisory board and also work as solution design partners with Oracle. Over the last 4 years, these design partnerships have resulted in significant enhancements for the industry's key issues. As the industry adapts to 300 mm wafer manufacturing, additional enhancements continue to be made in line with the recommendations and prioritizations set by its annual Customer Advisory Board.

Following is the overview of the current solutions offering for the semiconductor industry:

Shop Floor Execution

Oracle has developed functionality that expands current enterprise solutions offering for the semiconductor shop floor space. This set of functionality is referred to as "Oracle Shop Floor Management" or OSFM. This is not a stand-alone application. It consists of additional functionality provided to handle some of the specific requirements of the MES marketplace. The Oracle applications required for the Oracle Shop Floor Management are Oracle Inventory, Oracle Engineering Products, Oracle Work in Process, Oracle Quality and Oracle Cost Management. OSFM provides more detailed tracking of the shop floor / WIP. Whereas standard Oracle WIP did not provide the flexibility to track all the various transactions that happened on the shop floor (e.g. WIP split/merge, re-works), the added types of transactions and robustness of OSFM enable more detailed tracking of every transaction. The OSFM solution consists of the following functional components: complex lot transactions, lot genealogy, dynamic routing, yield-based costing, and co-product definition. Detailed descriptions of these modules are provided in the product data sheet. In addition, a separate white paper also is also available for reference.

With OSFM, two significant changes have been made to the standard Oracle Cost Management mechanism. The first is the concept of yield-based costing, and the second is to work in the shrinkage factor into costing at an operational level. Yield-based costing is determined by multiplying the actual costs at an operation by the reciprocal of the expected yield at that operation. It is based on the underlying concept that if one expects to have a percentage shrinkage at an operation, the costs will multiply the inverse of that percentage. Whereas in traditional manufacturing the bill of material (BOM) structure is typically like a pyramid (many components build up to one final product), the semiconductor industry's bill of material structure is different. Rather than many components being joined to become one final product, one key part is tracked, which then later can become many different finished goods. The different finished goods that derive from a common component are referred to as co-products.

The exceptional cases where information about a lot needs to be changed occur quite frequently on the fab floor. These may be process related, such as a lot merge or lot split, or they may be case-specific, such as changes to lot quantity or revamping the routing to be followed in processing this lot. With OSFM, one can take either an inventory or a WIP lot and perform the following transactions: lot split, lot merge, lot translate (update assembly, quantity, routing or name) or bonus. A new form is provided from which these transactions can be executed. As a further enhancement, the costing implications behind conducting such transactions are managed extensively by a separate and new cost processing mechanism.

OSFM keeps track of lot genealogy for all lots through multiple stocking points (i.e. WIP job completion points) and through multiple organizations and facilities. An additional form is provided which allows "genealogy surfing", the ability to start with any given lot and move downstream (i.e. check the lots which have propagated from that lot) or upstream (i.e. check the lots that make up this lot) in the manufacturing process. OSFM incorporates the concept of dynamic routing. In place of the linear route represented by a sequence of standard (or non-standard) operation, OSFM supports the concept of dynamic network routings. These routings are a representation of every possible occurrence on the shop floor. It is a collection of nodes and paths, the nodes being every possible operation for that part and the paths being the possible operations a user can move to from a given operation

Linking Multiple Shop Floors across the World

The enhancements made to Oracle Manufacturing for OSFM as described above provide extended "shop floor" control and make production information from multiple manufacturing sites (or MES systems including those of third-party locations) available to the central enterprise system. For the first time, a true global picture of shop floor execution from internal or contract sites worldwide can be made available to one transaction repository. It enables visibility in real time to link manufacturing activity to customer response. Order entry is transformed into silicon via a lot start in a day or less. Customers and management can track the status of product over, for example, internal fabs in England and Austin, an assembly and test operation in Malaysia, and a contract fab in Taiwan. All production facilities become vertically integrated for competitive advantage and timely customer response.

Advanced Planning Solutions

Even as OSFM embraces the integration between ERP and MES systems, a complete e-business solution requires strong functionality for planning across the enterprise. Independent corporate and manufacturing solutions cannot supply what customers require in an efficient manner. Oracle advanced Planning solutions (APS) extends information management beyond these "four walls" to meet the requirements of a customer-driven semiconductor industry. Integration of production facilities along with Oracle APS results in a business model that helps profits by maximizing profitability and cost-of-ownership through optimization of inventories across the enterprise.

Oracle APS transforms a semiconductor manufacturing enterprise into a global customer-responsive organization that represent the capability of an entire company and not a single manufacturing or distribution site. It uses the global ATP or CTP processes to examine the capability of wafer starts and distribution at all suitable facilities across the world, and is able to re-assign an order if problems at a selected site severely impact delivery time. Oracle APS also leverages the dynamic routings defined in OSFM along with information on yields in individual operations to develop detailed manufacturing plans for each and every customer order across the world.

Oracle APS along with OSFM thus, help semiconductor companies in managing businesses in the most cost effective manner and communicating instantaneously within their own facilities and with partners worldwide within a true real-time supply chain. This has reduced the existing distance between customer order and fulfillment from weeks to days. Response to orders or change orders by customers themselves can be now achieved in real-time using instant access.

Enterprise Asset Maintenance

Semiconductor Fabs have perhaps the highest capital investments in the industry and Oracle's Enterprise Asset Maintenance is one of the recent offerings to manage effective asset maintenance. It enables a shop floor to generate work orders for maintaining/ repairing these assets. It also helps in effective capacity planning; for example, it updates information from equipment on the fab floor to see if tool downtime will impact an expected delivery.

Product Life Cycle Management

Nowhere is the impact from the new direction in semiconductors more keenly felt than in product innovation or product process design. In fact, product design is now a global process where one may easily find two or three-circuit design teams in the US, package designers in Japan, and software developers in India all working on the same project. This makes the communication and information flow between these groups of utmost importance and increases the responsibility of product management who must coalesce large, collaborative, multi-skilled, and multi-cultural groups in disparate locations to work together. This in turn must mesh seamlessly with manufacturing for yield, quality, and reliability, CAD/CAM systems, suppliers for planning and procurement, and the customer. The increased ASIC market also puts a premium on time and reliability that drives the use of intellectual property for both hardware and software re-use especially with System-on-a-Chip approaches using mixed styles such as MEMS, digital, analog, RF, and power. Very few IC companies presently have an integrated method for this kind of information flow. Management of documents, change notices, sign-offs, and other deliverables quickly and efficiently worldwide is not something current design information infrastructures were designed to perform but will be essential for future success. In addition, development cost tracking by task and location, exchanges between marketing, sales, production, engineering, R&D, partners and suppliers, and general data distribution within shortened cycle times cannot be handled by ERP and CRM systems alone, but need an exhaustive solution offering in the space of product Life cycle management.

Customer Relationship Management

Oracle's CRM offerings shift the traditional role of a customer in the IC industry to one of Customer Relationship management, thereby expanding the mutual dependence between customer and IC producer. Oracle CRM achieves this not only by shrinking time-to-market pressures but also by providing the diversity of sales channels in business. Previously, the sales channel between customers and IC companies depended on field sales or account reps to transmit orders or customer specs back to a home office. Information flow was through a limited number of personnel who would act as bi-directional conduits on individual orders. For the modern semiconductor world, Oracle CRM offers a web based solution which supports a network of marketing and sales contacts, response/order management, approvals, sales planning, budgeting & forecasting, response, service, and follow-up, a variety of marketing functionaries, research analysis,

and activity planning/execution. These functions are also distributed over field sales, telemarkets, distributors, and internet sales. These offerings from Oracle CRM provide the customer with the best price, delivery, products, and access to the latest information anywhere at anytime.

Business Intelligence/ Portal

A short time-to-market world makes additional demands of company management to refocus its efforts on the customer, and growth of their own company, simultaneously. Beyond what has been mentioned above, corporate information systems should allow for operations that are more strategic than day-to-day such as business intelligence, activity -based costing, decision support, enterprise management, and global treasury. Making multiple queries into a collection of separate, site-specific ERP/MES systems does not make good business sense when decisions must be made quickly. Oracle's solution integrates these units collectively to provide the right information at the right time over all units across the globe. Product and solutions portfolios, financial status, consolidation of resources, quality issues, and other support functions are provided to give semiconductor companies answers that are consistent with running an international business.

Oracle's portal technology enhances these functions further by providing portals access to different constituents of the semiconductor value chain – fabs, foundries, design houses etc an access to specified "views" of a customer order so that the entire supply chain could have almost instant visibility into the production status, even so far as the shipping GPS tracking. Some of the projects under consideration by the IC industry and Oracle are the Internet-accessible tracers on wafer lots to furnish daily chip-level product data.

Summary

What is the cost for an IC company to make the move towards this integrated, global supply-chain system and the new business environment that comes with it? Conversely, what is the cost of not doing anything at all and keeping the present mode of doing business? Today, no IC producer or foundry can afford *not* to transition itself into a worldwide, E-business company because the competition will. The old methods and information infrastructures are no longer satisfactory. Maintaining them is costly, manpower-intensive, and time-consuming. Simply adding equipment to make profit is no longer optimal. Internal strategies based on extensive runs and large inventories are a thing of the past. ***External, customer-centered strategies focused on short runs on a wider mix of products with quick turnarounds based on customer demand are the new paradigm.*** The economics are changing and success in the future semiconductor marketplace will belong to those who are prepared

About the Author:

Rakesh Kumar works for Oracle Corporation and has previously managed globally diverse manufacturing/ supply chain operations for more than 20 years in various senior management capacities at a Fortune 50 Transnational. He holds a B.Tech in Mechanical Engineering from Indian Institute of Technology (IIT), New Delhi and MBA in Finance & Marketing from University of Chicago's Graduate School of Business.

Key SCM Challenges in Semiconductor Industry and Oracle's Strategy/Response
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Author: Rakesh Kumar

Oracle Corporation
World Headquarters
500 Oracle Parkway
Redwood Shores, CA 94065
U.S.A.

Worldwide Inquiries:
Phone: +1.650.506.7000
Fax: +1.650.506.7200
Web: www.oracle.com

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