

Microsoft® Manufacturing Industries

Leading Edge Collaborative Environments in Process Manufacturing Industries

White Paper

Working better is one of the main goals of every company. Working together is the way to achieve this. Internally or with business partners, seamless access to relevant information, transfer and sharing documents, automation of manual tasks to accelerate processes are examples of collaboration. Collaboration tasks are a condition for lean transformations, management by exception, innovation, cost reduction, operational performance and success.

This white paper is designed for business leaders of manufacturing companies who wish to explore the role of state of the art collaborative environments in delivering competitive advantage, and the approach to Information and Communication Technology (ICT) that delivers efficient, flexible support for collaborative solutions.

Thank you to partners

Microsoft would like to offer its thanks to the following organizations for contributing to and assisting in the production of this white paper:

AspenTech

OSIsoft

Siemens

Wonderware

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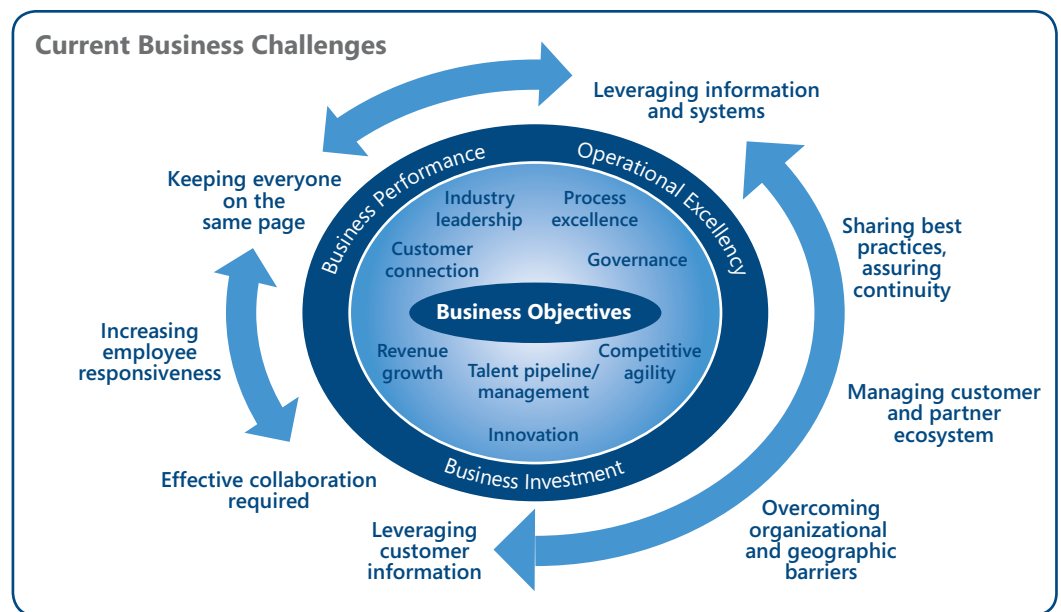
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Introduction

Leading manufacturing companies have found a new source of competitive advantage. It is collaboration. Collaboration helps companies act quickly and accurately, make decisions, assign tasks, and execute business processes. Collaboration opens up new ways of working and drives innovation. Collaboration has become an engine of productivity and an essential core competence.

In operations, collaboration capabilities catalyze innovation and help networks of in-house teams, suppliers and channel partners to act efficiently, flexibly, and quickly. For strategic development, the ability to collaborate gives business leaders freedom and confidence to initiate a wider range of strategies, including all types of outsourcing, and the full range of risk-reward sharing options in partner relationships.

At Microsoft, we and our partners are providing all of the advantages of collaboration, while allowing users to move between applications and information easily. Our tools empower users in collaborative environments irrespective of the devices they use – even when temporarily disconnected from a network.



The basis for our vision is an architecture that follows three guiding principles:

Service-Orientation: tool specialization is vital, but a tool's service must be readily accessible from another application.

Open and Standards-based: data formats and protocols must be open and based on standards where they apply.

Accessibility: tools and information must be readily accessible by any authorized user, inside or outside a business, connected or disconnected from a network, using any suitable device.

Microsoft technology adheres to these principles, maintains freedom to deploy all leading applications and provides the capability to deploy them in collaborative environments.

Collaborative environments help people connect to colleagues, customers, and partners using innovative Information and Communication Technology (ICT). To understand the importance and potential of collaborative environments, this document discusses:

- Issues driving growth in the business value of collaboration;
- The types of collaboration important to most manufacturers;
- Solution types and the collaborative environments created by leading application software designers;
- How to create integrated ICT platforms for collaborative environments.

World Class Manufacturing in the 21st Century

Today's manufacturing businesses face more opportunities, threats, and changes than ever. Businesses must be more efficient, agile, and competitive because:

Global markets: are more accessible. New competitors bring new technologies and new approaches to market. They compete for the same customers and offer new products, new services, and new brand values.

Customers: are well informed so regional premium pricing is no longer sustainable. Also, although demand remains price-sensitive, excellence is routinely achieved by most manufacturers so cannot be a differentiator.

Products: commodity products are under intense price pressure, with the capabilities of low cost regions fuelling both threats and opportunities; speciality products can be complex and demanding, and may require associated service capabilities.

Regulations: create increasingly demanding frameworks for business processes – from plant maintenance and material handling to audit trails and financial reporting.

Corporate strategies: have developed beyond mergers and acquisitions (M&A) of competitors, suppliers and distributors. Now, leading companies actively plan and manage M&A activities to achieve integrated product, service, and brand differentiators, as well as revenue, margin, and profit goals.

These pressures force manufacturers to implement strategies such as those shown below to improve performance in every business area. Customer-focused responsiveness has joined quality, efficiency, regulatory compliance, and cost control on the 'must-do' list of every manufacturer.

These strategies may involve new technologies, structures, partnerships, and commercial conditions. To be successful, it is necessary to work as part of a network and collaborate across all disciplines both in-house and with partners. Research and Development (R&D), process design, plant management, sales, distribution and service personnel must share information and expertise. Good collaboration creates value because it allows the speed, flexibility, and holistic view of small decision-making units combined with the quality and efficiency of a connected network.

Typical manufacturers' strategies

Create small, decentralized decision-making units, often within an enterprise, sometimes involving divestments and outsourcing.

Become customer-centric. Differentiate with excellent service, build connections to tracking and traceability systems used by customers to make it easy for them to buy and receive materials. Or help customers use your products by adjusting packaging.

Manage the value network to enhance customer experience. In both consumer and business-to-business environments, the customer experience depends on every touch-point with every partner. Interconnect supply chains to deliver better service.

Enhance responsiveness, quality and safety of operations with six-sigma and lean initiatives.

Outsource and automate to reduce cost, increase flexibility, and focus on core competence. Require suppliers to take more responsibility, for example, through risk-sharing.

Manage activities as projects, not independent steady-state functions. Activities in a single project may span multiple departments and companies.

Collaborate to co-ordinate

Imagine a supply chain incident; a supplier mixed up deliveries between two sites. Moving feedstocks between sites will take 48 hours, but they are needed for a customer order scheduled for production tomorrow. Is it possible to fulfil the order and maintain workloads at both sites?

Enterprise Resources Planning (ERP) planning shows a solution – but it involves delay to other orders, and planners need more information. Do the ERP feedstock records match reality? How critical are the orders according to sales? What is the impact of paying premium prices for additional feedstock from an alternative supplier today?

Planners (both at headquarters and site-based) would use a collaborative environment to: review real inventory and plant operations status; discuss priorities with sales and customers; negotiate with suppliers; and quickly implement a new optimal plan and schedule.

Collaborate to sell

Imagine the situation: a sales rep calls the office to report a meeting with a prospect. "They love our new fluorescent gel and agree it is exactly what they need to help service hydraulic parts. If they go for it, they'll want a global deal. But they want us to design an integrated dispenser and inspection device. If they like the design, then we'll have to work with their service people to agree the service procedure. Then we'll take responsibility for inventories at all service locations, worldwide. We must do this – it's worth millions!"

To make this particular sale, and deliver on the resulting commitments, the capability to collaborate efficiently will be critical. The gel manufacturer will need a manufacturing partner that can design and deliver the dispenser and the inspection device. The plan for global inventory management may involve a logistics partner, or perhaps existing and new local agents. Working with the service people may need third party consultants.

Collaborate to innovate

Fundamental product innovation often depends on process innovation, which is inherently a multi-disciplinary activity. Process innovation may include domain scientists, process engineers, energy specialists, vessel and control systems engineers, safety people, compliance people and plant operations representatives. This network of people must focus on shared goals, and work from shared information. To improve their chances of successful innovation, it must be easy for individuals and teams to share ideas, raise concerns and solve issues. By facilitating collaboration, the sponsor organization maximizes the chance that the project will consider all possibilities and issues, remain responsive, and achieve results quickly.

Collaborate to resolve a crisis

Perhaps the most dramatic collaboration scenario is the response to an equipment failure that has caused or might cause a halt in production. For example, if backup systems cannot compensate for failure of a pump or valve, the consequences can be delay, loss of a batch, or perhaps a safety incident triggering extensive investigation.

When the on-site or remote monitoring people or systems recognize a problem, they contact a process engineer. The extensive, urgent sequence of collaborations starts here.

The key to rapid, successful resolution of the crisis is rapid communication and immediate response of a co-ordinated extended team that could involve suppliers, local service personnel, production management, process engineers, health and safety specialists, plant maintenance teams and so on. A collaborative environment ensures the team has accurate, consistent, up-to-date information. This eliminates confusion and enables everyone to make decisions, act quickly, and deal with the situation, maintaining records and obtaining input and authorizations as required.

Collaboration

For manufacturers, today's drivers of change are not so much automation as handling the vast amount of information. ICT systems make the right information available at the right time, in the right place, in the right context and format to help ensure the right decisions are made.

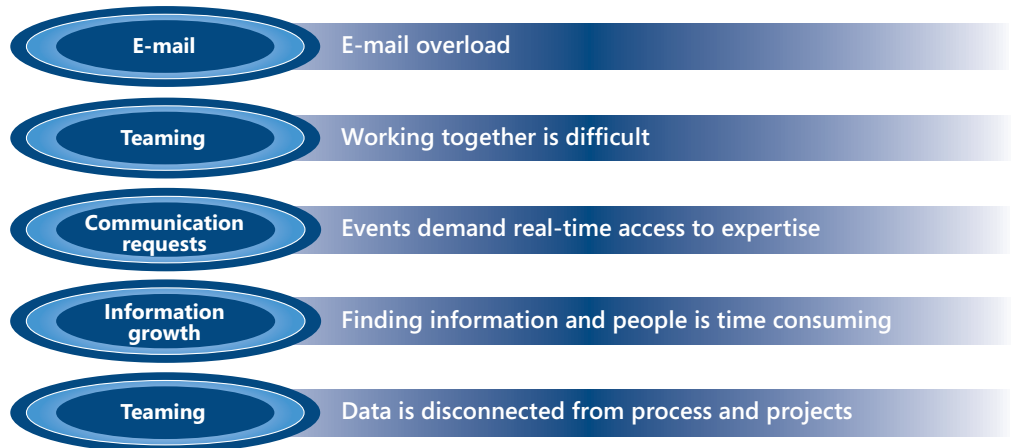
In business, we work with others to get jobs done, so why isn't collaboration a basic attribute of software? One reason is that tools have evolved in isolation – each focused on a narrow group of activities – and it's not easy to move between them with the information we need. Another is that our tools may be accessible only to people within company boundaries, or may not permit us to work while travelling, or otherwise disconnected from the corporate network.

The Microsoft collaboration vision is about providing software and services that deliver pervasive capabilities to help people and applications to work together. Microsoft has emerged as a leader in collaboration services because of its 30-year history of understanding end-user needs, best-of-breed productivity applications, proven infrastructure-level integration, extensive partner and developer ecosystem, and commitment to standards-based interoperability.

Providing authorized employees and partners with appropriate views of aggregated, consolidated, accurate, up-to-date status and plans is a powerful vision: people and systems then act on consistent information throughout. But shared information is not the complete solution: collaboration is also needed to ensure rapid response to inevitable changes in customer and market requirements.

Collaboration Has Its Own Challenges

Changing work climate driving new challenges



A collaborative environment:

- Offers more than simple information sharing.
It helps a team of people and systems to work together efficiently. The team may be in-house or spread across several companies. The environment ensures that all are using the right information to execute tasks, make decisions, and communicate actions.
- Provides user-friendly access to unified, integrated, real-time business data.
No more delays waiting for answers from departmental data silos. No more conflicting information sources.
- Facilitates discussion and action by the group involved. E-mail, instant messaging, shared Web sites, online conferencing all help individuals, departments and companies to work effectively together.
- Breaks down geographical and organizational barriers, and helps companies and their partners to operate as a single cohesive unit.
- Supports automation.
- Not all collaboration involves people. Where it is possible to automate, for example, actions triggered by standard conditions, then the collaborative environment facilitates information exchange.

There are three types of collaboration in manufacturing businesses. All can now be performed online, independently of the location of the parties involved:

Automation: information from one or more parts of the value chain is collected, processed, and used in another part of the value chain, without manual intervention. For example, information about feedstock levels and a plant's production status and plans could be used by suppliers to automate decisions about deliveries.

Planned collaboration: a business process may require two or more groups to share information and work together. For example, formal sign-off of a project milestone usually requires stakeholders to share and discuss project status information. In operations, handover of status information from one operating team to the next at shift changeover may be safety critical as well as vital for process efficiency.

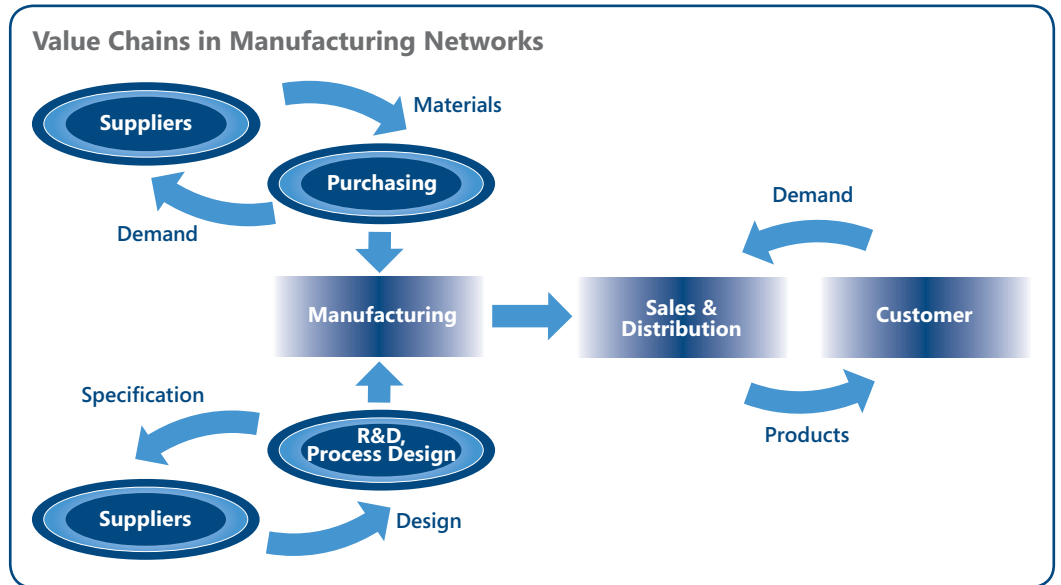
Ad-hoc collaboration: individuals or a group need information from another part of the value chain. Immediate communication and data sharing ensures that situations are resolved or escalated rapidly. For example, if a batch fails quality tests, input relating to feedstocks, process conditions, vessel preparation and so on must be gathered to identify and resolve the cause.

In a collaborative environment, businesses get complete clean, aggregated, timely data covering suppliers, customers and in-house activities – available to all employees at the right time, in the right context. Alerts and automation reduce or eliminate routine tasks. Online discussion and data sharing mean immediate resolution of uncertainties as well as consensus decision making across geographic and organizational boundaries.

Imagine the possibilities. Operators, managers and executives gain insight into business processes – of their own company and those of trading partners. Quick decisions, immediate responses, actions to improve performance, all co-ordinated with suppliers and customers, become the norm. The stage is set for dramatic change from average to excellent.

Understanding and Applying Collaborative Environments

New technology is sweeping away the barriers that encouraged information silos.



There was a time when access to data was restricted to the users of the application that owned the data. Even database sharing was limited to modules from a specific application vendor. So there were few options to share data along the value chain. The options that existed had limited capabilities – for example, print and distribute a report; or output data in a format that another application could use.

Now, the situation has changed. The Microsoft vision and architecture provide easy-to-use tools that empower application developers to:

- Eliminate information silos;
- Control and manage information access;
- Deliver information when and where it is needed.

Using Microsoft technologies, application developers can create open collaborative environments and facilitate communication, group working, and quick response.

Collaborative environments support interactions within a function, between functions and spanning large parts of the business network. In addition, people – from the production supervisor to chief executive – can gather information, gain insights, plan initiatives, and implement actions without barriers.

A collaborative environment must offer a familiar interface, and the 2007 Microsoft® Office system fulfils this need – most potential participants in collaborations are used to Office applications such as Word and Excel.

By connecting applications to Microsoft Office system, application developers are extending the range of people able to benefit from their solutions. This approach helps create collaborative environments that can reach everybody who adds value in day-to-day operations, problem solving or development of new products and services. Familiar Microsoft Office environments make it easy for users to access data from a range of applications. This encourages the use of shared information sources that in turn improve consistency of information across departments and trading partners.

For example, technical applications have for many years offered interfaces that integrate with Microsoft Office Excel® spreadsheet software – process and control system engineers use a spreadsheet as a convenient, familiar interface, and repository for technical data they like to keep close at hand. Now, the range of data that can be interrogated and updated from Office is growing. For example, Duet™, the first jointly developed solution between SAP and Microsoft, makes SAP business processes and information accessible to every employee through their familiar Microsoft Office environment. This capability is available to all applications via Office Business Application services, designed not only to make applications accessible via Office, but also to enable applications to be combined together 'behind' the familiar Office user interface. From enterprise applications to productivity tools, integration with Office is ensuring ease of use and deployment.

Microsoft Office system integrates applications

Speciality chemicals company Rohm and Haas uses a stage gate development process. At each of five or six gates, a project generates a gate document, usually three to five pages long. The six monthly project portfolio analysis, covering perhaps 75 projects, extracts information from each of these documents, so was quite time consuming. Rohm and Haas decided to implement an Microsoft Office Professional Edition 2003 based software product, InnovateEX, from Microsoft partner Qualisci to automate parts of the portfolio analysis. An R&D Director at Rohm and Haas commented: "At any point, we can run an analysis and determine whether the portfolio is serving the needs of the business." With global check-in and check-out, employees working at remote locations can work offline if necessary. A Process Analyst at Rohm and Haas commented: "This fits our needs as a global research company".

VICO Indonesia has been producing gas from four major fields in East Kalimantan for more than 25 years. Its major business applications – financial, inventory and petrotechnical – did not share information. Yet, employees needed information from all three to meet stringent production, financial, and regulatory requirements and to report on the state of the business. Key points of a project to address these issues included use of the XML capabilities of Microsoft Office system, Microsoft Office SharePoint® Portal Server 2003, and Microsoft NetMeeting® conferencing software. The VP Technical Support commented: "The Office 2003 Edition, XML, and SharePoint Portal Server 2003 will deliver real-time performance data to steer this company where it needs to go. This unprecedented visibility into the business is incredibly valuable."

To read full case studies, please go to <http://www.microsoft.com/casestudies/> and enter "Rohm" or "Vico" in the keyword field.

Using a collaborative environment

A collaborative environment has value for virtually every employee in a manufacturing company, from the boardroom to the plant floor.

A Process Engineer will use a collaborative environment to share technical information, investigate technical and project issues, take part in review meetings and gather information. The collaborative environment will allow the engineer to communicate with colleagues and partners to solve problems, make decisions, and agree action.

A Plant Manager or VP Operations may find the main use of a collaborative environment is to discuss changes with colleagues. Sales may want to push certain orders through. Maintenance may want to bring forward a planned refurbishment of part of the plant because of recent trends in test measurements. Purchasing may suggest the use of substitute materials. A supplier may want to propose the use of new, higher capacity trucks for delivery of feedstocks. In each case, the interaction can be on the basis of accurate, shared information – meaning fast decisions.

A Procurement Administrator may access goods-received data and initiate ad-hoc collaborative sessions with managers who requested purchases to complete authorization. Their discussions will be supported by immediate desktop or remote access to consistent, up-to-date information.

A Laboratory Manager will use a desktop display of 'traffic lights' showing aggregated real-time information on batches and test results, with drill-downs. The manager may use it in a planned manner to review and approve each batch, and equally – perhaps, when investigating an 'amber' condition – to initiate ad-hoc collaboration to get more details to decide how to handle unexpected results e.g. can a batch showing 'amber' for quality be re-run or blended to get the quality up to the required specification? And, is there time on the plant to accommodate this?

A Distribution Manager will use a collaborative environment to stay in touch with customer and distributor stock levels, orders, forecasts, and deliveries, and liaise with transport providers, the sales teams and production management to agree priorities.

A Maintenance Engineer will use a collaborative environment to gather technical information and procedures for a task, discuss snags and issues with specialists, and obtain sign-off for completed work.

Collaborative Environments in Process Manufacturing

When application software from Microsoft partners is added to the communications and collaboration infrastructure provided by Microsoft technologies, the results are world beating collaborative environments, providing support for priority business issues, and enabling teams of people to work together efficiently.

The next few pages provide short descriptions of this aspect of solutions from:

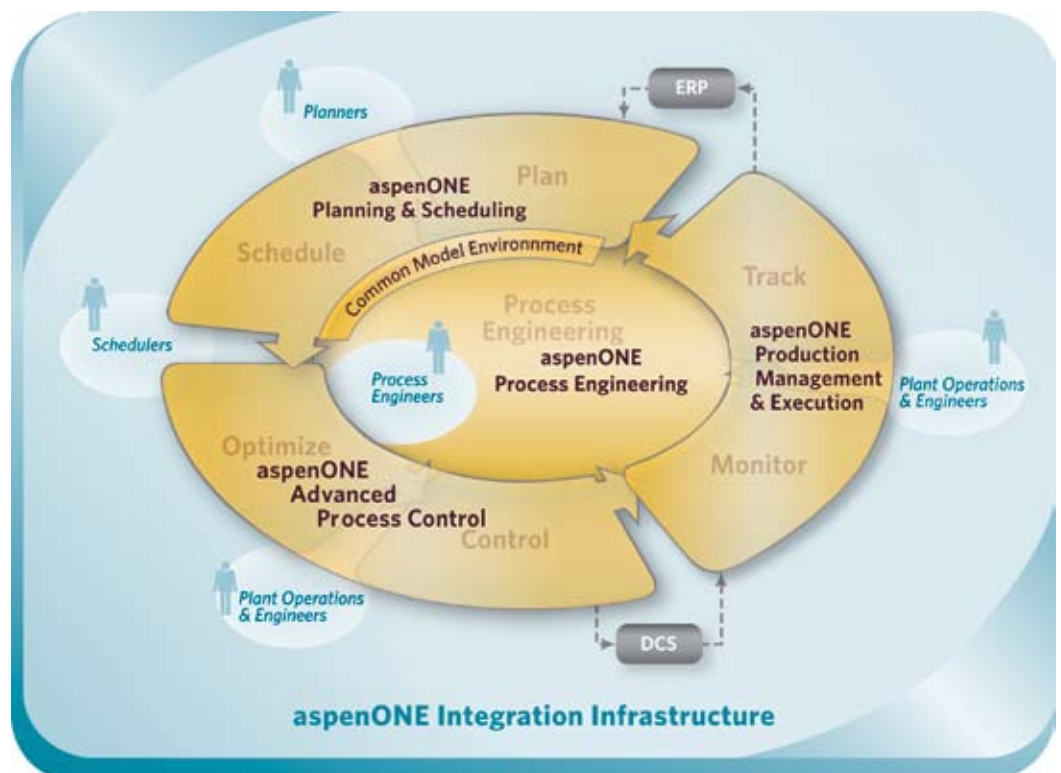
- AspenTech
- OSIsoft
- Siemens
- Wonderware

AspenTech (www.aspentech.com)

A typical medium scale site in the process industries produces products worth \$3-15 million per DAY! It purchases raw materials, supplies and energy approximately equal to 50-75% of the product value. On average, materials held by the supply chain supporting the plant and product sales cover 40-80 days of production, which could tie up half a billion dollars of working capital. Managing such an enterprise requires answers to a number of questions – What to buy? When to buy it? What equipment to run? What to sell? When can it be produced? Is it profitable to produce? These questions are not answered once for a particular day's production but repeatedly as demand and supply change, production upsets occur, energy prices fluctuate and transportation realities intrude. "Good" answers to these questions, as opposed to "bad" ones, could increase profit by \$10-100 per ton of product or more.

The process design, planning, scheduling, manufacturing execution and control functions are key to finding the "good" answers, helping companies to maximize efficiency, reduce energy and raw material costs, and maximize profit. Consistent decision making is also critical, since every inconsistency can lead to additional waste, cost and delay.

To enable companies to overcome these challenges, AspenTech provides the aspenONE® solution suite for the process industries.



aspenONE applications integrate and optimize engineering, manufacturing and supply chain operations for process manufacturers. The aspenONE suite provides a single, unified solution – tuned for specific vertical market segments – that can be implemented in stages, using individual business process applications to address priority challenges. aspenONE applications use a model-based approach that both enhances individual job performance, and enables collaboration between process engineering, planning, scheduling, and production. Effective collaboration between these functions makes it possible to control and optimize end-to-end operations, improving performance and profitability – allowing the best decision to be made as close to the process as possible and removing decision latency from the equation.

By enabling collaborative manufacturing, the aspenONE suite facilitates a totally different way of doing business, for some examples, see panel ‘aspenONE enables new ways of working’.

aspenOne enables new ways of working

Collaboration between Process Engineering and Plant Operations – improve plant performance

The Process Engineering department of a large chemical company has historically used AspenTech process models exclusively for design and occasional troubleshooting. Recently, in collaboration with operational staff, the process engineers tuned some design process models to match current operating conditions. To do this, they used aspenONE Production Management & Execution real-time process data and parameter estimation techniques. The tuned models simulate the real plant, not the as-designed plant. The process engineers deployed the process models online to calculate optimal operating conditions, and provided these results as guidance to the operations staff in the form of an electronic shift report. Operating targets included selected purges, reflux flows, steam flows and solvent flows. This collaboration enabled energy reduction in the plant by more than 11%.

Collaboration between Process Development and Plant Operations – reduce time to market

A major pharmaceutical company used aspenONE Process Development and aspenONE Production Management & Execution to improve collaboration and knowledge management between all engineers to develop a recipe and to transfer results to plant operations. The system enables interaction between the different departments (and different R&D centers) by using a common recipe management system across the corporation. All authorized users access consistent, up-to-date information, so can act quickly to progress a project.

Collaboration between end customers and the plant – reduce inventory

A major consumer products company recognized genuine demand forecasting problems in its market segment due to competitor sales campaigns. These occur at unpredictable times, and cause significant short-term demand fluctuations. One result was inventory levels higher than the company wanted. To drive improvement in operational efficiency, the company is using aspenONE Planning & Scheduling to improve planning and scheduling of the production and distribution process, taking into account real-time customer demand and operating constraints. This involves receiving information from the plant floor to identify available resources and production yields, and matching this capacity to real customer orders. This direct link between end customers and the plant led to inventory reduction of 20%.

Link operations with customers – improve customer service

The division of a major chemical company involved in the supply of automotive coatings to the global Original Equipment Manufacturer (OEM) automobile manufacturers market had a quality incident where one week’s automotive production was lost due to bad paint. The financial loss alone was in the tens of millions of dollars. As a result of this incident, the company decided to improve their information and analysis capability, and, since the application of paint on a vehicle is a complex process, make this capability available to their customers. This project involved configuration of aspenONE Production Management & Execution to execute its manufacturing operations integrated with SAP ERP. The data obtained during the paint manufacturing process is now available via the Web. As well as early detection of conditions that could lead to a quality incident, this initiative has improved customer service and customer relationships through better communication and information sharing.

aspenONE applications use ISA-95 standards to automate manufacturing workflow, enabling collaboration and driving true plant-to-enterprise business process interoperability. Through its integration infrastructure and common real-time data model, the aspenONE solution suite helps align people, information, and business processes across organizational and technological boundaries. Combined with the proven experience of AspenTech's services team, companies are able to speed up implementation, ensuring a rapid return on investment and low total cost of ownership.

AspenTech has a strategic alliance partnership with Microsoft in the process industries, providing chemical and energy companies with a compelling joint value proposition. AspenTech's applications are exclusively run and developed on a Microsoft platform, ensuring that its customers benefit from the value delivered by the latest Microsoft technologies. The two partners exchange details of their future product developments, so that advanced technologies can be adopted at an early stage, providing process companies with an important competitive advantage.

AspenTech and Microsoft are currently working on incorporating and integrating the Windows Vista® release and its Business Intelligence (BI) components. Key Microsoft technologies featured in existing aspenONE applications include:

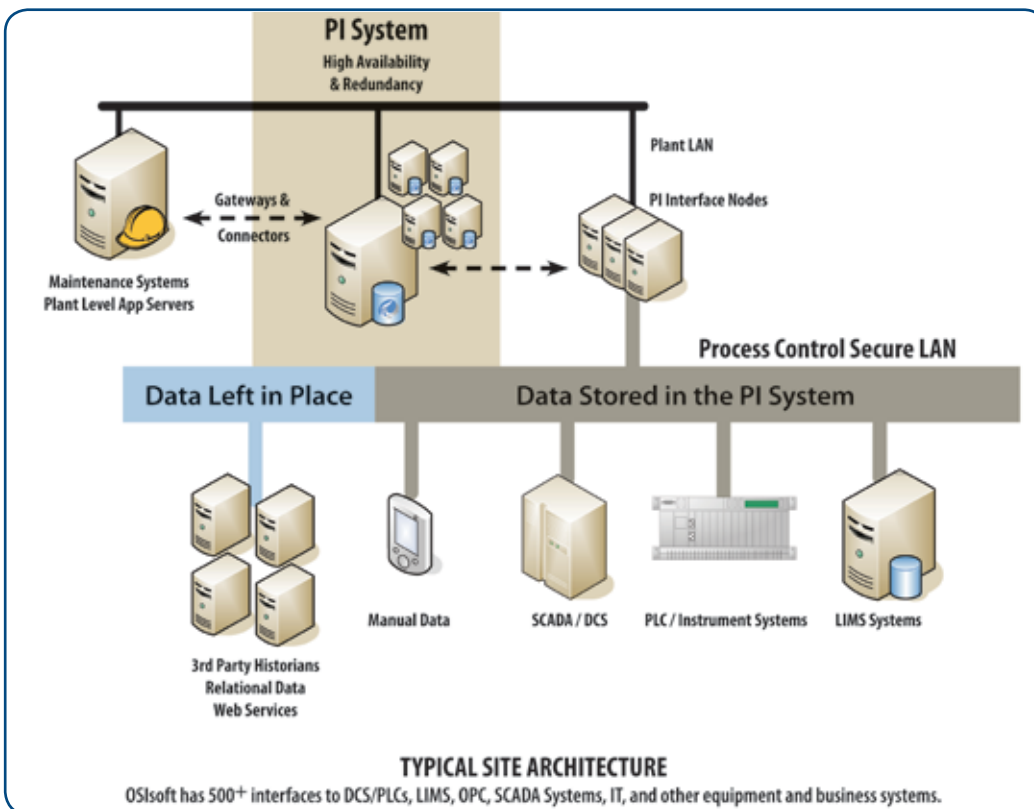
- Microsoft Office SharePoint Portal Server – for security-controlled, multi-user concurrent access to shared data and online conferencing;
- Microsoft BizTalk® Server – providing a single interfacing point to enable multi-way exchange of information – for example, using B2MML (the XML implementation of ISA 95);
- Microsoft SQL Server™ – database engine;
- Microsoft SQL Server™ Reporting Services – integrating, aggregating, analyzing and reporting data from multiple sources.

Microsoft technologies are also used in aspenONE product development (Microsoft Visual Studio®), and are integrated into aspenONE applications in many areas. For example, add-ins for Microsoft Office system component Excel facilitate data entry, reporting and analysis. Microsoft FrontPage® is used to customize Web-page reports of information such as equipment alarm summaries and yield trend plots. Support for Microsoft's OLE for Process Control (OPC) and Component Object Model (COM) interfaces enable easy exchange of data with process control equipment.

OSIsoft (www.osisoft.com)

Process-focused manufacturing companies produce extremely large amounts of time series data from a wide variety of sources throughout their operations, front office and back office. Plant managers and business executives need access to this information in a meaningful and practical format, so they can direct operations towards increased profitability and productivity, and additionally conduct effective business planning. Information aggregation from a multitude of sources manually or through custom programming can be costly and slow to deliver business value. The OSIsoft PI System unifies the streams of information from many sources into a single, comprehensive system that enables plant managers and business executives to achieve their business goals with the highest levels of operational performance and productivity.

OSIsoft delivers the PI System as the core of its real-time infrastructure platform. As an enterprise historian, the OSIsoft PI System gathers, archives, and processes operational data from automation and control systems. It provides all the tools needed to manipulate and distribute the data, turning it into meaningful information that can be processed and viewed in enterprise applications, web portals, and graphical dashboards via standard browsers.



The PI System keeps business-critical data always online and available in a specialized time-series database by:

- Gathering event-driven data, in real-time, from multiple sources across the plant and/or enterprise;
- Applying advanced analytical calculations and business rules to contextualize and analyze this data;
- Configuring smart and thin client tools to distribute and visualize knowledge/information to display critical operational metrics and integrate the user experience across different roles within the enterprise.

Through the PI System, OSIsoft unlocks the potential of information, by bringing data to a flexible environment where users can creatively solve problems. By providing consolidated views of real-time production data for both immediate access and historical analysis, OSIsoft solutions enable people and systems to optimize operational performance, both in response to events happening now, and through longer term planning, sharing information on inventories, production capabilities, product quality, and specifications. This connection of plant operations to business decision making enables collaboration across functions and between enterprises, allowing businesses to be more efficient, more responsive, and make better use of plant assets.

OSIsoft seeks both immediate and continuing return on investment for customers through strategies such as:

- Pervasive Connectivity. Weaving an event-driven data fabric is easy and cost-effective with the PI System's extensive library of interfaces to all data sources;
- Scalable Architecture. From its inception, the PI System was designed to store, manage and retrieve information accurately and efficiently.

"Using OSIsoft's Platform is a global initiative both as an operational improvement solution and as a solid infrastructure. The power of having real-time data so pervasive across the organization is a great advantage. Making operations data available to every employee and providing the environment to make use of the data correlates with our belief that our success depends on our employees' capabilities. OSIsoft's Platform helps create those capabilities."

Head of Process Automation and MES for major global process manufacturer

The OSIsoft PI System offers a real-time infrastructure for performance initiatives such as:

- Carbon risk management and market strategies;
- Asset lifecycle management – including condition-based and event-driven initiatives;
- Downtime monitoring and overall equipment effectiveness (OEE);
- Quality assessment – including Six Sigma-compliant processes.

OSIsoft and Microsoft have been partners since 1992, achieving landmarks such as PI 3.x as one of the earliest Microsoft Windows NT® server systems. OSIsoft's use of Microsoft technologies now includes availability on the latest Windows operating systems.

"As a long-time Microsoft partner, OSIsoft recognizes the potential for how Microsoft SharePoint collaboration capabilities could dramatically change the communication landscape".

OSIsoft

Examples of specific capabilities include:

- Analysis Framework 2.0, and PI Analysis and Notifications, use Microsoft SQL Server database for data storage;
- RtPortal is a set of configurable, role-based portal and smart client tools which can be integrated with Microsoft SharePoint to display processes, documents and information for effective team collaboration;
- RtWebParts enables users to build personalized pages in Microsoft SharePoint to monitor and manage real-time operations data, and include RtMessenger's use of Microsoft Office Live Communications Server for immediate conferencing;
- PI DataLink enables a direct connection between the PI System and Office Excel to create and publish reports and perform complex data analysis, including DataLink for Excel Services' use of Microsoft SharePoint Server to view the spreadsheets in a web browser;
- Manual Logger's capability to support data entry from Windows Mobile devices to the PI System.

Siemens (www.siemens.com)

"[Our] MES system provides us with total production management, with a SAP stock data update and optimized product control."

SIMATIC IT user

Siemens' offer to manufacturing operations is TIA – Totally Integrated Automation – covering all aspects of automation and control (Shop Floor Automation) and manufacturing operations management including Manufacturing Execution Systems (MES). For Siemens, TIA ranges from the sensor, actuator and local controller level up to the interface with the business level, including ERP, Product Lifecycle Management (PLM), Supply Chain Management (SCM), Logistic Systems and so on.

Siemens is a full service supplier, able to act as provider of automation components, and also able to take responsibility for design and delivery of global automation and manufacturing execution systems projects.

Siemens has observed increasing demand for active collaboration between the business level and the plant operations level. Manufacturers today cannot simply execute plans downloaded to an MES. They need to:

- React to unexpected events in the plant;
- Balance the supply chain according to a demand that is very dynamic and may change during daily operations;
- Handle new product introduction without disrupting operations;
- Act with speed and achieve planned quality levels at all times.

This is happening in an environment that is growing in complexity due to acquisitions and new regulations. At the same time, margins are being squeezed, so manufacturers must find new levels of efficiency in production.

These growing challenges can be addressed with an infrastructure at the plant level that is fully integrated into corporate IT infrastructures, such as Service Oriented Architecture (SOA), enabling business level and plant level to interoperate in real-time. This strategy is pursued by Siemens since the beginning and SIMATIC IT (Siemens MES capability within TIA) is the product that makes it possible to achieve such interoperability. SIMATIC IT is a family of products based on the concept of framework and components.

Integrated plant models facilitate regulatory compliance

The ISA-95 compliant Plant Model maintained by SIMATIC IT integrates with the S-88 compliant Cell Model maintained by SIMATIC BATCH. Leveraging TIA, this native and flexible integration allows production operations in SIMATIC IT to interact both ways with phases in SIMATIC BATCH. Shared Electronic Batch Record and Reporting between the two products ensures easy-to-use genealogy management and regulatory compliance reporting.

In addition SIMATIC IT provides pre-built environments for handling typical process manufacturing requirements such as In Process Test, Batch Analysis, HACCP (food and beverage industry), 21-CFR-Part11 (FDA certifications), and many others. Typical cross-industry functions such as OEE and Statistical Process Control (SPC) are available out-of-the-box.

The framework (a component called SIMATIC IT Production Modeler) enables modeling the plant according to the ISA-95 hierarchy down to the equipment level, therefore matching the granularity that is normally one of the biggest obstacles for business systems to truly handle plant operations. The Production Modeler is also the environment where production workflows (in the form of rules) are defined. The rules specify the operating procedures that will physically run the production operations. For example, rules in the Production Modeler will lead to a decision that two material-lots are transformed into a single new one, drive the required material-lot transformation, and build the genealogy records.

To synchronize this with the business level, SIMATIC IT offers interoperability through a component that is a message broker for transaction handling. This component is able to communicate to the outside world through all the most common standards including, among others, XML (and in particular B2MML, Business to Manufacturing Markup Language, the XML implementation of ISA-95 for the manufacturing environment). Additionally it supports communication to proprietary formats, for example SAP's IDoc and RFC protocol. This component is the natural interface to middleware solutions such as BizTalk server. SIMATIC IT's library structure provides a flexible and easy to install solution, which enables manufacturers to:

- Gain visibility of their operations;
- Take decisions based on real-time information;
- Ensure that information about production and demand flows smoothly.

SIMATIC IT unlocks incremental benefits through ERP by sharing higher quality manufacturing information between manufacturing operations and the business. By sharing this information, it becomes possible for executives, line-of-business managers, and plant users to achieve unified yet customized visibility and enjoy state-of-the-art decision support in real time. A shared, consistent view of key performance indicators (KPIs), alerts, exception warnings, and tailored reports all contribute to improving business agility.

"The integration of ERP and MES allows us a complete automatic data flow from customer to our assembly line. Together with the automatic monitoring of all processes, this is of great benefit for the business".

SIMATIC IT user

Production personnel can operate at a lower cost through proactively managing exceptions and KPI deviations. Different lines of business can monitor, measure, and control efficiency and actual production costs, sharing the right information in the right context. Different users in the operational hierarchy can share information, aggregated in different ways according to business need. For example, if a sales team is using 'capable-to-promise' functions of a business system to agree delivery dates, the accuracy of current and forecast availability of production capacity is critical. SIMATIC IT integration with business systems offers the most up-to-date production information available. Faced with a priority order, the sales team and the operations team can collaborate, using consistent information, and decide what action to take.

Siemens' entire TIA product portfolio is based on Microsoft technologies and all SIMATIC IT products are developed using Microsoft Visual Studio and Microsoft Visual Studio® .NET environments. At an application and user interface level, Microsoft Office system component Excel is one option for visualization and analysis of information.

SIMATIC IT products are structured as three tier applications:

- On the presentation tier, Microsoft Internet Explorer® is used to display Microsoft .NET screens that help users to interact with the system and carry out production management activities;
- On the business tier Microsoft Internet Information Services and Microsoft .NET Framework are used to manage access and interaction with SIMATIC IT Data Servers;
- On the data tier Microsoft SQL Server 2005 (32 and 64 bit) is used to store SIMATIC IT data. Transactional support is provided by Microsoft Distributed Transaction Co-ordinator (DTC), while multi-processor structures are handled with the support of Microsoft Clustering Services, if the customer requires it.

SIMATIC IT Application Servers expose standard COM interfaces and, using SIMATIC IT Cross Industry Library components, can interact with B2B systems such as Microsoft BizTalk Server using B2MML messages. User interfaces for MES users are developed as Web Applications using a customization of Visual Studio .NET.

Wonderware (www.wonderware.com)

Wonderware, a business unit of Invensys, provides automation and information software solutions for manufacturing and operational performance improvement to help optimise industrial organisations. Wonderware developed the ArchestrA® architecture for Invensys, based on future project goals that were being set by customers. The ArchestrA technology enables secure connection to almost every data source and control point found in a manufacturing facility and supports integrated access to consistent real-time, control system and business application information.

"Using Wonderware software, we've increased our productivity by 30%".

Plant Manager, ST Powder Coatings, Italy

In the past, PC-based automation systems started as single computers connected to a machine or specific manufacturing equipment. Customers focused on automation of individual pieces of equipment, processes, or plant areas; or they started to centralize plant manufacturing information. Now, customers are aiming to optimize their entire manufacturing enterprise, using consistent application solutions.

Targets include:

- Improve KPI's to be comparable with, or better than, competitors;
- Reuse best practice for plant optimization and supply chain integration.

Achieving this locally is not good enough. It is necessary to take into account all of their plants as well as the demand and availability signals that come from customers and suppliers.

Manufacturers need solutions to help ensure that defined processes are enforceable, repeatable, and appropriately automated. Wonderware recognizes that for leading companies, this is just one side of the coin because, for leaders, the most critical performance edge often comes from empowering the people involved. Each manufacturing corporation possesses a unique set of cultures, management structures, and skill sets that need to be supported with specific views of production and performance. This visibility needs to be available in real-time, to enable the collaborative efforts of the right people to be harnessed quickly to react to inevitable variations in customer orders, materials and feedstocks, and plant asset availability.

"Wonderware software solutions has allowed us to work as a team to pull operations, mechanical, electrical together, to be able to collect data, analyze it, make improvements to the process to produce more tonnage and produce higher quality."

Melt shop manager, Nucor Steel, Berkeley, South Carolina, USA

The CFO, COO, Plant Manager, Operations Supervisor, Plant Engineer, Process Engineer, Maintenance Manager, Quality Manager and Plant Floor Operator all need different views of information, and can initiate different actions according to their roles. The ArchestrA industrial Services Oriented Architecture provides orchestration and a flexible information model as a unifying layer on top of the different existing systems in manufacturing environments. This enables secure, reliable delivery of harmonised information in views tailored to the individual user. In this way, every dashboard, scorecard, alerting display and portal used at every level can be based on actual status information. The result is consistent information that helps align collaborative efforts to analyze "what if?" and "can we meet this request?" types of questions. By integrating plant automation and business systems with the Wonderware System Platform, built on ArchestrA technology, Wonderware software solutions create a collaborative environment for all of the people involved in manufacturing operations.

All of these ArchestrA based, Wonderware software solutions are built on top of Microsoft .NET and Microsoft server technologies. Add-ins enable Microsoft Excel and Word users to create reports from the same information used for production management. Integration of manufacturing applications with Microsoft SharePoint supports distribution and sharing of documents. Microsoft SQL Server database is used as the core manufacturing information repository, and to manage the plant application configuration database. XML, Web Services, and Microsoft BizTalk Server are used to integrate business systems and plant systems. Together with Wonderware's ArchestrA technology, this approach enables connectivity of plant systems both through industry standards such as OPC and also using more than 325 legacy network and automation system protocols.

"By using the Microsoft environment for connectivity and data management, Wonderware software solutions provide integrated, secure information to support collaboration, decision making and action. The specialist using a spreadsheet can use the same flow-rate information that the process operator sees; a supplier's business system can detect when a feedstock should be replenished; if something unexpected happens, a team can quickly take action based on consistent information. All this can cover both local operations, and a globally distributed value chain."

Wonderware

Information and Communication Technology for Collaborative Environments

Freedom and flexibility

For most manufacturing businesses, the top priority is to choose an approach that offers flexibility. This is important because it is difficult to predict exactly how future collaborations will develop. Therefore, the chosen ICT architecture must not restrict future choices. For example, every collaborating partner wants:

- Freedom of choice of applications;
- Freedom to use any application in any collaboration;
- Freedom to collaborate with every chosen partner.

These basic objectives have important implications. Not all approaches to ICT deliver freedom in these areas.

Single application?

For example, one approach to ICT for collaboration is to use just one application solution or application backbone. The theory is to encourage communication and collaboration by providing the same application environment for everyone. Obviously, this approach restricts choice of application to the chosen application or one that integrates with its backbone. This means that at least some individuals and groups in the collaborative network will believe they are being forced to use an application that is not optimum for their task.

What happens if the people, departments, or companies involved discover a new, innovative application that would transform the performance of their task? Should the new application be used? If it is not easy to use the new software, then the collaboration itself will be seen as a barrier to progress (even though in fact it is the choice of a single application solution that is the barrier). In this case, the operational decision to base collaboration on a single application solution could undo all the strategic benefits of encouraging collaborative work.

Industry standards

Fortunately, there is an alternative, better way of building collaborative ICT environments. This is to use applications that implement industry standards for data communication and co-ordination. These applications can then be deployed in an architecture that supports flexible data sharing, industry standards, and advanced user interfaces in a way that is independent of the applications.

This gives every partner in the collaborative group some independence in selection and deployment of applications. Each application can run on industry standard platforms. By using industry standard data communication, each application can 'plug-into' the backbone of the collaborative environment.

A top-level specification for a collaborative environment

- Use standards to allow inclusion of disparate, heterogeneous applications, systems and networks;
- Match the new structure of industries, which may need collaboration at individual, team, department, and company levels;
- Support flexible and configurable user interfaces;
- Present data from multiple sources;
- Support both group and individual needs;
- Automate the process of collaboration where possible;
- Model the process;
- Configure the process to eliminate routine information handling steps.

Why a Microsoft collaborative environment?

Microsoft is dedicated to developing products for the many sectors of the manufacturing industry – everything from oil and gas, chemicals and consumer goods to automotive, aerospace and high tech. Microsoft products offer best-in-class performance along with great value. Our promise to you of effective, manageable, cost-effective software rests on four foundations:

Familiar and Easy to Use

Microsoft software is familiar and accessible to people at all levels of your organization, as well as to your partners and customers. From tools for developers to systems and infrastructure for IT professionals to applications for your employees, Microsoft software vastly reduces training time and makes people more productive more quickly. When a business empowers its people with easy to use software, Microsoft calls this a **people-ready business**.

Widely Used and Supported

Microsoft makes some of the world's most widely used and supported software, ensuring that our customers will always find it easy to get the help they need to solve technical issues and have questions answered. In addition to our Microsoft technical support services, a worldwide network of developers, support professionals, and thousands of certified partners means you always have access to the expertise you need.

Integration That Works

Manufacturers everywhere already have spent large sums on technology, creating a pool of technology that is expensive to abandon but also costly to maintain and make available throughout an enterprise. Microsoft is at the forefront in developing tools such as Web services that can connect and stitch together far-flung data sources that until now were isolated from one another. Moreover, our software is designed to work together seamlessly, reducing integration hassles.

Software That's Innovative

At Microsoft, we are committed to developing software products that help manufacturing employees reach their full potential. We will continue to create new products that allow a business to evolve and adapt to an increasingly complex marketplace. Our commitment to and leadership in industry-standard technologies such as Web services ensure that companies who use Microsoft products have access to the widest possible array of technology partners and software platforms.

A Microsoft collaborative environment

Microsoft Office provides the familiar environment that encourages collaboration across the widest possible community.

Microsoft Windows supports the basic infrastructure of servers, clients, mobile devices and specialist devices. Microsoft technologies support integration pathways in the three technology categories – asynchronous, real-time, and business process – which together support people, systems and applications to achieve automation, planned collaboration, and ad-hoc collaboration:

Asynchronous collaboration

For example, e-mail, shared information access, and discussion boards, where information is delivered now, and the response can be immediate or later, supported, for example, by Microsoft Office Outlook®, Microsoft Exchange, Microsoft Office (document mark-up and review), Microsoft SQL Server and Microsoft Office SharePoint Server.

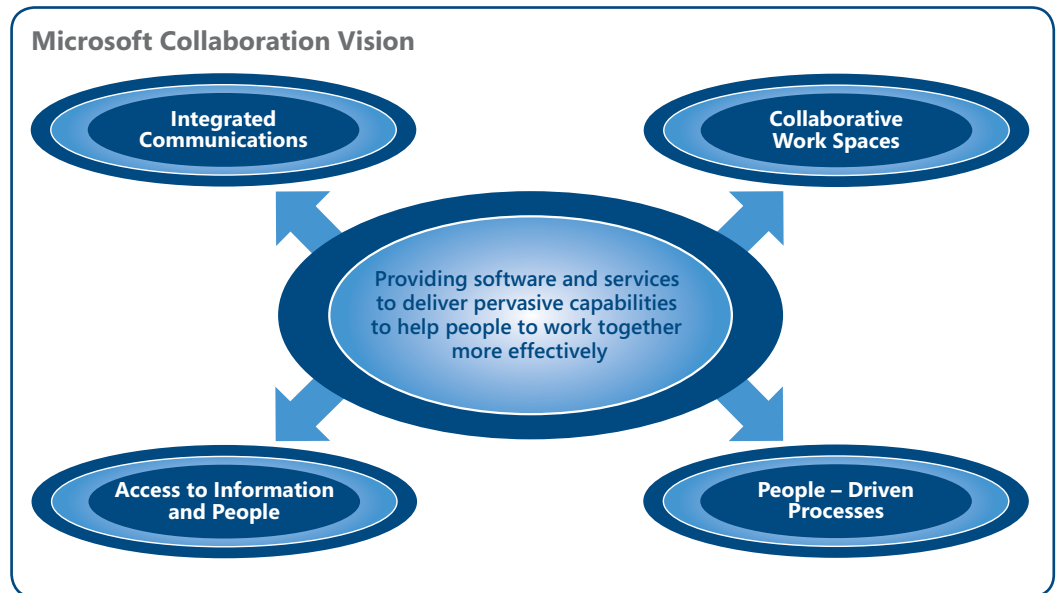
Real-time collaboration

Unified Communications where voice and computer-based communications are combined seamlessly for the user. Also, instant messaging and conferencing, where people respond immediately to voice, video or instant messages, supported, for example, by Microsoft Office Live Communications Server, Microsoft Live Meeting, Microsoft Live Messenger™.

Business process collaboration

Microsoft BizTalk Server is the central hub through which systems and applications implement automation and workflows by sending and receiving information. Microsoft capabilities are delivered and supported by global and local organizations around the world.

Conclusion



Microsoft has emerged as a leader in infrastructure-level collaboration services and is uniquely positioned to further its lead based on several critical differentiators:

Deep understanding of end user needs: From its 30 years creating desktop software, Microsoft has developed an unparalleled understanding of end user needs and behaviours. Microsoft Office productivity tools are world-class, market-leading products that continue to lead because of a tremendous R&D investment. Collaboration is the place where technology and people meet, and Microsoft has demonstrated success in creating software that works the way people work.

Proven infrastructure-level integration: Microsoft was a pioneer in integrating collaboration capabilities into the operating system infrastructure, with the introduction of Windows SharePoint Services. Microsoft is expanding infrastructure-level collaboration by making capabilities such as presence and personalization integral to its products. This gives information workers instant access to collaboration through products they already know and use, providing immediate productivity improvements. It also provides IT with a way to deliver new functionality while minimizing effort and cost.

Vibrant and extensive partner and developer ecosystem: The Microsoft ISV, developer and partner ecosystem is the richest in the world, providing more choices and lower costs for companies seeking to customize solutions based on Microsoft technologies. Partners are critical to the Microsoft business model, providing extensive local resources, innovation and support for customers worldwide.

Commitment to standards-based interoperability: Microsoft has a longstanding commitment to standards, such as XML and Web services, that allow organizations to create heterogeneous solutions that rely on Microsoft solutions working seamlessly with third-party applications.

Security: Through its Trustworthy Computing initiative, Microsoft has implemented an enormous drive to ensure a safe and secure computing environment. This has been driven into all Microsoft products right from design to development to testing to deployment. Microsoft has also developed White Papers for how secure the plant floor and the systems infrastructure which is connected to this is.

By using Microsoft capabilities to configure applications into collaborative environments, manufacturing companies can transform performance:

Efficiency. Collaborative environments help manufacturing networks to operate efficiently. Activities that were previously performed sequentially, with data passed from one person, department or company to another, can be replaced with a set of real-time collaborative sessions, sharing and updating master data. In some cases, it will be possible to automate interactions and achieve even greater time and accuracy gains.

Innovation. Collaborative environments help drive innovation. Communication between collaborating partners stimulates breakthrough developments in products, services, operations and marketing – as well as the small incremental innovations that polish and improve products and processes.

Strategy. Business leaders of companies that are strong in collaboration have new freedom to plan strategies and design value networks that match resources and skills to tasks. Geographically-dispersed sites and company boundaries are no longer barriers.

Opportunity. Collaborative environments tame the uncertainties of the market for manufacturers. For companies that understand collaborative environments, the growth of partnering in every area becomes an opportunity to create competitive advantage and manage risk – instead of a threat of lost value add and lower margins.

Microsoft offers efficiency, flexibility, and choice, together with a vision for the future that encompasses advanced collaboration and innovation. Microsoft technology is used by leading software vendors as the environment for innovative collaboration, providing manufacturers with freedom of choice and the opportunity to deploy tools that lead to new revenue streams and growth.

More Information

If you would like more information, please email the Microsoft Manufacturing team at **alfredoc@microsoft.com** and **nick.barnett@microsoft.com** or visit **www.microsoft.com/manufacturing**.