

November 2012

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Thought leadership from Atos

***white
paper***

**The
convergence
of IT and
Operational
Technology**

Operation Technology (OT) supports physical value creation and manufacturing processes. It therefore comprises the devices, sensors and software necessary to control and monitor plant and equipment. Information Technology (IT), on the other hand, combines all necessary technologies for information processing. During the last decades, most industries have developed and managed OT and IT as two different domains, maintaining separate technology stacks, protocols, standards, governance models and organizational units. However, over the last few years, OT has started to progressively adopt IT-like technologies. IP (Internet Protocol), for example, is gaining acceptance as an all-purpose networking protocol and Windows™ is more and more frequent in a wide range of devices. The convergence of IT and OT will bring clear advantages to companies including cost and risk reductions as well as enhanced performance and gains in flexibility.

A prerequisite to achieving these benefits is that strategic, organizational and technological challenges are mastered. Implementing what could be called IT/OT convergence, i.e. the end-to-end management of IT and OT, successfully implies that IT and OT Strategies are harmonized, common governance and process models are installed, security and data are managed centrally and resources are re-skilled to understand and know the requirements of both disciplines.

Change Management is required to ensure that the implementation process runs smoothly accompanied by consequent stakeholder management and open communication. In addition, the implementation of a joint IT/OT concept has to be step-by-step to demonstrate short-term benefits to all parties involved.

The reasons for IT services players to engage in IT/OT convergence are centered on business impact, i.e. the commercial opportunities that IT/OT creates for industrial customers. The value add can only be assured if challenges like pressures on production cost or a reduction in time to market for newly developed products, for example, can be mastered. IT/OT also opens up additional business to the mutual benefit of customers and vendors by defining and marketing new offerings including IT/OT strategy and governance consulting - or a solution that manages the transition of a product between R&D and operations.

The following defines a concept of what an integrated IT/OT landscape could look like.

Elements dealt with include:

- ▶ The development of production networks as well as the inherent separation of office (Office-IT) and production IT (Enterprise IT)
- ▶ The reasons companies should think about IT/OT convergence
- ▶ The strategies that lead to a successful convergence, addressing strategic, organizational and process-related challenges
- ▶ The opportunities that IT/OT convergence provides to different industries and their operations
- ▶ Future opportunities for industrial companies stemming from the optimization of their IT/OT landscape

The convergence of IT and Operational Technology

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About the Atos Scientific Community

The Atos Scientific Community is a network of some 100 top scientists, representing a mix of all skills and backgrounds, and coming from all geographies where Atos operates. Publicly launched by Thierry Breton, Chairman and CEO of Atos, the establishment of this community highlights the importance of innovation in the dynamic IT services market and the need for a proactive approach to identify and anticipate game changing technologies.

Historical Background

Looking back in history, Automation Technology has seen impressive development in its support for the optimization of production processes, especially in the manufacturing industry. Siemens AG, for example, made early and repeated decisive contributions to developments in automation which have ultimately resulted in the current advanced state of Automation Technology. The world's first electric reverse drive was constructed as early as 1906/07 for a steel block production line of Georgsmarienhütte in Germany. In 1959, system control modules were introduced to the market which featured logical links so that storing, counting and arithmetic computing could be carried out.

The subsequent development of the positioning and line control of machine tools and other equipment, especially during the sixties, led to the introduction of devices that made working in more rational ways possible. Today, fully-integrated automation (totally integrated automation) represents a fully consistent way of executing industrial automation tasks. It allows the usage of different technologies within overall systems for common data storage.

The above suggests that automation technology is still, and will potentially continue to be, in a period of significant change. The introduction of IT was a major driver of change, again with a notable start in the sixties. It is easily imaginable that automation technology's development relies more and more heavily on IT and its capabilities. From an IT perspective, there is much OT to be assessed.

Today, fully-integrated automation represents a fully consistent way of executing industrial automation tasks.

Current Situation in IT and OT

Atos' Definition of IT and OT

IT is a widely known and understood term; nevertheless for the purposes of this paper a specific definition is introduced: IT is considered to be the whole technology stack, including the hardware infrastructure and software applications used to transform data. An IT system can therefore be defined as an engine that accepts data flows as an input to deliver a new data flow, but does not interfere with the physical world. Examples of relevant IT systems include ERP (Enterprise Resource Planning) systems or CRM (Customer Relationship Management) applications.

This paper defines OT as the set of devices and processes that act in real time on physical operational systems, like electricity distribution networks, facilities or vehicle production plants. Examples of OT elements include MES (Manufacturing Execution Systems), SCADA (Supervisory Control and Data Acquisition), meters, valves, sensors and motors, etc.

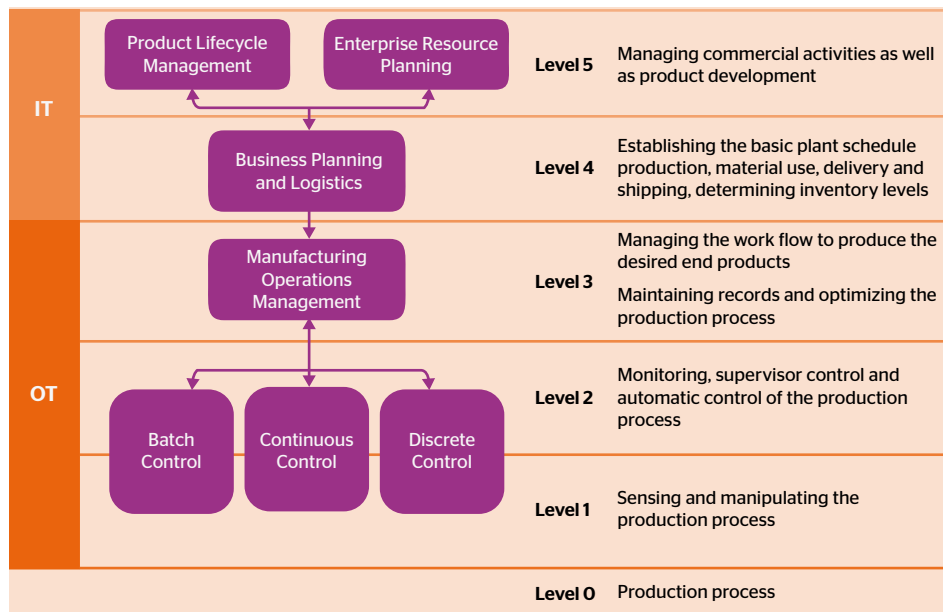


Figure 1

For a comprehensive overview of IT and OT, Atos uses the ISA 95 model. ISA is a non-profit and globally operating organization that sets globally accepted standards for automation.

ISA 95

ISA 95¹ is the international standard for the integration of enterprise (IT) and control (OT) systems. It comprises models and terminology that can be used to determine the information to be exchanged between commercial IT systems (e.g. finance and logistics) and systems for production, maintenance and quality. The information is structured in unified modeling language (UML) models which also serve as a base for the development of interfaces between IT and OT systems.

Figure 1 gives an overview of the spread of IT and OT components along the different layers.

¹ Definitions deducted from A-95.com; ISA European Office 2010

Disconnection: Separate IT and OT Silos

Technology Misalignment

Historically, the design of OT systems had to meet specific requirements including real-time availability and the introduction of technical data, like temperatures and liquid pressure, as well as resistance to specific environmental conditions, such as moisture and vibration. These aspects were not necessarily covered by equipment that had been designed for IT purposes. Twenty years ago in the time of thin-Ethernet cabling, for example, Ethernet and TCP/IP communications were not considered an option for OT due to their fragility and cost. Instead, simple wired communications were designed and hence thousands of kilometers of RS232 (V24) cables were deployed. Since then, this has changed dramatically. Recent devices that support TCP/IP and other forms of Wi-Fi (IEEE 802.11) networking can meet most of OT requirements.

Another important misalignment refers to operating systems (OSs). Traditionally, a choice needed to be made between time-sharing OSs (for IT) and real-time OSs (for OT), as no architecture was able to satisfy both needs at the same time at a reasonable cost. With the increase of embedded systems' capacity and the deployment of event-driven architecture ('RT-SOA' or Real-Time Service Oriented Architecture), there is now growing usage of traditional IT OS (Unix-like or MSFT Windows) integrated in the OT environment.

These kinds of historical technological constraints led to the development of a complete set of specific OT standards, covering areas from communications to security and process integration. Most of these standards are now de facto and promoted by large OT players (or a group of providers), like Westinghouse, Siemens, Rockwell and Invensys.

Cultural Aspects

OT departments within companies are usually made up of industry specialists, e.g. mechanical engineers in a machinery company. The people who make up these departments are educated in engineering schools and universities and a kind of 'endogamy' effect can be observed, exchanges with the world of IT are limited. Likewise, IT professionals often have a

computer sciences or commercial background. They are not necessarily interested in 'real-world' OT techniques, but are able to adapt to the latest IT concepts quickly. The differences in employee profiles between IT and OT have evolved from the organizational separation of the two domains: the production-oriented world of OT and the commercially-oriented world of IT. Since the technology and platforms used in IT and OT are becoming more and more similar, the profiles and skills of employees working in these disciplines are also converging.

Ownership and Governance

Today, IT and OT often have different 'owners' within an organization: IT platforms and processes are typically 'owned' by the CIO and managed by a centralized organization made up of software, hardware and infrastructure specialists. This organization 'owns' the IT systems found in all business units to enable the harmonization of systems throughout the company. This implies that CIOs largely impose governance on IT-related strategies by setting company-wide standards concerning the software and hardware products to be used and the way infrastructure is managed.

CIO vs. COO

OT is normally 'owned' by business unit or production managers, often at COO level, who have profit and loss responsibility. That means that harmonized systems across business units and even production sites within one business unit are scarce. Managers' objectives and associated indicators may differ from one unit to another, but they always direct business outcomes. There is rarely central governance to cover the definition and execution of company-wide OT strategies as responsibilities are scattered, as explained above. The different paths OT and IT have taken during the last decades are, to a large extent, the result of organizational partitions within companies. Therefore, a major issue in the convergence of IT and OT lies in adapting the organizational set-up to provide for common structures.

IT/OT convergence also requires the application of the same governance framework. ITIL (Information Technology Infrastructure Library) serves as an example; it is extensively used for service management in the IT world, but can, and is already, also applied for OT, with similar benefits.

Motivation: Companies starting to think about Convergence

There are currently two drivers for the promotion of IT/OT convergence: economic pressures resulting from globalization and intensifying competition and the benefits and eventual competitive advantages that stem from the integration of these disciplines.

Benefits of IT/OT Convergence

IT/OT convergence is beneficial to companies in many industries, from manufacturing to telecommunication and utilities. The benefits will be different for each sector in type and also volume. Usually, the expected benefits will be more significant in businesses where there have already been large investments in OT, for example manufacturing and transportation. Nevertheless, there will be common benefits found across all industries that strive to converge IT and OT, such as:

- ▶ **Cost reduction:** By applying similar technology, standards and governance principles for IT and OT, easy-to-convert synergies will be found in many organizations. Nevertheless, in most cases, cost cutting should not be the only visible driver as it is likely to lead to strong resistance from OT departments that foresee their disappearance within a global CIO office.
- ▶ **Risk reduction:** IT/OT convergence means security issues can be jointly addressed by IT and OT, leading to an integrated approach that provides enhanced security against intrusions from outside the company and to central security governance throughout the company.
- ▶ **Enhanced performance:** With the integration of IT and OT, time and costs will be saved by allowing for the smooth transition of newly-developed products into existing manufacturing operations, avoiding scrap and reducing time to market.
- ▶ **Flexibility gains:** IT/OT convergence will provide better transparency with regards to costs and cost structures and therefore lead to site efficiencies. The company will also become more flexible, allowing for manufacturing to shift between locations ('produce anywhere').

The IT/OT Challenge

Challenges to Master

As there is a strong case for pursuing IT/OT convergence, its realization also demands that different types of challenges are met, as categorized below:

- ▶ Strategic
- ▶ Organizational
- ▶ Technological

The following section explores current challenges and trends concerning IT/OT convergence.

Strategic Challenges

In order to execute IT/OT convergence, the strategies of a CIO responsible for IT and production management (e.g. a COO) responsible for OT will have to be unified. This is a major prerequisite to the successful convergence of the two disciplines, as there are currently multiple responsibilities with limited or no integration of business and technology strategies within most companies

Organizational Challenges

The current separation of the OT and IT domains implies that organizations supporting both disciplines have developed separate structures and processes. The challenges to overcome these separations include:

- ▶ The development of joint bodies and governance structures to align IT and OT
- ▶ The joint management and execution of cross-technology projects
- ▶ The harmonization of duplicate and/or overlapping processes
- ▶ The development of inter-disciplinary skills within both domains which acknowledge the needs and requirements of both
- ▶ The abolishment of split responsibilities between IT and OT, especially concerning security
- ▶ The joint management of the now separate infrastructures

Technology Challenges and Trends

Atos' prediction is that there will be two major fields of action for IT/OT convergence in the future:

First the integration of ERP applications, MES and shop floor systems along the levels defined by ISA 95 and, secondly, the integration of PLM systems and MES (Level 3 and Level 4) when it comes to the transition of a ready-to-market product into production. The challenges and trends for both areas are described below.

IT/OT Convergence Strategies

In order to successfully converge IT and OT, the challenges stipulated above have to be mastered. Convergence success will very much rely on the proper execution of the implementation of an IT/OT solution, i.e. assuring the 'buy-in' of managers and users from both disciplines and setting up structures that will ensure that the implemented solution can be maintained and operated over its complete lifecycle. In short, the success of IT/OT convergence will be dependent to high degree on whether a company will succeed in establishing joint structures and processes between the disciplines.

Analysts like Gartner foresee a major role for the CIO with regards to IT/OT convergence. The CIO's authority will change from leading the IT organization to "leading the exploitation of the business assets of processes, information and relationships across all technologies in the enterprise", which will also include OT to a large extent. The reasons behind this lie in the IT technologies (described above) that are finding their way into OT as well as the methodologies and organizational concepts that have already been successfully employed in IT and which form a base for IT/OT convergence implementation.

Successful IT/OT convergence will thus comprise the close alignment, and respective harmonization, of strategies, organizational set up and data, as well as the re-skilling of the workforces involved.

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Harmonization of Strategies, Processes and Organization

A major milestone on the road to success for integrated IT and OT is the harmonization of their strategies. This requires that IT and OT managements are willing to systematically cooperate in all relevant areas and practice open and frequent communication. In particular, they will have to follow the guidelines² outlined below:

- ▶ Agreement and set-up of a **common governance model**: This represents the base for future collaboration. It implies that solutions, technologies, policies and procedures involving IT and OT will be harmonized. Instead of having different responsibilities, there will be central bodies incorporating IT and OT expertise that will define the rules and guidelines for both disciplines in the future. This also implies that in the final set-up, existing IT and OT organizations will be replaced by a common organization headed by an IT/OT Chief Officer. This organization will incorporate functional units including business process management, application management, technology, resource sourcing and infrastructure management. This also means that there will be an overall architecture model based on common standards (e.g. ISA 95) which will determine the integrated system landscape. In addition, procurement policies will be standardized, providing for common and binding hardware and software baskets. In addition, software configuration and distribution will be harmonized and supported by a common toolset. System infrastructure is also likely to be harmonized and managed by a central infrastructure unit making use of standards such as ITIL (Information Technology Infrastructure Library).
- ▶ Duplicate and/or overlapping **processes will be harmonized** and governed by the policies, workflows and structures defined by the governance model and integrated organizational set-up described above.
- ▶ Definition of **common key performance indicators (KPIs)**: a major factor for the success of IT/OT convergence is that its implementation is closely tracked and enforced. This includes the introduction of a common set of KPIs measuring implementation progress.

Central Data and Security Management

Exposing OT systems to potentially open networks which are currently found in the IT world brings new challenges that have to be properly addressed in a converged IT/OT environment.

Re-skilling of Resources

Gartner sees IT as the lead when it comes to the management of governance in a future harmonized IT/OT environment. This is mainly due to the advanced governance concepts already employed by IT. Nevertheless, it also implies that the IT personnel involved in setting up the governance structure have to acknowledge the demands and characteristics of OT. In short, they will have to enlarge their skillsets by adopting OT know-how in order to fully integrate OT systems and infrastructure into centralized technology management. In particular, they will have to acquire knowledge about real-time intelligence systems and shop-floor system infrastructure so that they can successfully manage the future IT/OT world. Future teams employing governance in this environment should consist of joint forces comprising IT and OT experts.

Gartner sees IT as the lead when it comes to the management of governance in a future harmonized IT/OT environment.

² IT and Operational Technology: Convergence, Alignment and Integration, Gartner 2011-02-15, G00210814

Implementation Strategies

Process Harmonization

There are two aspects with regards to process harmonization: First, the common governance model will provide for harmonized processes that will govern the definition of policies, workflows and structures. Second, IT/OT convergence will also imply the harmonization of the business and/or core processes to which the IT and OT solutions will be applied.

Many companies make the mistake of only focusing on the alignment of technology when considering IT/OT convergence. In order to exploit the full benefits and encourage the buy-in of employees for an integrated IT and OT world, it is crucial to also harmonize the company processes supported by the two disciplines. The focus here will be on the reduction of existing process loops and overlaps in the support solution. This implies that a common understanding of manufacturing processes is established among system users; including the development of a common role model that will make responsibilities, tasks and supporting activities and the people who execute them transparent to everyone affected by IT/OT convergence.

A common business process management (BPM) function with the responsibility for maintaining processes over time will guide these activities.

Technology Harmonization

Enterprises are continuously evolving into more dynamic and complex business environments. Every part of an organization, including product development, supply chain and manufacturing, has to be able to respond to change within the shortest possible timeframe. As a general principle, IT systems which cater to downstream processes need advanced information about activities that are to be carried out. This helps to reduce the time and costs involved in product development and manufacturing.

There is therefore a need to build an agile enterprise application platform which helps a company to be proactive in carrying out its core activities. To facilitate such tight and effective integration in a modern enterprise, a service-oriented architecture to support both macro and micro-planning is applied. Current and future research focuses on the implementation of end-to-end service-oriented manufacturing process planning for enterprise application integration.

Step-by-step Implementation

IT/OT convergence generally means a complete change in the governance and management of PLM, ERP, MES and shop floor systems.

This change cannot be effected in one go that a company has to maintain and operate its daily business with no or very limited impact stemming from its IT/OT convergence efforts.

Therefore a step-by-step implementation approach is recommendable:

► **Identification of feasible IT/OT convergence projects³:** This approach calls for the undertaking of pilot projects that promise swift realization, offer tangible and sustainable benefits and represent a comparably low risk for the company (e.g. no danger of a production breakdown) and low risk to fail. The team involved in these pilot projects should consist of the best resources the company can provide mixing IT and OT. Management should also be closely involved in these projects, e.g. as project sponsors. The purpose of these pilots is to gather experience in IT/OT convergence, to train excellent resources who can serve as multipliers in future projects and deliver positive results that create a positive attitude towards IT/OT convergence. The pilots should act as 'ice breakers' to pave the way for future projects.

► **Piloting a governance model⁴:** As seen above, central governance is crucial to the success of IT/OT convergence. Since it will take substantial time to set up a complete governance concept, the starting point can be to conduct a governance pilot based on one of the pilot projects. This means to appoint governance for a system within a pilot to an existing governance body. Since benchmark governance models are often found in IT, most companies would appreciate the governance imposed by IT which would then be extended to include the OT part of the solution. The lack of OT know-how on the IT side is to be compensated by including OT experts in the governance planning team. The organization can learn by employing a virtual IT/OT team to manage integrated solutions in the future and to use the experience gained in the set-up of the common governance model.

³ Based on material from : Smart Grid The IT-OT Convergence Help & How-To Special Issue, October 2011

⁴ Based on material from : The Management Implications of IT/OT Convergence, Gartner 2011-03-04, G00174016

Change Management during Implementation

In order to successfully arrive at an integrated IT/OT environment, the implementation of strategies and concepts will be critical. Nevertheless their implementation will not be automatic. It will require a substantial change management effort to achieve acceptance by all company personnel involved. The following concepts represent major steps to accompany the implementation of IT/OT convergence.

Stakeholder Management

The support of management to drive IT/OT convergence is the starting point for all activities. Therefore, it has to be assured that the company's management, including top management (e.g. CEO and CFO), IT management (CIO) and OT management (production or unit management), commit themselves to IT/OT convergence and actively support it in front of their employees.

Communication

Communication should be carried out to inform, track and gather information about IT/OT convergence projects. Communication should target all parties involved and convince them of the benefits of IT/OT integration. The following communication instruments could be employed:

- ▶ (Virtual) IT/OT convergence hotline: problems can be escalated and questions forwarded to the implementation team by using an intranet application
- ▶ Executive talks: regular exchanges with company management with regards to IT/OT convergence activities and offering feedback from employees (input for further activities)
- ▶ Intranet page: provision of up-to-date information about IT/OT convergence projects;
- ▶ Newsletter: information from everyone touched, either in general or in particular by (specific) IT/OT convergence projects
- ▶ Information kit: general information package (presentations and/or handouts) to outline the benefits of and activities involved in IT/OT convergence

Communication encourages acceptance of IT/OT convergence within the company. The approach can be extended to include face-to-face interviews with employees at different levels to receive feedback and to measure the effectiveness of the communication. This also provides an indicator for the information forwarded by management to employees. In this way, deficits in communication as well as 'filtered' information can be easily detected and countermeasures can be defined and taken.

The success of realizing IT/OT convergence is very much dependent on 'soft' factors such as overcoming internal resistance and breaking up structures that have evolved over decades. Therefore, successful implementation depends as much on a consultative approach convincing stakeholders of the benefits of IT/OT convergence as the solution itself.

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A World of Opportunities

The next chapter deals with interesting examples from diverse industries that offer an overview of the opportunities that exist for IT/OT convergence. They also give hints to possible future developments in this area.

Manufacturing and Process Industries: IT/OT Strategy for PLM/MES Integration

Global markets and increasing product complexity put high pressure on today's manufacturing industry in terms of cost reduction and productivity. PLM-MES integration has become crucial to achieving this. The systematic improvement of collaboration between design and production, in terms of processes and systems, sustainably increases product quality. An innovative PLM system is the source of not only product but also process definition. The Bill of Process (BoP) therefore provides traceability to the Bill of Materials (BoM) to leverage PLM's configuration and effectiveness controls. Manufacturing process management defines and manages the complete BoP within the PLM system. Documentation and the follow-up of processes is carried out in the MES, which reshapes theoretically-designed processes to make them fit the reality on the shop floor.

As-build information is a strategic asset when it comes to maintenance, repair and optimization (MRO), and therefore needs to be reliably documented and available in both systems, which can be done via a platform provided by PLM-MES integration. The accuracy of data will also be ensured by proper root-cause analysis from MES, which includes real operational and output data.

Considering this, the proper integration of systems is vital, otherwise data would 'manually' be passed from PLM to MES. The digital factory has evolved from a theoretical idea to a real business requirement.

Atos suggests a holistic approach to the integration of PLM and MES, starting with clearly defining roles and interfaces. The questions "Where does PLM end?" and "Where does MES begin?" need to be answered. With the landscape clearly structured, infrastructure can be developed to harmonize information between engineering and manufacturing.

Firstly, an overall data backbone for all processes and functionalities for products and production must be implemented. In this context, PLM provides the planning information about how the product will be produced and the MES serves as the execution engine to realize the plan and BoP. As a next step, the information provided by PLM needs to be reshaped. It is important to increase the amount of detail included in product information to cover machine programming, operator instructions and task sequencing. Work plans, routing and BoP will serve as binding issues between PLM and the MES. To close the loop, the MES will automatically provide execution data to ensure holistic and reliable product information in the MRO stage.

Change Management in Operations

To use a production line effectively, interfaces between individual layers must be as seamless as possible. In this context, the targeted distribution of real-time information to the people affected within the production process is particularly important. The interaction of the upper layer is vividly shown in Figure 2.

As Figure 2 shows, different layers are not sequentially integrated, but rather form a network and circulation process. Central and direct coupling to mechanical production processes is also clearly shown as an example of assembly line production in the automotive industry. Often, the operation and maintenance of individual layers resides with different service providers; interfaces to coordinate process participants have been a challenge since the beginning of production line automation. Likewise, there is a continuous need for coordination, which is traditionally achieved via coordination meetings between individual service providers or teams in the plant. The continuous use of IT to connect layers to one another allows for a personalized individual information supply to be achieved and complexity to be significantly reduced.

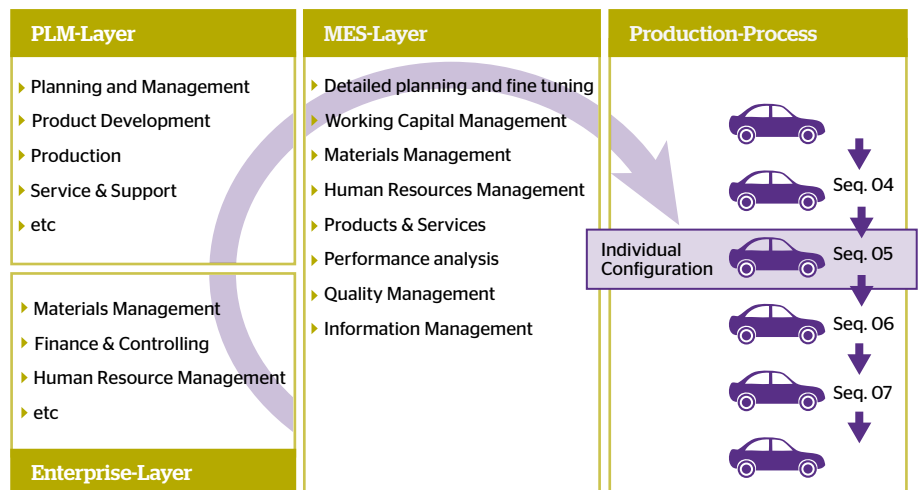


Figure 2

Opportunities for the Energy & Utilities Market

Energy & utilities companies deal with oil & gas upstream (energy) and power generation, power and gas transportation and distribution (utilities). IT/OT convergence opportunities in this sector are, to name a few:

- ▶ Smart metering: Metering was traditionally part of the OT world. Automated meter reading (AMR) and automated meter management (AMM) solutions come from OT and are now connected to the IT world. Billing, on the other hand was typically an IT solution. With end-to-end smart metering (meter-to-bill), bills are now based on exact readings and no longer on estimates. Customer relationship management (CRM), also part of the IT world, plays a vital role in this scenario. With end-to-end smart metering, when a customer contacts a call center to complain about quality of service (e.g. overvoltage), the operator can contact the customer's smart meter in real time to check the historical data stored locally. In addition, new contracts are now able to modify tariffs in the meter in near real time.
- ▶ In oil & gas (O&G) exploration and production (E&P) upstream, most wells produce both oil and gas (OT). Production is measured in MBOE (millions of barrels of oil equivalent); at present there is no valuation in US\$ on a platform. If platforms were connected to shore via pipes, it would be possible to decide, by following SPOT prices (IT), to produce more gas than oil during a gas peak hour, for example.
- ▶ On a floating liquefied natural gas vessel, like for FPSO (floating production, storage and offloading), production (OT) is generally managed by a major system, but is shared between shareholders (IT). It is now possible to have an end-to-end chain from the sensor in the reservoir (OT) to the enterprise resource planning (ERP) system (IT) on the boat or vessel to share production and manage production, as well as staff on board.

- ▶ In the water sector, Atos Worldgrid has already integrated OT and IT in a fully automatic unmanned multi-criteria optimization system that optimizes production globally (OT) and minimizes staffing needs (IT), chemical products (IT), stocks (IT) and maintenance (IT and OT).
- ▶ In the O&G downstream sector, it is now possible to build a safety (OT)-oriented real-time dashboard (IT) for the CEO that aggregates all data coming from each refinery and weighting the risks at company level.

In the water sector, Atos Worldgrid has already integrated OT and IT in a fully automatic unmanned multi-criteria optimization system.

The Future Radar

This chapter offers an example of a new area for the merging of IT and OT, and especially the application of IT concepts to the OT layer: the maintenance and eventual outsourcing of the maintenance of production IT and plant IT.

Over the last two years especially an increasing number of companies have been willing to add areas such as MES to external application management. The background to this is often a need for the further development of maintenance processes associated with MES, the costs in particular.

Offshoring can play a role in the context of application management for MES.

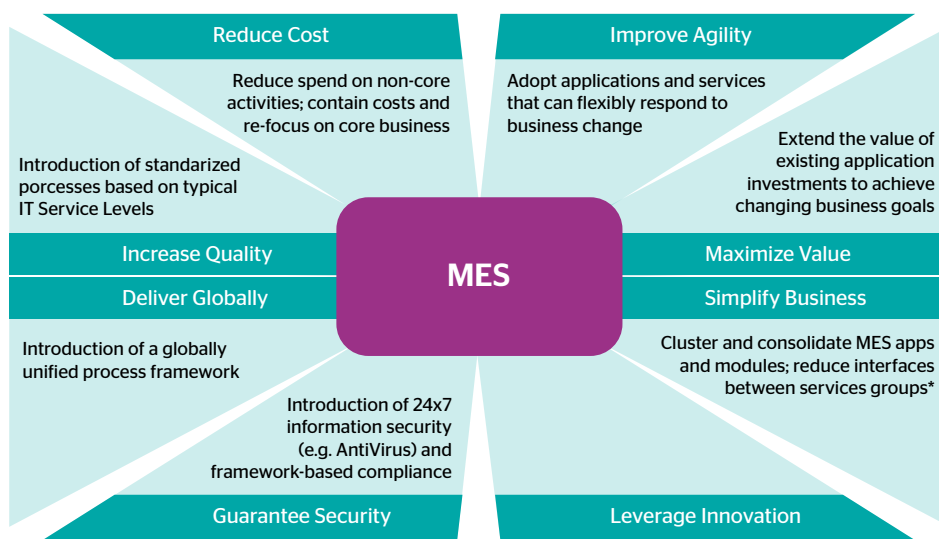


Figure 3

The IT industry should note that although in principle it is possible to apply IT virtues, such as global sourcing, to the topic, a differentiation between standardized delivery models and tailored approaches must be kept in a healthy mix.

Systematic knowledge in relation to an application needs to be separated from the business know-how around its operation in order to safeguard the vital lifelines of a company. However, whatever can be standardized can also be given over to global sourcing – as long as the service provider tightly manages the global processes. Offshoring can therefore also play a role in the context of application management for MES.

Application management for MES shouldn't simply be a one-to-one transfer of the concepts of the enterprise layer in order to succeed. Rather, it should be an overarching view of adjacent layers along with an advanced understanding of the processes required. In addition, willingness for a wider takeover of responsibility, where appropriate, should be in place.

Outsourcing allows companies to profit from typical IT service virtues, such as the introduction of real service level commitments which are based on standardized processes. Worldwide presence of the service provider and a global processes ensuring high process quality can be expected.

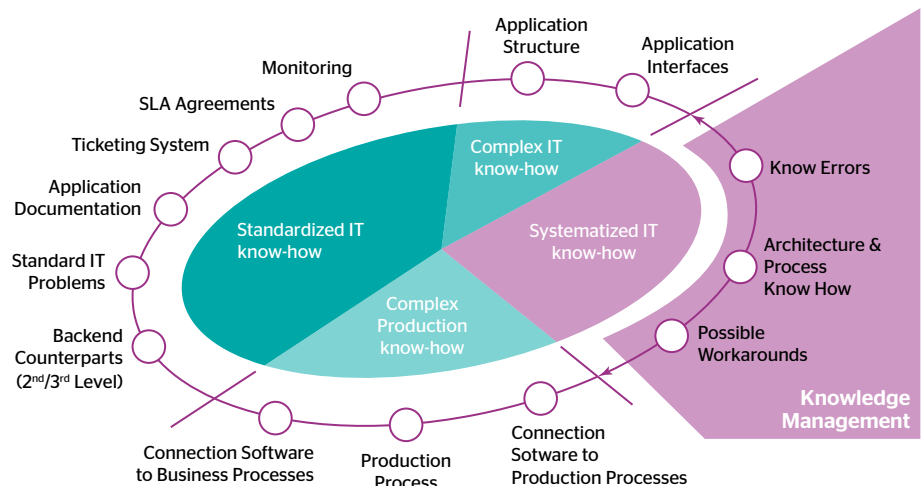


Figure 4

Since many MES applications are adapted to meet the needs of specific (production) processes, a dedicated IT services provider is useful to ensure future compatibility with MES manufacturers' developments. Often, a not insubstantial subsequent programming effort needs to be applied which can be cost-effectively realized in offshore development centers. However, it is also important to note that development teams need to be able to overlook underlying production-relevant processes.

Finally, and as shown by the example of application management for MES, the success of outsourcing also depends to no small extent on a stringent penetration at all levels of automation.

Segmentation of different IT-related components which keeps the balance between standardization and adaptation leads to the possible optimal provision of services which use process penetration and the necessary product know-how. The IT industry knows that currently (and perhaps also in the near future) entire and cross-layer outsourcing is the absolute exception. Within individual modules, consistent layer knowledge plays a crucial role - and determines results

Conclusion

During the last decades, most industries have developed and managed OT and IT as two different realms, maintaining separate technology stacks, protocols, standards, governance models and organizational units. Nevertheless, over the last few years, OT has been progressively adopting IT-like technologies.

The convergence of IT and OT will bring clear and tangible advantages to companies that include cost and risk reductions, as well as enhanced performance and flexibility gains. A prerequisite to achieving these benefits is that strategic, organizational and technological challenges are mastered. This means that IT and OT strategies must be harmonized, common governance and process models must be installed, security and data must be managed centrally and resources must be re-skilled to understand and know about the requirements of both disciplines. Change management also has to be employed to ensure that the implementation process runs smoothly.

By complying with these essential cornerstones of successful IT/OT convergence, companies can make a difference when competing with peers. Successful IT/OT convergence will allow them to exploit the potentials hidden in their supply chain by streamlining processes, increasing data transparency and allowing for better and quicker decision making.

Astonishingly, only few companies have pursued it. Now, new ideas and concepts are developing around IT/OT providing major opportunities for those who understand how to leverage their IT know-how to the shop floor. The time has come to capitalize on this!

The convergence of IT and OT will bring clear and tangible advantages to companies.

About Atos

Atos is an international information technology services company with annual 2010 pro forma revenues of EUR 8.6 billion and 74,000 employees in 42 countries at the end of September 2011. Serving a global client base, it delivers hi-tech transactional services, consulting and technology services, systems integration and managed services. With its deep technology expertise and industry knowledge, it works with clients across the following market sectors: Manufacturing, Retail, Services; Public, Health & Transport; Financial Services; Telecoms, Media & Technology; Energy & Utilities.

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