ARC STRATEGIES

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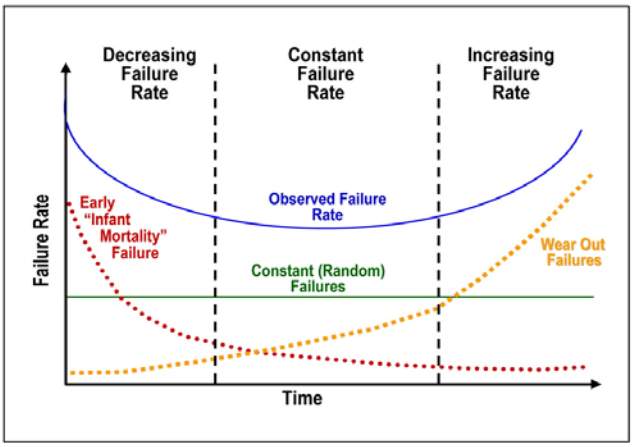
DECEMBER 2011

Managing Obsolete Technologies: Strategies and Practices

ARC Advisory Group



The Theoretical Bathtub Curve for Equipment Failure over Time
(Source: NASA)

Obsolescence Strategy	Benefits / Risk
Supplier Relationship Management	Lower risk of a supplier pulling out support
Spare Parts Management	Lowest cost in the short term
Wholesale Migration	Highest cost
Systematic Migration	Lowest cost with early realization of benefits
Train and Retain Approach	Focus on people and skills development
Virtualization and Emulation	Supports systematic migration
Capital Upgrade Plan and Automation Strategy	High level of awareness

Strategies for Dealing with Obsolescence

Executive Overview

In today's world, "commercial-off-the-shelf (COTS)," "open source" and "multi-supplier" are often-used terms to describe the decades-long move from proprietary to standards-based automation technologies. The reality is that there is an enormous installed base of last-generation technologies, some of which is proprietary design. ARC Advisory Group research estimates that there is approximately $65 billion dollars' worth of installed base of obsolete automation technology. ARC continues to research the industry's strategies and practices for managing proprietary, aging (mature), or obsolete technologies. ARC recently surveyed the technology and practices typically found in manufacturing plants or factories used to manage, direct, and control the production operation. This report analyzes these practices to help end users set viable strategies and practices.

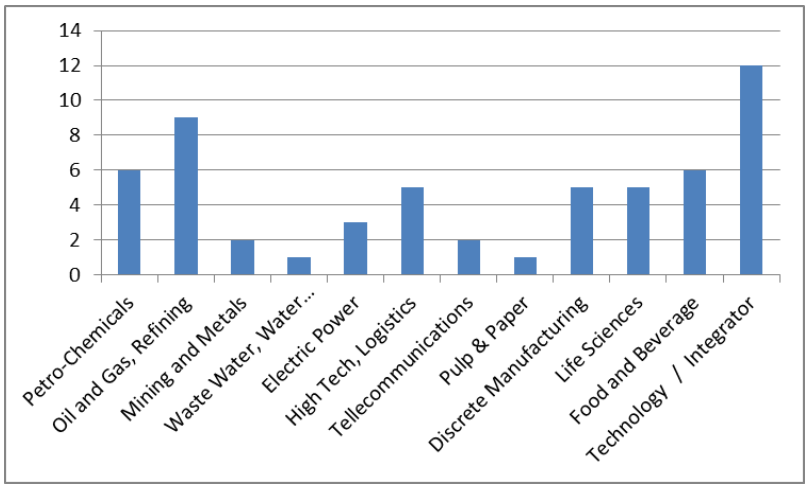
The survey revealed a clear message that as technology changes and end users migrate from obsolete proprietary technologies to modern COTS technology, there are tremendous implications on people, processes, and technology.

Results from this survey and interviews reveal a clear message; as technology changes and end users migrate from obsolete proprietary technologies to modern COTS technology, there are tremendous implications on people, processes, and technology. Maintaining proprietary and COTS systems as well as the skill set required both represent key considerations when planning for the future. If the change is not managed effectively, end users can end up with new challenges and potentially negative business impacts. The multiple industries represented in this end user survey activity all consider automation technology strategic.

Scope

In the last half of 2011 ARC surveyed and interviewed over 60 manufacturing clients across multiple industry segments on the subject of managing obsolete technologies. The survey was broad in scope and included multiple automation technologies. Previous research by ARC centered predominantly on the top distributed control systems (DCS) suppliers. The scope of this particular ARC research includes both proprietary and commercial-off-the-shelf technology used in manufacturing and serves to highlight current end user challenges and strategies. We've included references to the applicable standards, but kept company names confidential.

The chart below illustrates the broad scope of industry coverage of this ARC research.



Technology, People, and Process Considerations

Technology

It is becoming evident that the rate of technology change is occurring at a faster rate than ever before. Substantial evidence also suggests that complexity increases across the entire spectrum of the automation system. As an example, many end users reported that field-level bus technologies have introduced new complexities in wiring practices that change the way technologies are deployed. At the system level, Windows-based servers and workstations have introduced new maintenance procedures that must be managed carefully. End user experience revealed that changing technology alone in the plant can have significant implications on work processes, business processes, and people and introduces new risk to the business.

People - The Aging Workforce and the Millennials

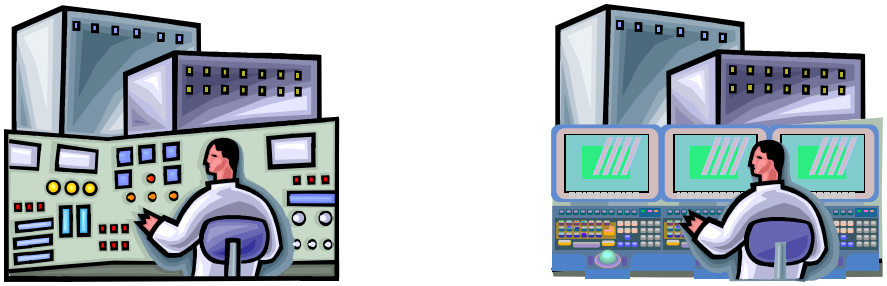
Upgrading or deciding to invest in COTS technology also has implications on people. The systems of yesterday inside the plant require specialized skills. Developing this training usually required investing in specialized training programs with automation suppliers. Modern COTS technology uses many of the components with which IT organizations are already com-

fortable. ARC research shows that the retirement of experienced workers has implications on who will support older, obsolete technologies and how organizations will manage the change. The new plant worker is sometimes referred to as the "Millennial" or "Re-generation." These new workers entering the workforce have differing learning styles and expectations about use of technology.

Process – Is My Work Process Still Valid?

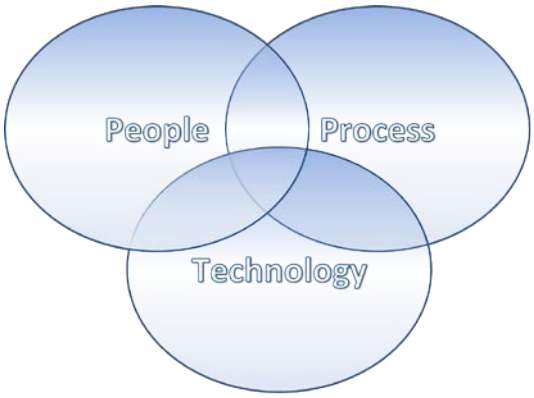
Migration to COTS brings the age of Microsoft and the Internet to the plant floor. This change brings many possibilities for changing work processes.

When considering the impact of technology on the daily routines of a process operator, micro level changes affect the many tasks an operator must perform to ensure that his or her plant is operating safely and profitably.



Control Rooms: Before and After

Consider the daily routine for the process operator pictured above on the left. The "before" picture shows the technology that was typical for a '70s vintage plant control room. Operators could only perform routine plant monitoring tasks by walking the board or panel, reading the various gauges and instruments, and comparing the measurement to nominal plant values. The picture on the right shows a modern control center built with COTS technology. COTS technology enables greater flexibility to customize and create new operational work processes and contextualize information for the plan operator. COTS allow a host of applications to be created that support safety and profitability of the operation. The operator on the left is focused on plant variables like flow, level, pressure, and temperature. The operator on the right can focus on business productivity, safety and, reliability functions that were not possible with the older generation control systems.

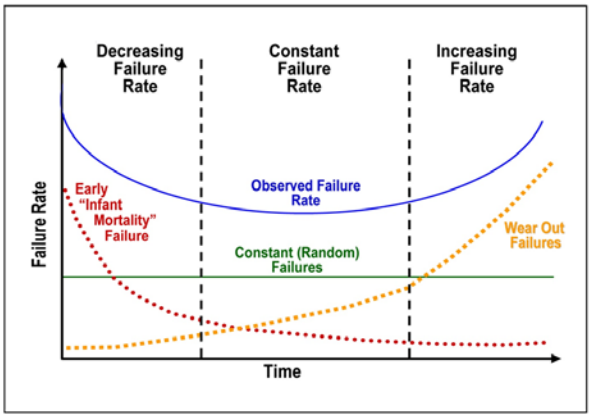


People, Process, and Technology Are Linked. Any Investment in Technology Requires Equal Consideration of the Other Two Components.

The Obsolescence Opportunity

Failure rate data for automation systems is not precise and supporting information can only get you in the range of actual failure rate experiences. Many automation systems still in use today were engineered back in the '70s or '80s and have continued to run well beyond their expected lifespans. Failure of electronic components is extremely hard to predict, particularly when viewed as replaceable parts in a system. In many cases, installation standards have a tremendous role in the longevity of assets. Equipment rack room standards, heating, cooling, and humidification cycles, combined with the presence or absence of corrosive materials impact the life of electronic components. But even extremes of these factors have not caused the demise of many older generation automation systems.

Many end users keep track of failures, but failure analysis does not go deep enough to help predict end of life accurately. By observing the theoretical bathtub curve from NASA chart on the next page, the question arises whether the bathtub curve actually exists. For many automation systems, the time along the x-axis ends up in a range of between 15 and 40 years.



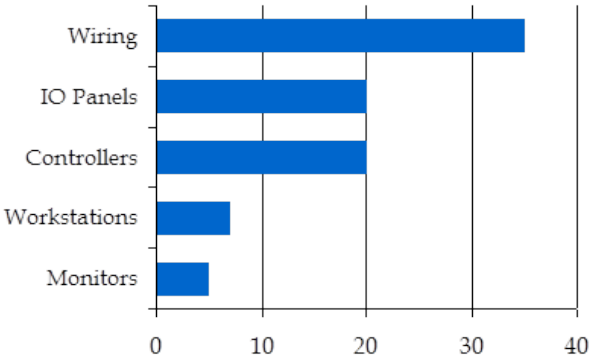
The Theoretical Bathtub Curve for Equipment Failure over Time (Source: NASA)

Automation engineering specialists across the manufacturing industries deal every day with the preciseness and deterministic repeatability of process control in a plant. However, the lack of preciseness for determining asset end of life leaves makes decisions around this important area difficult.

Users should factor in the lack of a deterministic character of end of life when considering key plant performance variables like safety, environmental, asset utilization.

Typical Component Lifecycles

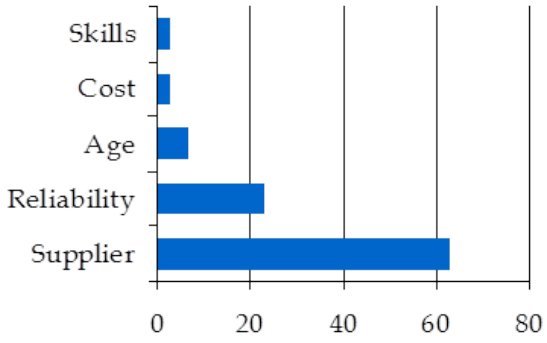
Another key factor complicating the obsolescence dilemma is that a typical automation system is comprised of many different components, each having vastly different expectations of service. For example, the CRT displays used in older DCSs get a lot of use and abuse, causing their life to be substantially shorter than, say, copper field wiring. ARC research provides estimates for the various components below.



Typical Lifecycles of Different Automation Components (in Years)

ARC End of Life Workshop

Early in 2010, ARC surveyed several end-users and conducted interviews in conjunction with the ARC End of Life User Workshop at the ARC World Industry Forum in Orlando, Florida. Sixty-five percent of participants were involved in a migration project to upgrade or replace obsolete technology.



End User Criteria for Investing in Migration

The survey revealed that over 75 percent of end users that their plant systems were more than 20 years old and most of these have utilized technology beyond the technology supplier's stated end of life.

ARC research indicates that the total cost of ownership (TCO) for an automation system is about 4.5 times the initial investment based on a 20-year safe usable asset life span -excluding internal and external full-time equivalent support staff.

From a cost accounting perspective, on average, assets depreciate fully in 20 years, so keeping automation assets in place beyond this can also muddle up the balance sheet for the company's shareholders.

Most end users admit that obsolescence alone cannot justify executing a large capital upgrade project and that enhanced functionality and system performance were major criteria impacting funding decisions. We also learned that 60 percent do not have a clear strategy and plan to deal with this issue, and 85 percent plan on executing obsolescence projects during normal turnaround and shutdown periods for manufacturing assets

End of life for the field instruments connected to the automation technology have a much longer time span and field replacement of wiring and instruments is handled at different times.

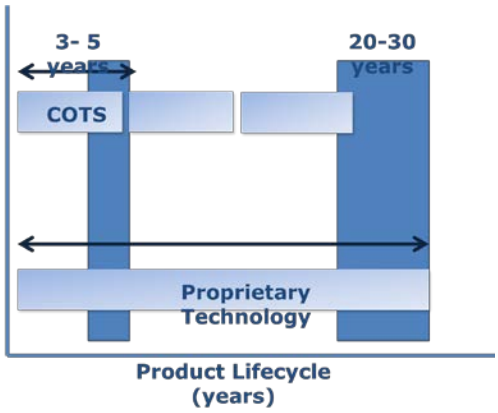
Migration to COTS Technology

Survey data indicates 80 percent of the respondents support both proprietary and commercial technologies, indicating that most were making investments in some form of migration of obsolete technology. The motivation for using COTS technology in plant automation systems lies partly in the end user's desire to reduce total cost of ownership and partly in opening up new possibilities for integrating systems on the plant floor that were not previously achievable with proprietary automation systems. One promise of COTS components is that they can be bought or licensed and repurposed, instead of having to develop purpose-built components. The ultimate goal is to reduce long-term maintenance costs.

In the mid '90s when COTS technology was first introduced to automation systems, many had considered COTS to be the "silver bullet" to reduce and simplify design of systems and deliver increased value to the manufacturing operations. COTS development however came with many not-so-obvious tradeoffs. The initial cost and development time can definitely be reduced, but often at the expense of increased software component-integration work and dependency on third-party component suppliers like Microsoft. In addition, new skills and methodologies were required to maintain plant systems.

The end users included in ARC research clearly were not prepared for the magnitude and complexity of the change. Many look back on maintaining proprietary systems as being a "set it and forget it" operation. Software upgrades usually happened on an annual basis. Engineers ordered the specialty media and loaded the system with the latest update. Now COTS technology, in contrast, introduces concepts like patch management, cyber security, and a host of other requirements appropriate for supporting Windows-based systems.

Most agree that the usable life of a COTS-based system will likely be substantially less than the proprietary system it replaces. The figure on the next page maps the number of end users and business risk over time. For proprietary-technology systems, this time span is usually 20-30 years. With COTS this time span is shortened to 3-5 years on average. Sustainable technology becomes iterative and must be refreshed more frequently.



Lifecycle Comparison between COTS and Proprietary Technology

New Technology Era Needs Software Lifecycle Management Strategies

Automation specialists consider Microsoft Windows to be a primary example of COTS technology. The Windows operating system is now at the heart of every control system. Since Windows was developed for the consumer market and services a wide variety of applications, its application to the automation and control world introduces new challenges in the plant environment. Some end users have reported an endless cycle of patches and software updates to maintain system integrity. Also, implementing and maintaining bus-based field systems such as FOUNDATION fieldbus, Profibus, and other digital automation protocols now requires deep IT skills. Keeping COTS technology up to date requires a constant refresh of support skills for workers who are responsible to develop and sustain technology plans at the plant floor.

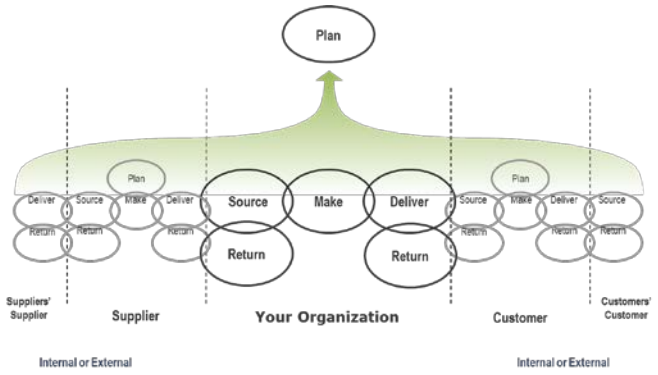
Technology Supplier's Point of View

One approach to consider how technology finds its way to market might be to think of several interconnected supply chains. As depicted in the "Supply Chain Reference" model, the fundamental functions are Source, Make, and Deliver. Most manufacturing organizations operate this way and when considering automation technology suppliers that support its business, each supplier will also have its own supply chains. The technology supplier must source the raw materials, as well

"The only big companies that succeed will be those that obsolete their own products before someone else does."

Bill Gates, Founder, Microsoft Corporation

as design, engineer, manufacture, and market technology to your company. If a particular product included in your plant automation is now obsolete, it may be due to the fact that your supplier's supplier no longer manufactures a given component. This may be due to a skill shortage or component that is no longer cost effective to manufacture.



The Supply Chain Reference Model
(Source: The Supply Chain Council)

Obsolescence strategies are key for technology suppliers today. It is likely that obsolescence is actually a driver for revenue and profitability of technology suppliers. A famous quote by Bill Gates, Microsoft's founder, describes an important consideration for COTS from the suppliers' perspective: "The only big companies that succeed will be those that obsolete their own products before someone else does."

Automation suppliers fully understand that automation components, software, and systems are instrumental to the success of a manufacturing company and represent a major capital investment. However, no technology lasts forever. To address product end-of-life without negatively impacting productivity, manufacturers rely on forward-looking suppliers.

For automation suppliers, as well as end users, product obsolescence pressures are increasing. Component supply challenges, regulatory compliance, COTS technology turnover, and market demand to reduce cost in the supply chain challenge many automation suppliers to extend product life. An aggressive lifecycle plan combines a constant push to extend technology support with tools that make new technology adoption easier. This creates a solid business value proposition in which users view their migration decision as a potential opportunity to gain advantage, rather than just a requirement. End users migrate when the business benefit to do so outweighs the cost.

As industrial technology becomes more intertwined with operations and business processes, the complexity of managing change increases dramatically. According to another major automation supplier that responded to our survey, end users must balance the risk of impacting productivity with upgrade costs, and the inter-relationships of technological change.

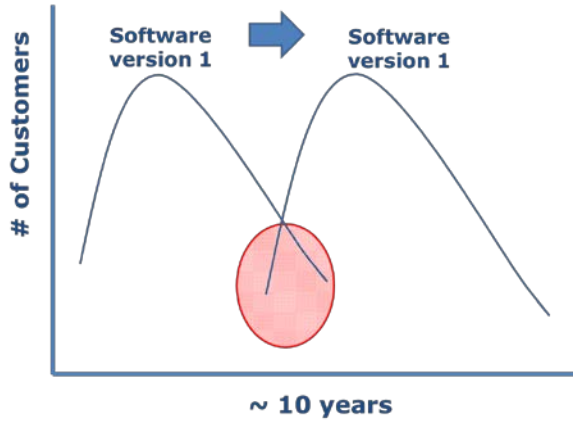
Obsolescence strategy combines advanced technologies and services in a broader, longer-term approach to modernization that enables a facility to extend the life, performance and reliability of existing systems. The programmatic approach should focus on operational performance where modernization can provide value-added benefits while reducing risk, minimizing a dependency on legacy skill sets, and lowering the total cost of ownership.

Core to this automation supplier's modernization program is a consultative approach that guides prospects to consider the "bigger picture" of a modernization program that drives current and future operational performance, safety, and productivity through a combination of technologies, skills, and processes. Customers can leverage broad experience, capabilities, and portfolio to assess their business needs and apply the right technology as needed for longer-term operational performance. Taking a holistic approach to modernization often helps provide justification for required investments by considering all areas of an operation's technologies, processes, and skills.

Software Companies and Obsolescence

In contrast to the large base of obsolete automation technology in place today, enterprise IT groups have adapted their project methodology and budgeting processes to synchronize with the way the enterprise software companies work to avoid obsolescence. The "Software Lifecycle" chart on the next page shows that an enterprise software supplier may market and install software for a business. Over a period of time – sometimes years – the installed software system evolves as several maintenance releases and major software versions are installed. Early adopters take larger technology risks but realize the benefit of using new functionality in their businesses. Early adoption also brings the best software support from the supplier since over the life of the major version of software more and more customers that also require support will purchase and install the software. Software suppliers also often provide extra support for early adopters be-

cause they need reference sites to build wider acceptance for the new software solution.



Enterprise IT Supplier Software Lifecycle

The supplier will no doubt allocate funds to maintain patches and fixes for the current version over a period of time, while simultaneously directing efforts to develop a newer version. Eventually, a major upgrade will be released and investment in the previous release will diminish and investment will be geared towards newer products. Suppliers can seldom invest in multiple versions of similar product lines, so older versions will be less in demand, with fewer customers and eventually obsoleted by the supplier. Customers that lag behind the supplier's product evolution are on a platform with a small customer base and are taking on additional risk for their business with diminished supplier support.

This is the current reality of enterprise software. ERP systems enable the business to run and, based on ARC research, few companies allow their ERP to become obsolete. When compared to automation budgets, the CIO or CFO budget to support ERP systems often appears almost unlimited.

Factors in Software Obsolescence

From the point of view of a technology supplier, several factors support the decision to obsolete a component. These include:

- Hardware, requirements, or other software changes to the system obsolete the functionality of the software (includes hardware obsolescence-precipitated software obsolescence; and software that obsoletes software)

- Sales and/or support for COTS software terminates from the supplier's supplier
- Inability to expand or renew licensing agreements and are legally un-procurable
- Digital media obsolescence terminates access to software. Suppliers of suppliers may not be able to manufacture the technology required to deliver digital media to load a given system. As an example, eight-inch floppy disks introduced in 1971 are in very short supply

The Business Case for Modernization

From the "corner office" perspective of the chief information officer or chief financial officer, the company balance sheet has many cost allocations. In the case of manufacturing, the cost of goods sold is usually the highest cost, which includes the cost of the raw materials. Sometimes, the technology costs are not transparent to the CIO or CFO. While, in many cases, the manufacturing automation costs get rolled up to budgets that do not reach the CIO or CFO, the one component of manufacturing technology that usually gets notice is the company ERP system.

Unlike manufacturing automation technology, ERP and other enterprise software projects can be designed, planned, and implemented on technology that essentially runs in parallel. Migration from an older ERP to a newer ERP version can be achieved with minimal downtime. Often, many IT systems are migrated over a weekend when the transactional processing functionality is not required.

ARC experience suggest that, while many manufacturing systems may be getting left behind and becoming obsolete, most companies are going ahead with their ERP upgrades. This poses the question: Are manufacturing technology systems upgrades struggling to survive as viable projects due to the complexity and inability to complete without impacting production negatively; or is it simply a lack of attention from the corner office of the CIO or CFO?

Of course, one can argue that technologies like the automation that is running your plant is altogether different. Many manufacturing plants are

expected to have high utilization to remain competitive. A lengthy installation of an automation system takes weeks, if not months to complete. Hot cutovers are risky and more costly and contribute to the already hard-to-justify project.

Justification Is Not Often Simple

Staying current with technology is not a justification. There are other factors to help justify upgrading obsolete systems. For example, unreliable and failure-prone systems that affect plant utilization might prove to be a justification. Looking into the plant's incident management database to determine incident rate can help quantify any return on investment. But often, it is not clear that the investment will "guarantee" reduced failures.

Another justification path is if the system does not meet current safety, health, or environmental requirements. An example would be upgrading an obsolete shutdown system that does not meet current industry safety standards.

There may be functionality requirements for increased manufacturing performance that the current system cannot provide. These might be important the plant needs to achieve higher throughput and the alternative is a major capital investment in production equipment to gain incremental production. Modern manufacturing automation systems should be able to help in these areas:

- Reduce unplanned process shutdowns and reduced maintenance costs using predictive maintenance practices
- Improve production management through increased process information exchange between the automation system and higher-level operations and enterprise software
- Process optimization through historical process monitoring and trending to allow process engineers to disseminate historical information

Regardless of the reasons for replacing the obsolete system, a modernization plan should include:

- Creation of new business opportunity the legacy system cannot support; such as increased production rates.

- Repurpose as much intellectual property as possible from the older system
- Minimizing impact on operations
- Minimizing cost of installation
- Providing new functionality or work process to improve operational or maintenance efficiencies and plant safety

Strategies for Dealing with Obsolescence

When we asked the survey respondents if they had a strategy and plan in place to support mature and obsolete technology, an alarming one-third did not know or were not sure. Survey results also conclude that the obsolescence issue is not restricted to just automation hardware. Nearly 50 percent indicated that IT systems are now part of the bucket of items that must be managed within the scope of their respective industries.

Some of the challenges that end users face also are not related solely to the supplier of the technology, although most of the issues were based on the inability to locate reliable parts, or to get timely support from the supplier. Nearly 80 percent indicated that they cannot find qualified technical personnel to maintain the site equipment.

An overwhelming majority of responses indicated that they relied heavily on internal support to manage the obsolete equipment. These same companies reported that they worked hard to be the best employers in the region. One-third have developed partnerships with local schools and 90 percent use on the job training to keep skills sharp. In contrast to the question about the skills pool nearly all responses indicated that newer employees are not interested in the older technologies.

Obsolescence Strategy	Benefits / Risk
Supplier relationship management	Lower risk of a supplier pulling out support
Spare parts management	Lowest cost in the short term
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Train and retain approach	Focus on people and skills development
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Supplier Relationship Management

The decision to purchase automation technology usually factors many criteria into the final investment decision. Criteria can include a systematic analysis of how well the technology satisfies the company's business requirements. However, but more often than not, the supplier of the now-obsolete technology is well aware of the eventual obsolescence and is likely to be thinking about repeat business and will have a solid end-of-life and migration strategy.

Most suppliers have a technology upgrade path, and in the unlikely case that the supplier is no longer in business, another supplier has often purchased the intellectual property to be able to support the legacy product. Some end users have successfully followed the supplier's obsolescence "matrix," which usually ends up with an agreement for the supplier to provide additional support for legacy equipment.

Most, but not all, suppliers have excellent legacy system upgrade paths, so the automation user must include long range planning in their supplier selection process. End users recognize the complexity of performing a migration and will choose a supplier largely based on its demonstrated success in this area. In some cases, third-party organizations have proved to be effective at supporting maintenance activities for the older equipment.

Developing a strong partnership with strategic suppliers is a very important approach for managing plant technology. Current supplier relationship management and stewardship techniques often include routine key measurements of success and rewards on both sides.

Spare Parts Management

An effective practice for some end users is to share spare parts with the technology supplier over a multi-year contract. Suppliers are aware of key components that are prone to failure or otherwise critical to the systems. Many suppliers have well-established "hot spare" programs for which both supplier and end user share the investment in long-range planning for spare parts.

A more risky, but effective, option for end users to minimize their investment in spare parts is to buy up old technology as it is decommissioned. As technology is replaced, the decommissioned components become spare parts for the legacy systems still in operation. One of the drawbacks to this method relates to how the parts are managed. Electronics components are sensitive to handling and may be damaged during storage or transport. In some cases, third-party service organizations can provide refurbished spare parts.

Wholesale Migration

Some end users used terms such as "bulldozer approach" or "rip and replace" to describe one effective, if disruptive and time-consuming approach to dealing with system obsolescence. Manufacturing operations that can tolerate the length of time the process will be unavailable or desire to complete any changes with the manufacturing off-line described this approach as having the lowest risk tor them. In addition to addressing obsolescence issues, these users wanted move rapidly to new technologies and become early adopters. Often, these users are trying to manage intellectual property and take advantage of the technology in its economic lifecycle where they have captured the first-mover benefits.

To capture lower total cost of ownership, end users also consider both in-kind migration to the next generation of the legacy system and also competitive migration to an alternative supplier. Competitive migration options range from phased approaches using the same form factor to the well-known "rip and replace" approaches.

Systematic Migration

The majority of users responding to our survey appeared to favor a systematic migration approach to overcome obsolescence issues in which automation is migrated in phases, with priority given to various components based on specific end user drivers (environment, health, and safety; production, reliability, etc.) Most indicated that the systematic approach represented the lowest risk option, with accelerated business benefits and lowest capital investment. End users would also integrate parts management strategies into this approach.

Most survey respondents indicated that the systematic, phased approach represented the lowest risk option, with accelerated business benefits and lowest capital investment.

As an example, many end users reported that their company strategy involved separating key proprietary software and hardware systems when upgrading to the non-proprietary software and hardware. Any migration projects must clearly define any interfaces between proprietary and non-proprietary systems to provide a smooth transition.

Other companies reported an approach that leveraged skills and technology used in their enterprise IT organizations. PC and server virtualization has allowed manufacturing groups to retain smaller systems that still provide business benefit. Operations and maintenance staffs could see no differences between legacy systems and the new systems built on virtualization technology. In most cases, the HMI layer was most affected by this change. Where virtualization would not support certain functions, some older terminals were retained to support system maintenance.

Process engineering could run as many as 100 virtual applications on a single server. The obsolete applications included older platforms like Microsoft NT and OS2 that ultimately ran safely and securely on virtual machines. Internal staff keeps must keep their skills up to date on the obsolete technologies, while also receiving current training on the virtual environment.

Many companies had a systematic obsolescence management process in place. The obsolete controls and software-based systems are mapped and reviewed periodically by multiple teams. In most cases, the teams plan to migrate the obsolete systems, typically within a three-year time frame. The main objective is to minimize the risk of a production failure due to failure of the automation systems. Benefits can be easily quantified for capital planning.

Train and Retain Approach

In some cases, respondents indicated that their companies were not likely to make any capital spending in the manufacturing environment. Possibly, the manufacturing plant itself is in the midst of an austerity program, with minimal maintenance expenditures allowed. When there was no opportunity to replace obsolete equipment, the most important factor end users reported was to develop internal programs to help training and retain employees. Comprehensive compensation programs and on-the-job training was common among these manufacturing sites. When a company had multiple sites and previously invested in standardization of automation assets, individuals were utilized across multiple sites (in some cases, spanning different countries) to sustain automation systems.

Suppliers have also begun reducing their support for obsolete equipment and have struggled to retain support staff. In many cases, supplier documentation is poor, introducing greater risk for end users.

Capital Upgrade Strategies

Planning for obsolescence begins by establishing a clear long-range plan for technology. Automation strategies that contain both qualitative and quantitative linkages to the business have the greatest chance for success through a budgeting cycle. For at least one of the survey respondents, the strategy for obsolescence begins with a clear view of the business and technology challenges. The long-range plan for technology typically supports the five-year business plan for manufacturing.

Initiatives are divided into two categories: growth projects and reliability projects. Growth automation projects typically focus on optimization of the process where a quantifiable return on investment can be assigned to an initiative. Manufacturing throughput increase is usually the main justification. In contrast, reliability-focused projects that support obsolete technology are justified by cost avoidance and best practices and are more qualitative in nature. Quantitative and qualitative supporting data is pulled from the incident management database to quantify production losses.

Some organizations have had success using a risk-based decision matrix. Any reliability projects that will target obsolete systems consider the risk of not performing the work in terms of its potential impact on health, safety,

environment, and finances as well as likelihood that an unplanned event due to a failure in an automation system might shut down production

Key points to keep technology from becoming obsolete include:

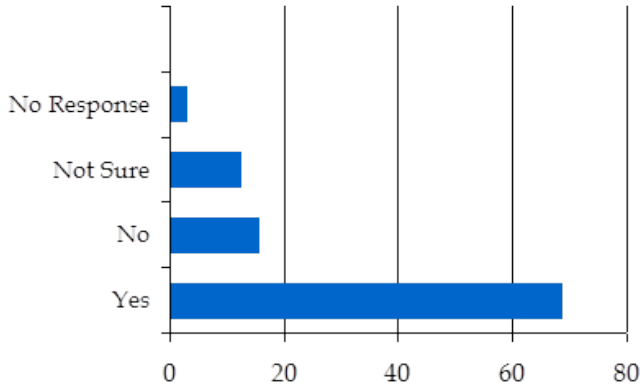
- An automation strategy with a minimum of a five- to ten-year view
- A technology sustainment plan including allocation of full-time equivalent resources both internally and externally
- Regular awareness to the level of the GM, CIO or CFO
- Quantifiable benefits for safety, production growth, reliability, utilization included in a benefits sustainment program

Methodology and Survey Results

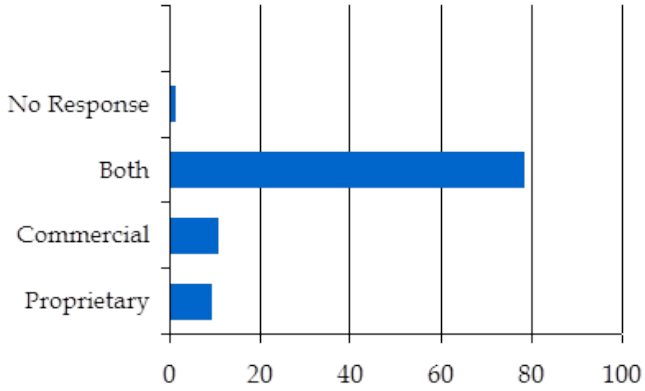
ARC clients were surveyed during the last half of 2011. The charts that follow provide the detailed responses. ARC invited individuals with appropriate job titles to participate in the survey through an email invitation. Some respondents also participated in a more comprehensive interview after the web survey was complete. All respondents and company names are held confidential.

Context for the web survey was included below:

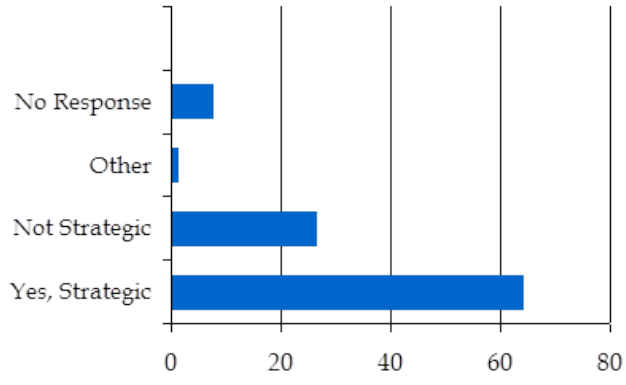
In today's world, COTS, open-source, and multi-supplier are often used to describe the decades long move from proprietary to standards-based technologies. The reality is that there is an enormous installed base of last generation technologies, some of which is proprietary design. ARC Advisory Group continues to research the strategies and practices of industry for managing proprietary, ageing (mature) or obsolete technologies. The focus of this survey is technology typically found in manufacturing plants or factories used to manage, direct and control the production operation. The objective of our research is to analyze these practices to help the end user set viable strategies and practices.



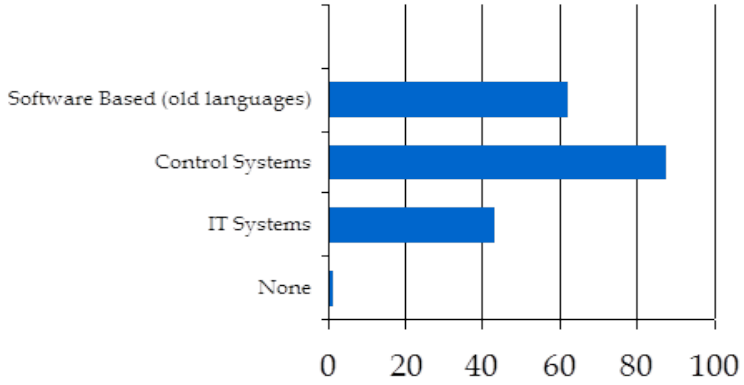
Does Your Company Have a Strategy and Practice for Supporting Mature or Obsolete Technologies?



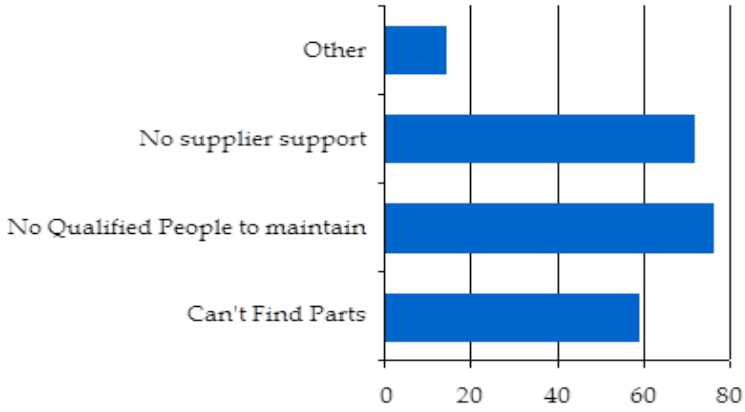
If You Do Have Mature or Obsolete Technologies, Do They Include Proprietary as Well as Commercially Developed Technologies?



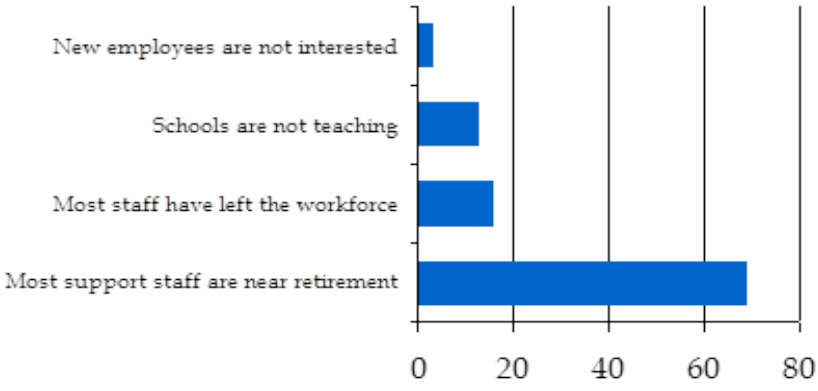
If You Have Proprietary Technologies, Do You Consider It Strategic to Your Business?



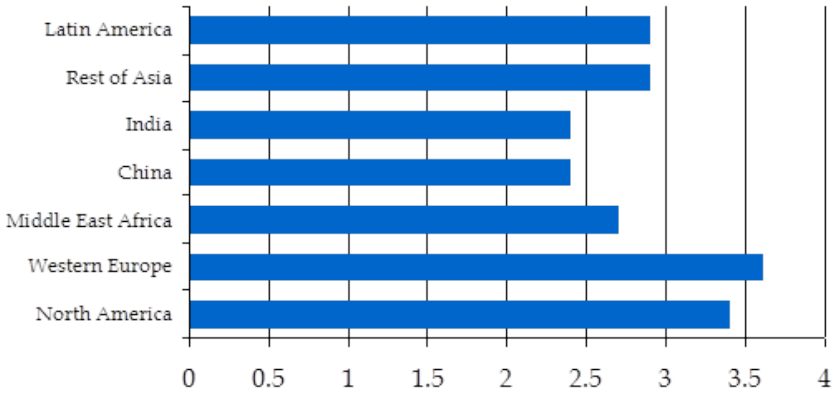
How Would You Characterize the Types of Mature or Obsolete Technology Your Company Is Supporting?



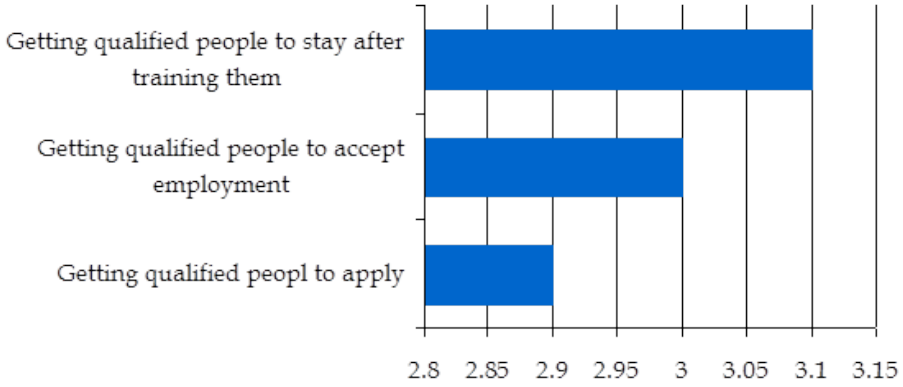
What Difficulties Do You Have Supporting Obsolete Systems?



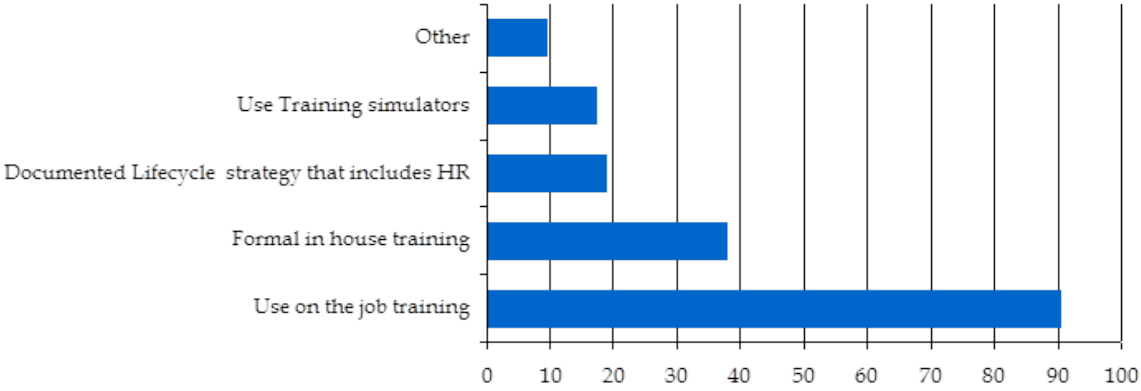
Please Rate Your Support Staff Situation



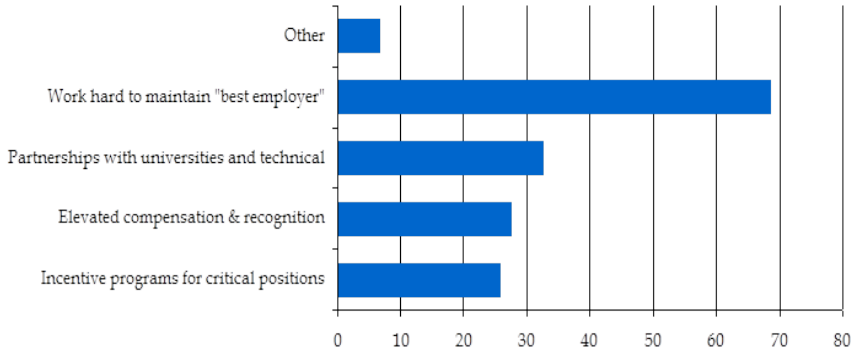
Please Rate Your Technology Challenges by Geographical Region



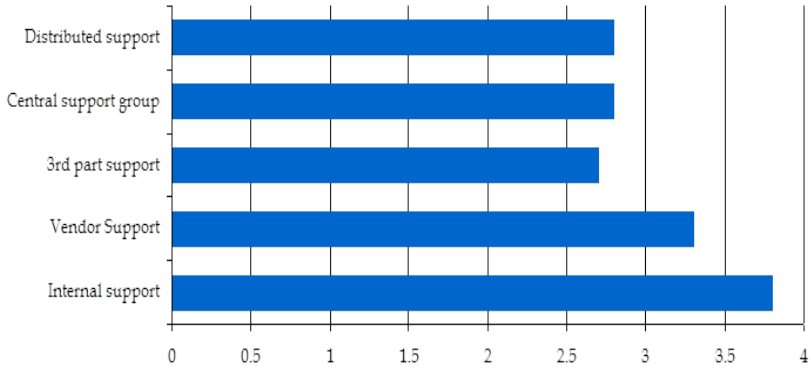
What Is Your Experience Attracting and Retaining Qualified Staff to Work with Obsolete Technology?



How Do You Handle Knowledge Transfer?



What Strategies Do You Use to Attract and Retain Resources?



Please Rate the Effectiveness of the Following Support Models

Recommendations and Conclusions

Planning for obsolescence is a complex problem. The combination of an aging workforce, skills gap, and the effort to keep manufacturing operations running at peak performance with minimal downtime only adds to the complexity. Capital spending in this economic environment is a premium. Suppliers of technology also play an important role in simplifying the migration from obsolete systems to current technologies.

Development of a long-range plan and strategy for automation technology is critical. Plans should include a thorough understanding of the impact on people, skills, and sustainability. Work process and modern best practices in the plant and technology must be well understood, while planning also needs to develop solid change management approaches to safely roll out new technology. Technology management also goes well beyond the com-

pletion of a project. End users must be very clear how technology will be maintained and operated over many years. Newer COTS technology also requires a different approach to maintenance and can easily become a complex problem in the plant environment. Enterprise IT has learned through many lessons that introducing COTS technologies represents a new stage in how businesses manage and maintain their technology lifecycles.

The gap between enterprise-level business systems and plant-level automation systems is closing.

The gap between enterprise-level business systems and plant-level manufacturing automation systems is closing. Several standards have been developed in recent years by IT groups to help businesses sustain technology. Industry has become increasingly aware that IT is critical to business. ARC believes that industry standards like COBIT (Control Objectives for IT and related technology) and ITIL (IT Infrastructure Library) should be leveraged across the enterprise and down to the shop floor.

Key points to ensure the success of a company's technology management plan include:

- Develop an automation and technology strategy that links projects to business strategy and long-range business plans
- Create awareness at all levels of the organization by implementing an effective change management program
- Demonstrate clear return on investment to your CEO, CIO, and CFO

Conclusion

The dynamics of the market for obsolete equipment has changed in recent years. For one thing, the recession has significantly curbed capital spending in process automation end user businesses. While this market has always been averse to capital spending, the situation is even more constrained now, requiring an even stronger value proposition and justification than in the past for migration projects.

Technology suppliers have also significantly expanded their migration offerings to include migrating from competitors' systems and for migrating from a legacy system to a new system from the same supplier. It has also become apparent that migration is no longer strictly a proprietary technology issue, but has grown to encompass commercial-off-the-shelf technologies.

Users have a variety of approaches when evaluating potential obsolescence strategies. For many end users, migration represents a significant enough step change to warrant a complete review of all the supplier offerings in the marketplace. ARC advocates that end users should be just as rigorous in their approach to selecting a migration supplier as they would be for control system selection. One thing end users should take into account is the potential supplier's ability to provide a solution that minimizes downtime and risk, while providing a tangible business value proposition that will have a positive economic impact on the business. No matter how smooth the implementation may have gone, if the company simply ends up with a like-for-like functional replacement, it has failed to exploit an excellent opportunity to improve business performance.

ARC will be hosting its 16th annual World Industry Forum in Orlando Feb. 6-9, 2012. The overall theme will be "Transforming Industry through New Processes and Technologies. The Control System Lifecycle Management Workshop will provide an opportunity for end users and solution providers to discuss both migration planning and new technology management. This four- to five-hour long workshop is scheduled for Monday afternoon at the Forum. ARC invites all end users to participate.

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Acronym Reference: For a complete list of industry acronyms, refer to our web page at www.arcweb.com/Research/IndustryTerms/

CEO	Chief Executive Officer	**ERP**	Enterprise Resource Planning
CFO	Chief Financial Officer	**GM**	General Manager
CIO	Chief Information Officer	**HMI**	Human Machine Interface
COBIT	Control Objectives for IT	**HR**	Human Resources
COTS	Commercial off the Shelf	**IT**	Information Technology
CRT	Cathode Ray Tube	**ITIL**	IT Infrastructure Library
DCS	Distributed Control System	**TCO**	Total Cost of Ownership

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