White paper

Lowering Control System Life Cycle Costs and Risks through System Evolution

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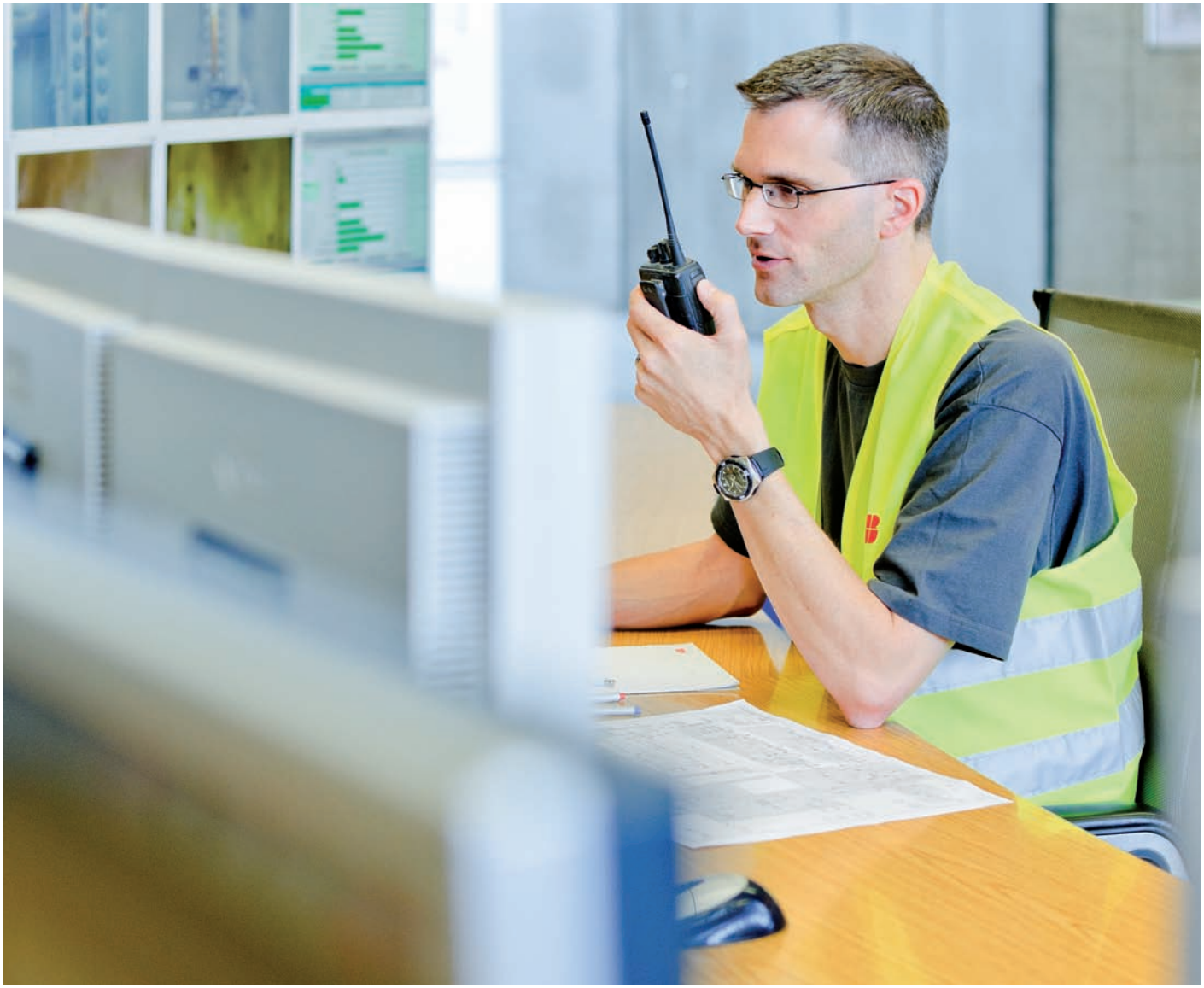
1. Executive Summary

Control system vendors must make a commitment to their system owners that ensure future advances in system technologies will enhance rather than compromise their customer's current system investments. Evolution policies should allow system owners to maximize the useful life of both their control systems and the intellectual assets built upon them. Through stepwise system evolution solutions, the risk associated with system change is mitigated; minimizing process / system down-time and protecting the owner's long-term investments in control applications, process graphics, and historical data.

Control vendors need to work side-by-side with their system owners and be guided by the owner's business goals in the development of the evolution path and its pace forward. Regardless of whether the initial investment by the customer was made 1, 5, 10, or 15 years ago, the installed automation system is still a vital and sustainable part of the customer's business and manufacturing strategy that can be enhanced and extended for years to come in a way that presents the lowest life cycle costs and lowest risk.

This manuscript will outline a four-point strategy that provides the roadmap to a successful system evolution implementation.



2. Four-Point Evolution Strategy

Superior products should be part of a vendor's evolution strategy; however, simply incorporating new products into an existing system will not ensure success or provide the desired results. An evolution commitment consists of a four-point strategy that represents a comprehensive solution and provides a roadmap to successful system evolution. This four-point strategy includes:

2.1. Product Planning Process

System planning and development strategy is fundamental – new features and capabilities must be adapted seamlessly with minimum impact to existing applications. The development process should involve rigid guidelines to ensure the compatibility of differing versions and models of system products and components. Each new step is a natural progression of the current system offering and never behaves like a plug-in or raw adaptation of someone else's product. For example, the application code runs as it did when first developed and new controllers seamlessly coexist on the same control network as previous generation controllers. In order to fulfill an individually tailored upgrade path, vendor's system enhancements must provide a unique blend of flexibility and scalability. The ability to mix and match hardware and software of different generations is a major strength. Services and solutions must preserve the system owner's investments. This ensures the continued use of base control hardware infrastructure and protects the intellectual asset investment made in software applications.
For example:

- **Process Graphics**: Save time and expense of re-engineering and intensive user/operator retraining
- **Database:** History data preservation restores existing historical data and can be transferred directly to the new history platform
- **Field Wiring:** Eliminates the need for field re-wiring and reduces the time and costs of re-testing when existing I/O is replaced with a new I/O product
- **Control applications:** Preservation of field proven control configurations and documentation minimizes production risk and project/ engineering costs

2.2. Customer Evolution Planning Process

A successful evolution program begins with a solid plan driven by the owner's business goals. Good planning is critical for any incremental, stepwise evolution and can minimize the negative production impact of the actual upgrade process. It can simplify and improve the yearly budgeting process and facilitate better system upgrades and planned plant shutdowns.

Individualized planning is essential. Different industries invariably have different strategies and business issues going forward. Sales account managers and technical experts should work with system owners individually to address their unique needs. The collaborative relationship results in the best strategies for each individual site.

After a comprehensive audit of the existing system, and with an understanding of the business drivers, the control vendor should:

- Submit a 3–5 year plan to be reviewed and revised as necessary. An incremental approach supports flexibility; allowing for changes to the plan as required over time.
- Identify and target which facilities are at the greatest risk for production loss and those that have the greatest potential for increased production. As each phase is identified, the vendor should provide value assessments and Return-on-Investment support for consideration in order to facilitate successful project appropriation requests.
- Review the long-term plan periodically; update as required to reflect changing business needs and new system solutions. This approach takes the guessing out of the budgeting process. As part of this planning process, specific projects are identified and implemented.

2. Four-Point Evolution Strategy

2.3. Customer Evolution Programs

Control vendors must promote a proactive approach to hardware and software upgrades; working with system owners to stay current and avoid hitting the brick wall of obsolescence through stepwise, incremental upgrades. This philosophy allows system owners to continuously improve productivity as new technologies and automation product offerings become available.

This approach provides the financial flexibility to move from existing automation system products to new, higher performance human system interfaces, system engineering tools, controllers, control networks, and information management – one functional area at a time.

2.4. Solutions Delivery

Delivery of sound system solutions based on evolution plans is another important process in the evolution value chain. Control vendor's system engineers must be highly trained, skilled, and equipped with the tools and resources to do the job right. They need to know what is installed, know what is needed to meet future goals, and have the knowledge to deliver it.

The project begins with a comprehensive review of the requirements formulated in the long-term plan. System engineers work closely with the system owner to formulate a project plan that achieves the desired end results. Based on this collaborative effort, the system engineers design a solution that delivers results, protects system investments, and presents the lowest risk possible during installation.

3. Evolution advantages versus ‘Rip-and-replace’ risks

The table below highlights the advantages of ABB’s evolution approach compared to the rip-and-replace alternative.

ABB’s evolution approach	Rip-and-replace alternative
Retain proven control application software for: – Calibration and control tuning – Permissive and interlocks – Startup/shutdown, automatic load runbacks – Signal scaling and failure modes – Alarm setpoints and alarm conditioning logic – Simulator tuning and fault scenarios Process control remains same as before	Control code re-engineering or translation is required. New algorithms result in different process control behaviors and require retuning
Retain plant knowledge base, operations and maintenance philosophy. Upgraded engineering tools afford documentation that is the same as existing Upgraded HMI affords familiar operational philosophy for: – User interface to control actions – Situation handling and SOPs – Graphic display and navigation – System diagnostics – Alarm, event handling, logs, reports, SOE Upgraded system hardware affords familiar maintenance procedures for: – Control system maintenance – Diagnostic and troubleshooting procedures – Engineering and online change procedures – Maintenance and tag out procedures	Plant personnel need to learn a new system. New documentation and new O&M procedures are different and unfamiliar to plant personnel that are supporting: – Troubleshooting for process control – Troubleshooting for system hardware – Operations look and feel – Maintenance procedures
Preserve Investment in control system I/O – Hardware upgrades can be easily implemented, at opportune times, by plant personnel – Offers significant cost savings, less work, less demands on plant resources	Requires massive change-out of system hardware (I/O, controllers, communication infrastructure, HMI and, as a minimum specialty I/O terminations)
Minimal commissioning and startup (no retuning of loops)	Long commissioning and startup periods (reconfiguration and retuning of loops)
Results in – Minimal loss of production – Minimal risk – Lower project costs	**Results in** – Greater loss of production – Increased risk – Higher project costs
Rip-and-replace risks	
Risk unnecessary plant trips and production downtime due to: – Errors creating a familiar controller strategy – Errors recreating a familiar HMI strategy – Operational errors due to unfamiliar system or control philosophy – Unfamiliar documentation and troubleshooting procedures	
Risk cost escalations and schedule delays due to: – Executing a large engineering development project – Implementing retuning efforts – Retraining for plant operations, engineering and maintenance – Installation wiring errors and missed scope – Construction change requests – Extended checkout and startup (I/O checks, logic checks, graphic checks) – Reimplementation and troubleshooting for third-party interfaces	

4. Summary of customer benefits received from the control system evolution planning process

- Unparalleled support of customer's life cycle needs
- Make informed control system life cycle decisions
- Reduce system support costs for multiple, aging system technologies
- Improved control system life cycle costs
- Extend the life of your existing control system
- Remove uncertainty in your budgeting process
- Eliminate unplanned production losses from process upsets and trips due to system interruption
- Maximize system investments and assets, both physical and intellectual
- Strengthened service relationship with your control vendor

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