

White Paper

Evolution of the Control System Integrator

The Present and Future of the Industrial Controls Industry



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As the times change, control system integrators become more vital to industrial organizations looking to successfully navigate the turbulent seas of new and ever-evolving disruptive technologies.

The operational technology (OT) industry, which includes industrial controls, hasn't experienced the same rapid technological expansion seen by the information technology (IT) industry. While this disparity wasn't widely perceived as an issue for many years, the recent demand for more data has brought attention to the technological gap between OT and IT. As the demand for data dramatically increases, industrial organizations will heavily depend on control system integrators to navigate the convergence of OT and IT.

Integrators' ability to expertly blend together the digital world of IT with the practical world of OT makes them linchpins in an industrial

organization's efforts to keep up with the latest technological trends. As such, control system integrators have a unique perspective on the technologies and trends driving this convergence.

In order to better inform and equip integrators to handle the changing technological demands, we asked them for their perspectives on the most important trends shaping the industry. We surveyed a pool of over 9,000 integrators to find out:

- **What are the current challenges of the industrial controls industry?**
- **How are current technologies affecting integrators and their projects?**
- **Which technologies and skills are imperative for the future?**
- **What does the future hold for integrators and the industrial automation industry?**

In this paper, we will examine what integrators told us in regards to the current challenges and future developments for industrial controls professionals.



The role that control system integrators play grows even more vital to industrial organizations.



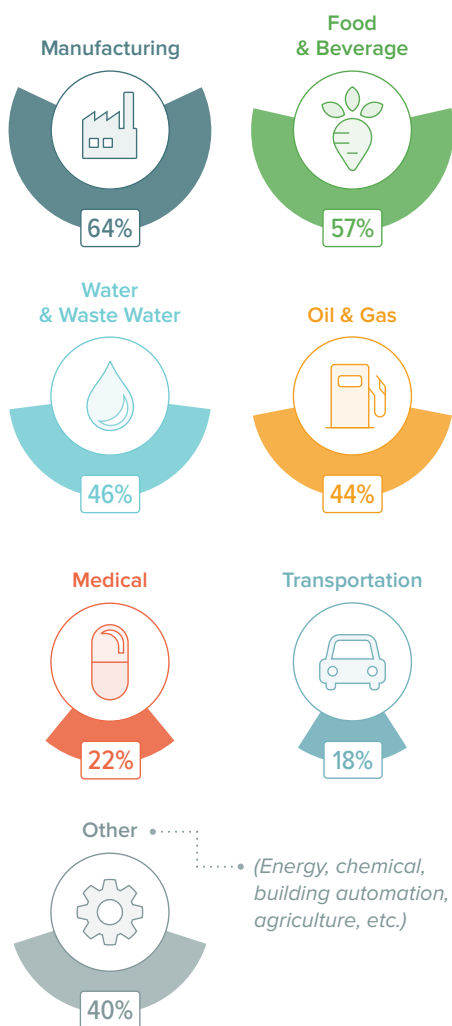
About the Survey Respondents

Our survey respondents included integration professionals with a wide range of experience levels, serving a variety of industries.



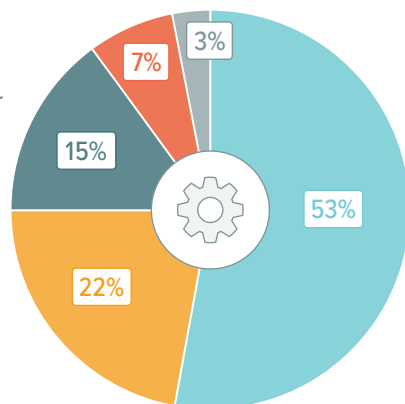
Industries Served

The percentages reflect survey respondents' ability to choose one or multiple industries.

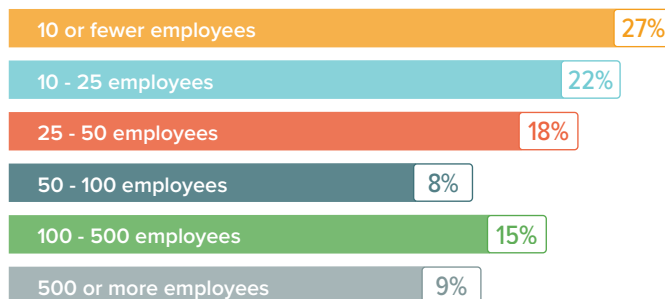


Profession

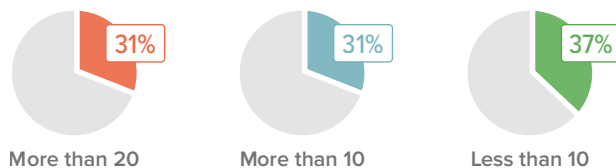
- Control System Integrator
- Controls Engineer
- Software Engineer
- IT Professional
- Other



Company Size



Years of Experience

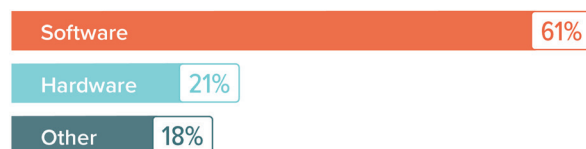




Current Challenges of the Industrial Controls Industry

Before looking at the future trends of the industrial controls industry, it's important to understand the issues that integrators face today. As you might expect, integrators face technological challenges with software and hardware, data management, and legacy systems. Interestingly enough, our participants strongly responded that the logistics of working with clients, project requirements, budgets, and timeframes also pose significant challenges.

What are the current challenges of the industrial controls industry?



■ Technological Challenges:

Software and Hardware

In our survey, 61% of our respondents said software is the greatest pain point, while 21% said hardware, and 18% cited other issues. The main issues cited were software compatibility, limited selection, complexity, training, and support.

Unfortunately, many traditional HMI/SCADA software solutions still operate on a very limited number of operating systems and are based on proprietary technology. This can cause serious issues with compatibility, limit the available options, and lock an integrator and their client to one software vendor. The latter issue can become especially serious if a vendor goes out of business or stops supporting a product.

To avoid these issues, integrators can choose a software solution that is grounded in open, IT-standard technologies from vendors with a history of successful industrial implementations. Opting for open solutions instead of proprietary ones

results in easier connectivity with enterprise systems and increased access to a wealth of training and support opportunities from a variety of sources.

■ Data Integration

As industrial organizations begin to connect their data from the industrial controls side to the enterprise level, integrators will definitely face data integration challenges as indicated by 12% of our survey respondents.

Traditional SCADA solutions store data in costly, proprietary process historians, which severely hamper their ability to share and analyze data. Solutions that connect controls data to an ERP system, for example, can cost a fortune and may take months to implement.

Data is simply too valuable to silo away. Thanks to open IT standards like SQL databases, the way data is collected, shared, and analyzed has improved tremendously in recent years. Integrators can fulfill a customer's need for easy data accessibility by using SQL databases to log historical data instead of process historians.

■ Legacy Systems

Legacy HMI and SCADA systems can be 20 years old or older. While a company can enjoy the reliability of a legacy system, 11% of respondents indicated that legacy systems are a challenge.

Some organizations want to maintain their legacy systems in order to save money. Yet, customers also want to connect their legacy systems to modern enterprise systems. This poses a challenge to integrators looking to incorporate new technology into a current system.

It's vitally important that any new technology solution an integrator uses is flexible enough to bridge legacy HMI/SCADA systems to cutting-edge enterprise-level software. Finding such a solution helps to overcome the challenges of unsupported hardware, proprietary technologies, and unsupported custom code often found in legacy systems.

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Logistical Challenges:

■ Customers and Project Requirements

In our survey, 38% of the participants indicated that their top challenge is working with customers and defining project requirements.

Some customers know exactly what they want, while other customers know that they need a solution but don't know where to start. When the customer does not have a concrete direction for their project, it is almost impossible for the integrator to be successful.

To avoid this, the integrator should make every effort at the beginning of a project to work with the customer to clearly establish the end goal. Without this information, it's very likely that the ensuing project will result in lost revenue and increased frustration.

■ Budgets

In the survey, 21% of respondents indicated that budgets can affect their ability to complete or even start a project. Many HMI/SCADA software vendors charge for every client, tag, and upgrade, which can push software costs into the hundreds of thousands of dollars. This kind of pricing structure makes it extremely challenging, if not impossible, for integrators to provide value to their customers.

Integrators can put themselves at an advantage by embracing software solutions with a simpler and less restrictive licensing model that eliminates surprise software expenses and offers more value to their customers. Additionally, software solutions with an unlimited pricing model can empower integrators to offer customers more scalability in the future, without drastically ballooning the budget for future projects.

■ Timeframes

All integrators have experienced the dreaded scenario of unrealistic deadlines. In the survey, 17% of participants said that time-related issues are the most serious challenge.

Several issues can seriously impact an integrator's ability to meet a deadline. These include issues such as defining project requirements, working

with proprietary and complex software, and finding enough engineers with specific skills to complete a project.

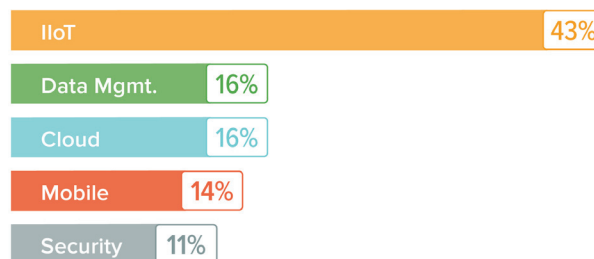
One thing integrators can do to meet strict deadlines more efficiently is to choose a software package equipped with tools for rapid project development. This gives integrators the ability to complete proof-of-concept prototypes more quickly so that full-scale work for project development and implementation can be started ahead of schedule.



The Future of Industrial Controls

Our survey respondents have indicated that we're entering an exciting time in the industrial controls industry. These insights into the new technologies and skills that will be vital for integrators in the future reveal the need to connect SCADA systems with enterprise systems in order to properly align OT and IT.

Which technologies and skills are imperative for the future?



■ IIoT and MQTT

In our survey, 43% of respondents indicated that the Industrial Internet of Things (IIoT) and Message Queueing Telemetry Transport (MQTT) are two big developments to watch.

IIoT incorporates intelligent machines that collect and share massive amounts of data, enabling companies to identify inefficiencies, save money, and improve quality. MQTT is an extremely lightweight publish/subscribe messaging protocol that is ideal for remote M2M devices in situations

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where bandwidth and power are at a premium. MQTT decouples edge-of-network devices from applications; instead, edge-of-network devices connect to applications through message-oriented-middleware (MOM), which reduces bandwidth congestion and allows for easy scalability.

IIoT architectures that employ MQTT and MOM offer a revolutionary solution to the issues of low bandwidth and the need to access data from remote devices. IIoT allows organizations to scale their application by simply adding connections to the MOM infrastructure rather than making additional connections to edge-of-network devices.

■ Data Management and SQL Databases

The convergence of OT and IT and the rise of IIoT have been triggered by industrial organizations' need to access more data. In the survey, 16% of respondents said that data management technology is important. As more industrial organizations look to connect the industrial controls side with the enterprise side, integrators must look into data technologies to stay competitive.

Traditional SCADA systems were simply designed to acquire time-series data and store it on process historians. In most cases, process historians use a proprietary method of data management, which limits the ability to connect to other systems. To connect to other systems, integrators must implement an incredibly costly solution that still does not meet all of the organization's requirements. Fortunately, there's a cost-effective solution that IT and enterprise software employ: SQL databases.

Integrators can take advantage of SQL databases' powerful features by incorporating them into a SCADA system. SQL databases free integrators from the restrictive nature of process historians by allowing them to log historical data. Once data is in a SQL database, other systems can access that data to create relationships and enable better decision-making.

■ Virtualization and Cloud Solutions

Also, 16% of survey participants mentioned that virtualization and cloud computing are upcoming technologies to look out for. While the two terms

are often used interchangeably, virtualization and cloud computing are separate concepts.

Virtualization, which dates back to the 1960s, refers to the separation of the application layer from the physical hardware. Traditionally, when software is installed on a computer, those applications are tied to the physical hardware. Virtualization refers to the creation of a virtual machine that mimics a single physical computer with an operating system but is actually running on several machines with pooled resources. Virtualization is what makes Cloud computing possible.

While most people identify the Cloud as a means of storage, the power of the Cloud lies in its ability to provide a wide range of services and resources such as applications, networking, and storage. Companies have rapidly adopted Cloud computing because it is far more economical than implementing an on-site solution.

Technologies such as IIoT are paving a new way for SCADA systems. Using virtualization and Cloud technologies, integrators have a wide array of architecture options that allow for applications and servers to be hosted in the Cloud rather than a physical machine. This is ideal for applications where installing a physical server is not practical, or creating a fail-safe in the event of an outage. Virtualization and Cloud computing offer huge benefits: companies can save money by investing less on physical hardware, and global organizations can quickly and easily connect employees wherever they are.

■ Mobile Devices

The Internet of Things (IIoT) and mobile technology are set to bring people and devices closer together. Our smartphones and tablets are packed full of sensors and wireless radios that allow us to communicate and interact with other devices in our homes, at work, at stores, and in our cars. In the survey, 14% of respondents indicated that integrators must consider mobile devices as they allow people to interface with machines and devices.

Enterprise-level software already enables users to view and analyze data using smartphones and tablets.

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With home automation being incredibly popular in IoT, the importance of mobile devices in IIoT becomes crystal clear.

With mobile integration, organizations are more empowered to interface with their systems and make smart decisions while in the field and on the move.

■ Security

Until recently, security and data encryption were never a major concern for integrators. In the past, most HMI/SCADA systems did not need to connect to other systems and remained self-contained. In some cases, where critical systems were involved, keeping off of networks was seen as the best security measure. Now, however, more organizations are looking to bridge the data gap, and 11% of the survey participants indicate that security is important.

IT has made considerable headway in regards to security. Well-established IT security practices include client authentication and auditing. When sharing data with an organization, a client authentication and auditing system should be implemented to manage all of the users. Through client authentication and auditing, integrators can give organizations total control over adding and removing users, what information users can see, what areas users can access, and view users' behavior, all with a click of a button.

Another IT security practice involves online commerce. You can bank online, purchase items, pay bills, and perform financial transactions all via the Internet. In order to perform these financial tasks, a high-level security technology such as Secure Socket Layer (SSL) is used to create a secure encrypted link and to encrypt data.

The excellent security and stability of MQTT make it an ideal protocol for the IIoT. Similar to SSL, MQTT uses Transport Layer Security (TLS) which encrypts sensitive information over networks. TLS uses certificate authorities and blocks common attack routes by closing all ports over the network between edge gateways and MQTT servers.

Stability is maintained through stateful awareness, allowing MQTT to manage communication paths, connect to other available MQTT servers, and initiate failover when a failure is detected.



The Future is Now

Our respondents have provided a clear picture of the current and upcoming trends in industrial controls. While integrators are definitely focused on keeping up with the latest technologies, spending more time working with customers and understanding their business needs will help bring balance to their projects.

New solutions that embrace the best of IT such as Java, SQL databases, Python, and SSL encryption are making it easier to integrate SCADA solutions into enterprise infrastructures. Features like unlimited licensing, web deployment, multiple-OS compatibility, and comprehensive support give integrators a greater ability to help organizations scale their solutions with little to no restrictions. Most importantly for the integrator, development time can be reduced dramatically, allowing more time to focus on other important issues.

Perhaps the most interesting trend is the convergence of OT and IT, which has paved the way for a solution with the potential to revolutionize the industry. Integrators must embrace the best of IT and combine it with the best of OT. As the architectural framework of IIoT becomes more established, more locations and applications will have access to data.

Technologies that combine OT and IT are available today, and integrators who use them in combination with the advancements to Internet, wireless, and security technologies have a serious edge in their project development. These solutions empower integrators to tackle the challenges they face today, and prepare them for the challenges of tomorrow.

Industrial Application Platform for SCADA, MES & IIoT



The Industrial Internet of Things: It's Here, It Works, It's **Ignition**

There is only one unified SCADA and IIoT platform that can turn the promise of the IIoT into a reality. Ignition empowers your enterprise to rapidly develop, deploy, upgrade, scale, and improve solutions in any way you need.

Discover the world's first universal industrial application platform:

✓ **IIoT & SCADA on One Platform:**

Ignition is the only IIoT platform with full-featured SCADA functionalities built right in.

✓ **Streamline Your Data Pipeline:**

Create one efficient data pipeline for all your IIoT data – any type of data from any device.

✓ **Unlimited Licensing:**

Add unlimited clients, screens, tags, connections, and devices.

✓ **Web-Based Deployment:**

Launch Ignition on any web-enabled desktop or mobile device.

To put the IIoT to work for you, visit:
inductiveautomation.com/iiot

