Capgemini engineering

HIGH TIME
FOR LOW-CODE IN INDUSTRIAL IT/OT

87.5%
of digital transformations failing to meet their original objectives

Today, **industrial companies are under pressure to produce more complex products, faster and more efficiently** than ever before. The solution to many of these challenges lies deep inside the data of the machines and processes that underpin their operations. But the real task is **transforming all of these data into actionable insight - and delivering it to the right people at the right time, in the right format**.

In order to support this increasing complexity (and its associated challenges), **industrial organizations** across the world are undertaking **large digital transformations**. Yet, according to the Harvard Business Review, most digital transformations fail. HBR cites studies from academics, consultants, and analysts indicating that the rate of digital transformations failing to meet their original objectives ranges from **70% to 95%, with an average at 87.5%.**

The traditional **'high code' approach to digital transformation involves the creation of software solutions, using specialist developers** fluent in languages like Python, Java and JS. High Code often requires high CAPEX - as before you can even start development, you must select your architecture and middleware, procure hardware, licenses and services (like databases) and mobilise different skillsets. And, if you want to add mobile capability (eg. use on tablets or phones) there's the added struggle of properly architecting your solution. All of this means that many companies struggle with their digital transformations.

The challenges of traditional software development for industrial IT/OT

There are various reasons why companies struggle to deliver such software projects at acceptable costs and timescales.

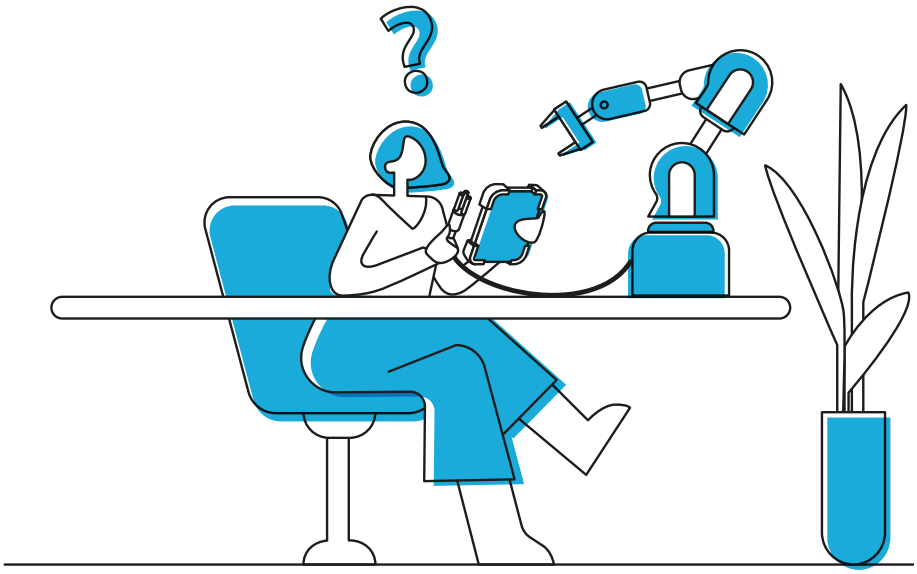
Firstly, **traditional software development, even when done via the agile methodology, is often a lengthy, costly process**. Development can take months (or years) to complete. Today, this is just not fast enough.

Secondly, **rising development demand and developer shortages**. Most companies try to reduce IT costs while also having to meet (or exceed) the demand for the goods and/or services they provide. Additionally, there is a shortage of skilled software developers in many industries. This is a problem, as businesses become increasingly reliant upon software.

Thirdly, **too many 'shadow IT' solutions or paper and Excel-based processes**. Many business processes aren't described or supported by software, thus leading organizations to create inefficient workarounds. Such workarounds, like Excel, paper, or shadow IT, are often the last resort of a business trying to cope with day-to-day operations. These result in poor process efficiency and business satisfaction, a lack of control of business data, and, of course, the emergence of unregulated shadow IT.

Poor access to 'premium data'. Businesses generate a lot of complex data, which, most of the time, are not accessible or valued throughout the development process. The idea or definition of a product or process is defined in the IT layer of the information system, whereas, as soon as we move to the physical world (for example, where things are being built), this data resides mostly in OT and ERP systems. This means that it is two different and disconnected worlds, in terms of information.

And lastly, existing software often **lacks mobile capabilities**, which are highly beneficial for business. For example, systems could be useful in a tablet or mobile, on the move for maintenance, or on the shop floor, far from a computer. However, most legacy systems don't support mobility.



NAVIGATING THE LOW-CODE WORLD

Many still have a negative perception of low-code based on its first generation, which came about in the late 1990s. In those early days, low-code platforms were mostly used as 'code generators'. Although this hastened the development process, their use often led to sprawling and hard-to-maintain codebases. It also required developers to understand and adapt this code, which generated substantial extra work.

Today's solutions are more capable and mature, with a wide variety of standard reusable components enhanced by the power of the cloud. Traditional developers are usually not necessary and are only occasionally required to insert some custom code when needed. The underlying technology is very stable, safe and offers good performance.

Get to know the low-code family

The term 'low-code' describes various families of the technology with different capabilities. These include:

- **Business Process Management (BPM)**, like Appian and PEGA.
- **Robotic Process Automation (RPA)**, like UiPath and Power Platform.
- **Customer Relationship Management (CRM)**, like Salesforce and Zoho.
- **Content Management Systems (CMS)**, like Wordpress and Joomla.
- **Analytics and Reporting platforms**, like PowerBI, Tableau and Qlik.
- **Low-Code Development Platforms (LCDPs)**, like Mendix, PowerApps or OutSystems.

THE BENEFITS

In the industrial IT/OT context, Low-Code Development Platforms (LCDPs) are definitely the direction of travel - allowing the rapid development of custom applications in order to reap significant IT and OT benefits. These are outlined below:

More innovative and collaborative

Low-code brings IT and business teams together in a series of very straightforward virtuous loops: "show and tell", "demonstrate", and "adapt". The development process is easy, rapid and intuitive, thanks to **visual development**, with changes that can be seen in real time. Thus, through many small and easy-to-implement iterations, using feedback from the right stakeholders, a business can quickly get the apps it needs - ensuring adoption and satisfaction. Low-code can help a business to transform its innovative ideas into new digital experiences that help the company redefine its processes. It also helps to **boost business adoption** of these applications, as it can lead to the custom-built digital experiences that are effective and enjoyable for users.

Cheaper and more agile

As Capgemini has observed, **low-code can deliver value 5-7 times more quickly**, with a rapid application development and deployment cycle which is easy to demonstrate, change and iterate. The reduced reliance on coding and the ability to leverage pre-built components can result in significant time and cost savings - minimizing the need for specialized developers. It can also decrease the time taken to respond to business feedback, new demands and opportunities. Depending on their complexity, **apps can be delivered in a matter of weeks**, largely or entirely without specialist developer help.

And, unlike some traditional approaches, LCDPs also support use on phones and tablets without extra development work. This includes the 'offline-first' approach, allowing these apps to perform their core functions without internet access - very useful on remote sites, or areas that lack full signal coverage. The apps can also leverage the assets of smart devices, like cameras, microphones, accelerometers, GPS and so on.

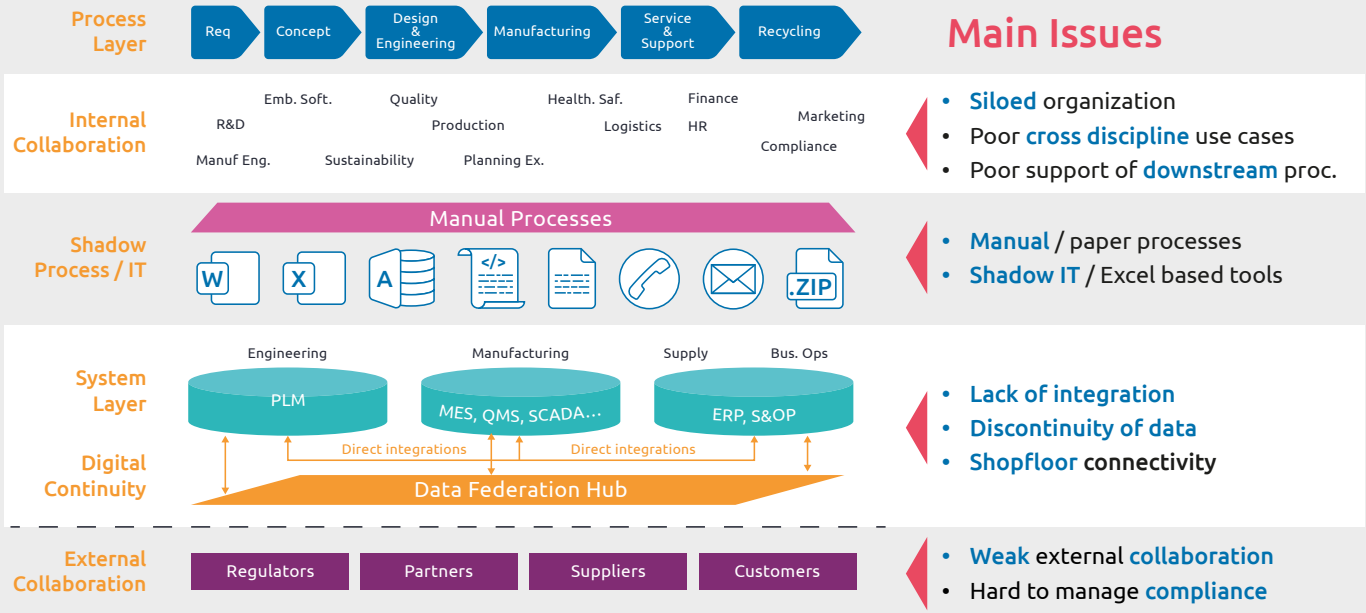


Figure 1 - Representation of challenges on the IT/OT layer

Can unlock hidden value in your business

Another dimension is how to best leverage legacy data, which often resides in multiple complex systems. Thankfully, low-code solutions are the champions of the integration world. They allow the development of composite apps, which can support very complex use cases, leveraging information gathered from multiple sources, like Product Lifecycle Management (PLM), Manufacturing Execution Systems (MES) and Enterprise Resource Planning (ERP) platforms, into a single interface. This, for example, could be very useful on the shop floor, or for maintenance.

Low-code solutions have many features that allow them to connect to any kind of database, API or data source with ease. They use standard connectors - for example, Mendix (Siemens) is highly compatible with the Siemens world (PLM - Teamcenter, MES - Opcenter, IoT - Mindsphere), but also supports numerous platforms, like IoT hubs, SAP, Salesforce, the entire Microsoft suite, and more. Low-code tools can also leverage complex data from legacy sources - for example, 2D, 3D, CAD, documents, bills of materials, digital work instructions and much more.

In many cases, this allows businesses, for the first time, to leverage rich data that was previously difficult to access, due to the complexities of integration. But, without the use of such standard connectors, it could have taken months to integrate these data sources.

Low-code: an example in practice

Imagine you own a maintenance center for aircraft engines. This busy hub, located in an international airport, works 24x7 and 365, but struggles to keep up with all of the incoming requests for maintenance, team shift planning and facility allocation.

On top of that, you face regular problems with managing and updating paper-based documentation and work instructions, as well as tracking work progress and deviations. Even billing is a struggle. In this ever-evolving world, things change, engines arrive late and people get sick.

There is no 'one' complete solution on the market that can help you to manage this complex environment. The answer? Build a tool specific to your needs, through low-code. Consider the following features.

- Facility/Team: You build a module to track your facility allocation, based on planning and assigning teams to pieces of work.
- Maintenance documentation: You stay in control of your documentation by managing maintenance instructions (text and illustrations) within the system. You use version control to track/highlight any changes to procedures.
- Work instructions on the go: You make instructions accessible on a tablet application, so that your staff can use this compact device, wherever and whenever needed. The device is robust, has a minimal, streamlined interface, and uses big buttons designed for use with oil and hydraulic fluid stained fingers.
- Track progress: For the first time, you can get information from everywhere, live - for example, real time progress updates on all maintenance actions on your shop floor. You develop beautiful dashboards to track important metrics and because of your awareness, are ready to quickly adapt when issues arrive.
- Seamless billing: For the last module, you track completed work as well as deviation work (justifiable work that was not forecasted). You have full traceability of completed work, and can now bill accordingly and automatically, by creating the bills in your ERP tool from your low-code system.

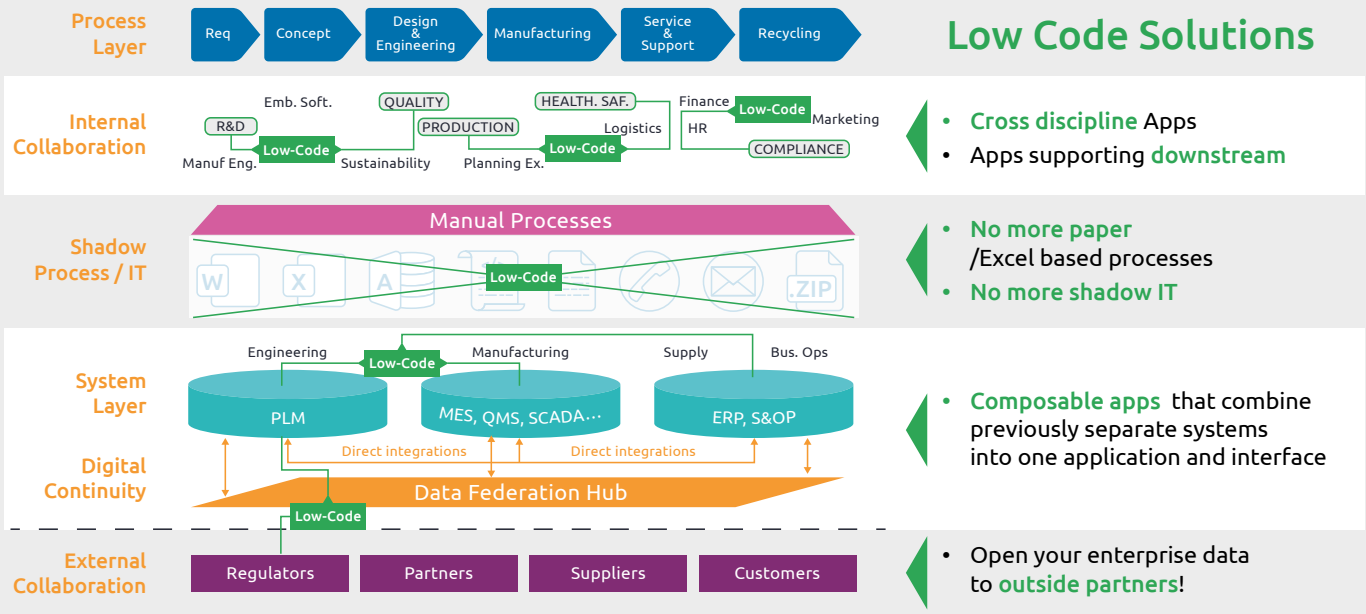
Thanks to the involvement of a team from your business and Capgemini, in under 6 months, you incrementally deployed

a solution that supports your unique processes. The solution was modular, allowing its various features to be easily and quickly deployed, even as other features were being built.

The results are considerable. You gained 20% efficiency on the shop floor work, as you removed all manual and paper-based activities. You are now more accurate on billing by 5%, and you never miss a piece of work, or justification. Your interactions with your end customer are truly professional, as any of your staff can provide an update, track the work that's been done and provide valuable information. You also made your business very happy - which isn't strictly a KPI, but is always a good thing.

You're now excited about what you've been able to do with low-code in your organization, but there are so many more things yet to optimize - you can't wait for your next low-code project. In fact, you're thinking of building an end customer request portal…

Figure 2 - Filling the gaps with low-code and eliminating shadow IT/manual processes



THE CHALLENGE OF SELECTING A LOW-CODE PLATFORM FOR YOUR IT/OT ECOSYSTEM

The question: how should you deliver low-code projects? The answer: Agile is usually best. But where to begin? Today, there are hundreds of low-code solutions. Which is best for you? That depends - and one solution might not be enough.

Some companies already have a LCDP in place, but, sometimes, the right thing to do is to use a mix of those platforms, as each have different strengths and weaknesses. The challenge, of course, is selecting the right one. The leading LCDPs for industrial companies are Mendix, OutSystems and PowerApps.

What should you consider when selecting a LCDP for your business? Below are some key drivers:

- The ability to run in the cloud, or on your premises
- The data connectors available/data integration capabilities
- The types of legacy systems it can connect to (eg. PLM, ERP, MES)
- The quality of its reusable components
- The expected user experience
- The licensing model
- How well it supports mobility
- The overall stability of the platform, its performance and scalability

Need some expert guidance? Capgemini can help you select the right platform, based on your specific needs. We have experience in setting up the right governance, architecture guidance and development teams to support you in your journey.

We offer a range of delivery models to suit your maturity (for example, are you in the early MVP phase, or moving to a deep transformation of your business?). And we can also help you to set up your roadmap, based on tangible benefits and time-tested business cases that repeatedly deliver results for our clients.

HOW TO GET STARTED WITH LOW-CODE

Make a business case

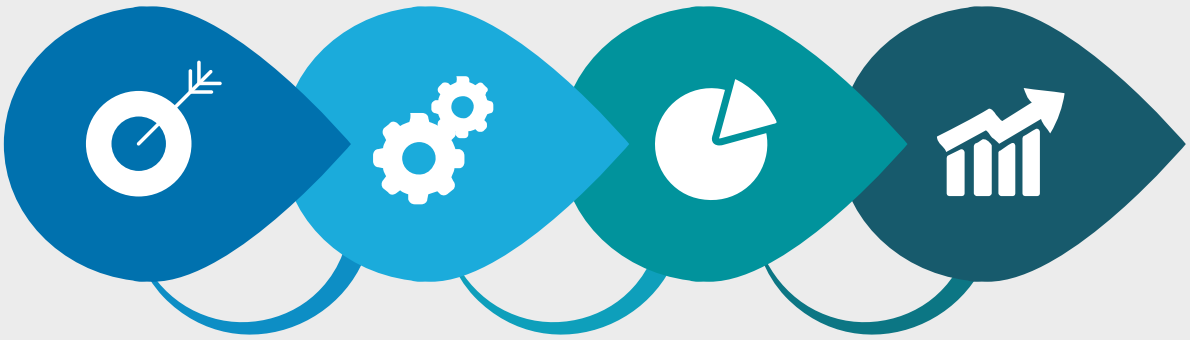
Set some objectives and secure your budget - is there a use case that has a tangible impact and can demonstrate the value of low-code technology within your organization? For example, are there any painstaking manual processes that can be automated? Which paper or Excel-based procedures need to change? This is an ideal place to start, and most low-code applications offer a very fast return on investment.

Identify specific areas where the development of low-code applications could improve efficiency or address an existing challenge. Perhaps try developing an application for a relatively small area of the business. This will probably involve the participation of several disciplines, who may struggle to work together on complex data. As such, ensure that there are suitable channels for them to collaborate. This will provide confidence in the platform and the pace of its development.

Build a minimum viable product (MVP)

Begin with a small pilot project or a proof-of-value to validate the effectiveness of your first low-code solution. Think of it as a lab for testing and experimentation, where low stakes mistakes can be made and lessons learned, before you try it on anything bigger. This will help you to get a sense of what low-code is capable of, and how your business can best make use of it.

Bring together representatives from your IT and business teams to shape your app development requirements. IT is essential in this phase, as you need those apps to fit your overall IT landscape. Occasionally, old technology may lack a connector and require some 'high code' to be integrated into your low-code app. So, don't leave your IT team out! IT will remain in control of the deployment of these apps, and is a powerful ally in your digital transformation.



Initial MVP
Initial Minimum Viable Product to gain business buy-in on your process

Secure Budget
Identify first candidate apps and budget

First Apps
Start development of the first apps

Platformization
Integrate Low-Code as a digital continuity enabler and contribute to digital threads

Build more apps and platformize

Once you've got your first low-code applications up and running, the next step is to adopt this technology as a platform for industrial use cases. Set up some delivery teams to work in parallel and increase the pace. Some of our customers have implemented more than 70 apps in under 3 years, eliminating paper and streamlining many important processes.

The ease of creating and deploying an app creates many possibilities. This can lead to complexities in enforcing uniform standards, security adherence, cost control, and so on. An appropriate governance mechanism, driven by technical expertise, must be in place to regulate low-code deployments and make sure that they align with the organizational strategy and your security requirements.

And, as you continue to extend the scope of the delivery, standardize the use of low-code and refactor your existing apps to make them better.

APPS FOR YOUR GAPS

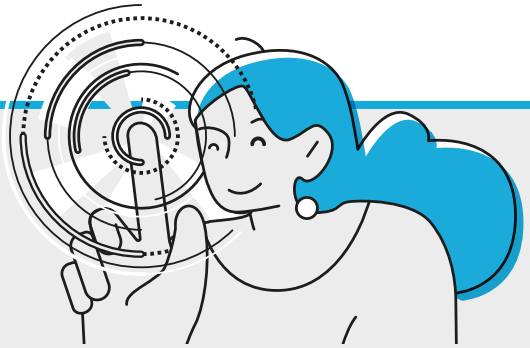
Low-code is no longer just for innovators and early adopters and it won't make coding obsolete. It will, however, help businesses overcome challenges presented by the tech talent gap. The strong appeal of low-code development lies in its adaptability and potential to act as a driver for stronger, deeper partnerships between IT and business operations.

Low-code no go zones

That said, it's important to note that, while low-code technologies offer numerous benefits, they are not suitable for every application or organization. Probably not, for example, mission critical or enterprise-wide systems - at least not without a lot of IT department and system integrator involvement. LCDPs can help you build a range of powerful solutions, however, the licensing model for low-code tools can sometimes make existing commercial off the shelf (COTS) solutions more appealing.

Here are some areas in which low-code may not be suitable:

- Trying to rebuild a large COTS application as a low-code solution (eg. PLM, MES, IoT and ERP).
- Using standard connectors from low-code to build an interface between systems.
- Using low-code as data analytics platform. Though low-code can help you develop dashboard applications to review major information, it lacks the sophistication of dedicated big data analytics tools.



YOUR LOW-CODE FUTURE

Low-code fosters innovation, reduces the gap between IT and business, and helps to create bespoke, beautiful, modern apps that support your organization. It fills the gap between legacy platforms and can respond to unique use cases which standard software usually can't meet. Even small customers are adopting LCDPs to boost their operations. In fact, low-code early adopters are often considered 'superheroes' by the business for the value they can deliver in such a small timeframe. That said, skilled developers aren't going away anytime soon, it's just that you might not have to rely on them quite so much as you once did.

So, if your business is struggling with tech availability, and you want to embrace a new breed of developers (with unique perspectives), low-code might be the way forward. This can help you rapidly develop highly valuable apps and ecosystems that increase business productivity and innovation, without the cost, timescales and investment in software skills that traditional coding requires.

If you want the best results, get the best help

While its possibilities are almost endless, these possibilities must be realized through a realistic plan of action, backed with the necessary resources and, of course, business buy in. You must set the priorities for your transformation, as well as drive, control and execute your development roadmap.

Want to increase your odds of success, or get there faster? Consider engaging with a dedicated low-code partner to support you in your journey. Capgemini can be that partner for you - we have years of experience and many successful digital transformations (across many industries) under our belt.

We also have platform vendor partnerships, underpinned by an international team of deep experts who understand your challenges and how to solve them. All of this can help you succeed with low-code in your digital transformation.

LOW-CODE Q&A

"This is good, but it must be expensive?"

Low-code's benefits come at a cost. However, this cost covers the ability to deliver faster, all the automation, the platforms etc. These costs are more easily manageable and predictable for IT. Unfortunately, most low-code solutions don't offer the same licensing models, so the right choice might depend on your specific business needs. In most cases, it's worth it.

"How do we ensure citizen development does not create shadow IT in the enterprise?"

With low-code platforms, IT stays in control and defines what is allowed in production. Though the business could build local apps itself (through citizen development), strategic platforms must be designed and built by the IT department or an external system integrator. Low-code, then, contributes to eliminating shadow IT and moving those solutions to a common platform under IT's control.

"How does total cost of ownership compare between traditional and low-code platforms?"

Traditional software usually comes with almost no license costs, however, it is 5-7 times more expensive to build and requires extensive CAPEX (databases, connectors, infrastructure etc.). You also need to maintain it in the long run. In contrast, low-code minimizes development costs; all costs are included in the subscription model (license plus hosting) and you control the apps that you want in production. Because of the platform's inherent stability, you have no maintenance costs and only pay for the introduction of new features.

"I have already a low-code platform, but it has limitations"

There is no 'one size fits all', unfortunately. Some low-code platforms are better than others, especially in the field of industrial processes. The key differentiators are the expected experience, the source of data, and the standard components/connectors available.

"How good are the integration capabilities of low-code platforms?"

Really good. Most of the standard protocols are available. Some low-code platforms have 200+ connectors to the most common platforms. Typically, connecting to Sharepoint, Salesforce or SAP can be done in a few hours or less.

"I am subject to compliance requirements - so, what about my confidential data?"

Most low-code platforms are cloud native, but some could fit your security requirements, as they can be deployed on premises, or on an edge device on your shop floor. Low-code vendors usually document the security standards that their tools meet - which makes the security compliance for these apps easier.

"Can (or should) I rebuild large solutions with low-code?"

You can, but it depends. As long as you are not replacing an off-the-shelf solution with complex capabilities, it's possible. The idea is to build independent modules than can be released quickly to the business. Don't wait for a 'big solution' to be ready before putting things in production. Low-code makes your upgrades and changes more agile.

"Can I decustomize my legacy system tools and build apps in low-code instead?"

Yes, that's what we are seeing in some of our customers, for example, keeping the SAP core clean and building a low-code customization on top of it. This can accelerate the deployment of the low-code platform.

"How good is the user experience?"

Low-code platforms are built on latest standards of development, most of them have a very intuitive, modern UI/UX with near-infinite levels of customization and styling. The limit is your imagination - not the technology.

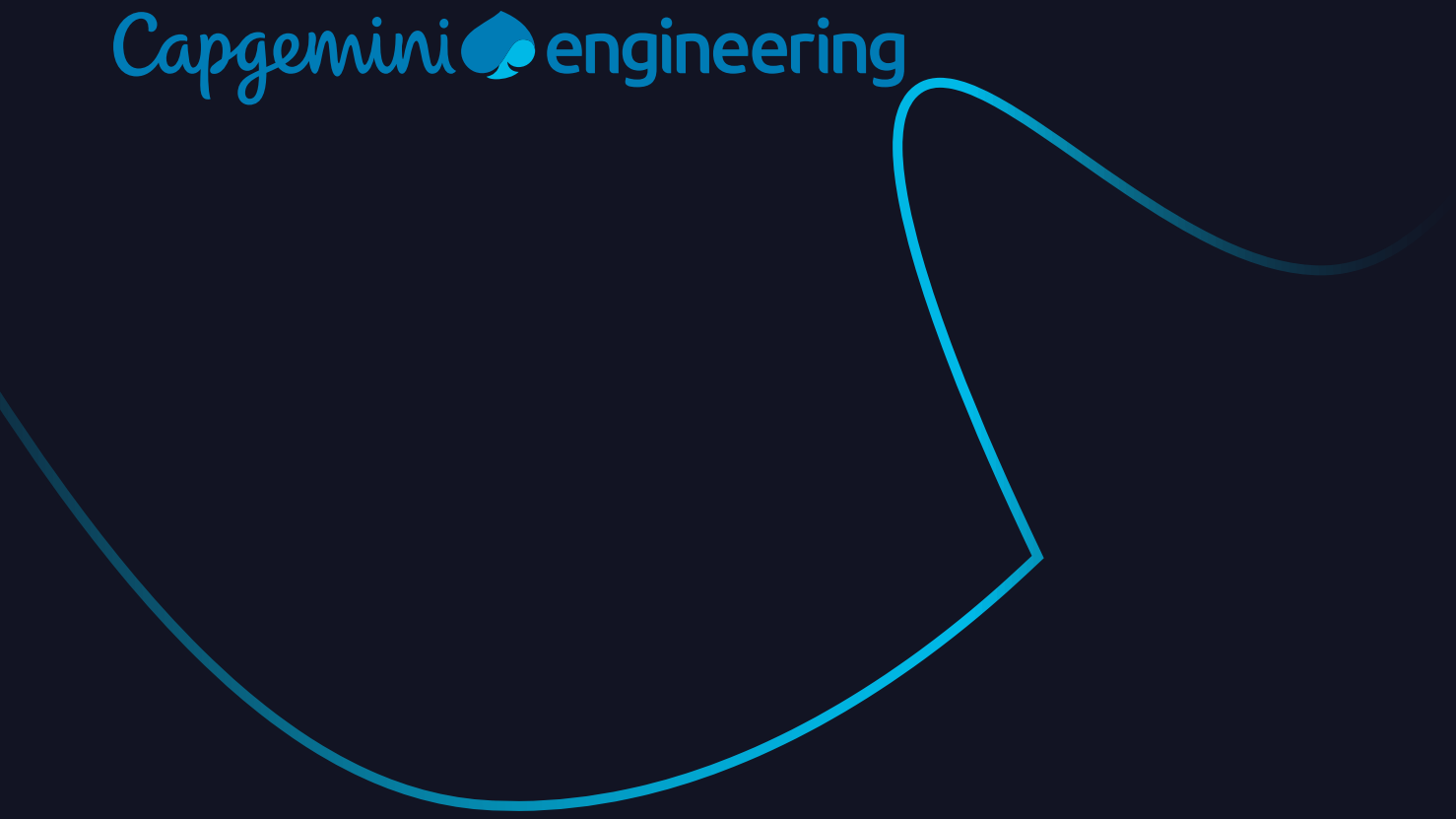
ABOUT THE AUTHOR

Thomas Zynda

Lead Architect - Digital Continuity Center of Excellence

thomas.zynda@capgemini.com

Thomas Zynda is a Lead Architect as part of the Capgemini Engineering Digital Continuity Center of Excellence. He has 15+ years experience in the field of Industry, with much of that in PLM. The Center of Excellence supports new technologies that are accelerating the Digital Transformation and Digital Continuity for Industrials. Thomas believes that low-code is one of the most disruptive technologies of today, and that it will significantly boost industrials' business efficiency.



About Capgemini Engineering

World leader in engineering and R&D services, Capgemini Engineering combines its broad industry knowledge and cutting-edge technologies in digital and software to support the convergence of the physical and digital worlds. Coupled with the capabilities of the rest of the Group, it helps clients to accelerate their journey towards Intelligent Industry. Capgemini Engineering has more than 60,000 engineer and scientist team members in over 30 countries across sectors including Aeronautics, Space, Defense, Naval, Automotive, Rail, Infrastructure & Transportation, Energy, Utilities & Chemicals, Life Sciences, Communications, Semiconductor & Electronics, Industrial & Consumer, Software & Internet.

Capgemini Engineering is an integral part of the Capgemini Group, global leader in partnering with companies to transform and manage their business by harnessing the power of technology. The Group is guided everyday by its purpose of unleashing human energy through technology for an inclusive and sustainable future. It is a responsible and diverse organization of over 360,000 team members in more than 50 countries. With its strong 55-year heritage and deep industry expertise, Capgemini is trusted by its clients to address the entire breadth of their business needs, from strategy and design to operations, fueled by the fast evolving and innovative world of cloud, data, AI, connectivity, software, digital engineering and platforms. The Group reported in 2022 global revenues of €22 billion.

For more information please visit:
www.capgemini.com

Contact us at:
engineering@capgemini.com