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INTRO TO LOW CODE and what you need to get started

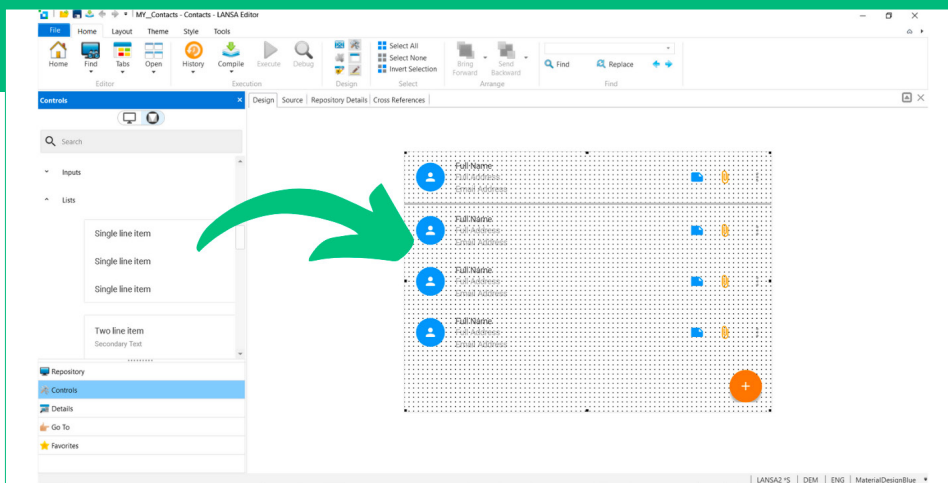


Intro to Low-Code

Low-code development platforms allow the creation of application software using less program code than would typically be needed when developing with traditional computer programming languages. Software development is usually a lengthy and complex process so low-code's promise to simplify, accelerate and reduce the cost for the development of applications can be a very attractive proposition for busy IT departments.

Forrester Research coined the term 'low-code' in 2014 and use it to define development platforms that:

enable rapid delivery of business applications with a minimum of hand-coding and minimal upfront investment in setup, training and deployment.



Many providers of application development tools attempt to offer a 'no-code' approach by enabling users to use graphical user interfaces and configuration options rather than traditional programming code. These systems do a good job of enabling departmental employees to build simple apps to quickly meet their needs. However, applications built with these tools often fall short of the needs of enterprise IT.

Some code is normally required to extend functionality, integrate with existing systems or utilize pre-built existing application components. Hence 'low-code' rather than 'no-code'. In this white paper we look at the transformative potential of low-code for enterprise application software development.

We discuss the challenges faced by enterprises looking to exploit technology to deliver competitive advantage and what that means for IT departments who need to rise to this challenge. In addition, we present the top five things to look for when selecting a lowcode platform and finally we look at how to deliver on the promise of low-code software development.

Intro to Low-Code the Business Enterprise Application Development Challenges

The Business

Business is changing at a faster pace than at any time in history. New entrants are redefining the rules of engagement and disrupting markets where the terms of reference may not have changed for decades.



You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete.

Buckminster Fuller

For market incumbents and new entrants alike, building a new model is the holy-grail. Stealing a march on the competition and establishing yourself as the leader in a new, high growth market. For many business leaders, technology is seen as the way to make this innovation happen. Come up with a new model and use technology to establish it quickly and make it work. Minimize the costs and maximize the profits.

For established businesses though, working through the change presents additional challenges. Existing processes, roles and systems may need to be totally re-imagined through the transition. Legacy systems will need to be carried forward as new systems and applications are created to support the future business model. The amount of work laid at the door of IT both to support the existing business operation and create the new business environment is more than many can cope with.

Worldwide demand for software developers is outpacing supply.
This will continue, thereby causing many companies to fail
to achieve business goals that require the enabling support
of software extensions and new apps.

Digital transformation is the integration of digital technology into all areas of business. It's fundamentally changing the way the business operates and delivers value to its customers.

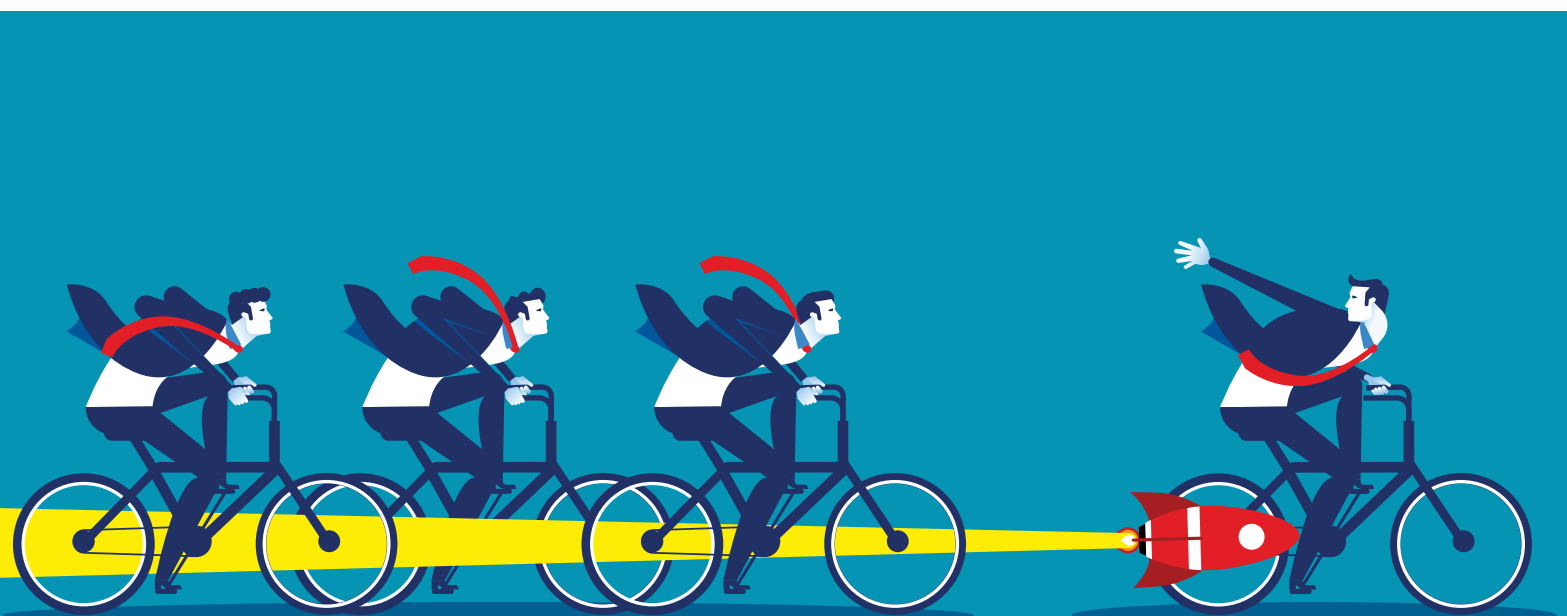
Digital transformation may include many elements such as:

- Automating new processes
- Updating legacy systems
- Removing paper-based, manual processes
- Creating new applications to support future business
- Deploying new systems in innovative and flexible ways

Many processes are still run using spreadsheets that may start small and then grow and grow to become unwieldy monsters that go far beyond their initial intent and scope. Modern systems need to support modern working methods, which can mean transforming these outdated processes to professional, maintainable and reliable apps. That means taking information to wherever key people and processes exist (including customers) even in hard to reach places. Applications need to be adaptable and mobile.

Moving applications to mobile devices or the web and deploying them in the cloud to get the scalability and flexibility required, is a large part of most digital transformation strategies. The challenge for business is clear. Reimagine, redefine and reinvent the business process to win customers and outsmart the competition. Most of all, do it quickly or be beaten to the punch by the competition. Use technology as the enabler and the driver.

The challenge is not easy especially when time is short, but the rewards are clear.



IT Pressure

The enormity of change technology has brought about in business over the past fifty years cannot be underestimated. Yet the pressure on IT to deliver business transformation has grown as the pace of market change has accelerated.

That has meant that IT backlogs have grown, whilst at the same time, resources have become stretched and budgets often tightened.

IT backlogs grow as the application maintenance burden grows. Studies have shown that application maintenance can typically consume up to 80% of an application's total life-cycle costs. For many developers then, maintaining existing applications is the bulk of the work and tends not to allow time for the addition of new skills.

Building new modern systems requires many different skill sets and that's a challenge for IT managers looking to recruit the people with the right skills. For modern web, cloud and mobile applications, dozens of technologies often need to work together and finding developers with all the skills is both difficult and expensive. This often results in many developers needing to be recruited. Each one with a different skill set.

In some cases, business units see IT as the obstacle to getting changes made. They're used to having change requests of IT take far longer and cost much more than expected. Whilst IT wants to be seen as an enabler, too often the opposite perception is projected (IT as the 'Department of No'). This can lead to a rise in the growth of Shadow IT where business users take application development into their own hands to implement systems because they cannot rely on IT to do it for them in the timescale they would like.

Connecting these shadow applications to central systems and databases gives rise to its own set of issues and potentially to conflict with IT. Business units too may not fully realize the implications of the systems they are creating (such as the maintenance burden).

IT then have a number of challenges to overcome in order to be the driver of change and enable the business transformation needed to be successful in the future. These include:

- Workload and backlog
- Access to new and constantly evolving skills requirement
- Developer productivity and a reduction in the maintenance burden
- The rise in shadow IT
- Becoming the 'Department of Yes'

Developer Challenges

Software developers have their own set of challenges. The greatest is probably the pace of change in the software development industry. With the move to modern software development on web, mobile and cloud, new languages, frameworks, plug-ins, modules and components appear almost weekly. How can developers keep on top of all the options available and how can developers ensure the choices made of which to use, are the right ones in the long-term?

Building a new generation of modern applications may require significant reskilling of the development team. For maintaining existing applications, there may be little opportunity for developers to add new skills. Some developers will embrace the change, whilst others will prefer to stick with what they know.

For the business, having developers that really understand the business process, can work closely with business people and can deliver on their requirements, is what really makes developers valuable. There is an opportunity for developers to gain business analysis skills if that is something that interests and motivates them.



Low-Code Software Development to Address the Challenges

The introduction of low-code software promises to help:

- For business, it can allow applications to be created far more quickly than traditional methods. As a result, the business model can be reengineered quickly and allow the flexibility needed to react to changing market dynamics and conditions.
- For IT, low-code promises an easier way to build applications and a faster way to deliver them to the business without being held up by an inability to find the right skills and resources. Thus, development backlogs can be reduced and the perceived value to the business will be improved.
- And for developers, low-code offers the chance to build new, modern applications without having to learn a multitude of new development tools and languages and at the same time, bringing them closer to the business.

Low-code offers a new way forward where developers can focus on learning the business and delivering apps as opposed to the next web framework. Continuing to learn, implement and support the latest and greatest development languages and open-source frameworks is no longer viable. Low-code software development can be the means to catalyze the transformation of the business using technology as the driver.

Low-code development platforms can help enterprises in a variety of different ways:

Faster development

Writing less code means more apps can be built faster than ever before. Enterprises finally have the means to attack the backlog of apps the business needs.

Digital transformation

Transformation of manual and paper-based processes into cloud, desktop, web and mobile applications for better efficiency, productivity, data accuracy and customer service.

Reducing the maintenance burden

By simplifying application maintenance as well as development, overall life-cycle costs can be reduced and resources freed up to build new applications.

Move to mobile

Satisfy the increasing demand for mobile applications across the business. Build mobile apps in-house with existing developers and quickly deploy them into users' hands.

Cloud computing

Improve availability while cutting operational costs by quickly moving applications, or parts of applications to the cloud for better agility and elasticity.

Skills management

Eliminate pockets of expertise and specialized skills. Allow any developers to work on any part of an application. Eliminate resource shortages and conflicts.

Combating Shadow IT

Accelerate the deployment of applications so that business users don't feel they need to take matters into their own hands. Deliver apps in days or weeks instead of months or years.

Low-code enables the creation of a new breed of applications designed to support the changing needs of the business, faster than ever before. Even as underlying software technologies may change, low-code shields developers from those changes allowing them to focus on the business needs to drive change through new technology and software applications.



Getting Started With a Low-Code Solution

The right low-code software development platform will significantly reduce costs over the entire software development life cycle. They also shield developers from having to worry about how their project will be deployed across various devices, interfaces and platforms, enabling them to remain focused on quickly delivering business applications.

Below is a list of the key elements to consider when evaluating a low-code platform. Finding the right solution that addresses all of these areas will help simplify application development, increase the pace of delivery and insulate developers from the ever-changing underlying technologies in the long run.

The key elements to look for from a low-code platform:

- Breadth of application creation capabilities
- Simple integration with new and existing systems
- Depth of the development environment
- Simplified application maintenance through business rules
- Broad cross-platform support and deployment options

Breadth of Application Creation Possibilities

The most successful low-code development platforms will assist in the rapid prototyping, design and deployment stages of creating enterprise-grade web and mobile applications. Abstracting the business logic from the underlying programming code can help to build supportable and maintainable applications that last.

Real-time Prototyping

Working alongside business analysts and end users, prototypes should be defined in short order so that ideas can be fleshed out and processes simplified. Gathering user feedback early through the use of real-time prototyping, often saves time on the back-end of the development phase and greatly increases user acceptance.

Some low-code development platforms convert these prototypes directly into the final application by replacing prototypes parts with real programs that reflect actual business logic. This ensures the prototyping effort is not wasted and helps to deliver final applications more quickly than before.

Flexible Deployment Options

Low-code platforms will typically address the needs of deploying to many different device types from mobile phones and tablets, right through to desktop and web browsers. The use of responsive design techniques helps significantly.

Many low-code solutions take a mobile-first approach. That sometimes means the desktop version can suffer if additional development is not done.

The best low-code platforms will offer different mobile and desktop versions from the same code base. The mobile version will be optimized for small screens and the desktop version for large screens to provide a Windows-like user experience that enables end users to be as productive as possible.

Developer Productivity

Low-code development platforms are designed to boost developer productivity by providing an intuitive development environment that hides and abstracts low-level functionality to achieve much greater levels of efficiency and a shorter learning curve.

Simple Integration with New and Existing Systems

Many applications are thought of as single entities that service a particular task or function. The reality is that under the covers, applications involve a series of multiple integration points, communicating with many different components including databases, internal and external APIs and connected devices. This integration of multiple components is therefore a critical element in the strength of any low-code platform.

Many low-code platforms will claim to integrate with ‘everything’ through the use of RESTful APIs. Whilst this is useful and RESTful APIs have a valuable role to play, they may not always be available and may need to be developed externally in order to allow the integration to take place. Low-code solutions are designed to do away with external development, so this somewhat negates its promise.

The ability to integrate with a wider selection of integration points is therefore imperative. Most organizations have legacy applications with EXEs, DLLs and .NET components that contain code that runs their business. Integrating with these without having to wrap them as RESTful APIs is important.

A strong low-code platform should provide support for many different integration points including:

Web Services:	REST, SOAP and XML Web services.
Data Formats:	XML, JSON, XLS(T), PDF, CSV, TSV, TXT, EDI (ASC X12 and UN/EDIFACT), Zip, etc.
Direct Database Access:	All relational and non-relational (NoSQL) databases.
Direct Calls To:	DLLs, EXEs, JAR, .NET components, ActiveX, etc.
Transport Protocols:	HTTP(S), FTP(S), (S)FTP, SMS, SMTP, POP3, AS2, AS3, SSH, etc.
Messaging:	ActiveMQ (Apache), WebSphere MQ (IBM), Sonic MQ (Progress Software), Tibco Rendezvous (Tibco), etc.

Depth of the Development Environment

Organizations will often be attracted to low-code solutions because it's very difficult and expensive to find and hire full-stack developers that can quickly work on any aspect of an application. Low-code development platforms shield developers from the complexity and accelerate the application development process by auto-generating all of the source code on behalf of the developer.

Developers should never need to see the code generated. However, with some platforms they may need to drop down into the code (and out of the low-code environment) to maintain or extend the application beyond the capabilities of the low-code solution. Dropping into Visual Studio or Eclipse and reverting back to traditional application development negates the benefits and promise of low-code. In addition, having to drop out of the low-code environment will often break a fully integrated DevOps process.

When building, maintaining and extending applications, the best low-code platforms should never require developers to leave the low-code environment.

The more often developers are forced to work outside the environment, the less "low-code" those platforms become as developers have to revert to traditional application development. This has massive implications for maintenance which will now need to be done both inside and outside the low-code environment.

With weaker low-code platforms, this happens most often when:

- Redesigning screens - Debugging applications
- Modifying code - Deploying applications

Being able to perform these tasks within the development environment ensures that both development and ongoing maintenance does not become fragmented.

It is also far easier to introduce new developers if ever the original developer moves on from the project.

Simplified Application Maintenance Through Business Rules

Business rules that include details of how information should be handled are very important to applications. In an application context these can include:

- Data definitions
- Connections
- Business logic
- Table definitions
- Relationships

Maintaining these business rules is an ongoing challenge. Multiple applications often need to refer to and use the same rules. Hard coding them in every program increases the maintenance burden and introduces potential inconsistencies by having rules residing in multiple places.

There is great architectural advantage in storing all the definitions, connections and rules in a centralized business rules engine, external to the application whereby when a rule is changed, all applications that use it will automatically inherit the change. The execution of the rule will be guaranteed and enforced in every application.

High-end low-code platforms typically separate business rules from the applications themselves into a business rules engine that should allow for:

Creation, storage and maintenance of definitions in a single repository

The fundamental tenet of the rules engine is to keep data definitions separated from the applications and databases with which they work. Every developer must be able to easily see and access the repository. It can isolate layers of the application from each other enabling for example, the swap out of one database technology for another without impacting the rest of the app.



Storage of definitions at an independent data services layer

The downside of deploying rules at the database level is that all database vendors have proprietary ways to implement triggers and stored procedures. This locks applications into using specific databases features. Rules engines can avoid database lock-in by injecting the rules at the application layer. However, every program then has to duplicate source code which can lead to inconsistencies and difficulties managing code.

The ideal deployment model is an independent data services layer where the rules engine is loosely coupled from the database the applications layers.

This architectural benefit allows changes made within the rules engine to be automatically enforced without changes or recompiling of applications.

Importation of existing data schemas

Many projects must extend applications with existing databases. Ensuring developers can import existing data, schema and stored procedure definitions from sources outside the low-code platform for use within the rules engine is an important requirement.

Accessibility of business rules from programs outside the low-code platform

When the rules engine can be leveraged from any application, regardless of the development environment used (e.g. low-code, Java, C#, PHP, VB, JavaScript, etc.), all applications, irrespective of their age or technology, will benefit. They will all be able to share a common set of business rules to govern all database I/O which will greatly improve data accuracy.

If business rules cannot be used outside the low-code platform, they will need to be duplicated. Duplicate rules mean duplicate maintenance and that can lead to business rule inconsistencies.

The rules engine should be able to be maintained by non-developers (business people) who can define a rule once, knowing it will be enforced everywhere.

Such an approach makes it considerably easier to:

- Implement change requests
- Simplify the addition of new application functionality
- On board new developers to take on the maintenance task

Taken together, this dramatically shrinks the maintenance burden of an app with enormous reductions in application maintenance effort and costs as a result.

Broad Cross-Platform Support and Deployment Options

One of the key benefits of a low-code solution is that it shields developers from the underlying technologies and easily allows migration from one technology to another. The same is true for deployment options. Low-code development platforms that possess many deployment options, can ease a future migration path and help easily port applications over to a different technology stack if required in the future.

It's critical that low-code platforms support a range of deployment options and capabilities including:

Web Applications:	Responsive design for optimized viewing on phones, tablets and desktop browsers.
Mobile Apps:	Web browser for all devices. Hybrid and/or native for iOS, Android and Windows Mobile devices on any form factor.
Databases:	Microsoft SQL Server, Oracle, IBM DB2, Sybase SQL Anywhere, MySQL, MongoDB and all the other popular relational and non-relational (NoSQL) DBMS.
Server Platforms:	Windows and Linux with potential for other platforms depending on specific needs and requirements.
Location:	Cloud, on-premise or hybrid.

Portability is as important as supporting the deployment options listed above. High quality low-code development platforms will provide a level of abstraction enabling easy portability of server platforms or databases with little to no modifications of applications. Migrating to or from the cloud must also be a simple process, as well as supporting hybrid environments.

In addition to mobile and web applications, standalone or client-server Windows desktop applications for laptops and workstations and Windows server programs initiated from job schedulers, are important within many organizations. Where Windows is a critical part of the infrastructure, the low-code solution must also provide support for building native Windows apps.

Beyond the Technology

The right low-code development platforms are those that significantly reduce the total cost of ownership (TCO). This encompasses the initial design and development as well as the ongoing application maintenance, modernization and extension. The ability to easily maintain and extend applications must therefore be a key consideration when selecting a low-code platform. In addition to the technical considerations of a low-code development platform, selecting the right vendor to partner with is also critically important. For low-code solutions factors including the following should be considered:

- History of supporting customers with application development, including number and types of projects undertaken
- Track record of staying current on new technology
- Ability to support proof-of-concept projects
- Support, training and mentoring options offered
- Professional services offerings
- Customer reviews and references

It's important to be sure the vendor will be available to support development efforts on an ongoing basis. Major digital transformation projects can often take years and whilst the low-code approach will reduce the time to deliver, it's important the vendor and its platform will be there for the long haul.



Conclusion

Markets are rapidly evolving and the businesses who succeed in the future will be the ones who use technology to steal a march on their competition and make the most of the new opportunities presented. In practice, this means new systems and applications will need to be created or existing ones updated and modernized.

Traditional application development methods fall short and cannot keep up with the demands from the business for innovation in the tight timescales required.

Low-code development platforms offer a new and better way to meet the business need for high quality applications, delivered in a timely fashion with easy deployment and maintenance options.

Low-code has never been more accessible to organizations large and small and it presents the greatest opportunity for new applications to deliver transformational value to the business.

In this white paper, we've listed the challenges of building new applications and how low-code can help to address them. In addition, we've summarized the key capabilities to look for when getting started with low-code platforms. LANSA is ready to be your trusted partner with its industry leading low-code platform Visual LANSA, along with services, support and expertise to help you on your journey to innovate, improve and transform your business through application development done better.

For further reading, please check out additional white papers available at www.lansa.com.

LANSA's mission is to make advanced software simple. We do this by taking care of the underlying and constantly changing technologies, enabling software developers to focus on the business problems that need solving and to rapidly produce high quality software.

When businesses can effectively capitalize on IT to innovate and differentiate, they gain a competitive edge. LANSA helps to make it happen.



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