Low-Code/No-Code Development

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What is Low-Code/No-Code (LCD/NCD) Development?

Low-Code: Creating software with small amount of code by reducing the amount of traditional hand coding.

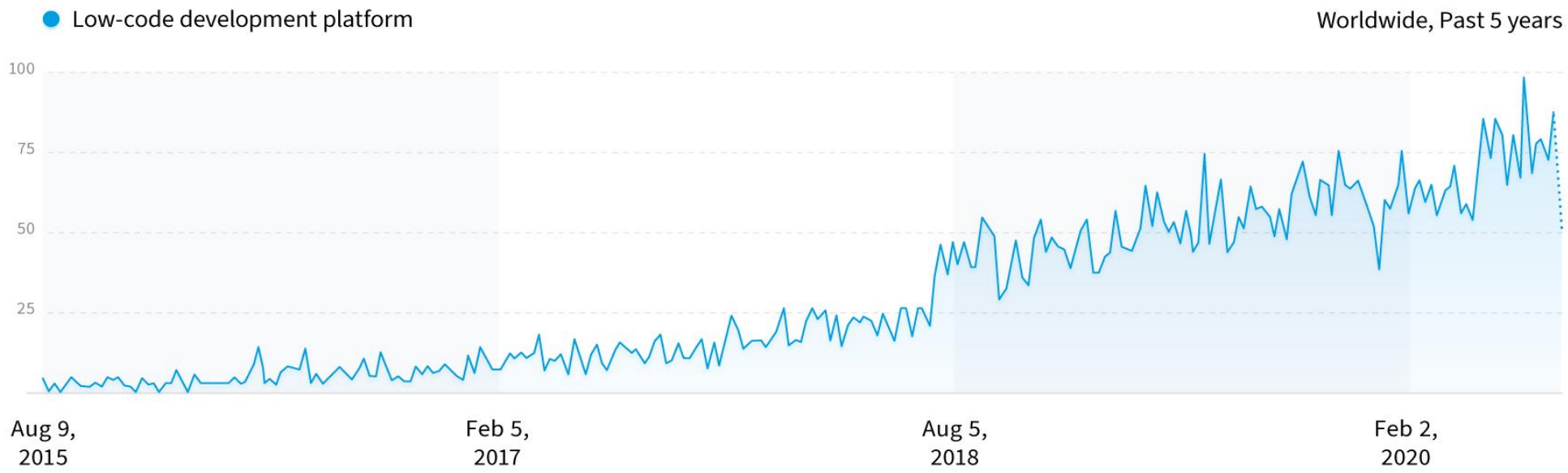
No-Code: Create software using graphical user interfaces and configuration instead of traditional computer programming. Closely related to Low-Code development platforms.

Other definitions: Visual Programming, Drag-and-drop. Graphical User Interface, What you see is what you get.

Why Low-Code/No-Code Development is Getting Popular?

- Research company Gartner says that by 2021, the demand for information systems will increase five times faster than the ability to provide them by IT departments.
- Number of employees are not growing at a sufficient pace.
- Recruiting software engineers has become increasingly difficult as demand is high and supply is low.
- More than 50 percent of medium to large enterprises will have adopted to these application platforms by 2023
- People with no programming knowledge can easily adopt to these platforms to build applications.
- First Low-code integrated development environment (IDE): Visual Basic .NET

Trends


Low-code development platform
Worldwide, Past 5 years
100
75
50
25
Aug 9, 2015
Feb 5, 2017
Aug 5, 2018
Feb 2, 2020

Traditional Development vs NCD/LCD [5]

CHARACTERISTIC	TRADITIONAL DEVELOPMENT	NO-CODE/LOW-CODE DEVELOPMENT
Development resources	Developers with expertise in programming languages for: •web app development •mobile app development	An intuitive drag-and-drop interface for web/mobile app development by: •citizen developers •professional developers
Development time	Lasts for months and includes: •extensive coding •multiple prototype revisions •testing and bug fixes	Is accelerated by 10x thanks to: •no need for coding •ready-made design templates •drag-and-drop interface
Development cost	Depends on the developer's hourly rate:	Depend on the subscription plan and the number of users:

CHARACTERISTIC	TRADITIONAL DEVELOPMENT	NO-CODE/LOW-CODE DEVELOPMENT
Multiplatform	The app should be developed separately for each platform	The app can work: •for mobile •for web •in the cloud
Maintenance	•requires additional development •is extensive to support	•easy to update and extend •great for prototyping
Deployment	•requires many steps •requires much development resources •slow and complex	•one-touch deployment to multiple environments

When to Use LCD/NCD and Traditional Development[6]

Use LCD/NCD:

1. For Business Use Cases that Drive Agile Transformation
2. Quick Application Development by Business Users
3. For Unique and Customizable Solutions

Use Software Development:

1. For Open-Ended Solutions
   problems require open-ended thinking

2. For Applications Requiring High Level of Specialized Interactivity
   applications require a high level of specialized interactivity. provide the flexibility and freedom because of infinite number of functionalities.

What platforms are used?

Bubble.io

Airtable

Wix (Editor X)

WordPress

Outsystems

Microsoft Power Apps

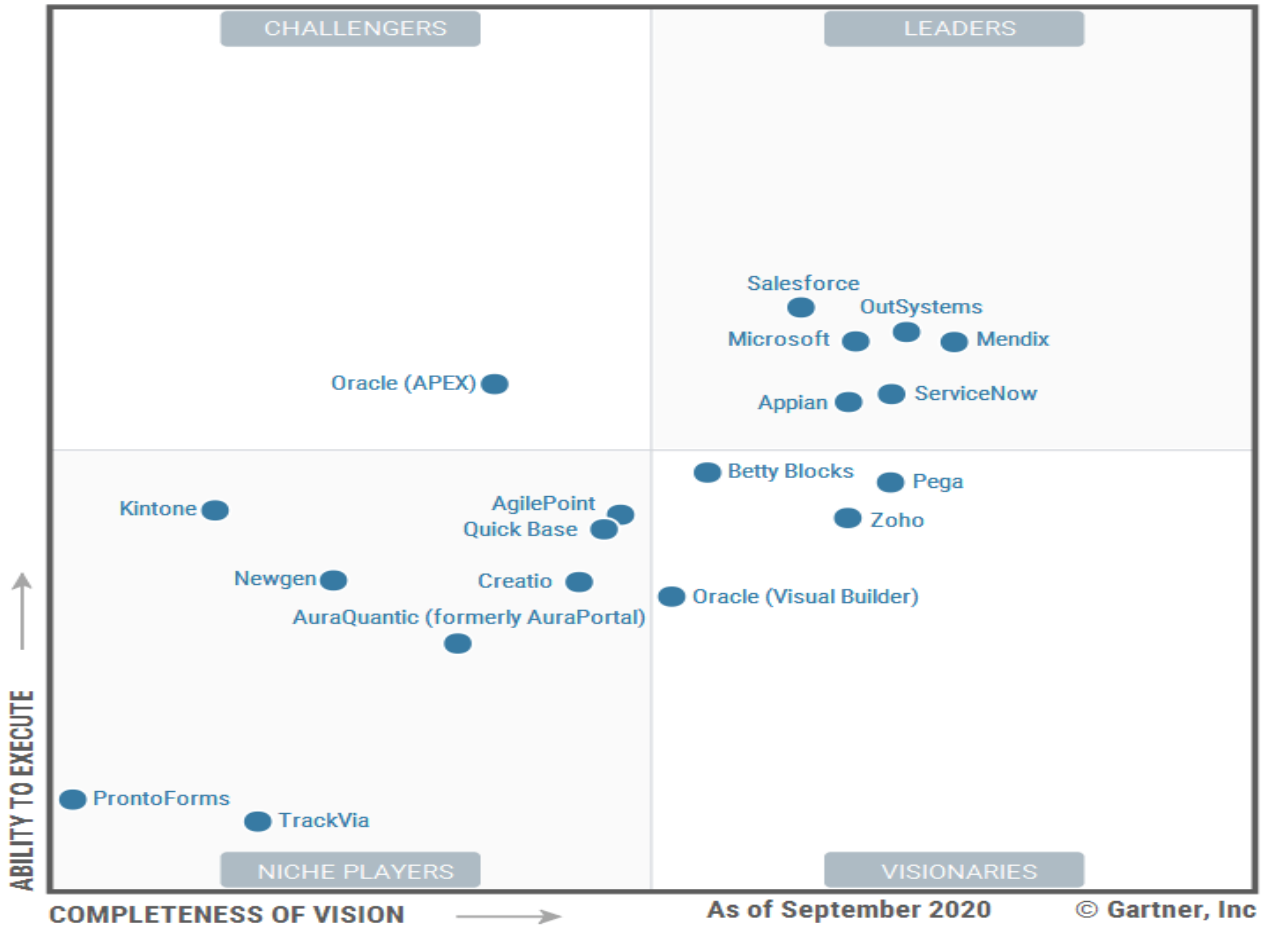
Google App Maker

Salesforce App Cloud

Shopify

Zapier

Glide

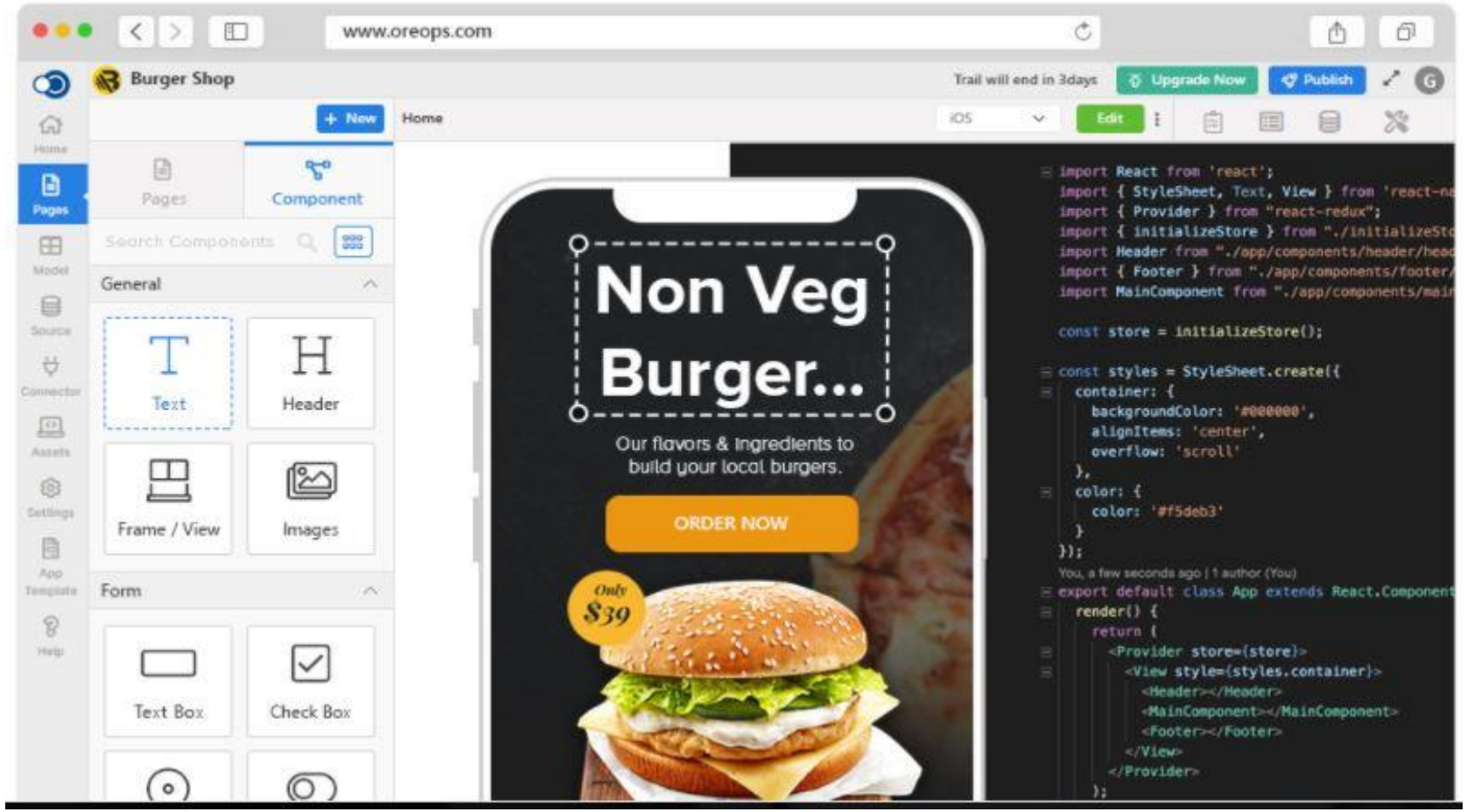


Supporting Technologies Behind LCD/NCD contd.

1. React Native Development platform: Develop Android and iOS apps.

OREOPS is a low code platform to develop react-native mobile applications.

Mobile Components: Configure models for text, images, videos, lists, buttons, etc.
API Integration: Integrate your app with legacy systems or third-party applications for easy data access.
App Pages: Create app pages in a click and simply drag and drop components
Files and Media: Ensures a simple upload of docs including Js files for effective use.
SmartCode: Let you design your app with limited or no coding knowledge.


www.oreops.com
Burger Shop
Trail will end in 3days
Upgrade Now
Publish
New
Home
iOS
Edit
Pages
Component
Search Components
General
Text
Header
Frame / View
Images
Form
Text Box
Check Box
Non Veg Burger...
Our flavors & ingredients to build your local burgers.
ORDER NOW
Only $39
import React from 'react';
import { StyleSheet, Text, View } from 'react-na
import { Provider } from "react-redux";
import { initializeStore } from "./initializeSto
import Header from "./app/components/header/head
import { Footer } from "./app/components/footer/
import MainComponent from "./app/components/mai
const store = initializeStore();
const styles = StyleSheet.create({
container: {
backgroundColor: '#000000',
alignItems: 'center',
overflow: 'scroll'
},
color: {
color: '#f5deb3'
}
});
You, a few seconds ago | 1 author (You)
export default class App extends React.Component
render() {
return (
<Provider store={store}>
<View style={styles.container}>
<Header></Header>
<MainComponent></MainComponent>
<Footer></Footer>
</View>
</Provider>
);

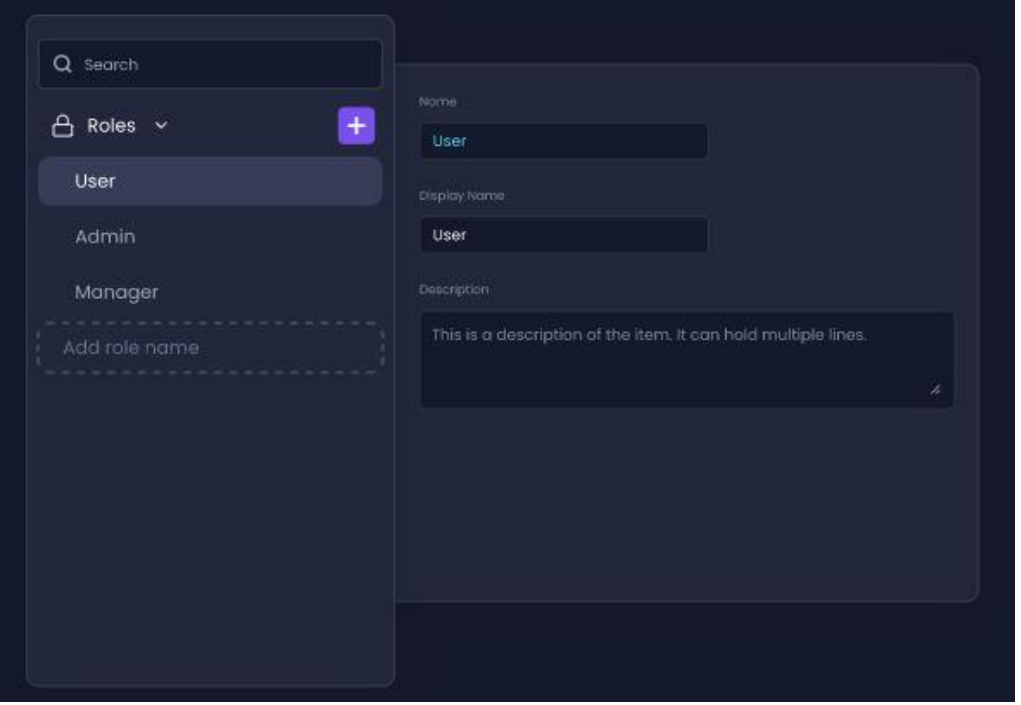
Supporting Technologies Behind LCD/NCD contd.

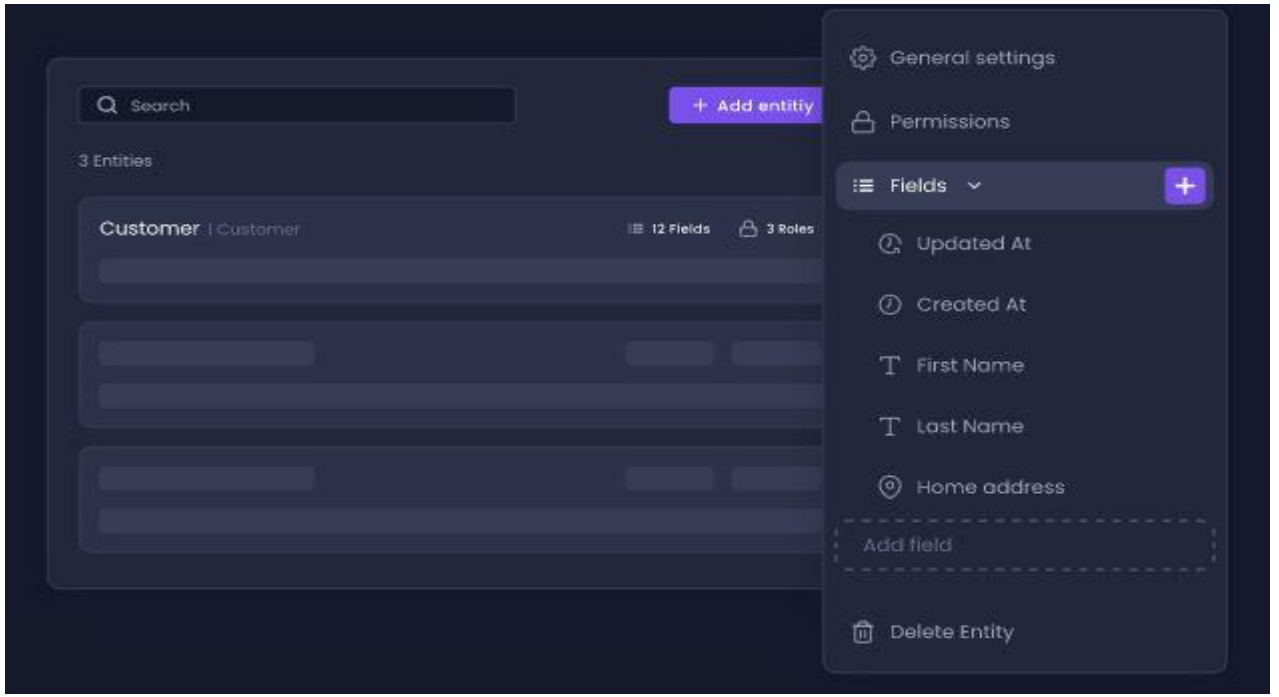
2. Node.js

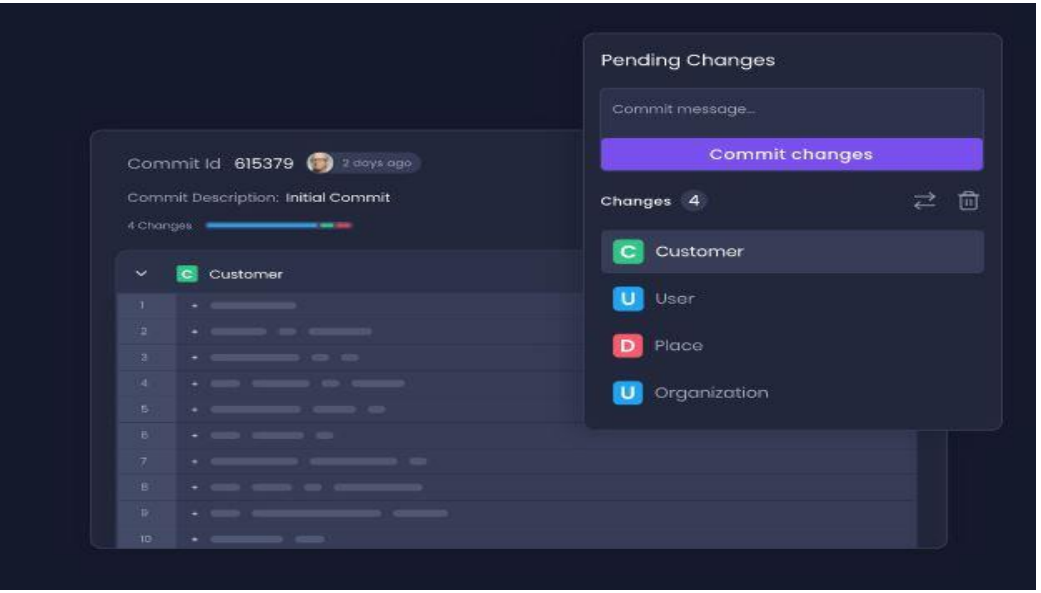
- Node-RED is a low-code programming for event-driven applications built on Node.js
- Amplication is an open source development tool that helps to develop quality Node.js applications.

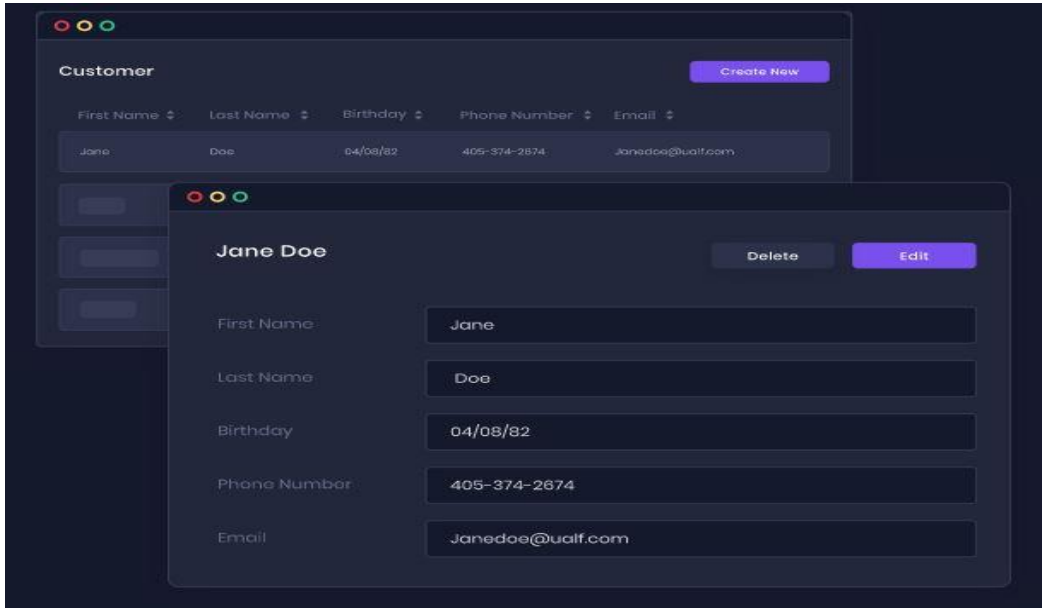
Amplication works:

1. Design model and roles : Define data entities and role-based access through Amplication's UI or CLI, and it will auto-generate you database, an Admin UI, and API
2. Deploy your application in one click
3. Sync your app with GitHub
4. Access your app: Auto-generated admin UI based on the data model schema enables to access data with ease.
5. Connect your code using REST or GraphQL.


Search
Roles
User
Admin
Manager
Add role name
Name
User
Display Name
User
Description
This is a description of the item. It can hold multiple lines.


Search
Add entitiy
3 Entities
Customer | Customer
12 Fields
3 Roles
General settings
Permissions
Fields
Updated At
Created At
First Name
Last Name
Home address
Add field
Delete Entity


Commit Id 615379
2 days ago
Commit Description: Initial Commit
4 Changes
Customer
Pending Changes
Commit message...
Commit changes
Changes 4
Customer
User
Place
Organization


Customer
Create New
First Name
Last Name
Birthday
Phone Number
Email
Jane
Doe
04/08/82
405-374-2674
Janedoe@ualf.com
Jane Doe
Delete
Edit
First Name
Jane
Last Name
Doe
Birthday
04/08/82
Phone Number
405-374-2674
Email
Janedoe@ualf.com

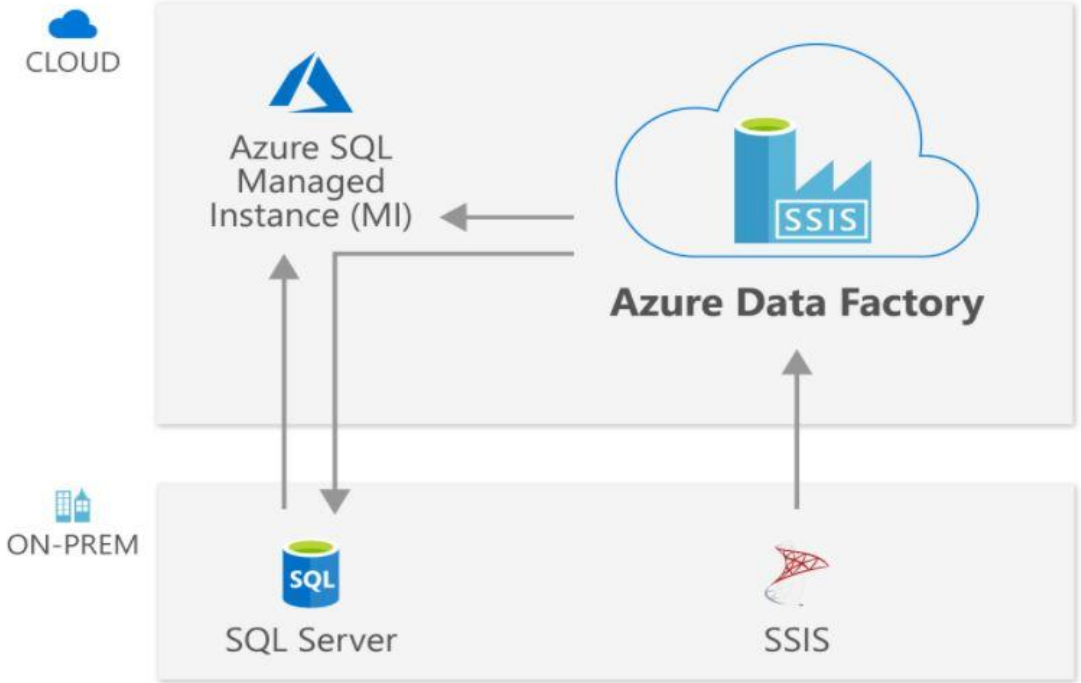
Supporting Technologies Behind LCD/NCD contd.

Apache Spark : Unified analytics engine for large-scale data processing

Azure Data Factory: A fully managed, serverless data integration service. Accelerate data transformation with code-free data flows. Managed Apache Spark service take care of code generation and maintenance.

Easy-to-use: Rehost SQL Server Integration Services (SSIS) in a few clicks and build ELT and ELT pipelines code-free, with built-in-Git and CI/CD support.

Cost-effective: Enjoy a pay-as-you-go, fully managed serverless cloud service that scale on demand
Powerful: Ingest all your premises, and software as a service (SaaS) data with more than 90 built-in connectors.


CLOUD
Azure SQL Managed Instance (MI)
SSIS
Azure Data Factory
ON-PREM
SQL
SQL Server
SSIS


Salesforce
SAP HANA and Table
ServiceNow
Dynamics
Amazon S3 and Redshift
Google Cloud Storage and BigQuery
SAAS APPLICATIONS
BIG DATA SERVICES
Marketo
HDFS
Mongo DB
NoSQL
GENERIC PROTOCOL
Generic HTTP
Azure Data Factory
FTP/SFTP
FILE
File System
ENTERPRISE DATA WAREHOUSES
Netezza
Azure SQL DB
AZURE DATA SERVICES
Cosmos DB
Oracle Exadata
Azure Synapse Analytics
Azure Storage
Teradata

Supporting Technologies Behind LCD/NCD contd.

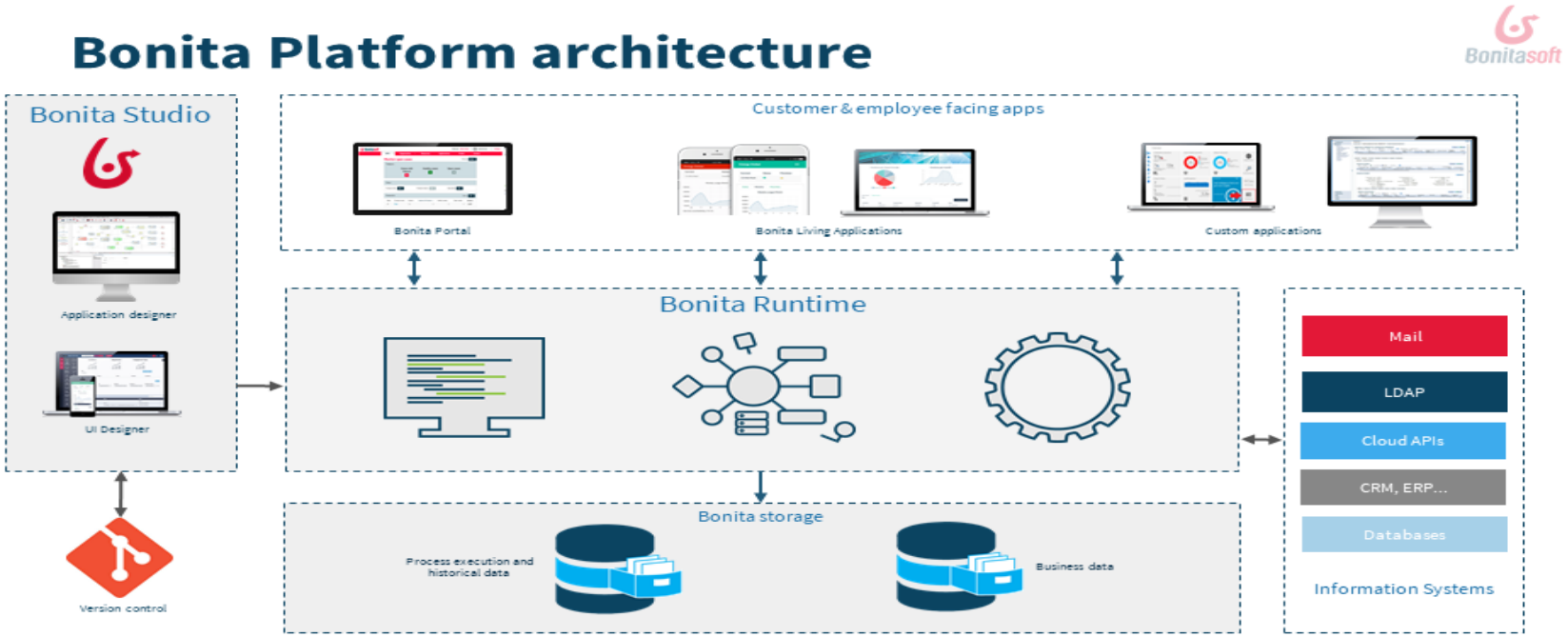
Server-side scripting : In web development that involves employing scripts on a web server and produces a response customized for each user's request. Allow user to create website with zero code.

WordPress:
Plugins: Infinite combinations, infinite possibility.
Ecommerce: Turn your site into a store
Built-in marketing: Rely on built-in SEO tools, Mailchimp, Google Analytics integrations.

Supporting Technologies Behind LCD/NCD contd.

SOAP (Simple Object Access Protocol) : Messaging protocol specification for exchanging structured information in implementation of web services.

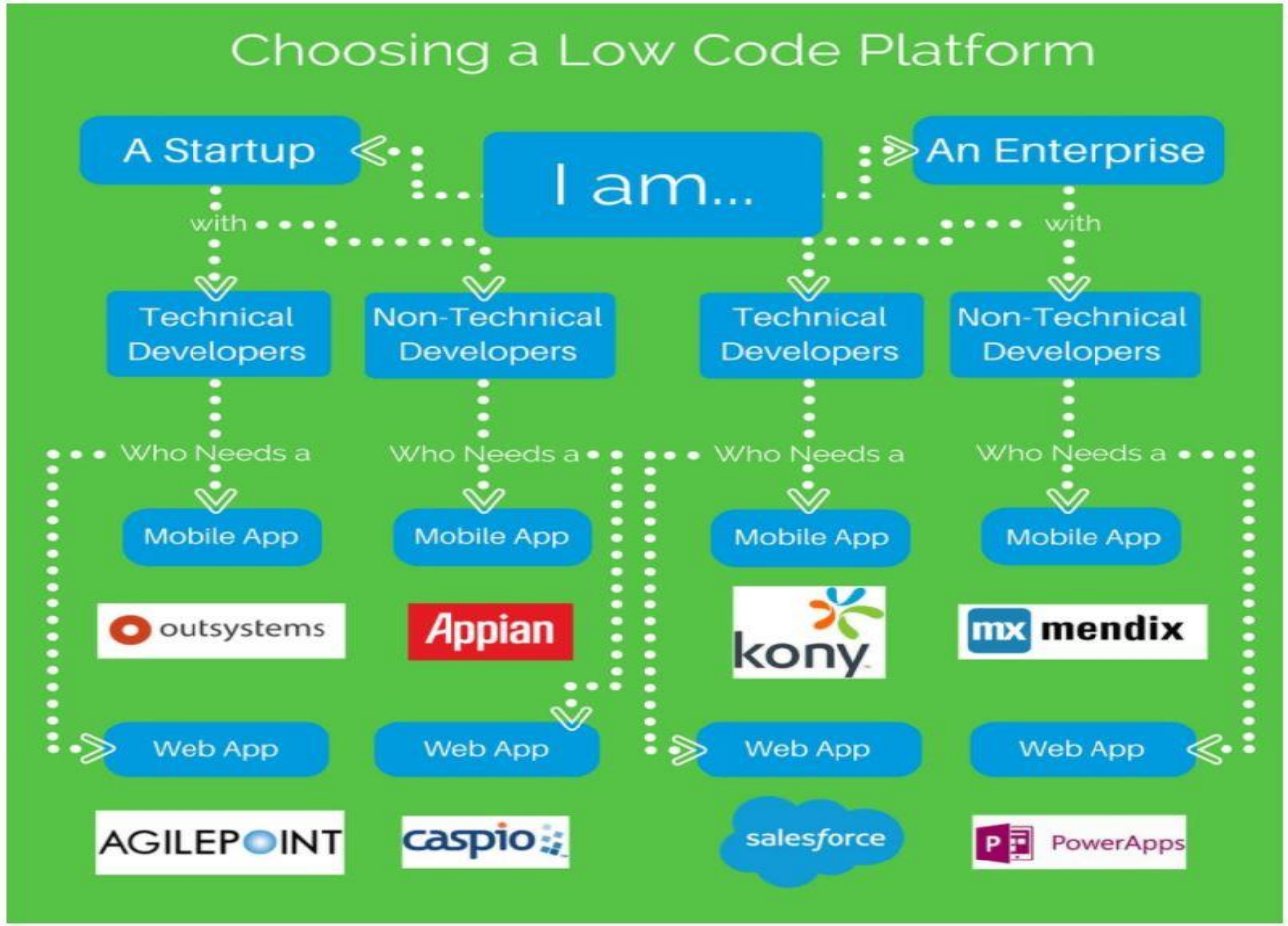
Bonita: Open Source digital process automation platform. Use model-driven Bonita Studio with drag-and-drop visual process design to define fundamental business logic.
Use connectors and REST APIs to integrate with you enterprise technology stack.



Types of Applications developed.

Mobile Applications
Web Applications

[7]



Customer Relationship Management with LCDP/NCDP [8]

A CRM is a technology for managing all the company's relationship and interactions with customers and potential customers.
Marketing sales, customer service, and support.

Works as a customer data storage software, data analytics, interactive dashboards.

Advantages: Quick application development, low development cost, no programming knowledge needed.

LCDP/NCDP for HealthCare [9]

Healthcare applications are developed with privacy, security, and compliance. A low code platform built specifically for healthcare means that all applications are custom built in a secure and HIPAA compliant environment.

Use Cases for using in healthcare:

1. Patient Safety: Care teams can integrate solutions make it easier for team members to report incidents and events, manage events, perform reviews.
2. Quality Monitoring and Clinical Rounding Tools: Can build tools to support clinical rounding. Supports quality monitoring tools to make it easy to share data, measure outcomes, track clinical performance.
3. Employee Health: Can build an app to make it easy to stay up-to-date on employee health activities and records.

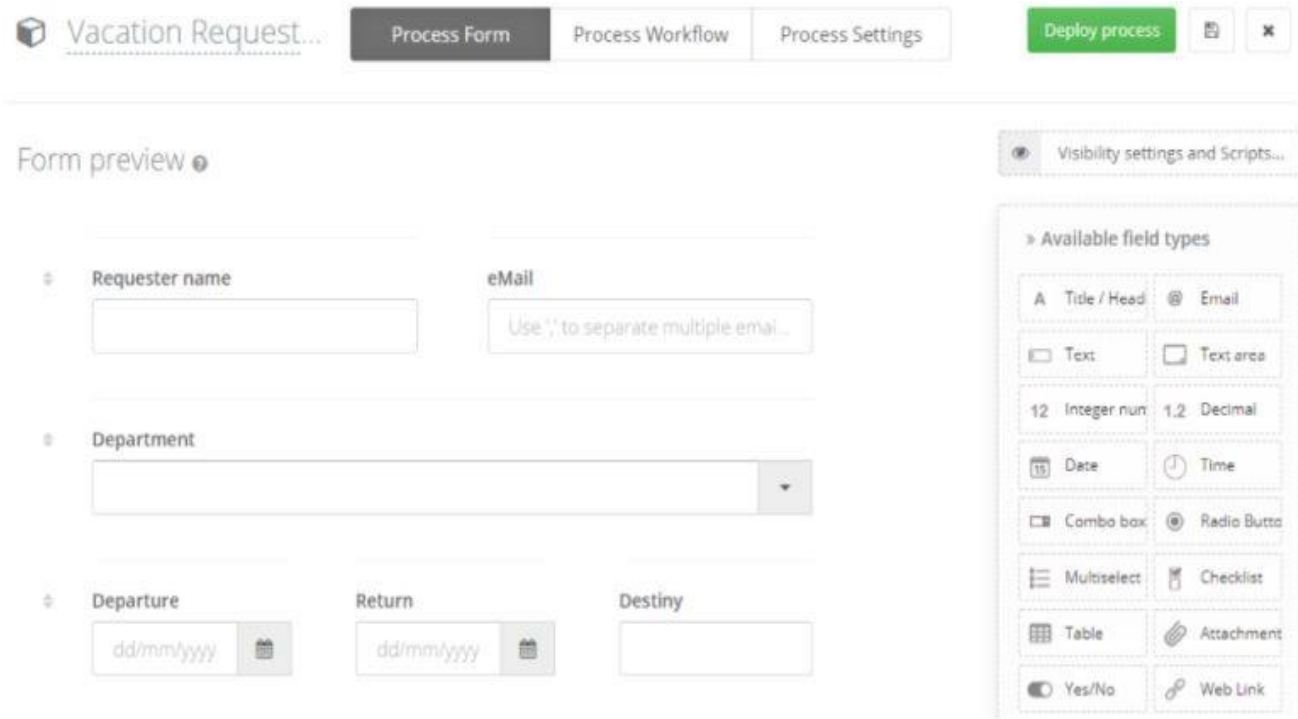
Features: Capability with mobile, tablet, and desktop devices, cloud hosting, HIPAA compliant, interoperability with other health IT systems and legacy systems.

Workflow and Business Process Management with LCDP/NCDP [10]

BPM: Is a discipline to improve business processes that sustain the operations.

LCDP/NCDP allows to automate business processes and workflows completely without programming skills.

1. Defining the structure to store data: Tools provide a form generator to allow to drag and drop different fields into a form, that centralize all relevant information.
2. Drawing the process flow in an appropriate notation: Define the workflow. (Standard is BPMN diagrams: super simple, complete). Allows user to draw their process. So it is easy to specify a process in minutes, and clearly documented.
3. Deploying the process and go into production in 1 click: Pressing a single button, the process is deployed and made available for end-users.


Vacation Request...
Process Form
Process Workflow
Process Settings
Deploy process
Form preview
Visibility settings and Scripts...
» Available field types
Title / Head
Email
Text
Text area
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Decimal
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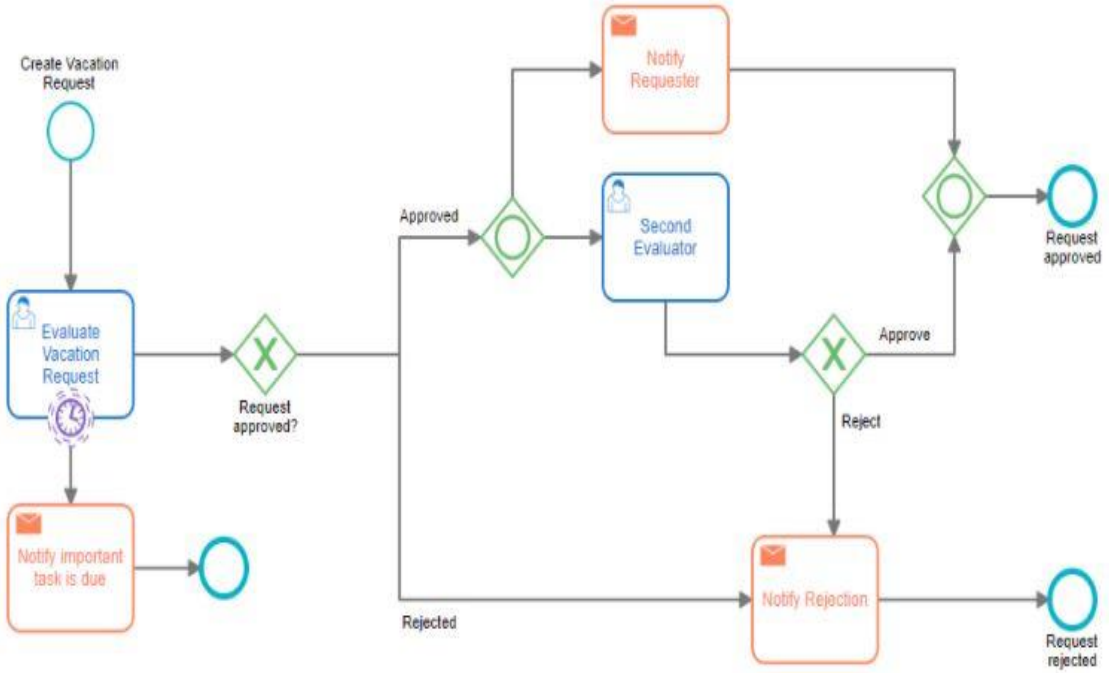
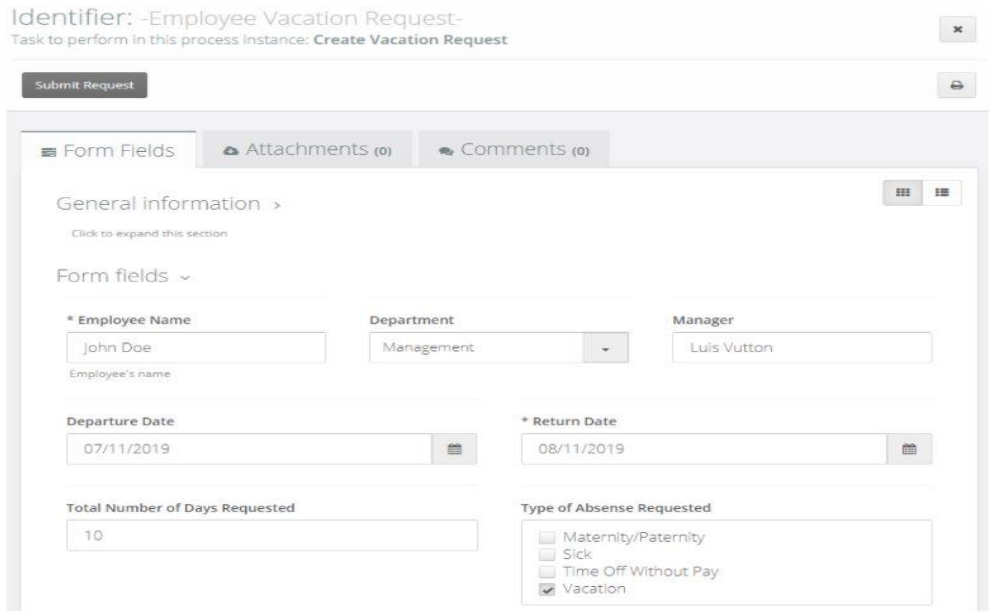

Create Vacation Request
Evaluate Vacation Request
Request approved?
Notify important task is due
Approved
Notify Requester
Second Evaluator
Approve
Reject
Request approved
Notify Rejection
Request rejected
Rejected


Identifier: -Employee Vacation Request-
Task to perform in this process instance: Create Vacation Request
Submit Request
Form Fields
Attachments (0)
Comments (0)
General information
Click to expand this section
Form fields
* Employee Name
John Doe
Employee's name
Department
Management
Manager
Luis Vutton
Departure Date
07/11/2019
* Return Date
08/11/2019
Total Number of Days Requested
10
Type of Absense Requested
Maternity/Paternity
Sick
Time Off Without Pay
Vacation

Other Kinds of Supported Applications:

Event Monitoring

Process Automation

Approval Process Control

Escalation Management

Inventory Management

Quality Management

Workflow Management

Benefits

Faster development

Ease of study and use

Lower IT cost (Open-source)

Rich and ready-to-use units

Newbie friendly

Improved system quality

Strong integration and expansion capability

Minimal efforts

Better user experience

Improved IT governance

Limitations and Challenges

High learning curve

High pricing

Lack of customization

Slow loading and publishing

Less powerful than programming

Complex issues still need coding

No access to source code

Limitations for experience developers

Vendor lock-in

Difficulty of maintenance and debugging

Need of basic programming knowledge

Capabilities that a LCD/NCD platform can Offer and their features[2]

- Graphical User Interface: Represents provided functionalities available in frontend.
  Features: Drag-and-drop tools, forms, point and click approach, pre-built dashboards, built-in workflows

- Interoperability support with external services and data sources:
  possibility of interacting with external services. (Dropbox, Zapier, Office 365)
  Features: Interoperability with external services, connection with data sources

- Security Support: Security aspects like authentication mechanisms, adopted security protocols.
  Features: Application, Platform security

- Collaborative Development Support: Collaboration models.
  Features: on-line, off-line collaborations

- Reusability Support: Enable to reuse already developed artifacts.
  Features: Built-in workflows, Pre-built forms/ reports, pre-built dashboards.

Capabilities and Features Contd.

- Scalability Support: Scale up applications according to different dimensions.
  Features: Scalability on number of users, data traffic, data storage.

- Business Logic Specification Mechanisms:
  Specify the business logic of the application modeled.
  Features: Business rule engine, graphical workflow editor, AI enabled business logic, API support

- Application Build Mechanisms: Ways the application is built.
  Features: Code-generation, models at run-time.

- Deployment Support: Deploying the modeled application.
  Features: Deployment on cloud, local infrastructures.

References

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Acknowledgement

Dr. Wei Yang