Low-Code vs.
Model-Driven Architecture

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Outline

- Motivation
- Model-Driven Architecture
- Low-Code Architecture
- Criticisms
- Evaluation of Low-Code Tools
- Findings & Future Work
- Conclusion

Motivation

- What are the advantages and disadvantages of low-code tools do?
- Are they a viable alternative to model-driven or traditional development?
- When to choose one approach over the other?

Model-Driven Architecture

- provides a set of guidelines for the structuring of specifications
- standardise on models in a given domain to reduce code duplication and speed up development
- code (fully or partially) generated from models, e.g. from UML diagrams
- aimed at developers who have good understanding of underlying programming languages

Model-Driven Architecture

- Example: Swagger
    - API specification given in OpenAPI format
    - API client is generated for the specified programming language
    - support for new languages/frameworks can be added by implementing a new generator
    - very easy to provide clients for many languages with virtually no development effort

Low-Code Architecture

- provides pre-built application components
- graphical user interface for creating both the application logic as well as the user interface
- typically aimed at end-users rather than developers

Criticisms

- Model-Driven Architecture
  - UML diagrams lack details included in the code itself.
  - “the Code is the design” - Should models be derived from code instead of code from models?
- Low-Code Architecture
  - Unsuitable for implementing scalable and mission-critical applications.
  - Increase in unsupported applications built by shadow IT, i.e. applications which are not controlled by a company’s IT department.
- Do these approaches actually make development easier and cheaper?

Evaluation of Low-Code Tools

- Find low-code tools in the following categories:
  - open-source
  - developed by well-known company
  - developed by unknown company
  - old/well-established platform
  - new/unestablished
- Set up each tool
- Build a test application (TODO List) with each tool

Open Standard Business Platform (OSBP)

- open-source
- plug-in for the Eclipse IDE developed since 2016
- community version of the commercial OS.bee product developed by COMPEX
- latest version over one year old
- does not work with latest version of the Eclipse IDE

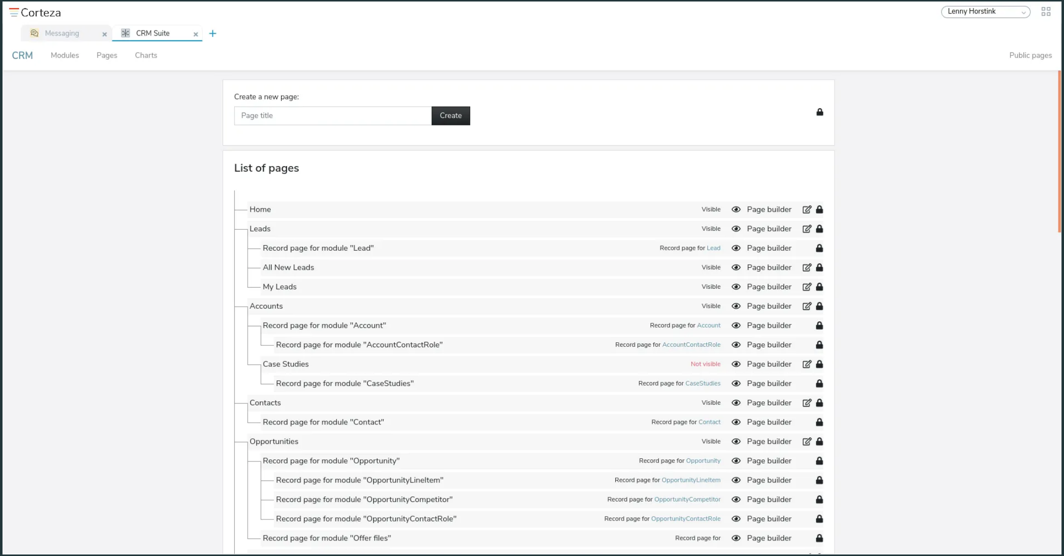
Corteza Low Code

- open-source
- part of the Corteza Project initiated by Crust Technology in 2019
- the Corteza Project includes a CRM solution built on top of Corteza Low Code, among other things
- web-based platform
- test by signing up with a GitHub or Google account or by deploying it locally using Docker

Corteza Low Code

- made for building record-based management applications
- process for building the test application:
    1. create application namespace
    2. create module for TODO List records, specifying the necessary fields (status, title, body)
    3. create page and add a list block linked to the module

Corteza Low Code: Editor



Corteza

Messaging | CRM Suite

CRM Modules Pages Charts Public pages

Lenny Horstink

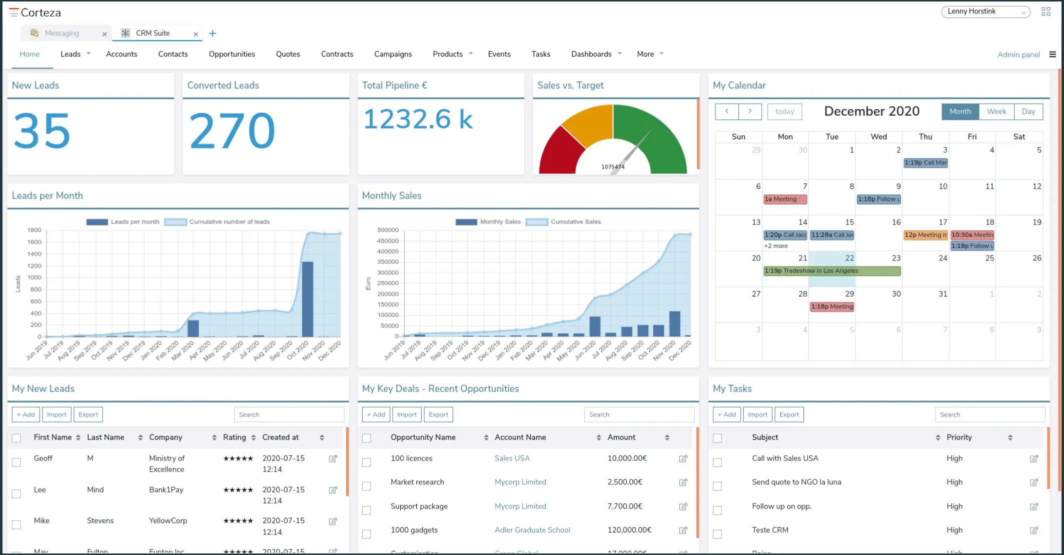
Create a new page:

Page title | Create

List of pages

Home	Visible	Page builder
Leads	Visible	Page builder
Record page for module "Lead"	Record page for Lead	Page builder
All New Leads	Visible	Page builder
My Leads	Visible	Page builder
Accounts	Visible	Page builder
Record page for module "Account"	Record page for Account	Page builder
Record page for module "AccountContactRole"	Record page for AccountContactRole	Page builder
Case Studies	Not visible	Page builder
Record page for module "CaseStudies"	Record page for CaseStudies	Page builder
Contacts	Visible	Page builder
Record page for module "Contact"	Record page for Contact	Page builder
Opportunities	Visible	Page builder
Record page for module "Opportunity"	Record page for Opportunity	Page builder
Record page for module "OpportunityLineItem"	Record page for OpportunityLineItem	Page builder
Record page for module "OpportunityCompetitor"	Record page for OpportunityCompetitor	Page builder
Record page for module "OpportunityContactRole"	Record page for OpportunityContactRole	Page builder
Record page for module "Offer files"	Record page for	Page builder

Corteza Low Code: Application



New Leads: 35

Converted Leads: 270

Total Pipeline €: 1232.6 k

My New Leads

First Name	Last Name	Company	Rating	Created at
Geoff	M	Ministry of Excellence	★★★★★	2020-07-15 12:14
Lee	Mind	Bank1Pay	★★★★★	2020-07-15 12:14
Mike	Stevens	YellowCorp	★★★★★	2020-07-15 12:14
May	Fulton	Funton Inc	★★★★★	2020-07-15

My Key Deals - Recent Opportunities

Opportunity Name	Account Name	Amount
100 licences	Sales USA	10,000.00€
Market research	Mycorp Limited	2,500.00€
Support package	Mycorp Limited	7,700.00€
1000 gadgets	Adler Graduate School	120,000.00€
Customization	Green Global	17,000.00€

My Tasks

Subject	Priority
Call with Sales USA	High
Send quote to NGO la luna	High
Follow up on opp.	High
Teste CRM	High
Raise	High

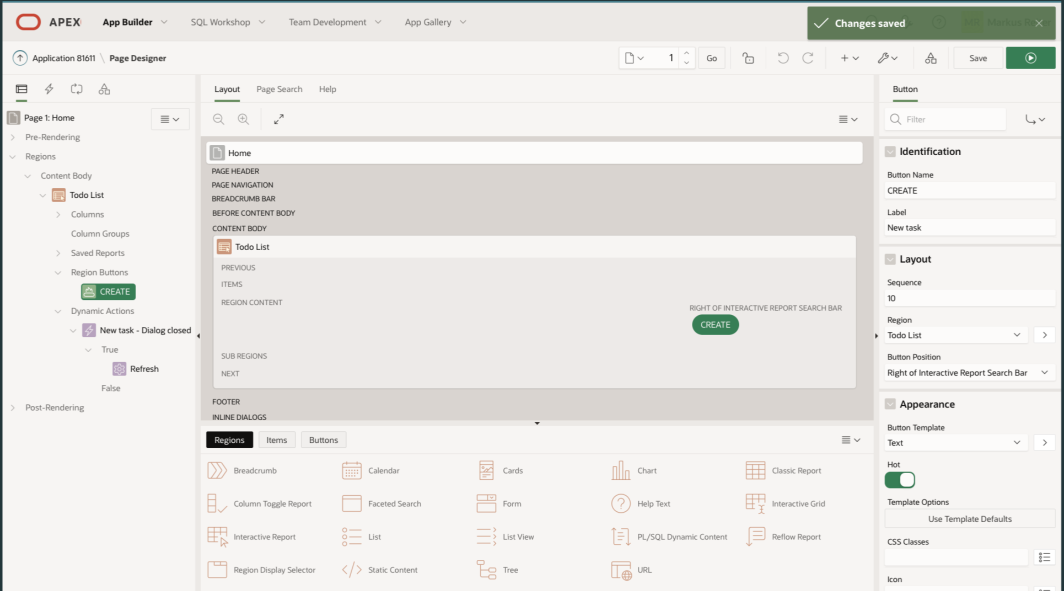
Oracle APEX (Application Express)

- commercial
- initially released as Oracle Flows in 2000
- web-based platform
- test by signing up for an Oracle Cloud account or by requesting an APEX workspace

Oracle APEX (Application Express)

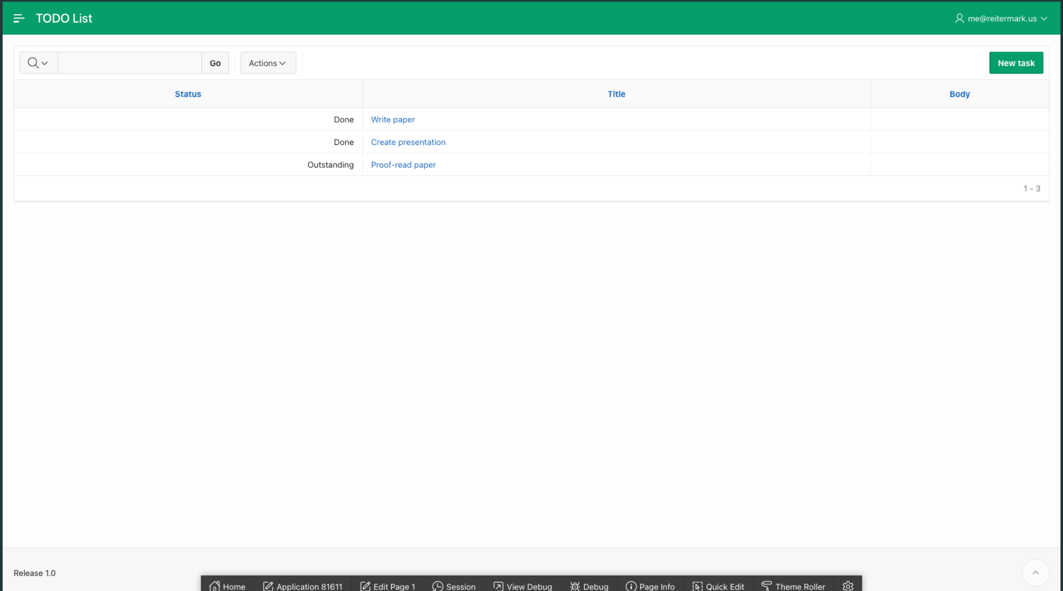
- process for building the test application:
    1. create database table for TODO List items (requires basic SQL knowledge)
    2. create new blank application
    3. add list view to home page and select the corresponding database table
    4. add new form page (dialog style) and select the corresponding database table
    5. add a button to the home page that opens the form page
    6. add a dynamic action that refreshes the list view when the form dialog is closed

Oracle APEX: Page Designer



Button Name: CREATE
Label: New task
Sequence: 10
Region: Todo List
Button Position: Right of Interactive Report Search Bar
Button Template: Text
Hot: on
Template Options: Use Template Defaults
CSS Classes:
Icon:

Oracle APEX: Application



Status	Title	Body
Done	Write paper	
Done	Create presentation	
Outstanding	Proof-read paper	

1 - 3

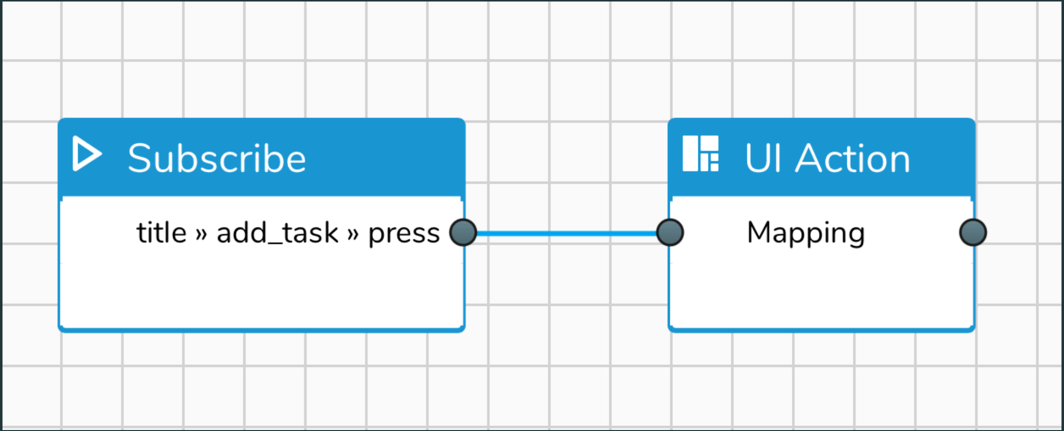
Simplifier

- commercial
- initially released by iTiZZiMO in 2012
- web-based platform
- test by using the Simplifier Playground (data is wiped every day) or by requesting a Simplifier test instance

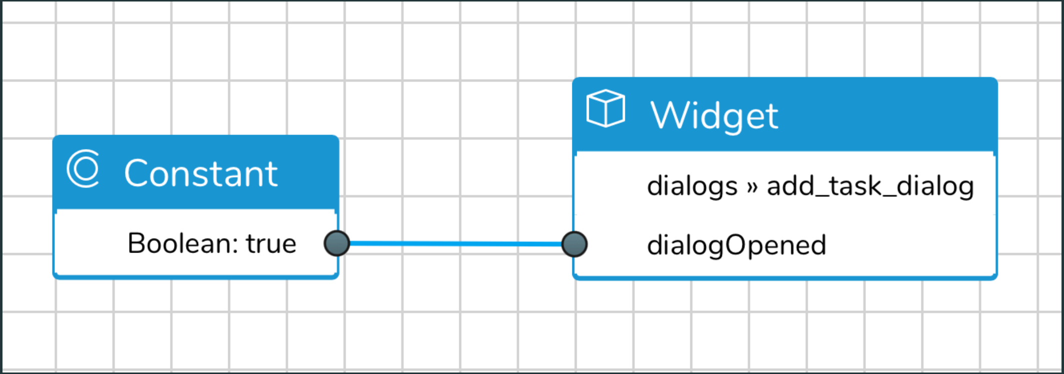
Simplifier

- process for building the test application:
    1. create database connector (SQLite)
    2. create database schema for TODO List items and deploy to connector
    3. add list view and button to home page
    4. add new page containing a form with input fields and button
    5. create processes for
        - loading items into list view
        - submitting the form page
        - opening the form page with the button

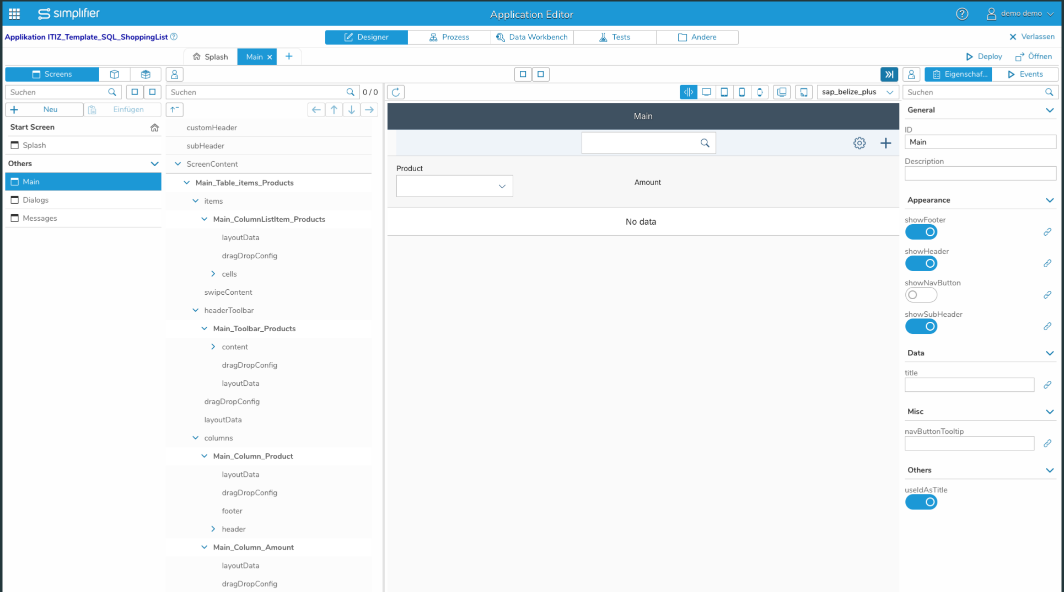
Simplifier: Process



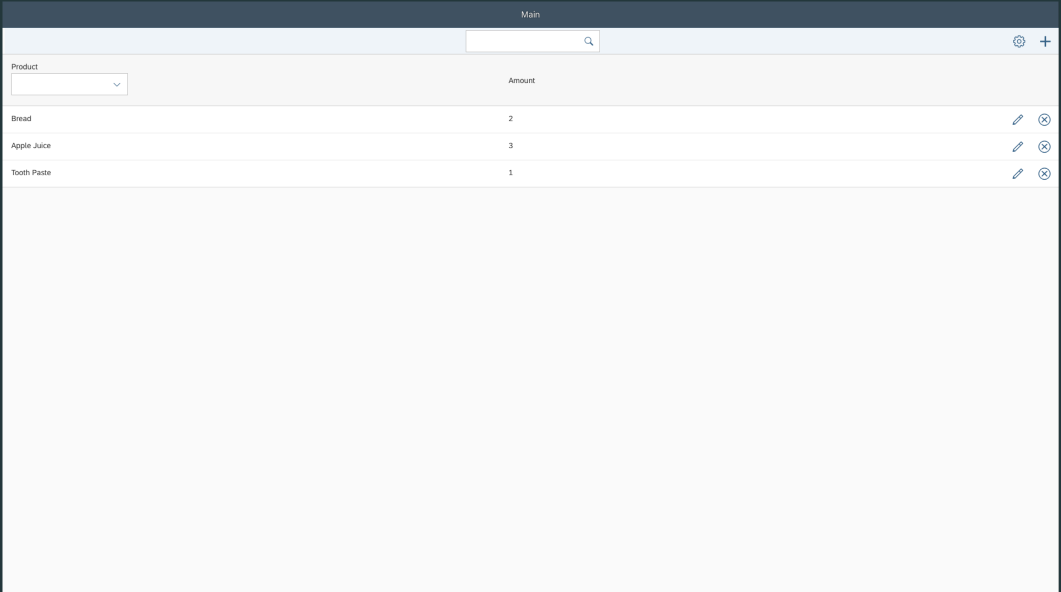
Simplifier: Process



Simplifier: Application Editor



Simplifier: Application



Product	Amount
Bread	2
Apple Juice	3
Tooth Paste	1

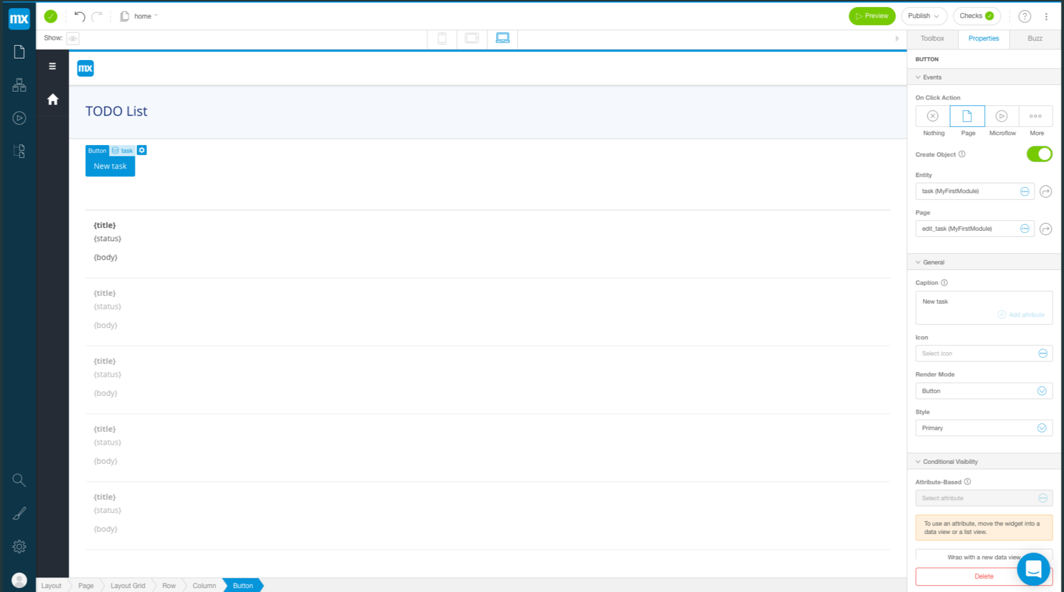
Mendix

- commercial
- founded in 2005 as a subsidiary of Siemens
- web-based platform (Mendix Studio) and Windows application (Mendix Studio Pro) with advanced features
- test by signing up for a regular account which allows hosting unlimited applications (with 1GB of memory and 0.5GB of storage per application)

Mendix

- process for building the test application:
  1. create blank application
  2. add list view and button to home page, which prompts the user to select or create a new data source
  3. create data source for TODO List items
  4. add new form page linked to the corresponding data source
  5. add button to home page that opens the form page

Mendix Studio



TODO List

Button | task

New task

{title}
{status}
{body}

{title}
{status}
{body}

{title}
{status}
{body}

{title}
{status}
{body}

{title}
{status}
{body}

BUTTON

Events

On Click Action: Nothing | [✓ Page] | Microflow | More

Create Object: ✓

Entity: task (MyFirstModule)

Page: edit_task (MyFirstModule)

General

Caption: New task

Add attribute

Icon: Select icon

Render Mode: Button

Style: Primary

Conditional Visibility

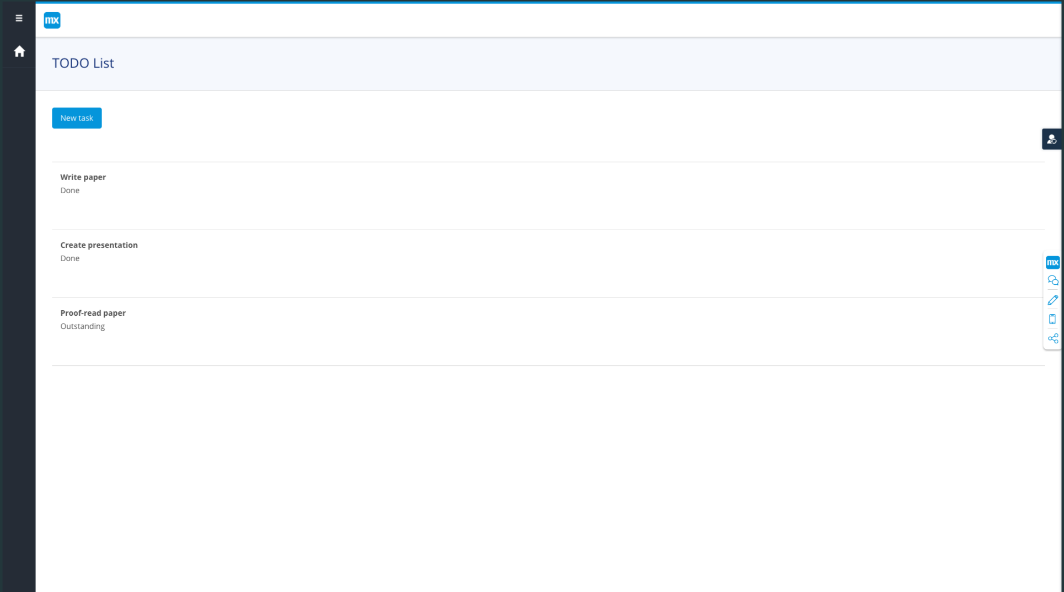
Attribute-Based: Select attribute

To use an attribute, move the widget into a data view or a list view.

Wrap with a new data view

Delete

Mendix: Application


TODO List

Write paper
Done

Create presentation
Done

Proof-read paper
Outstanding

Unique Features

- **Oracle APEX**
  - Creation of applications from existing data, e.g. CSV files
- **Mendix**
  - AI-assisted wizard for creating custom workflows (microflows)
  - publishing as native mobile applications for iOS and Android

Assessment of Low-Code Tools

- ease of use
- customisability
- portability
- scalability
- suitability for mission-critical applications

Assessment of Low-Code Tools

	OSBP	**Corteza**	**APEX**	**Simplifier**	**Mendix**
ease of use	N/A	high	medium	medium	high
customisability	N/A	low	medium	medium	high
portability	N/A	medium	low	medium	medium
scalability	N/A	medium[1]	high	high	high
mission-criticality	low	high	high	medium[2]	high

[1] medium in general, high for certain types of applications, e.g. management applications

[2] medium only due to the problems encountered, high otherwise

Findings & Future Work

- very small number of open-source low-code tools
    - assumption: open-source community mostly consists of developers, so there is no need/demand for low-code platforms
    - future work: investigate low-code other types of platforms and compare their presence in the open-source vs. the commercial space
- more streamlined user interface in the more mature products like Oracle APEX and Mendix
- lack of portability is a valid concern for low-code tools,
  stored data may be the only element of a platform that is portable by using

Conclusion

- low-code platforms are a valid alternative to model-driven development
- low-code platforms are not as flexible and limited in the ways they can be extended
- choice between low-code and model-driven architecture:
    - highly dependent on which low-code platform is used,
      similar to choosing a programming language or framework for a particular task
    - highly dependent on the application requirements,
      low-code well-suited for management applications
      (e.g. process management, CRM)

Questions?