

REPORTING

Unit 3 – Query languages and visualization
S3 –4 – REPORTING

OUTLINE

1. REPORTING
2. REPORTING TOOLS REVIEW
3. PENTHO REPORT
4. MY FIRST REPORT
5. BI: FUTURE

- REPORTING
 - Wide experience in organizations
 - Many organizations are still document oriented
 - Information systems:
 - Document Management Systems
 - Relational DB Systems & Reporting Tools
 - Mature technology

2. REPORTING TOOLS REVIEW

- REPORTING TOOLS REVIEW
 - PROGRAMMING SUITES
 - JASPER REPORTS LIBRARY
 - ECLIPSE BIRT
 - PENTAHO REPORTING

2. REPORTING TOOLS

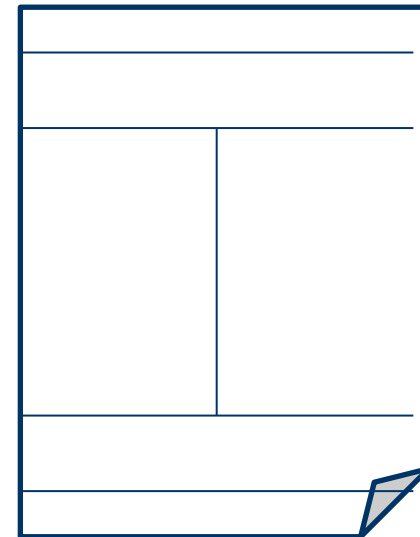
- PROGRAMMING SUITES
 - JASPER REPORTS LIBRARY
 - Very popular reporting engine
 - Open source
 - Variety of formats: HTML, PDF, Office, Excel, Word.
 - Classical approach: editing xml
 - Modern approach: Jaspersoft Studio (Eclipse IDE)
 - Workflow:
 - Design report (creating jrxml file)
 - Compile report (to obtain .jasper file)
 - Fill the report, passing parameters and data source to generate JasperPrint object (.jprint)
 - Print, check, export JasperPrint object to PDF, Excel, PDF,...

- JASPER REPORTS LIBRARY

Report template: BasicReport.xml

```
<jasperReport name="BasicReport" >
  <parameter name="Title" class="java.lang.String"/>
  <queryString><![CDATA[select name, cost from product]]>
</queryString>
  <field name="NAME" class="java.lang.String"/>
  <field name="COST" class="java.lang.Double"/>
  <title>
    <band height="50">
      <textField>
        <reportElement x="0" y="0" width="200" height="50" />
        <textFieldExpression class="java.lang.String">$P{Title}</textFieldExpression>
      </textField>
    </band>
  </title>
  <pageHeader>
    <band>
    </band>
  </pageHeader>
  <columnHeader>
    <band height="20">
      <staticText>
        <reportElement x="180" y="0" width="180" height="20" />
        <textElement>
          <font isUnderline="true"/>
        </textElement>
        <text><![CDATA[ NAME ]]></text>
      </staticText>
    </band>
  </columnHeader>
  <detail>
    <band>
      <table>
        <tr>
          <td><field name="NAME" /></td>
          <td><field name="COST" /></td>
        </tr>
      </table>
    </band>
  </detail>
  <pageFooter>
    <band>
    </band>
  </pageFooter>
  <summary>
    <band>
    </band>
  </summary>
</jasperReport>
```

- title
- pageHeader
- columnHeader
- Detail
- columnFooter
- pageFooter
- summary



- JASPER REPORTS LIBRARY

Report template: BasicReport.xml

- Parameters \$P{name}
- Fields \$F{name}
- Variable \$V{name}

```
<jasperReport name="BasicReport" >
  <parameter name="Title" class="java.lang.String"/>
  <queryString><![CDATA[select name, cost from product]]>
</queryString>
  <field name="NAME" class="java.lang.String"/>
  <field name="COST" class="java.lang.Double"/>
```

```
<title>
  <band height="50">
    <textField>
      <reportElement x="0"
      <textFieldExpression>
</textFieldExpression>
    </textField>
  </band>
</title>
```

```
<textField>
  <reportElement x="40" y="0" width="100" height="15"/>
  <textElement/>
  <textFieldExpression class="java.lang.Integer"><![
  [CDATA[ $V{PAGE_NUMBER} ] ]></textFieldExpression>
</textField>
```

```
<pageHeader>
  <band>
  </band>
</pageHeader>
<columnHeader>
  <band height="20">
    <staticText>
      <reportElement x="180" y="0" width="180" height="20"/>
      <textElement>
        <font isUnderline="true"/>
      </textElement>
      <text><![CDATA[ NAME ] ]></text>
    </staticText>
```

textField containing a page
number using a variable
PAGE_NUMBER defined internally
By JasperReport

- JASPER REPORTS LIBRARY

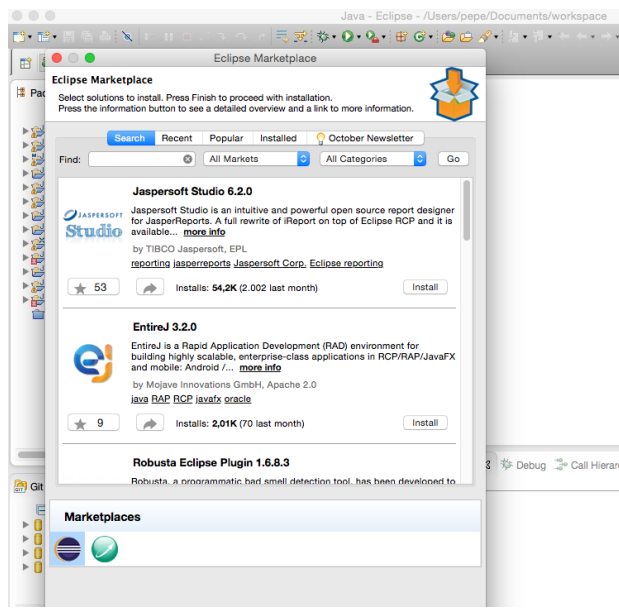
Java code

```
// First, load JasperDesign from XML and compile it into
JasperReport
JasperDesign jasperDesign =
JasperManager.loadXmlDesign("BasicReport.xml");
JasperReport jasperReport =
JasperManager.compileReport(jasperDesign);
// Second, create a map of parameters to pass to the report.
Map parameters = new HashMap();
parameters.put("ReportTitle", "Basic JasperReport");
parameters.put("MaxSalary", new Double(25000.00));
// Third, get a database connection
Connection conn = Database.getConnection();
// Fourth, create JasperPrint using fillReport() method
JasperPrint jasperPrint = JasperManager.fillReport(jasperReport,
parameters, conn);
// You can use JasperPrint to create PDF
JasperManager.printReportToPdfFile(jasperPrint,
"BasicReport.pdf");
// Or to view report in the JasperViewer
JasperViewer.viewReport(jasperPrint);
```

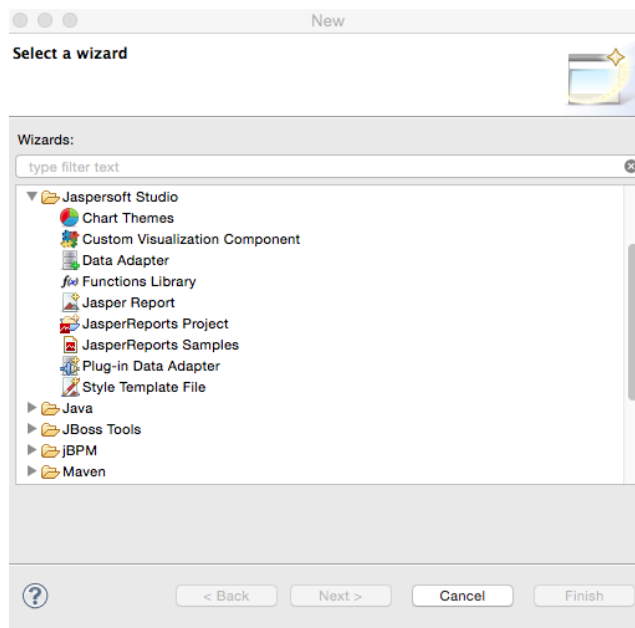
```
<jasperReport name="BasicReport" >
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<queryString><![CDATA[select name, cost from product]]>
</queryString>
<field name="NAME" class="java.lang.String"/>
<field name="COST" class="java.lang.Double"/>
<title>
<band height="50">
<textField>
<reportElement x="0" y="0" width="200" height="50" />
<textFieldExpression class="java.lang.String">${Title}</textFieldExpression>
</textField>
</band>
</title>
<pageHeader>
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<reportElement x="180" y="0" width="180" height="20"/>
<textField>
<font isUnderline="true"/>
</textField>
<text><![CDATA[NAME]]></text>
</staticText>
```

- REPORTING TOOLS
 - PROGRAMMING SUITES
 - JASPER STUDIO: ECLIPSE
 - Community: embedded report engine, generation xml, pdf,...
 - Commercial: flash charts and widgets.

Eclipse Market Place

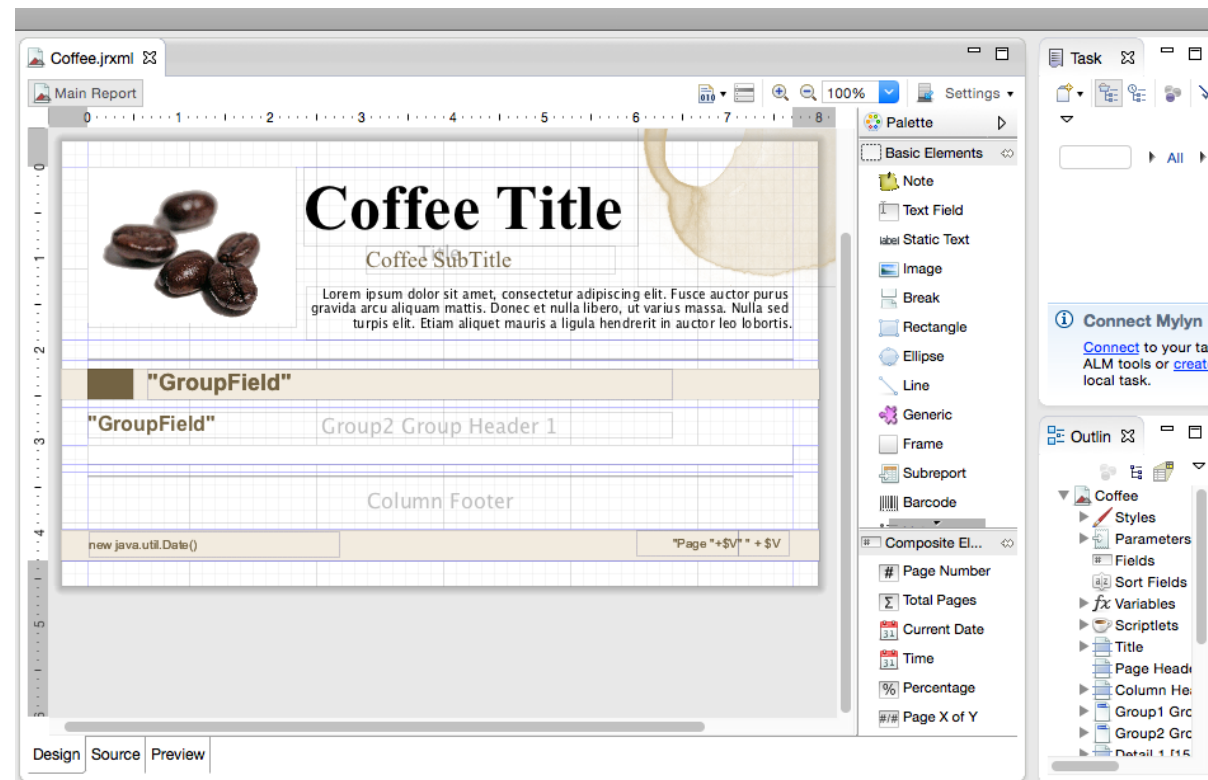


New Project



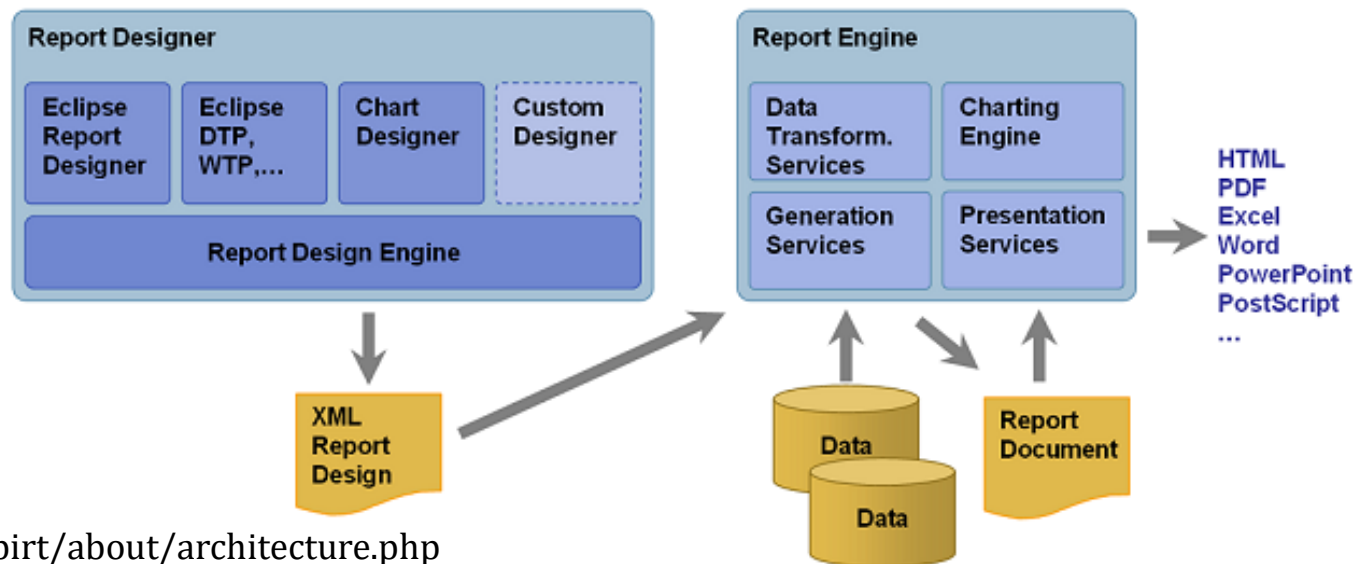
- REPORTING TOOLS
 - PROGRAMMING SUITES
 - JASPER STUDIO: ECLIPSE

New Report Coffee.jrxml (<https://community.jaspersoft.com/wiki/designing-report-jaspersoft-studio>)



- REPORTING TOOLS
 - PROGRAMMING SUITES
 - ECLIPSE BIRT

- Eclipse Project
- Open-source (supported by IBM, OpenText & Innovent solutions)
- Similar to Jasper



- REPORTING TOOLS
 - PROGRAMMING SUITES
 - PENTAHO REPORTING

Open Source (Pentaho acquired by Hitachi)

Java library (previously jFreeReport)

Stand alone desktop tool

Easy integration with Pentaho Framework

Workflow:

- Connect to data source and constrain the data with a query
- Arrange data elements in the Report Designer workspace
- Apply formatting and other graphical elements
- Create formulas/calculated fields using data from Step#1
- Publish the report

	BIRT™	Jaspersoft® Studio	Pentaho®
Open Source Website	eclipse.org/birt	community.jaspersoft.com	reporting.pentaho.com
Commercial Web Site	developer.actuate.com	jaspersoft.com/reporting	www.pentaho.com
License	Eclipse Public License (EPL)	JasperReports Lib LGPLv3 JasperSoft Studio EPL	Pentaho Reporting LGPL V2.1 (or later)
Report Designer	BIRT Report Designer 4.4.1 Built on Eclipse 4.4.1	JasperSoft Studio 6.0.1 Built on Eclipse 3.8.1	Pentaho Report Designer 5.2.0-GA
Designer Platforms	Windows, Linux, Mac OS X	Windows, Linux, Mac OS X	Windows, Linux, Mac OS X
Eclipse Plug-in Available	✓	✓	✗
NetBeans Plug-in Available	✗	✗	✗
Standalone Java Client Available	✓	✓	✓
Design Paradigm	web page design frames tables lists	banded reports pixel positioning	banded reports pixel positioning
Report Compilation	Not required	Required	Not required
Report Format	XML (.RPTDESIGN)	Report design files (.JRXML) compile to Java Byte Code (.JASPER) Deploy/Run .JASPER files	XML Report file (.PRPT) is a ZIP of Design and other resources

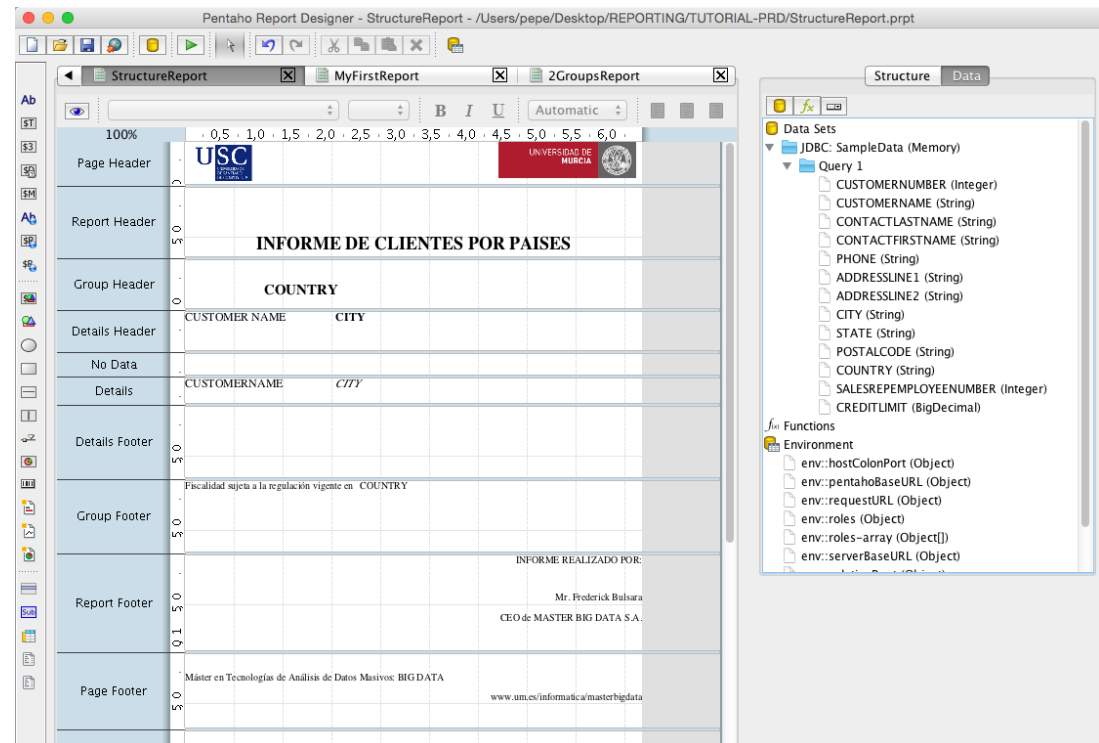
- REPORTING TOOLS
 - Comparative table

	JASPER	BIRT	PENTAHO
Designer	Eclipse plug-in	Eclipse project	Stand alone
Multicolumn	Y	N	N
Multiple data sources	N (Y via subbreports/charts)	Y	Y
JDBC drivers	24	2	>40
Hadoop support	Y	Y	Y
Pentaho integration	N	N	Y
Output	HTML, PDF EXCEL, PPT,OPENOFFICE, PS,...	HTML, PDF EXCEL, PPT,OPENOFFICE, PS, FLASH,...	HTML, PDF, EXCEL,...

Complete comparative at:
<http://www.innoventsolutions.com/comparison-matrix.html>

3. PENTAHO REPORTS

- REPORTING ARCHITECTURE OF PENTAHO
 - REPORTING SDK
 - Classic engine + documentation + libraries (java)
 - REPORTING ENGINE
 - Java library (before JFree Report) generate reports
 - Server/Client side
 - REPORT DESIGNER
 - Stand alone desktop tool
 - Visual tool to design complex reports



- PENTAHO REPORT DESIGNER (PRD)

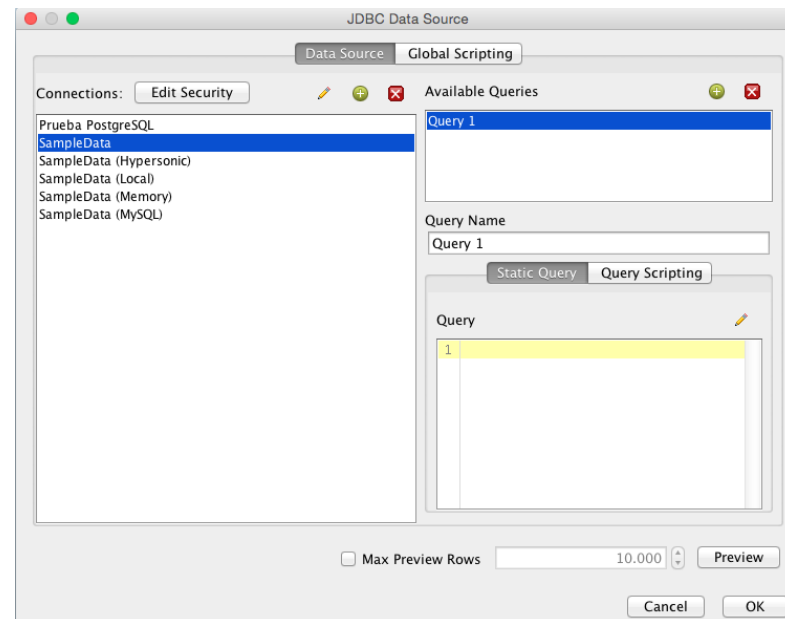
Data sources
&
Report structure

Components

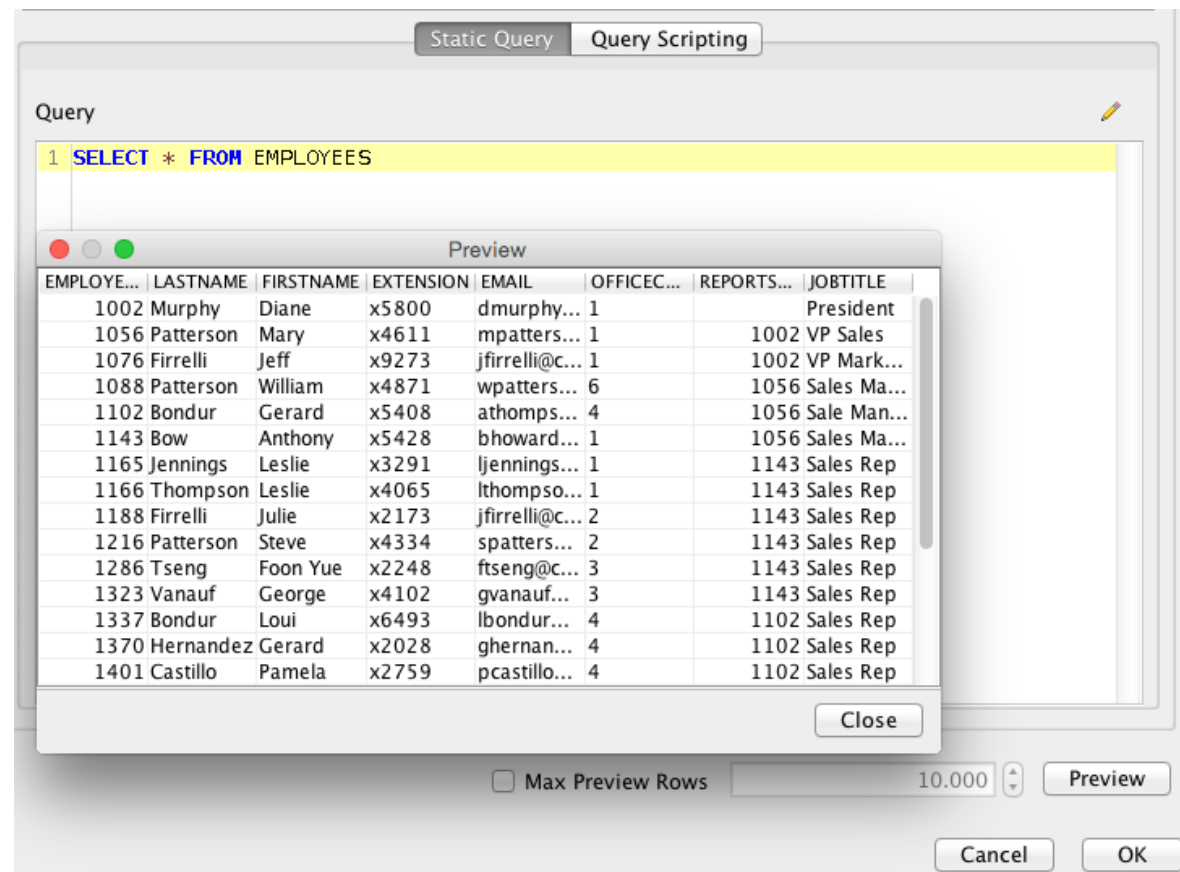
The screenshot displays the Pentaho Report Designer (PRD) interface. On the left, a vertical toolbar contains various report components. The main workspace shows a report layout with sections like Page Header, Report Header, Group Header, Details Header, No Data, Details, Details Footer, Group Footer, Report Footer, and Page Footer. A red box highlights the report structure, showing a table with columns for CUSTOMER NAME and CITY. On the right, a panel titled 'Data Sets' lists the data sources, including 'JDBC: SampleData (Memory)' and 'Query 1'. Below this, a 'Functions' panel lists environment variables like 'env::hostColonPort' and 'env::pentahoBaseURL'.

- REPORT WIZARD
 - 4 STEPS:
 1. LOOK & FIELD
 2. DATA SOURCE AND QUERIES
 3. LAYOUT
 4. FORMAT

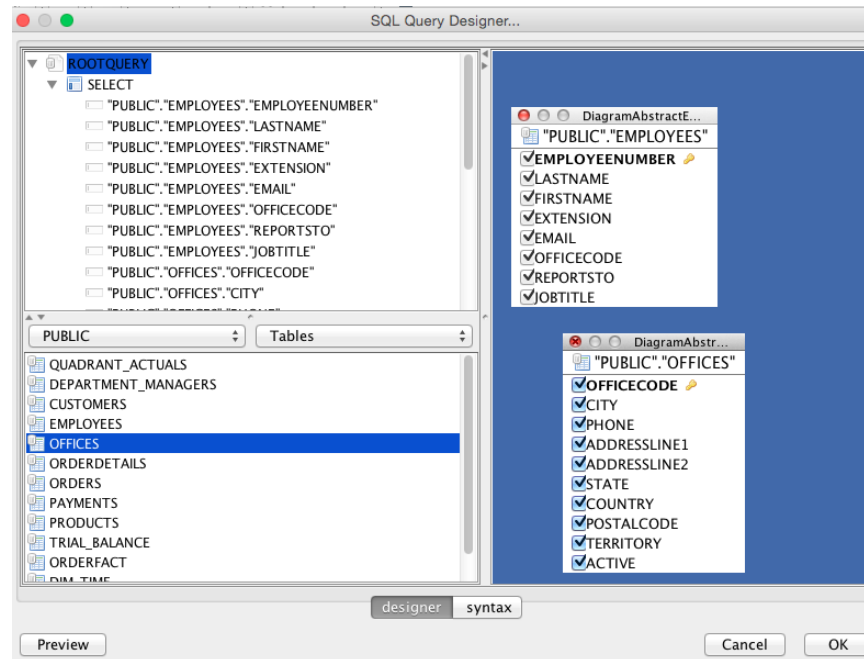
- REPORT WIZARD
 - 4 STEPS: (1) DATA SOURCE AND QUERIES
 - Press +
 - Choose a Data source type:
 - Files: tables (spreadsheets), xml, metadata (pentaho xmi), JDBC, etc.
 - Pentaho (OLAP Analysis: Mondrian /Data Integration: Kettle)
 - Design a query



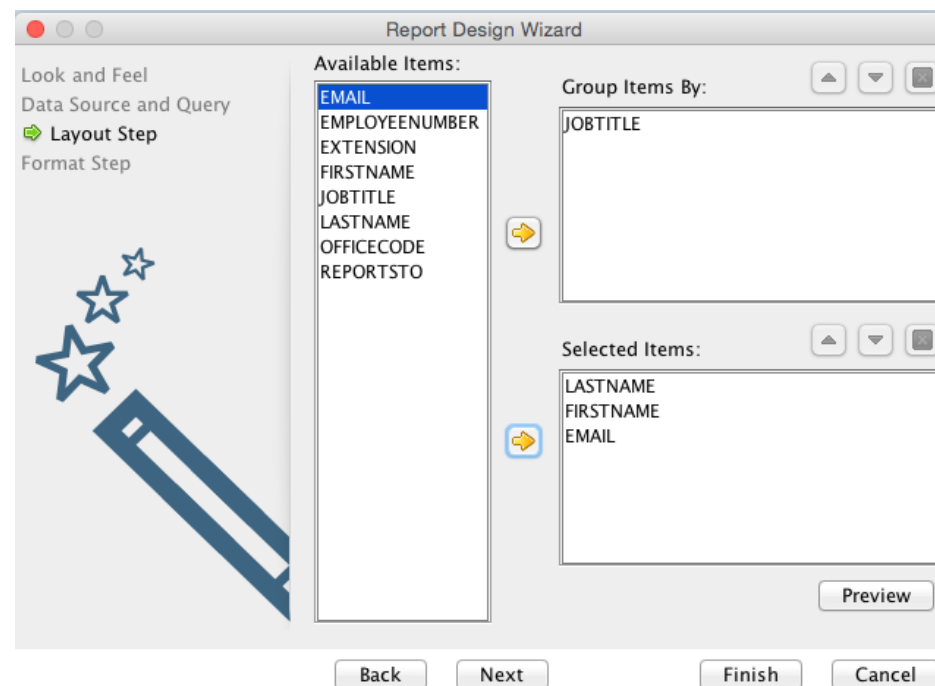
- REPORT WIZARD
 - 4 STEPS: (1) DATA SOURCE AND QUERIES
 - Design a query:
 - Code a query:



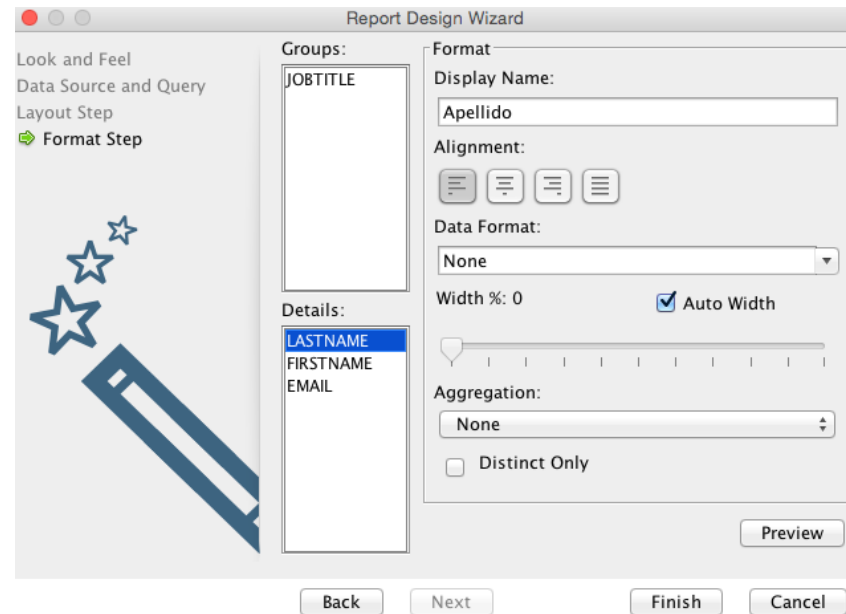
- REPORT WIZARD
 - 4 STEPS: (1) DATA SOURCE AND QUERIES
 - Design a query:
 - Visual query



- REPORT WIZARD
 - 4 STEPS: (2) LAYOUT
 - Grouping the information in the report



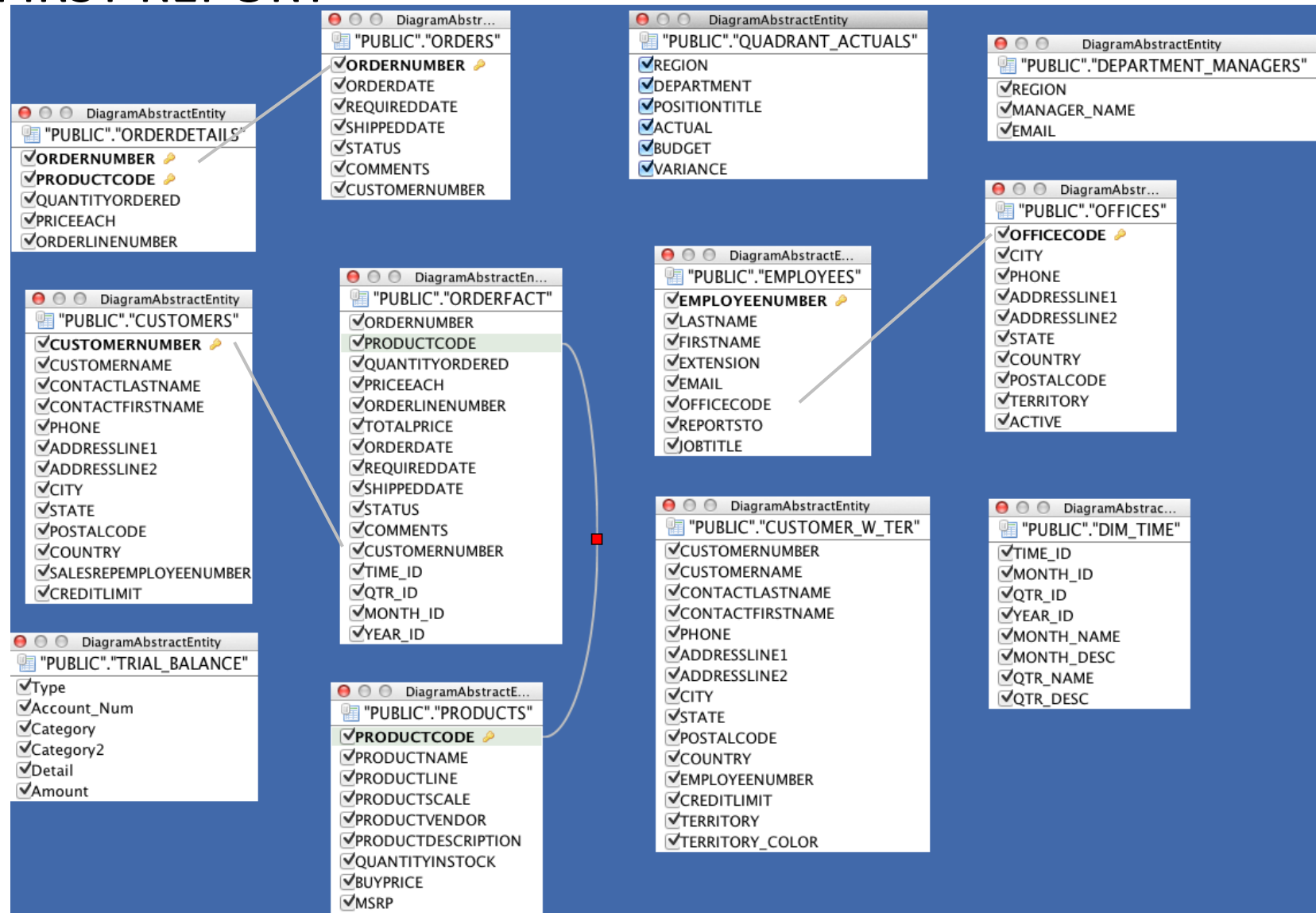
- REPORT WIZARD
 - 4 STEPS: (3) FORMAT
 - Labels to be displayed



4. MY FIRST REPORT

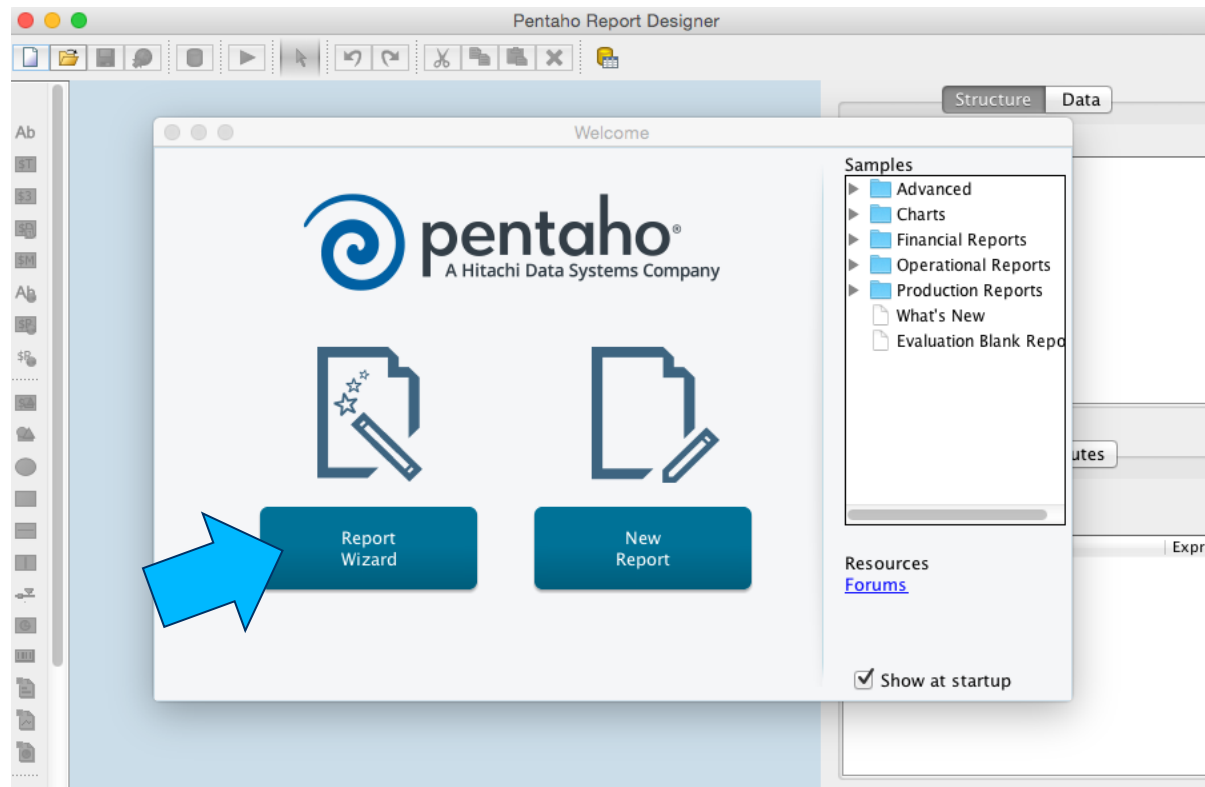
- MY FIRST REPORT
 - CREATING A REPORT USING THE WIZARD
 - USING LOCAL RELATIONAL DATABASE

• MY FIRST REPORT



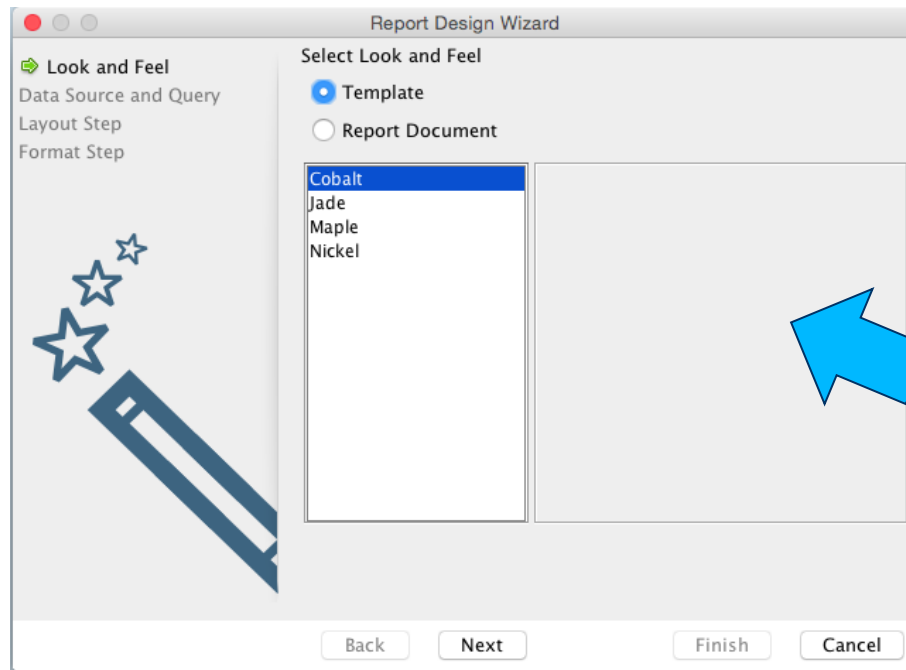
- MY FIRST REPORT
 - “LIST OF EMPLOYEES BY POSITION”
 - WELCOME PAGE

MyFirstReport.prpt



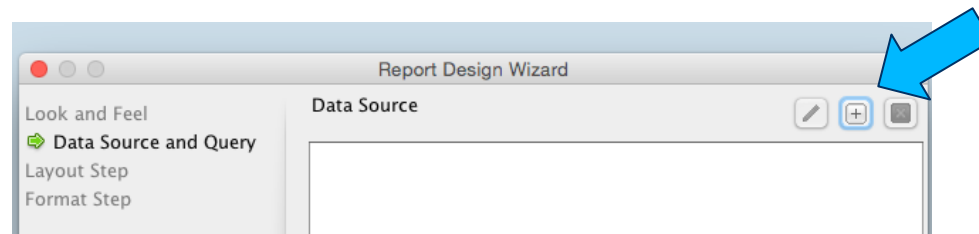
- MY FIRST REPORT
 - “LIST OF EMPLOYEES BY POSITION”
 - TEMPLATE:

MyFirstReport.prpt

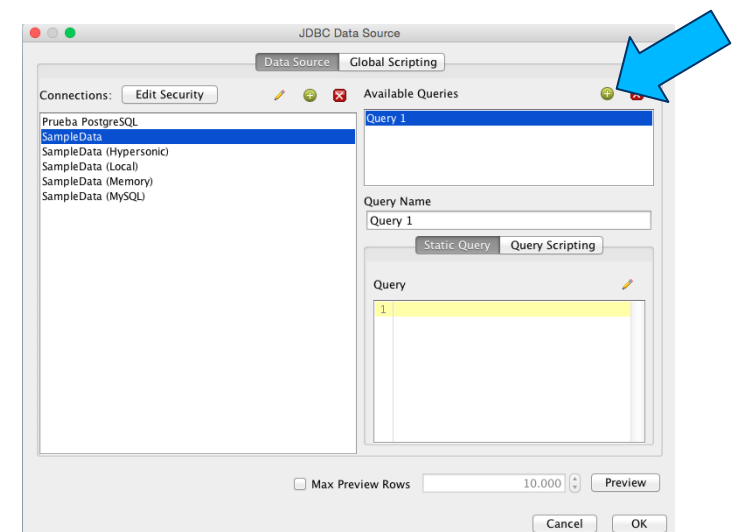


- MY FIRST REPORT
 - DATA SOURCE AND QUERIES

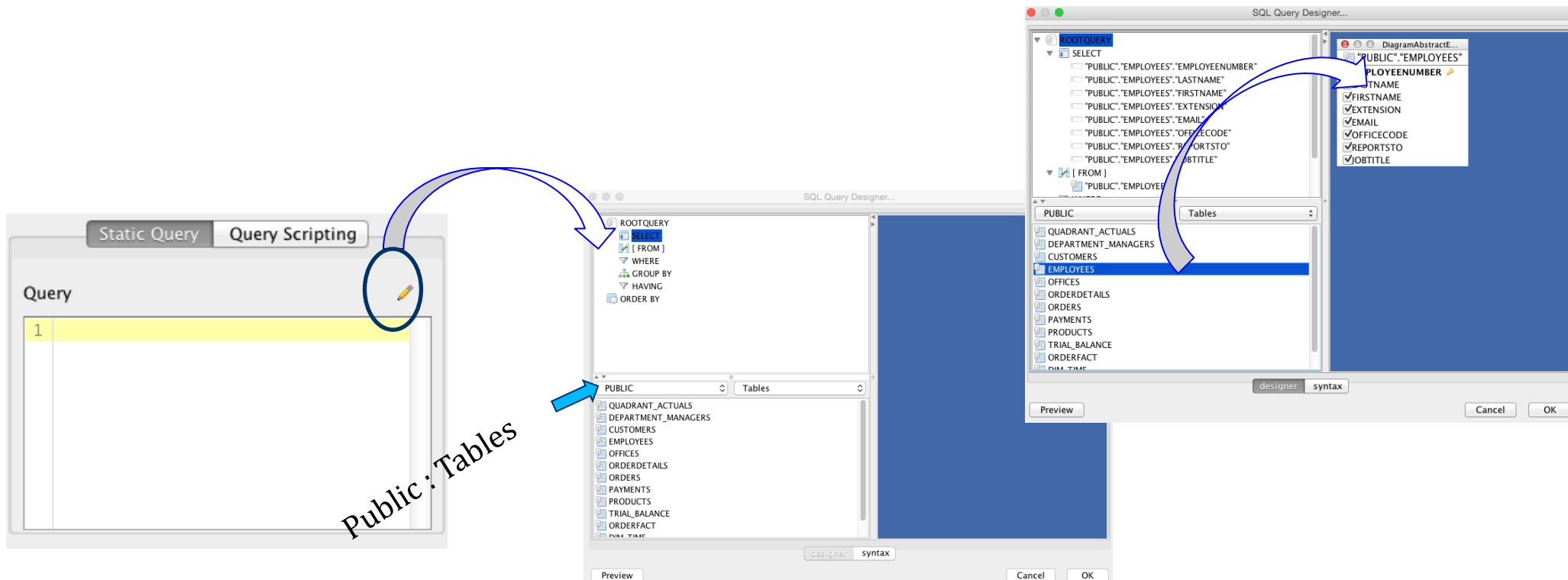
1. Press +



1. Choose a Data source type: JDBC
2. Choose **SampleData (memory)**
3. Available Query: Add new Query



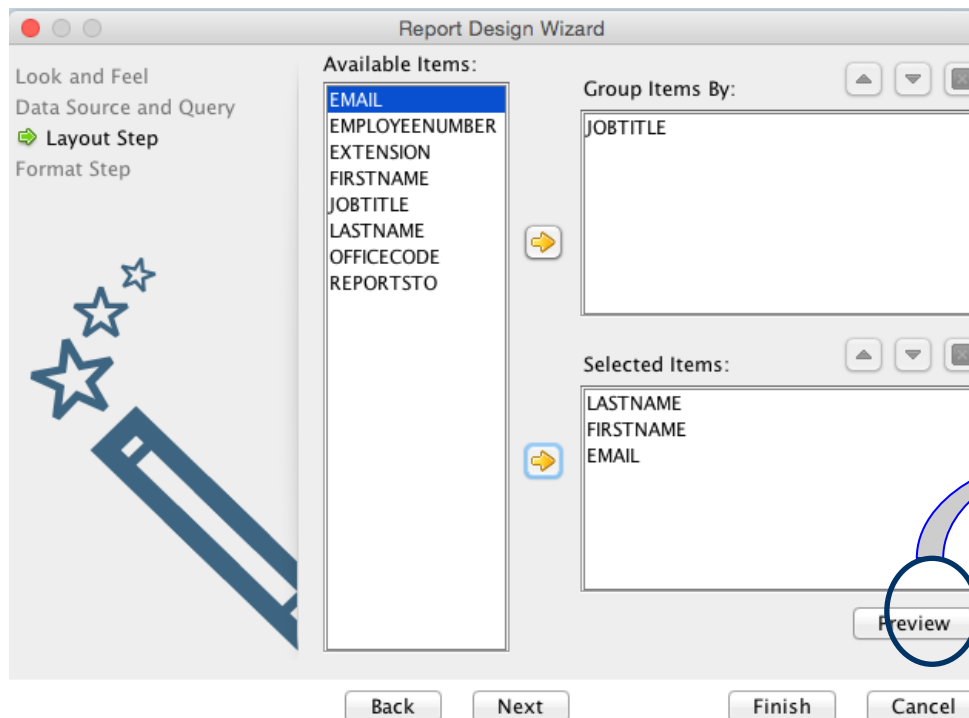
- MY FIRST REPORT
 - DATA SOURCE AND QUERIES
 - 4. Design a query:
 - Visually design a query
 - Public: Tables::Employees
 - Drag & Drop Employees to canvas



• MY FIRST REPORT

• LAYOUT

- Group Items By: JOBTITLE
- Selected Items: LASTNAME, FIRSTNAME, EMAIL



Report Preview

Report Export View Help

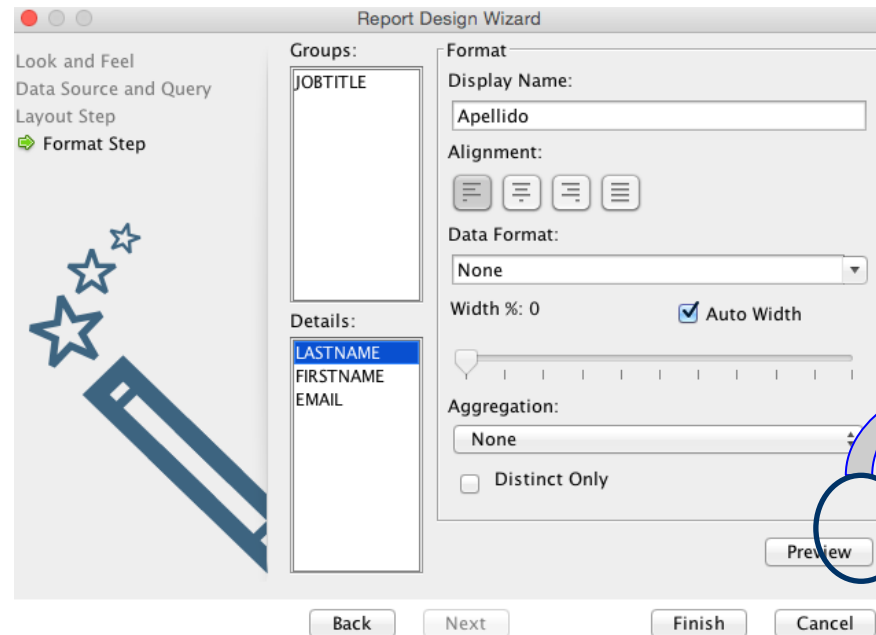
100%

PUESTO	President	Nombre	Comez-E
Aplido	Diane	dmurphy@classicmodelcars.com	
Murphy	PUESTOVP Sales	Nombre	Comez-E
Aplido	mpatterson@classicmodelcars.com		
Patterson	PUESTOVP Marketing	Nombre	Comez-E
Aplido	Jeff	jfinel@classicmodelcars.com	
Frelli	PUESTOSales Manager (JAPAN, APAC)	Nombre	Comez-E
Aplido	William	wpatterson@classicmodelcars.com	
Patterson	PUESTOSale Manager (EMEA)	Nombre	Comez-E
Aplido	Gerard	athompson@classicmodelcars.com	
Bondur	PUESTOSales Manager (NA)	Nombre	Comez-E
Aplido	Anthony	bhoward@classicmodelcars.com	
Bow	PUESTOSales Rep	Nombre	Comez-E
Aplido	Leslie	ljennings@classicmodelcars.com	
Jennings	Thompson	lbompson@classicmodelcars.com	
Thompson	Julie	jfinel@classicmodelcars.com	
Frelli	Steve	spaters@classicmodelcars.com	
Frelli	Poon Yue	fyong@classicmodelcars.com	
Va	George	gvanat@classicmodelcars.com	
Bon	Lou	lbondur@classicmodelcars.com	
IS	Gerard	ghernande@classicmodelcars.com	
Casti	Pamela	pcastillo@classicmodelcars.com	
Bott	Larry	lbott@classicmodelcars.com	
Jones	Barry	bjones@classicmodelcars.com	
Fater	Andy	afater@classicmodelcars.com	
Marsh	Peter	pmarsh@classicmodelcars.com	
King	Tom	tking@classicmodelcars.com	
King	Mami	mmaki@classicmodelcars.com	
Kato	Yoshi	ykato@classicmodelcars.com	
Gerard	Martin	gmartin@classicmodelcars.com	

• MY FIRST REPORT

• FORMAT:

- JOBTITLE → Display Name **PUESTO**
- LASTNAME → Display Name **Apellido**
- Same with FirstName (**Nombre**) & Email (**Correo-E**)



PUESTO	Nombre	Correo-E
President	Diane	dmurphy@classicmodelcars.com
President	Mary	mpatterson@classicmodelcars.com
President	Jeff	jfinelli@classicmodelcars.com
President	William	wpatterson@classicmodelcars.com
President	Gerard	gthompson@classicmodelcars.com
President	Anthony	athompson@classicmodelcars.com
President	Leile	lfinelli@classicmodelcars.com
President	Steve	sfinelli@classicmodelcars.com
President	Poon Yue	pyuanat@classicmodelcars.com
President	George	gbernande@classicmodelcars.com
President	Lou	lbernande@classicmodelcars.com
President	Barry	bbernande@classicmodelcars.com
President	Andy	afinelli@classicmodelcars.com
President	Peter	pmurphy@classicmodelcars.com
President	Tom	tfinelli@classicmodelcars.com
President	Mami	mkato@classicmodelcars.com
President	Yoshi	yfinelli@classicmodelcars.com
President	Martin	mfinelli@classicmodelcars.com

- MY FIRST REPORT
 - Document Structure:
 - Group: JOBTITLE
 - Group Header

Style Attributes

Name	Value	Expr
common		
type	label	
value	PUESTO	

• band

- Label: ~~'JOBTITLE'~~ → 'PUESTO'
- to change select "Attributes"
- text-field: JOBTITLE

The screenshot shows the reporting tool interface with two tabs: Structure and Data. The Structure tab is active, displaying a tree view of the report structure. The Data tab is also visible, showing the data fields for the selected band.

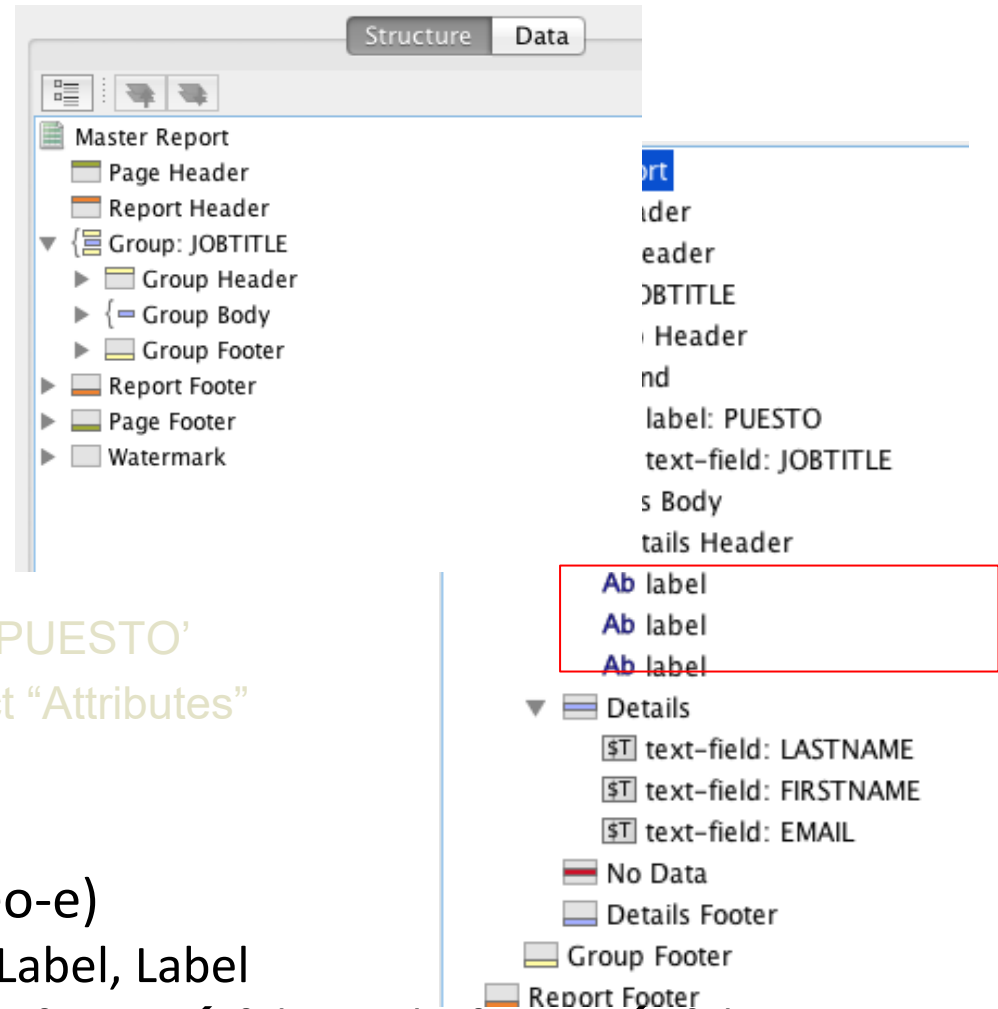
Structure Tab:

- Master Report
 - Page Header
 - Report Header
 - Group: JOBTITLE
 - Group Header
 - Group Body
 - Group Footer
 - Report Footer
 - Page Footer
 - Watermark

Data Tab:

- Master Report
 - Page Header
 - Report Header
 - Group: JOBTITLE
 - band
 - Ab label: PUESTO
 - \$T text-field: JOBTITLE
 - Details Body
 - Details Header
 - Ab label
 - Ab label
 - Ab label
 - Details
 - \$T text-field: LASTNAME
 - \$T text-field: FIRSTNAME
 - \$T text-field: EMAIL
 - No Data
 - Details Footer
 - Group Footer
 - Report Footer
 - Page Footer
 - Watermark

- MY FIRST REPORT
 - Document Structure:
 - Group: JOBTITLE
 - Group Header
 - band

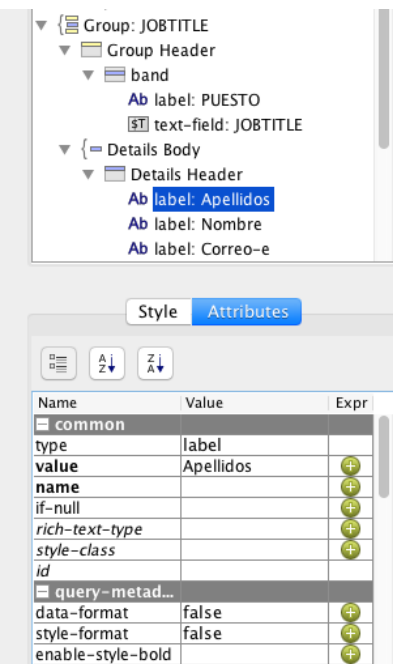


- Label: ~~JOBTITLE~~ → 'PUESTO'
- to change select "Attributes"
- text-field: JOBTITLE

Details Body:

(apellido, nombre, correo-e)

- Detail Headers → Label, Label, Label
value ← "apellido" data-format ← false style-format ← false
- Details → text-field, text-field, text-field



- MY FIRST REPORT
 - FINAL RESULT
 - FINISH BUTTON

Report Preview

Report Export View Help

100%

PUESTO	President	Nombre	Apellido	Correo-E
	Murphy	Diane		dmurphy@classicmodelcars.com
PUESTO	VP Sales	Nombre	Apellido	Correo-E
	Patterson	Mary		mpatterson@classicmodelcars.com
PUESTO	VP Marketing	Nombre	Apellido	Correo-E
	Firrelli	Jeff		jfirrelli@classicmodelcars.com
PUESTO	Sales Manager (JAPAN, APAC)	Nombre	Apellido	Correo-E
	Patterson	William		wpatterson@classicmodelcars.com
PUESTO	Sale Manager (EMEA)	Nombre	Apellido	Correo-E
	Bondur	Gerard		athompson@classicmodelcars.com
PUESTO	Sales Manager (NA)	Nombre	Apellido	Correo-E
	Bow	Anthony		bhoward@classicmodelcars.com
PUESTO	Sales Rep	Nombre	Apellido	Correo-E
	Jennings	Leslie		ljennings@classicmodelcars.com
	Thompson	Leslie		lthompson@classicmodelcars.com
	Firrelli	Julie		jfirrelli@classicmodelcars.com
	Patterson	Steve		spatterson@classicmodelcars.com
	Tseng	Foon Yue		ftseng@classicmodelcars.com
	Vanauf	George		gvanauf@classicmodelcars.com
	Bondur	Louie		lbondur@classicmodelcars.com
	Hernandez	Gerard		ghernandez@classicmodelcars.com
	Castillo	Pamela		pcastillo@classicmodelcars.com
	Bott	Larry		lbott@classicmodelcars.com
	Jones	Barry		bjones@classicmodelcars.com
	Fixter	Andy		afixter@classicmodelcars.com
	Marsh	Peter		pmarsh@classicmodelcars.com
	King	Tom		tking@classicmodelcars.com
	Nishi	Mami		mnishi@classicmodelcars.com
	Kato	Yoshimi		ekato@classicmodelcars.com
	Gerard	Martin		gmartin@classicmodelcars.com

<Untitled Report>

100%

Page Header

Report Header

Group Header

Details Header

No Data

Details

Details Footer

Group Footer

Report Footer

Structure Data

Master Report

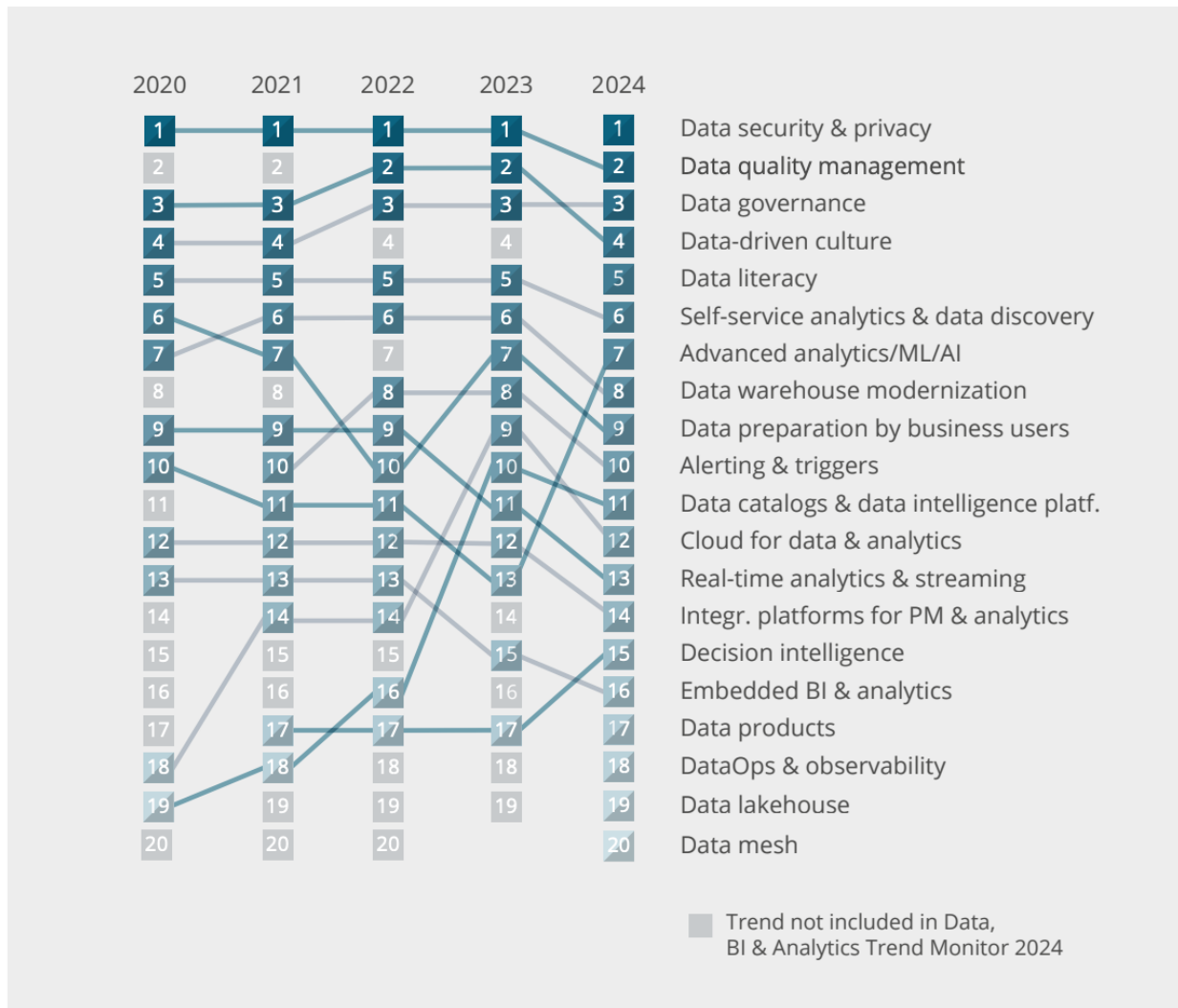
- Page Header
- Report Header
- Group: JOBTITLE
- Report Footer
- Page Footer
- Watermark

PUESTO	JOBTITLE	Apellido	Nombre	Correo-E
		LASTNAME	FIRSTNAME	EMAIL

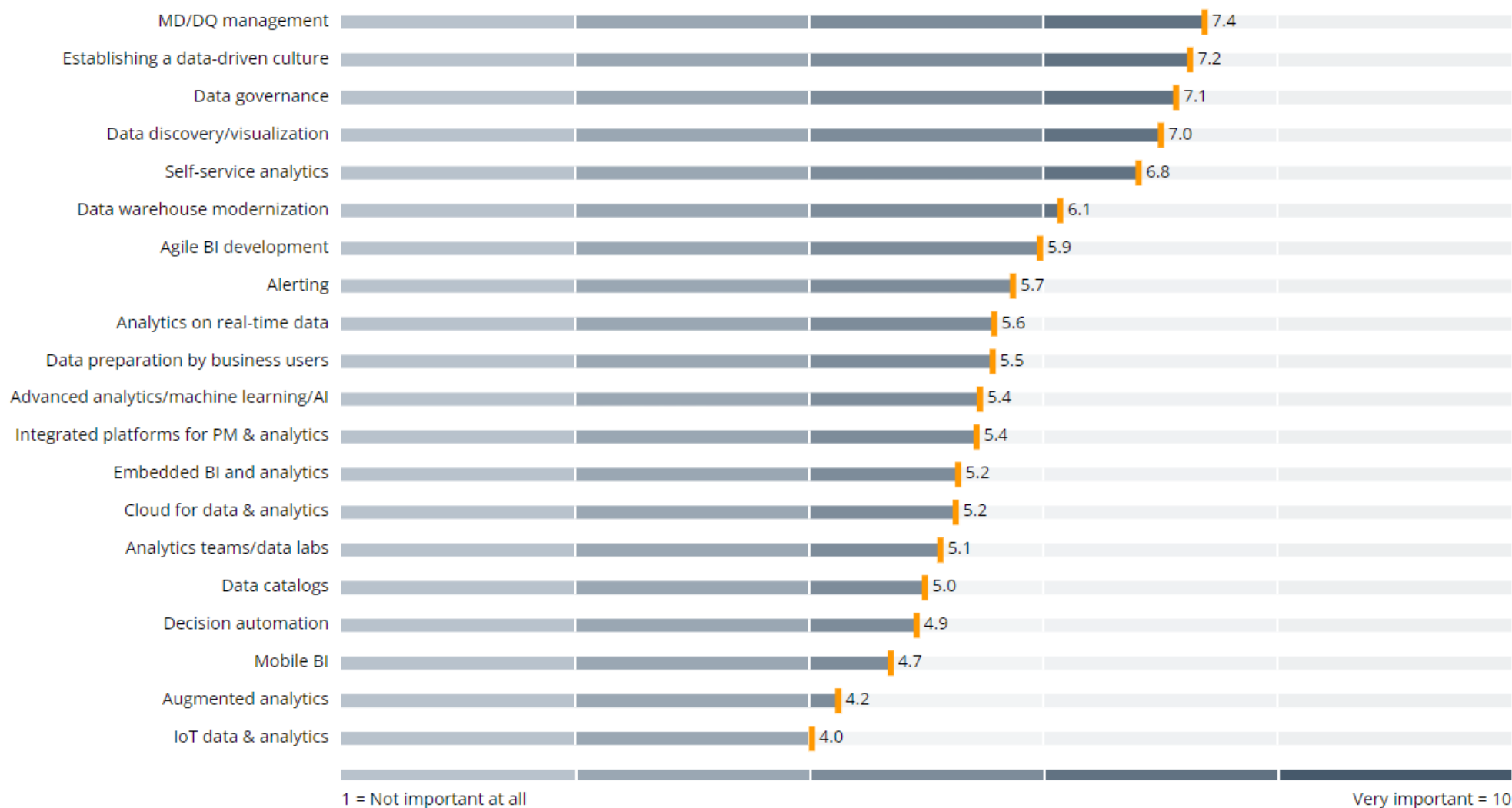
Magic Quadrant for Analytics and Business Intelligence Platforms

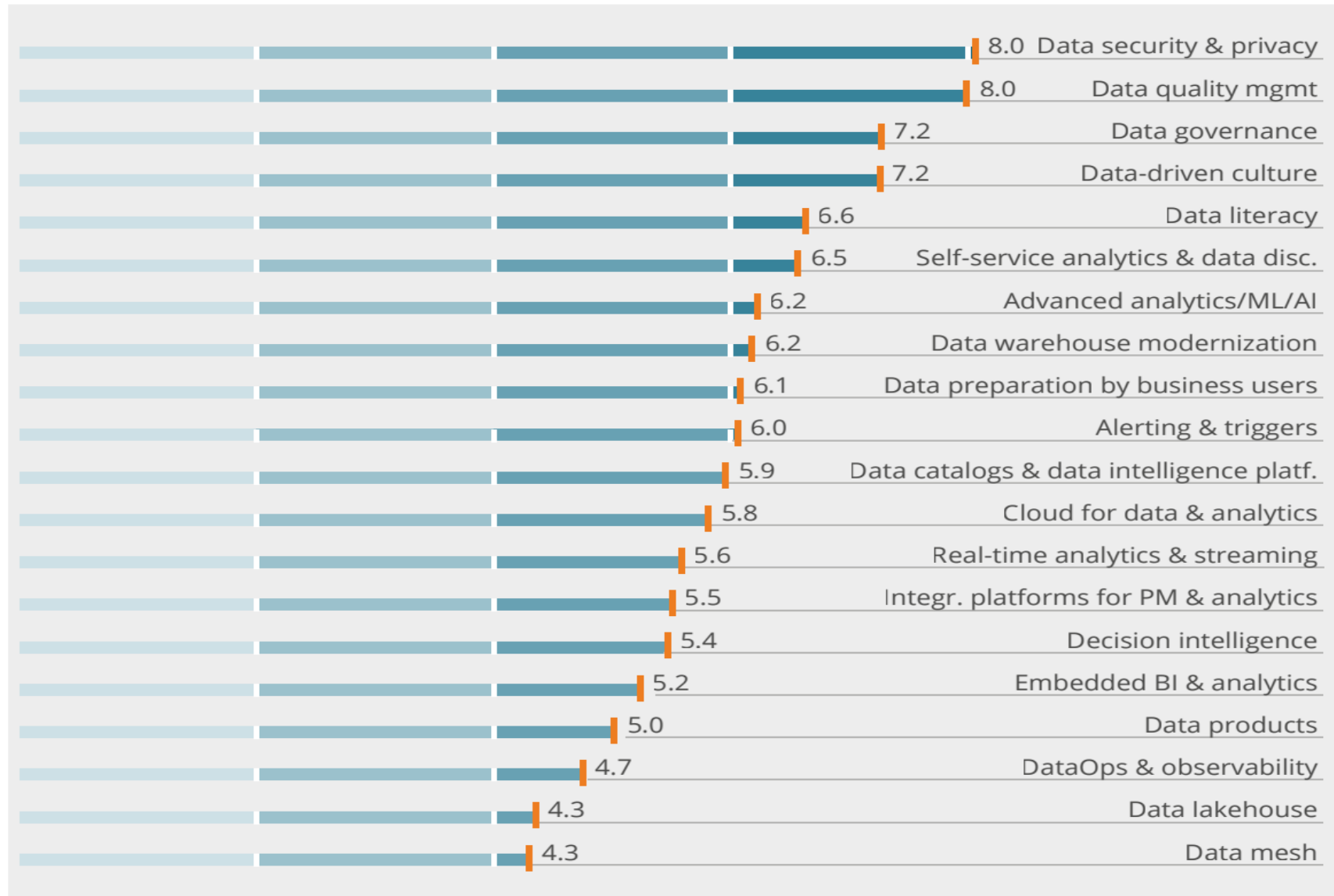


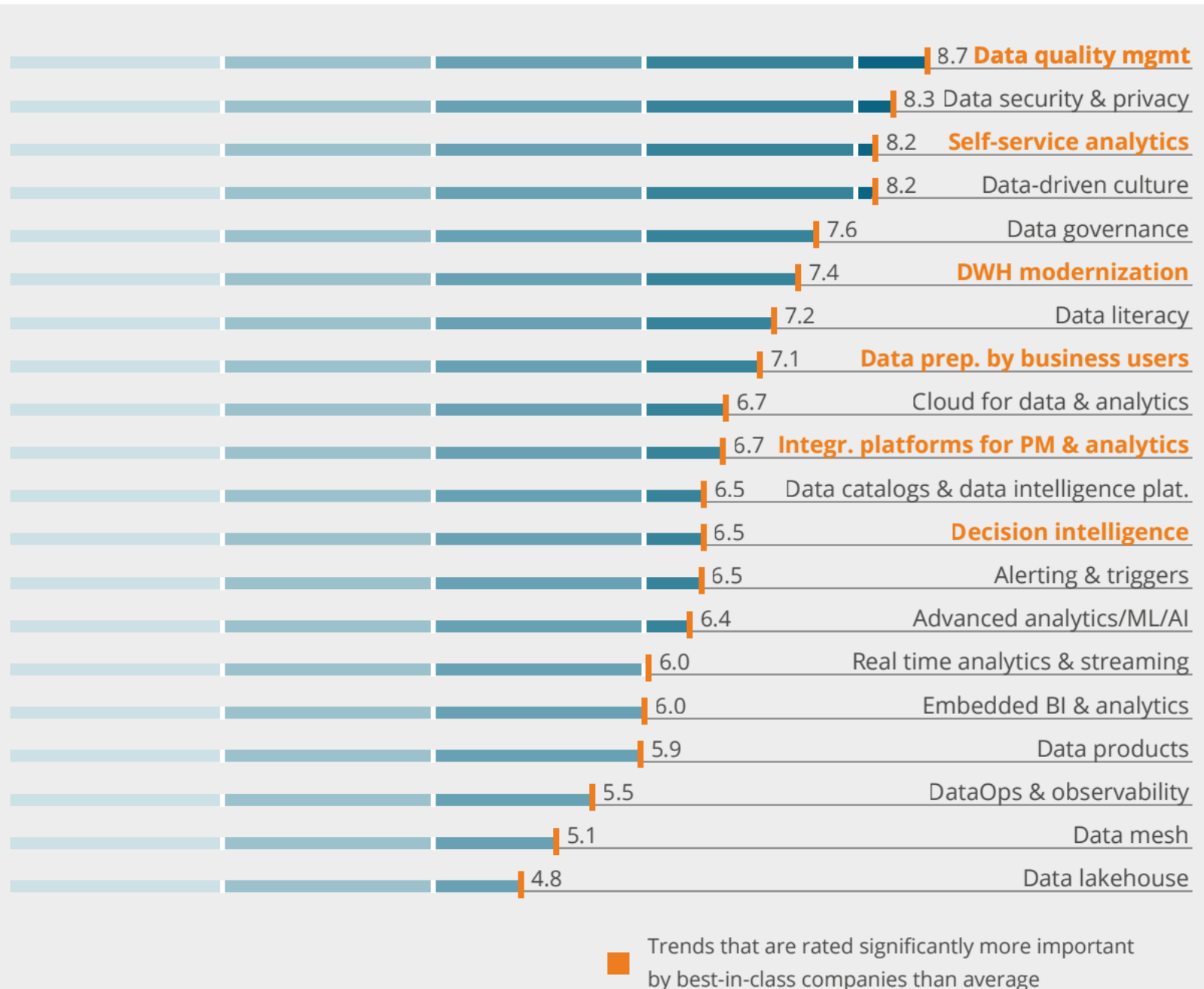
- BI continues to be a top priority for organizations. Very competitive market.
- Fastest growing technologies in IT (also # of professionals)



Importance of Data, BI and Analytics Trends in 2022 (n=2,396)







**Figure 2a. Which of the following types of architecture do you have in your environment?
(n=236)**

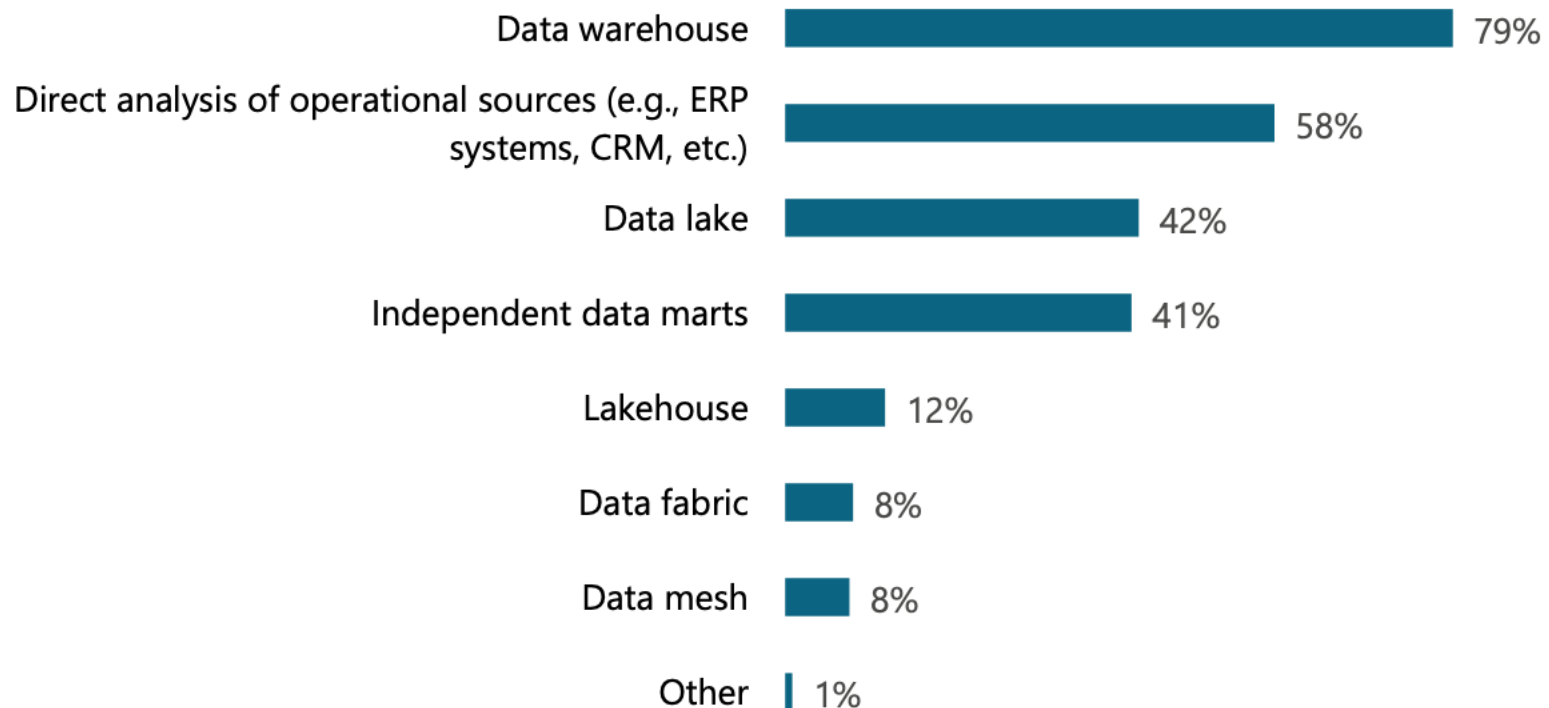


Figure 3. What are the biggest challenges in your current analytics environment? (n=238)

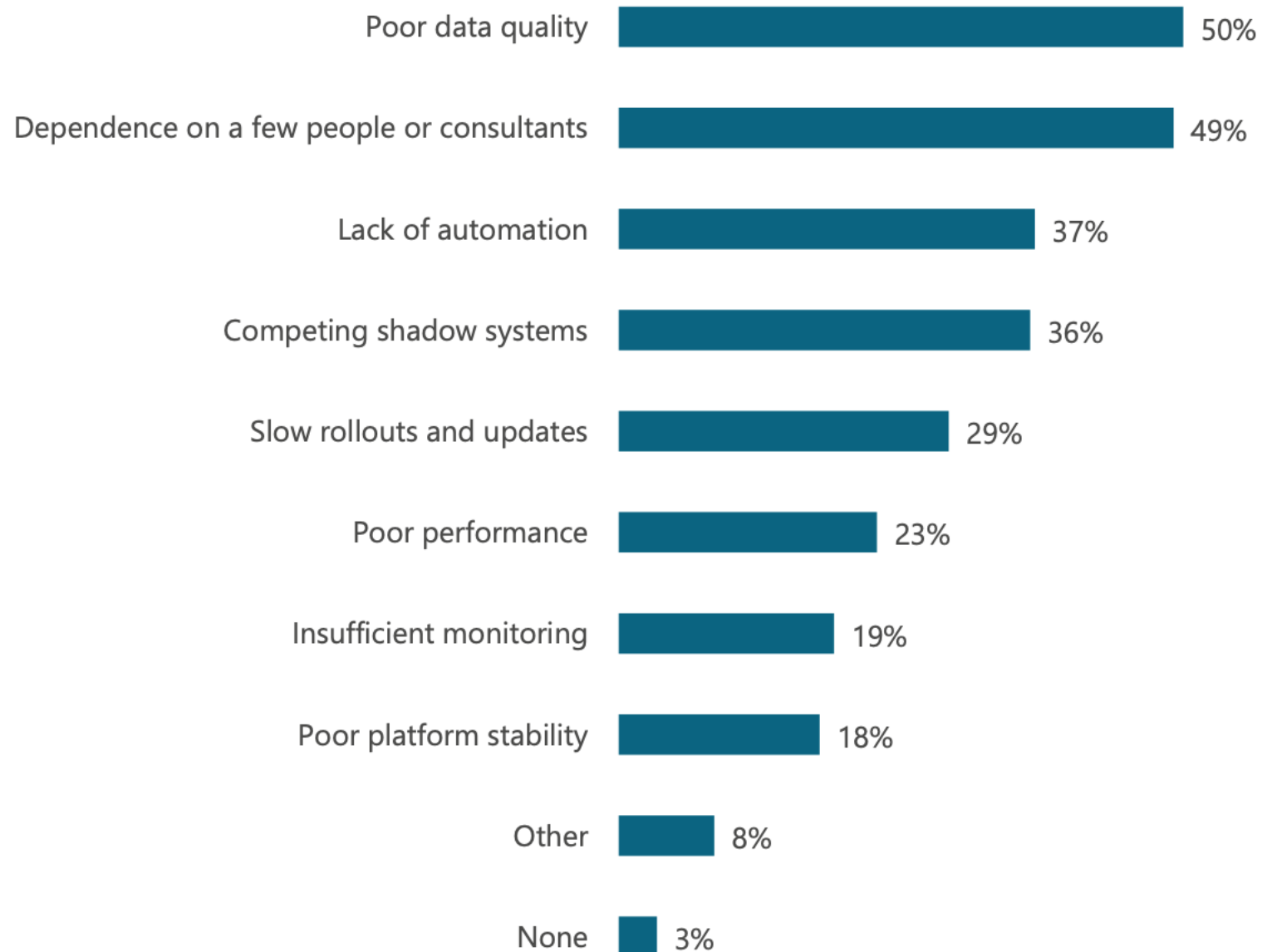


Figure 6. What environment updates and modernization steps do you plan in the next 3 years?
(n=237)

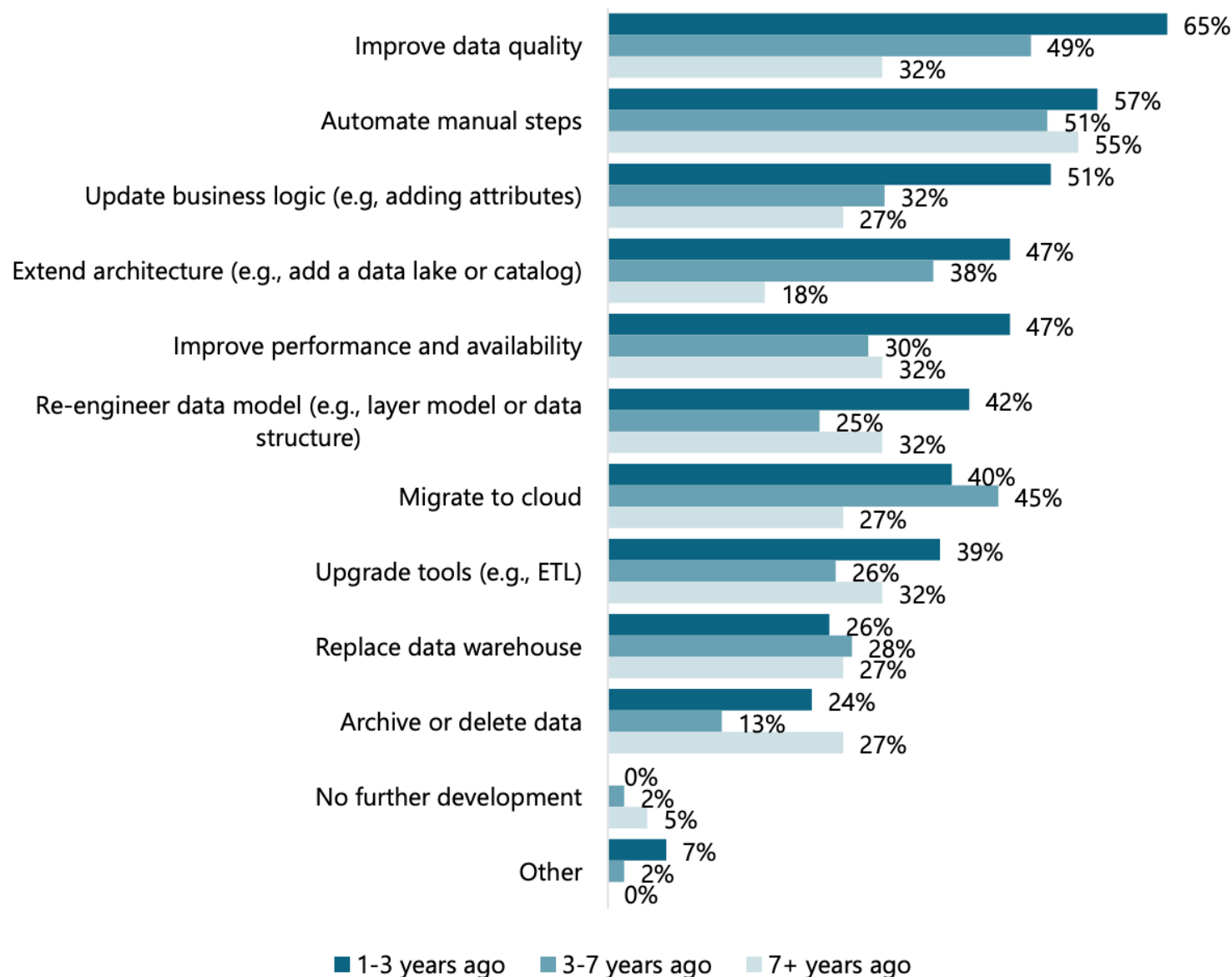
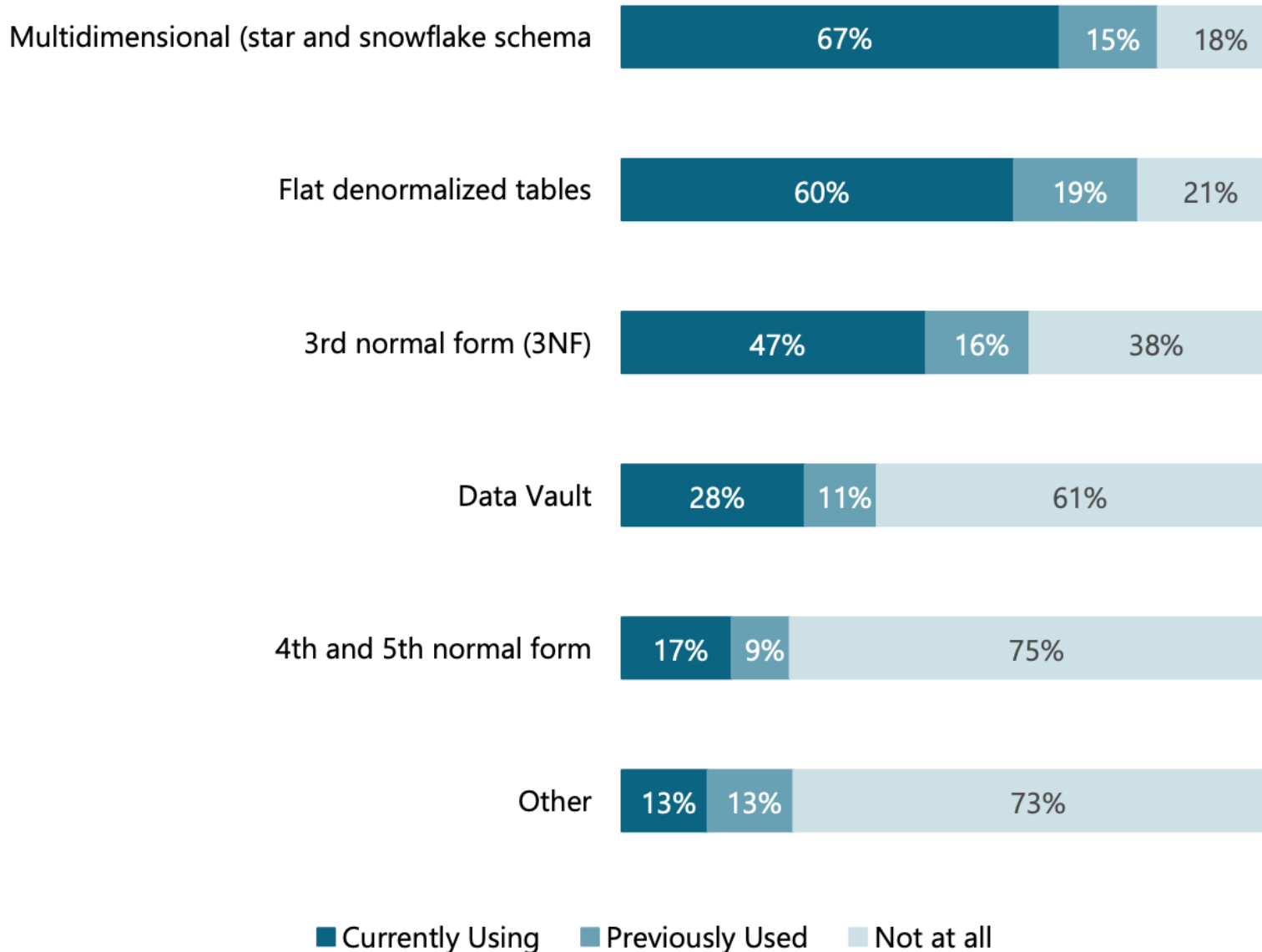


Figure 9. What data modeling techniques does your company use, or has it used in the past? (n=238)



- Big Data changes the way enterprises manipulate data
- More automation. More operational. Multiple latencies.
- Lakes and warehouse are complementary. Several architectures: DW outside Data Lake, DW inside DL, DW in front DL. No more data silos.
- Agile: Change is welcome.
- Infrastructure available in short time. Hybrid: (multi)Cloud/in-premises
- Technological perspective: integration of technologies
- Additional use cases: e.g. data science. Elastic to adapt to changing needs. Data quality is a must.
- Self-Service: access to everybody
- Expand: (Dashboards/scorecards/reports/OLAP/...) to include prescription/prediction/forecasting
- Powerful visualizations and AI-driven analysis

What we want to improve?

- Business/User satisfaction
- Optimize resource usage
- Enhance productivity
- Adaptation to changes
- Better (timely) information
- ROI
- Integration

Challenges:

Find BI professionals understanding technologies and business
DWH needs to become agile

Self-service analytics-> Searches & NLP (part of augmented analytics)

Reverse ETL-> Takes data from the DWH and moves it back to the operational systems.

DataOps, Decision Intelligence (DI) and analytics at the Edge.

DataOps:

- Inspired by DevOps, decreases the time from data to value
- Users: Analysts and scientists looking for creating and deploying models and visualizations
- Improves data and analytic pipelines, automating data ingestion, transformation and “orchestrating” of data workflows.

Decision Intelligence:

Use AI techniques to improve decision making. Use ML, statistics and analytics to solve business needs.

Edge Analytics:

Descentralized & near-sensor analysis (usually IoT devices)

Market

- \$14,3 billion (2018), \$27.11 billion (2022) , \$29.42 billion (2023), \$54.27 billion (2030). Annual growth rate ~9%
- BI becomes a core component of operations
- By 2023, ~ 33% of large companies will implement decision intelligence
- Self-service BI essential for 60% R&D departments

Adoption

26% (global)

80% (#staff >5000)

Cloud platforms increasingly adapting SaaS to BI applications

Cloud –based BI market fastest growing BI segment

Cloud-based BI being adopted by manufacturing (~58%), and business and financial services (~40% each)

Growing job market (55% business have dark data)

SaaS BI

- Applications implemented in the cloud and accessed via a browser
- Pricing: subscription with different payment models
- Delegation: less responsibility
- Suitable for usages requiring flexibility and scalability. High adoption
- Comply with security/regulations is a challenge