REPORTING

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

OUTLINE

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

REPORTING

- 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

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

2. REPORTING TOOLS

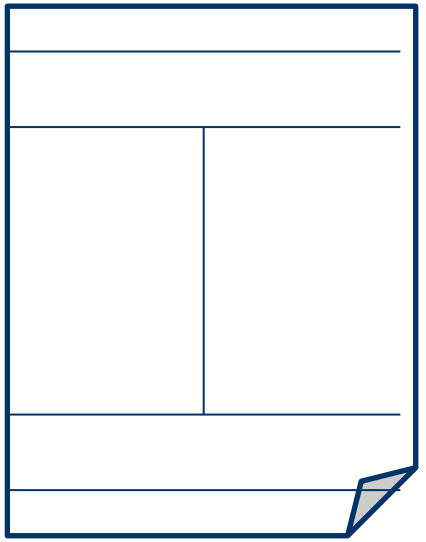
- PROGRAMMING SUITES
  - JASPER REPORTS LIBRARY
    - Very popular reporting engine
    - Open source
    - Variety of formats: HTML, PDF, Office, Excel, Word.
    - Classical approach: editing xml
    - Modern approach: Jaspersoft Studio (Eclipse IDE)
  - Workflow:
    - Design report (creating jrxml 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>
```

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



Example extracted from:
http://www.javaworld.com/article/2074594/java-security/reports-made-easy-with-jasperreports.html

- JASPER REPORTS LIBRARY

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        </textElement>
        <text><![CDATA[NAME]]></text>
      </staticText>
```

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

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

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

Example extracted from: http://www.javaworld.com/article/2074594/java-security/reports-made-easy-with-jasperreports.html

- 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);
```

```
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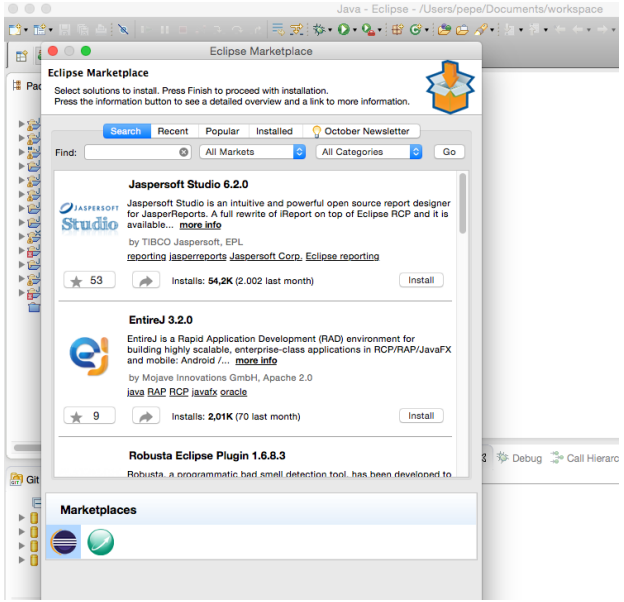
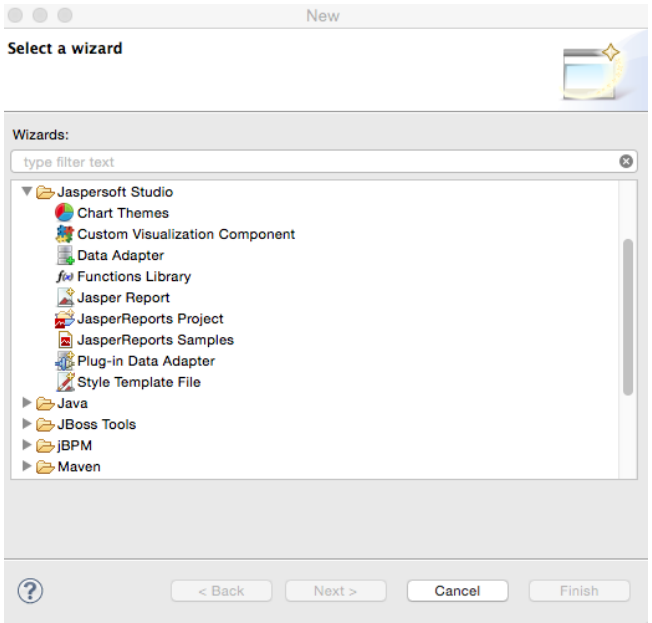
REPORTING

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

Eclipse Market Place

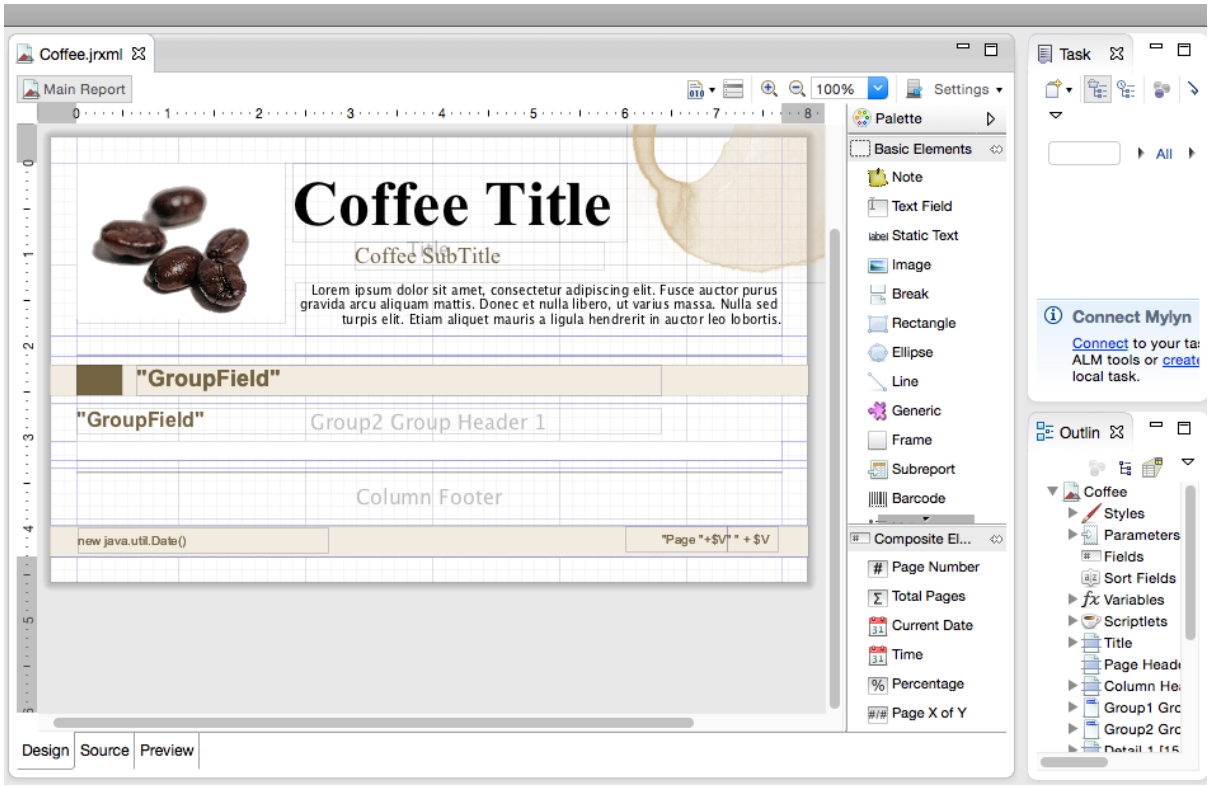


New Project



- 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

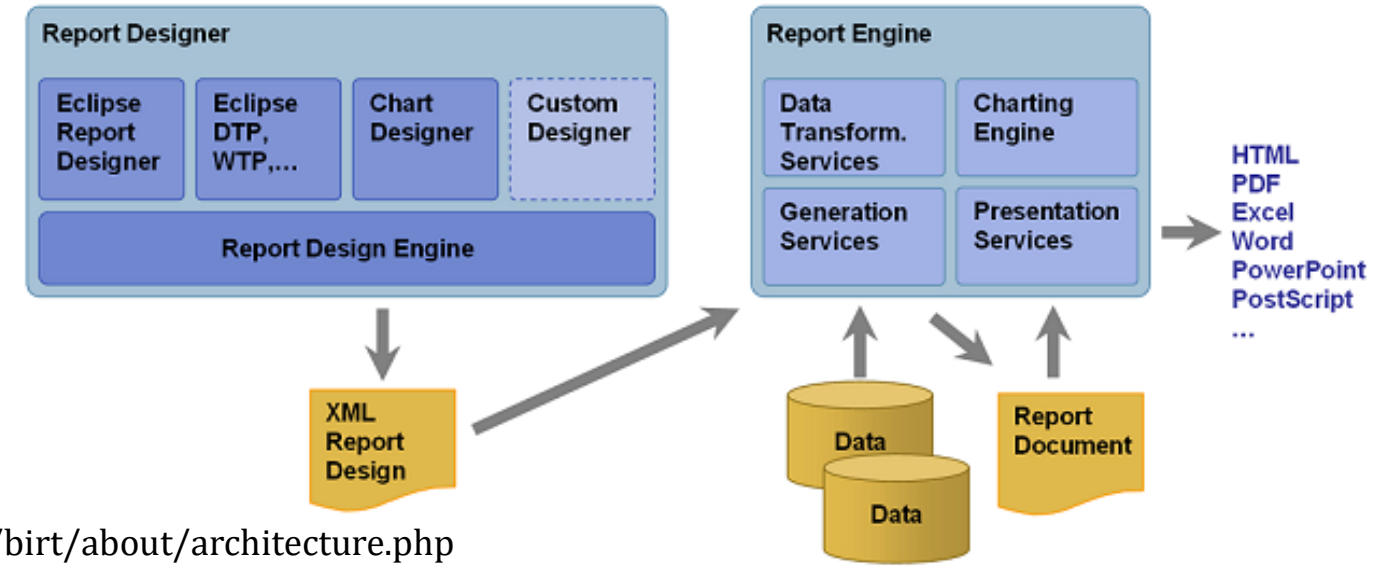


Figure from:
http://www.eclipse.org/birt/about/architecture.php

REPORTING

	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
  - 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

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

REPORTING

- 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,…

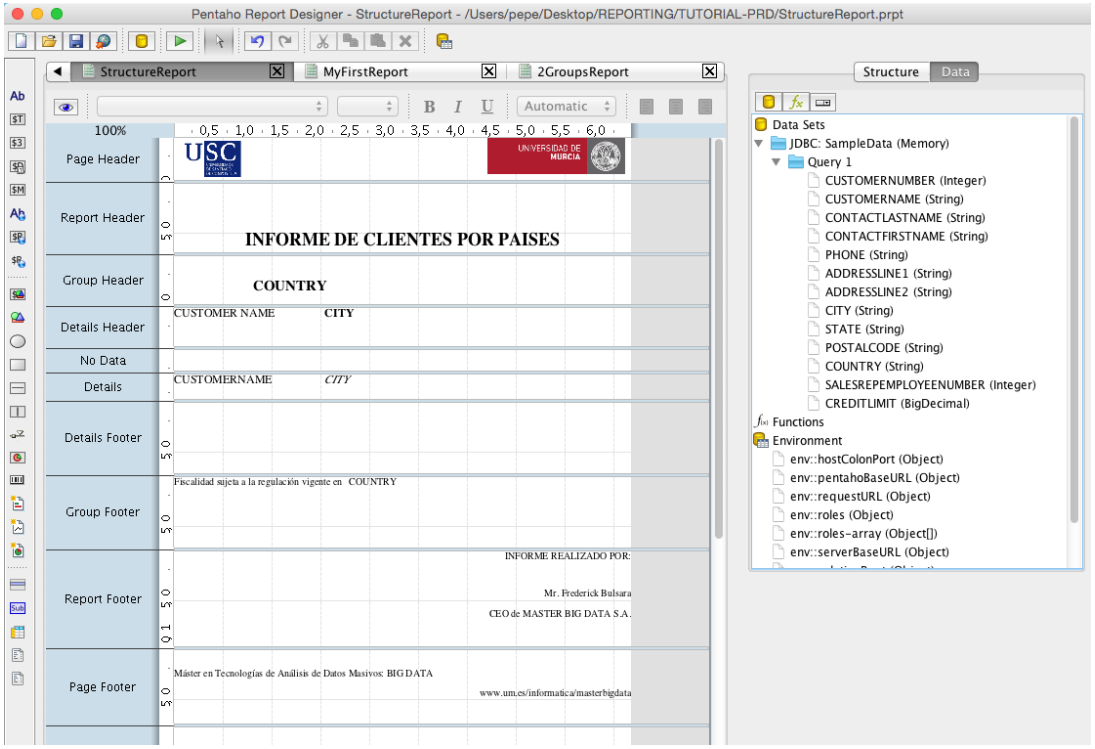
Complete comparative at:
http://www.innoventsolutions.com/comparison-matrix.html

3. PENTAHO REPORTS

REPORTING

- 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

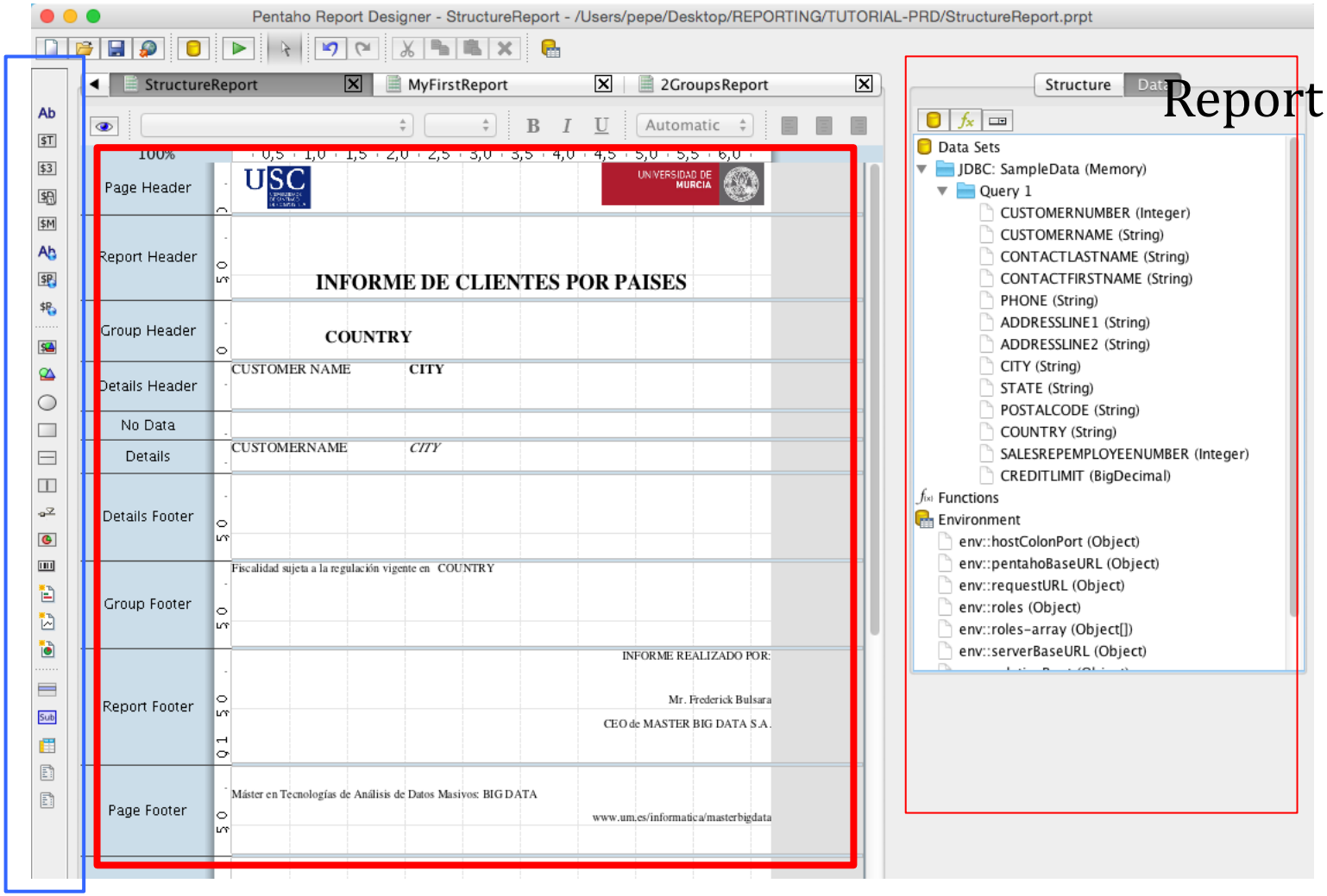
- PENTAHO REPORT DESIGNER (PRD) V7.1
  - Desktop tool
  - Download from https://sourceforge.net/projects/pentaho/files/Report%20Designer/



- PENTAHO REPORT DESIGNER (PRD)

Components

Data sources & Report structure

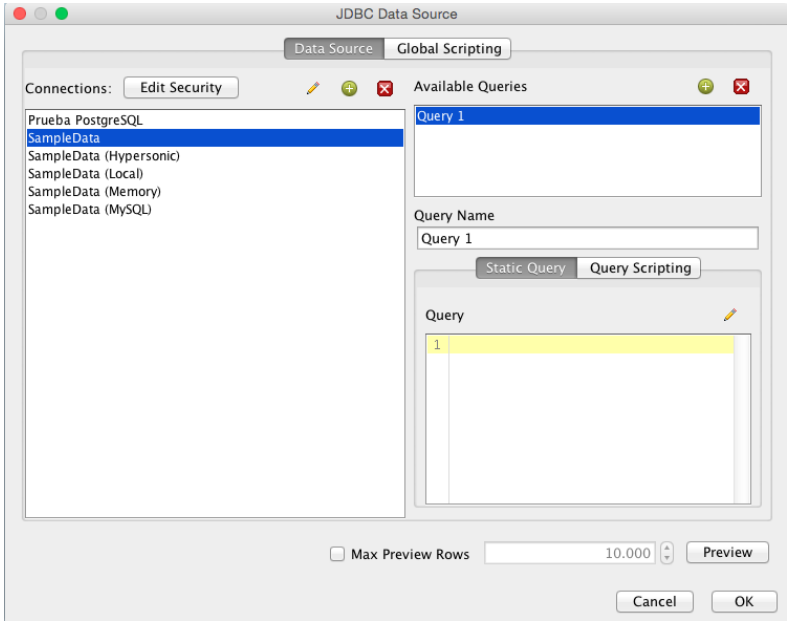


REPORTING

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

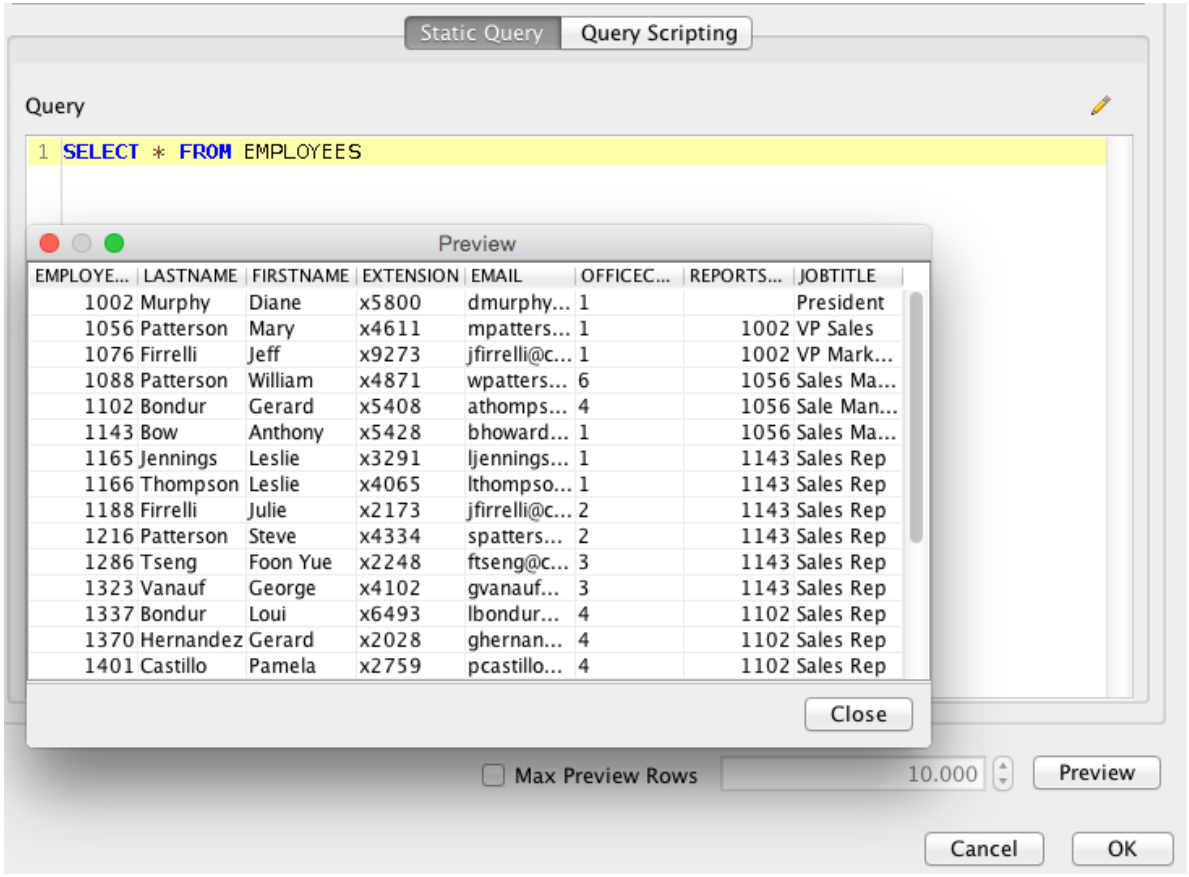
REPORTING

- 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



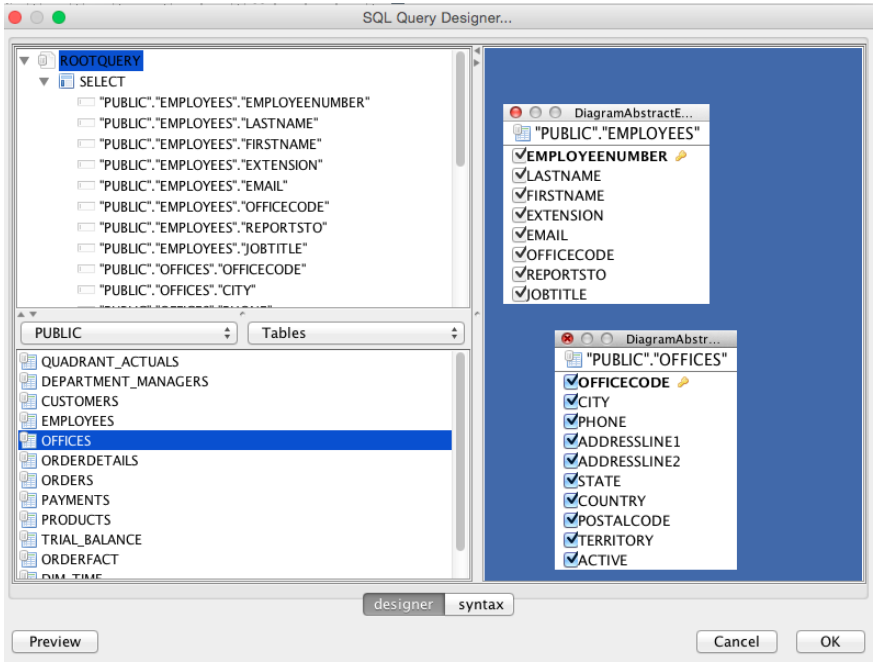
REPORTING

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



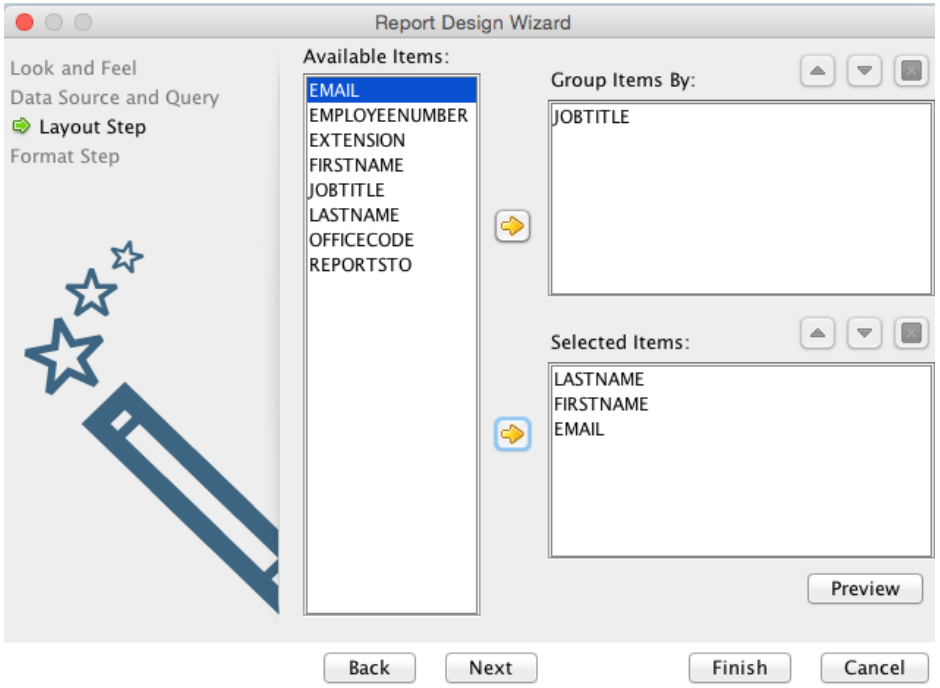
REPORTING

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

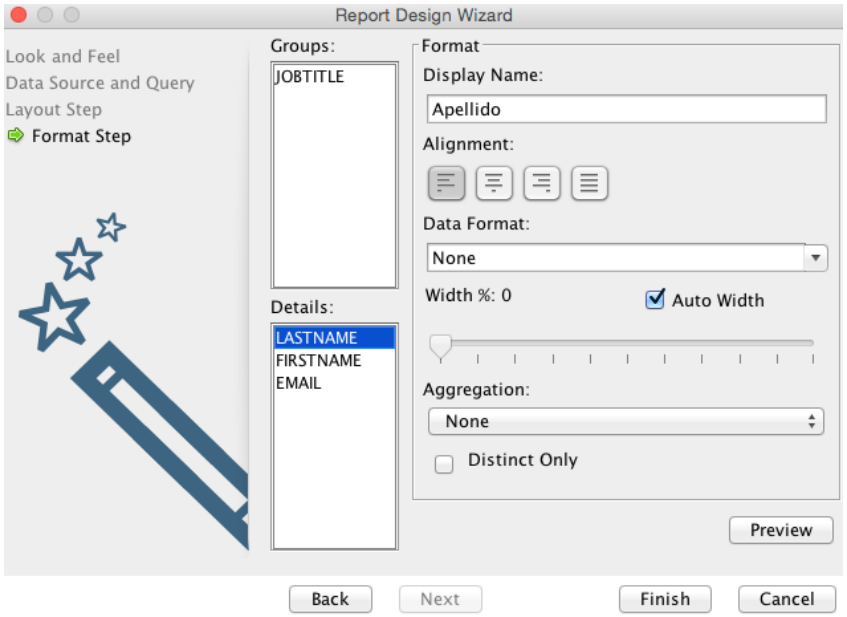


REPORTING

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



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



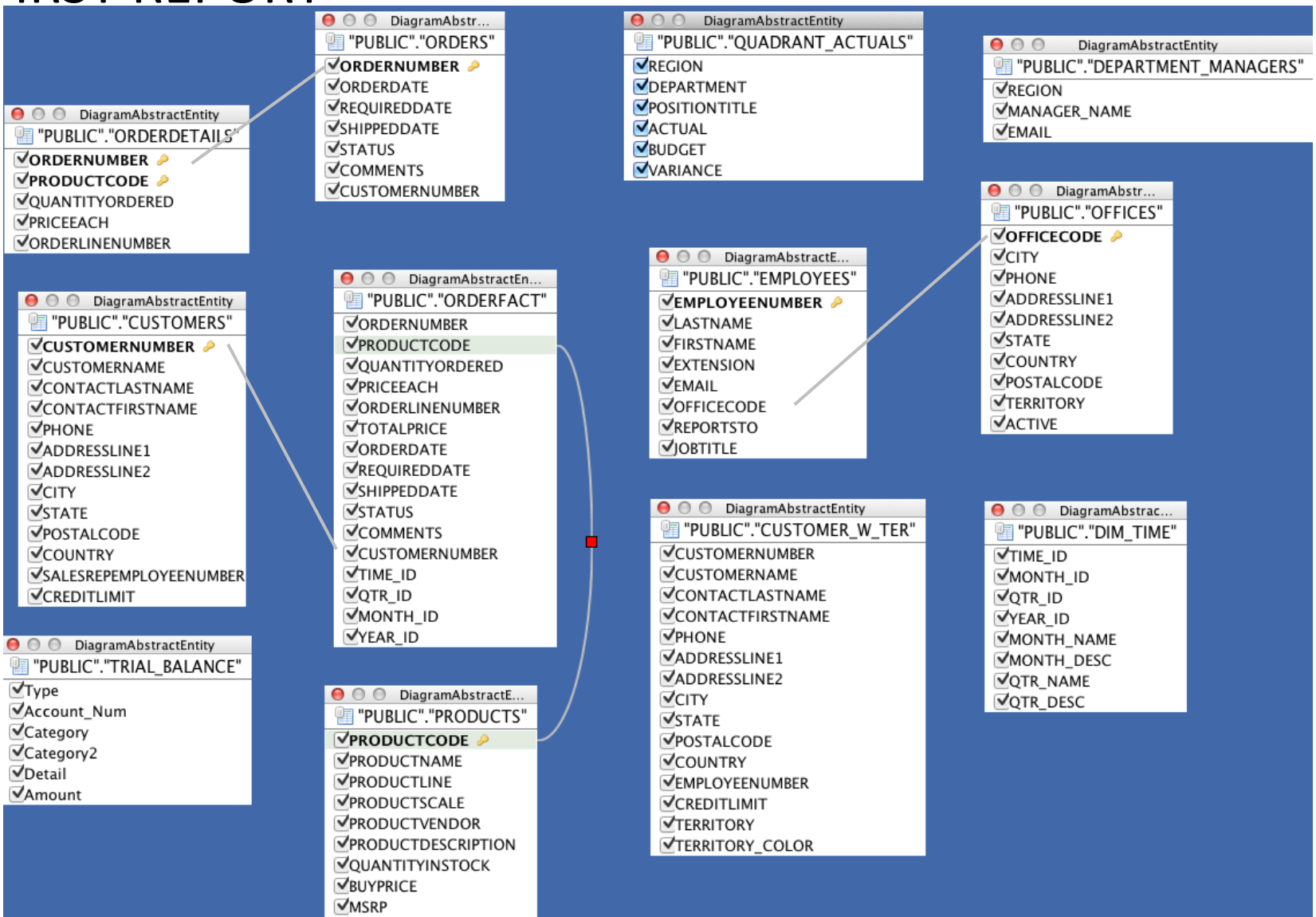
4. MY FIRST REPORT

REPORTING

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

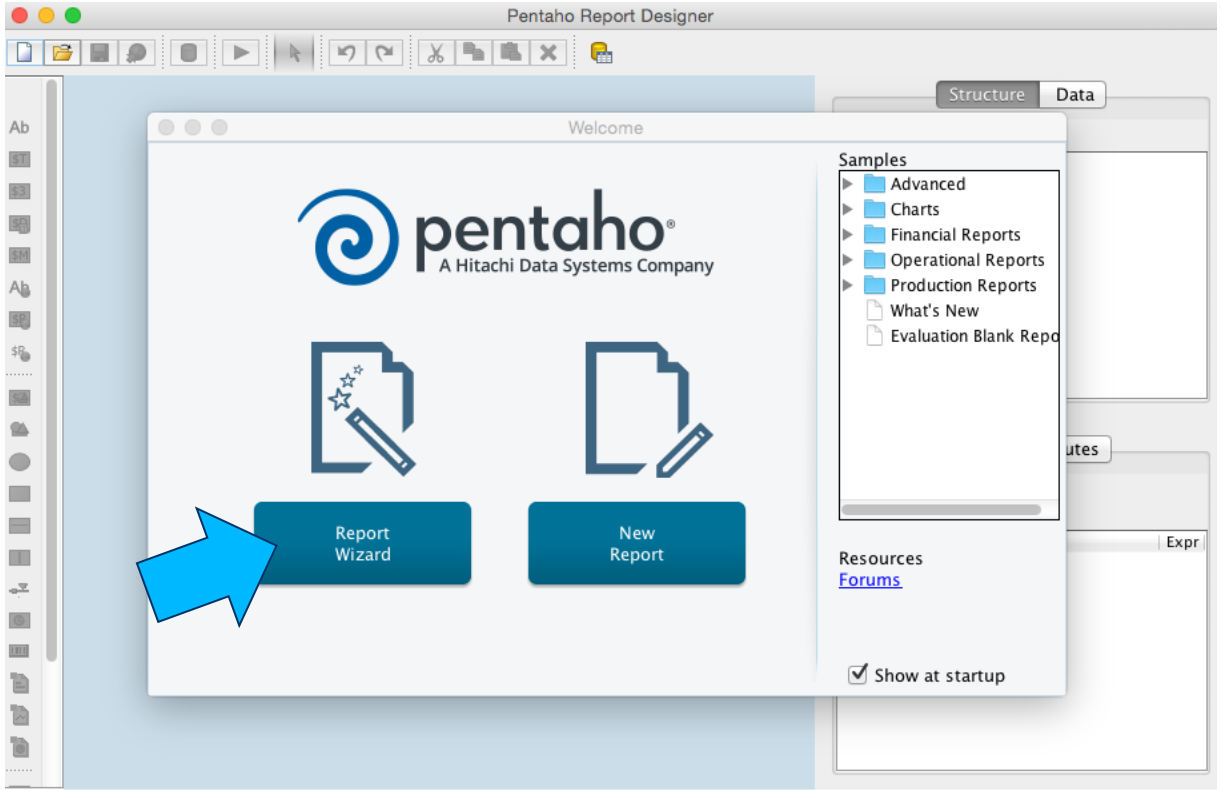
REPORTING

- MY FIRST REPORT

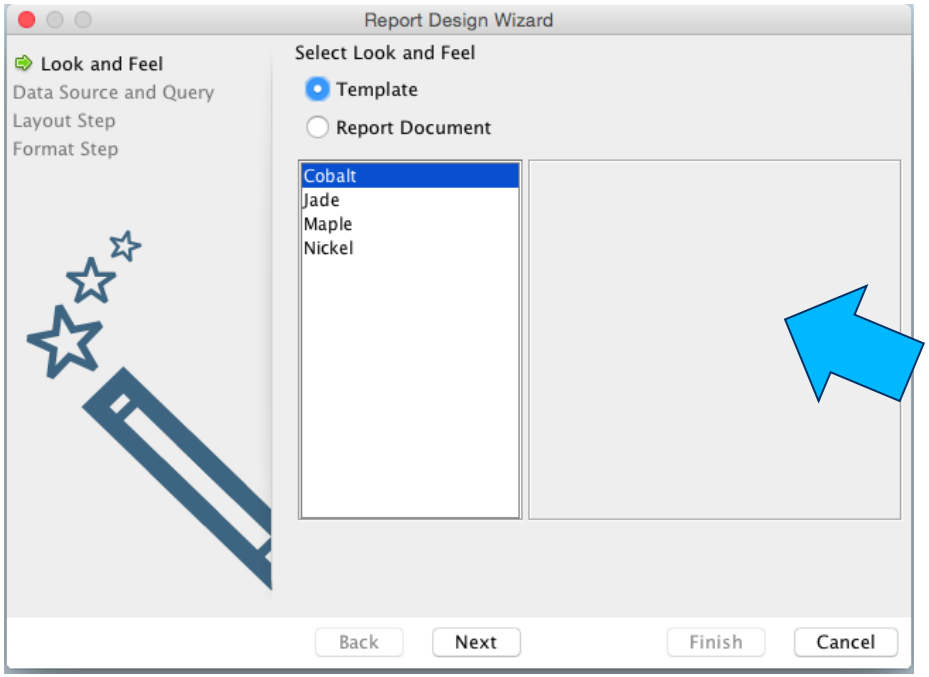


REPORTING

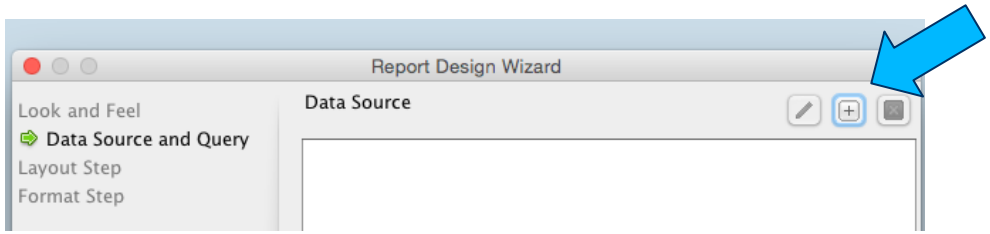
- MY FIRST REPORT *MyFirstReport.prpt*
  - "**LIST OF EMPLOYEES BY POSITION**"
  - WELCOME PAGE



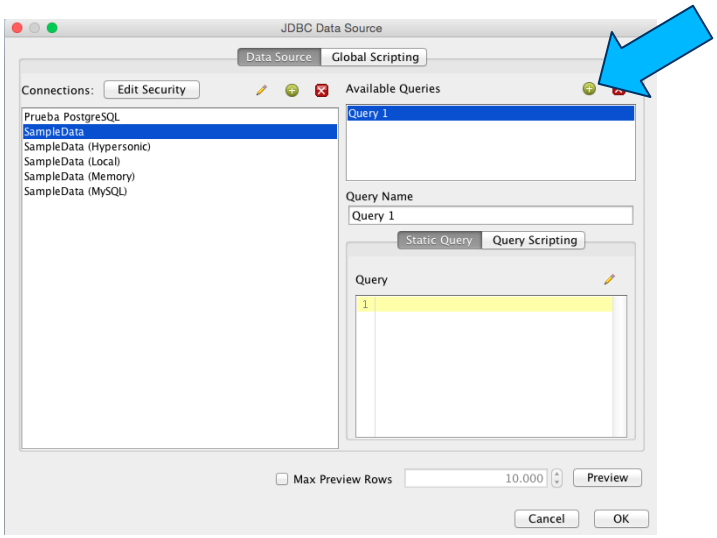
- MY FIRST REPORT *MyFirstReport.prpt*
  - "**LIST OF EMPLOYEES BY POSITION**"
  - TEMPLATE:



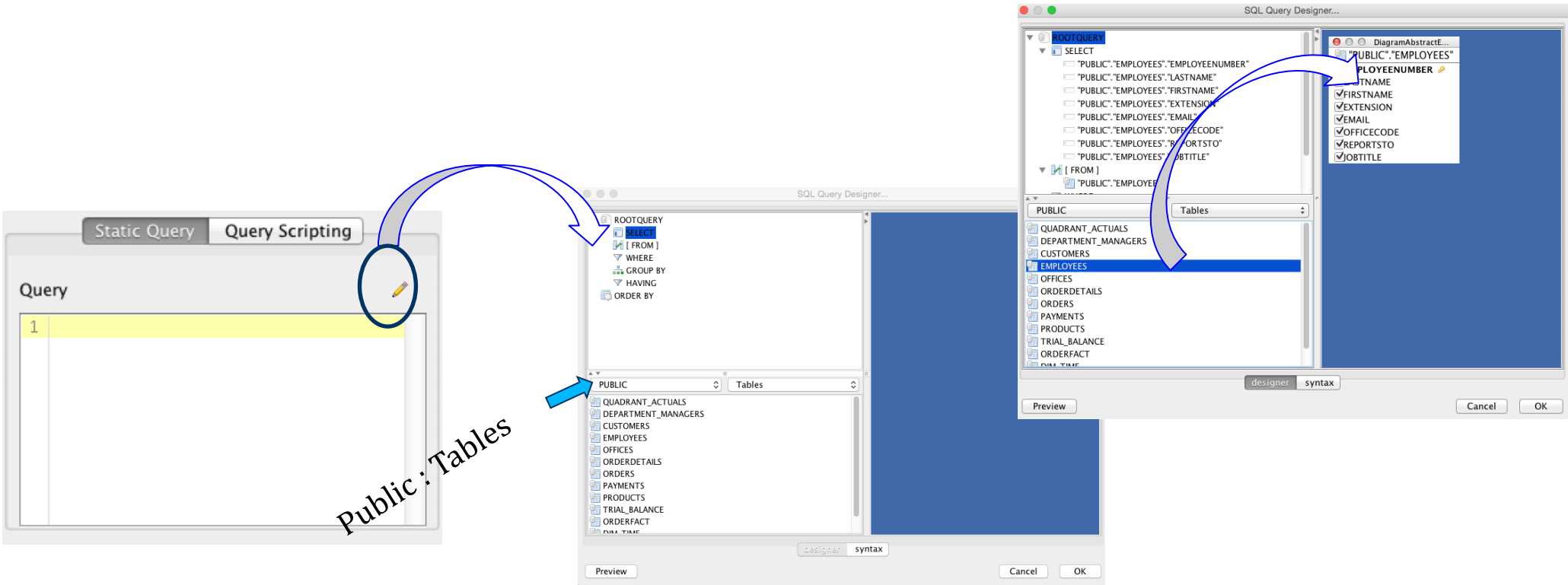
- MY FIRST REPORT
  - DATA SOURCE AND QUERIES
    1. Press +



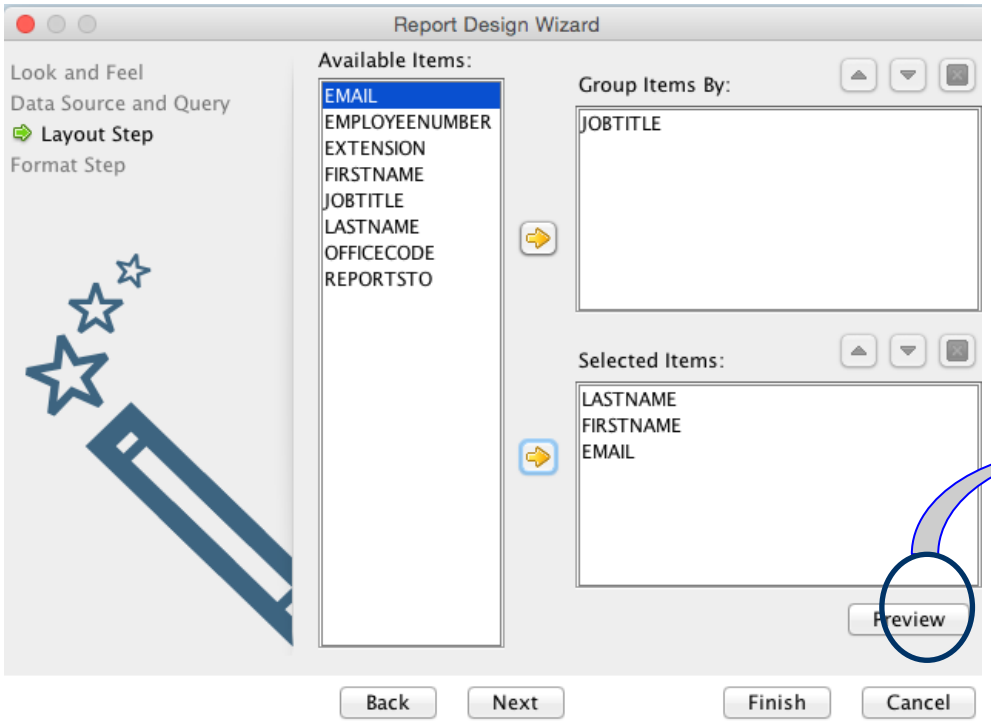
    1. Choose a Data source type: JDBC
    2. Choose **SampleData (memory)**
    3. Available Query: Add new Query

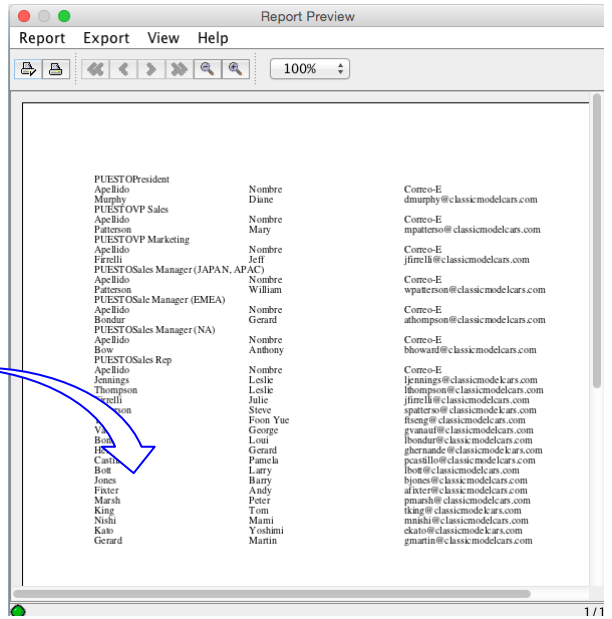


- MY FIRST REPORT
  - DATA SOURCE AND QUERIES
    4. Design a query:
       - Visually design a query
         - **Public**: **Tables**::**Employees**
         - Drag & Drop Employees to canvas

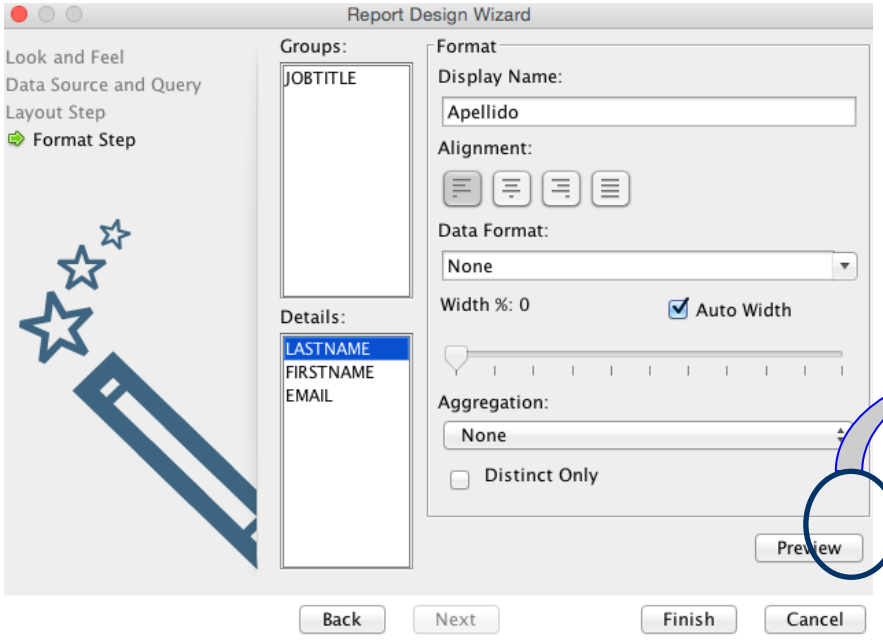


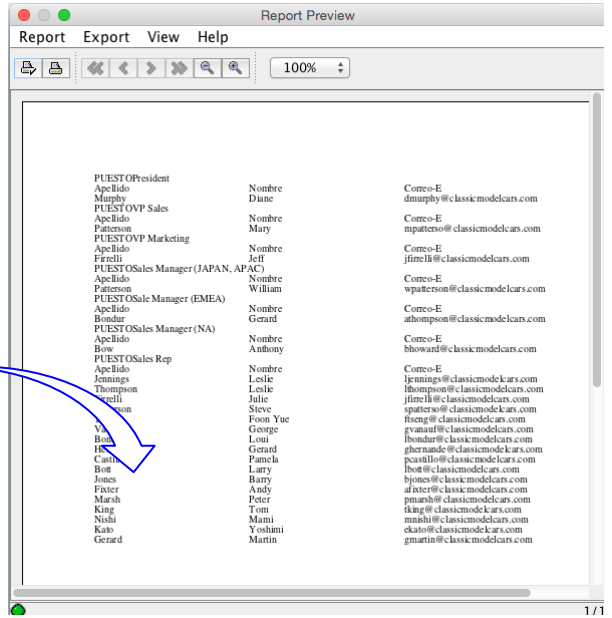
- MY FIRST REPORT
  - LAYOUT
    - Group Items By: JOBTITLE
    - Selected Items: LASTNAME, FIRSTNAME, EMAIL





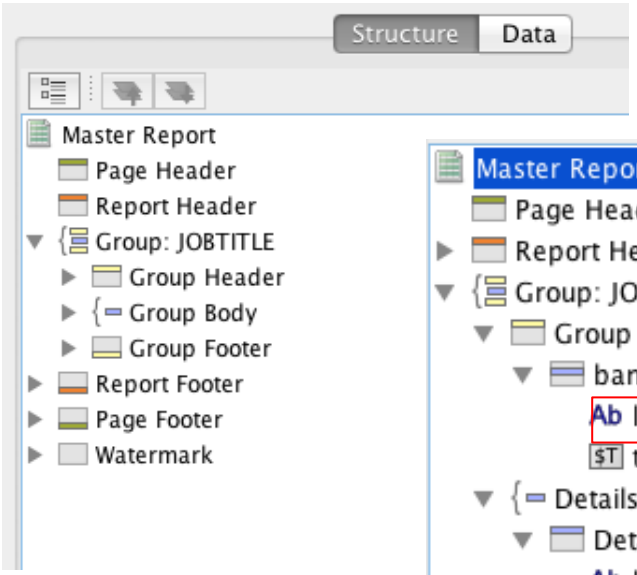
- MY FIRST REPORT
  - FORMAT:
    - JOBTITLE → Display Name **PUESTO**
    - LASTNAME → Display Name **Apellido**
    - Same with FirstName (**Nombre**) & Email (**Correo-E**)

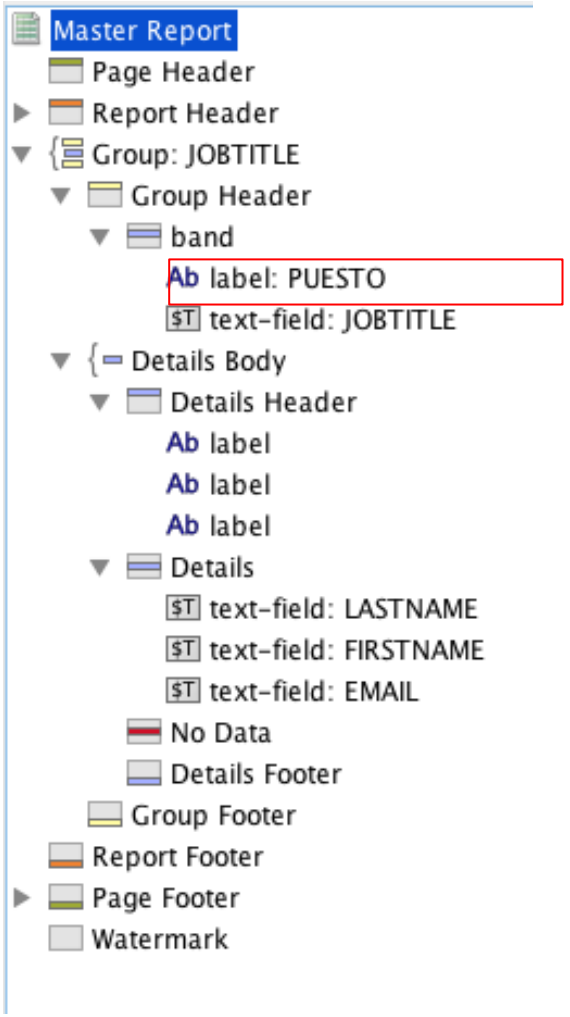




REPORTING

- MY FIRST REPORT
  - Document Structure:
    - Group: JOBTITLE
      - Group Header
        - band
          - Label:'~~JOBTITLE'~~ → 'PUESTO'
          - to change select "Attributes"
          - text-field: JOBTITLE





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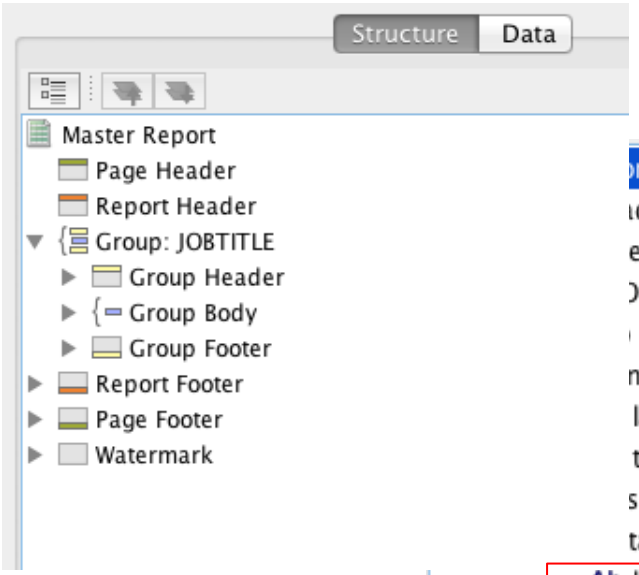
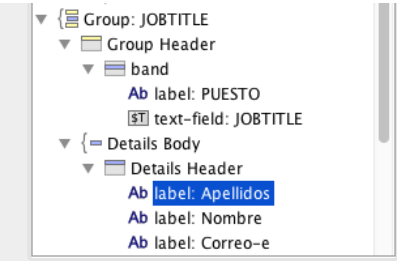
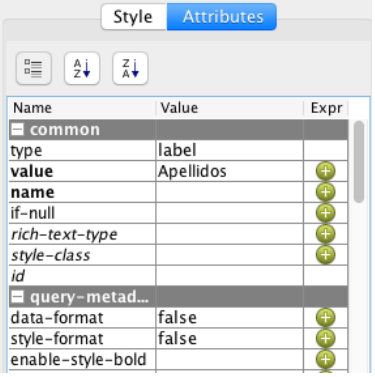
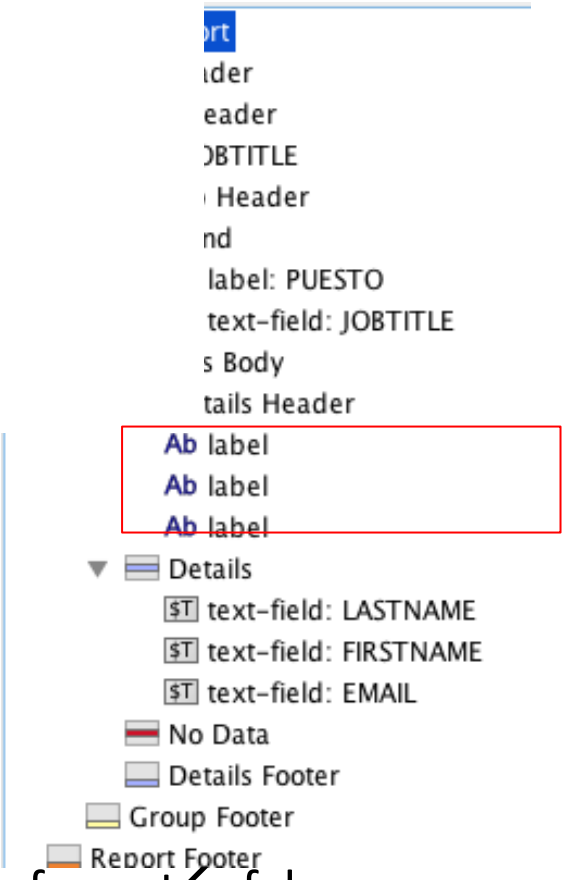
  - Document Structure:
    - Group: JOBTITLE
      - Group Header
        - band
          - Label: ~~'JOBTITLE'~~ → 'PUESTO'
          - to change select "Attributes"
          - text-field: JOBTITLE
      - Details Body:
        (apellido, nombre, correo-e)
        - Detail Headers → Label, Label, Label
          value←"apellido" data-format←false style-format← false
        - Details → text-field, text-field, text-field



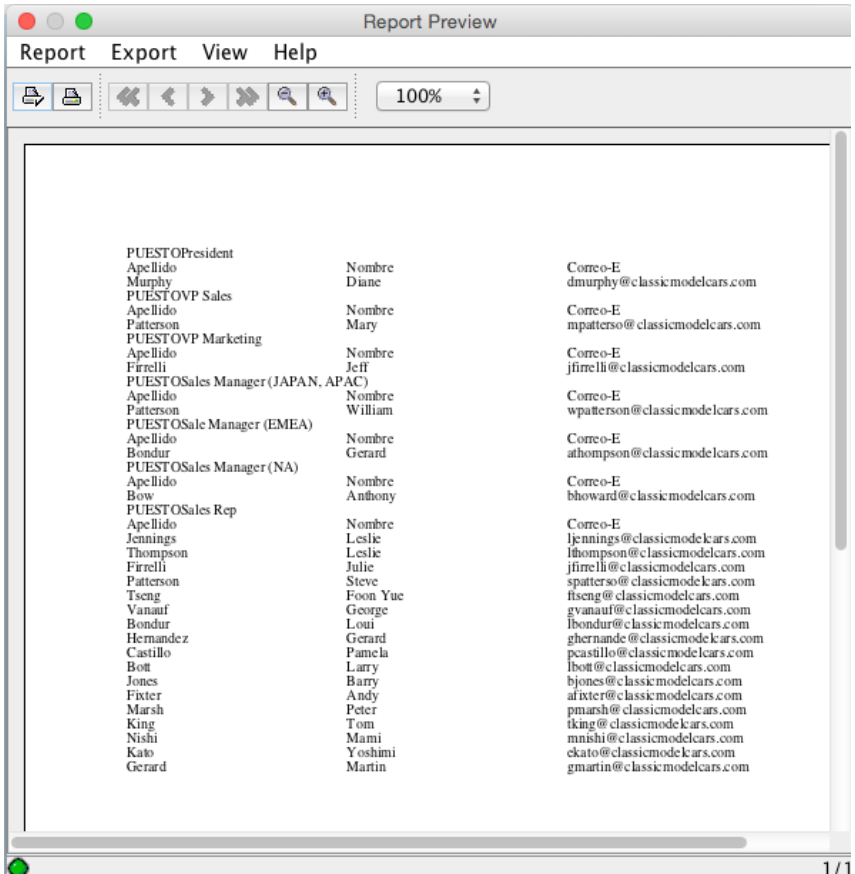


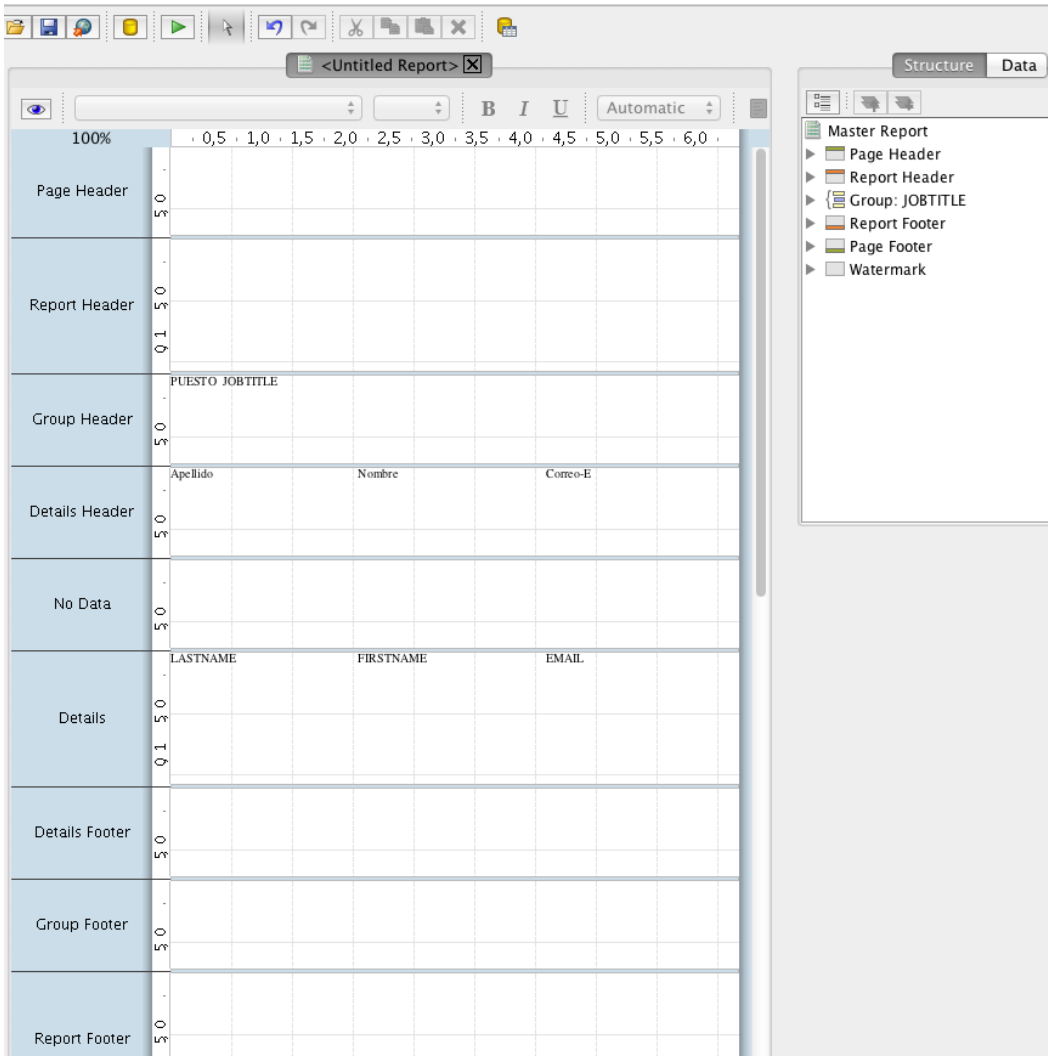




REPORTING

- MY FIRST REPORT
  - FINAL RESULT
    - FINISH BUTTON

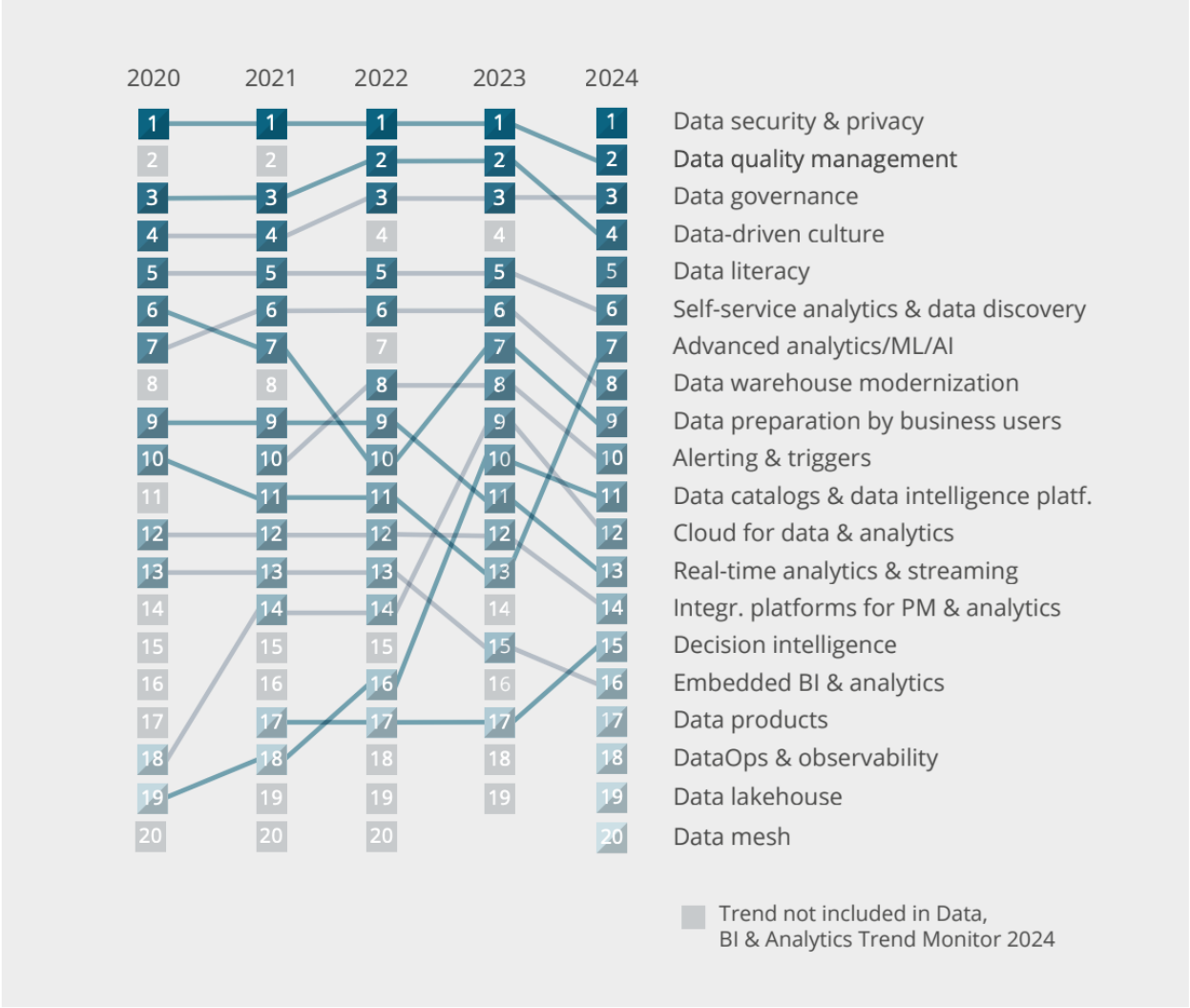




Magic Quadrant for Analytics and Business Intelligence Platforms

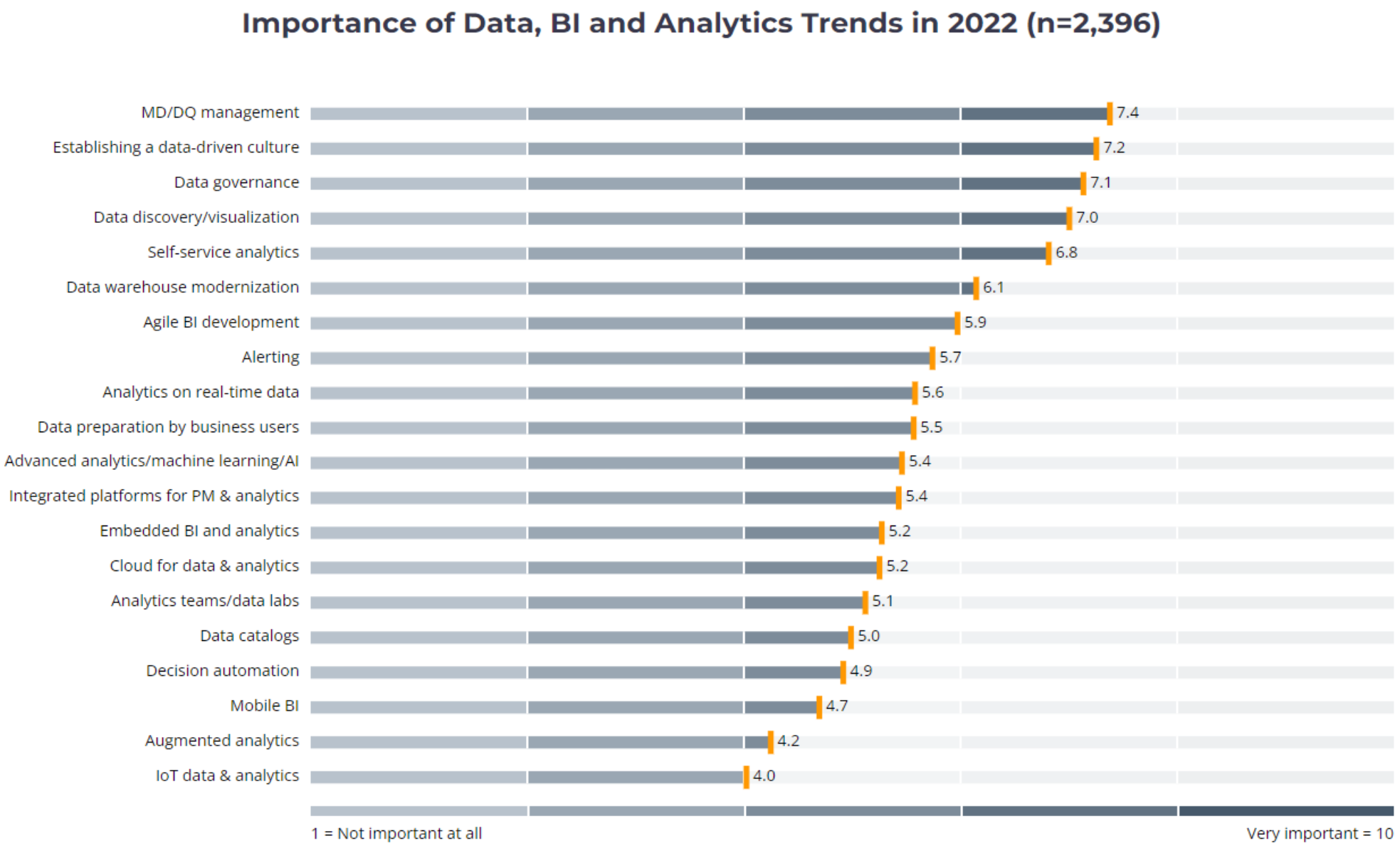
BI:Future

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



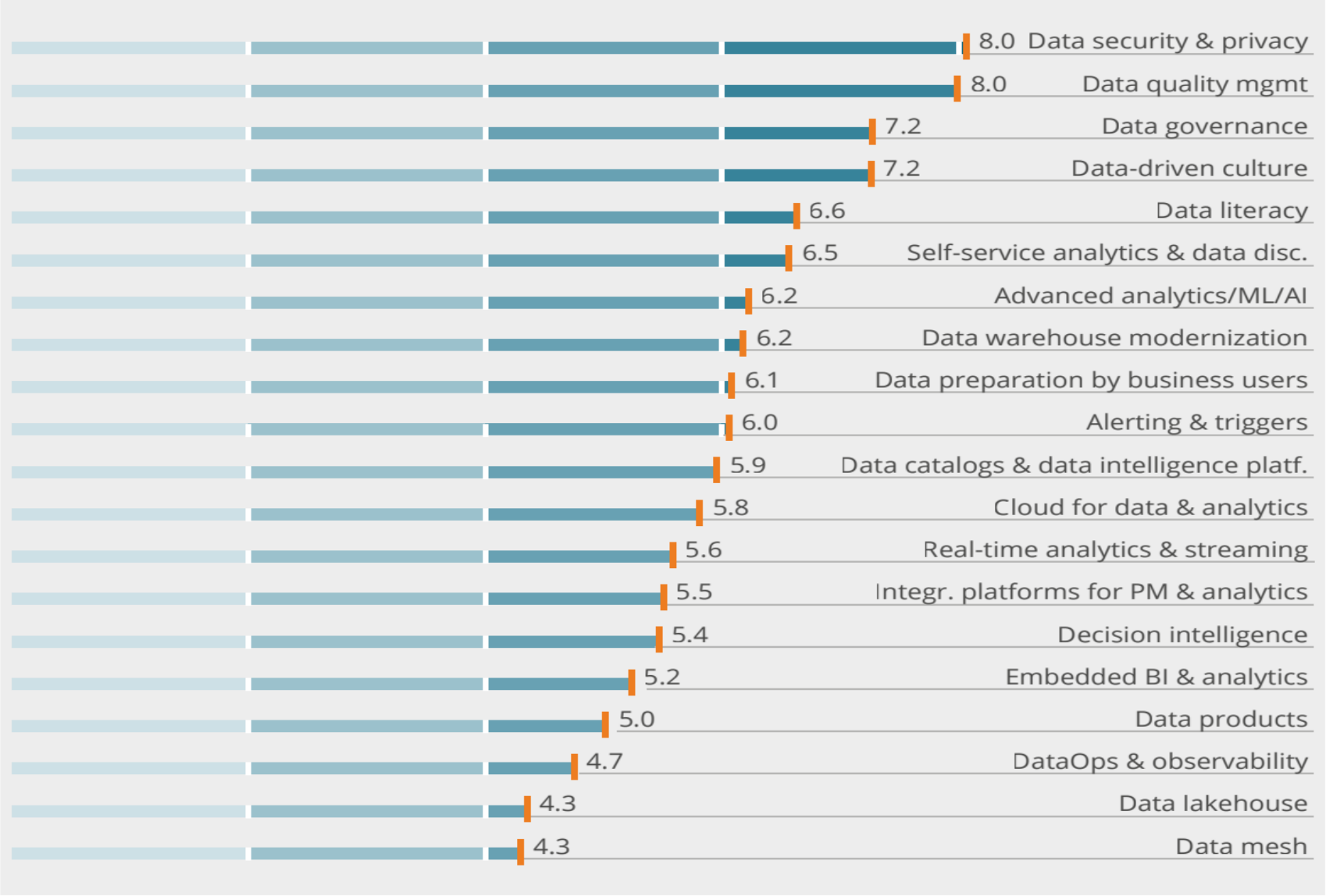
Source: Data, BI and Analytics Trend Monitor 2024. BARC Research Study

BI:Future



Source: Data, BI and Analytics Trend Monitor 2022. BARC Research Study

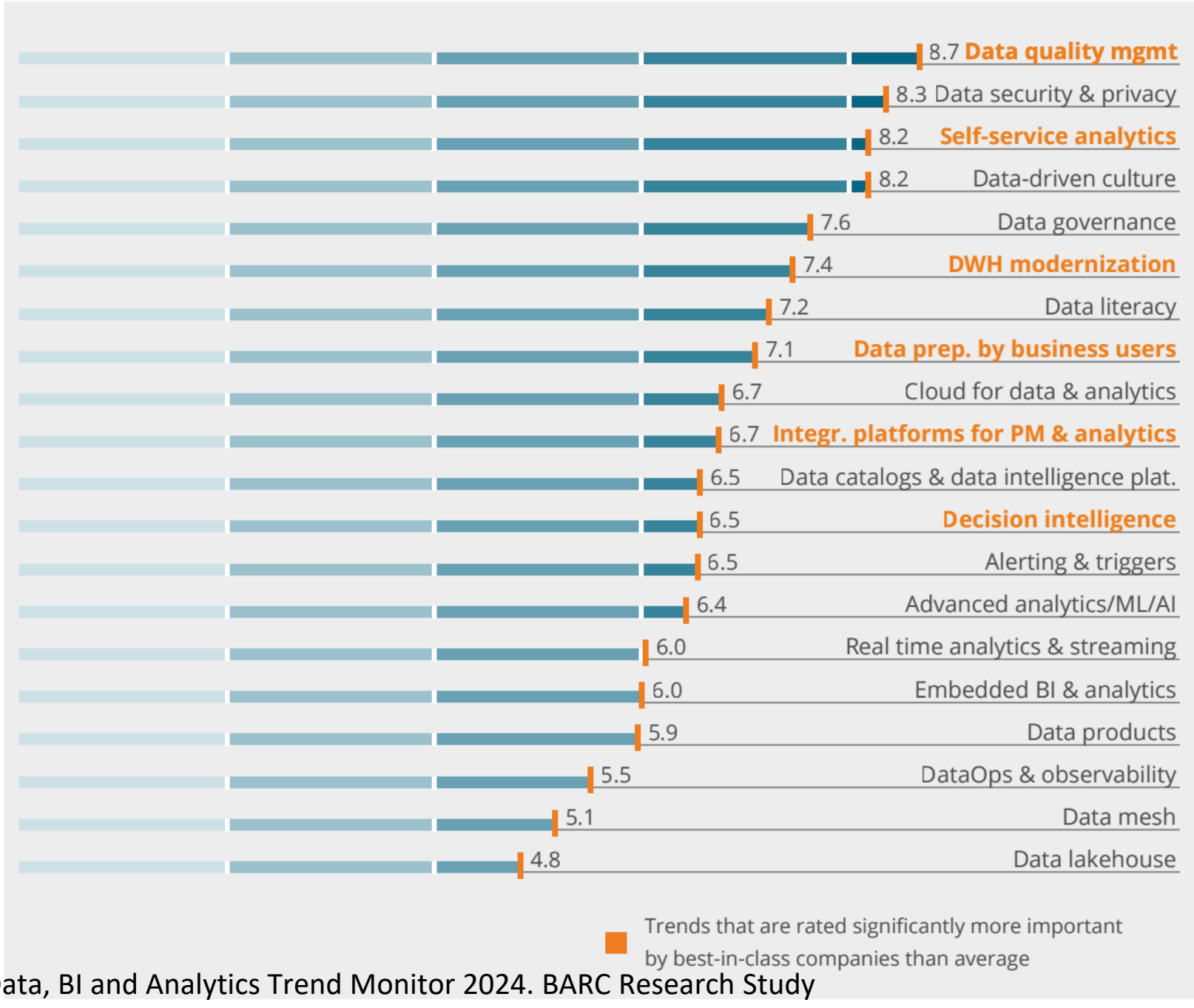
BI:Future



n = 2,398

Source: Data, BI and Analytics Trend Monitor 2024. BARC Research Study

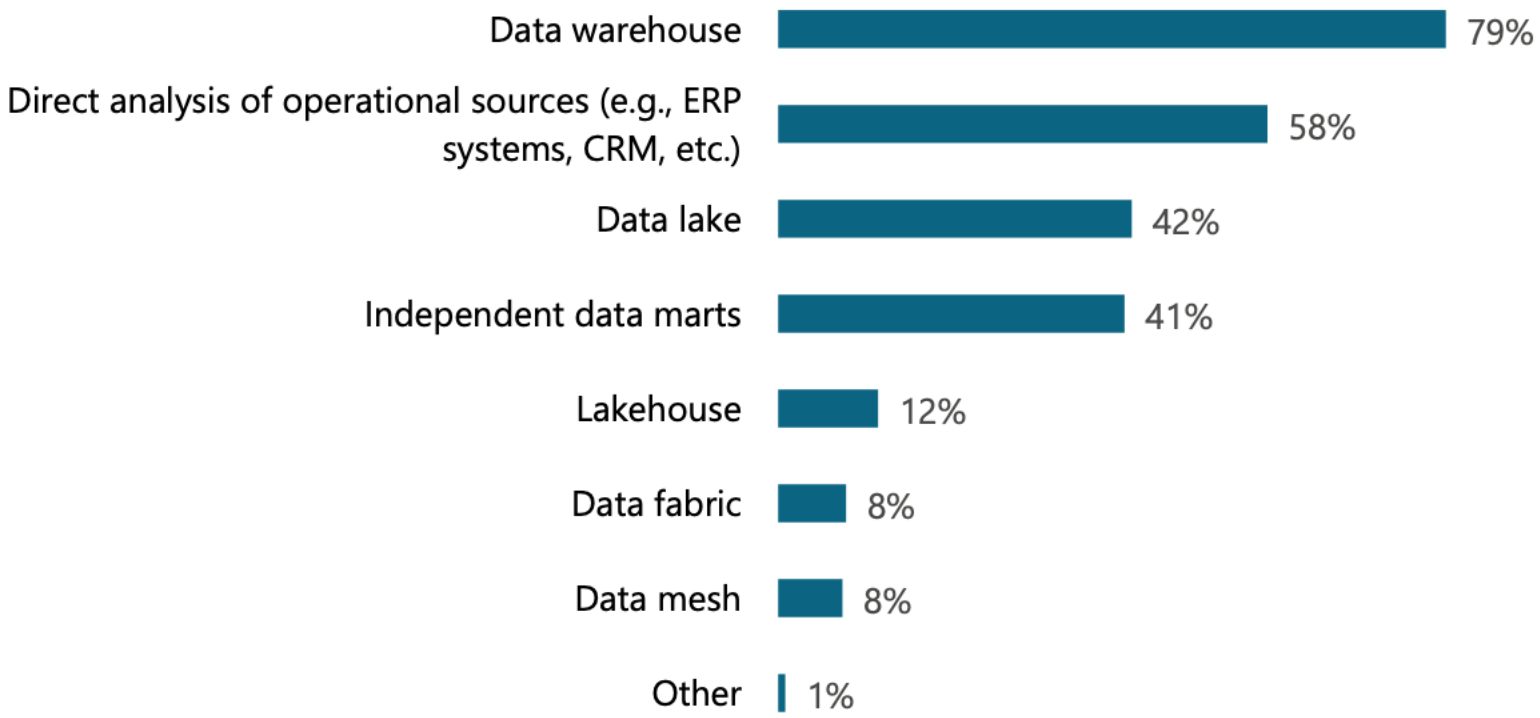
BI:Future



Source: Data, BI and Analytics Trend Monitor 2024. BARC Research Study

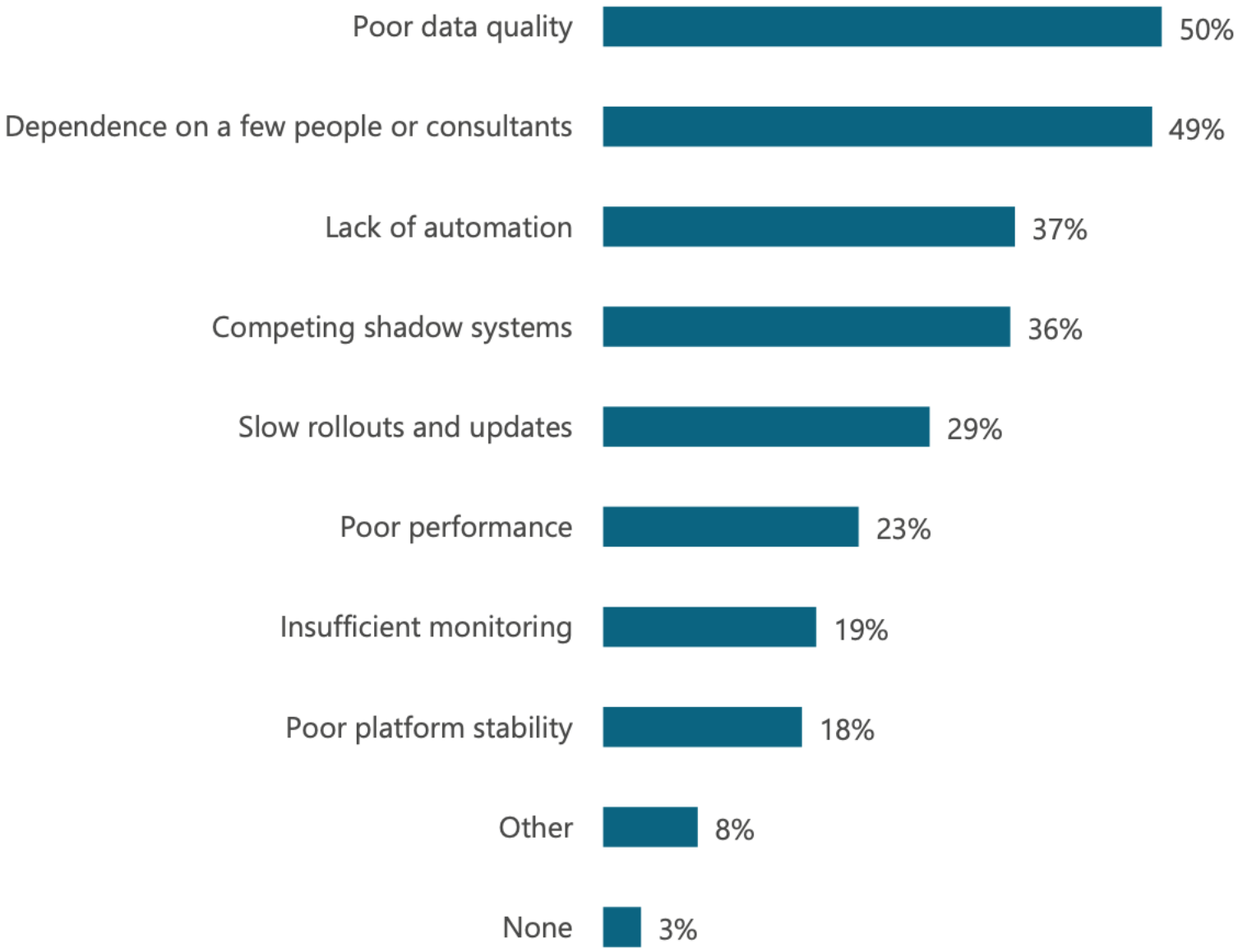
BI:Future

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



Source: Data Warehouse and data vault adoption trends. BARC Research Study

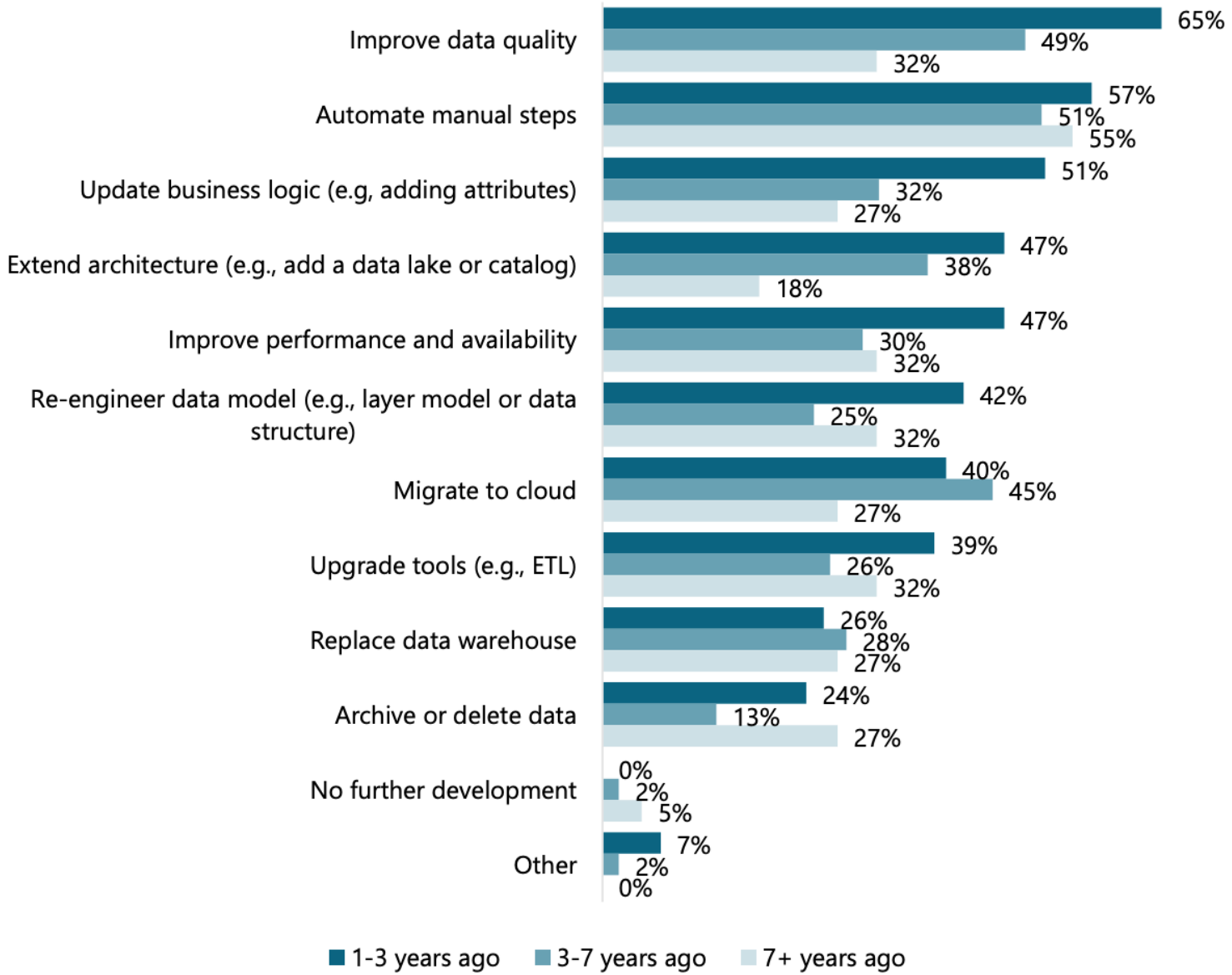
Figure 3. What are the biggest challenges in your current analytics environment? (n=238)



Source: Data Warehouse and data vault adoption trends. BARC Research Study

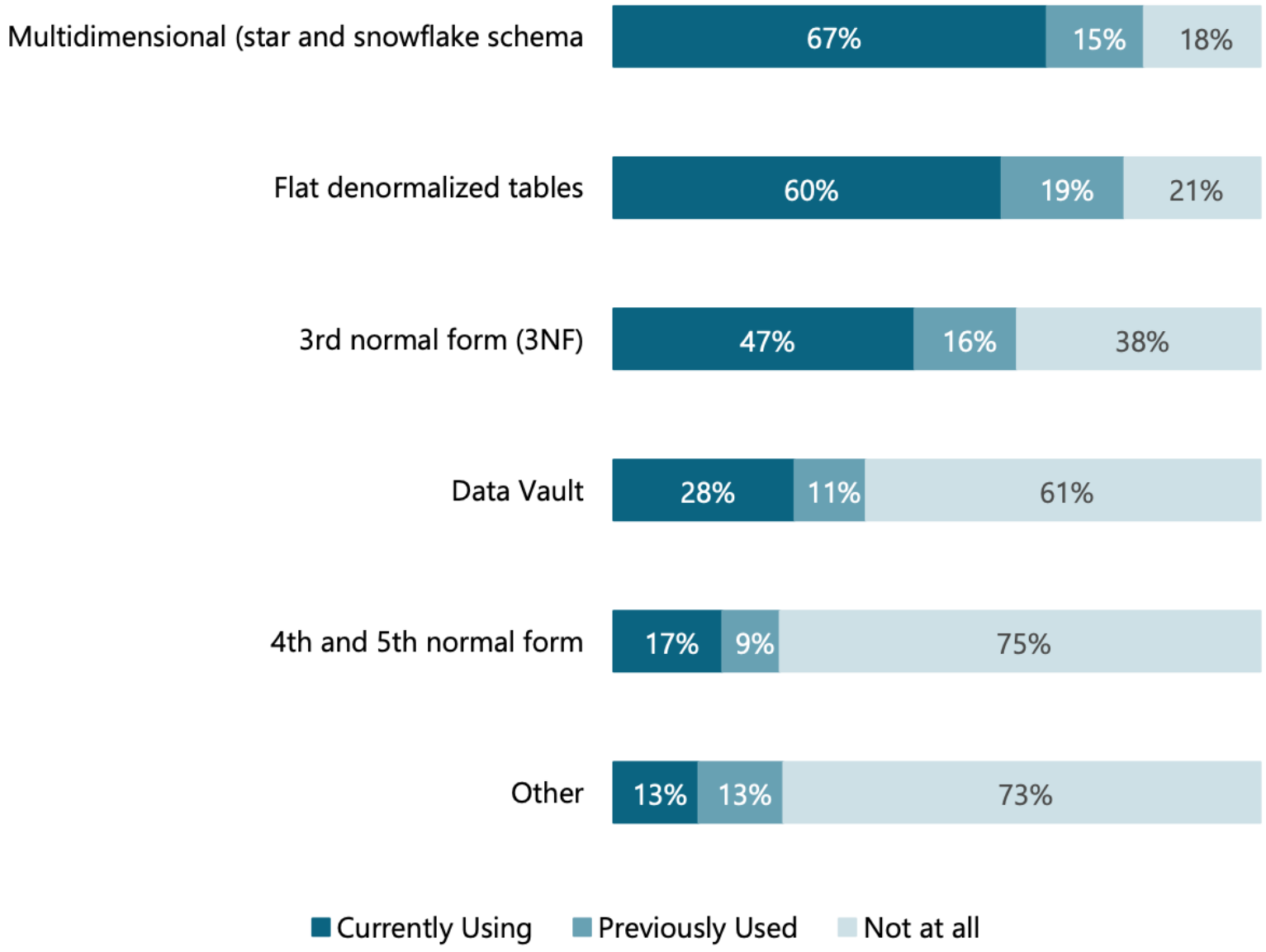
BI:Future

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



Source: Data Warehouse and data vault adoption trends. BARC Research Study

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



BI:Future

- 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

BI:Future

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.

BI:Future

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 ands analytics to solve business needs.

Edge Analytics:

Descentralized & near-sensor analysis (usually IoT devices)

BI:Future

Market

- $14,3 billion (2018), $27.11 billion (2022) , $29.42 bilion (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)

BI:Future

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