Create

Your step-by-step guide to successfully create an app with FileMaker
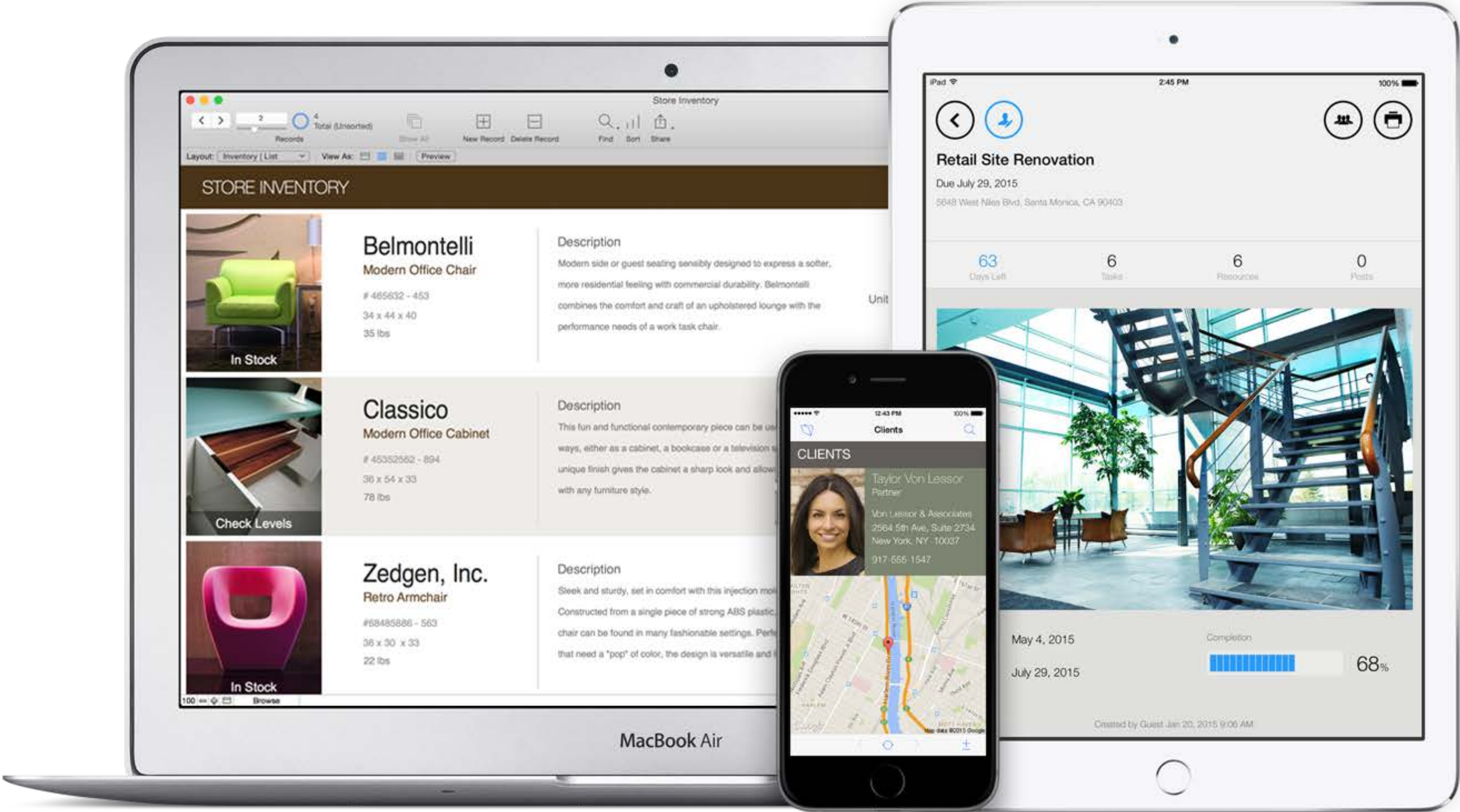
FileMaker®
An Apple Subsidiary

Bring it to life!

Now that you've completed the Plan guide and have learned to gather requirements, prototype your design, and get user feedback, you're ready to roll up your sleeves.

This guide walks you through the first steps of creating your custom app using the FileMaker Platform.

Build the perfect custom apps to connect your team to your business.

Start building your custom app using the FileMaker Platform!

This is the second part of a three-part guide which covers the steps for building a custom app using the FileMaker Platform.

Learn the essential components of FileMaker and then begin to make your idea a reality.

In this guide

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The steps to building a custom app

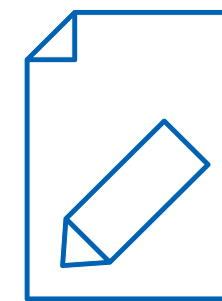Building a custom app starts with three principles.
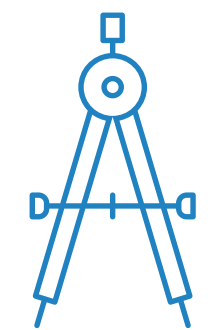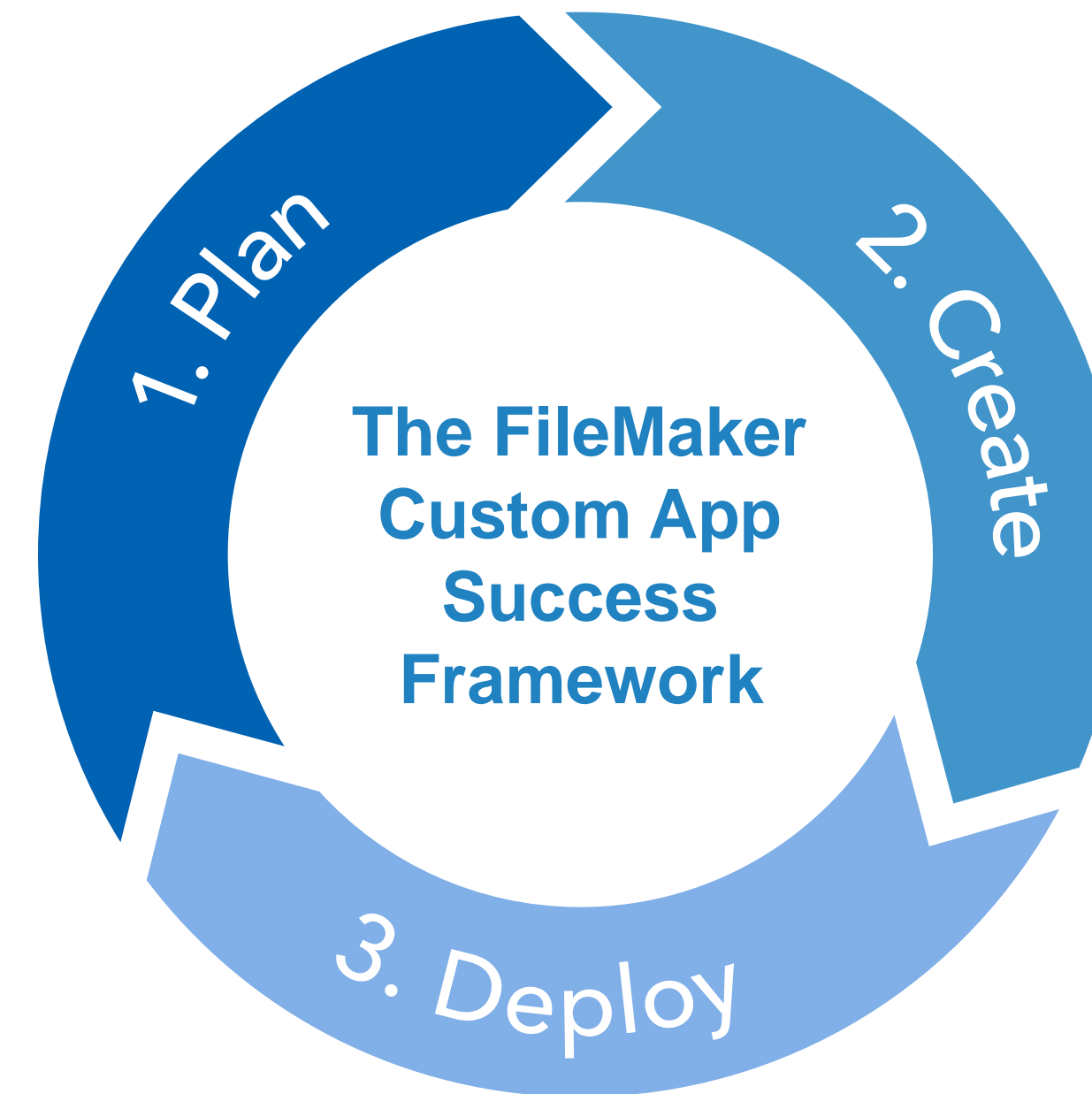
Plan

Create

Deploy

These principles, illustrated in three separate guides, lead you through the process of creating a custom app that transforms the way you do business.

Three principles help you build a custom app.

The FileMaker Custom App Success Framework

1. Plan
2. Create
3. Deploy

Explore what you can do with custom apps. Start with *Plan*.

Develop your custom app with *Create*, a step-by-step guide to working with the FileMaker Platform.
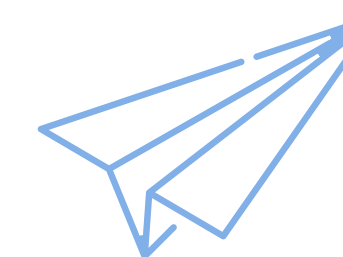
Put your custom app into action. Learn how to roll it out to users with *Deploy*.

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Assumptions

Make sure you have the most recent version of FileMaker Pro or FileMaker Pro Advanced on your desktop.

If you don't, consider:

Contact Sales: (800) 725-2747 or
Download a Free Trial: www.filemaker.com/trial

Note: this guide makes references to the user scenario of "Jennifer" outlined in the *Plan Guide*. Please refer to the Plan Guide for more details about this scenario.
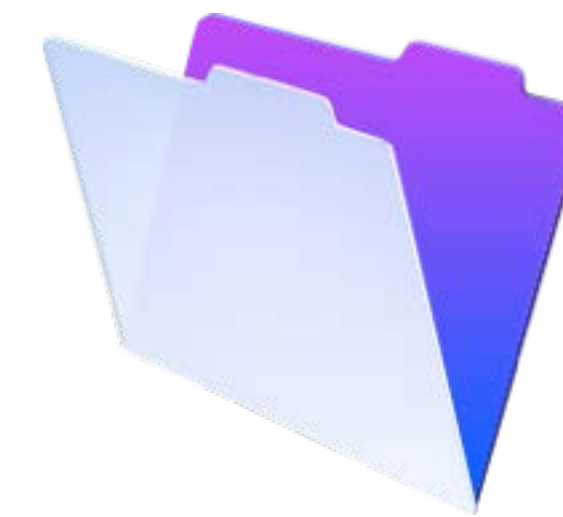
FileMaker Pro

FileMaker Pro Advanced
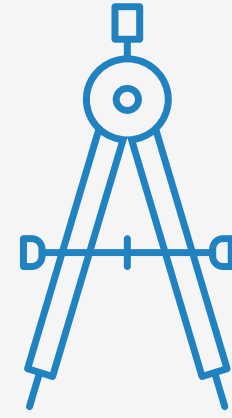
FileMaker Platform: A custom app platform

FileMaker is a rapid application development tool.

It has a drag-and-drop graphical user interface to make it easy to build apps.

It has a scripting language for automation.

It has at its core a database providing the structure to store and retrieve a variety of data.

Getting Started Tour
within FileMaker Pro

FileMaker
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Learn about databases

- The steps to building a custom app

- **Learn about databases**

- Design data model

- Design user interface

- Import data

- Integrate other data sources

- Create business logic and design workflow

- Set up security

- Test your app

- Appendix A

2. Create

FileMaker
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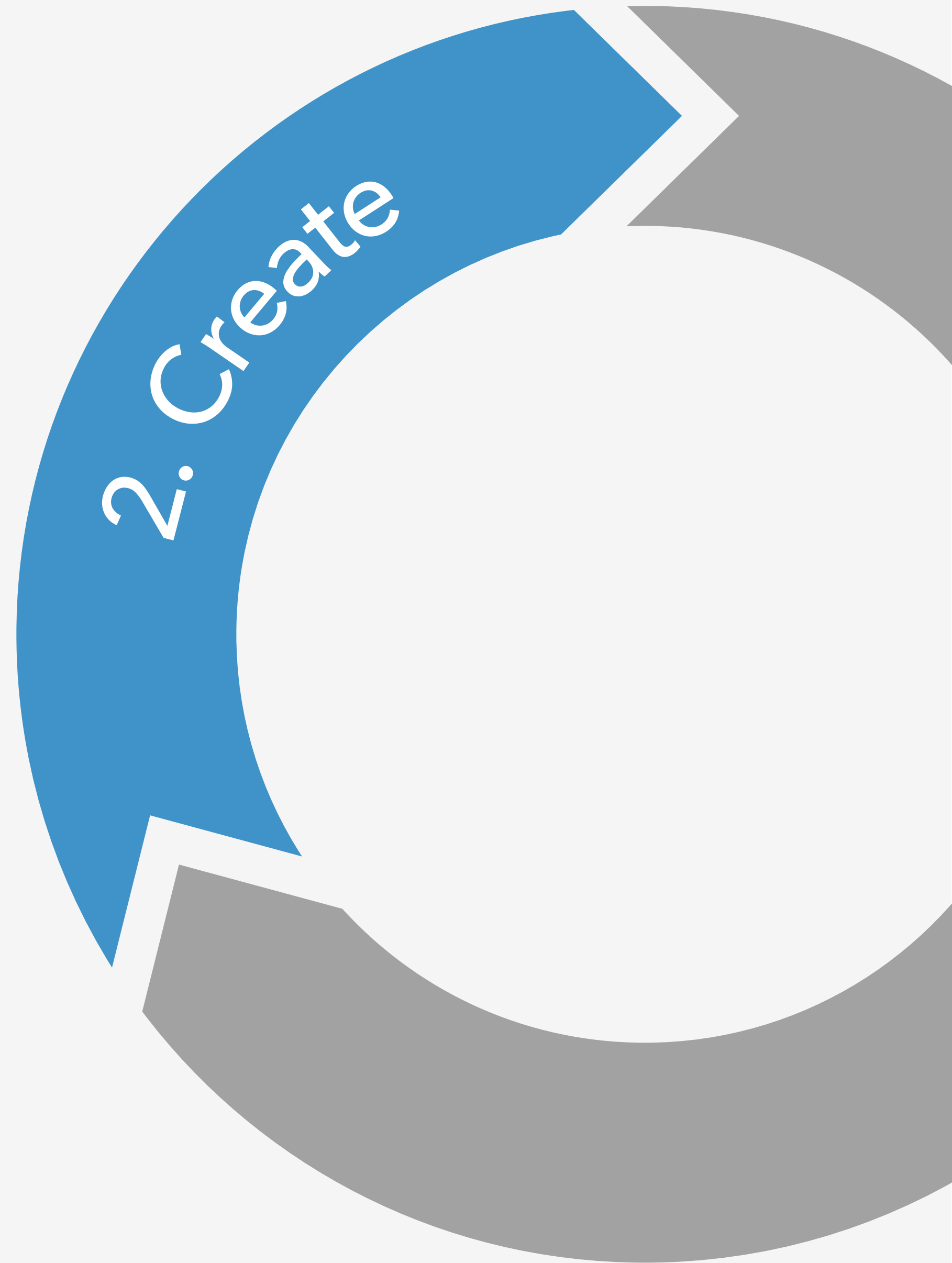
Foundations

**What does a relational database do for you?**
Relational databases are used to manage large amounts of information effortlessly.

Why does this matter to you?
With a single point of entry, you can create or retrieve data while keeping duplication at a minimum.

For example, consider a company with multiple contacts who share the same work address. One work address is shared for contact A, B, and C. If the address needs to change, it only needs to change once for all contacts.

People use relational databases to manage inventories, maintain a list of student grades, track people or assets, and much more.
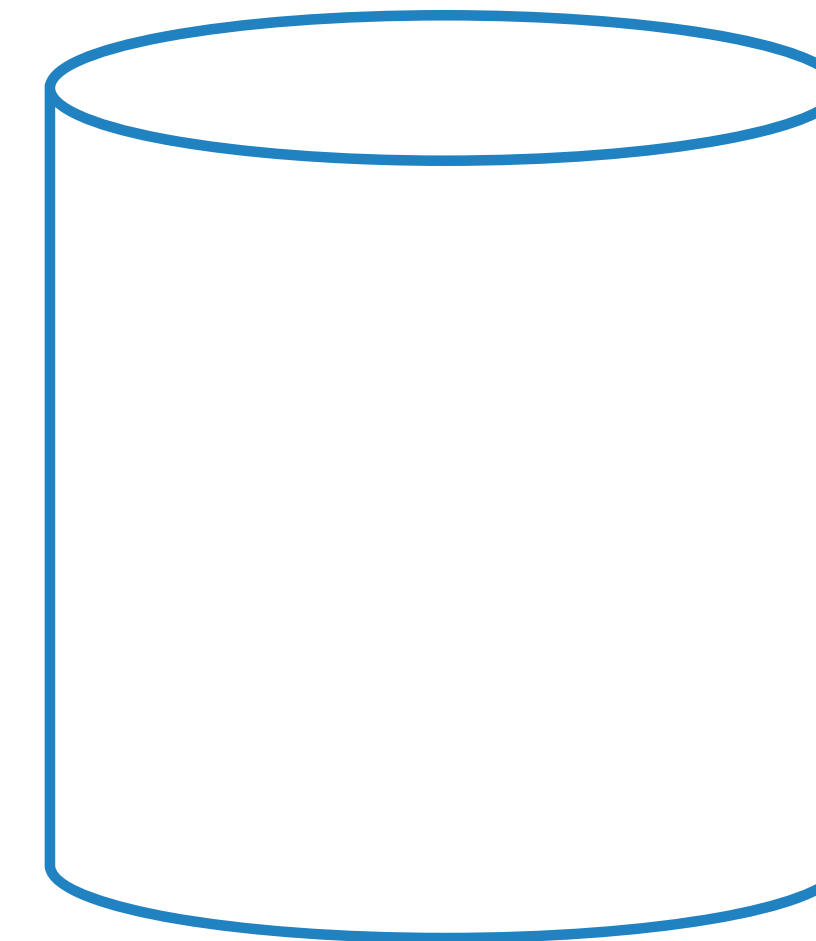
Database

Organizing your data

The first step in data modeling is looking at your data and figuring out how you're going to organize it. What are the groups of things that you're trying to describe? These are called entities.

Entities describe generic groups or classes of things that are distinct from one another.

You describe each entity using *attributes*, which provide specific and individual information about an entity.

Examples of entities

Entity
Employees

Attributes
company, department, name, address, etc.

Entity
Cars

Attributes
manufacturer, model, year, color, etc.

FileMaker Training Series:
Advanced Module 2

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Relational database structure: Tables, records, and fields

In database terminology, the entities are represented by tables. The individual items in the table are records, and the entities' characteristics or attributes are fields. Together, the tables, records and fields are part of what makes up the database schema.

As you create the schema for your app, the structure of your relational database is modeling the real-world problems you are trying to solve. Relational database tables work together to ensure that the correct data is available when you need it.

Here, we show Jennifer's customer table. The example shown is much like a spreadsheet. Each customer is a record (row), and each customer's attribute such as name, company, address, etc. is a field (column).

When entering data in a database, think about how to break up the data into its most basic components, so that you maximize your search capabilities. For example, when entering a person's name into a database, define the first name and last name as two different fields. Likewise, for a person's postal address, break it up into components such as street address, city, state, etc., as shown in the example.

Customer Table

Fields (Columns)

First	Last	Company	Street Adress	City
Dave	Jones	West Side Antiques	500 W. Main St.	Smalltown
Sue	Smith	Rankin Studios	7788 N. First St.	Metropolis
Tom	Chase	XYZ Global	45 Loma Linda St.	Sunnydale
⋮	⋮	⋮	⋮	⋮

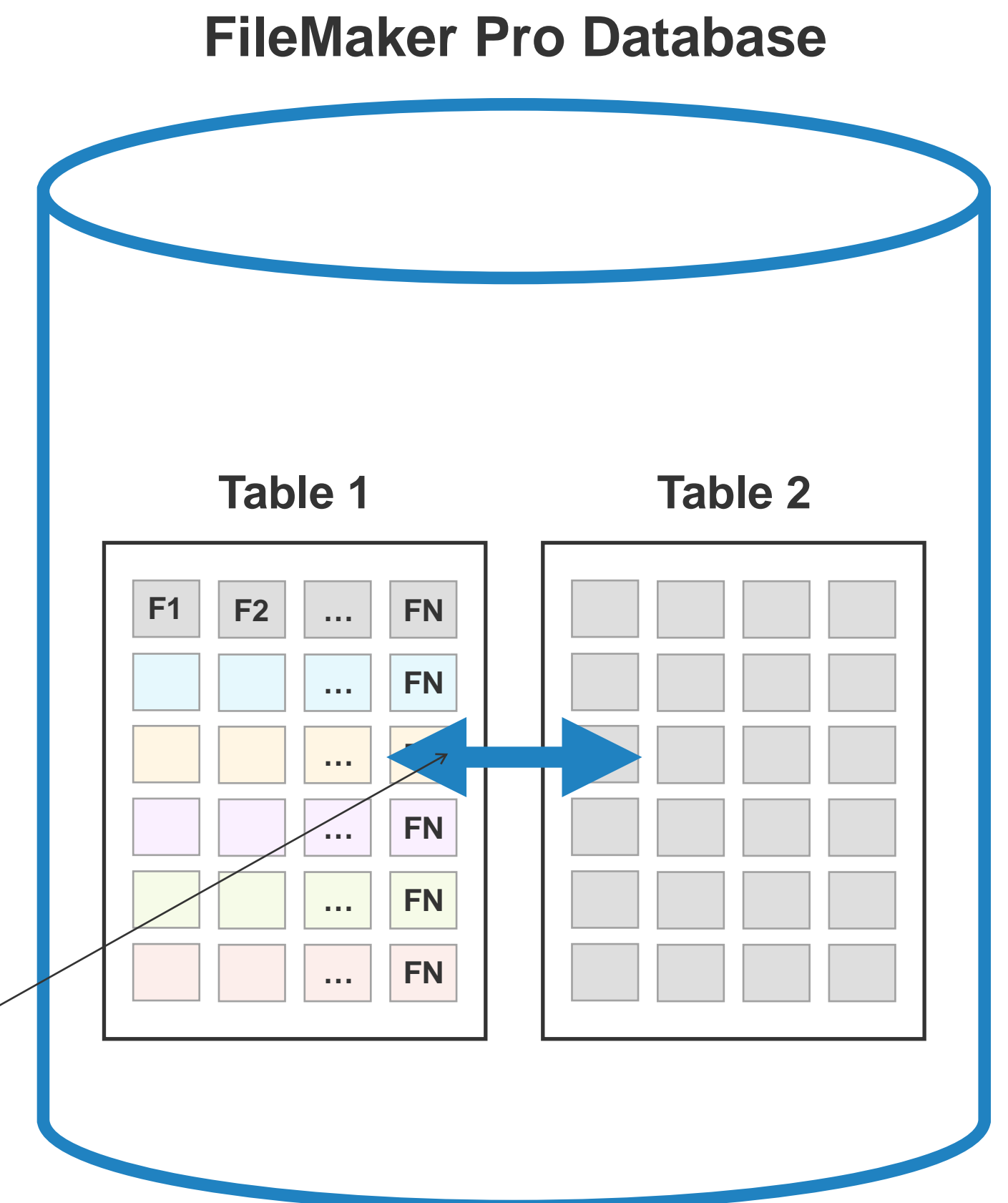Records (Rows)

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Relationships

Relationships connect data stored in different tables, so that when you are looking at a record in one table, you also have access to the connected data in another table. The connection is accomplished by matching information between the two tables. Here are some examples:

- A person and his/her insurance policies. A person can have many insurance policies, and each insurance policy belongs to only one person.

- A car and its oil changes. A car may have many oil changes over time, and an oil change is performed on one car.

- A department at a company and its employees. The department may have many employees, and each employee belongs to one department.

Next slide, we'll dig a little deeper into how these connections are made.

FileMaker Pro Database

Table 1   Table 2

| F1 | F2 | ... | FN |

Relationships connect tables

FileMaker Training Series:
Basics Lesson 8

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Relationships

When setting up a relationship, we match pairs of fields between the two tables in order to connect them. These fields are called "keys" because their values must match for the relationship to make a connection. The fields must be unique, for example an ID field that represents a unique record. In the example below, the

Car ID column in the car table is the primary key, while the Car ID column in the service table is the foreign key. By matching these two fields, each car in the car table is related to one or more service jobs in the service table, and each service job in the service table is related to only one car.

Primary Key
A primary key is a field whose values are guaranteed to be non-empty, unchanging, and unique for the first table in your relationship.

Foreign Key
A foreign key is a field in the second table. Its values are populated so that they match to values in the primary key. It's called "foreign" because its value originates in another table.

Car Table

Owner	Make	Model	Year	Car ID
Joseph	Toyota	Prius	2014	35672897
Mary	Ford	Explorer	2009	87390286
Dan	Honda	Accord	2005	54289318
:	:	:	:	:

Service Table

Car ID	Service Date	Type of Service	Technician ID	Hours Worked	Job ID
35672897	2/5/14	Oil Change	1	3	123
35672897	5/20/14	Tuneup	3	4	456
35672897	8/3/14	Brake Job	5	2	789
87390286	3/30/14	10K Service	1	3	257
87390286	9/17/14	Smog Check	2	4	942
87390286	4/23/15	Oil Change	4	2	715
54289318	6/18/14	Oil Change	2	4	142
54289318	1/8/15	Oil Change	3	5	736
:	:	:	:	:	:

About Relationships

Creating Relationships

Quick Start Training Guide

Types of Relationships

FileMaker Training Series: Basics Lesson 8

FileMaker
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Relationships

Now let's look at our example with Jennifer. It has a similar structure to the preceding examples:

- Each customer may have many assets

- Each asset is associated with only one customer

Defining relationships between tables sets up a powerful foundation for future logic and reporting. When you create tables and create relationships between them, you apply data modeling concepts. Review your User Scenarios and Requirements documents to think about the relationships you will need to create. How is your data connected?
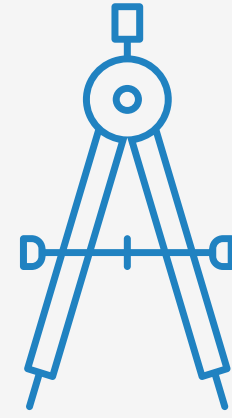
Customer Table

First	Last	Company	Street	Customer ID
Dave	Jones	West Side Antiques	500 W. Main St.	103
Sue	Smith	Rankin Studios	7788 N. First St.	110
Tom	Chase	XYZ Global	45 Loma Linda St.	109
John	White	Iris Designs	392 Oak St.	102
⋮	⋮	⋮	⋮	⋮

Asset Table

Customer ID	Category	Item	Serial Number	Cost
103	Telephone	VOIP	779182737S	75
103	Computers	15"	BN299765G	1000
110	Appliances	Espresso	2267155789A	100
110	Office	Desk	5582939281G	50
110	Cameras	Digital	1X2U9H28JS	300
110	Computers	Desktop	ZA9982938829	1200
109	Office	Desk	5575372783E	50
109	Computers	Desktop	ZA9962536488	1200
⋮	⋮	⋮	⋮	⋮

About Relationships   Creating Relationships   Types of Relationships

FileMaker. An Apple Subsidiary
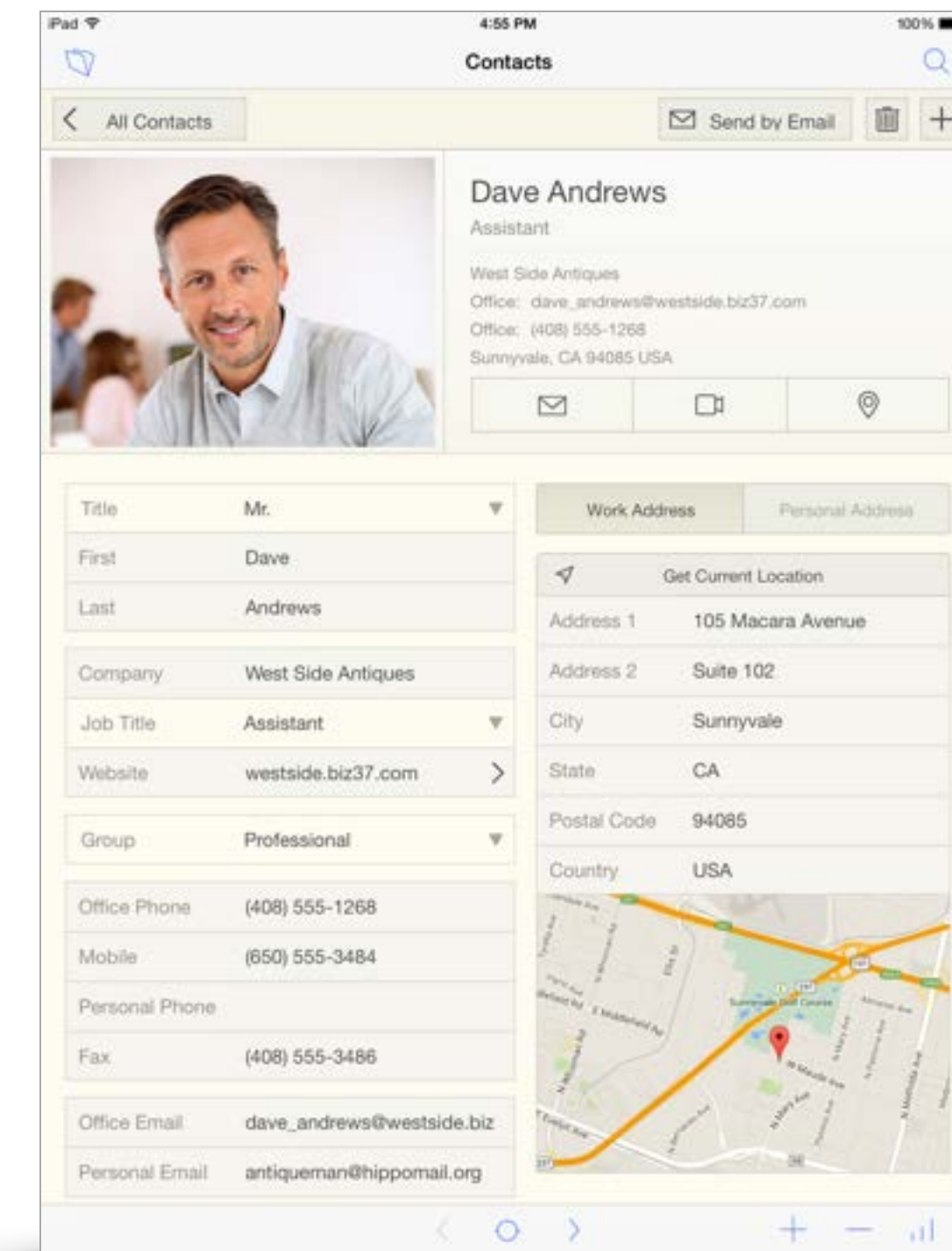
Design data model

- The steps to building a custom app

- Learn about databases

- **Design data model**

- Design user interface

- Import data

- Integrate other data sources

- Create business logic and design workflow

- Set up security

- Test your app

- Appendix A

2. Create

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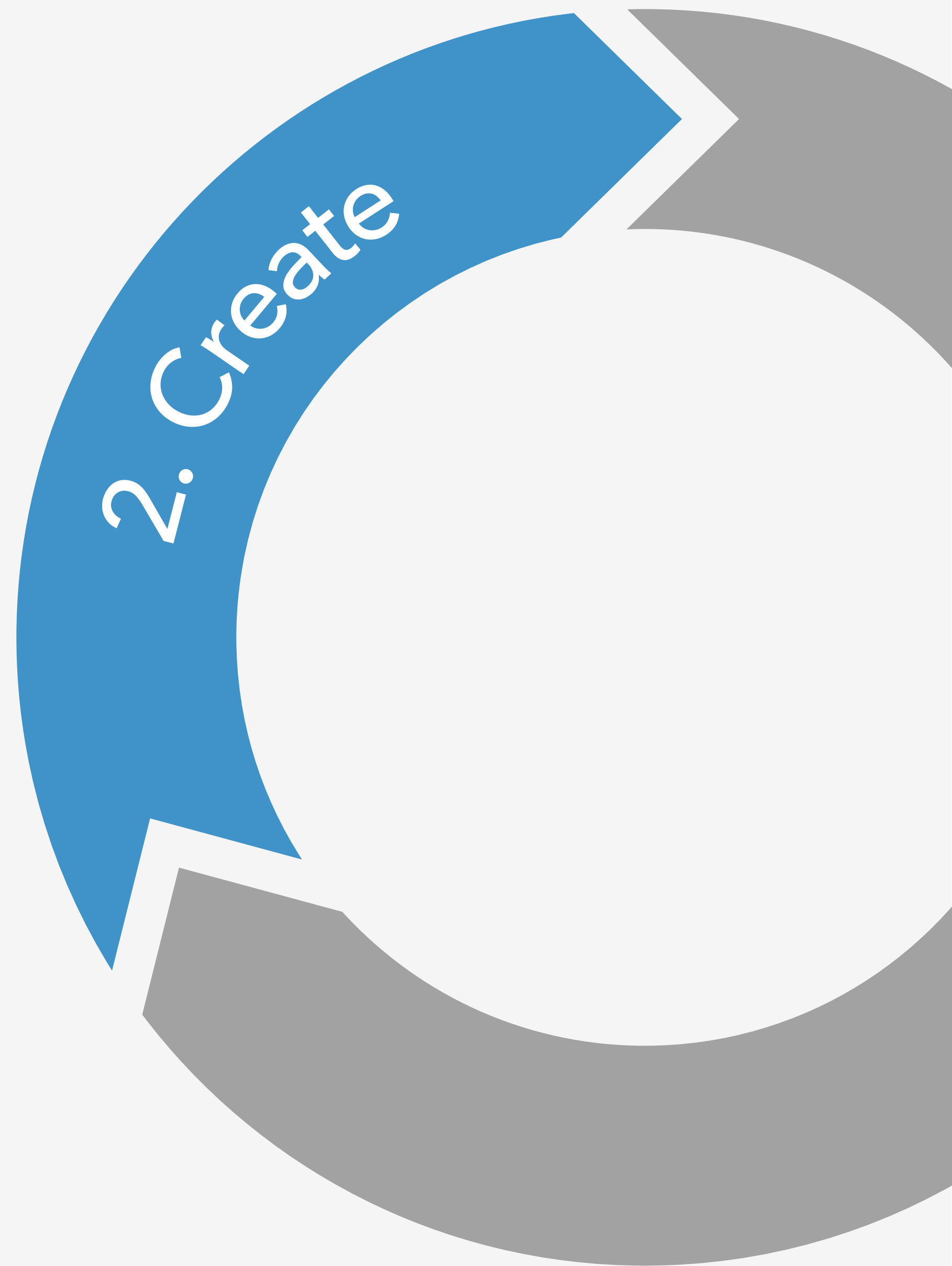
Layouts

Layouts are the building blocks of the user interface, allowing the user to view and interact with the data. The data may be displayed as a form, where only one record shown at a time, or as a list or table, where multiple records are shown at once. In the illustration below, the data is being displayed as a form. As the user moves from record to record, the data displayed on the form changes.

FileMaker Pro Database

Records

Imported or
entered data
will fill tables
for use
in layouts.

Table

Records
in a table

Each form
layout displays
some of the
fields for each
record.

F1	F2	...	FN
		...	FN
		...	FN
		...	FN
		...	FN
		...	FN

Adding and
Viewing Data

Entering Data
in Records

FileMaker Training Series:
Basics Lessons 3 and 9

FileMaker Training Series:
Advanced Module 3

FileMaker
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Layouts

Layouts can be viewed in three different ways. Table View displays one or more records at a time, similar to a spreadsheet. List View displays one or more records as a list. It provides more formatting options than Table View. Form View displays one record at a time and provides the same formatting options as List View.

Layout views from Jennifer's customer table

Table View

First	Last	Company	Street	…
Dave	Jones	West Side Antiques	500 W. Main St.	…
Sue	Smith	Rankin Studios	7788 N. First St.	…
Tom	Chase	XYZ Global	45 Loma Linda St.	…
…	…	…	…	…
John	White	Iris Designs	392 Oak St.	…

Displays one or more records at a time in a spreadsheet like view.

List View

Dave	Jones	West Side Antiques	500 W. Main St.	…
Sue	Smith	Rankin Studios	7788 N. First St.	…
Tom	Chase	XYZ Global	45 Loma Linda St.	…
…	…	…	…	…
John	White	Iris Designs	392 Oak St.	…
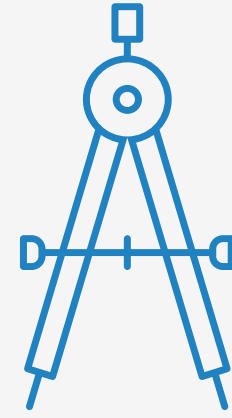
Displays one or more records as a list.

Form View
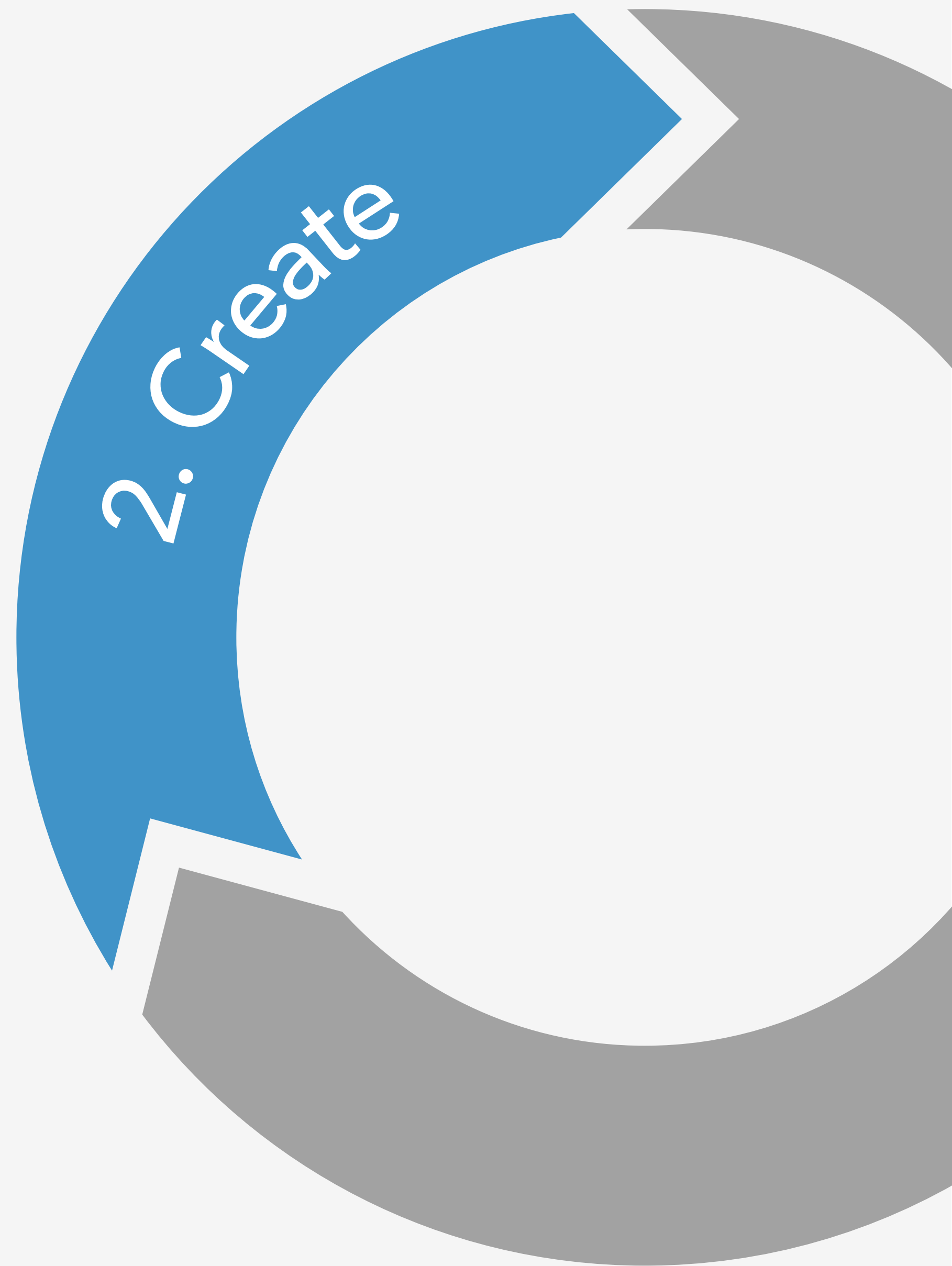
Dave Jones 500 W. Main St. Paso Robles, CA Owner West Side Antiques	800-555-1268

Displays one record at a time.

FileMaker Training Series: Basics Lessons 3 and 9

FileMaker Training Series: Advanced Module 3

FileMaker. An Apple Subsidiary

Design user interface

- The steps to building a custom app

- Learn about databases

- Design data model

- **Design user interface**

- Import data

- Integrate other data sources

- Create business logic and design workflow

- Set up security

- Test your app

- Appendix A

2. Create

FileMaker.
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Design user interface

Designing a user interface is an iterative process. You'll start by thinking about the users and the activities they are trying to accomplish. Are they performing data entry? Looking up information? Taking action based on specific data?

The user requirements gathered in the 'Plan' step of this framework will help you decide how the user interface needs to look, and what the business rules are to connect your data.

Getting Started Tour
within FileMaker Pro

Quickly Create
FileMaker Solutions

Quick Start
Training Guide

FileMaker Training Series:
Basic Lessons 9 and 13

FileMaker An Apple Subsidiary

Layout Assistance

When you create a layout, FileMaker helps you choose a layout template appropriate for the device where the layout will be viewed. There are templates for computers (desktops and laptops), iOS devices, and printers. Most Starter Solutions include layouts for mobile devices as well.

FileMaker Training Series:
Advanced Module 3

FileMaker
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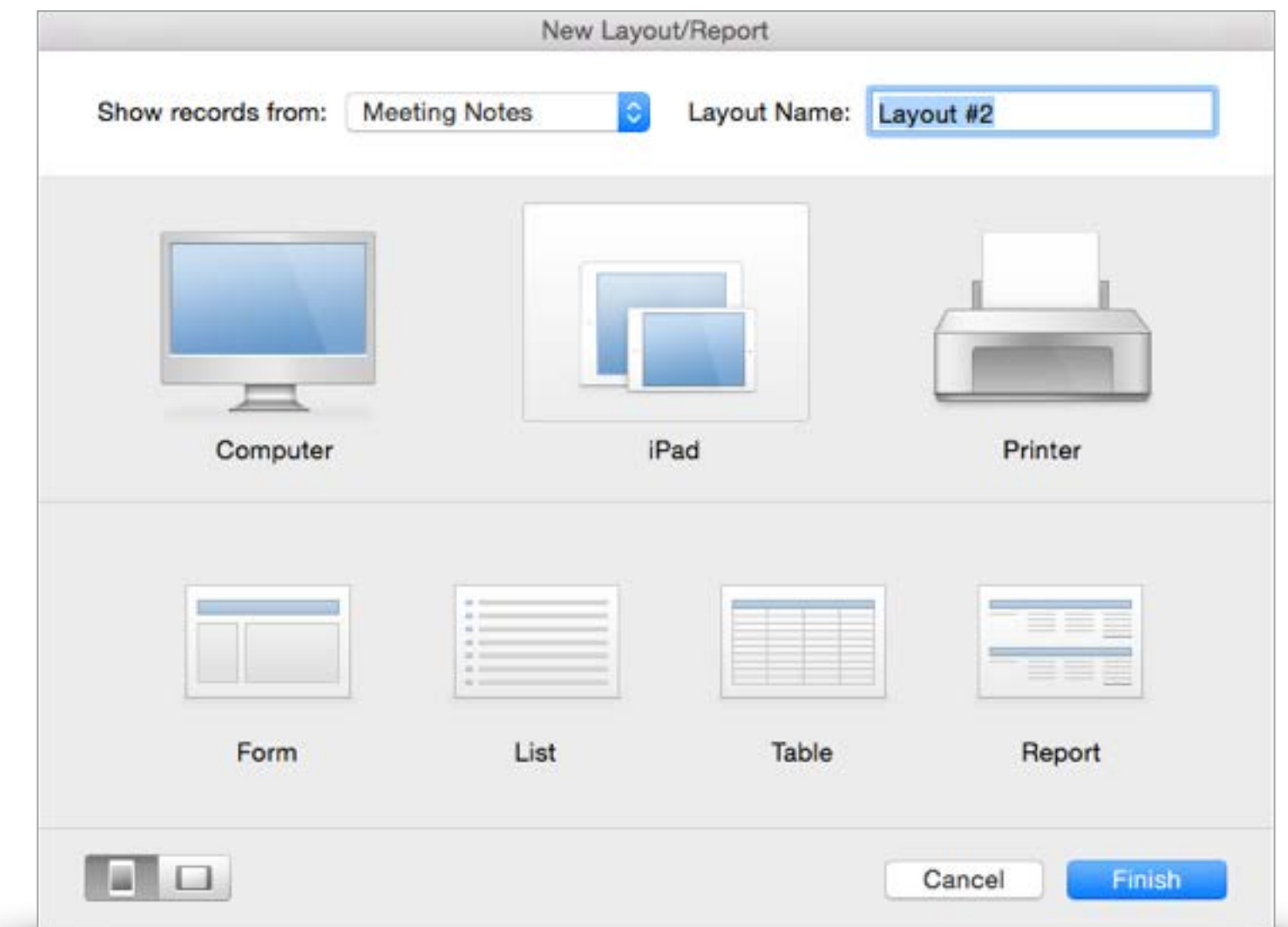
Themes

Another great feature FileMaker offers is the ability to choose themes for your layouts. Themes help create a visually attractive user interface by providing consistent styles for buttons, fields, background and other objects on a layout. They apply pre-defined fonts, sizes, colors, and other styling to your layout to give the user interface a professional and attractive look and feel.

FileMaker Training Series:
Advanced Module 3
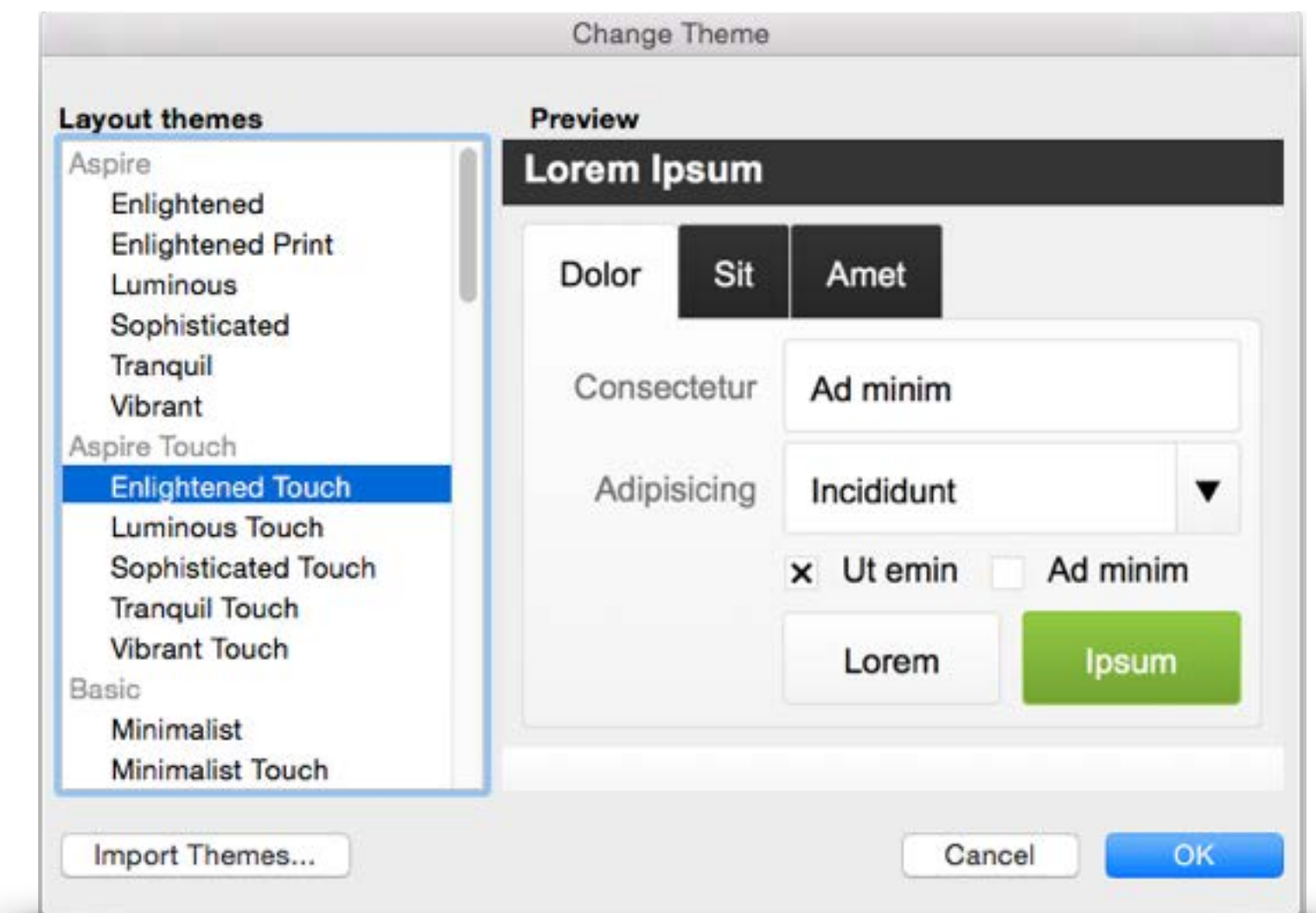
Reports

You may want to see data in other formats such as a dashboard or a report. See Appendix A for more layout details.

Dashboard
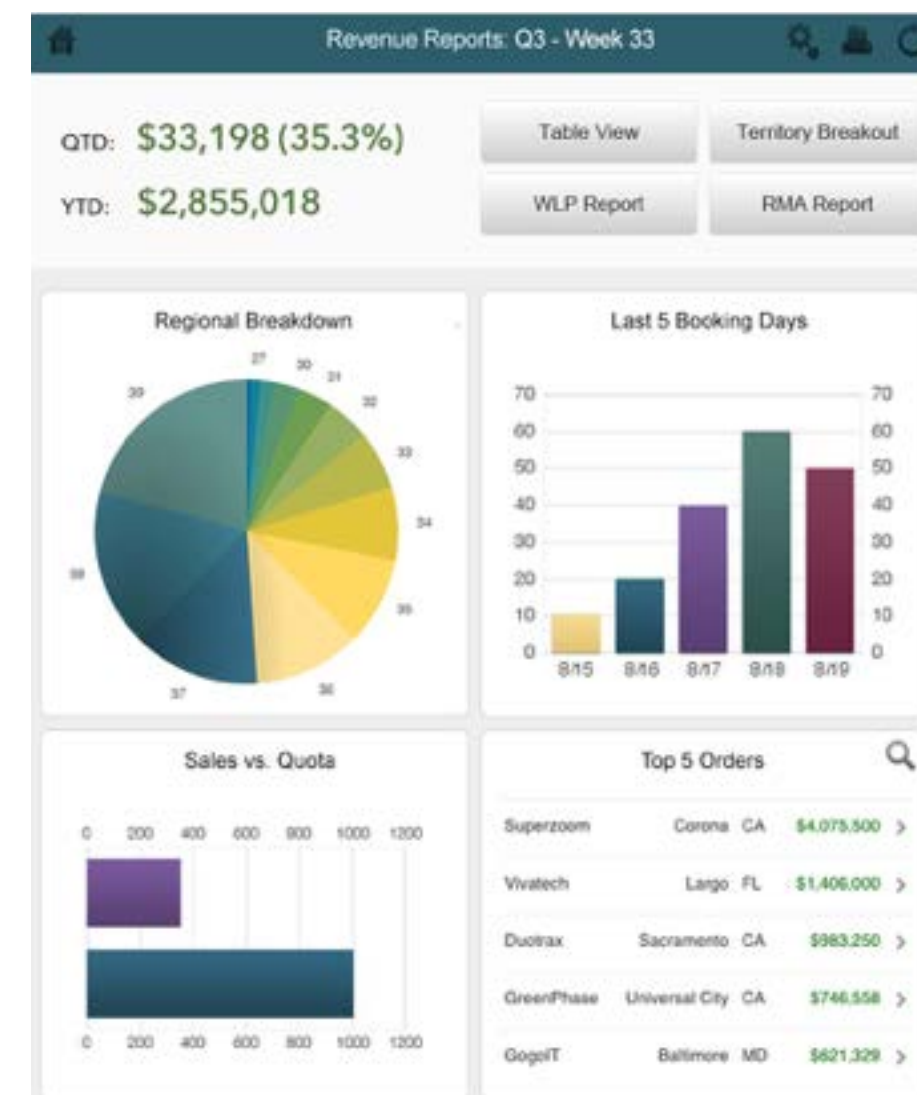
Dashboards use the charting tool and global fields to summarize the data.

Report

Reports display data in categories, use summary fields and present data at different levels of a hierarchy.

Import data

- The steps to building a custom app

- Learn about databases

- Design data model

- Design user interface

- **Import data**

- Integrate other data sources

- Create business logic and design workflow
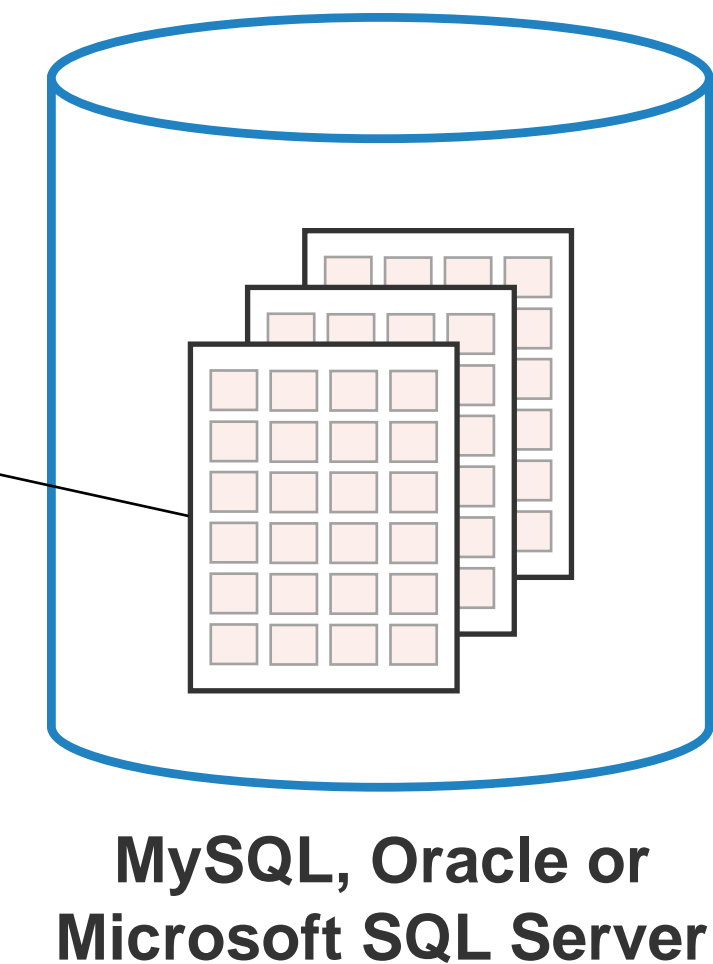
- Set up security

- Test your app

- Appendix A

2. Create

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Choose a way to start

There are three ways to get started:

FileMaker Pro or Pro Advanced
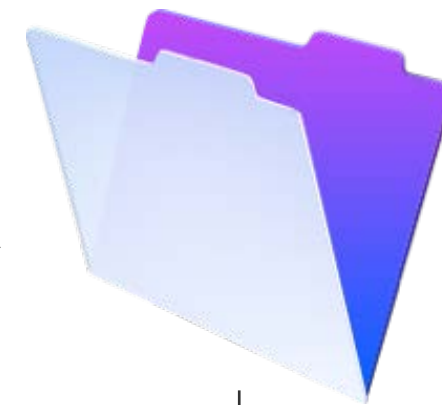
Use an example

FileMaker Pro provides
Starter Solutions.

Import your data
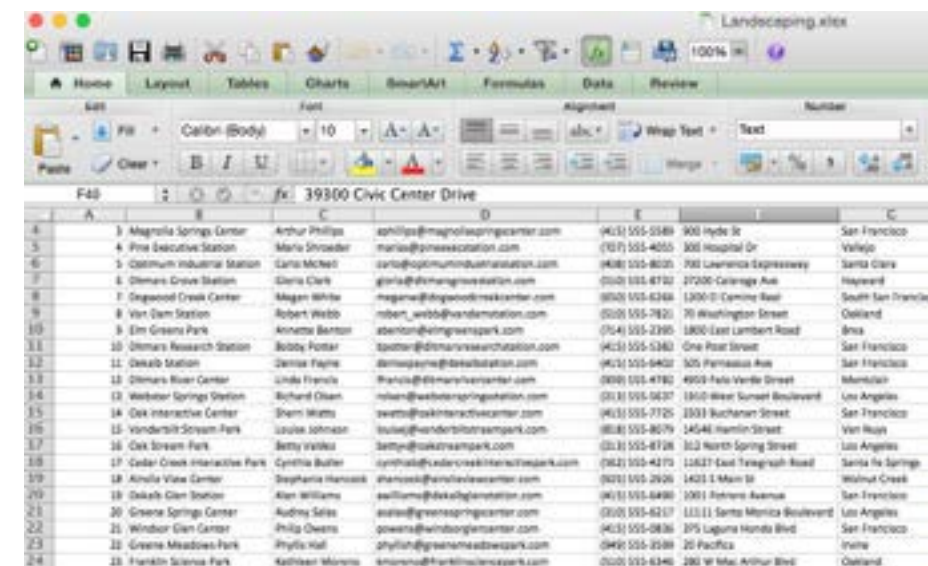
Importing is as easy as
drag and drop.

Start from scratch
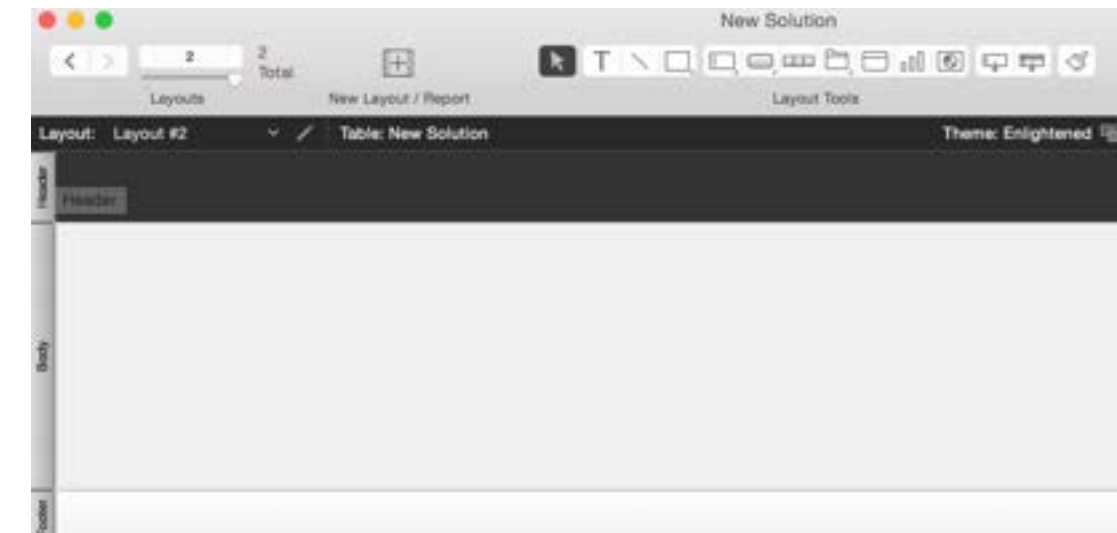
If you know how your interface
needs to look, start here.

Creating a FileMaker
File from a Starter Solution

Importing Data into a
New FileMaker File

Creating a
FileMaker File

Starter Solutions

Start from a FileMaker Starter Solution available in the File Menu.

- Projects
- Event Management
- Contacts
- Assets
- Content Management
- Invoices
- Inventory
- Tasks

- Estimates
- Resource Scheduling
- Meetings
- Expense Reports
- Product Catalog
- Personnel Records
- Time Billings
- Research Notes

Creating a FileMaker
File from a Starter Solution

FileMaker
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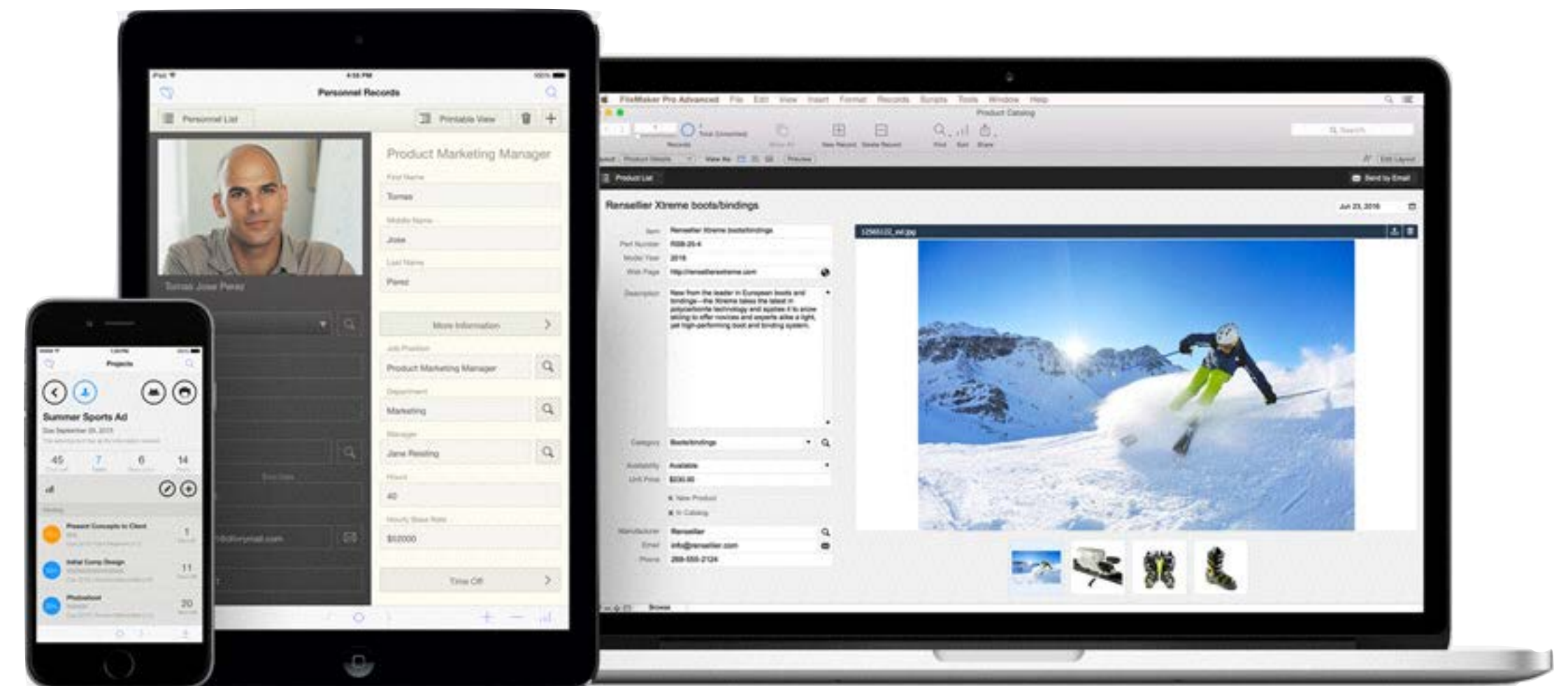
Import data

When you import data, you are bringing data from another source (usually a file) into a FileMaker file. You can import data from:

- Another FileMaker file

- A Microsoft Excel file, or another supported file type

- An external source like ODBC or MySQL
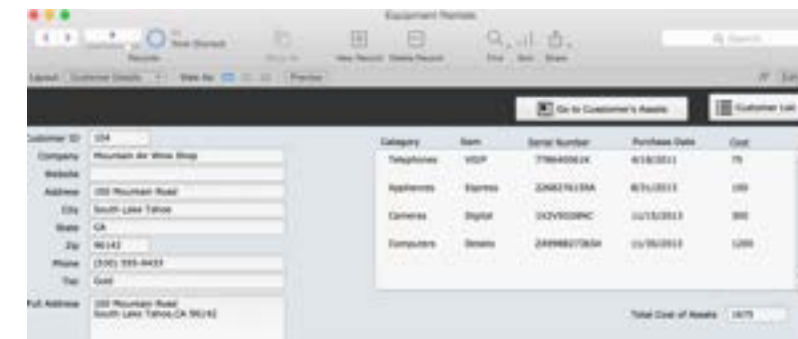
Another FileMaker file
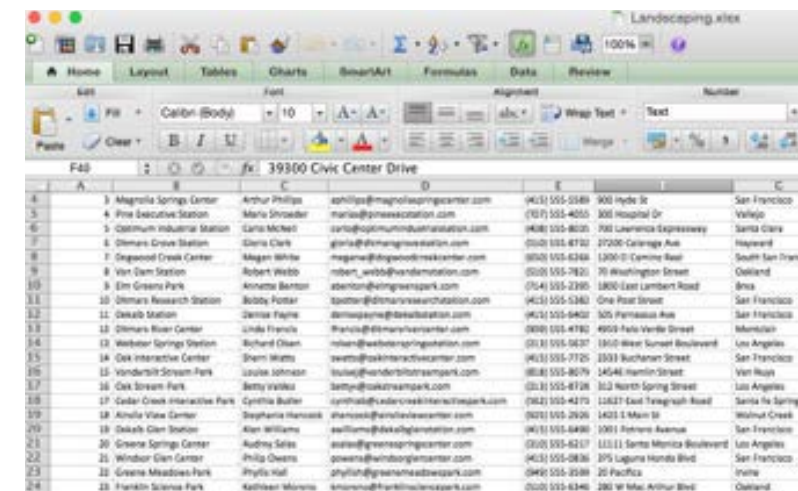
Microsoft Excel file

Database

External Source

FileMaker Pro file

Importing Data into a New FileMaker File
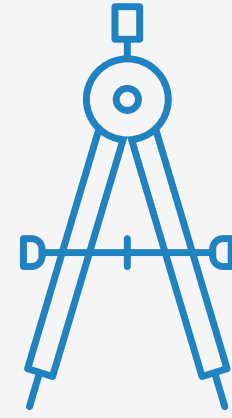
FileMaker Training Series: Basics Lesson 6

Quick Start Training Guide

Integrate other data sources

- The steps to building a custom app

- Learn about databases

- Design data model

- Design user interface

- Import data

- **Integrate other data sources**

- Create business logic and design workflow

- Set up security

- Test your app

- Appendix A

2. Create

FileMaker
An Apple Subsidiary
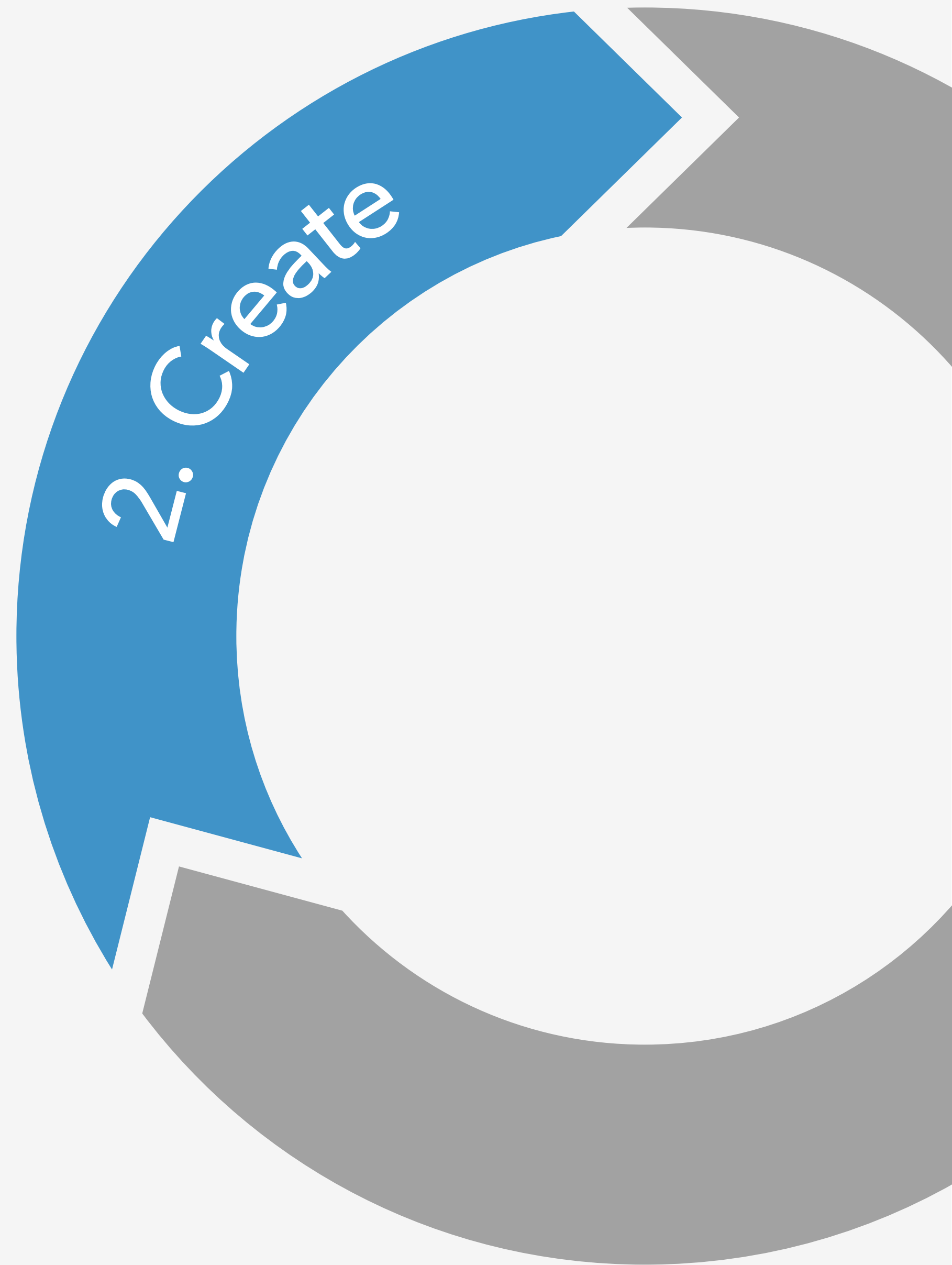
External Data Sources

Scheduled integration

You can use FileMaker software's automation tools to schedule your data integration so that data is brought into your FileMaker app in batches at designated days and times.
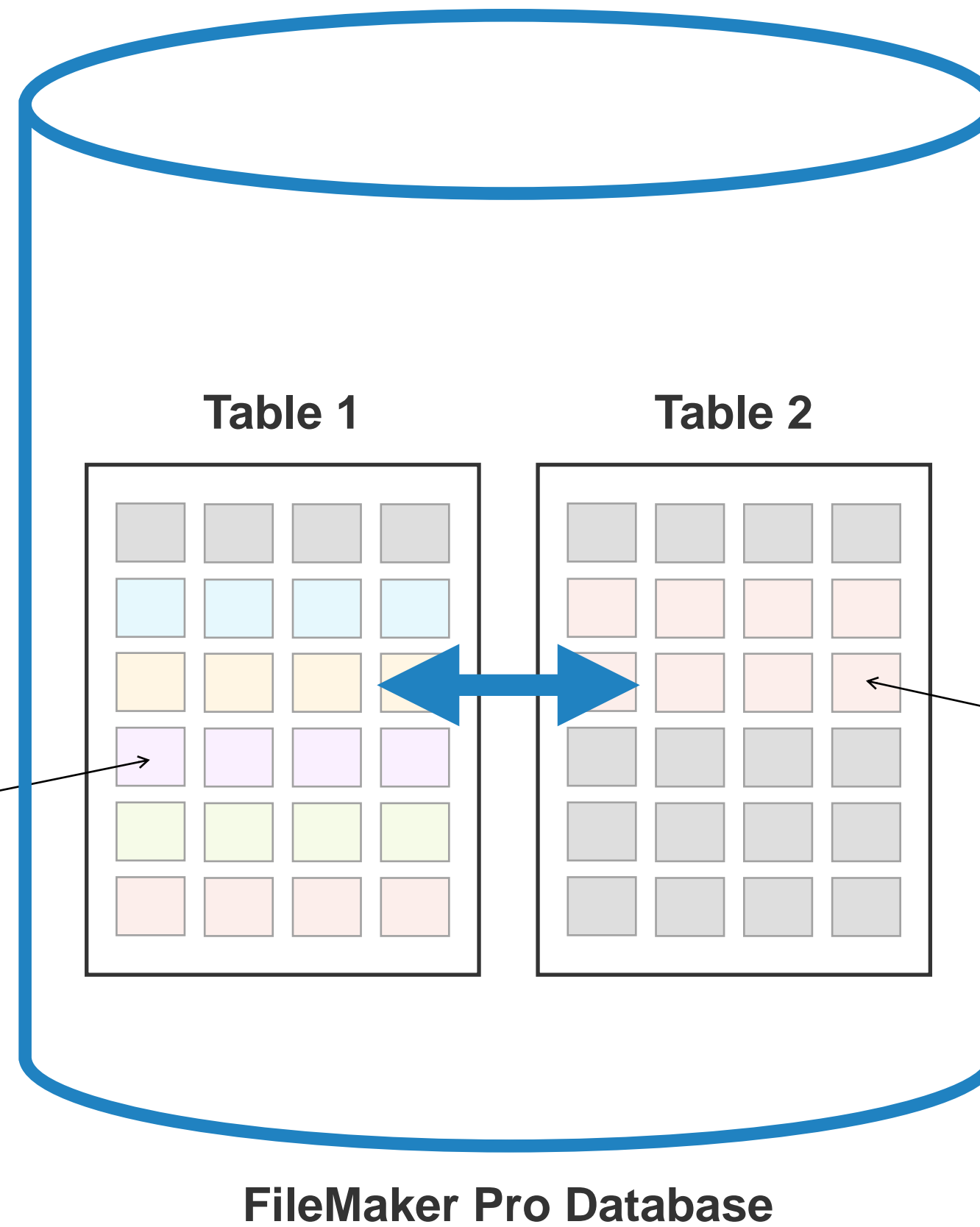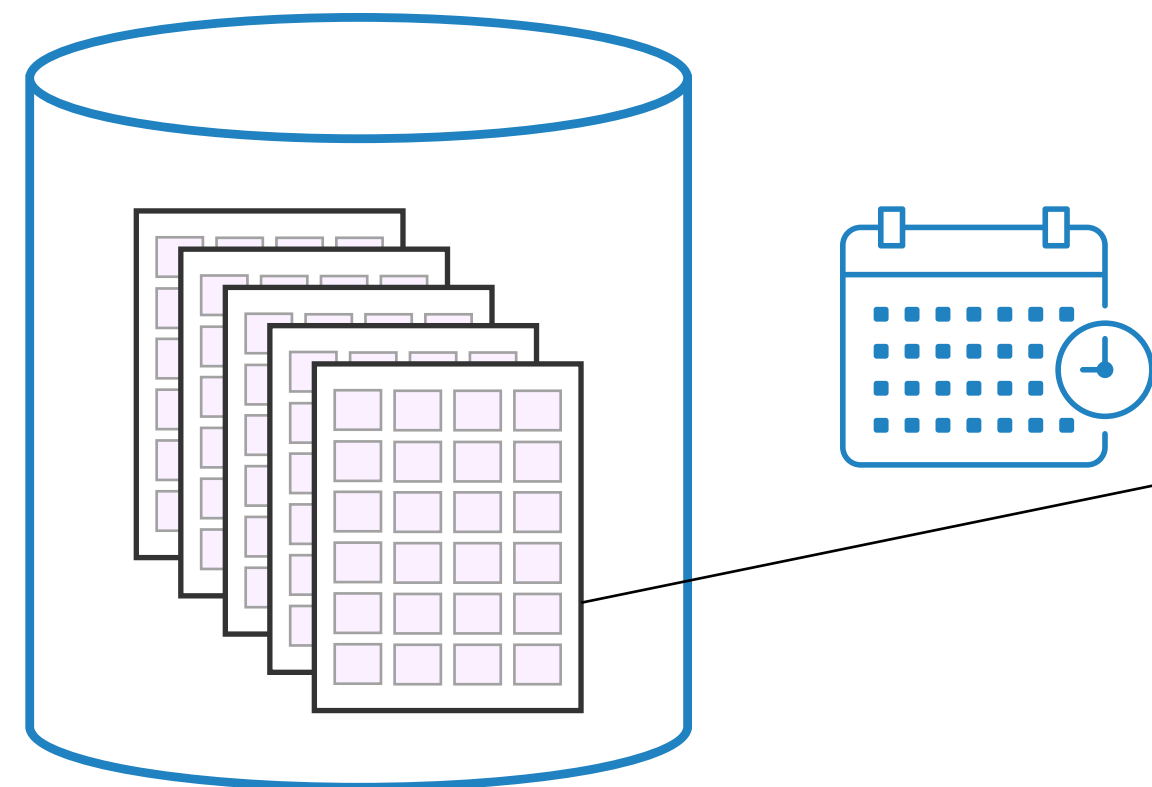
Real-time integration

You can integrate with external data in real-time by maintaining an ongoing connection to an external source. This powerful feature allows you to interact with data stored in other systems just as if it were part of your FileMaker app.

Table 1   **Table 2**

FileMaker Pro Database

MySQL, Oracle or Microsoft SQL Server

Introduction to External SQL Sources

Accessing External Data SQL Sources

FileMaker Training Series: Basics Lesson 17

FileMaker Training Series: Advanced Module 9

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External Data Sources

In our example, Jennifer needs to track customer contact information located in an external database in the corporate office. Using FileMaker software's real-time data feed capabilities, an app can be designed to access this external data just as if it were located in a FileMaker Pro table.

Customer Table
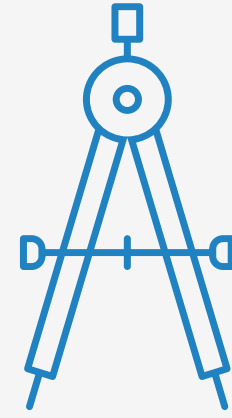
FileMaker Pro populates the layout.

External Database

FileMaker Pro Database

Customer Layout (Form View)

Introduction to External SQL Sources

Accessing External Data SQL Sources

ODBC/JDBC Integration Overview

FileMaker
An Apple Subsidiary

Create business logic and design workflow

- The steps to building a custom app

- Learn about databases

- Design data model

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- Integrate other data sources

- **Create business logic and design workflow**

- Set up security

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- Appendix A

2. Create

FileMaker.
An Apple Subsidiary
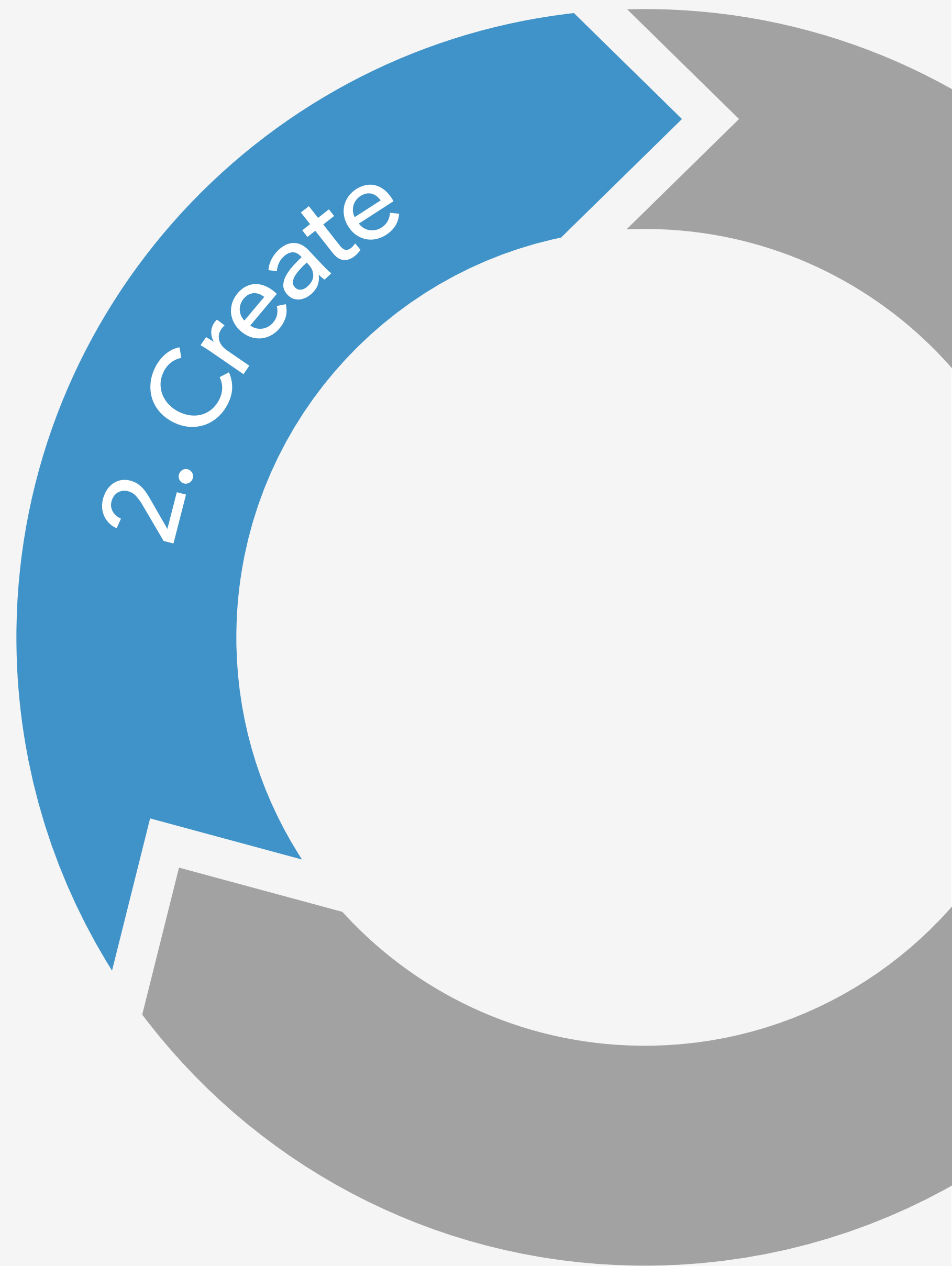
What is business logic?

Business logic is the programming that manages the communication between an end user interface and a database. The main components of business logic are business rules and workflows.

- A business rule describes a specific procedure

- A workflow consists of the tasks, procedural steps, required input and output information, and tools needed for each step of that procedure

Business automation

When building your custom app, it's likely that you'll need to automate some aspect of your workflow. FileMaker provides an intuitive scripting language to help with this. This language is easy to read and write, while also providing considerable power and allowing you to model complex scenarios.

In addition to the scripting language, FileMaker includes calculation formulas, functions, and other useful tools for streamlining processes.

Scripting: An important aspect of app logic

Scripting allows you to automate processes, from simple navigation tasks to complex reporting and workflows. Automation is accomplished by creating and using scripts. A script consists of a series of instructions. Scripts can be invoked by performing an action in the app. For example:

- Selecting an item on a menu

- Clicking a button on a layout

- Entering a layout

- Navigating between records

- Opening a file

FileMaker Training Series:
Basics Lesson 15

FileMaker Training Series:
Advanced Module 5

Script Workspace

The Script Workspace in FileMaker is where you create, edit, view, and organize your scripts.

Highlighted below is a one step script that changes the screen, causing the customer list layout to be displayed.

Script Workspace

Left bar shows a list of current scripts
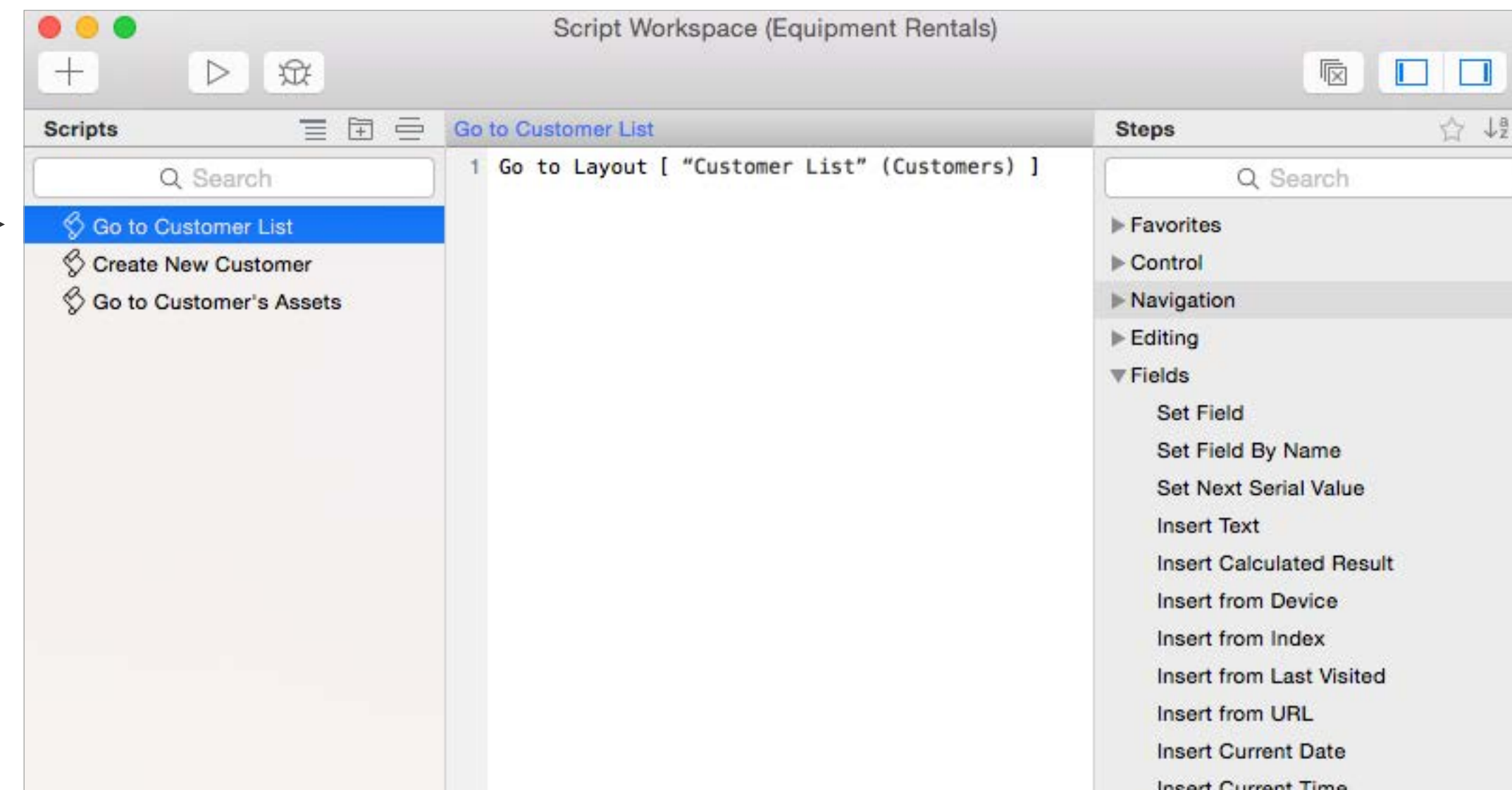
Editing tool bar

Right side shows a list of script steps that you can use to build a script

FileMaker Training Series:
Basics Lesson 8

FileMaker
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Automating a task

Jennifer needs to enter information on new customers. Here is an example of how a script can meet her needs:
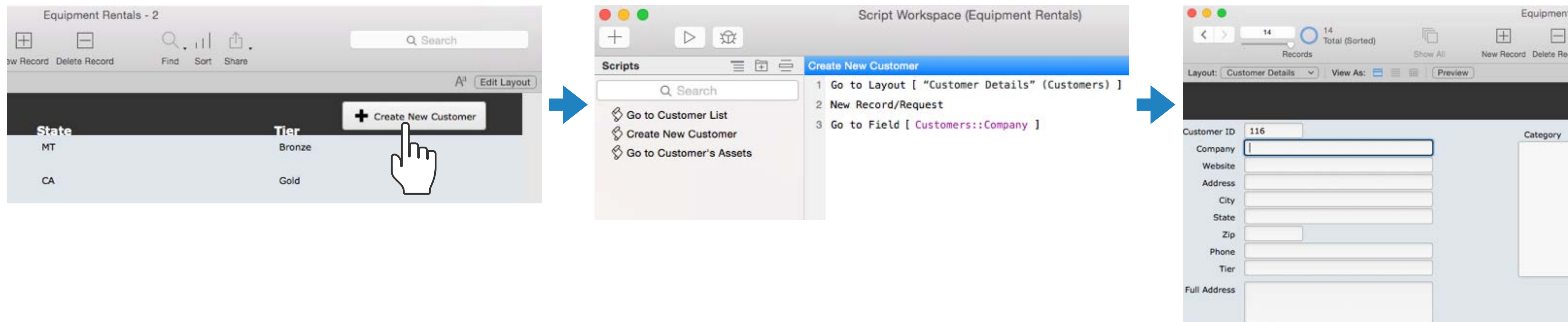
What the user does:

User clicks on the button "Create New Customer". This button has been set up to invoke the 'Create New Customer' script.

What happens:

Step 1: FileMaker Pro goes to the layout called "Customer Details."

Step 2: A new record is created.

Step 3: The cursor moves to a field called "Company."

What the user sees:

A blank customer form is displayed. The cursor is positioned on the "Company" field, so the user can start entering the new customer's data.

Automating a task

Jennifer also wants to automate the task of generating reports. Here's what she does:
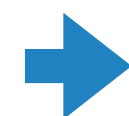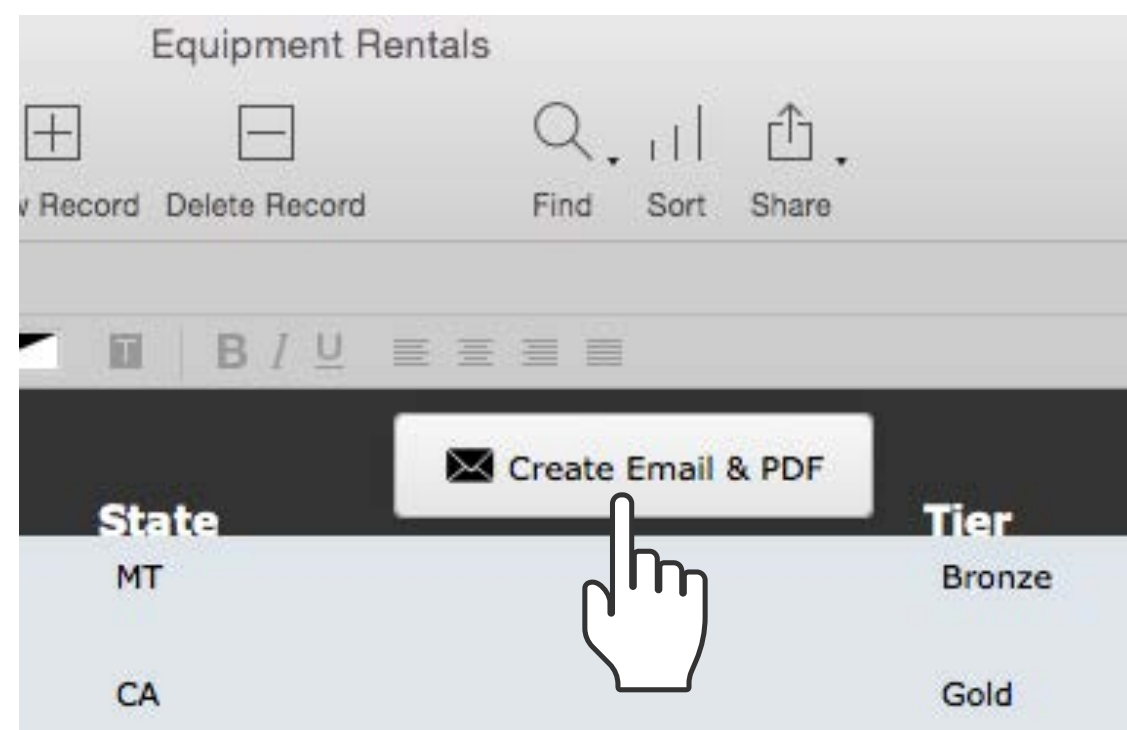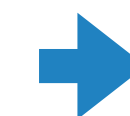
What the user does:

User clicks on the button "Create Email & PDF."
This button has been set up to generate an email
with a PDF attachment.

What happens:

Step 1: The chart layout is displayed.
Step 2: Print settings are established (in this
          case, landscape).
Step 3: A temporary file path is generated to
          establish a place to store the PDF file.
Step 4: The PDF file is generated and attached
          to an email.

What the user sees:

Users receive an email with the PDF attachment.

Calculations

A calculation uses a formula to generate a result. Sometimes the result is displayed on the screen much as formulas are displayed in a spreadsheet. Other times, the result is used by a script to make decisions about what the script does next. The use of calculations in FileMaker software is similar to the use of formulas in spreadsheets.

Calculations can used to populate fields, provide tooltip messages, set up dynamic emails, and for many other purposes.

FileMaker Training Series:
Basics Lesson 14

FileMaker Training Series:
Advanced Module 4

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Business Intelligence

Jennifer wants to know the total cost of equipment. She is also interested in metrics like the asset category, the asset purchase date, the rental agreement starting date, and the individual asset cost for inventory planning purposes. Developing a custom app using the FileMaker Platform can help Jennifer make better business decisions by monitoring these specific metrics.

FileMaker Pro can present this information in the form of reports or charts for easy visualization as shown in the next few pages.

Calculations

For Jennifer's app, we can define two calculations, one to find the number of days an asset is leased, and the other to find the total cost of a customer's assets. These metrics can be tracked over time to help Jennifer make better business decisions.

Defining the calculations

Displaying the calculations

Here the total cost of assets is calculated for this customer.

Data visualization

FileMaker software can generate hierarchical reports that summarize groups of records.

The assets on this report have been grouped into appliances, cameras, computers, office furniture and telephone records for easy viewing of costs.

FileMaker Report

Data visualization

The same asset data can be presented as a pie chart for easy visualization.

FileMaker Report

Set up security

- The steps to building a custom app

- Learn about databases

- Design user interface

- Design data model

- Import data

- Integrate other data sources

- Create business logic and design workflow

- **Set up security**

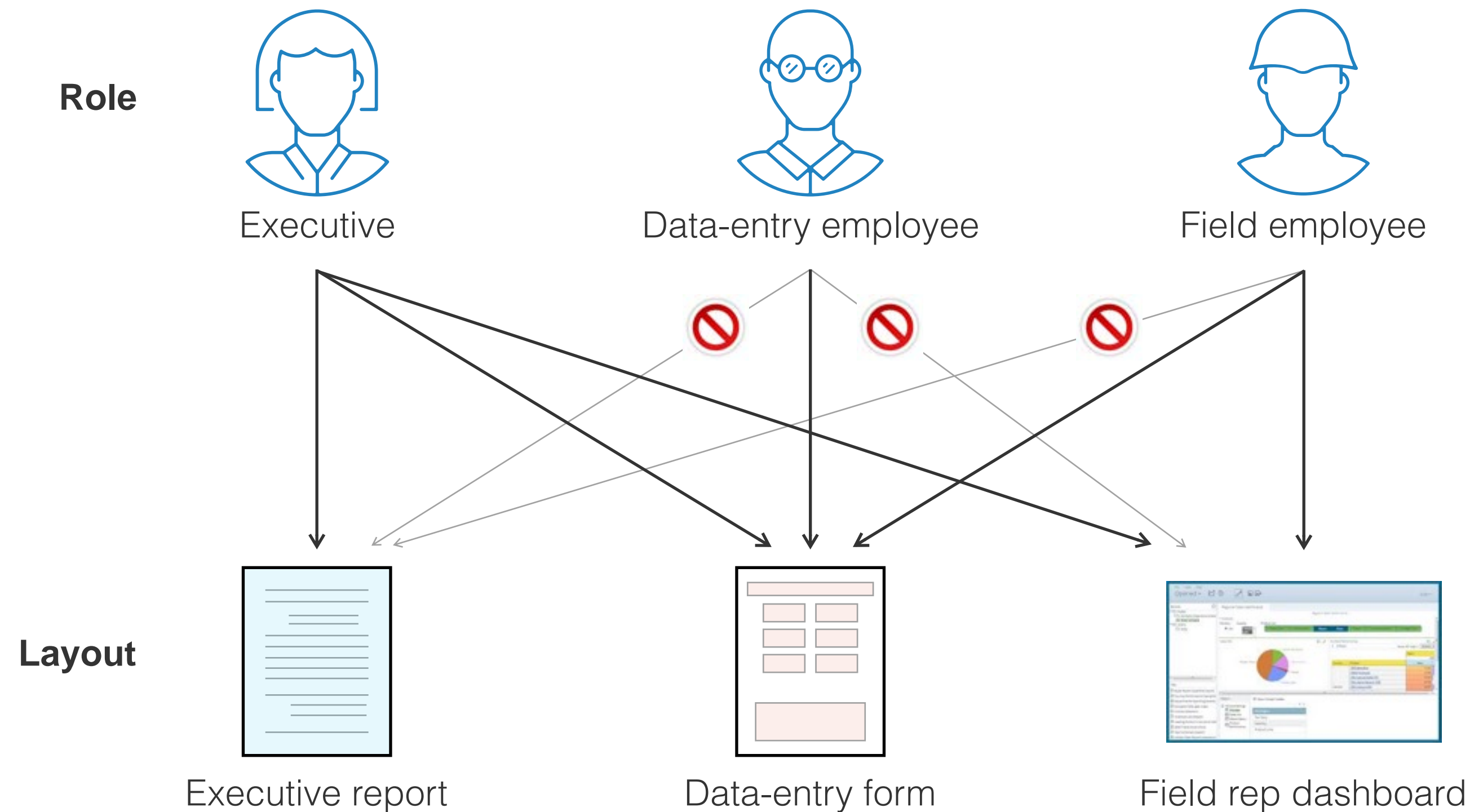- Test your app

- Appendix A

2. Create

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Role-based security: Who will use the app?

Identity
Authentication verifies the identity of the user. The user creates an account which includes a username and password.

Access Control
FileMaker software allows you to set privileges for each user by creating privilege sets and associating them with specific user accounts. Privilege sets control what a user can do. For example, they determine what data the user can view, create, edit, and delete and what layouts and scripts the user can access.

Role

Executive   Data-entry employee   Field employee

Layout

Executive report   Data-entry form   Field rep dashboard

The executive has access to all three layouts, the data-entry employee has access to only one layout, and the field employee has access to two layouts.

FileMaker Training Series:
Basics Lesson 18

FileMaker Training Series:
Advanced Module 7

FileMaker
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Role-based security: Privilege sets

Every new FileMaker app you create has 3 pre-defined privilege sets:

Full Access
The user has complete access to the file.

Data Entry Only
The user can view, create, edit and delete records; and import and export data.

Read Only
The user can view records and export data.

Additionally, you can define custom privilege sets for fine-grained control over what a user can do.

Managing accounts locally or externally

FileMaker provides two types of accounts, local and external, allowing you to manage them within each individual FileMaker file or externally from a directory service.

Local accounts are defined within the FileMaker Pro database file itself. You can have as many as you want, and you can use scripts to create and modify them automatically.

With external accounts, accounts are created in an external system, typically Active Directory or Open Directory, so that authentication can be managed by an IT administrator.

High-level security diagram

The FileMaker Platform employs a unified security model, where the security that you establish for an app is applied across iPad, iPhone, Windows, OS X and the web.

(*) Indicates areas where security is setup outside of the FileMaker Platform.

Active Directory
Open Directory

External Data
Sources for accessing
ODBC data

FileMaker Pro or FileMaker
Pro Advanced for
apps development

Apps updates

FileMaker
Server

LAN

Server Admin Console
for server configuration
and management

Apps for web
browsers using
FileMaker WebDirect

WiFi
3G/4G
WAN

Apps for iOS using
FileMaker Go

Apps for Mac
and Windows using
FileMaker Pro

Insuring your data is secure at rest and in flight

FileMaker Pro Advanced offers encryption at rest, which obfuscates and secures all the information stored within a given FileMaker app so that it can only be accessed by authorized users. This is in addition to the account-based security discussed previously.

FileMaker Server uses Secure Sockets Layer (SSL) technology to encrypt connections between FileMaker Server and its FileMaker Pro and FileMaker Go clients, as well as between the Web Publishing Engine and its FileMaker WebDirect and Custom Web Publishing clients. This helps to ensure that your hosted communications remain private.

FileMaker Security
Guide

FileMaker
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Test your app

- Learn about databases
- Design user interface
- Design data model
- Import data
- Integrate other data sources
- Create business logic and design workflow
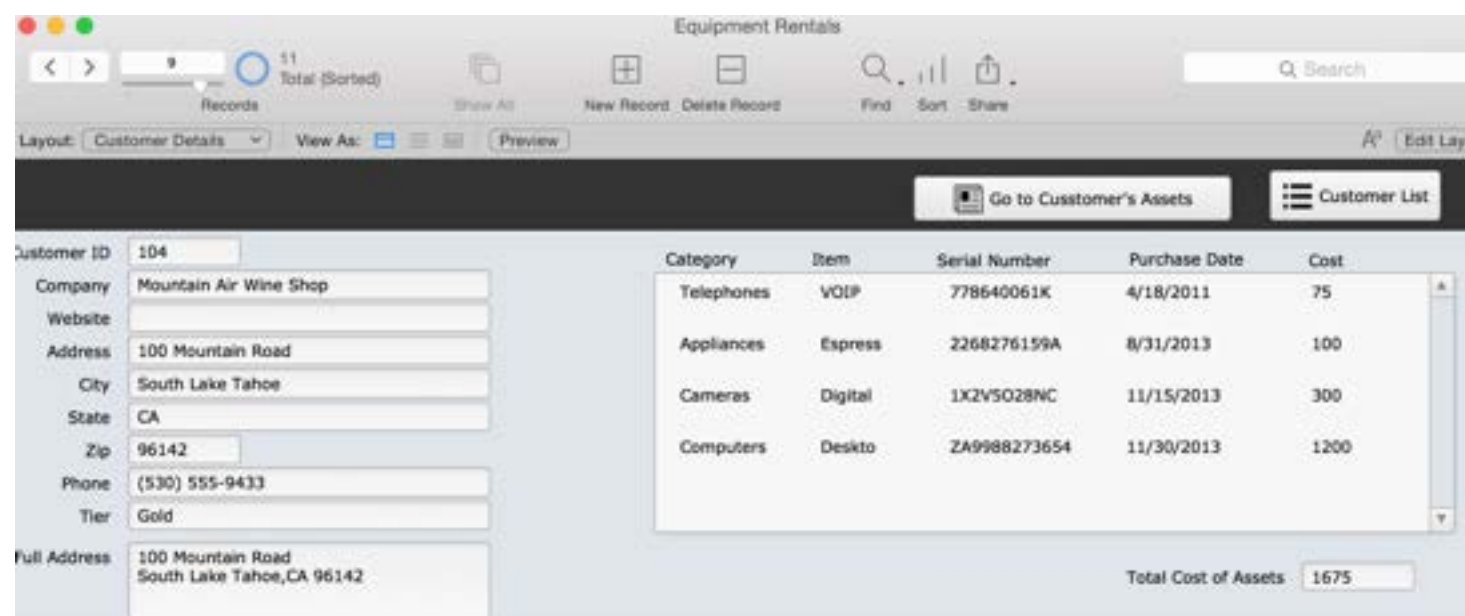- Set up security
- **Test your app**
- Appendix A

2. Create

FileMaker
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Test your app

After building your app, test your design with the intended users.

Testing is an iterative process and a critical step in building your app. The results of testing will determine whether you to repeat another cycle of the design process before moving on to the 'Deploy' step.

Test your app

Circle back and test your design with users
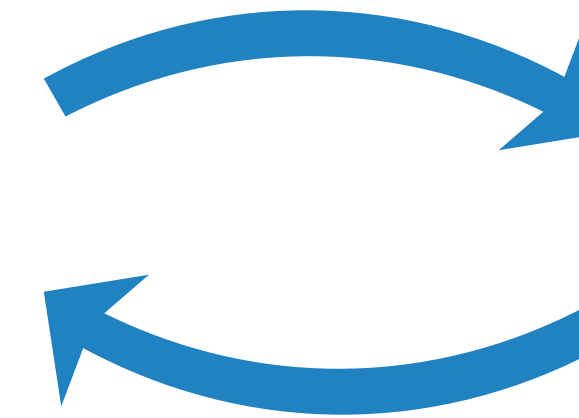
Users

Implement users' feedback

FileMaker
An Apple Subsidiary
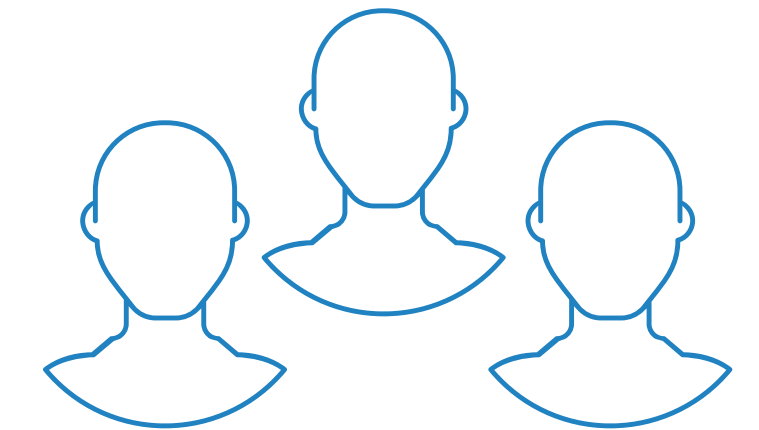
Appendix A

- The steps to building a custom app

- Learn about databases

- Design data model

- Design user interface

- Import data

- Integrate other data sources

- Create business logic and design workflow

- Set up security

- Test your app

- **Appendix A**

2. Create

FileMaker.
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FileMaker Pro layout views

Layout View Options
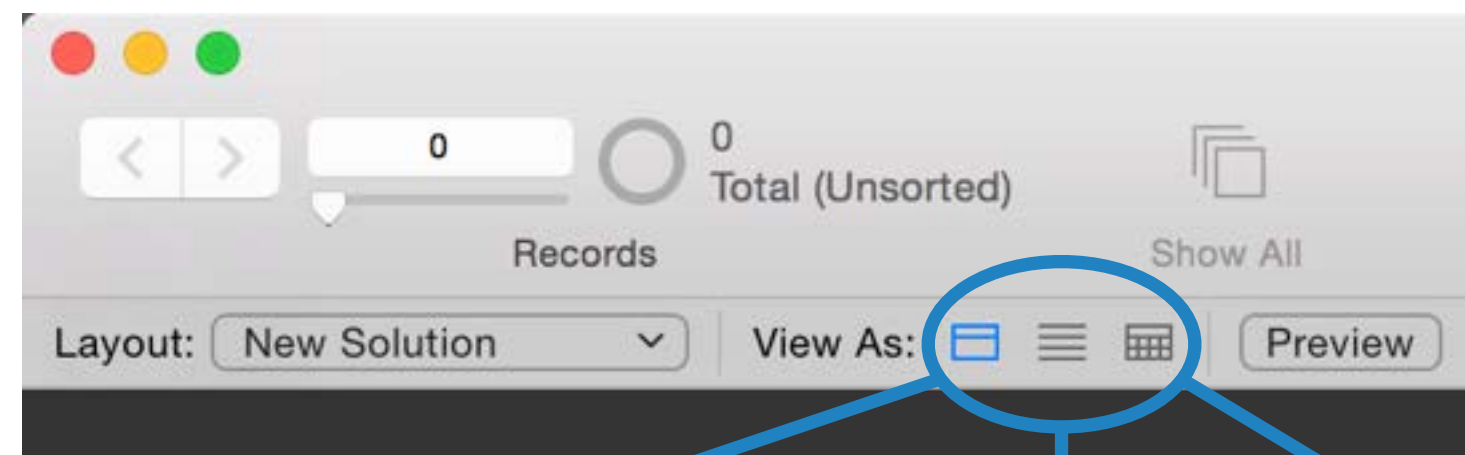
Form View

List View

Table View

Working with Data
in Table View

FileMaker
An Apple Subsidiary
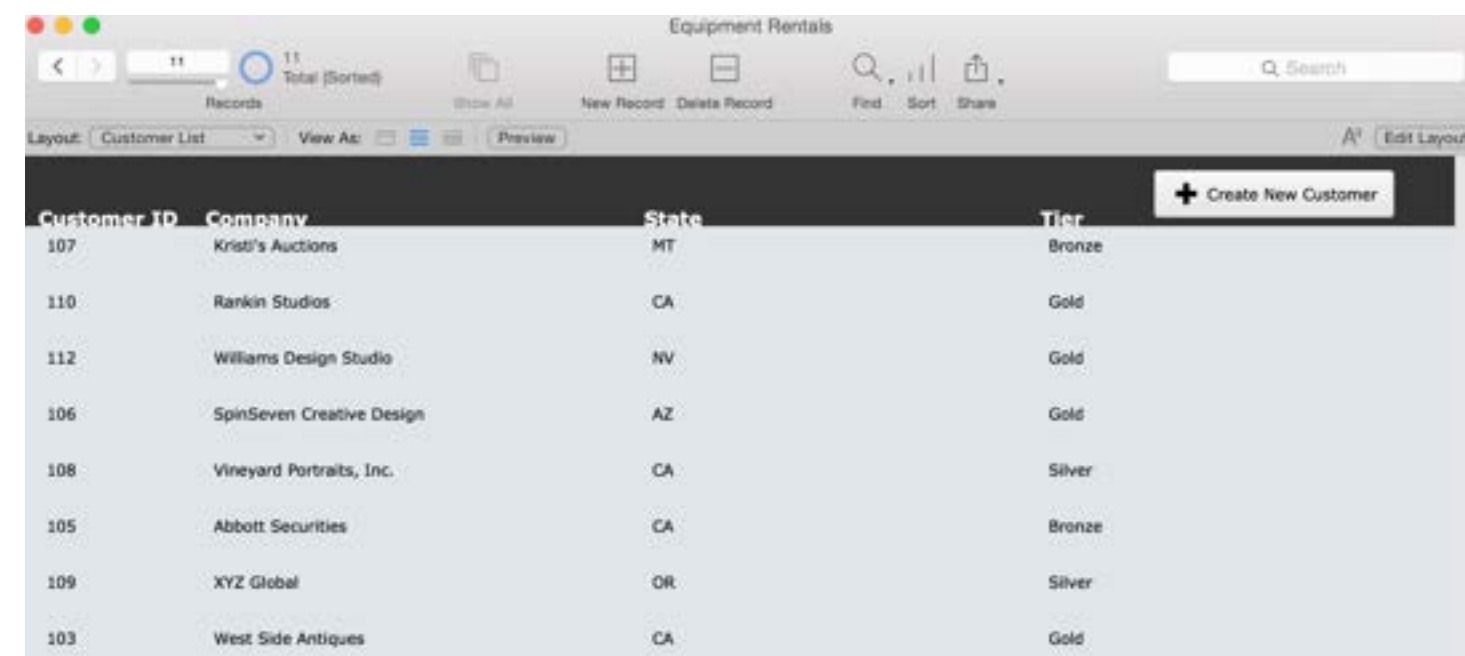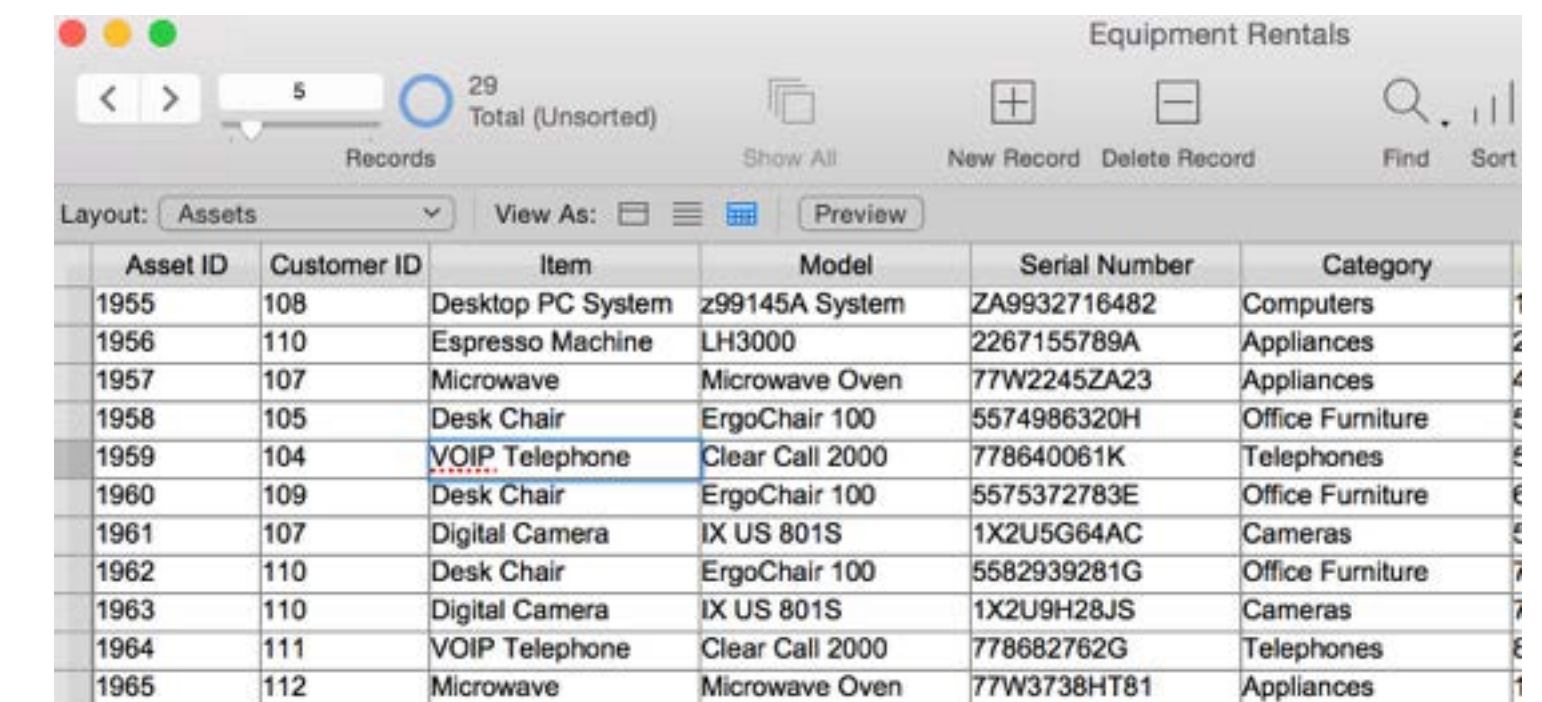
How are FileMaker Pro four Modes used?

| Mode	What can you do in this mode?
Browse	Data entry/view, add, edit, sort and delete records
Find	Search for records and fields
Preview	View data before printing; also for reports
Layout	Create user interface; edit

For using the app

For building the app

FileMaker Pro Modes

Find Mode
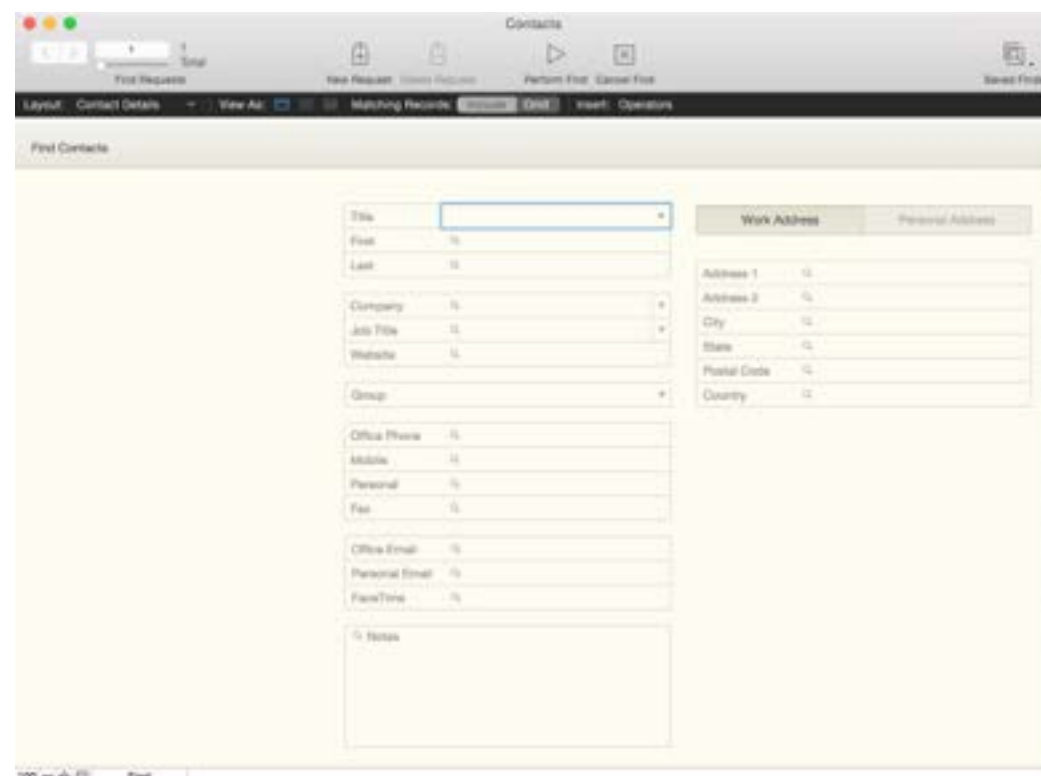
Search through your data and find records that match the criteria you enter

Browse Mode
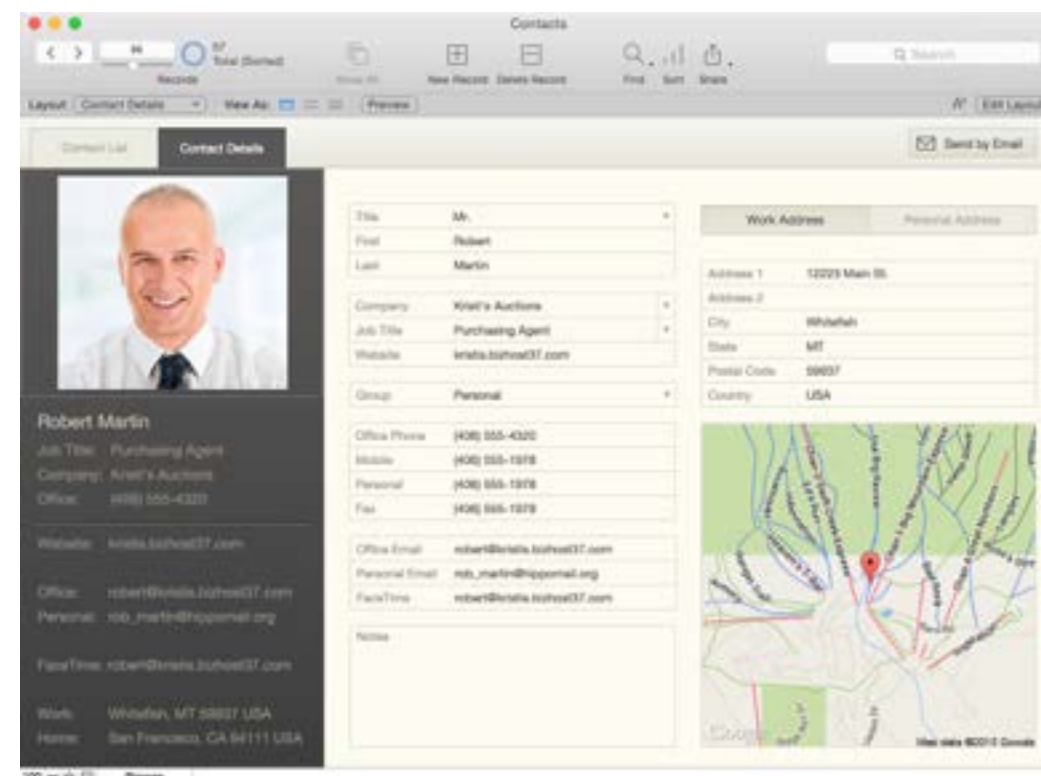
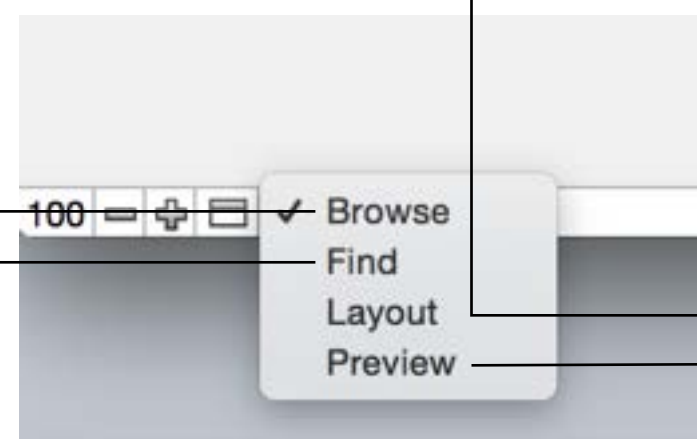Enter, edit, and view the data

Layout Mode
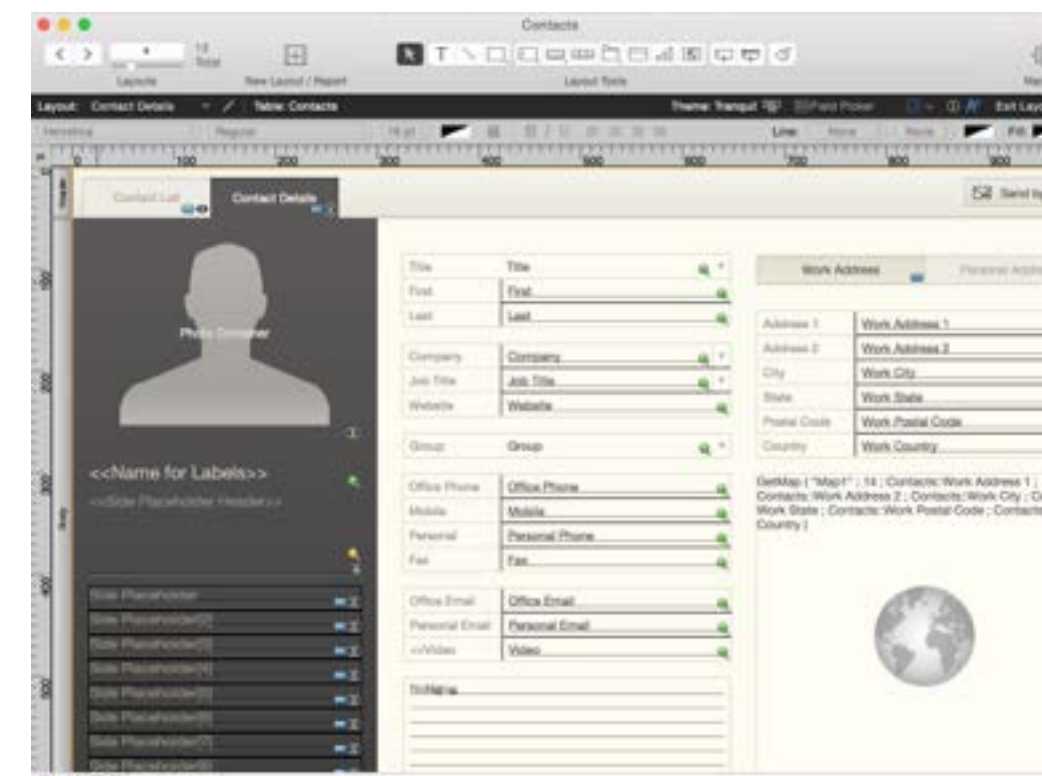
Design interfaces, deciding how data should look

Preview Mode
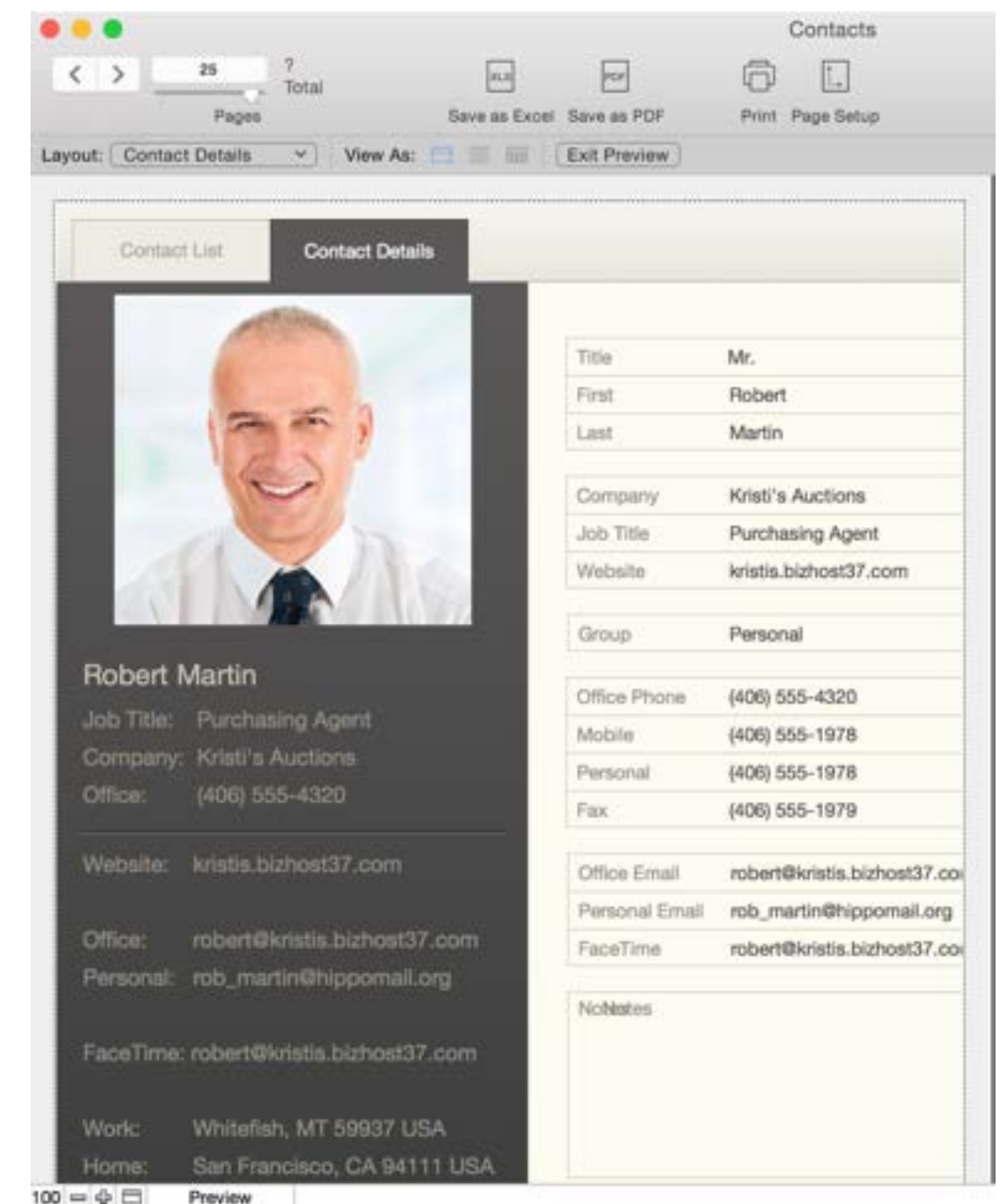
See how your data and layout will be printed or saved to PDF

Changing modes in layout mode
(Left bottom corner)

Layout parts

A layout is divided into various parts. The most commonly used ones include:

- Header
- Body
- Footer

Layout parts control how and where objects such as fields, text objects and graphics are displayed.

When you create a new layout, it will include one or more parts depending on your choice of layout template and the layouts dimensions are based on device type selected.

Header

Body

Footer

FileMaker
An Apple Subsidiary
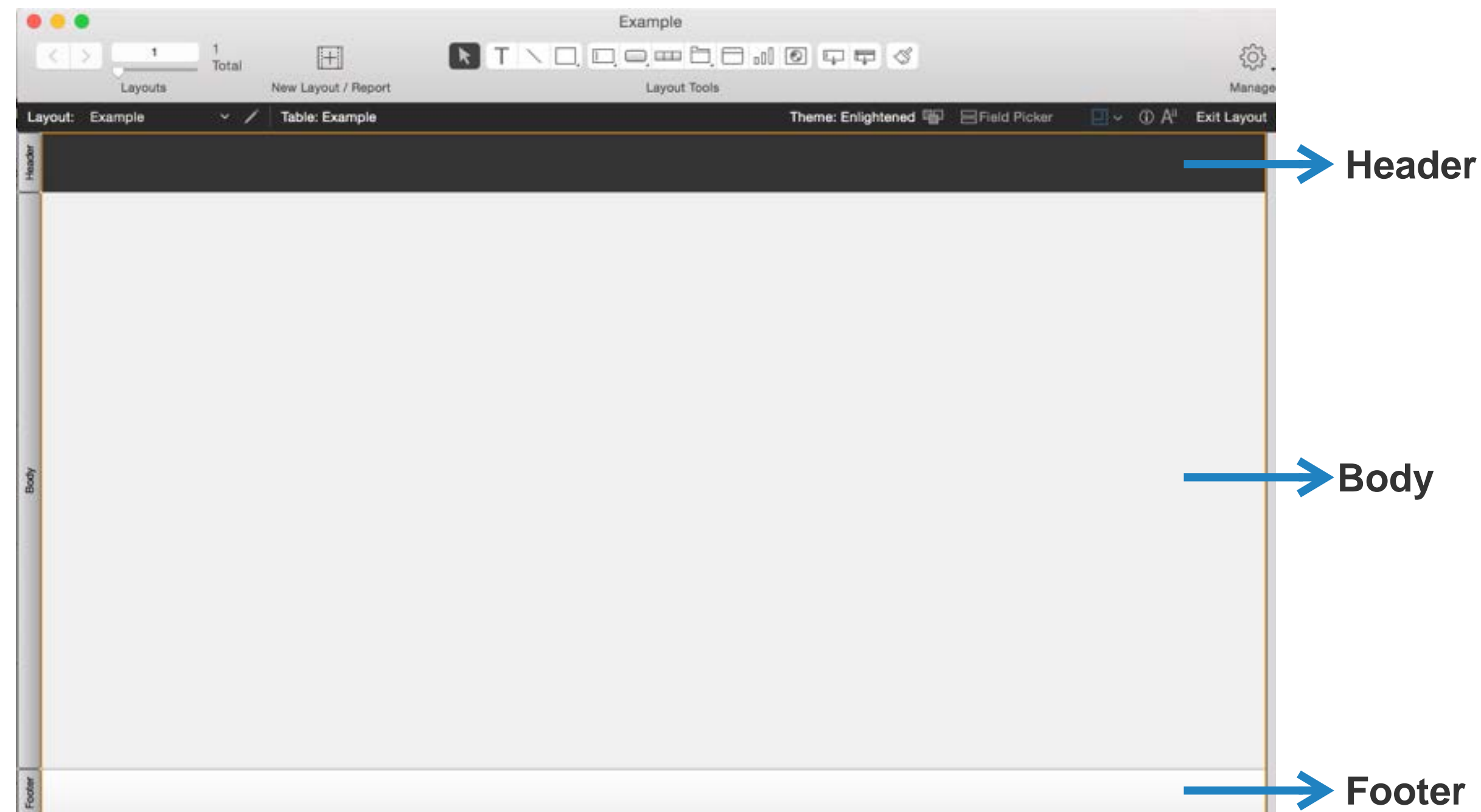
Layout mode navigation and editing tools

In Layout mode, FileMaker provides editing options on the Status Tool Bar to add layout objects such as portals for displaying related table information, button bars for adding navigation or printing a report, web viewers for displaying web content and much more. The Inspector Tool Bar gives you control over the objects placed on the layout.
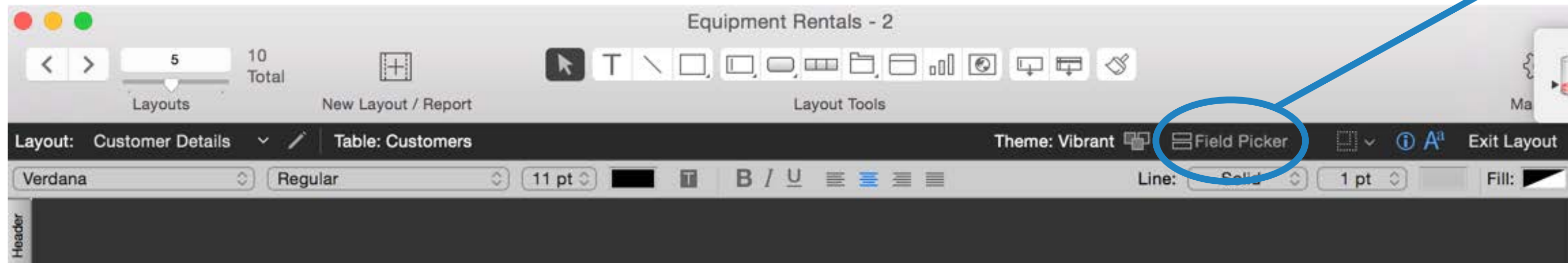
Status Tool Bar
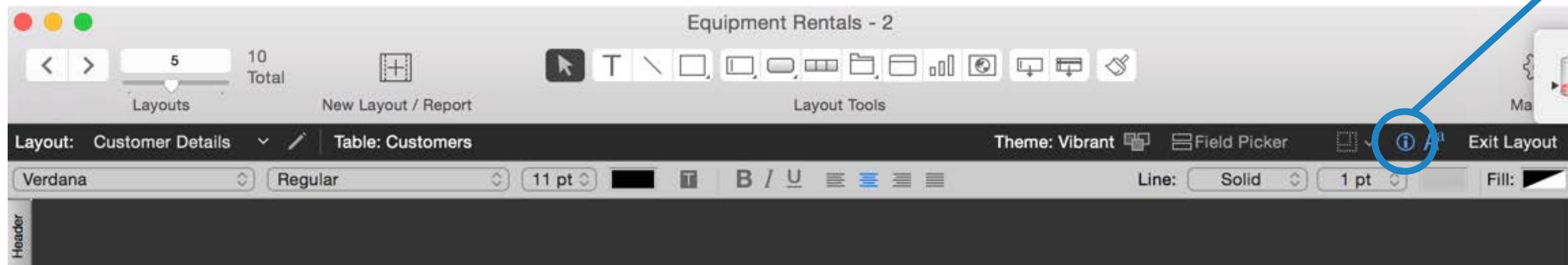
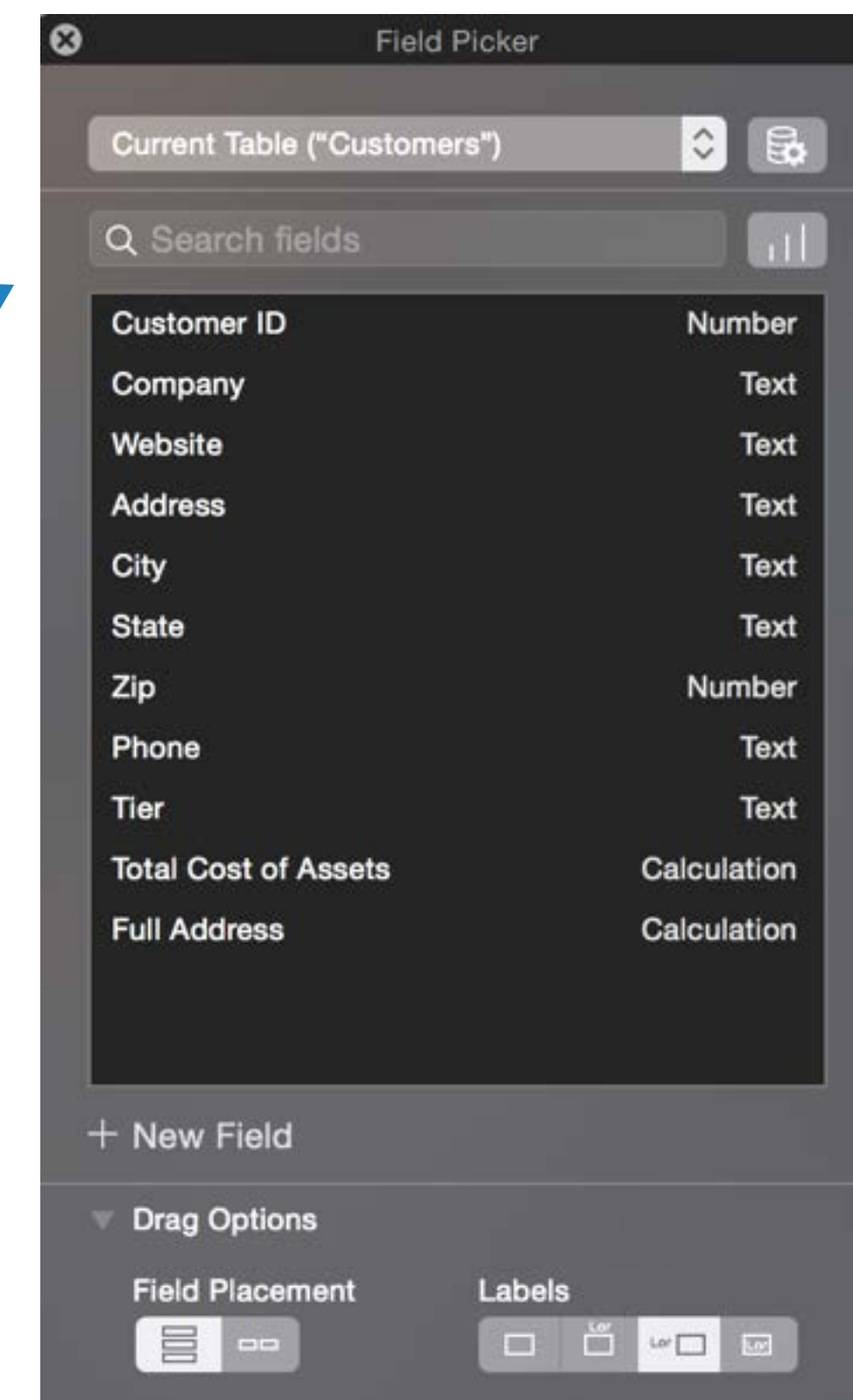**Inspector Tool Bar (Object Control Center)**
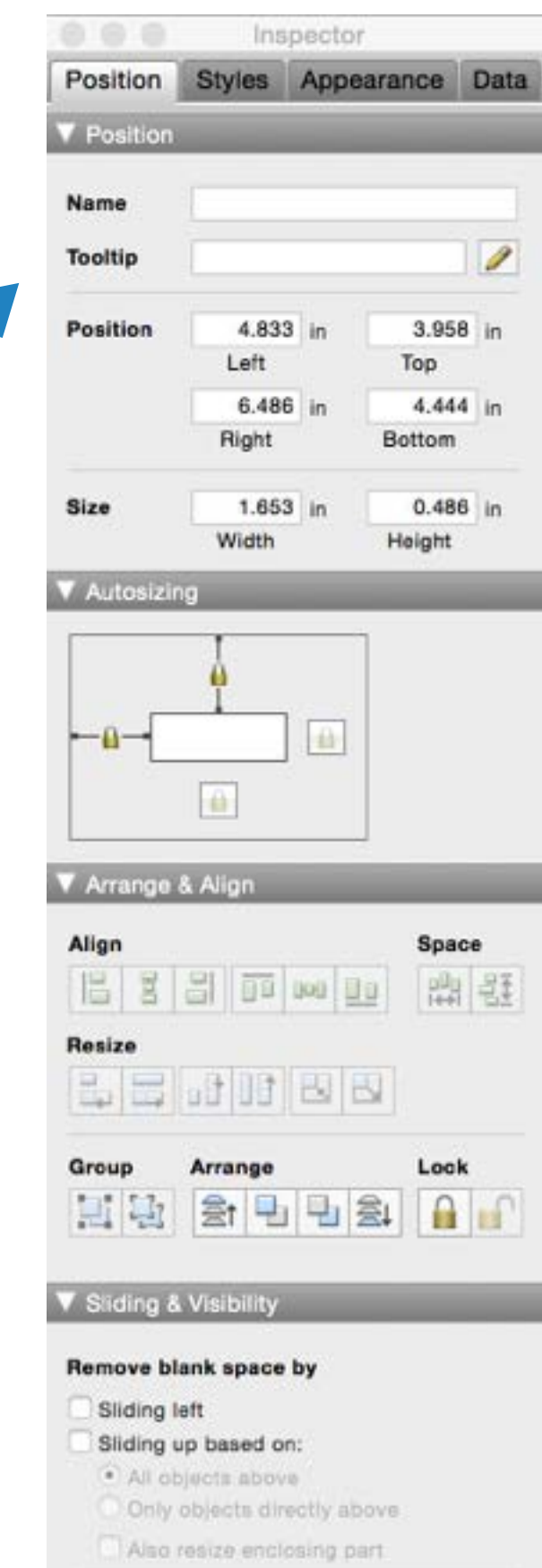
Layout mode navigation and editing tools

The Field Picker is used to define fields for your app, and to add or change fields for an existing layout. Once fields is created, you simply drag them over to your desired layout. You can also view and create fields from other tables using Field Picker.

Field Picker

Status Tool Bar

Get started sharing your app with our next guide:

Deploy

Your step-by-step guide to successfully deploying your FileMaker app.