

# Flutter for Beginners

An introductory guide to building cross-platform mobile applications with Flutter and Dart 2

**Alessandro Biessek**



**BIRMINGHAM - MUMBAI**

# Flutter for Beginners

Copyright © 2019 Packt Publishing

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, without the prior written permission of the publisher, except in the case of brief quotations embedded in critical articles or reviews.

Every effort has been made in the preparation of this book to ensure the accuracy of the information presented. However, the information contained in this book is sold without warranty, either express or implied. Neither the author, nor Packt Publishing or its dealers and distributors, will be held liable for any damages caused or alleged to have been caused directly or indirectly by this book.

Packt Publishing has endeavored to provide trademark information about all of the companies and products mentioned in this book by the appropriate use of capitals. However, Packt Publishing cannot guarantee the accuracy of this information.

**Commissioning Editor:** Amarabha Banerjee

**Acquisition Editor:** Larissa Pinto

**Content Development Editor:** Akhil Nair

**Technical Editor:** Sachin Sunilkumar

**Copy Editor:** Safis Editing

**Project Coordinator:** Manthan Patel

**Proofreader:** Safis Editing

**Indexer:** Pratik Shirodkar

**Production Designer:** Jyoti Chauhan

First published: September 2019

Production reference: 1120919

Published by Packt Publishing Ltd.

Livery Place

35 Livery Street

Birmingham

B3 2PB, UK.

ISBN 978-1-78899-608-2

[www.packt.com](http://www.packt.com)

*To my mother, Antonina, and my father, Euclides, for their sacrifices and for exemplifying the  
power of determination*

*– Alessandro Biessek*



mapt.io

Subscribe to our online digital library for full access to over 7,000 books and videos, as well as industry leading tools to help you plan your personal development and advance your career. For more information, please visit our website.

## Why subscribe?

- Spend less time learning and more time coding with practical eBooks and Videos from over 4,000 industry professionals
- Improve your learning with Skill Plans built especially for you
- Get a free eBook or video every month
- Fully searchable for easy access to vital information
- Copy and paste, print, and bookmark content

## Packt.com

Did you know that Packt offers eBook versions of every book published, with PDF and ePub files available? You can upgrade to the eBook version at [www.packt.com](http://www.packt.com) and as a print book customer, you are entitled to a discount on the eBook copy. Get in touch with us at [customercare@packtpub.com](mailto:customercare@packtpub.com) for more details.

At [www.packt.com](http://www.packt.com), you can also read a collection of free technical articles, sign up for a range of free newsletters, and receive exclusive discounts and offers on Packt books and eBooks.

# Contributors

## About the author

**Alessandro Biessek** was born in the beautiful city of Chapecó, in the state of Santa Catarina, southern Brazil, in 1993. He is currently working on mobile application development for Android and iOS in his hometown. He has more than 7 years of experience in development, from desktop development with Delphi to backend with PHP, Node.js, Golang, mobile development with Apache Flex, and Java/Kotlin. Most of his time is devoted to the development of Android apps. Always interested in new technologies, he has been following the Flutter framework for a long time, evidencing its growth and adoption in recent months.

*Firstly, thanks to the Flutter team for their incredible tool that is helping the developer community to help other people.*

*I am grateful to all of those with whom I have had the pleasure to work with during this project, all the reviewers, and the entire Packt team who helped me in this work.*

*I'd like to thank my friends, coworkers and family, especially my mother Antonina, my father Euclides, my sister Hellen and my brother Alan, for being supportive and were holding the fort while I worked hard on the book. Also, thanks to my graduation teachers, who encouraged me to face challenges like this book in a more natural and brave way.*

*Finally, I'd like to thank you, the reader. Your support of books such as this, through your purchase, makes it possible for everyone who wants to share their experiences to continue.*

## About the reviewer

**Ugurcan Yildirim** is an enthusiast of Android and Flutter mobile application development frameworks. He graduated as valedictorian with a BSc degree in Computer Science from Bilkent University, Ankara. Since 2015, he has been working as an Android Engineer at Accenture Industry X.0, Istanbul. With Flutter's promising uptrend that started in 2018, he began to concern himself with the peculiarities of Flutter and experiment with them. Since then, he has contributed to the open source community of Flutter by writing articles on Medium (@ugurcany) and giving presentations. His latest contribution is to review this book, which he believes should be consulted and referenced by Flutter developers of any level.

*I would like to thank Packt for giving me the opportunity to contribute to the ever-expanding Flutter universe by reviewing one of the first and most comprehensive Flutter books published. I would also like to thank my parents and my wife, Karsu, for their support and patience over the course of reviewing this book.*

## Packt is searching for authors like you

If you're interested in becoming an author for Packt, please visit [authors.packtpub.com](https://authors.packtpub.com) and apply today. We have worked with thousands of developers and tech professionals, just like you, to help them share their insight with the global tech community. You can make a general application, apply for a specific hot topic that we are recruiting an author for, or submit your own idea.

# Table of Contents

<b>Preface</b>	1
<b>Section 1: Introduction to Dart</b>	
<b>Chapter 1: An Introduction to Dart</b>	9
<b>Getting started with Dart</b>	9
The evolution of Dart	10
How Dart works	11
Dart VM and JavaScript compilation	11
Hands-on Dart	12
DartPad	12
Dart development tools	13
Hello world	14
<b>Understanding why Flutter uses Dart</b>	15
Adding productivity	16
Compiling Flutter apps and hot reload	16
Easy learning	17
Maturity	19
<b>Introducing the structure of the Dart language</b>	21
Dart operators	21
Arithmetic operators	22
Increment and decrement operators	23
Equality and relational operators	23
Type checking and casting	23
Logical operators	24
Bits manipulation	24
Null-safe and null-aware operators	25
Dart types and variables	25
final and const	25
Built-in types	26
Numbers	26
BigInt	27
Booleans	27
Collections	27
Strings	28
String interpolation	28
Literals	29
Type inference – bringing dynamism to the show	29
Control flows and looping	31
Functions	31
Function parameters	32
Data structures, collections, and generics	35
Generics	36

When and why to use generics	36
Generics and Dart literals	37
<b>Introduction to OOP in Dart</b>	37
Dart OOP features	38
Objects and classes	39
Encapsulation	40
Inheritance and composition	40
Abstraction	40
Polymorphism	41
<b>Summary</b>	41
<b>Further reading</b>	42
<b>Chapter 2: Intermediate Dart Programming</b>	43
<b>Dart classes and constructors</b>	44
The enum type	45
The cascade notation	46
Constructors	46
Named constructors	47
Factory constructors	48
Field accessors – getters and setters	49
Static fields and methods	50
Class inheritance	52
The toString() method	53
<b>Interfaces, abstract classes, and mixins</b>	53
Abstract classes	54
Interfaces	55
Mixins – adding behavior to a class	56
Callable classes, top-level functions, and variables	58
Callable classes	59
Top-level functions and variables	60
<b>Understanding Dart libraries and packages</b>	60
Importing and using a library	61
Importing show and hide	62
Importing prefixes to libraries	63
Importing path variants	64
Creating Dart libraries	65
Library member privacy	66
The library definition	67
A single-file library	67
Splitting libraries into multiple files	68
A multiple-file library – the export statement	71
Dart packages	74
Application packages versus library packages	74
Package structures	75
Stagehand – the Dart project generator	77
The pubspec file	79
Package dependencies – pub	81
Specifying dependencies	82



The version constraint	83
The source constraint	84
<b>Introducing async programming with Futures and Isolates</b>	86
Dart Futures	86
Dart Isolates	90
<b>Introducing unit testing with Dart</b>	91
The Dart test package	92
Writing unit tests	92
<b>Summary</b>	95
<b>Chapter 3: An Introduction to Flutter</b>	97
<b>Comparisons with other mobile app development frameworks</b>	98
The problems Flutter wants to solve	98
Differences between existing frameworks	99
High performance	100
Full control of the UI	100
Dart	102
Being backed by Google	103
Fuchsia OS and Flutter	103
Open source framework	104
Developer resources and tooling	104
<b>Flutter compilation (Dart)</b>	106
Development compilation	107
Release compilation	107
Supported platforms	107
<b>Flutter rendering</b>	108
Web-based technologies	109
Framework and OEM widgets	110
Flutter – rendering by itself	111
<b>Widgets introduction</b>	111
Composability	112
Immutability	112
Everything is a widget	112
The widget tree	113
<b>Hello Flutter</b>	114
pubspec file	117
Running the generated project	120
lib/main.dart file	120
Flutter run	120
<b>Summary</b>	123
<b>Section 2: The Flutter User Interface - Everything is a Widget</b>	
<hr/>	
<b>Chapter 4: Widgets: Building Layouts in Flutter</b>	127
<b>Stateful versus stateless widgets</b>	127
Stateless widgets	128

Stateful widgets	129
Stateful and stateless widgets in code	129
Stateless widget in code	131
Stateful widgets in code	132
Inherited widgets	135
Widget key property	137
<b>Built-in widgets</b>	137
Basic widgets	137
The Text widget	138
The Image widget	138
Material Design and iOS Cupertino widgets	140
Buttons	141
Scaffold	141
Dialogs	142
Text fields	142
Selection widgets	143
Date and time pickers	143
Other components	143
<b>Understanding built-in layout widgets</b>	144
Containers	144
Styling and positioning	145
Other widgets (gestures, animations, and transformations)	145
<b>Creating a UI with widgets (favor manager app)</b>	146
The app screens	146
The app code	146
Favors app home screen	148
The layout code	150
The request favor screen	158
The layout code	159
<b>Creating custom widgets</b>	162
<b>Summary</b>	164
<b>Chapter 5: Handling User Input and Gestures</b>	165
<b>Handling user gestures</b>	165
Pointers	166
Gestures	167
Tap	167
Double tap	168
Press and hold	169
Drag, pan, and scale	169
Horizontal drag	169
Vertical drag	170
Pan	171
Scale	171
Gestures in material widgets	172
<b>Input widgets</b>	173
FormField and TextField	173
Using a controller	174
Accessing FormField state	174