

# Mobile Strategy

How Your Company Can Win by Embracing Mobile Technologies

Dirk Nicol



Foreword by Bob Sutor

Vice President, Business Analytics and Mathematical Sciences, IBM Research

FREE SAMPLE CHAPTER



SHARE WITH OTHERS

# Related Books of Interest

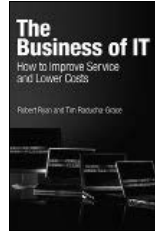


## Developing and Hosting Applications on the Cloud

By Alexander Amies, Harm Sluiman, Qiang Guo Tong, and Guo Ning Liu  
ISBN: 0-13-306684-3

The promise of cloud computing is that centralization, standardization, and automation will simplify user experience and reduce costs. However, achieving these benefits requires a new mind set. *Developing and Hosting Applications on the Cloud* covers these aspects of application development and operation and provides practical guidance, giving numerous code examples and demonstrations of system utilities for deployment, security, and maintenance.

This title makes special reference to the IBM SmartCloud Enterprise, but the principles explained are general and useful to anyone planning to automate management of IT infrastructure using the cloud. Developers using cloud management application programming, architects planning projects, or others wanting to automate management of IT infrastructure will value this end to end story for why they would want to develop a cloud application, how to do it, and how to make it part of their business.



## The Business of IT How to Improve Service and Lower Costs

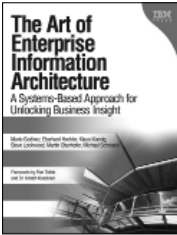
By Robert Ryan and Tim Raducha-Grace  
ISBN: 0-13-700061-8

Drive More Business Value from IT...and Bridge the Gap Between IT and Business Leadership

IT organizations have achieved outstanding technological maturity, but many have been slower to adopt world-class business practices. This book provides IT and business executives with methods to achieve greater business discipline throughout IT, collaborate more effectively, sharpen focus on the customer, and drive greater value from IT investment. Drawing on their experience consulting with leading IT organizations, Robert Ryan and Tim Raducha-Grace help IT leaders make sense of alternative ways to improve IT service and lower cost, including ITIL, IT financial management, balanced scorecards, and business cases. You'll learn how to choose the best approaches to improve IT business practices for your environment and use these practices to improve service quality, reduce costs, and drive top-line revenue growth.

Sign up for the monthly IBM Press newsletter at  
[ibmpressbooks/newsletters](http://ibmpressbooks/newsletters)

# Related Books of Interest



## The Art of Enterprise Information Architecture A Systems-Based Approach for Unlocking Business Insight

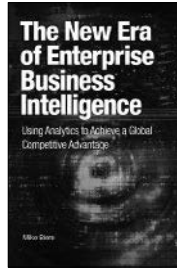
By Mario Godinez, Eberhard Hechler, Klaus Koenig, Steve Lockwood, Martin Oberhofer, and Michael Schroeck

ISBN: 0-13-703571-3

Architecture for the Intelligent Enterprise:  
Powerful New Ways to Maximize the  
Real-time Value of Information

Tomorrow's winning "Intelligent Enterprises" will bring together far more diverse sources of data, analyze it in more powerful ways, and deliver immediate insight to decision-makers throughout the organization. Today, however, most companies fail to apply the information they already have, while struggling with the complexity and costs of their existing information environments.

In this book, a team of IBM's leading information management experts guide you on a journey that will take you from where you are today toward becoming an "Intelligent Enterprise."



## The New Era of Enterprise Business Intelligence: Using Analytics to Achieve a Global Competitive Advantage

By Mike Biere

ISBN: 0-13-707542-1

A Complete Blueprint for Maximizing the  
Value of Business Intelligence in the  
Enterprise

The typical enterprise recognizes the immense potential of business intelligence (BI) and its impact upon many facets within the organization—but it's not easy to transform BI's potential into real business value. Top BI expert Mike Biere presents a complete blueprint for creating winning BI strategies and infrastructure, and systematically maximizing the value of information throughout the enterprise.

This product-independent guide brings together start-to-finish guidance and practical checklists for every senior IT executive, planner, strategist, implementer, and the actual business users themselves.

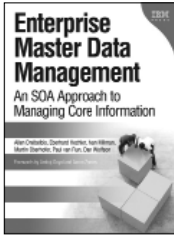


Listen to the author's podcast at:  
[ibmpressbooks.com/podcasts](http://ibmpressbooks.com/podcasts)

**IBM**  
Press

Visit [ibmpressbooks.com](http://ibmpressbooks.com)  
for all product information

# Related Books of Interest



## Enterprise Master Data Management An SOA Approach to Managing Core Information

By Allen Dreibelbis, Eberhard Hechler,  
Ivan Milman, Martin Oberhofer,  
Paul Van Run, and Dan Wolfson  
ISBN: 0-13-236625-8

The Only Complete Technical Primer  
for MDM Planners, Architects, and  
Implementers

*Enterprise Master Data Management* provides an authoritative, vendor-independent MDM technical reference for practitioners: architects, technical analysts, consultants, solution designers, and senior IT decision makers. Written by the IBM® data management innovators who are pioneering MDM, this book systematically introduces MDM's key concepts and technical themes, explains its business case, and illuminates how it interrelates with and enables SOA.

Drawing on their experience with cutting-edge projects, the authors introduce MDM patterns, blueprints, solutions, and best practices published nowhere else—everything you need to establish a consistent, manageable set of master data, and use it for competitive advantage.



## Mining the Talk

Unlocking the Business Value in  
Unstructured Information  
Spangler, Kreulen  
ISBN: 0-13-233953-6



## Is Your Company Ready for Cloud?

Choosing the Best Cloud Adoption  
Strategy for Your Business  
Isom, Holley  
ISBN 0-13-259984-8



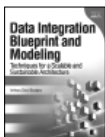
## Get Bold

Using Social Media to Create a  
New Type of Social Business  
Carter  
ISBN 0-13-261831-1



## IBM Cognos 10 Report Studio

Practical Examples  
Draskovic, Johnson  
ISBN-10: 0-13-265675-2



## Data Integration Blueprint and Modeling

Techniques for a Scalable and  
Sustainable Architecture  
Giordano  
ISBN: 0-13-708493-5

Sign up for the monthly IBM Press newsletter at  
[ibmpressbooks/newsletters](http://ibmpressbooks/newsletters)

*This page intentionally left blank*

# Mobile Strategy

*This page intentionally left blank*

# Mobile Strategy

How Your Company Can Win  
by Embracing Mobile Technologies

**Dirk Nicol**

**IBM Press  
Pearson plc**

**Upper Saddle River, NJ • Boston • Indianapolis • San Francisco  
New York • Toronto • Montreal • London • Munich • Paris • Madrid  
Cape Town • Sydney • Tokyo • Singapore • Mexico City**

**[ibmpressbooks.com](http://ibmpressbooks.com)**



The author and publisher have taken care in the preparation of this book, but make no expressed or implied warranty of any kind and assume no responsibility for errors or omissions. No liability is assumed for incidental or consequential damages in connection with or arising out of the use of the information or programs contained herein.

© Copyright 2013 by International Business Machines Corporation. All rights reserved.

Note to U.S. Government Users: Documentation related to restricted right. Use, duplication, or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corporation.

IBM Press Program Managers: Steven M. Stansel, Ellice Uffer

Cover design: IBM Corporation

Associate Publisher: Dave Dusthimer  
Marketing Manager: Stephane Nakib  
Executive Editor: Mary Beth Ray  
Publicist: Andrea Bledsoe  
Senior Development Editor: Christopher Cleveland  
Technical Editors: Vijay Dheap, Christopher Pepin  
Managing Editor: Kristy Hart  
Designer: Alan Clements  
Project Editor: Jovana Shirley  
Copy Editor: Apostrophe Editing Services  
Indexer: Cheryl Lenser  
Compositor: Nonie Ratcliffe  
Proofreader: Jess DeGabriele  
Manufacturing Buyer: Dan Uhrig

Published by Pearson plc

Publishing as IBM Press

IBM Press offers excellent discounts on this book when ordered in quantity for bulk purchases or special sales, which may include electronic versions and/or custom covers and content particular to your business, training goals, marketing focus, and branding interests. For more information, please contact

U. S. Corporate and Government Sales  
1-800-382-3419  
corpsales@pearsontechgroup.com.

For sales outside the U. S., please contact

International Sales  
international@pearson.com.

The following terms are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both: IBM, the IBM Press logo, developerWorks, and Lotus. Worklight is a trademark or registered trademark of Worklight, an IBM Company. A current list of IBM trademarks is available on the web at "copyright and trademark information" as [www.ibm.com/legal/copytrade.shtml](http://www.ibm.com/legal/copytrade.shtml).

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates. Microsoft, Windows, and ActiveSync are trademarks of Microsoft Corporation in the United States, other countries, or both. Other company, product, or service names may be trademarks or service marks of others.

The Library of Congress cataloging-in-publication data is on file.

All rights reserved. This publication is protected by copyright, and permission must be obtained from the publisher prior to any prohibited reproduction, storage in a retrieval system, or transmission in any form or by any means, electronic, mechanical, photocopying, recording, or likewise. For information regarding permissions, write to:

Pearson Education, Inc.

Rights and Contracts Department

501 Boylston Street, Suite 900

Boston, MA 02116

Fax (617) 671-3447

ISBN-13: 978-0-13-309491-6

ISBN-10: 0-13-309491-X

Text printed in the United States on recycled paper at R.R. Donnelley in Crawfordsville, Indiana.

First printing April 2013 with corrections September 2013

*To Phyllis and Bruce Nicol for teaching me perseverance.*

*And to my wife Joy and sons, Luke, Caleb, and Isaiah  
for their love and support.*

# Contents

1	Introducing Mobile Enterprise . . . . .	1
	<b>Mobile Landscape</b> . . . . .	2
	<b>The Disruption of Smartphones and Tablets</b> . . . . .	5
	<i>Catalysts for Disruption</i> . . . . .	5
	<b>Implications of the Consumerization of IT</b> . . . . .	9
	<b>BYOD: Bring Your Own Device to Work</b> . . . . .	11
	<b>A Preview of Enterprise Mobility Strategy</b> . . . . .	13
	<b>Summary</b> . . . . .	14
	<b>Endnotes</b> . . . . .	16
	<b>Additional Sources</b> . . . . .	16
2	Defining Business Value . . . . .	17
	<b>A Brief History of the Smartphone:     The Power of Context, Intelligence,     and Engagement</b> . . . . .	18
	<b>App Revolution: Bringing Together     Context, Intelligence, and Engagement     While Driving End User Value</b> . . . . .	21
	<i>Contextual Information: Key Ingredient         to Improving Outcomes</i> . . . . .	21
	<i>Mobile Intelligence: Ubiquitous Computing         and Decision Making</i> . . . . .	22
	<i>Engagement: Weaving into Daily Life</i> . . . . .	23
	<b>How the Mobile App Enters into Lives     to Add Value</b> . . . . .	24

	<b>Defining Goals Based on Business Value</b> . . . . .	<b>27</b>
	<i>B2E or B2B Value Goals</i> . . . . .	28
	<i>B2C Value Goals</i> . . . . .	29
	<b>Thinking Through Mobile App Value</b> . . . . .	<b>30</b>
	<b>Summary</b> . . . . .	<b>32</b>
	<b>Endnotes</b> . . . . .	<b>33</b>
	<b>Additional Sources</b> . . . . .	<b>34</b>
<b>3</b>	<b>Mobile Business Challenges</b> . . . . .	<b>35</b>
	<b>Mobile Application Development Challenges</b> . . . . .	<b>36</b>
	<i>Developing for Multiple Mobile Platforms</i> . . . . .	37
	<i>Delivering High-Quality Apps That Engage Users and Meet Business Objectives</i> . . . . .	40
	<i>Connectivity to Back-End Systems and Data</i> . . . . .	40
	<i>Meeting Accelerated Time-to-Market Requirements</i> . . . . .	41
	<i>Integration with Existing Development Processes</i> . . . . .	42
	<b>Security and Management</b> . . . . .	<b>43</b>
	<i>Management and Post-Deployment Control of Apps</i> . . . . .	46
	<b>Summary</b> . . . . .	<b>46</b>
<b>4</b>	<b>The Mobile Framework</b> . . . . .	<b>49</b>
	<b>A Mobile Framework</b> . . . . .	<b>50</b>
	<b>Mobile App Becomes the Fundamental Value Delivery Vehicle</b> . . . . .	<b>52</b>
	<b>Mobile Development, Security, Management, and Business Transformation</b> . . . . .	<b>57</b>
	<i>Mobile Development</i> . . . . .	57
	<i>Management and Security</i> . . . . .	62
	<i>Mobile Business Transformation</i> . . . . .	65
	<b>Summary</b> . . . . .	<b>68</b>
<b>5</b>	<b>Mobile Development</b> . . . . .	<b>69</b>
	<b>Speed and Quality</b> . . . . .	<b>70</b>
	<i>Speed</i> . . . . .	70
	<i>Quality</i> . . . . .	71
	<b>Diversity of Devices</b> . . . . .	<b>71</b>
	<b>Integration</b> . . . . .	<b>72</b>

	<b>Rethinking the Development Process for Radical Speed and Quality</b> .....	<b>73</b>
	<b>Mobile Testing</b> .....	<b>78</b>
	<b>Continuous Experience Management</b> .....	<b>80</b>
	<b>Types of Mobile Apps</b> .....	<b>82</b>
	<i>Native Mobile Applications</i> .....	83
	<i>Mobile Web Applications</i> .....	85
	<i>Mobile JavaScript Frameworks</i> .....	86
	<i>HTML5</i> .....	88
	<i>Future of HTML5</i> .....	89
	<i>Hybrid Mobile Applications</i> .....	90
	<i>Mobile Application Comparison</i> .....	92
	<i>Strategic Decision Making</i> .....	93
	<b>Mobile Connectivity and Integration</b> .....	<b>95</b>
	<b>Summary</b> .....	<b>97</b>
	<b>Endnotes</b> .....	<b>97</b>
	<b>Additional Sources</b> .....	<b>98</b>
6	<b>Mobile Security and Management</b> .....	<b>99</b>
	<b>Mobile Has Unique Characteristics That Impact Security</b> .....	<b>100</b>
	<b>Mobile Devices Are Used Differently Than PCs</b> .....	<b>100</b>
	<b>Enterprise Security Requirements</b> .....	<b>102</b>
	<i>Mobile Device Management and Security</i> .....	102
	<i>Mobile Network Management and Security</i> .....	103
	<i>Mobile Application Management and Security</i> .....	103
	<b>Mobile Security and Management Consideration</b> .....	<b>104</b>
	<b>Mobile Device Management and Security</b> .....	<b>106</b>
	<i>MDM</i> .....	106
	<i>Mobile Threat Management</i> .....	108
	<b>Mobile Network Management and Security</b> .....	<b>118</b>
	<i>Mobile Network Protection</i> .....	119
	<i>Mobile Identity and Access Management</i> .....	120
	<b>Mobile Application Management and Security</b> .....	<b>126</b>
	<i>Application Security Scanning</i> .....	127
	<i>App Security Capabilities</i> .....	127

	<i>Enterprise App Store</i> .....	130
	<i>Mobile Information Protection</i> .....	132
	<b>The Adaptive Mobile Security Approach</b> .....	144
	<b>Summary</b> .....	145
	<b>Endnotes</b> .....	146
	<b>Additional Sources</b> .....	147
7	<b>Mobile Business Transformation</b> .....	149
	<b>Mobile Business Transformation</b> .....	150
	<b>Delivering a Mobile Transformation:</b>	
	<b>Extending Existing Systems to Mobile Employees</b>	
	<b>and Customers Through Context, Engagement,</b>	
	<b>and Intelligence</b> .....	153
	<i>Mobile Context</i> .....	154
	<i>Mobile Engagement</i> .....	155
	<i>Mobile Intelligence</i> .....	160
	<i>SoCloDaMo: Coherent Integration Between</i>	
	<i>Social Networks, Cloud, Data Analytics, and Mobile</i> .....	163
	<i>Security, Privacy, and Trust Become Paramount</i> .....	163
	<b>Strategy for Delivering a Mobile Transformation</b> .....	164
	<b>Summary</b> .....	166
	<b>Endnotes</b> .....	167
8	<b>Planning a Mobile Project</b> .....	169
	<b>Define Mobile Team Structure and Leadership</b> .....	171
	<b>Define Value Goals</b> .....	172
	<b>Define Value Indicators and Value</b>	
	<b>Measurements (What Does the Customer</b>	
	<b>Want to Accomplish?)</b> .....	173
	<b>Choose an Approach: Define Functional Patterns</b>	
	<b>and Capabilities</b> .....	174
	<b>Assess Gaps: Use Mobile Framework to Assess Gaps</b> ..	175
	<b>Define Overall Roadmap and Plans Based</b>	
	<b>on a Mobile Framework</b> .....	177
	<b>Assess Against Measurements and Improve</b> .....	178
	<b>Summary</b> .....	178

9	SoCloDaMo (Social + Cloud + Big Data + Mobile) . . . . .	179
	<b>Cloud and Mobile</b> . . . . .	<b>180</b>
	<b>Defining Cloud Computing</b> . . . . .	<b>180</b>
	<i>Cloud Characteristics</i> . . . . .	181
	<i>Service Models</i> . . . . .	181
	<i>Deployment Models</i> . . . . .	182
	<b>Why Mobile and Cloud</b> . . . . .	<b>183</b>
	<i>Device Limitation on Computing Resources</i> . . . . .	183
	<i>Short Cycles</i> . . . . .	183
	<i>Small Budgets Create Cloud Advocates</i> . . . . .	184
	<i>Emerging Markets</i> . . . . .	184
	<b>Mobile Cloud Development Considerations</b> . . . . .	<b>185</b>
	<i>Mobile Cloud Services</i> . . . . .	185
	<i>Centralized Build Environment in the Cloud</i> . . . . .	185
	<i>Testing Mobile Apps: How the Cloud Can Make</i> <i>Mobile Testing Simpler</i> . . . . .	186
	<b>Social and Mobile</b> . . . . .	<b>187</b>
	<i>Mobile Social Discovery: Attracting and Retaining Customers</i> . . . . .	188
	<i>What Is Unique About Social and Mobile?</i> . . . . .	189
	<b>Big Data</b> . . . . .	<b>190</b>
	<i>What Is Unique about Mobile and Data?</i> . . . . .	190
	<b>Summary</b> . . . . .	<b>190</b>
	<i>Mobile Strategy Decisions</i> . . . . .	191
	<b>Endnotes</b> . . . . .	<b>192</b>
	<b>Additional Sources</b> . . . . .	<b>193</b>
10	International Considerations . . . . .	195
	<b>Issues Influencing Adoption of Smartphones</b> <b>and Tablets in Emerging Markets</b> . . . . .	<b>196</b>
	<i>Cost Can Be Too High, but Things Are Changing</i> . . . . .	196
	<i>Network Connectivity Inhibits Use of Mobile App,</i> <i>but There Are Things That Can Help</i> . . . . .	197
	<i>Complexity of Smartphones Can Be an Inhibitor</i> <i>to Adoption, but This Will Change over Time</i> . . . . .	197
	<b>Unique Usage Patterns</b> . . . . .	<b>198</b>



	<b>What to Consider When Developing a Global Mobile Strategy . . . . .</b>	<b>199</b>
	<b>What to Consider When Developing a Dual Strategy for Smartphones and Feature/Basic Phones . . . . .</b>	<b>201</b>
	<i>Advantages of SMS . . . . .</i>	201
	<i>SMS-Based Application-to-Person (A2P) . . . . .</i>	202
	<b>Summary . . . . .</b>	<b>205</b>
	<b>Endnotes . . . . .</b>	<b>206</b>
	<b>Additional Sources . . . . .</b>	<b>206</b>
11	<b>Case Studies and Mobile Solutions . . . . .</b>	<b>207</b>
	<b>When Does an App Fail? . . . . .</b>	<b>208</b>
	<b>What Makes a Great App? . . . . .</b>	<b>209</b>
	<b>Air Canada: Innovation Through Customer Experience, Multichannel, and Cross-Channel . . . . .</b>	<b>210</b>
	<b>Visa: Reaching the Right Customer at the Right Time with the Next Best Action . . . . .</b>	<b>211</b>
	<b>TBC Corporation: 360-Degree Customer Experience . . . . .</b>	<b>212</b>
	<b>Waze: Adding Social Insight . . . . .</b>	<b>214</b>
	<b>Nike+ FuelBand: Enhancing Value by Extending with APIs . . . . .</b>	<b>215</b>
	<b>Withings: Integrate into the Life Style to Serve at the Moment of Need . . . . .</b>	<b>215</b>
	<b>Tesco's Home Plus: Reducing Steps in Daily Tasks . . . . .</b>	<b>216</b>
	<b>Square Wallet . . . . .</b>	<b>217</b>
	<b>Summary . . . . .</b>	<b>219</b>
	<b>Endnotes . . . . .</b>	<b>220</b>
	<b>Additional Sources . . . . .</b>	<b>220</b>
12	<b>Moving Forward . . . . .</b>	<b>221</b>
	<b>What You Have Learned . . . . .</b>	<b>222</b>
	<b>Guiding Principles . . . . .</b>	<b>224</b>
	<b>Conclusion . . . . .</b>	<b>225</b>

# Foreword

“Mobile” is a topic that seems to have been with us for a very long time, yet it still seems very new. The excitement, the enthusiasm, and even the frenzy is obvious across the web, in newspapers and magazines, and in water cooler conversations in businesses. We take so much for granted now, features that didn’t even exist five years ago, but we should also accept that we’re only at the beginning of this revolution.

Why do I say “revolution” instead of the safer, more conservative “evolution”? Mobile is not just about the latest smartphone or tablet, or 3G vs. 4G vs. WiFi, or even how big your device’s app store is compared to mine. The societal changes being driven by the significant use of highly programmable and interactive mobile devices with fast connectivity are affecting healthcare, banking, retail, mining, and almost all industries with which we engage. If you question this, just ask your local doctor or, even better, a teenager.

Many pieces had to come together to cause this great acceleration. First, of course, are the devices and their operating environments. These vary from very closed to very open depending on the provider, but they form the basis, the foundation, on which we can build.

Next are the apps. I’m not necessarily impressed with the sheer volume of the hundreds of thousands of apps that are out there because of the great redundancy and variable quality. However, they are showing us how the fundamental notion of “software application” has morphed. “Pick one thing and do it right” is not a bad motto for many app developers, at least at first. “Do something no one has ever done before” might follow, and “Change the way I live my life” might ensue. There are apps that do all this. I believe apps will change significantly over the next five years. How do you even begin to make sense of this revolutionary transformation?

Start with this book. I have worked with Dirk Nicol for many years as a colleague at IBM® and I believe he captures exceptionally well what you need to understand to do mobile right. Why do mobile at all? What value can it return to your business, your organization, your clients, or you? How do you handle security and manage those devices and apps? How do you decide how to build the best app for your intended use?

Dirk addresses all these questions and more. Use this book to quickly get yourself current on the state of the art for mobile, then start building those apps and services that will make you stand out successfully against your competitors.

—**Bob Sutor**, Vice President, Business Analytics and  
Mathematical Sciences, IBM Research

# Preface

For the past 20 years of my IT career, I have focused mostly on business strategy. I have played a key role in defining IBM's strategy around e-business, Java™, Web 2.0, cloud computing, Internet standards, developer communities, and most recently mobile. Over the years, I have honed my skills in strategy development and have applied these experiences to writing this book.

Of all the technology trends I have been involved in, mobile has had one of the most profound impacts on the industry and individuals. Unlike other technologies, mobile is personal. It has become part of our everyday lives. The mobile device is always with us helping get things done—helping us connect to friends and colleagues or simply entertaining us in our spare moments on the go. Because mobile technology has integrated into our daily lives, it creates a historical opportunity for businesses to interact, engage, and deliver new value to their customers and employees. As a result, mobile has become a top priority for business leaders today.

For the past several years, I have worked in the mobile arena educating customers, speaking at events, briefing analysts, and developing product strategies—almost universally, business leaders struggle with how to develop a mobile strategy. The challenge is due to the unique nature of the mobile industry. Mobile technology is in constant flux—there seems to always be a new set of technology or platforms to consider. Mobile is broad, touching almost every aspect of a business. The high-expectation for quality apps that are delivered quickly is unprecedented. Finally, security and privacy becomes a fundamental issue because the device contains a mixture of personal and corporate data. With all these challenges, the biggest strategic question I hear over and over is, "How do I get started?"

This is why I wrote this book. I wanted to apply my experiences in strategy development and mobile technology to help business leaders start developing their mobile strategy. I wanted to give them the tools to help answer the key strategic questions: What are all the capabilities and technologies I need to consider? How do all the pieces fit together? How do I get my app developed? How do I manage and secure my mobile business? How do I take full advantage of mobile technologies to transform my business? How do I prepare my mobile business for the future? I have pulled together the latest thinking and concepts in the industry today to help business leaders answer these strategic questions.

I hope you enjoy the book and can apply some of the concepts to help make your mobile business better. The mobile technology era is just starting, and there will be many new exciting technologies and innovation in the future. There is much more ahead of us and much more to learn. I would love to have a conversation with you to hear what you have learned. Please join me at my blog (<http://www.dirknicol.com>) and my Twitter account (<http://twitter.com/dirknicol>).

—Dirk Nicol

## How This Book Is Organized

Each chapter follows a similar structure. There is an introduction that outlines the key market situation surrounding a topic. The bulk of the chapter defines key considerations for your mobile strategy and discusses key concepts and technologies. The chapter then concludes with a summary of key concepts. The overall structure of the book is designed to outline key trends in the industry, a framework for defining a mobile strategy, and a set of strategic considerations that help you define your mobile strategy. These use cases are supported by examples.

- **Chapter 1, “Introducing the Mobile Enterprise”:** This chapter provides an introduction to the overall mobile landscape and outlines the implications to consider when developing a mobile strategy.
- **Chapter 2, “Defining Business Value”:** This chapter outlines how to define the overall goals for your mobile strategy and how to deliver business value.
- **Chapter 3, “Mobile Business Challenges”:** This chapter outlines the challenges that businesses face as they adopt mobile technologies.

- **Chapter 4, “The Mobile Framework”**: This chapter defines an overall framework for defining a comprehensive mobile strategy.
- **Chapter 5, “Mobile Development”**: This chapter outlines the key considerations for building mobile applications and connecting them to back-end systems.
- **Chapter 6, “Mobile Security and Management”**: This chapter talks about how to manage and secure your mobile applications and devices.
- **Chapter 7, “Mobile Business Transformation”**: This chapter provides insight and direction as to how you can transform your business to take advantage of mobile technology.
- **Chapter 8, “Planning a Mobile Project”**: This chapter outlines the key steps and considerations for defining an overall mobile project.
- **Chapter 9, “SoCloDaMo (Social + Cloud + Big Data + Mobile)”**: This chapter describes the emerging new platform that brings together social networks, cloud computing, data analytics, and mobile and how you can leverage it in your mobile strategy.
- **Chapter 10, “International Considerations”**: This chapter brings a worldwide perspective to your mobile strategy.
- **Chapter 11, “Case Studies and Mobile Solutions”**: This chapter provides examples that can help you understand how other companies have delivered successful mobile solutions.
- **Chapter 12, “Moving Forward”**: This chapter concludes the book with a summary of key concepts.

*This page intentionally left blank*

# Acknowledgments

I would like to thank Vijay Dheap and Chris Peppin for their assistance in reviewing the content of this book and providing great suggestions and insight. Vijay and Chris are experts in their field, so it was a privilege to have them contribute to this effort.

I also wanted to thank several of my team members at IBM who took the time to review sections of the book and provide thoughtful comments. Thank you to Todd Kaplinger, Miku Jha, Ron Favali, Girish Dhanakshirur, and Yonni Harif.

I would like to thank the team at IBM Press for the opportunity to deliver this book to you. Thanks goes to Chris Cleveland, Jovana Shirley, and San Dee Phillips for their help in bringing the best possible product to our readers. Thank you to our executive editor, Mary Beth Ray, for allowing us the opportunity to create this book on a flexible schedule.

I also wanted to thank IBM's Steve Stansel, the editorial program manager for IBM Press, for giving me the opportunity to write my first book.

I would like to thank Bob Sutor and Michael Karasick for giving me the opportunity to take a leadership role in driving our mobile product strategy at IBM.

Finally, I would like to thank my family, Joy, Luke, Caleb, and Isaiah, for supporting me in the ambitious undertaking of writing my first book.



*This page intentionally left blank*

# About the Author

**Dirk Nicol** is the program director for IBM Mobile Strategy and Product Management at IBM. He has spent years helping IBM advance new and emerging technologies. He has held a variety of roles at IBM, which included semiconductor development, programming, hardware development, marketing, and strategy.

Dirk has worked extensively with helping to educate and build communities around new technologies. Prior to his current position, Dirk led IBM's cloud standards program and was a founder of the Cloud Standards Customer Council initiative. Dirk also conceived and led the development of the developerWorks® project—one of the largest worldwide developer communities. Dirk holds a master's degree in electrical engineering and an MBA degree in management and strategy at the University of North Carolina. He calls North Carolina his home but is often seen presenting about the latest technology trends and strategy around the world. When home, he enjoys time with his wife and three boys jogging along the North Carolina Tobacco Trail.

We are at the beginning of a new mobile era. The technology, best practices, and methodologies will continue to evolve. This book was designed to be a starting point on a journey. I would like to take that journey with you to learn and grow together. Check in from time to time to let me know what you have learned and how your mobile strategy is progressing.

Dirk's blog is at <http://www.dirknicol.com>

Follow him at twitter at: <http://twitter.com/dirknicol>

Linkedin: <http://www.linkedin.com/in/dirknicol>

*This page intentionally left blank*

# 9

## SoCloDaMo (Social + Cloud + Big Data + Mobile)

*SoCloDaMo (Sō-Klow-Dā-Mō) is the evolution of four key technology trends—social, cloud, big data, and mobile—that has begun to converge into a new IT delivery platform. It is driven by consumer behavior, smaller IT budgets, and unending supply of connected smart devices. Most people see these forces working in their personal and business lives; however, there are profound implications to IT leaders.*

*There is a growing interdependence and convergence between social networking behavior and mobile interactions, enabled by “around the clock” availability through cloud and big data. Social, cloud, big data, and mobile come together to reinforce each other, and when combined deliver greater value than they do individually. Mobile brings location, context, always-on capability, and convenience. Mobile reinforces—and is a vehicle for—social networks and collaboration. Social networks link people to each other to work in new and interesting ways. The cloud offers a utility that provides an always-on platform for mobile and social interaction. The multitenant nature of the cloud enables everyone to interact with the same application at the same time, thus reinforcing social interaction. The cloud also delivers a platform for collecting and analyzing information. The mobile device is generating information that gives the context for behavior. Sensors are collecting information as a result of GPS coordinates, social interaction, and past buying*

*behavior. This information is then generated as a result of the tasks people perform on their device. The resulting data then gives the enterprise new insight about behavior that can provide new value to customers and employees in the form of new features, new offers, improved processes, and customer retention. The reality is that a SoCloDaMo platform is here to stay and will grow in prominence in any mobile solution. You must consider the key ways that SoCloDaMo can contribute to an overall mobile strategy and use it appropriately.*

*This chapter outlines the key capabilities and trends around cloud, social, and big data as it relates to mobile. The chapter then covers how these four major trends come together to offer a set of new capabilities for businesses that compliments an overall mobile strategy.*

## Cloud and Mobile

Mobile and cloud computing are often talked about together as two major computing trends that reinforce each other to create new value. Mobile applications can utilize the cloud for storage and computing power. Cloud computing can provide a set of services and capabilities that can complement the mobile applications on the device. Even with the first release of the Apple iPhone, cloud-based applications such as Gmail and Google Maps were part of the mobile story. Over time, the cloud and mobile story has evolved, and new capabilities such as Apple's iCloud for offline backup have provided more convenience and value for end users. Cloud-based storage complements mobile devices by reducing the need for local storage on the device. This frees the device to devote more of the hardware footprint to other capabilities. Cloud computing can also reduce the complexity of setting up and managing a mobile infrastructure. Mobile Enterprise Applications Platforms (MEAP) and Mobile Device Management (MDM) systems can be deployed as virtual images, saving time and effort in deploying a mobile infrastructure solution. In addition, mobile specific cloud services—such as notifications, location services, advertising, and social integration—can assist developers as they build their mobile applications.

## Defining Cloud Computing

To understand how mobile and cloud computing come together to provide new value, you need to first understand what cloud computing is and how it is defined.

*Cloud computing* enables an on-demand network access to a shared pool of computing resources (for example, networks, servers, storage, applications, and services) that can be rapidly provisioned and released.<sup>1</sup>

Cloud computing is attractive to businesses as an additional computing deployment model for computing resources. For those situations in which the complexity of setting up and managing a computing environment might be prohibitive, cloud computing can provide an alternative. It can be particularly attractive for small companies and startups that do not have the skill and capital to set up and manage a full-blown computing environment. Cloud computing can also be valuable in situations in which there are temporary or seasonal spikes in computing resource. In this case, a cloud environment could be used to handle the extra computing demands.

## Cloud Characteristics

There are several key distinguishing characteristics of cloud computing. In the same way an electric utility company provides power, cloud computing relies on the sharing of computing resources to achieve economies of scale. The cloud provider's computing resources are pooled to serve multiple end users (multitenant). Resources are provisioned and deprovisioned based on end user demand. To the end user, the cloud computing resources appear to be unlimited and can be accessed through any device.<sup>2</sup>

## Service Models:

There are a variety of types of clouds that vary by the level of abstraction to the end user or developer. There are three primary service delivery models for the cloud:

- **Software as a Service (SaaS):** A software delivery model in which applications are hosted by the service provider. The end user does not manage or control the underlying infrastructure (storage, network, and operating systems). Examples include Gmail, Google Docs, Netflix, Google Apps, Box.net, Dropbox, and Apple iCloud.
- **Platform as a Service (PaaS):** Provides a computing platform or operating environment over the Internet. The end user creates software applications using a PaaS development environment from the provider. The end user does not manage or control the underlying infrastructure (storage, network, servers, and so on); however, the end user may set deployment

and configuration settings. Examples include Windows Azure, Google App Engine, and IBM SmartCloud Application Services.

- **Infrastructure as a Service (IaaS):** Delivers underlying computing and processing resources such as storage, network, hardware, servers, and so on. Examples include Amazon.com Web Services, IBM SmartCloud Enterprise, and Rackspace Cloud.

The industry has also coined derivative terminology for particular niche cloud capabilities such as Monitoring as a Service (MaaS), Network as a Service (NaaS), and Communications as a Service (CaaS). In addition, as you will see, there is an emerging new cloud approach for mobile development called Mobile Back End as a Service (BaaS).

### **Deployment Models:**

The following are several ways that a cloud infrastructure can be deployed:

- **Private cloud:** The cloud infrastructure is managed and provisioned for use by a single organization. Some choose the private cloud approach when more control of the cloud infrastructure is needed. This is the case when security or control of corporate data may be a concern.
- **Public cloud:** The cloud infrastructure is provisioned for use by the general public. This approach may have the lowest upfront cost.
- **Hybrid cloud:** The cloud infrastructure is a combination of attributes of both the private and public cloud approaches. In this case, an organization can take advantage of the particular attributes of the private or public cloud to meet its particular needs.

You need to consider all the ramifications of cloud computing before adopting it as a solution. In the case of a public cloud, you need to understand the total cost of cloud deployment. You might find that over the lifetime of a computing solution, the pay-as-you-go approach might end up being more expensive than an in-house deployment. You also need to understand the security implications of cloud computing. Particularly with a public cloud, you need to consider where the data is located and who has access to it. Sensitive corporate and government data might not be appropriate for a public cloud deployment. Also, many of the cloud computing environments are proprietary in nature, in which solutions developed for one cloud cannot

be moved to another. Although standard efforts work to provide more freedom and choice for cloud users such as the Open Cloud Manifesto (which initiated the cloud standards movement) and the Cloud Standards Customer Council (defining the cloud standards requirements for the industry), continuous work is needed. As a result, you must consider the implications of vendor lock-in and freedom of choice.

## Why Mobile and Cloud

As you consider a mobile strategy, you must understand the unique aspects that drive the use of cloud computing in a mobile solution. These are described in following sections.

### **Device Limitation on Computing Resources**

Even though mobile devices today, such as smartphones and tablets, offer unprecedented computing power in the palm of your hands, it is not unlimited. Relying on cloud computing to provide additional storage and computing power can give the end user a complete experience. Cloud-based storage can offer value to a mobile solution. With technologies such as Apple's iCloud, the ability to back-up data, pictures, videos, and applications to cloud storage not only provides a needed storage solution but also protects the information if the device is lost or stolen. Storage of large documents with solutions such as Dropbox or box.net can help overcome the limitations of on-device storage and make it easy to share the files with others. Applications such as Gmail or Google Maps can give the end user a comprehensive application on the cloud outside of the mobile device. However, the use of third-party cloud-based solutions should only be considered in context of an overall security strategy and policy.

### **Short Cycles**

A consistent characteristic in any mobile project is the short development cycles. The expectations for shortened timelines makes any mobile project a challenge. There was a time when software projects took years; then with the web the expectation was "web years," which were actually months. Now you have a new era of ridiculous expectations in which the inception to deployment of an app should be done in a "mobile minute."



Development teams cannot afford to spend weeks trying to debug and set up back-end systems. When time is short and the pressure is on, developers turn to cloud-based solutions. Computing resources that are already set up and easily accessed on demand can radically accelerate development processes. Instead of reinventing a storage, security, or network solution for each app, it makes sense to rely on an available cloud infrastructure with all the required capabilities already available.<sup>3</sup> This is where the emerging cloud capability BaaS comes in. A BaaS is a cloud-based set of services specifically tailored to mobile developers that can significantly reduce the cost and complexity of a mobile project while speeding up delivery.<sup>4</sup>

BaaS providers deliver key mobile services such as storage, push notification, messaging, analytics, user management, and other essential services for mobile developers, using a pay-as-you-go pricing model.

### **Small Budgets Create Cloud Interest**

Budget constraints have always been an issue in the IT industry. “More with less” seems to be the norm. With the speed and frequency of mobile development projects, however, budget constraints are more important now than ever. Small companies and startups most likely do not have the initial capital needed to set up a sophisticated IT infrastructure. Even for large companies where experimentation in mobile solutions is common, the mobile project return on investment (ROI) might not be clear or perhaps the project is short lived. Setting up a cloud infrastructure quickly and with low upfront costs can make a lot of sense. With cloud computing, you can pay as you go, start quickly, and add more resources over time. After the Mobile project proves its value, you can move more of the infrastructure to a traditional infrastructure if needed.

### **Emerging Markets**

Not every part of the world has the same infrastructure in place for a complete mobile development and delivery process. Remotely accessing a mobile infrastructure for development and deployment can be critical in emerging markets in which there may be limited availability of the necessary hardware, network, and software infrastructure.<sup>5</sup> In this case, a mobile cloud infrastructure delivered as a complete service can be indispensable for emerging markets.<sup>6</sup>

## Mobile Cloud Development Considerations

### Mobile Cloud Services

You can build and deliver a mobile application in a variety of ways. You can use the software development kits (SDK) provided by the handset mobile OS manufacturers, such as Apple iOS or Google Android. This approach is fine for a single and simple app targeting a particular mobile OS. However, if you need to build for a variety of mobile devices and connect to a heterogeneous enterprise infrastructure, you will need a more comprehensive mobile application platform. You can use an installed software approach such as a MEAP.

Generally, a MEAP is a middleware platform installed within the enterprise. It has a cross-platform mobile application development environment that supports connectivity to back-end enterprise applications and databases. A MEAP also provides a centralized management component that enables administration, management, and enterprise security of the applications. In addition to an on-premise deployment, the MEAP itself could be deployed as a virtual image within a cloud environment. This can help save IT teams the steps to set up and manage the MEAP environment and may offer a rental pricing model which may be attractive to some development teams. Additionally, some companies (also known as Mobile Back end as a Service or BaaS) have begun to offer specific cloud based mobile services, such as storage, user management, analytics, advertising, payments, push notifications, and integration with social networking services. These mobile specific services can be complimentary to your MEAP deployment by incorporating these mobile specific cloud services into your mobile development process.

### Centralized Build Environment in the Cloud

When building for multiple device platforms, each build environment has its own compiler. As such, each development team (Android, Apple, Microsoft, and so on) needs its own build environment. Maintaining multiple build environments can be a challenge for some operation teams. For example, with the popularity of the Apple products, you might think that an iOS platform would be a mainstay in today's enterprises; in reality, many businesses do not support the deployment of Apple products. This is due to a variety of reasons including skills, security concerns, or just capacity. In the

end, this can create a challenge for those trying to define a mobile development strategy. Developers need access to the Mac operating system to compile the source code into an executable mobile app. Without access to Macs, the ability to develop a cross-platform mobile app strategy is not viable.

One approach to solving the challenge of building mobile applications when supporting multiple device platforms is to outsource the development or consider a centralized build in the cloud. You can access the build environments through a centrally managed cloud remote desktop. In addition to solving the issue of accessing Macs, the cloud approach can also provide a centrally managed build environment, significantly reducing the cost of managing the app build process for a variety of platforms.

### **Testing Mobile Apps: How the Cloud Can Make Mobile Testing Simpler**

It is clear that users have many choices for device types, sizes, and platforms. It is even common for users to have more than one device. As a result the mobile device landscape is fragmented—forcing businesses to support many different types of devices. The interfaces are nonstandard with a variety of screen sizes and resolutions. Each device type has its own operating system with unique characteristics and user experience. There are many variations of mobile operating systems. This is most prominent with the Android platform. There are many different permutations and versions of the operating system and even forked versions of the Android open source project. Each carrier may tweak the mobile OS to optimize for a particular hardware platform or a particular network. As a result, the test matrix for a mobile app can be huge with many, many permutations. Unlike the web, where the test target was essentially the web browser, with mobile development you need to have access to the mobile device to understand it. You also need to simulate the back-end systems, network, and environment. Development teams located across multiple locations need to collaborate and share access to the mobile devices. A typical mobile development project needs 30–40 devices that are currently in the market, and 30 percent will need to be replaced each quarter.<sup>7</sup> Add to this the dynamic nature of the mobile market and short development cycles, and the cost in logistics, procurement, and management of these devices can be cost-prohibitive. In the end, complexity of mobile testing can be a significant challenge for any IT department.

A cloud-based mobile test environment can significantly simplify the testing process. There are vendors in the market, such as Perfecto Mobile and Device Anywhere, which offer web-based access to a large pool of physical mobile devices, connected to live networks worldwide. Developers and testers can access these devices through a cloud interface. This gives developers access to a wide variety of mobile devices during the testing phase for both manual and automated testing. The development team is essentially renting the latest collection of mobile devices it needs to meet its test plan. The mobile devices can be set up in a variety of locations around the world to validate the experience on a specific carrier network. Because these devices are centrally managed, the testing can be automated to ensure that specific test cases are validated with all the interaction recorded on video. The cloud-based test facility then provides the developer with a complete view of all the test results. After the test phase is complete, the mobile devices are returned to the centralized pool of devices. In this way, each developer feels they have unlimited access to mobile devices whenever they are needed. This saves the enterprise from having to maintain and manage all these devices and gives them a true on-demand test environment. Because all the devices are available in the cloud, there is no need to procure and manage the devices. Devices can be added or replaced immediately, and development teams can access the same device to replicate bugs and resolve test issues.

Not only can the device test experience be delivered through a cloud, but you can also simulate a back-end system through a cloud-based environment. Solutions such as IBM's Rational Test Virtualization Server help you in modeling and simulating real system behavior to eliminate application test dependencies and reduce infrastructure costs. This helps improve the quality of software applications by enabling developers to use cloud computing technologies to conduct testing of software applications, including mobile applications, without having to set up the actual infrastructure.

## Social and Mobile

Social networking has become a prominent way by which people interact, share information, and collaborate. Because smartphones leverage GPS and the camera, they enable much more interaction and contextual engagement. As a result, social applications are among the most popular for mobile devices. Applying the social networking philosophy and capabilities to the enterprise can certainly add to the bottom line. McKinsey and Company report that the revenue growth of social businesses is 24 percent higher than

businesses that do not apply social capabilities.<sup>8</sup> Enabling the workforce to share information and collaborate can make the organization more effective. Applying social technologies such as blogs, wikis, social bookmarking, instant messaging, e-meetings, and document sharing can help a workforce to collaborate, uncover innovation, and improve competitive posture.

In the consumer space, mobile devices have become the main way that people interact with social networks. For example, 60 percent of Facebook updates are from mobile devices.<sup>9</sup> In the enterprise, when combining social capabilities with mobile devices, you are now adding context (location through GPS, environment through sensors, orientation through compass, and so on) to an overall social strategy while enabling employees to collaborate anytime and anyplace. Mobile adds a new level of insight into enterprise information sharing and collaboration. This can tremendously increase the value of a social business strategy and improve the bottom line. Your enterprise social strategy, both internally and externally to the enterprise, should have a mobile component and be tightly aligned with your overall mobile strategy.

### **Mobile Social Discovery: Attracting and Retaining Customers**

Social discovery is a way to use mobile phones and tablets to find nearby people, events, and places that are relevant at a particular moment. This information helps customers gain insight and information that can drive purchases, create loyalty, and create community. They may also be swept up in the activity of the crowd and make a transaction based on the activity of other people.

To drive social discovery, a system is needed that understands a user's past buying habits, behavior, and activities. End users would opt in to get value from the interaction at the same time the system is learning about the customers' behavior, matching tailored offerings that would have the greatest likelihood of closing. All this information must be collected, analyzed, and sorted for value.

A great example of this is the Foursquare app. When you start the Foursquare app it offers you the choice to 'check-in' to the establishment where you are currently. For example, if you are at a coffee shop, the Foursquare app would determine your location based on your GPS coordinates. You can then check-in to the coffee shop. You are then given the option to type a few words describing what you are doing, which can be

shared through your Twitter or Facebook. Once you check-in, you may be presented with a badge that you earn based on certain achievements (first time check-in, most check-ins, and so on). You may also receive coupons or other offers from the coffee shop or tips from other visitors. This process helps the coffee shop get free advertising based on Twitter and Facebook posts. The customer can gain offers, the enjoyment of reaching various levels of achievement, and tips from others.

### What Is Unique About Social and Mobile?

When mobile and social are brought together, there are some unique considerations:

- **Mobile devices can sense the world around you providing context and driving innovation and business value:** Mobile devices have a rich set of new sensors such as compass, GPS, accelerometers, gyroscopes, and NFC. This can enable many new business scenarios such as identifying colleagues based on GPS coordinates, e-meetings on the go, mobile device transcription of conference calls, and many other new innovations.
- **Mobile and social can increase information and data:** As social tools and mobile apps take advantage of new devices sensors, they can provide more consumer data and more contextual insight. This massive amount of available data will create new opportunities to better serve your customers and employees. Data analytics and Big Data (likely related to cloud computing) can play a major role in understanding the data that can drive innovation. Organizations must become better at collecting, protecting, managing, interpreting, and acting on the data collected via social interaction through mobile devices.<sup>10</sup>

It is clear that mobile amplifies social networking, giving interaction a context. This context provides a much richer level of interaction and insight—in the moment. The contextual information, in the form of sensor and location data, generates a tremendous amount of data that must be sorted and analyzed in order to have any value to a business process. Social information can be combined with analytics to help users gain insight to perform the next best action. Consider how the GPS traffic app called Waze uses social information from app users along with analytics to determine traffic patterns, speed traps, and car crashes in real time. This is where big data and the cloud come in to the mobile story.

## Big Data

Big data analytics is defined as data sets that go beyond the capacity of conventional databases. Big data usually relates to collecting massive information about the world. Data collected can be too big, streams too fast, or arrive in a structure that cannot be easily analyzed. The idea around big data is that new techniques and approaches are needed to deal with these new types of information. If analyzed correctly, this massive amount of data can give new insight that can help differentiate your business. The sort of technology needed to analyze and process large data sets has been around for some time but only available to a few companies with deep pockets. New technologies leveraging commodity hardware and scale via cloud computing have made big data analysis available to smaller companies, startups, departments, and individuals.<sup>11</sup>

### **What Is Unique about Mobile and Data?**

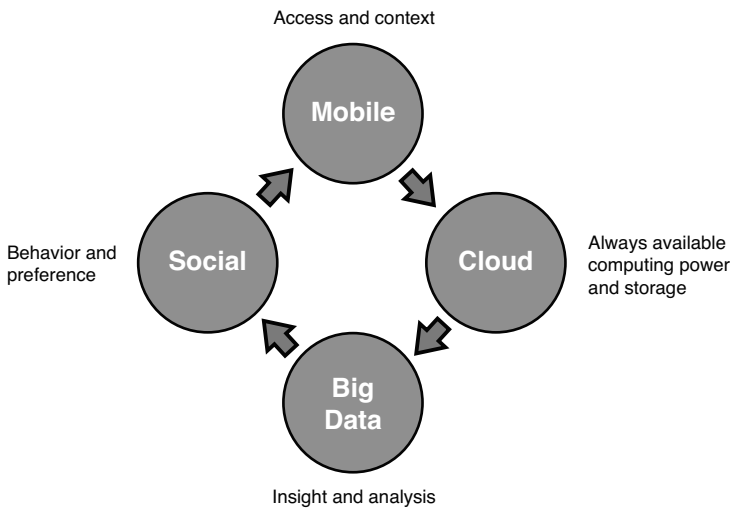
Cloud-enabled data analysis gives mobile the information context that can enhance the social and mobile experience. Advanced analytics, stream processing, Hadoop, and other technologies have given businesses unprecedented power to analyze complex behavior within manageable costs.

People are sharing information through their social interactions—information about the latest project, best practices, and latest data. Customers provide information about their preferences through buying and searching behavior. Harnessing this information gives businesses unprecedented insight into the behavior of their customers and how to empower their employees to be more efficient. Mobile increases the volume, velocity, and variety of data and gives it greater context and relevance.

## Summary

There was a time when an individual's technology experience was much more sophisticated at work than at home. This has changed. The consumer-based services that you use daily in your personal life are so compelling because they effectively bring together social, cloud, data and mobile. It is as though the computing platforms of your personal life have set high expectations for the IT departments at work. As a result, IT is catching up. Companies see the consumerization of IT as both a challenge and an

opportunity to differentiate. Bringing together social, cloud, data, and mobile in the right way can create a platform for IT that can form the basis of a “system of engagement,” as shown in Figure 9.1. The SoCloDaMo platform can deliver a system that empowers customers, employees, and partners through mobile apps that address their specific task in context of their immediate need. It brings together the behavior and preferences of their peers (social) with access and context (mobile) to give them insight (data analytics) when they need it (cloud).<sup>12</sup>



**Figure 9.1** Four elements of a SoCloDaMo platform.

## Mobile Strategy Decisions

The following are many strategic considerations that can help to guide your strategy:

- **Cloud**
  - What service model is needed (IaaS, PaaS, or SaaS)?
  - Considering security and access, which deployment model is needed (private, public, or hybrid)?
  - Are there specific needs that can drive the cloud adoption—speed of development, reducing cost, test, deployment, and so on?



- Have all the security, vendor lock-in management issues been considered?
- How can your cloud strategy link to your existing IT and security infrastructure?
- **Social**
  - Will the app inherently drive social interaction, or is social training and education needed?
  - Does the social behavior drive value linked to your business goals?
  - How can the data from the social interaction get fed into the data analysis systems?
  - Social insight happens with scale. Does the social platform tie into a cloud-based system?
- **Mobile**
  - Which MEAP platform most easily ties into the SoCloDaMo vision?
  - How does your MEAP and BaaS systems tie together?
  - Does the app engage the end user to generate the behavior and insight needed to deliver business value?
  - Does the mobile device provide the appropriate context of location, behavior, and activity that can generate the appropriate data while protecting privacy and personal information?
- **Big Data**
  - Are systems available to manage the velocity, variety, and volume of data based on the mobile and social data streams?
  - Are the tools in place to analyze the data that may be structured and nonstructured?
  - Are the analysis systems tied into the business processes so that insight can drive new value for customers and employees?

## Endnotes

- <sup>1</sup> NIST. "Final Version of NIST Cloud Computing Definition Published": <http://www.nist.gov/itl/csd/cloud-102511.cfm>
- <sup>2</sup> Wikipedia. "Cloud Computing": [http://en.wikipedia.org/wiki/Cloud\\_computing](http://en.wikipedia.org/wiki/Cloud_computing)

- 3 The Server Side. “Why Mobile Developers Embrace the Cloud. Why Others PaaS on It”: <http://www.theserverside.com/feature/Mobile-Developers-Embrace-Cloud-Computing-Platforms>
- 4 Forrester. Mobile Backend-As-A-Service: The New Lightweight Middleware? [http://blogs.forrester.com/michael\\_facemire/12-04-25-mobile\\_backend\\_as\\_a\\_service\\_the\\_new\\_lightweight\\_middleware](http://blogs.forrester.com/michael_facemire/12-04-25-mobile_backend_as_a_service_the_new_lightweight_middleware)
- 5 How Cloud Computing Transforms Emerging Markets: <http://smarterplanet.com/blog/2011/03/how-cloud-computing-could-transform-emerging-markets.html>
- 6 Ibid.
- 7 Mobile Application Testing. “Three Key Recommendations/ Considerations for Choosing a Mobile Testing”: <http://www.mobileappstesting.com/category/cloud-mobile-testing/>
- 8 ZD Net. “Social tech in biz more than collaboration”: <http://www.zdnet.com/social-tech-in-biz-more-than-collaboration-2062302300/>
- 9 <http://blog.pontiflex.com/2012/01/03/70-of-mobile-users-access-face-book-via-mobile-apps/>
- 10 ZD Net. “The convergence of mobile and social: The next IT battleground”: <http://www.zdnet.com/the-convergence-of-mobile-and-social-the-next-it-battleground-7000003015/>
- 11 Strata. “What is big data?”: <http://strata.oreilly.com/2012/01/what-is-big-data.html>
- 12 [http://www.gartner.com/DisplayDocument?doc\\_cd=234840&ref=g\\_noreg](http://www.gartner.com/DisplayDocument?doc_cd=234840&ref=g_noreg)

## Additional Sources

Gartner: “Every budget is an IT budget”:

<http://www.zdnet.com/gartner-every-budget-is-an-it-budget-7000006151/>

Rational Test Virtualization Server

<http://www-01.ibm.com/software/rational/products/rtvs/>

*This page intentionally left blank*

*This page intentionally left blank*

# Index

## *A*

- A2P (application-to-person) solutions, 202-205
- accelerometer for input, 8
- access management, 44, 103, 120
  - biometric authentication, 124
  - certificate management, 121
  - multifactor authentication, 122-123
  - pattern-based authentication, 125-126
  - proximity-based authentication, 124
  - single sign-on, 121
- adapatability of transformative mobile apps, 161
- adaptive authentication, 144-145
- adoption rates for smartphones/tablets
  - influences on, 196
    - complexity of devices*, 197
    - device cost*, 196-197
    - network connectivity*, 197
  - rural versus urban adoption rates, 200
  - statistics, 200
- agile development in mobile development, 58
- Air Canada case study, 210-211
- analysis of data, 161
- Android in history of smartphones, 20
- Angry Birds Space, 112
- antimalware, 117
- antiphishing software, 117

Apache Cordova, 72, 90

## APIs

management, 96

native API access, 84

Nike+ FuelBand case study, 215

Apple iPhone in history of smartphones, 19

application linking, 159-160

application security scanning, 127

application-to-person (A2P) solutions, 202-205

## apps, 8

case studies

*Air Canada*, 210-211

*Nike+ FuelBand*, 215

*resources for information*, 220

*Square Wallet*, 217-218

*TBC Corporation*, 212-213

*Tesco's Home Plus*, 216-217

*Visa*, 211-212

*Waze*, 214

*Withings*, 215-216

development. *See* mobile development

distribution model, 8

driving value with, 21

*consumer versus retailer value*, 24-27

*contextual information*, 21-22

*mobile intelligence*, 22-23

*user engagement*, 24

failure of, 208

functional patterns in, 52-55

future of, 221-222

in history of smartphones, 20

linking, 159-160

post-deployment control, 46

security, 103-104, 127

*application security scanning*, 127

*authenticity testing*, 128

*challenges*, 43-45

*encrypted on-device storage*, 128

*enforcing remote updates*, 129-130

*enforcing security updates*, 129

*enterprise app stores*, 130-132

*information protection*, 132-143

*offline authentication*, 128

*steps in*, 64

*unique device IDs*, 129

successful customer engagement, 209

testing, 78-80

*in cloud*, 186-187

transformative apps, 207-208

types of, 82

*comparison*, 92-93

*hybrid mobile applications*, 90-92

*mobile web applications*, 85-88

*native mobile applications*, 83-85

Astley, Rick, 111

augmented reality, 26-27

authentication, 44, 103, 121

adaptive authentication, 143

biometric authentication, 124

multifactor authentication, 112, 122-123, 143

offline authentication, 128

pattern-based authentication, 125-126

proximity-based authentication, 124

authenticity testing, 128

authorization, 44, 103, 121

automated testing, 80

## B

B2B (business to business)

value-based goals, 28-29

B2C (business to consumer)

value-based goals, 29-30

B2E (business to enterprise)

value-based goals, 28-29

BaaS (Mobile Back End as a Service), 182, 184

back-end event management in mobile development, 60

- back-end systems**
  - connections to, mobile app development for, 40-41
  - establishing context with, 153-154
  - integration with, 95-96
  - virtualization, 80
- battery life for mobile technology, 7**
- big data, mobile technology and, 190**
- biometric authentication, 124**
- black-box testing, 127**
- BlackBerry in history of smartphones, 19**
- bring your own device (BYOD) policies**
  - advantages and disadvantages, 11-12
  - security concerns, 63
- budget constraints, cloud computing and, 184**
- business drivers of mobile strategy**
  - defining, 172-173
  - linking with user expectations, 173-174
- business processes, improving, 152**
- business solutions, creating, 152**
- BYOD (bring your own device) policies**
  - advantages and disadvantages, 11-12
  - security concerns, 63
- C**
- CaaS (Communications as a Service), 182**
- call and text blockers, 117**
- case studies**
  - Air Canada, 210-211
  - Nike+ FuelBand, 215
  - resources for information, 220
  - Square Wallet, 217-218
  - TBC Corporation, 212-213
  - Tesco's Home Plus, 216-217
  - Visa, 211-212
  - Waze, 214
  - Withings, 215-216
- CEM (Customer Experience Management) strategy, 82**
- centralized builds, 76, 185-186**
- certificate management, 121**
- change control, 76**
- client-side injection, 113-114**
- cloud computing, mobile technology and, 180**
  - advantages of, 183-184
  - centralized build environment, 185-186
  - characteristics of cloud computing, 181
  - cloud computing, defined, 180-181
  - deployment models, 182-183
  - MEAP, 185
  - service models, 181-182
  - testing mobile apps, 186-187
- Cloud Standards Customer Council, 183**
- cloud storage, 134**
- code generation, 39, 76**
- code reviews, 127**
- collaboration**
  - of agile development teams, 77
  - in mobile development, 58
- Communications as a Service (CaaS), 182**
- complexity of devices, effect on smartphone/tablet adoption, 197**
- computing**
  - history of, 2-4
  - mobile technology compared with other computing technologies, 4-5

- connection availability with mobile technology, 7
- connectivity with back-end systems, 95-96
  - mobile app development for, 40-41
- consumer value driven by mobile apps, 24-27
- consumerization of IT (Information Technology), 9-11
- containerization, 137-138
- context
  - driven by mobile apps, 21-22
  - in history of smartphones, 18-20
- continuous experience management, 80-82
- continuous improvement in mobile development, 59
- controlled releases, 79
- Cordova, 72, 90
- corporate data protection, 104, 132-133
  - data loss
    - causes of*, 134
    - defined*, 133-134
    - prevention*, 45
  - data separation
    - mobile app wrappers*, 138-139
    - mobile containerization*, 137-138
    - mobile virtualization*, 139
    - with SDK development*, 138
  - encryption, 135-136
  - strategy, 140-143
- corporate network connectivity, mobile app development for, 41
- cost of smartphones/tablets, 196-197
- cross-channel, 74, 156-158
- cross-organizational leadership for mobile data protection strategy, 140
- cross-platform strategy with SMS messages, 201-205
- cross-platform support in mobile development, 58
- crowdsourcing (Waze case study), 214
- customer engagement. *See also* mobile engagement
  - driven by mobile apps, 24
  - in history of smartphones, 18-20
  - Nike+ FuelBand case study, 215
  - resources for information, 220
  - Square Wallet case study, 217-218
  - with successful apps, 209
  - TBC Corporation case study, 212-213
  - Tesco's Home Plus case study, 216-217
  - with transformative mobile apps, 151-152
  - Visa case study, 211-212
  - Waze case study, 214
  - Withings case study, 215-216
- customer expectations, 73
  - Air Canada case study, 210-211
  - continuous experience management, 80-82
  - linking with mobile strategy goals, 173-174
  - mobile app development for, 40, 59
  - native mobile applications, 84
- customer experience
  - with HTML5, 89
  - international customers, 198-199
  - mobile engagement, 66
  - with mobile technology, 6
- Customer Experience Management (CEM) strategy, 82
- Cydia, 115



**D**

data analysis, 161  
mobile technology and, 190

data loss  
causes of, 134  
defined, 133-134  
prevention, 45

data separation  
encryption versus, 136  
mobile app wrappers, 138-139  
mobile containerization, 137-138  
mobile virtualization, 139  
with SDK development, 138

decision making with mobile apps, 22-23

denial-of-service (DoS) attacks, 113

deployment models for cloud computing, 182-183

designing user interface, 75

desktop PCs, role in computing history, 3

development challenges for mobile apps, 36-37  
accelerated time-to-market requirements, 41-42  
connectivity to back-end systems and data, 40-41  
high user expectations, 40  
integration with existing development processes, 42-43  
multiple platforms, 37-40

development cycle times, 183-184

device clouds, 79

device configuration, 107

device inventory, 107

digital certificate, 122

disposable income, considering in international mobile strategy, 200

distribution model for apps, 8

document containers, 137

document security, 135

Dorsey, Jack, 217

DoS (denial-of-service) attacks, 113

dynamic app testing, 127

**E**

emerging markets, cloud computing and, 184. *See also* international mobile strategy

employees  
productivity, 152  
security and, 45

encryption, 45, 135-136  
management, 107  
on-device storage, 128

engagement  
mobile engagement, 66, 153-155  
*application linking*, 159-160  
*omnichannel*, 156-158  
*service composition*, 159  
*simplified information delivery*, 156

user engagement  
*driven by mobile apps*, 24  
*in history of smartphones*, 18-20  
*Nike+ FuelBand case study*, 215  
*resources for information*, 220  
*Square Wallet case study*, 217-218  
*with successful apps*, 209  
*TBC Corporation case study*, 212-213  
*Tesco's Home Plus case study*, 216-217  
*with transformative mobile apps*, 151-152  
*Visa case study*, 211-212  
*Waze case study*, 214  
*Withings case study*, 215-216

enterprise agile development in mobile development, 58

enterprise app stores, 130-132

- enterprise mobile strategy.** *See also*
- mobile apps**
  - aspects of, 222-223
  - framework for, 50-52
    - functional patterns in mobile apps,* 52-55
    - mobile business transformation,* 65-67
    - mobile development,* 57-62
    - mobile management and security,* 62-64
  - goals, 13-14
  - guiding principles, 224-225
  - international considerations, 199-201
  - methodology, 169-170
    - functional patterns, defining,* 174-175
    - gap assessment,* 175-176
    - goals, defining,* 172-173
    - mobile architecture, defining,* 177
    - performance assessment,* 178
    - team structure and leadership, defining,* 171
    - user expectations, linking goals with,* 173-174
  - post-deployment control of apps, 46
  - questions to answer, 36
  - security challenges, 43-45
  - SoCloDaMo strategy decisions, 191-192
  - for transformative mobile apps, 164-166
  - value-based goals in, 27-28
    - B2C goals,* 29-30
    - B2E and B2B goals,* 28-29
    - combining with performance indicators and implementation approach,* 30-32
- environmental context,** 155
- delivering value in, 65
- extensible development**
- platforms, 75
- external memory protection,** 135
- ## F
- failure of mobile apps,** 208
- fake utilities,** 112
- feature integration with mobile technology,** 7
- feature/basic phones.** *See* crossplatform strategy
- file attachments, data loss from,** 135
- firewalls,** 117
- flexible deployment,** 108
- FlexiSpy,** 110-111
- Foursquare app,** 188
- framework for mobile strategy development,** 50-52
- functional patterns in mobile apps, 52-55
  - mobile business transformation, 65-67
  - mobile development, 57-62
  - mobile management and security, 62-64
- functional patterns**
- categories of, 175
  - defining, 174-175
  - in mobile apps, 52-55
- future**
- of HTML 5, 89-90
  - of mobile technology, 221-222
- ## G
- gap assessment,** 175-176
- geofencing,** 8
- gesture recognition,** 89
- global mobile strategy**
- considerations, 199-201
  - crossplatform strategy with SMS messages, 201-205

influences on smartphone/tablet  
 adoption, 196  
*complexity of devices*, 197  
*device cost*, 196-197  
*network connectivity*, 197  
 resources for information, 206  
 unique usage patterns, 198-199  
**goals**  
 of mobile strategy  
*defining*, 172-173  
*linking with user expectations*,  
 173-174  
 value-based goals, 27-28  
*B2C goals*, 29-30  
*B2E and B2B goals*, 28-29  
*combining with performance indicators  
 and implementation approach*,  
 30-32  
**Google Android in history of  
 smartphones**, 20  
**GPS (Geo Positioning System)**  
 with mobile technology, 7-8  
**guiding principles for enterprise  
 mobile strategy**, 224-225

## H

**hacking mobile devices**, 44  
**historical behavior**, 155  
 delivering value in, 66  
**history**  
 of computing, 2-4  
 of smartphones, 18-20  
**Home Plus case study**, 216-217  
**HTML 5**, 72, 88  
 future of, 89-90  
 mobile devices and, 89  
**hybrid clouds**, 182  
**hybrid mobile applications**, 90-92  
 comparison with other types, 92-93

## I

**IaaS (Infrastructure as a  
 Service)**, 182  
**IBM Simon in history of  
 smartphones**, 19  
**identity management**, 103, 120  
 biometric authentication, 124  
 certificate management, 121  
 multifactor authentication,  
 122-123  
 pattern-based authentication,  
 125-126  
 proximity-based authentication,  
 124  
 single sign-on, 121  
**Ikee worm**, 111  
**image-based authentication**,  
 125-126  
**implementation approach**,  
 combining with value-based  
 goals, 30-32  
**in-the-moment offers**, 161-162  
**independent information**,  
 building trust with, 162-163  
**individual identity**, delivering  
 value in, 66  
**information protection**, 104,  
 132-133  
 data loss  
*causes of*, 134  
*defined*, 133-134  
*prevention*, 45  
 data separation  
*mobile app wrappers*, 138-139  
*mobile containerization*, 137-138  
*mobile virtualization*, 139  
*with SDK development*, 138  
 encryption, 135-136  
 strategy, 140-143  
**Information Technology (IT)**,  
 consumerization of, 9-11

**Infrastructure as a Service (IaaS)**, 182  
**innovation speed for mobile technology**, 6  
**input with accelerometer**, 8  
**integrated development platforms**, 75  
**integration**  
   with back-end systems, 95-96  
   *mobile app development for*, 40-41  
   with internal security systems, 107  
   in mobile development, 60  
**intellectual property protection**, 134  
**intelligence**  
   driven by mobile apps, 22-23  
   in history of smartphones, 18-20  
**intercepting data communications**, 134  
**internal system integration**, 107  
**international mobile strategy**  
   considerations, 199-201  
   crossplatform strategy with SMS messages, 201-205  
   influences on smartphone/tablet adoption, 196  
   *complexity of devices*, 197  
   *device cost*, 196-197  
   *network connectivity*, 197  
   resources for information, 206  
   unique usage patterns, 198-199  
**Internet, role in computing history**, 3  
**iPhone in history of smartphones**, 19  
**IT (Information Technology)**, consumerization of, 9-11

### *J-K-L*

**jailbreaking mobile devices**, 44, 115-116  
**journey maps**, 74

**leadership, defining**, 171  
**learning curve for mobile devices**, 38  
**legal issues, regulatory compliance**, 134  
**life-cycle management in mobile development**, 59  
**linking mobile apps**, 159-160  
**local storage**, 89  
**location awareness**, 89  
**location-based security**, 107  
**logical architecture**, 177  
**lowest-common-denominator apps, avoiding**, 38

### *M*

**MaaS (Monitoring as a Service)**, 182  
**mainframes, role in computing history**, 2-3  
**malware**, 109-110  
**MAM (Mobile Application Management)**, 103  
**man-in-the-middle (MitM) attacks**, 119  
**MDM (Mobile Device Management)**, 44, 63, 102, 106-108  
**MEAP (Mobile Enterprise Application Platform)**, 4, 92, 127, 185  
**measurements**, 178  
**MitM (man-in-the-middle) attacks**, 119  
**mobile app wrappers**, 138-139  
**Mobile Application Management (MAM)**, 103  
**mobile apps**, 8  
   case studies  
     *Air Canada*, 210-211  
     *Nike+ FuelBand*, 215  
     *resources for information*, 220

- Square Wallet*, 217-218  
*TBC Corporation*, 212-213  
*Tesco's Home Plus*, 216-217  
*Visa*, 211-212  
*Waze*, 214  
*Withings*, 215-216
- development. *See* mobile development
- distribution model, 8
- driving value with, 21
  - consumer versus retailer value*, 24-27
  - contextual information*, 21-22
  - mobile intelligence*, 22-23
  - user engagement*, 24
- failure of, 208
- functional patterns in, 52-55
- future of, 221-222
- in history of smartphones, 20
- linking, 159-160
- post-deployment control, 46
- security, 103-104, 127
  - application security scanning*, 127
  - authenticity testing*, 128
  - challenges*, 43-45
  - encrypted on-device storage*, 128
  - enforcing remote updates*, 129-130
  - enforcing security updates*, 129
  - enterprise app stores*, 130-132
  - information protection*, 132-143
  - offline authentication*, 128
  - steps in*, 64
  - unique device IDs*, 129
- successful customer engagement, 209
- testing, 78-80
  - in cloud*, 186-187
- transformative apps, 207-208
- types of, 82
  - comparison*, 92-93
  - hybrid mobile applications*, 90-92
  - mobile web applications*, 85-88
  - native mobile applications*, 83-85
- mobile architecture, defining, 177
- Mobile Back End as a Service (BaaS), 182, 184
- mobile business transformation, 65-67, 150-152
  - engagement, intelligence, context, 153-154
  - examples
    - building trust*, 162-163
    - in-the-moment offers*, 161-162
  - key imperatives, 65-67
- mobile context, 154
  - environmental context*, 155
  - historical behavior*, 155
  - individual identity*, 155
- mobile engagement, 155
  - application linking*, 159-160
  - omnichannel*, 156-158
  - service composition*, 159
  - simplified information delivery*, 156
- mobile intelligence, 160
  - adaptability*, 161
  - data analysis*, 161
  - "next best action,"* 161
- security, privacy, trust, 163-164
- SoCloDaMo, 163
- steps in, 67
- strategy for, 164-166
- systems of engagement versus systems of record, 153
- mobile collaboration, 55, 175
- mobile commerce, 55, 175
- mobile containerization, 137-138
- mobile context, 154
  - with back-end systems, 153-154
  - delivering value in, 65-66
  - environmental context, 155
  - historical behavior, 155
  - individual identity, 155

**mobile development, 57-62**

- challenges, 36-37, 69
  - accelerated time-to-market requirements, 41-42*
  - connectivity to back-end systems and data, 40-41*
  - device diversity, 71-72*
  - high user expectations, 40*
  - integration with existing development processes, 42-43*
  - multiple platforms, 37-40*
  - speed and quality, 71-78*
- continuous experience management, 80-82
- integration with back-end systems, 95-96
- key imperatives, 58-60
- resources for information, 98
- security, 63, 104
- steps in, 60-62
- strategic decisions during, 93-95
- testing, 78-80

**Mobile Device Management**

(MDM), 44, 63, 102, 106-108

**mobile devices. *See also***

smartphone adoption; tablet adoption

- diversity of, 71-72
- HTML5 support, 89
- on-device data encryption, 136
- security
  - MDM (Mobile Device Management), 102, 106-108*
  - PCs, compared, 100-101*
  - steps in, 64*
  - threat management, 108-117*
  - unique characteristics, 100*
  - unique device IDs, 129*
- storage limitations, 183
- unlocking, 115

**mobile engagement, 66, 153-155.***See also* user engagement

- application linking, 159-160
- omnichannel, 156-158
- service composition, 159
- simplified information delivery, 156

**Mobile Enterprise Application**

Platform (MEAP), 4, 92,

127, 185

**mobile framework for mobile**

strategy development, 50-52

- functional patterns in mobile apps, 52-55
- mobile business transformation, 65-67
- mobile development, 57-62
- mobile management and security, 62-64

**mobile gateways, 117****mobile identity and access**

management, 64

**mobile information protection, 63****mobile intelligence, 67,**

153-154, 160

- adaptability, 161
- data analysis, 161
- “next best action,” 161

**mobile management, 62-64, 77**

- key imperatives, 62-64
- steps in, 64-65

**mobile marketing, 55, 175****mobile middleware, 4****mobile money, 198-199****mobile network protection, 63****mobile network security, 103, 118**

- identity and access management, 120
  - biometric authentication, 124*
  - certificate management, 121*
  - multifactor authentication, 122-123*
  - pattern-based authentication, 125-126*

- proximity-based authentication*, 124
- single sign-on*, 121
- mVPN (mobile virtual private network), 119-120
- types of threats, 119
- mobile operations**, 55, 175
- mobile projects, planning**, 169-170
  - functional patterns, defining, 174-175
  - gap assessment, 175-176
  - goals, defining, 172-173
  - mobile architecture, defining, 177
  - performance assessment, 178
  - team structure and leadership, defining, 171
  - user expectations, linking goals with, 173-174
- mobile security**, 62-64, 77
  - BYOD (bring your own device) policies, 12
  - in enterprise mobile strategy, 43-45
  - framework, 105
  - importance of, 99
  - key imperatives, 62-64
  - mobile apps, 103-104, 127
    - application security scanning*, 127
    - authenticity testing*, 128
    - encrypted on-device storage*, 128
    - enforcing remote updates*, 129-130
    - enforcing security updates*, 129
    - enterprise app stores*, 130-132
    - information protection*, 132-143
    - offline authentication*, 128
    - unique device IDs*, 129
  - mobile devices
    - MDM (*Mobile Device Management*), 102, 106-108
    - PCs, *compared*, 100-101
    - threat management*, 108-117
    - unique characteristics*, 100
  - mobile network access, 118
    - identity and access management*, 120-126
    - mVPN (mobile virtual private network)*, 119-120
    - types of threats*, 119
  - mobile networks, 103
  - resources for information, 147
  - steps in, 64-65
  - in transformative mobile apps, 163-164
  - vulnerability testing, 80
- mobile technology**
  - big data and, 190
  - characteristics of, 5-7, 9
  - cloud computing and, 180
    - advantages of*, 183-184
    - centralized build environment*, 185-186
    - characteristics of cloud computing*, 181
    - cloud computing, defined*, 180-181
    - deployment models*, 182-183
    - MEAP, 185
    - service models*, 181-182
    - testing mobile apps*, 186-187
  - comparison with other computing technologies, 4-5
  - role in computing history, 2-4
  - social networking and, 187-188
    - advantages of*, 189
  - usage statistics, 5
- mobile threat protection**, 63
- mobile toolkits for mobile web applications**, 86
- mobile virtual private network (mVPN)**, 119-120
- mobile virtualization**, 139
- mobile web applications**, 85-88
  - comparison with other types, 92-93
- Monitoring as a Service (MaaS)**, 182
- Moore, Geoffrey, 153

**multichannel, 156-158**  
 Air Canada case study, 210-211  
 mobile apps, 74  
 support in mobile development, 58  
**multifactor authentication, 112,**  
 122-123, 143  
**multiple mobile platforms, mobile**  
 app development for, 37-40  
**mVPN (mobile virtual private**  
 network), 119-120

## N

**NaaS (Network as a Service), 182**  
**native API access, 84**  
**native mobile applications, 83-85**  
 comparison with other types, 92-93  
**Network as a Service (NaaS), 182**  
**network connectivity, effect**  
 on smartphone/tablet  
 adoption, 197  
**network data encryption, 136**  
**network security, 44, 103, 118**  
 identity and access management, 120  
*biometric authentication, 124*  
*certificate management, 121*  
*multifactor authentication, 122-123*  
*pattern-based authentication,*  
 125-126  
*proximity-based authentication, 124*  
*single sign-on, 121*  
**mVPN (mobile virtual private**  
 network), 119-120  
 steps in, 64  
 types of threats, 119  
 “next best action,” 161  
**Nike+ FuelBand case study, 215**  
**nonfunctional prototypes, 75**

## O

**offline authentication, 128**  
**omnichannel, 156-158**  
 in mobile engagement, 66

**on-device data encryption, 136**  
**online computing, role in**  
 computing history, 3  
**Open Cloud Manifesto, 183**

## P

**PaaS (Platform as a Service), 181**  
**Palm Pilot in history of**  
 smartphones, 19  
**pattern-based authentication,**  
 125-126  
**PCs**  
 mobile devices, compared, 100-101  
 role in computing history, 3  
 synchronization, 134  
**PDA (personal digital assistant) in**  
 history of smartphones, 19  
**people, security and, 45**  
**performance assessment, 178**  
**performance indicators**  
 combining with value-based goals,  
 30-32  
 defining, 173-174  
**phased development, 74**  
**phishing, 113**  
**physical architecture, 177**  
**PKI (Public Key**  
 Infrastructure), 121  
**planning mobile projects, 169-170**  
 functional patterns, defining,  
 174-175  
 gap assessment, 175-176  
 goals, defining, 172-173  
 mobile architecture, defining, 177  
 performance assessment, 178  
 team structure and leadership,  
 defining, 171  
 user expectations, linking goals  
 with, 173-174  
**Platform as a Service (PaaS), 181**  
**policy management, 107**



portability, native mobile applications, 85  
post-deployment control of mobile apps, 46  
privacy in transformative mobile apps, 163-164  
private clouds, 182  
productivity of employees, 152  
proprietary platforms, 38  
prototypes, 75  
proximity-based authentication, 124  
public app stores, delivery through, 85  
public clouds, 182  
Public Key Infrastructure (PKI), 121  
push notifications, 96

## Q

QR codes, 209  
  spoofing, 114  
quality control in mobile development, 59  
quality management, 77  
quality of mobile apps, 71  
  mobile development process changes, 73-78

## R

regulatory compliance, 134  
remediation, 108  
remote control, 107  
remote device lock/wipe, 106  
remote updating, 107  
  enforcing, 129-130  
Research in Motion (RIM) in history of smartphones, 19  
resources for information  
  innovative mobile apps, 220  
  international mobile strategy, 206  
  mobile development, 98

  security, 147  
  SoCloDaMo, 193  
responsive web design, 86  
retailer value, driven by mobile apps, 24-27  
return on investment (ROI), 33  
reusability, 77  
reverse proxies, 117  
RIM (Research in Motion) in history of smartphones, 19  
risky behavior, increasing threat risks, 114-116  
roaming device support, 107  
ROI (return on investment), 33  
rooted devices, 44, 115-116  
rural adoption rates, 200

## S

SaaS (Software as a Service), 181  
SDK development, data separation with, 138  
security, 62-64, 77  
  BYOD (bring your own device) policies, 12  
  in enterprise mobile strategy, 43-45  
  framework, 105  
  importance of, 99  
  key imperatives, 62-64  
  mobile apps, 103-104, 127  
    *application security scanning*, 127  
    *authenticity testing*, 128  
    *encrypted on-device storage*, 128  
    *enforcing remote updates*, 129-130  
    *enforcing security updates*, 129  
    *enterprise app stores*, 130-132  
    *information protection*, 132-143  
    *offline authentication*, 128  
    *unique device IDs*, 129  
  mobile devices  
    MDM (*Mobile Device Management*), 102, 106-108  
    PCs, *compared*, 100-101

- threat management*, 108-117
- unique characteristics*, 100
- mobile network access, 118
- identity and access management*, 120-126
- mVPN (mobile virtual private network)*, 119-120
- types of threats*, 119
- mobile networks, 103
- resources for information, 147
- steps in, 64-65
- in transformative mobile apps, 163-164
- vulnerability testing, 80
- sensors with mobile technology**, 7-8
- service composition**, 159
- service management**, 96
- service models for cloud computing**, 181-182
- services, coordinating**, 66
- session hijacking**, 113
- Short Messaging Service (SMS) messages**, 96
  - crossplatform strategy with, 201-205
- show rooming**, 22
- Simon in history of smartphones**, 19
- simplified information delivery**, 156
- simulators**, 79
- single sign-on (SSO)**, 121
- skill availability for mobile app development**, 39
- smartphone adoption**
  - influences on, 196
    - complexity of devices*, 197
    - device cost*, 196-197
    - network connectivity*, 197
  - rural versus urban adoption
    - rates, 200
  - statistics, 200
- smartphones, history of**, 18-20
- SMS messages**, 96
  - crossplatform strategy with, 201-205
- social engineering**, 112-113
- social interaction with mobile technology**, 7
- social networking, mobile technology and**, 187-188
  - advantages of, 189
- SoCloDaMo**, 163, 179-180, 191
  - big data and mobile, combined, 190
  - cloud and mobile, combined, 180
    - advantages of*, 183-184
    - centralized build environment*, 185-186
    - characteristics of cloud computing*, 181
    - cloud computing, defined*, 180-181
    - deployment models*, 182-183
    - MEAP*, 185
    - service models*, 181-182
    - testing mobile apps*, 186-187
  - resources for information, 193
  - social networking and mobile, combined, 187-188
    - advantages of*, 189
  - strategy decisions, 191-192
- Software as a Service (SaaS)**, 181
- software development processes, integration of mobile app development with**, 42-43
- spear phishing**, 113
- speed of delivery**, 71
  - mobile development process
    - changes, 73-78
- spyware**, 110-111
- SQL injection**, 113

Square Wallet case study, 217-218  
 SSO (single sign-on), 121  
 static app analysis, 127  
 statistics, mobile technology  
   usage, 5  
 storage limitations for mobile  
   devices, 183  
 strategic decision making during  
   mobile development, 93-95  
 synchronization with PCs, 134  
 systems of engagement, 153  
 systems of record, 153

## T

T2FA (tokenless two-factor  
 authentication), 123

tablet adoption

influences on, 196

*complexity of devices*, 197

*device cost*, 196-197

*network connectivity*, 197

rural versus urban adoption

  rates, 200

  statistics, 200

TBC Corporation case study,  
 212-213

team collaboration in mobile  
 development, 58

team structure, defining, 171

Telecom Expense Management  
 (TEM), 107

Tesco's Home Plus case study,  
 216-217

testing mobile apps, 39, 43, 59,  
 78-80, 186-187

threat management, 102, 108-109

  key capabilities, 117

  risky behavior, 114-116

  types of threats, 119

*client-side injection*, 113-114

*malware*, 109-110

*social engineering*, 112-113

*spyware*, 110-111

*Trojan horses*, 111

*viruses and worms*, 111

time-to-market requirements,  
   mobile app development for,  
   41-42

tokenless two-factor  
 authentication (T2FA), 123

traceability, 76

transformative mobile apps,  
   150-152, 207-208

  engagement, intelligence, context,  
   153-154

  examples

*building trust*, 162-163

*in-the-moment offers*, 161-162

  mobile context, 154

*environmental context*, 155

*historical behavior*, 155

*individual identity*, 155

  mobile engagement, 155

*application linking*, 159-160

*omnichannel*, 156-158

*service composition*, 159

*simplified information delivery*, 156

  mobile intelligence, 160

*adaptability*, 161

*data analysis*, 161

*"next best action,"* 161

  security, privacy, trust, 163-164

  SoCloDaMo, 163

  strategy for, 164-166

  systems of engagement versus  
   systems of record, 153

Trojan horses, 111

trust building, 162-163

trust in transformative mobile  
 apps, 163-164

## U

**unique device IDs**, 129

**unlocking mobile devices**, 115

**updates**

- enforcing
  - remote updates*, 129-130
  - security updates*, 129
- to mobile apps, 46

**urban adoption rates**, 200

**usage architecture**, 177

**usage patterns of international customers**, 198-199

**usage statistics for mobile technology**, 5

**user engagement. *See also* mobile engagement**

- driven by mobile apps, 24
- in history of smartphones, 18-20
- Nike+ FuelBand case study, 215
- resources for information, 220
- Square Wallet case study, 217-218
- with successful apps, 209
- TBC Corporation case study, 212-213
- Tesco's Home Plus case study, 216-217
- with transformative mobile apps, 151-152
- Visa case study, 211-212
- Waze case study, 214
- Withings case study, 215-216

**user expectations**, 73

- Air Canada case study, 210-211
- continuous experience management, 80-82
- linking with mobile strategy goals, 173-174
- mobile app development for, 40, 59
- native mobile applications, 84

## user experience

- with HTML5, 89
- international customers, 198-199
- mobile engagement, 66
- with mobile technology, 6

## user identity in context

, 155

## user interfaces

- design, 75
- matching to mobile devices, 38

## V

## value, driven by mobile apps

, 21

- consumer versus retailer value, 24-27
- with contextual information, 21-22
- with mobile intelligence, 22-23
- with user engagement, 24

## value indicators, defining

, 173-174

## value-based goals in enterprise

### mobile strategy

, 27-28

- B2C goals, 29-30
- B2E and B2B goals, 28-29
- combining with performance indicators and implementation approach, 30-32

## virtualization

, 80, 139

## viruses

, 111

## Visa case study

, 211-212

## visually-oriented development

### tools

, 76

## VPNs (virtual private networks)

### for mobile devices

, 119-120

## vulnerability testing

, 80

## W-X-Y-Z

## Waze case study

, 214

## web filtering

, 117

## web protection software

, 117

## web reputation services

, 117

web sites as mobile web  
    applications, 85-88  
white-box texting, 127  
Wi-Fi hacking, 119  
winterboarding, 115  
wireframes, 75  
Withings case study, 215-216  
workspace containers, 137  
worms, 111  
X.509 standard, 122