With grounded skill and enthusiasm, Reinventing the Product makes a stringent case for companies to rethink their product strategy, their product roadmap and their digital capabilities.

Patrick Koller, CEO, Faurecia

Dave Sovie and Eric Schaeffer bring fresh thinking and inspiring practical advice for successfully managing the digital transformation and creating value.

Marco Argenti, Vice President Technology, Amazon Web Services

Full of innovative insights about AI, platforms, and smart products. And the 'Product Reinvention Quotient' provides great insights in how to think about 'Product X.0' and how to develop a set of capabilities that are necessary to succeed in the future.

Guido Jouret, Chief Digital Officer, ABB

The nature of product innovation is fundamentally changing. Reinventing the Product shows how to combine hardware, software and business model innovation in an agile manner to meet the fast-changing needs in a world of smart connected devices.

Yoon Lee PhD, Senior Vice President and Division Head Content and Services, Product Innovation Team, Samsung Electronics America

Eric Schaeffer did it again. After spearheading Industry X.0, which has inspired our team of entrepreneurs to adapt our digital strategy creatively, he now co-authors with David Sovie a brilliant, richly detailed roadmap to the digital future for all product making companies. No doubt: this is a must-read.

Zhang Ruimin, Chairman of the Board of Directors and CEO, Haier Group

Reinventing the Product looks at the ways traditional products are transforming into smart connected products and ecosystem platforms at a rate much faster than most organizations think. Eric Schaeffer and David Sovie show how this reinvention is made possible: by digital technologies such as AI, IoT sensors, blockchain, advanced analytics, cloud and edge computing and by developing a radical new kind of product roadmap. They show how to deliver truly intelligent, and potentially even autonomous, products with the more personalized and compelling experiences that today's users, consumers and enterprises expect.

Reinventing the Product makes a stringent case for companies to rethink their product strategy, their innovation and engineering processes, and the entire culture to build the future generations of successful 'Living Products'. Featuring case studies from global organizations such as Faurecia, Signify, Symmons and Haier – from interviews with thought leaders and business executives of top companies including Amazon, ABB, Tesla, Samsung and Google – it provides practical advice for maker-companies as they embark on, or accelerate, their digitization journey.
PRAISE FOR REINVENTING THE PRODUCT

‘Eric Schaeffer and David Sovie bring some great new insights into the product arena of the future that have broad implications. With grounded skill and enthusiasm, Reinventing the Product makes a stringent case for companies to rethink their product strategy, their product roadmap and their digital capabilities.’

Patrick Koller, CEO, Faurecia

‘Powerful factors – such as the rapid rise of cloud computing, high-speed networks and AI – are converging. They require all product companies to fundamentally transform their products and their company. Dave Sovie and Eric Schaeffer bring fresh thinking and inspiring practical advice for successfully managing this digital transformation and creating value.’

Marco Argenti, Vice President Technology, Amazon Web Services

‘Thoroughly researched and full of innovative insights about AI, platforms and smart products. The “Product Reinvention Quotient” provides great insights in how to think about “Product X.0” and how to develop a set of capabilities that are necessary to succeed in the future.’

Guido Jouret, Chief Digital Officer, ABB

‘The nature of product innovation is fundamentally changing. Reinventing the Product shows how to combine hardware, software and business model innovation in an agile manner to meet fast-changing needs in a world of smart connected devices. And it provides compelling and inspiring case studies and examples that help to understand how your company can find its way that fits best.’

Yoon Lee, PhD, Senior Vice President and Division Head: Content and Services, Product Innovation Team, Samsung Electronics America
‘Eric Schaeffer did it again. After his spearheading *Industry X.0*, which has inspired our team of entrepreneurs to adapt our digital strategy creatively, he now co-authors with David Sovie a brilliant, richly detailed roadmap to the digital future for all product making companies. No doubt: this is again a must-read.’

**Zhang Ruimin, Chairman of the Board of Directors and CEO, Haier Group**

‘Well researched, with vivid illustrations and concrete suggestions, this valuable guide can help firms and leaders to build a new set of priorities and capabilities to succeed in a shifting, digital landscape.’

**Professor Michael G Jacobides, Sir Donald Gordon Chair of Entrepreneurship & Innovation, London Business School**

‘In a time of digitally induced seismic shifts across all fronts, *Reinventing the Product* captures the impact of this change and thoughtfully develops new value creation approaches in product development and manufacturing. A ground-breaking book.’

**Phil Jansen, Vice President and Head of Product Development, Fiat Chrysler Automobiles**

‘*Reinventing the Product* is a practical guide for harnessing IoT and AI to transform the very basis of a company’s offerings. This is a must-read for industrial manufacturers looking to ensure their businesses remain relevant in the digital age.’

**Tim O’Keeffe, CEO, Symmons Industries**

‘Digital technologies such as AI, advanced analytics, edge computing, cloud and blockchain are transforming our lives fast. Thoroughly researched, *Reinventing the Product* doesn’t just describe the emergence of a fascinating new product landscape that is shifting from traditional to smart connected products, including autonomous products. It is also an inspiring call-to-move for companies to seize enormous new opportunities fast – good for them, good for users and customers, good for growth and progress of societies.’

**Prof. Dr. Christoph Lütge, Peter Löschner Chair of Business Ethics and Global Governance, Technical University of Munich**
‘Dave Sovie and Eric Schaeffer lay out a powerful new framework for how to evolve both the product and business strategy needed to succeed in the digital age, and they give fresh and very concrete recommendations on how to implement it pragmatically. *Reinventing the Product* should be required reading for all product company executives and their managers.’

**Bill Bien, Chief Marketing Officer and Head of Strategy, Signify**

‘Deep analysis of major shifts product companies are facing, and a well-elaborated blueprint for their future success. Every leader of this industry should learn from this book.’

**James E. Heppelmann, President and CEO, PTC**

‘*Reinventing the Product* doesn’t just look thoroughly at how the disruptive waves of digital technologies will affect product companies (including the subscription economy). Drawing on a deep analysis of five profound shifts they face and complemented with compelling case studies, Eric Schaeffer and David Sovie also provide strategic and practical “how-to” advice for businesses as they develop digital products. An inspirational call-to-action.’

**Eric Chaniot, Chief Digital Officer, Michelin**

‘The swiftly emerging world of intelligent, smart connected products will reshape industries, business processes, and consumer experiences. Schaeffer and Sovie’s book is an important and essential guide for business leaders, entrepreneurs and investors looking to chart the course and unlock the value of this important trend.’

**Paul R Daugherty, Chief Technology & Innovation Officer, Accenture, and co-author of the bestseller *Human + Machine: Reimagining Work in the Age of AI***

‘A comprehensive analysis on the digitally driven big shifts product-making companies are facing, and a detailed roadmap to innovate and capture the endless opportunities in a fascinating new product world.’

**Raghunath Mashelkar, National Research Professor and Chairman, Reliance Innovation Council**
‘In their inspiring new book Eric Schaeffer and Dave Sovie not only show the fundamental shifts product companies are exposed to in digital times; they also provide creative analytical tools and concrete how-to advice for these companies to innovate, stay profitable and grow.’

**Cyril Perducat, Executive Vice President, Internet of Things & Digital Offers, Schneider Electric**

‘Eric Schaeffer and Dave Sovie provide a rare encompassing view on the reinvention of the product, re-imagining the current “digital transformation” trend. Original, remarkably thoughtful and with high practical relevance on every page.’

**Richard Mark Soley, PhD, Chairman and CEO, Object Management Group; Executive Director, Industrial Internet Consortium**

‘This is a fascinating book on how we should rethink and manage product making in disruptive times. New perspectives, fresh concepts, unexpected ideas abound. A must-read for any leader and manager in product companies.’

**Pascal Daloz, Executive Vice President, Chief Financial Officer and Corporate Strategy Officer, Dassault Systèmes**
Executive excerpt

This is an advance executive excerpt from Reinventing the Product, which will be published in March 2019. The excerpt comprises endorsements, the table of contents, introduction, Chapter 3, a case study from Chapter 12 and information about the authors.

NB. The page numbering here is taken from the book and does not match the pages in this excerpt. The excerpt omits the endnotes, although markers to them have been left in the text.

Reinventing the Product

How to transform your business and create value in the digital age

Eric Schaeffer and David Sovie
CONTENTS

About the authors xiii
Foreword by Paul R Daugherty xv
Preface xvii
Acknowledgements xxi

Introduction 1
New technology, new perspectives 1
Product X.0: a product becomes a service with experience 4
Platforms and ecosystems: the new product habitats 5
Reinvention mandate: engineering in the New 5
How to use this book 7

PART ONE Enter the New: smart connected products for the digital age 9

01 The digital transformation of product making – happening faster than you think! 11
Digital eclipses hardware as a value source 15
Dual needs: digital transformation and product reinvention 18
Navigating the disruption: six digital imperatives 20
Different sectors, different degrees of disruption 22
Takeaways 26

02 Trends driving the case for product reinvention 27
From output to outcome 30
Value shifts across the chain 32
Industrial consumerism, simplicity and ease at any time 34
Accelerating the pace of innovation 36
Contents

The power of personalized experiences 39
Ecosystems as the new force 41
Takeaways 43

PART TWO The digital reinvention of the product 45

03 A radically new kind of product: adaptive | collaborative | proactive | responsible 47
The Product Reinvention Grid 49
From traditional to reinvented products: 10 traits 52
The Product Reinvention Quotient 66
The future here, start now 67
Takeaways 68

04 Big Shift One: From features to experience 69
The slow but certain waning of the feature economy 72
Experience: a quantum leap beyond features and services 73
The differences between B2B and B2C experiences 78
Engineering user experience 81
Good and bad experiences 83
Human + machine experiences for the industrial worker 85
What’s at stake? 86
Takeaways 88

05 Big Shift Two: From hardware to ‘as a service’ 89
Software industry leads the way 91
Product as a service 92
Redefining the core product architecture 96
It is an enterprise-wide challenge 99
Takeaways 104
06 Big Shift Three: From product to platform 105
Platforms: the new dominant driver of value creation 107
Many types of platform, not all are alike 111
Nine key components of a successful platform 112
The imperative of platforms for product makers 119
The product makers finding the way 121
Internet platform giants: friend and foe? 123
Takeaways 127

07 Big Shift Four: From mechatronics to artificial intelligence (AI) 129
AI: a quantum leap for product companies 131
Three factors enabling the rise of AI 136
The unstoppable ascendancy of voice 137
AI in every product 141
The AI pathfinders 143
Time to get artificially smart 147
Takeaways 149

08 Big Shift Five: From linear to agile engineering in the New 151
The path from linearity to ‘experiment and scale’ 154
Ideate, launch and iterate in cycles 157
Flattened hierarchies and fluid organizations for greater agility 158
‘Engineering in the New’ to achieve 10X digital factor 160
From ageing products to evergreen design 163
As-a-service business models determine hardware features 165
Integrating engineering and IT for agility 166
Twinning and threading your product 168
Takeaways 174
PART THREE  The journey to the reinvented product 175

09 Seven pivotal capabilities for managing the reinvention of the product 177
1 Design ‘flexagility’ 179
2 Agile engineering in the New 184
3 Data augmentation, leveraging AI 191
4 ‘As-a-service’ competencies 194
5 The experiential workforce 198
6 Ecosystem orchestration 201
7 Pervasive security 204
Takeaways 206

10 The roadmap to success with living products and services 207
Marker 1: Definition of vision and value spaces 210
Marker 2: Digitization of the core business to fund expansion 213
Marker 3: Sketching the smart connected product roadmap 216
Marker 4: Creation of a digital innovation factory to accelerate the change 218
Marker 5: Setting up a digitally skilled organization to enable friction-free execution 222
Marker 6: Tracking results to constantly adjust course 224
Marker 7: Starting the pivot now instead of waiting for the next New 226
Takeaways 227
11 Insights from the field 229
Tesla 231
Automotive start-up in China 238
Samsung 241
Dassault Systèmes 247
PTC 250
Caterpillar 257
HP Inc 263
Mindtribe 268
Amazon 274
Google 277
Professor Michael G. Jacobides, Sir Donald Gordon Chair of Entrepreneurship & Innovation, London Business School 279

12 Reinvented products in action 285
Faurecia case study: Get behind the wheel and... relax, work and socialize! 287
Signify (formerly Philips Lighting) case study: LED there be smart light! 296
Symmons Water Management case study: Turning pipe dreams into a digital business 302
Haier Group case study: Putting a platform before the palate 307
PART FOUR  Future product realities 317

13  Outlook 2030: How the reinvented product governs our lives – a crowd-sourced story of innovation in five takes 319
Take 1: Farming means high tech 321
Take 2: Private life is fully digitally curated 323
Take 3: Ownership. Owner... what? 324
Take 4: Feel at home or at work on the road 325
Take 5: The polite Frankenstein creatures we all love 326
Scary? Not at all. Inspiring! 328

Takeaways at a glance 329
Glossary of terms 335
Endnotes 339
Index 355
ABOUT THE AUTHORS

Eric Schaeffer

Eric Schaeffer is a Senior Managing Director at Accenture, focused on helping industrial organizations harness connected innovation to digitally transform their businesses for growth.

Over the last 30 years at Accenture he has helped industrial clients across Europe and now globally to envisage and deliver transformation by placing product innovation at the centre of the change process. His first book, *Industry X.0: Realizing digital value in industrial sectors*, published in English, German, French, Japanese, Chinese, and soon Brazilian Portuguese and Russian, examines the six fundamental digital ‘no regret’ capabilities every industrial business needs as a launchpad for digitization.

Schaeffer leads Accenture’s Products Industry X.0 practice, bringing together innovation, engineering, product development, manufacturing, digital operations, and product service optimization to help industry clients master the opportunities of the Industrial Internet of Things. He is also the Global Lead for Automotive, Industrial Equipment, Infrastructure and Transportation, helping these companies to digitally reinvent their business.

Schaeffer’s background is in engineering. He studied at the École Supérieure d’Électricité, and is based in Paris, where he lives with his family.

David Sovie

David Sovie is a Senior Managing Director at Accenture and the Global Lead for High Tech Industry. He focuses on shaping and executing large-scale digital transformation and business reinvention programmes for leading technology companies globally.
About the Authors

Sovie also leads the Industry X.0 practice for Accenture’s Communications, Media and Technology group, which provides digital transformation services across the product innovation, engineering, manufacturing and product support business functions. The Industry X.0 practice helps clients reinvent their product and service offerings and create new revenue streams by leveraging new engineering approaches and digital technologies such as AI, advanced analytics, blockchain and augmented reality.

Sovie studied Electrical Engineering at Rensselaer Polytechnic Institute and went on to receive his MBA from Harvard Business School.

He lives in Tokyo with his wife.
‘When the wind of change rises, some people build walls while others erect windmills.’ This is an old Chinese saying, but it is very relevant in the era of innovation that we are living in today.

There is no doubt about the rising wind: a new era of smart-connected products is in the offing; a fascinating period with lots of opportunities for businesses. But still we see many businesses staying wedded to accustomed ways of making and using industrial products, missing out on the massive potential that the fast-advancing digital technologies offer once they are put to use within products.

This important book, Reinventing the Product: How to transform your business and create value in the digital age, pushes back against traditional modes of thinking and operating in the product-making world. It draws business leaders’ attention to the urgency of embracing and shaping the emerging global smart-connected product landscape: very quickly, we’ll see large parts of this novel product category evolving from basic interactivity to very advanced intelligence, becoming ‘living’ products essential to businesses and consumers in daily life.

Two industry leaders and shapers, Eric Schaeffer and David Sovie, have joined forces to write the book. Their combined experience across traditional industrial sectors, along with the software and technology sectors, is a reflection on the blueprint required for smart connected products.

Schaeffer’s precursor publication, Industry X.0, described the fundamental shift industrial product-making is undergoing as digital technology and software transforms products and business processes.

This book now offers the logical follow-up, and highlights the end-game of these trends: smart-connected intelligent products and the unprecedented user experience they deliver. And it shows how this will shape the future for businesses and consumers, and be a powerful value creator.
The future is arriving quickly, which is why this book is timely. Every day we witness seeing new smart-connected products emerge. One of my own professional focuses within this wide topic is the ever-closer relationship between humans and machines, and the enormous potential this combination delivers. Digital technology and artificial intelligence are taking centre stage as the main forces for creating the assistant and ‘cobot’ technologies relevant to smart-connected products in so many industrial sectors from industrial equipment to automotive to home appliances. But this is just part of the enormous overall potential of smart-connected products.

Schaeffer and Sovie trace the irreversible shifts that products are undergoing to embody intelligence, deliver rich user experiences and extend into value-creating ecosystems and platforms. They make this approachable by providing practical road maps and blueprints for building the necessary business capabilities to enter this new product world.

Reinventing the Product is an outstanding vade mecum for any business leader, industrialist, entrepreneur or investor. We’ve only seen a glimpse of the true economic potential of the world of smart-connected products. However, the wind of change has clearly risen. And this book helps product-making businesses to put up as many windmills as possible to make the most of it.

Paul R Daugherty
Chief Technology & Innovation Officer at Accenture
Co-author of Human + Machine:
Reimagining work in the age of AI
January 2019
Introduction

The advent of the smart connected product is about to change beyond recognition the ways in which products are used and how businesses conceive, make, distribute, and support products in the market.

For the last 200 years of industrial history, a product’s sale marked the end of the following value chain: inputs such as raw materials and electro-mechanical components were sourced, labour force and machines were allocated to carry out manufacturing processes, and a finished product was eventually sold on a margin that reflected selling price minus input cost. Product makers were clearly delineated as producers, acting within the defined borders of their business and within a fairly simple financial calculus. The point of purchase marked the handover of responsibility for the product to the user and that was that.

This well-worn routine is about to experience a tectonic tilt towards a new product world where traditional product-making businesses will need to apply much more fluid business practices if they want to survive. With the rise of the smart connected product the linearity of value chains defined by clear beginnings and endings within siloed business organizations will be relegated to the history books. Products that are rendered digitally intelligent will instead be designed to interact with their makers, their users and other products over their whole lifespan. Value chains will turn into value circles or even multi-directional value generating systems.

New technology, new perspectives

A product ending in the hands of a user will now be far from sold and forgotten. Once it starts a smart life in the field as part of an installed base, it will be under a regime of remote contact and permanent data
Introduction

exchange with its manufacturers, who use the constant stream of information to adopt the role of the product’s lifelong innovator, service designer, intellectual minder and perpetual tutor — following the novel business and operational models that digitized economies enforce.

Why is all this happening? The backdrop is rampant technological progress — quite simply, the most dynamic phase of technological invention and innovation in the 100,000 years modern humans have been wandering the earth. In no time we will be entering an era in which the following marvels will be as mundane as watching a kettle boil: autonomous fleets of unmanned taxis; personalized medical pills that communicate back to pharmacologists and doctors; home lighting that senses your emotions and adjusts accordingly; roads laid using 3D printing; and industrial assembly lines reconfigured in minutes and on their own. Digital high technology, involved in virtually every corner of economic and societal life, will become the norm and play a role in everything we do.

The smart connected product is something entirely new. Its intelligent life is breathed into it via a stack of cutting-edge technologies that have already economically attractive levels of maturity and affordability, or are going to soon. The product of the future is smart because it has cognitive technology on board: software and intelligent algorithms that form a ‘mind’ allowing for independent decision making. It is smart because sufficient processing power and storage capacity can now be crammed into the tiniest hardware space in almost any device. It is smart because the necessary electronic power supply, batteries or photovoltaic cells have breached the sound barrier in terms of miniaturization, longevity and performance. And it is smart because information on its usage and performance can seamlessly flow between its makers, its users or third parties. This last capability is possible because the product is connected around the clock, wherever it is. It lives on a powerful leash of mobile bandwidth that enables real-time data exchange with cloud and edge servers. There, sophisticated data analytics software creates insights from the relayed data that help the product to show its intelligence while in use and its makers to improve it incessantly.
Finally, the smart product knows what is going on because it has optical, haptical and audio sensors all over it, providing sharp perceptual capability comparable to what humans are born with. The combination of these capabilities will also enable products of the future to be highly customizable and personalizeable in a way that is simply not possible today.

And the technology shows no sign of standing still. On the horizon are new stacks and components about to reach maturity, all of which will also play a role in the smart connected product – among them, higher-speed 5G networks, quantum computing, 4D printing, nanotechnologies, smart materials and bio-molecules.

Special mention must be given to artificial intelligence (AI). In the technology stack for smart products, it is the breakthrough capability that is about to push hardware into another league, accelerating the tilt to smart products across the board. While the various technologies that actually make up AI, such as machine learning or natural language processing, have existed for years, they are currently going through such a steep phase of maturation that AI will soon form the intellectual bedrock of all smart products, from home speakers to autopilots in cars to collaborative robots.

All this has deep consequences for how devices are made and put to use. The technology involved will change production cost structures, development styles, and innovation approaches within the remit of product makers as well as their broader spectrum of supply chain and ecosystem partners.

But that’s not all. It will also change user expectations for products. Smart products are containers for fluidly reconfigurable software and digital intelligence. As such, they can be adaptable, reconfigurable, responsive and easy to use via exceedingly user-friendly interfaces anytime. All product users from families and individual consumers to industrial and white-collar workers and business leaders will become accustomed to highly tailored ‘evergreen’ products that can precisely fulfil very individualized purposes at any given moment. There will no longer be large mass markets for uniformly featured products.
Product X.0: a product becomes a service with experience

With all the adaptability and responsiveness, users start to expect more and more complex outcomes from products. A smart mining truck can have a full set of top-notch safety features on board, but the real point will be to orchestrate them to meet precise outcomes agreed between product maker and buyer – say to reduce accident rates by 40 per cent. This will be the real value to the customer and will be what makes the difference in the marketplaces of the future, the so-called ‘outcome economy’. The ability to deliver outcomes – lower costs, increased revenues, improved environmental impact – will be the unique selling point of smart connected products going forward. Outcomes, along with great product experiences will be the most valuable currency of the digital age.

In fact, in many cases it will be the outcome that is sold, with the product just the delivery device. Many smart connected products will experience a dramatic shift to ‘as a service’ and outcome-based business models. These models will have the deepest potential for value creation both for manufacturers and users. Eventually, many product makers will not be able to stay in a market without reinvented or newly developed products that enable and support an as-a-service business model. Manufacturers who shirk this will see old passive devices becoming commoditized and turning into low-margin basket cases over time.

Innovation in the new world of smart connected products will largely take place via software updates and real-time, intelligent usage of the data generated by the product. Managers of smart connected product manufacture will need to build in agility throughout the product lifespan because, whether the product is installed in the field or still in development on some drawing board, it is effectively always in development, always updatable by its manufacturer via software. This will have a huge effect on the work of research and development, and on marketing and customer services units. Product profiles and service bundles sold on the back of software updates need careful framing by marketers because individual client groups will become much smaller and more diverse.
Platforms and ecosystems: the new product habitats

For the vast majority of product makers, to deliver the finished outcome and maximize value will, in most cases, require them to work with new technology, services and multiple other ecosystem partners. Few individual companies will be able to provide on their own all the components, software and services needed to run on or in tandem with the hardware product. So, product makers must learn to build entire new ecosystems around their products or partner with and plug into a leading ecosystem created by another player.

Closely intertwined with such ecosystems is the concept of platforms. Typically, the way a platform works is that external partners congregate around a product to run their own business on its back. An agricultural machinery producer might think to data-enable and refine its tractors through making weather data part of their operation. A software company might consider linking up hardware fleets of all sorts to create smart ecosystems that deliver outcomes such as transport or accommodation. Platforms are a source of tremendous value-creation potential, and hardware product makers can become platforms players, although not all can succeed nor should they try.

Reinvention mandate: engineering in the New

To successfully create the next generation of smart connected products and services, companies will need to build entirely new capabilities and get used to running multiple business models and new product roadmaps in the future.

Here in a nutshell are the recommendations this book will lay out in more detail over the coming chapters – recommendations for any maker of hardware or software who embarks on the digitization journey.
Apply digital technology at scale and at pace to make your internal functions as seamless as possible. In many areas within your business organization, teams and individuals will be able to make productive use of the rich and insightful data sets reported back by your smart connected products. They must all be able to get hold of that data and work with it. Only digitization will create the speed and agility needed to supervise, reconfigure and update intelligent products successfully after shipping so that they keep their adaptive qualities for the user across their lifespan. The wholesale digitization of business organizations is what will create the efficiency needed to accumulate the funds to launch the pivot to the new product world.

Always think through your customer proposition from the end point: the user. He or she will show more and more demand for bundled outcomes rather than just for the means, tools and devices to create the desired outcome on their own. To ideate, create and deliver convenient and hyper-contextualized end-to-end experiences is an art in which not only electrical, mechanical or software engineers should have a say. It is also a core task for designers, manufacturing engineers, service technicians, IT professionals, and marketers.

Also, be aware that your product might create much more value for you once it is used in a platform or ecosystem context. Selling smart connected products as mere hardware devices is no longer the only option, and as-a-service models and integration into outcome solutions may well net more value. Thinking through business models should therefore always entail the evaluation of all potential ecosystem arrangements, while practical planning must foresee the right interfaces to interact with ecosystem or platform partners.

Conceptualizing, curating and continually updating smart products after shipping cannot be achieved through traditional skills and professional profiles. A lot of new expertise will be needed. For example, new skill sets such as those of experience designers and platform developers are necessary to master the creation of attractive services and user interfaces. Also, managers must defer decision making to the smaller agile and flexible teams working closely on the products rather than trying to run development processes from the top down.
Committed investment and the allocation of resources between the old core business and the new need perpetual recalibration. The phasing in of the new product world in a business will happen gradually, though this process must constantly be backed by clear entrepreneurial conviction.

This is the essence of the age of ‘Product X.0’ that we can see rising fast, if we put on the lens that this book is offering.

How to use this book

The book has four parts. Part One sets the scene for the journey towards the smart connected product. It shows how data-driven products will dramatically change and build on customer expectations and even the workings of whole economies and market models, and it explains how businesses can make the most of these trends.

In Part Two, an introductory chapter describes 10 defining traits of smart connected products and contrasts them with traditional products. A new analytical framework – we call it the ‘Product Reinvention Grid’ – is suggested to target new value spaces, which can scale and mitigate the slowing growth of the core. This grid shows in what way product makers can combine different stages of technological advancement with various stages of user experience sophistication. A product’s Intelligence Quotient (IQ) is squared with its Experience Quotient (EQ), resulting in its ‘Product Reinvention Quotient’ (PRQ). Progressing within this binary grid transforms products into exponential change with them becoming intelligent and eventually autonomous. After that we identify five big shifts pushing businesses in the journey from passive traditional products to smart connected products. This highlights the evolution from features to experiences, from hardware functionality to product as a service, from product to platform, from mechanical to artificial intelligence, and from linear to agile ‘Engineering in the New’.

Part Three focuses on the most important capabilities product-making businesses need to develop and introduces a clear roadmap for their journey to smart connected products. It also provides four in-depth case
Introduction

studies portraying real businesses in transition towards the New and a selection of expert interviews on the topic with business practitioners and academics, revealing further thought-leading insights in this exciting and challenging journey to new product horizons.

Finally, Part Four caps the book by propelling the reader into 2030 where a day-to-day world is highlighted that is for consumers and industrial users almost entirely driven by smart connected products.

Ultimately, Reinventing the Product makes a stringent case for companies’ need to rethink their product strategy and their product road map along digital lines. Digital technology is simultaneously friend and foe, highly disruptive, and cannot be ignored. Companies that fail to make use of it put themselves in the line of fire for disintermediation or even eradication. But digital technology is also the biggest opportunity in a long time to reposition incumbent product-making businesses internally and externally via product ranges, reimagined to draw from massive new pools of value potential.
PART TWO

The digital reinvention of the product
A radically new kind of product: adaptive | collaborative | proactive | responsible

CHAPTER SUMMARY

In this chapter, we introduce two new tools to deal with the reinvention of the product: our Product Reinvention Grid and the Product Reinvention Quotient (PRQ). It outlines the evolution on two key axes of the grid, the (Product) Intelligence Quotient (IQ) and the (Product) Experience Quotient (EQ), and describes changing traits as products evolve on each axis. The combinatorial effect of both changes leads to what we call the Product Reinvention Quotient (PRQ) for any product or product company. Connected to this line of thought, we outline five big shifts enabling new kinds of products that are reflected in the grid and that will be analysed in more detail in the remaining chapters of Part Two of this book.
Being smart and connected sounds a little like humanity’s default mode. We can all adapt reasonably well to changing environments thanks to the way our senses work with our cognitive, communicative and physical capabilities. Pretty much everyone can tell the difference between an executive board meeting, a dinner party, and a funeral. We judge what is appropriate and react accordingly.

Smart connected products – whether hardware or software – will eventually master this kind of cognitive versatility as perfectly as humans. That is why they are also often branded ‘living’ products. They stand out from the disconnected non-smart crowd by uniting, in a coordinating ‘mind’, the capacities for adaptation, collaboration, decision making and responsiveness. Many old-world products are going to need reinvention along these lines to meet the challenges of the New.

Orchestrated digital technologies such as cloud and edge computing, artificial intelligence (AI), robotics and 5G networks determine each smart product’s capacity for adaption, collaboration, proactivity and responsiveness. The art is to find the right configuration to fulfil a user’s desire for satisfying outcome experiences, giving the product’s maker a competitive edge and a lasting new source of value. This transition to outcome-oriented products and services also creates new requirements and challenges for the initial product design where user-centricity has to be observed and individualized hardware designs created.

The Product Reinvention Grid

Developing smart connected products is a journey. Based on our extensive work with hundreds of clients across a wide variety of industries, we have boiled down this journey into two key dimensions that are shown on the Product Reinvention Grid in Figure 3.1. The most important lodestar on this trip is to find the right combination between a product’s Intelligence Quotient (IQ) – the level of smartness, connectedness and cognitive independence – and its Experience Quotient (EQ), reflecting the quality of experience it can offer through its technology.
stack and functionalities. Square these two dimensions correctly and you will spot pools of new value for your business.

All traditional products start in the bottom-left corner. They have limited IQ as they have no or few sensors, no AI capabilities and are not connected. Likewise, this coincides with a low EQ as these products are typically sold in a transactional way. With no ongoing customer relationship beyond the point of sale, they become sold and are largely forgotten by their manufacturers. Leaving this corner means that the products must evolve either in experience levels and/or level of technological enablement and settle in various points of this continuum for specific market demands. For different sectors, markets and customer groups, different combinations of IQ and EQ might apply. That is why
the upper-left-hand corner is far from the desired spot to be for all businesses. It is very difficult to reach as it involves running a fully developed platform business, which should not and cannot be the aim for all product-making companies. Nevertheless, this is a spot promising huge value for the right businesses.

But let us first access this framework in a more systematic way by examining what is happening on each axis independently. As a product progresses up the EQ axis, the depth and breadth of the customer experience intensifies. The overall journey from feature to experience focus will be described in Chapter 4. The first step, which in reality most product companies have already taken, is to augment the product with value-added services. These could be basic services like warranty and product support, or more sophisticated ones such as data services based on the insights coming from a connected product. Sliding the axis upwards, a massive step change arises with the move towards as-a-service models, which focus on outcomes versus outputs. This requires moving from selling a transactional product to designing, selling and supporting an end-to-end lifecycle experience, a crucial milestone analysed in detail in Chapter 5. A further marked change that some, but not all product companies will take is to evolve their product into a platform that connects with a wide range of ecosystem partners, a strategic tack we will explore in depth in Chapter 6.

Along the IQ axis we find the evolution of the technology stack – from traditional to intelligent and potentially an autonomous product. Here as well, crucial step changes can be delineated. A first move is in many cases to make a product connected via some basic sensor technology that generates and sends product data. The next step towards an intelligent product, which we define as one with product-embedded AI capabilities, may seem trivial but typically requires a major product architecture shift as well as fundamental changes to the product development process. We have dedicated Chapter 7 to this major shift.

As already stated, not all products can end their journey in the upper-left corner of the diagram, nor should they. On the contrary, many
new products will start somewhere in the middle and stay there as long as their markets are thriving. Still others might start conceptualized for an existence as a complicated platform product while some more traditional products might take longer to leave the bottom-right corner as they cater for still very profitable markets.

It is worth going deeper into the concept of living products within the IQ/EQ framework. These products evolve intelligently over time, through human intervention or by autonomous impulse, generating dynamic experiences which target different user contexts. These are products with the highest IQ on the x-axis that are capable of delivering experiences of the highest levels of EQ.

Marrying the progression of products along the intelligence continuum with their increasing experience levels is a journey during which the combined evolution transforms into exponential change, with products becoming intelligent and autonomous. It is intelligence and autonomy that makes these products eventually come to life. At this stage they become responsive and steadily progress to becoming intuitive and learning.

To deliver best experiences, such products, or their key components, must become platforms capable of attracting and assimilating the participation of players from multiple ecosystems while data becomes the key input, and security and trust the biggest asset.

From traditional to reinvented products: 10 traits

Let’s consider how traditional products stack up against new smartened-up ones. We have put together a table showing the 10 defining features of both categories. Four of these traits are associated with movement on the Intelligence Quotient axis and six are more focused on the Experience Quotient. It becomes clear what a departure from the old world the ever-higher content of digital technology and software in devices means in terms of a value-rich ‘living’ product existence. This will help you get a sense of the latter’s new business opportunities.
### Figure 3.2  Traditional product vs smart connected product

<table>
<thead>
<tr>
<th></th>
<th>TRADITIONAL</th>
<th>SMART CONNECTED PRODUCT</th>
<th>CONTINUUM RELEVANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ‘Always on’ with superspeed highway access</td>
<td>No or very low speed/bandwidth connection</td>
<td>‘Always on’ high-speed/high-bandwidth connection to the cloud and between devices</td>
<td>IQ</td>
</tr>
<tr>
<td>2. Sensorized for awareness</td>
<td>No/few sensors</td>
<td>Multiple to several hundred sensors capturing up to terabytes of data per day</td>
<td>IQ</td>
</tr>
<tr>
<td>3. Smarter than smart</td>
<td>Fairly ‘dumb’</td>
<td>Increasing artificial intelligence and processing power at the ‘edge’ Processing power of basic device can exceed mainframe from 20 years ago</td>
<td>IQ</td>
</tr>
<tr>
<td>4. Software eats hardware and digital eats software</td>
<td>Value primarily from the hardware, but software gaining value in last two decades</td>
<td>80% of product value from software and digitally enabled services</td>
<td>IQ</td>
</tr>
<tr>
<td>5. Evergreen via upgrade</td>
<td>No or very limited upgradeability</td>
<td>Living product that regularly receives software upgrades adding significant functionality</td>
<td>IQ &amp; EQ</td>
</tr>
<tr>
<td>6. Digital age user interface (UI)</td>
<td>Physical controls, keyboard entry or basic guided touchpad</td>
<td>Digital voice-based UI widely adopted with some products also using gestures, eye movements or augmented reality as UI</td>
<td>EQ</td>
</tr>
<tr>
<td>7. Hyper-personalized</td>
<td>No or limited user customization</td>
<td>Automated personalization based on actual usage behaviour preferences and, in some cases, user’s current mood and context adaptive experience hyper-contextualized</td>
<td>EQ</td>
</tr>
<tr>
<td>8. A platform for multiple parties</td>
<td>Stand-alone product</td>
<td>Platform with open APIs to enable third-party partners; comes with a robust ecosystem to ‘feed’ the platform</td>
<td>EQ</td>
</tr>
<tr>
<td>9. Embedded in ecosystems</td>
<td>None</td>
<td>Dozens (potentially thousands) of ecosystem partners that co-develop products, build applications for them, leverage their data or service the products</td>
<td>EQ</td>
</tr>
<tr>
<td>10. Digital thread as an eternal umbilical cord</td>
<td>Limited linkage between engineering, manufacturing and ‘as is’ installed data</td>
<td>End-to-end data models and systems enabling ability to compare the ‘as designed’ to the ‘as manufactured’ to the ‘as is’ product over the entire lifecycle</td>
<td>EQ</td>
</tr>
</tbody>
</table>
Traits to increase the Intelligence Quotient

‘Always on’ with superspeed highway access

First there is connectivity. We saw in the previous chapters the tremendous advances made by this vital ingredient for the smart connected product world. Traditionally there has been either no or very limited connectivity between makers and users of a hardware product, let alone between the products themselves. It was the software industry that eventually pioneered the concept of ‘always-on’ relationships – between product creators and users of a software solution – via permanent contact through a cloud server. With the arrival of 5G mobile bandwidth, there will be a solid infrastructure to connect any physical product permanently, allowing for quick design iterations, remote servicing, personalization, and bilateral communication between devices.

Only high-performance connectivity bandwidth will allow for the mass use of cloud technology, one of the central pillars of smart connected products. In that regard, connectivity is among the most powerful enablers of the new smart connected product world and has become a prerequisite for products today. Just consider what capacity leap the coming upgrade from 4G to 5G mobile networks entails. 5G networks will run at much higher frequencies and use shorter wavelengths, making the antennae much smaller but still extremely powerful. Each one of them can handle 1,000 more devices per metre compared to 4G infrastructure, with up- and download times being up to 20 times faster. All these parameters will have direct impact on latency and user experience.

But there is still more to connectivity. In the future, much data produced by smart connected products will be processed and analysed by on-board computing capability, a concept called edge computing. It will mean that products can, to a large extent, self-organize and be independent from connectivity to their manufacturers, owners and users.
Concurrently, however, connectivity between different smart products will increase, for instance in the world of domestic appliances, where it will be possible to coordinate your various devices’ energy consumption by networking them. In a similar way truck and vehicle fleets, autonomous internal logistics vehicles and cobots can be connected for platooning purposes and collaboration on the shop floor.

Sensorized for awareness

Another key trait of the smart connected product is sensor and awareness technology. In the old world, products had almost no sensors. The odd data feeler might have been used – temperature or pressure sensors for a combustion engine or industrial machinery – but there was no range of high-tech, low-cost, miniature sensors available to enable mass data collection.

This has changed dramatically. Today a typical smartphone carries, for example, more than a dozen sensors, allowing for sophisticated user experiences. Many hardware products, industrial and consumer-facing, now also have large numbers of practically maintenance-free sensors which, often supported by lifelong battery life, have become low-cost, mainstream products. Up to a few terabytes of data can now be easily harvested in a very short time and sent into the cloud for use by the user, the product maker or even the product itself. Figure 3.4 shows how cars can now be densely sensorized for data collection.

A new aircraft engine includes now around 5,000 sensors producing 10 GB of data per second, corresponding to around 844 terabytes per day based on typical usage. Overall there are a good 24,000 sensors on a contemporary plane. But only 2 per cent of the data generated by these sensors is fully used, as most data sets are stuck in the different subsystems, which do not communicate. This led plane maker Airbus to build a digital platform which allows all these systems to communicate, and make use of 100 per cent of the data generated.
The car cockpit maker Faurecia is developing a sensorized car seat that adapts automatically to personal driver preferences and monitors health data to deliver maximum comfort for the user. Future cars are forecast to carry up to 200 sensors on board – the cockpit alone will have 24, varying from piezo for heat and vibration measurements to weight and position sensors in the seats to cameras – up from 60–100 today, while it is estimated that a typical home will contain around 500 smart devices by 2022. And even in medicine smart sensors are now sent through the intestinal tracts of patients to collect health data for diagnostic purposes. Even washing machines boast around half a dozen sensors these days to control among other things drum speed, water pressure and temperature or balance.

One can see why sensor technology has been such a game changer. However, take note: more sensors mean more complex testing and validation procedures in product development and more operational cost in processing and managing all the data generated.
Smarter than smart

Then there is the new cognitive character of products. Consider how far we’ve already come: today’s smartphones boast at least as much processing capacity as a supercomputer of 20 years ago. From the thoroughly unintelligent, unresponsive lumps of metal, plastic and electronic components they once were, products are emancipating themselves, carrying their own processing, storage and analytics power around with them, turning into ‘thinking’, autonomously analysing, decentralized, decision-making brains.8

Artificial intelligence and edge computing will be crucial technological enablers here, combining with the smart interconnection of objects and cloud computing technologies. More and more intelligence is also being embedded in microchips to cater for distinctive vertical sector applications such as automotive. All this will of course have huge repercussions within the business organizations managing smart connected products.

Soft drink maker Coca-Cola leverages AI to combine weather data, satellite images, information on crop yields, pricing factors, acidity and sweetness ratings to ensure that orange crops are grown in an optimum way, and maintain a consistent taste. The algorithm then finds the best combination of variables in order to match products to local consumer tastes in the 200-plus countries around the world where its products are sold.9

Agricultural engineering firm John Deere, meanwhile, acquired Blue River’s key technology ‘see and spray’. It’s a set of cameras fixed onto crop sprayers that uses deep learning to identify plants. If it spots a weed, it’ll hit it with pesticide and if it sees a crop, it’ll drop some fertilizer. All these parameters can be customized by the farmer, and Blue River claims it can save ‘up to 90 per cent’ of the volume of chemicals being sprayed, while also reducing labour costs.10

In 2012, Amazon acquired Kiva Systems, which develops warehouse robots. AI-controlled Kiva robots have been tasked with product monitoring, replenishment, and order fulfilment. That’s a big jump in Amazon’s efficiency, compared to the time when humans had to do the grunt work.11
Software eats hardware and digital eats software

With the advent of smart connected products, the balance of value will tilt in a transformative way towards software and digital technologies, a shift most dramatically felt by hardware producers. Digital technologies include various types of artificial intelligence such as machine learning, natural language processing and voice assistants as well as the advanced big data and analytics capabilities to harness and utilize all the data being captured by a sensorized, intelligent device. Non-intelligent products are rendered smart and connected; their value profile changes. The pure engineering features lose their market clout to software that makes products adaptable and collaborative.

In the future, electro-mechanical product features will account for only a small fraction of a product’s value. The much bigger value driver will be digital data technology built into the product to allow for tailored service offerings and the creation of a product platform to connect to wider fulfillment ecosystems.

That does not mean that hardware is becoming completely unimportant. The key is components – whether hardware or software – that enable a convincing experience for users. Hardware features will still play a part in defining user experiences. They can even be the centre of profit.

Figure 3.4  Simplified view of product evolution

<table>
<thead>
<tr>
<th>THE PRODUCT OF YESTERDAY</th>
<th>THE PRODUCT OF TOMORROW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features</td>
<td>Experiences</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Mechanical</td>
</tr>
<tr>
<td>Electronic</td>
<td>Electronic</td>
</tr>
<tr>
<td>Software</td>
<td>Software</td>
</tr>
<tr>
<td></td>
<td>Digital Technologies - AI, Analytics, Connectivity,...</td>
</tr>
<tr>
<td></td>
<td>Data</td>
</tr>
<tr>
<td></td>
<td>Services</td>
</tr>
<tr>
<td></td>
<td>Platform and Ecosystem</td>
</tr>
<tr>
<td></td>
<td>Digital Age User Interface</td>
</tr>
</tbody>
</table>
A Radically New Kind of Product

generation, as for Apple, or a mere delivery vehicle for services, as for Google for example. Entirely new or heavily re-engineered devices will emerge that depend heavily on how their users perceive their experience profile. Consider for example Haier, the Chinese appliances maker, which has completely reinvented the fridge to make it a social platform in the home. The case is covered in a detailed study later in this book.\textsuperscript{12}

Value is not only created by a comfortable user experience, but also through measurable financial impact. An autonomously driving harvester is less expensive to operate than a manned one. An industrial machine that is reconfigurable via software for multidimensional purposes is less capital-intensive than its non-smart counterparts.

To show how seminal the current shift is, let us briefly recapitulate how the reinvention of the product came about.

In the 1960s most hardware products contained practically no advanced electronic components conferring even basic smartness or value beyond the merely mechanical. By the 1980s, however, an average of 30 per cent of a product’s value already relied on its electronic components, a share that increased to 40 per cent in the 2000s when software components started to account for around 20 per cent and digital technology elements 10 per cent.\textsuperscript{13}

In the future this balance will tilt even more drastically towards digital and software. Technologies such as artificial intelligence or cloud and edge computing as well as connectivity will dominate a product’s ‘value pie’ – with electronic and mechanical features shrinking to a meagre combined value share of just 10 per cent, as we showed in the first chapter. But this might be a challenge bigger than expected for many traditional product makers. As James E Heppelmann, CEO of business software maker PTC told us: ‘You don’t go to bed as an industrial company and wake up as a software company – it is a lot harder than that.’\textsuperscript{14}

It is a big advantage that reinvented smart products, including software products, can add value in multiple areas at the same time. The usage data these products transmit back to base can be directly used to optimize internal processes at the makers, informing for instance research and development units or shaping marketing activities. But exactly the same data can also trigger instant product adaptation while in
the user’s hands. The same data also helps product makers to remotely service products in the field, again providing insights that feed back into designs for a product’s generational updates or create the basis for development of entirely new service propositions.

No wonder it is estimated that smart products will drive global productivity growth of 2.5–5 per cent over the next 10 years. That translates into combined revenue growth and cost savings of $900 billion per year for the industrial sector alone.15

**Traits to increase the Experience Quotient**

Evergreen via upgrade

The capacity to frequently upgrade via software is a characteristic of moving up the EQ axis from a transactional product to an outcome-oriented as-a-service or platform model. Software is fluid: simple code lines can drastically change product characteristics. This gives them an adaptive life, able to offer true experiences rather than mere product features, and to be constantly made new again, literally renewed.

Think of US car maker Tesla. Autonomous driving modes can be enabled overnight via software upgrades.16 Or think again of your smartphone’s operating system, updated regularly to improve usability or data safety. Without this capacity the product cannot react to new user needs or collaborate adequately.

In addition to traditional remote upgrades, newer generations of devices will be able to learn and become real-time aware, allowing them to become both self-configuring and self-repairing.

Digital age user interface

The user interface of a product is the core component of the experience, so to transform the experience most product companies will need to transition to new digital interfaces. In the old days, stationary physical dashboards with a limited number of switches and gauges were the norm. However, product interfaces have now turned into digitally enabled, voice-, swipe- or gesture-activated, artificial intelligence-driven, user-personalized, ergonomically highly adaptable mobile technology
modules that allow for seamless communication and collaboration between a user and a smart connected product.

Voice as the core user interface is a seismic technological advance that cannot be overstated. It is the key to a satisfying user experience for any smart connected product. Remember how much this technology has come of age. Where the first on-board voice assistants had to be controlled by defined vocabulary and phrase structures, modern AI-powered voice assistants can fluently deal with natural language commands, making human interaction as easy as talking to another passenger. We very much agree with Nytec CEO Rich Lerz’s statement that ‘voice is going to have a paramount impact on the future, and is going to unlock and unleash new applications and capabilities beyond our imagination’. Voice, Lerz says, is more unique and powerful than a fingerprint scan, as it can sense emotion and attitudes as well, thus becoming a core element of personalization.17

Consider, for example, Nest, which made a thermostat that was one of the first smart connected products to be operated via an in-built touchscreen. Nest’s first wave of devices controlled primarily by voice began appearing in 2017. In the near future a wide range of devices will be voice controlled.18 Gesture controls are being added by BMW and other carmakers as a core interface of the future.19

Figure 3.5  The evolution of human-machine interaction
The Digital Reinvention of the Product

These new interfaces like voice and gestures are much more intuitive and make us as humans a more seamless part of the connected product and service experience. We will communicate with these products and they will in turn communicate back to us in a natural way that does not require learning a new language or method of interaction. Meanwhile, in the background, the product is translating all of these inputs into the digital world inputs.

Hyper-personalized

Once a product has digital user interfaces and enough intelligence, it is possible to consider a degree of personalization that simply was not possible only a few years ago. These new user interfaces are flexible enough to deliver the right user experience (and the right outcomes) at the right time in the right, personalized context. But their software-enabled flexibility is also an important precondition for highly tailored experience personalization in individual user contexts. Having the flexibility and capacity to morph into a very personal product offering for a large number of users is one of the crucial drivers of customer value in the age of smart connected products. Rendered autonomously intelligent by artificial intelligence a product such as a car can even learn and take its own decisions on how best to personalize its user experience.

In car interiors, old-style dashboards are increasingly giving way to uniform touch-sensitive interfaces to allow for maximum personalization. Future car cockpits will be intelligent enough, thanks to sensors and locally acting artificial intelligence, to personalize the user experience to an even greater degree. As described above, the average car will have a wide array of sensors, which will be able to enable a completely new generation of personalized experiences. All cars will be able to identify who is in the driving seat, then adjust seat and mirror positions as well as playlists on the car stereo automatically. Through AI the car also adapts to individual user conditions such as fatigue levels, and to external driving conditions such as traffic density and weather.
A platform for multiple parties

Another decisive development is the impressive transformation from a product in isolation to a connected product platform, allowing for the deep and versatile involvement of third parties. Think of your smartphone, which comes to life for your day-to-day use and experience only by means of the numerous apps provided by third parties. Or consider Faurecia again, with its digital car cockpit primarily operated by users via the voice assistant Alexa, provided by Amazon.20

While many smart connected devices will not become platforms as no new value will thereby be tapped, some surely will. Only a platform – be it as a closed proprietary or more open ecosystem-oriented version – opens a product up to really rich adaptability, responsiveness, collaboration and personalization experiences. A platform also opens up the opportunity to extend into new markets and capabilities beyond the traditional core product. For example, Apple is now a leading provider of music, entertainment and other cloud services. In the case of most smart connected products, this will turn them into serious value generators for the manufacturer, the user and the third-party developer.

For this to happen, hardware products will need open APIs to make the co-creation of experiences as easy and financially attractive as possible for partnering external innovators.

Embedded in ecosystems

The emergence of the product as a flexible and living platform goes hand in hand with the emergence of the ecosystem that builds organically around it. Ecosystems mostly emerge because third-party applications are being developed to run the platform, because third parties are approached to service the product, or because they leverage product hardware and/or data to create their own complementary service designs for the product user. Ecosystem developers orbiting a platform today might number anywhere from a few dozen to millions, as in the case of Apple’s iOS and AppStore.

The emergence of product ecosystems is one of the defining trends of the new product world in an era of complex digital business models. Yet
ecosystems do not involve just third-party developers. They are also the framework for forming alliances with strategic suppliers or external marketers. Product ecosystems are a natural extension of the platform existences of smart connected products and a vital prerequisite for their commercial success. The war between competing products will be won by the better ecosystem bundling the more convincing customer proposition and user experience. Platform product manufacturers must therefore not only enable but also support, nurture and manage this ecosystem.

The emergence of ecosystems around smart connected products poses new challenges for marketers and brand managers. In a hyper-connected product world in which mobile phones, home thermostats, domestic appliances and even sports clothes are increasingly connecting to the Internet and potentially each other, brands have to learn to play well with each other or give up a certain amount of control to those who own the most popular interfaces. In most ecosystems, the brand in contact with the end user will occupy the most lucrative position.

Digital thread as an eternal umbilical cord

In order to provide an outcome-based and compelling experience, it is essential to be able to track and trace the product over its entire lifecycle – including the changes to the hardware, software and data attributes over time. This requires smart connected products to run on a data leash controlled by its makers long after sale, in a way that almost no hardware maker does today. These goals will be achieved via two related concepts, the digital twin and the digital thread.

The digital twin is a complete digital representation of a physical product, including not only 3D modelling, but also the material properties, the software and data. The digital twin becomes the single version of the truth of all product-related master data.

The digital thread extends this concept over the entire product lifecycle to track changes to the product’s configuration over time and trace its data flows. With the digital thread, a service technician in the field could compare the ‘as is’ configuration of today, to the ‘as manufactured’
to the ‘as designed’ product. If the technician is equipped with augmented reality technology, she can even see these views simultaneously and compare them.

Digital products that are fully instrumented with sensors, data processing capacity and connectivity and that are also backed by a digital twin and digital thread allow multiple streams of data, from feature usage to performance, to be sent back to product development and engineering teams. This kind of ‘listening’ to a smart product used in the field, and the actions in response to findings and usage patterns it enables, are central to the concept of a smart product that evolves
The Digital Reinvention of the Product

technologically over time via constant new software iterations installed remotely.

The existence of a digital thread platform and subsequent collection and analysis of usage data also opens up new opportunities to monetize the data in new and innovative ways. For example, data collected by a Wi-Fi company on who is accessing the network and where they are physically located could be used to add intelligence to building systems to tell facilities people not to turn off the air conditioning at the normal time of the day because there is a group working. The majority of companies do not have digital twin and digital thread capabilities today, but these will become a critical capability underpinning reinvented products in the near future.

The Product Reinvention Quotient

Returning to our Product Reinvention Grid: by taking the combinatorial impact of moves along both the IQ and EQ axes, we have created an index that we call the ‘Product Reinvention Quotient’ (PRQ). It is a measure of the degree of change required to achieve the transformation from a traditional product to any quadrant on the matrix shown in Figure 3.7.

We believe there are two main breaks on this matrix that represent discontinuities. The first is the IQ axis move from Connected to Intelligent Product, where we assign a jump from 90 to 120, and the second is the move on the EQ axis from Product & Services to ‘Product as a Service’, which moves from 30 to 60, or double the complexity. We want to stress that the upper-right-hand quadrant is not the desired outcome for all product companies. Indeed, we believe that very few companies should aspire to this quadrant. We will revisit in detail how to navigate this grid and drive the product reinvention in Chapter 10.
The future here, start now

Virtually every product will need to be reinvented and transformed in the near future. In fact, the race is already on, and business leaders who dither for too long about creating new generations of smart connected products run a significant risk of their organizations being disrupted and even pushed from the market. Indeed, the massive disruption represented by the product reinvention is enabling new entrants, often from completely different sectors. For example, very few consumer electronics

---

**Figure 3.7** The ‘Product Reinvention Quotient’ = IQ + EQ

<table>
<thead>
<tr>
<th>Experience</th>
<th>Output</th>
<th>Product &amp; Service</th>
<th>Product as a Service</th>
<th>Closed Ecosystem</th>
<th>Open Ecosystem</th>
<th>No Product’s Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>90</td>
<td>120</td>
<td>150</td>
<td>160</td>
<td>190</td>
<td>210</td>
</tr>
<tr>
<td>120</td>
<td>110</td>
<td>140</td>
<td>170</td>
<td>150</td>
<td>180</td>
<td>200</td>
</tr>
<tr>
<td>150</td>
<td>140</td>
<td>170</td>
<td>200</td>
<td>150</td>
<td>180</td>
<td>210</td>
</tr>
<tr>
<td>200</td>
<td>160</td>
<td>220</td>
<td>210</td>
<td>180</td>
<td>190</td>
<td>200</td>
</tr>
</tbody>
</table>

**IQ - INTELLIGENCE CONTINUUM**
**EQ - EXPERIENCE CONTINUUM**
companies would have imagined five years ago that Amazon and Google would become two of their most formidable competitors.

But reinventing the product itself can only be the start. Remember, smart connected products, in an advanced stage, will be able to remote control, optimize, adapt, decide and respond entirely by themselves. The resulting business cases will be so radically new as to be almost inconceivable to business leaders today. But all this is just around the corner. In order to be ready for it, it is vital to start your pivot away from the old product world and build by intelligible increments towards the New.

The following chapters provide details on five big shifts that all product companies need to consider in order to successfully reinvent their products. These are:

1. From features to experience.
2. From hardware to ‘as a service’.
3. From product to platform.
4. From mechatronics to artificial intelligence (AI).
5. From linear to agile ‘engineering in the New’.

**Takeaways**

1. A new product world is emerging in which products are becoming more intelligent and more experience-rich. We can plot every product of this emerging new world against a new analytical tool that we call the Product Reinvention Grid.

2. We have identified five big shifts. For most companies, a major transformation exploiting the five big shifts will have to be managed to succeed with their products in the new digitally driven world.

3. Companies can manage to drive the increase of the IQ and the EQ. The magnitude of the management effort required to be successful can be estimated by combining the desired shift in IQ and EQ to calculate what we propose as the Product Reinvention Quotient (PRQ).
12

Reinvented products in action
To facilitate the rotation to the new product world, we have shown that business leaders need a set of core capabilities and a clear roadmap. And we have backed up this with some encouraging testimonials from other business practitioners and thought leaders who have already begun work in this area. That is what we have so far provided in Part Three of this book.

Finally, to give the topic and our related views even more weight, we now present four long-form case studies – on Haier, Faurecia, Signify (formerly Philips lighting) and Symmons. These companies are active in different industries, are different in size and scale and are based in different regions (China, France, the Netherlands and the United States respectively). But each of them offers valuable and exclusive takeaways on how businesses representing a broad range of product makers who have embarked on the journey to reinvented products. They are all targeting different new value spaces, pivoting parts of their business to the New, and working on transforming and thus reinventing their products. Studying these examples will give you, we think, that crucial extra dose of confidence that smart connected products are where the future value is, and will be a source of inspiration to rethink your strategy accordingly.

**Faurecia case study: Get behind the wheel and... relax, work and socialize!**

*Having overcome debt and weak auto markets in the aftermath of the financial crisis, Faurecia has come out fighting. The company’s new CEO, Patrick Koller, is steering the global automotive supplier to become a systems integrator of digital cockpit and passenger technologies for the autonomous transportation markets of the future.*

Playing the guitar, doing yoga or cardio exercises, shaving, knitting, and more – Faurecia strategists received a surprisingly broad list of replies when they asked car users what they would do if freed from the task of piloting vehicles.\(^1\) Watching videos or adjusting makeup were the more prosaic activities, things many drivers already do in today’s non-autonomous vehicles.
In any case, top management at the company, the sixth-largest supplier of car seats, vehicle interiors and clean mobility technology, felt encouraged by these surveys. It had decided in 2016 to make Faurecia a leading provider of ‘digitally enabled on-board life’ to cater for the semi- and fully autonomous electric cars forecast to hit the roads in only three to five years.

‘We pitched our “cockpit of the future” to the coming car markets because we wondered what people would do in a vehicle if no longer obliged to dedicate their attention to the road. Apart from the driver, the car is already “autonomous” and nothing really compelling is so far proposed to the occupants who are not driving’, CEO Patrick Koller explained in an interview at Faurecia’s global headquarters in Nanterre on the fringes of the French capital.

**Internal digitization precedes product reinvention**

Faurecia is a stock market-listed business with a 45 per cent stake held by the French car maker Peugeot PSA. Having joined its seating division in 2006, Koller took leadership of the company in May 2016. His predecessor, Yann Delabrière, had successfully turned things around after the company found itself plagued by debt and dramatically cooled automotive markets in the aftermath of the 2007 credit crisis. Up to 2015, the deployment of digital technology happened within Faurecia with a view to boosting internal efficiency levels and restoring profitability. During those years, much less focus went into the creation of digital components, features and functionalities that would enrich the company’s product lines.

Once in charge, Koller, a mechanical engineer by training, who had held management roles in industries such as chemicals, lost no time in pushing ambitious strategic thinking, envisioning and acting. ‘That’s not something I credit only to myself,’ he says. ‘During the turnaround we were focused on execution, with almost no resources to think about a strategy for the future. But after that it was important for all of us in management to ask: what’s next? We had sold one of our activities – exterior vehicle parts – which made us debt free and allowed us to seriously envision new things.’
Led by Koller, the management board settled for the term ‘systems integrator’ to frame the operational role Faurecia would fulfil in the emerging digital automotive markets. It was decided that the core of Faurecia’s new product lines should be a smart cockpit intelligence platform (CIP), an information technology hub serving as the main software base for the new smart cockpit and cabin interior designs.

To back the plan up, a €100 million innovation budget was earmarked to conquer what was identified as a set of ‘new value spaces’. In total, Faurecia identified potential value spaces in the area of ‘sustainable mobility’ as well as ‘smart life on board’, with the latter being divided into six sub-value spaces, of which the CIP project is one.

Roughly around the same time, Faurecia also launched an internal transformation programme to improve competitiveness in the more traditional product lines. The measures are meant to provide further financial tailwind for its pivot to new smart product ranges. Faurecia aims, for instance, to achieve a 30 per cent reduction in costs for research and development by offshoring 1,200 engineering posts to India. Faster project management tools such as e-Kanban and technologies such as AI

**Figure 12.1** The smart cockpit intelligence platform as core of new product lines

![Diagram of CIP Core, CIP Sense, CIP Connect, and CIP Cloud components, including Added-Value Services from OEM Apps, AI Processor, Additional Services, Telematics Unit, and Cloud Services.]

**Source** © Accenture based on Faurecia Investor presentation
have been introduced to make ideation and design processes more efficient. The company also anticipates reducing development times from 36 months to 22 months, by using blockchain technology to further increase accountability and efficiency.

In a nutshell, Koller’s reinvention blueprint for Faurecia aims at transforming the company’s core business and operations by pivoting their product ranges, workforce and processes to generate savings by leveraging digital technologies. These savings will be used to further grow the company’s three core business pillars – seating, interior and clean mobility technology – and, in parallel, build scale in the new value spaces.

**Interiors and safety turning into differentiators**

Koller has put out ambitious financial targets to Faurecia’s shareholders for both its core product ranges and, especially, the new smart connected product lines. By 2025 the company aims to reach €30 billion of total sales, representing annual growth of above 8 per cent. The new value spaces are expected to grow three times as fast. While smart cockpit technology is expected to reach €4.2 billion, clean mobility technology is forecast to turn over €2.6 billion by 2025, reflecting an annual growth rate of 33 per cent. In 2017, Faurecia registered an overall turnover of around €17 billion, with global car producers such as Volkswagen, Ford, Renault-Nissan, BMW, PSA and Daimler.³

Koller is convinced that the automotive markets will experience a seminal turning of tides. ‘Once the car becomes autonomous, you will, as a carmaker, no longer be able to differentiate yourself via your brand, through the exterior design or through the specifics of your powertrain. You will differentiate yourself mainly through the user experience inside your vehicle and its interior smartness’, he argues.

With no drivers left in autonomous traffic, nobody is interested in horsepower and chassis design, especially with road traffic set to turn fully electric. All there will be is passengers wanting to get from A to B as quickly, smoothly and safely as possible while enjoying maximum attractive opportunities to work, relax or socialize. Cars must therefore be
connected at all times, with passengers able to use the same apps as they would at home or work. Faurecia is now the only global supplier left controlling all vehicle interior elements, so it was logical to go for smart technologies and integrate them with existing design features to deliver tailored solutions for targeted user groups. ‘It was common sense for us to say: we should be a key player here’, Koller recalls.

In late 2016, the CEO initiated the creation of a new cross-business team called ‘Cockpit of the Future’ (CoF). It attracted some initial scepticism and even slight resistance within the organization, as it was funded through existing business groups’ innovation teams. In some quarters, the idea of digitizing seats and interiors was seen as nursing expensive gadgets with no real economic prospects. Still, these headwinds were overcome by arguing the opportunities of drastically changing markets, so that the plan got enough senior people on board for launch.

Systems integration needs a range of partners

At first Koller’s CoF initiative merely entailed laboratory work. A team of 15 started ideating on new cockpit configurations and usages in a new venture located at Faurecia’s research site in Meru, France. The team’s first task was to help carmaker clients to envision and test drive new propositions for the autonomous car cockpit of the future.

As the operational leader responsible for the whole CoF initiative, David Degrange, an experienced engineer and business development manager, was appointed, reporting to a board of seating and interior division directors. After his ‘lab’ churned out a number of encouraging first ideas, the CoF team took on strategic responsibility to commercialize its new digital solutions.

Yet Faurecia’s management saw clearly that, to become a system integrator in fast-moving digital car markets, they needed to fill expertise gaps. To this end, the company vigorously immersed itself in an ecosystem of specialized partner businesses. A few were even competitors in certain product fields and all were innovators in their own fields, sharing Faurecia’s vision of the cockpit of the future.
The Journey to the Reinvented Product

‘As a system integrator we understand the full value chain of the cockpit of the future. So we can identify points where it doesn’t make sense for us to invest on our own because the entry costs are too high and because you would anyway have world leaders with stronger market positions on hand you could partner with who are recognized experts in these domains’, Koller explains.

Faurecia saw, for instance, that to properly handle car safety, a development alliance with ZF, a German-based specialist in car safety systems, made strategic sense. For similar reasons, it went into a co-development deal with the specialist Mahle, a world leader in vehicle air conditioning systems. ‘The typical air conditioning system in cars today feels too mechanical. It will become an electrical system to make it even smaller but also to personalize the climate comfort’, Koller says.

Acquisitions to beef up software teams

But for some key capabilities, especially in embedded software and AI-powered assistant technologies, Faurecia felt it needed new expertise under its own roof to build the cockpit platform. Koller therefore decided to make bolt-on acquisitions. In 2017 Faurecia bought French-based car infotainment specialist Parrot for €100 million, and went into an equity joint venture with Chinese company Coagent for €193 million.

Both firms offer software know-how Faurecia did not have. Parrot brings strong automotive software capabilities to the table, with 300 engineers located in Paris, while Coagent provides 400 software specialists as well as manufacturing capabilities in China, commanding an 8 per cent market share as a software provider to Chinese carmakers. Under the headline ‘Faurecia Tech’, the company created a distinct architecture of knowledge blocks tying in not only mature corporate partners but also academics, start-ups and other technology platforms.

All Faurecia’s partners share a strong innovation culture and their expertise will play a role in future automotive markets. Security and
safety will be key in the adoption of autonomous vehicle technology, thermal management will be crucial for extending the range of electric vehicles, and AI and cloud computing will be critical drivers of smart on-board features such as voice assistants.

**Integrating technologies**

To get support in tying all this expertise together and building the complex informational technology architecture behind smart car interiors, Koller added Accenture as a partner to its ecosystem. ‘Their expertise is digital transformation and IoT landscapes. Again, we are not in this field, but we want to benefit from the innovations. We do not work with different industries like Accenture does, so they have a much better understanding of what the market offers and are in fact accelerating our capacity to integrate the best solutions’, he explains.

With Accenture’s support, Faurecia conducted a string of ideation sessions to convert use cases into actual product solution lines for CIP.
The Journey to the Reinvented Product

David Degrange and his leadership team prioritized the technologies to be developed for the intelligence platform. They proposed a short list of features and Koller had the final say. Ultimately, the overall vision encompasses not just the core but also sensing, acting, and cloud computing, in a unique blueprint that is currently without parallel elsewhere on the market.

To identify these unique and differentiating product features, Faurecia undertook a few market studies starting in late 2016. The team also conducted user interviews to create ‘hassle maps’ and to build use cases and group them into segments. For each of the segments, they thought about offering distinctive technology solutions. Continuing on, the team is conducting further regional market studies in the United States, China and Germany. These will focus on the changing needs and usage habits of potential car drivers and passengers.

The cockpit of the future is highly adaptable

The development of the digital cockpit as part of Faurecia’s ‘new value space’ strategy is strongly guided by user needs and expectations. The car can completely reconfigure for each individual driver and for external driving conditions. The cockpit seamlessly integrates all smart components: electronics, active decoration, smart surfaces and actuation, intuitive human-to-machine interfaces, multiple transformable touch displays, state-of-the-art software applications, adaptive seating with sensors for biometric data collection, and infotainment elements. Voice assistants act as principal interfaces to control functions. The cockpit also combines enhanced passenger safety, predictive wellbeing, and transportation convenience with a maximum of external connectivity.

For its voice control, the cockpit is fitted with a choice of voice assistants (including the popular Amazon Alexa, Google Assistant, and Baidu DuerOs) differentiating between user voices so that each passenger can direct their preferred assistant to perform separate tasks. Among other functions, the assistant can adjust seat positions, start a seat massage, change climate settings, and upload video and music
playlists. Crucially, users can tap into the car’s settings on their preferred voice assistant at home or in the office. They can, for example, consult and update to-do and shopping lists while in the vehicle or get their car ready to drive by setting the climate control levels from home. The assistant can also be used to make maintenance appointments with garages and coordinate them with those business’s MS Office calendars.

The traditional driver dashboard has been reshaped to include one large digital display. Instrument panels consist of adaptive surfaces that are able to change display, functionality and position. The cockpit also features facial recognition, allowing the vehicle to suggest music or specific scenic routes depending on driver identity or mood. Each passenger can enjoy privacy, particularly when it comes to sound. Thanks to designated ‘sound bubbles’, the driver can follow GPS instructions while passengers listen to their choice of audio or have a phone conversation without anyone disturbing anyone else.

Patrick Nebout, Vice President of innovation in the seating business, says Faurecia has also developed an ‘active wellness’ seat, which employs biometric sensors and predictive analytics to measure and respond to occupant stress, drowsiness and other symptoms. Via a smart trim, the seat collects an expanded range of biological and behavioural data, such as heart rate, respiration rate, body movement – eg fidgeting – and humidity. For a smarter and safer seat, Faurecia and ZF developed a frame concept that allows cabin occupants to drive, relax and work safely and seamlessly. The seatbelt, belt retractor and airbags are all integrated into the seat, with these safety functions designed to operate optimally in different seat positions.

Next to its many adaptive features, the cockpit also offers predictive functionalities. It can, for instance, anticipate a driver’s preferences and adjust positions of seat, mirrors and steering wheel. More important, the cockpit is intelligent enough to anticipate individual drivers and passenger safety levels and adjust controls, displays and autonomous handovers to match. This is of particular value for car-sharing schemes, where drivers have their profile and driving history saved so that they get personally preconfigured cars regardless of where they hire a vehicle.
Going via flexibility and personalization from B2B to B2C

Faurecia has in view a potential market of €35 billion for technologies associated with its intelligent cockpit by 2025. Assuming that the majority of this potential is realized between 2017 and 2022, and further assuming that Faurecia will gain a 15 per cent share of this market, this technology alone, according to analysts, could add 3 per cent per annum to Faurecia’s stock value over the next five years.

The company’s CEO sees its incumbent business model as changing over time as the demand for flexibility and individualization grows in the car markets of the future:

‘You will have to provide equipment solutions that can continue to individualize and adjust to new needs. You as a consumer buy a car interior with some use cases and two years later you have a baby, so you need a configuration for a third use case. It’s never exactly the same car. This degree of flexibility is not built in yet today but it will happen. And this will also change our business model, which is today a B2B model. At the moment we are moving with the cockpit to a B2B2C model and eventually we will have a significant business in B2C markets too.’
“With grounded skill and enthusiasm Reinventing the Product makes a stringent case for companies to rethink their product strategy, their product roadmap and their digital capabilities.”

Patrick Koller, CEO, Faurecia

“Dave Sovie and Eric Schaeffer bring fresh thinking and inspiring practical advice for successfully managing the digital transformation and creating value.”

Marco Argenti, Vice President Technology, Amazon Web Services

“Full of innovative insights about AI, platforms, and smart products. And the ‘Product Reinvention Quotient’ provides great insights in how to think about ‘Product X.0’ and how to develop a set of capabilities that are necessary to succeed in the future.”

Guido Jouret, Chief Digital Officer, ABB

“The nature of product innovation is fundamentally changing. Reinventing the Product shows how to combine hardware, software and business model innovation in an agile manner to meet the fast-changing needs in a world of smart connected devices.”

Yoon Lee PhD, Senior Vice President and Division Head Content and Services, Product Innovation Team, Samsung Electronics America

“Eric Schaeffer did it again. After spearheading Industry X.0, which has inspired our team of entrepreneurs to adapt our digital strategy creatively, he now co-authors with David Sovie a brilliant, richly detailed roadmap to the digital future for all product making companies. No doubt: this is a must-read”.

Zhang Ruimin, Chairman of the Board of Directors and CEO, Haier Group

Reinventing the Product looks at the ways traditional products are transforming into smart connected products and ecosystem platforms at a rate much faster than most organizations think. Eric Schaeffer and David Sovie show how this reinvention is made possible: by digital technologies such as AI, IoT sensors, blockchain, advanced analytics, cloud and edge computing and by developing a radical new kind of product roadmap. They show how to deliver truly intelligent, and potentially even autonomous, products with the more personalized and compelling experiences that today’s users, consumers and enterprises expect.

Reinventing the Product makes a stringent case for companies to rethink their product strategy, their innovation and engineering processes, and the entire culture to build the future generations of successful ‘Living Products’. Featuring case studies from global organizations such as Faurecia, Signify, Symmons and Haier – from interviews with thought leaders and business executives of top companies including Amazon, ABB, Tesla, Samsung and Google – it provides practical advice for maker-companies as they embark on, or accelerate, their digitization journey.

Kogan Page
London
New York
New Delhi
www.koganpage.com