APPENDIX

A Brief History of Software and Software Engineering

You are probably curious about why and how the profession of software engineering arose. Thus, it is useful to briefly examine the evolution of software provisioning and especially the awareness of the need for the structured approach provided by software engineering.

While the forerunner of computing is often cited as the work of Charles Babbage and Ada Lovelace in the 19th century, as well as the development of Hollerith punched card equipment in the early part of the 20th century, it was the developments starting in the 1940s that provided the starting point for modern computing. These early computers (some electrical-mechanical) were programmed in a very primitive manner by switches, by punched paper tape, or by some form of plug board wiring that directed the computers' operation. The application of these early machines focused upon numerical computation of mathematical functions, and the programs were quite small.

A major breakthrough occurred when the notion of stored program computers was proposed by John von Neumann in the latter part of the 1940s and was implemented, among other applications, for the first commercial computer, the Univac I. At this stage, while numerical computation was still important, the focus began to shift to data processing (being able to store and process large quantities of data stored on magnetic tapes). In fact, the first Univac I delivery in 1951 was to the United States Bureau of the Census, where processing of population and production data as well as provisioning of statistics was the focus.

During the 1950s, a variety of stored program computers were produced and marketed by several companies in the United States, Europe, the Soviet Union, and Japan. Programming of these early computers was still a challenge since machines were programmed at the machine instruction level. A major breakthrough occurred in 1951 when Grace Murray Hopper introduced a means of compiling program code for numerical computations and called the program that did this a "compiler." This provided for easy re-use of program code in an effective manner, in particular the code for mathematical functions.

During the 1950s, a number of programming languages and compilers evolved for numerical computation—for example, Fortran—as well as the increasingly important area of data processing resulting in COBOL (which even today remains as the most pervasive programming language for data processing). Further, in the early 1960s, the utilization of computers for physical process control started to evolve, and eventually languages that facilitated a higher-level means of programming these devices were provided.

As these higher-level languages furnished a means to construct significantly larger applications and the use of computers became more pervasive, it rapidly became clear that developing and sustaining large suites of programs presented an enormous intellectual and management challenge as described by Fred Brooks [Brooks 1975]. During the 1960s it was recognized that there was a "software crisis" as indicated in the following quotation.

> "The major cause of the software crisis is that the machines have become several orders of magnitude more powerful! To put it quite bluntly: as long as there were no machines, programming was no problem at all; when we had a few weak computers, programming became a mild problem, and now we have gigantic computers, programming has become an equally gigantic problem."
> [Dijkstra 1972]

Thus, as computing technology advanced and as larger and larger software suites evolved during the 1950s and 1960s, it became evident that a more structured approach to software was required. While the term "software engineering" had been used by some authors in the mid-1960s, it was at a NATO-sponsored meeting in Garmisch, Germany, in 1968 that the need for a software engineering profession was clearly addressed [NATO 1968]. The conference was attended by international software experts who agreed upon the need to define best practices for developing and sustaining software systems that are grounded in the application of an engineering approach.

There are a variety of brief definitions of software engineering; for example, the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronic Engineering (IEEE), respectively, each still define the profession directly in line with the 1968 Garmisch intentions. According to them, software engineering entails: "systematic application of scientific and technological knowledge, methods, and experience to the design, implementation, testing, and documentation of software to optimize its production, support, and quality [ISO/IEC 2382 2015.]" and "application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software [ISO/IEC/IEEE 24765 2017.]."

As the need for software engineering evolved, advances in hardware technology in the 1960s and 1970s provided both more powerful large computers and a range of smaller so-called mini-computers. A major hardware advance occurred in the mid-1970s with the development of large-scale integrated circuits. Certainly, the availability of inexpensive microprocessors, large primary and secondary memories, graphic processors, and communication via networks, including the Internet, have been game changers leading eventually to desktop computers and today's laptops, mobile phones, and tablets as well as the pervasive use of embedded systems in a variety of products.

So, in addition to the early application areas of numerical computation, data processing, and process control, the software business has expanded to provide a wide variety of new application products such as e-mail, chatting, games, voice recognition, advanced graphics, smart phones, robotics, mobile communication, intelligent embedded devices, and so on. Furthermore, more recent developments have led to new infrastructure facilities in the form of cloud computing, the Internet of things (IoT), and cyber-physical systems. All of these developments have had a radical effect upon our society. While providing many new possibilities, the "software crisis" that Dijkstra pointed to has definitely intensified and we live in an era that raises important socio-technical issues as well as fundamental concerns related to safety, security, and integrity. Thus, there is a definite need to improve our capability to develop and sustain high-quality software.

Based upon this brief history of software evolution and the advances in hardware leading to new software challenges, you now have an idea of why the software engineering profession evolved, but there is much yet to do. It has become clear that programming and coding are only one aspect of software engineering. As you will have discovered in reading this book, there are many problems (technical, organizational, managerial, and social) that need to be dealt with in the provisioning and sustainment of high-quality software. The presentation of software engineering through the lens of Essence in this book provides a generic yet substantive definition of the profession far beyond the typical single-sentence definitions.

In the challenging environment that has evolved, there have been many discussions of the best practice approach to deal with the multiplicity of factors involved in providing sustainable and high-quality software systems. Is it a prescriptive engineering approach or the more agile practice approach that is to be preferred? Or is it some combination of both approaches? In continuing this brief software history story, then, focus is placed upon how various approaches to software engineering evolved.

Some of the most important software engineering historical developments are as follows.

- During the late 1960s and 1970s, most popular approaches were based on the structure of programs emphasizing a function-data paradigm, so that basically a software system had two parts—the program part and the data part where the program part was organized to process a flow of data. One of the most popular was Jackson Structured Programming (JSP) introduced by Michael Jackson [Jackson 1975]. In another important development, Douglas Ross developed SADT (Structured Analysis and Design Technique), which also emphasized the flow of data (for program structures) as well as the flow information and processing activities [Ross 1977].
- During this period, an approach to organizing work now called the "waterfall method" evolved, in which activities were related to a sequential design process where progress is seen as flowing steadily downward (like a waterfall) through phases such as conception, initiation, analysis, design, construction, testing, production/implementation, and maintenance.
- During the same time period in the telecommunication business, another program structure approach based on the component paradigm was applied—a system here is a set of components interacting by sending messages to one another. Ivar Jacobson (an author of this book) was the original developer of this new approach. His colleague Göran Hemdal refined it and implemented it with programming language support and firmware to provide components "all the way down" to executable code. In 1976, Ericsson AB used this approach and produced the AXE telecommunication switching system that became the world's leading system and resulted in the largest commercial success story ever in Sweden. At the same time, the visual language of the approach inspired the development of an international standard in telecommunications called Specification and Description Language (SDL). Sequence diagrams showing interactions among components, one of Ivar's ideas, were adopted in SDL.
- During the 1980s, object-oriented programming (with languages such as Simula—which had appeared already in the late 1960s—plus Smalltalk, Eiffel, Objective-C, C++, Ada, Java and so on) became mainstream and a

large number of approaches to building object-oriented systems became popular. Object-orientation took the idea of components to a level of much finer granularity (everything was an object), so that the system was viewed as a huge set of objects where program behavior was realized by the objects interacting with one another.

- Eventually (in the late 1980s and 1990s) the component idea and the object idea were merged and components became exchangeable packages; the objects were then executable elements creating the functional behavior.
- During this period, an important abstraction called Use Cases, used to model the requirements of a system, was introduced by Ivar Jacobson [Jacobson et al. 1992].
- A more comprehensive set of abstractions were provided in the Unified Modeling Language (UML) standard for design of software intensive systems, which was adopted by Object Management Group in 1997. The three original developers of UML were Grady Booch, Ivar Jacobson, and James Rumbaugh [Booch et al. 2005].
- An international standard for Software Life Cycle Processes—namely, ISO/IEC 12207—was developed in the early 1990s [ISO/IEC/IEEE 12207] and was followed by the development of the ISO/IEC 15288 standard for System Life Cycle Processes. This was in recognition that a software system always exists in a wider system context. One of the authors of this book, Harold "Bud" Lawson, was the architect of this system standard. More recently, Ivar Jacobson and Bud Lawson contributed to and edited a book that provides various perspectives on software engineering in the systems context [Jacobson and Lawson 2015]. The 12207 and 15288 standards are being harmonized in recognition of the strong relationship between systems engineering and software engineering [ISO/IEC/IEEE 15288].
- The most popular method for software engineering became the Unified Process (UP), which was provided as Rational UP (RUP) in 1996. Ivar Jacobson was a father of RUP, but many other people contributed to its development—in particular, Philippe Kruchten and Walker Royce [Kruchten 2003]. RUP was based upon some proven best practices still in use today, such as use cases, components, and architecture. However, RUP was too large, too prescriptive, and very difficult to adopt widely.
- Around 2000, as a counter-reaction to RUP and other document-heavy approaches, a new movement arose that promoted light and flexible methods

combined with modern ideas for teamwork and fast delivery with feedback. Agility became the word of the day, and agile methods became the way forward. The most influential contributors to this movement were the following:

  - Extreme Programming with User Story and Test-Driven Development (TDD), introduced by Kent Beck [Beck 1999, 2003]; and
  - Scrum by Ken Schwaber and Jeff Sutherland [Schwaber and Sutherland 2016].

- Now in more recent years, new methods for scaling agile have arisen, such as:
  - Scaled Agile Framework (SAFe), introduced by Dean Leffingwell [Leffingwell 2007];
  - Disciplined Agile Delivery (DAD), introduced by Scott Ambler and Mark Lines [Ambler and Lines 2012];
  - Large Scale Scrum (LeSS), introduced by Craig Larman and Bas Vodde [Larman and Vodde 2008];
  - Scaled Professional Scrum (SPS), introduced by Ken Schwaber (see https://www.scrum.org/index.php/resources/scaling-scrum).

While various approaches have imparted structure and discipline in providing software products, the number of these methods and practices has exploded. And, while there are successes, there are far too many failed and very expensive software endeavors. Many methods have become "religions" among enthusiastic creators and their followers. In fact, the popularity of the methods seems to be more like in the fashion industry, where differences are not well understood and artificially magnified. Further, there is a lack of objective evaluation, comparison, and validation of the methods and their composed practices.

So, given the multiplicity of methods that have arisen, a vital question is WHAT method should YOU (and the team of which you are a member) learn to utilize? Further, how well do the method and its practices that you select provide the multiple capabilities required to perform effective team-based software engineering?

In the series of best practice and method churns, a new community woke up. This community, called Software Engineering Method And Theory (SEMAT) and founded by Ivar Jacobson, Bertrand Meyer, and Richard Soley, wanted to stop the madness of throwing out all of what organizations and their teams had established and constantly starting over with new methods. As a result of the diligent efforts of a group of software engineering professionals, the Essence of Software Engineering evolved as a method- and practice-independent approach that has become an Object Management Group standard [OMG Essence Specification 2014]. This new approach will certainly provide a basis for re-founding the profession of software engineering [Jacobson and Seidewitz 2014].

So now you should have an appreciation of how software and in particular software engineering have evolved. Essentializing software engineering as presented in this book has provided, for the first time, a means of unifying the multiple perspectives of software engineering.

References

Alpha State Card Games. 2018. https://www.ivarjacobson.com/publications/brochure/alpha-state-card-games. 99, 153

S. Ambler and M. Lines. 2012. *Disciplined Agile Delivery: A Practitioner's Guide to Agile Software Delivery in the Enterprise*. IBM Press. 297, 339, 346

K. Beck. 1999. *Extreme Programming Explained: Embrace Change.* Addison-Wesley Longman. 203, 285, 346

K. Beck. 2003. *Test-Driven Development by Example*. Addison Wesley. 346

K. Bittner and I. Spence. 2003. *Use Case Modeling.* Addison-Wesley Professional, 2003. 222, 285

G. Booch, J. Rumbaugh, and I. Jacobson. 2005. *The Unified Modeling Language User Guide.* 2nd edition. Addison-Wesley. 222, 285, 345

F. Brooks. 1975. *The Mythical Man-Month*. Addison Wesley. 342

M. Cohn. 2004. *User Stories Applied: For Agile Software Development.* Addison-Wesley Professional. 204, 247, 285

E. Derby and D. Larsen. 2006. *Agile Retrospectives: Making Good Teams Great.* Pragmatic Bookshelf, Dallas, TX, and Raleigh, NC. 196, 198, 284

E. W. Dijkstra. 1972. "The Humble Programmer." Turing Award Lecture, *CACM* 15 (10): 859–866. DOI: 10.1145/355604.361591. 342

D. Graziotin and P. Abrahamsson. 2013. A web-based modeling tool for the SEMAT Essence theory of software engineering. *Journal of Open Research Software*, 1,1(e4); DOI: 10.5334/jors.ad. 147, 153

ISO/IEC/IEEE 2382. 2015. Information technology–Vocabulary. International Organization/International Electrotechnical Commission, Geneva, Switzerland. https://www.iso.org/obp/ui/#iso:std:iso-iec:2382:ed-1:v1:en. 343

ISO/IEC/IEEE 12207. 2017. https://en.wikipedia.org/wiki/ISO/IEC_12207 345

ISO/IEC/IEEE 15288. 2002, 2008, 2015. Systems and software engineering—System life cycle processes. International Standardization Organization/International Electrotechnical Commission, 1 Rue de Varembe, CH-1211 Geneve 20, Switzerland. 345

ISO/IEC/IEEE 24765. 2017. Systems and software engineering–Vocabulary. International Organization/International Electrotechnical Commission, Geneva, Switzerland. https://www.iso.org/obp/ui/#iso:std:iso-iec-ieee:24765:ed-2:v1:en. 343

M. Jackson. 1975. *Principles of Program Design*. Academic Press. 344

I. Jacobson. 1987. Object-oriented software development in an industrial environment. *Conference Proceedings of Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA 87).* DOI: 10.1145/38807.38824. 221, 285

I. Jacobson and H. Lawson, editors. 2015. *Software Engineering in the Systems Context*, Systems Series, Volume 7. College Publications, London. 345

I. Jacobson and E. Seidewitz. 2014. A new software engineering. *Communications of the ACM*, 12(10). DOI: 10.1145/2685690.2693160. 347

I. Jacobson, M. Christerson, P. Jonsson, and G. Overgaard. 1992. *Object-Oriented Software Engineering: A Use Case Driven Approach*. ACM Press Addison-Wesley. 345

I. Jacobson, I. Spence, and K. Bittner. 2011. Use-Case 2.0: The Guide to Succeeding with Use Cases. https://www.ivarjacobson.com/publications/whitepapers/use-case-ebook. 169, 222, 226, 233, 285

I. Jacobson, P.-W. Ng, P. E. McMahon, I. Spence, and S. Lidman. December 2012. The essence of software engineering: The SEMAT kernel. *Communications of the ACM*, 55(12). http://queue.acm.org/detail.cfm?id=2389616. DOI: 10.1145/2380656.2380670. 30, 95

I. Jacobson, P.-W. Ng, P. E. McMahon, I. Spence, and S. Lidman. 2013a. *The Essence of Software Engineering: Applying the SEMAT Kernel*. Addison-Wesley. xxvi, 30, 90, 95, 336

I. Jacobson, I. Spence, and P.-W. Ng. (October) 2013b. Agile and SEMAT: Perfect partners. *Communications of the ACM*, 11(9). http://queue.acm.org/detail.cfm?id=2541674. DOI: 10.1145/2524713.2524723. 30, 96

I. Jacobson, I. Spence, and B. Kerr. 2016. Use-Case 2.0: The hub of software development. *Communications of the ACM*, 59(5): 61–69. DOI: 10.1145/2890778. 169, 222, 226, 285

I. Jacobson, I. Spence, and P.-W. Ng. 2017. Is there a single method for the Internet of Things? *Queue*, 15.3: 20. DOI: 10.1145/3106637. 335, 339

P. Johnson and M. Ekstedt. 2016. The Tarpit—A general theory of software engineering. *Information and Software Technology* 70: 181–203. https://www.researchgate.net/profile/Pontus_Johnson/publication/278743539_The_Tarpit_-_A_General_Theory_of_Software_Engineering/links/55b4490008aed621de0114f5/The-Tarpit-A-General-Theory-of-Software-Engineering.pdf. DOI: 10.1016/j.infsof.2015.06.001. 91, 92, 96

P. Johnson, M. Ekstedt, and I. Jacobson. September 2012. Where's the theory for software engineering? *IEEE Software*, 29(5). DOI: 10.1109/MS.2012.127. 84, 87, 96

R. Knaster and D. Leffingwell. 2017. *SAFe 4.0 Distilled: Applying the Scaled Agile Framework for Lean Software and Systems Engineering.* Addison-Wesley Professional. 297, 339

P. Kruchten. 2003. *The Rational Unified Process: An Introduction*. 3rd edition. Addison-Wesley. 345

C. Larman and B. Vodde. 2008. *Scaling Lean & Agile Development: Thinking and Organizational Tools for Large-Scale Scrum.* Pearson Education, Inc. 346

C. Larman and B. Vodde. 2016. *Large-Scale Scrum: More with LeSS.* Addison-Wesley Professional. 297, 339

D. Leffingwell. 2007. *Scaling Software Agility: Best Practices for Large Enterprises.* Addison-Wesley. 346

P. E. McMahon. January/February 2015. A thinking framework to power software development team performance. *Crosstalk, The Journal of Defense Software Engineering*. http://www.crosstalkonline.org/. 96, 154

NATO. 1968. "Software Engineering: Report on a conference sponsored by the NATO Science Committee." P. Naur and B. Randell, editors. Garmisch, Germany, October 7–11. 342

S. Newman. 2015. *Building Microservices.* O'Reilly Media, Inc. 250, 285

P.-W. Ng. 2013. Making software engineering education structured, relevant and engaging through gaming and simulation. *Journal of Communication and Computer* 10: 1365–1373. 99, 153

P.-W. Ng. 2014. Theory based software engineering with the SEMAT kernel: Preliminary investigation and experiences. *Proceedings of the 3rd SEMAT Workshop on General Theories of Software Engineering*. ACM. DOI: 10.1145/2593752.2593756. 30, 96

P.-W. Ng. 2015. Integrating software engineering theory and practice using Essence: A case study. *Science of Computer Programming*, 101: 66–78. DOI: 10.1016/j.scico.2014.11.009. 96, 152, 154

Object Management Group. Essence—Kernel and Language for Software Engineering Methods (Essence). http://www.omg.org/spec/Essence/1.1. 63

OMG Essence Specification. 2014. http://www.omg.org/spec/Essence/Current. 95, 346

D. Ross. 1977. Structured Analysis (SA): A language for communicating ideas. In *IEEE Transactions on Software Engineering*, SE-3(1): 16–34. DOI: 10.1109/TSE.1977.229900. 344

K. Schwaber and J. Sutherland. 2016. "The Scrum Guide. The Definitive Guide to Scrum: The Rules of the Game." Scrum.org.

Index

201 Principles of Software Development, 84–85

Accept a User Story activity, 207, 214–215
Acceptable state in Requirements alpha, 57, 215–217
Acceptance Criteria Captured detail level for Test Case, 209
Acceptance Criteria Listed detail level for Story Card, 209
Achieving the Work alpha, 215
ACM (Association for Computing Machinery), 342
Actionability in Essence kernel, 89
Activities
  Essence, 55
  Essence kernel, 72–75
  Microservices Lite, 255–257, 267–270
  Scrum, 175–176, 178
  Scrum Lite, 188–197
  thing to do, 62–63
  Use Case Lite, 229, 238–244
  User Story Lite, 207, 211–215, 217–218
Activity spaces
  Essence kernel, 68, 72–73
  essentializing practices, 63–65
Adapt in Plan-Do-Check-Adapt cycle, 132
Adaptability in microservices, 252
Adapts achievement level in Development competency, 61–62
Addressed state in Requirements alpha, 57, 80
Agile Manifesto, 335–336
Agility and Agile methods
  Agile methods era, 25–26
  Essence kernel relationship to, 90–91
  introduction, 346
  practices and methods, 335–336
All Stories Fulfilled state in Use Case alpha, 231
Alphas
  Chasing the State game, 105–108
  Checkpoint Construction game, 112–113
  composition of practices, 279–281
  customer area of concern, 160–163
  development, 128–132
  development journey, 146–148
  Essence, 54–55
  Essence kernel, 68–72, 89, 151–152
  kick-starting development, 122–123
  large and complex development, 311
  Microservices Lite, 257–259
  Objective Go game, 108–111
  overview, 56
  Progress Poker game, 100–104
  Scrum, 175–177
  Scrum Lite, 179–182
  states, 55–59
  sub-alphas, 124
  Use Case Lite, 229–233
  User Story Lite, 207–209, 215–216
Alternative practices, 278–279
Ambler, Scott, 346
Analysis competency, 76

Analyzed state in Use-Case Slice alpha, 233
Anomalies in development journey, 148
Application logic, definition, 251
Applies achievement level in Development competency, 61–62
Architecture Selected state in Software Systems, 59, 80, 311
Areas of concern in Essence kernel, 67–68
Assists achievement level in Development competency, 61–62
Association for Computing Machinery (ACM), 342
Attainable attribute in SMART criteria, 196–197
Automated detail level
  Build and Deployment Script, 265
  Test Case, 210
AXE telecommunication switching system, 344

Babbage, Charles, 341
Background in practices, 34
Backlog-Driven Development practice, 33
Beck, Kent, 86, 346
Booch, Grady, 345
Bounded state in Requirements alpha, 56, 80, 215–216
Briefly Described detail level in Use-Case Narrative work product, 235
Brooks, Frederick P., 84, 342
Build and Deployment Script, 264–265
Building blocks, 10
Bulleted Outline detail level in Use-Case Narrative work product, 235
Bureau of the Census, 341

Capabilities in practices, 33–34
Capability Maturity Model Integration (CMMI), 306
Capacity Described work product, 183
Card games
  Chasing the State, 105–108
  Checkpoint Construction, 111–113
  Objective Go, 108–111
  overview, 97–99
  Progress Poker, 99–105
  reflection, 113
Cards
  alphas, 57–58
  Essence, 38
  user stories, 204
Census, 341
Chasing the State game, 105–108
Check in Plan-Do-Check-Adapt cycle, 131–132
Checking in Essence, 138–139
Checkpoint Construction game, 111–113
Checkpoint pattern, 78–80
Checkpoints
  kick-starting development, 122–123
  kick-starting development with practices, 159–165
  large and complex development, 310
Cloud computing for microservices, 252
CMMI (Capability Maturity Model Integration), 306
COBOL programming language, 342
Code
  thing to work with, 54, 56
  work product cards, 60
Coder role pattern card, 79
Coherent state in Requirements alpha, 57, 215–216
Collaboration
  importance, 11–12
  Scrum, 165–166, 174
Collaborations and Interfaces Defined detail level in Design Model work product, 261
Common ground in Essence, 34–37
Competencies
  Essence, 55
  Essence kernel, 68, 75–77
  programming, 61–62
  testing in, 10
Compilers, 341–342
Complete state in Microservices alpha, 258–259

Completed PBIs Listed work product, 184
Complex development. *See* Large and complex development
Component methods, 22–25
Component paradigm, 344–345
Composition of practices
description, 276–282
Essence, 282–284
overview, 275–276
reflection, 282–283
Conceived state in Requirements alpha, 56, 311
Confirmation in user stories, 205
Consensus-based games
Chasing the State, 105–108
Checkpoint Construction, 111–113
Objective Go, 108–111
Progress Poker, 99–105
reflection, 113
Containers definition, 251
Context in kick-starting development, 118–121
Continual improvement in large and complex development, 321–323
Continuous detail level in Build and Deployment Script, 265
Conversation Captured detail level in Story Card, 209
Conversations in user stories, 205
Coordination in activity space, 74
Culture issues, 330–331
Customer area of concern
alphas, 160–163
competencies, 76
development perspective, 119–120
development process, 139
Essence kernel, 68–70
Customer-related practices, 19
Customers
description, 42–43
value for, 43–44

DAD (Disciplined Agile Delivery)
agile scaling, 27
introduction, 346
monolithic methods, 297
practices from, 296
Daily Scrum activity
description, 173, 178
diagram, 175–176
overview, 192–193
Daily Standup practice in Scrum, 26, 33, 173
Data in structured methods era, 21–22
Data processing focus, 341
Data stores, definition, 251
Davis, Alan, 84–85
Definition of Done (DoD) in Scrum, 176–177
Demonstrable alpha state, 59, 100
Deployment in activity space, 74
Descriptive theory of software engineering, 87–88
Design Model work product, 254, 257, 260–263
Design overview, 14
Design Patterns Identified detail level in Design Model work product, 262
Design phase
iterative method, 21
waterfall method, 19–20
Detail levels
Build and Deployment Script, 265
Microservice Design work product, 264
Story Card, 209
Test Case, 210
Use Case Lite work products, 233–236
Use-Case Narrative work product, 235
Use-Case Slice Test Case work product, 237
work products, 60–61
Developers
Scrum, 173
Tarpit theory, 92
Development
doing and checking, 138–139
kick-starting. *See* Kick-starting development; Kick-starting development with practices
overview, 127–132

Development *(continued)*
- Plan-Do-Check-Adapt cycle, 128–132
- plans, 132–138
- way of working, 140–142

Development competency, 61–62, 77
Development Complete checkpoint, 80
Development endeavor, 79–80
Development journey
- anomalies, 148
- overview, 145
- progress and health, 146–148
- visualizing, 145–146

Development types
- culture issues, 330–331
- overview, 325
- practice and method architectures, 326–328
- practice libraries, 328–330

DevOps practice, 302
Dijkstra, E. W., 86, 342–343
Disciplined Agile Delivery (DAD)
- agile scaling, 27
- introduction, 346
- monolithic methods, 297
- practices from, 296

Disciplined approach in software engineering, 14–15
Do in Plan-Do-Check-Adapt cycle, 131
Document elements in Essence, 54
DoD (Definition of Done) in Scrum, 176–177
Doing alpha in PBIs, 181
Doing in development, 138–139
Done alpha in PBIs, 181
Done term, definition, 99–100

EA (enterprise architecture), 24
Endeavor area of concern
- competencies, 77
- development perspective, 120–121
- development process, 136–139
- Essence kernel, 68, 70–71
- kick-starting development with practices, 163–165
- practices, 19
- Scrum, 199

Endeavors
- description, 42–43
- teams, 48–49
- ways of working in, 49–50
- work in, 49

Engaging user experiences, 37–38
Enterprise architecture (EA), 24
Ericsson AB, 344
Essence
- common ground, 34–37
- composition of practices, 282–284
- development. *See* Development
- development journey. *See* Development journey
- engaging user experiences, 37–38
- essentializing practices, 63–65
- essentials focus, 37
- evolution, 346
- insights, 32
- kick-starting development. *See* Kick-starting development
- language, 54–61
- large and complex development, 310–311, 322–324
- methods and practices, 32–34
- microservices, 252–256
- OMG standard, 29–30
- overview, 31
- practices, 298–299
- purpose, 42
- Scrum with, 174–179
- serious games. *See* Serious games
- theory of software engineering, 87–91
- Use Case Lite practice, 227–230
- User Story Lite practice, 207–208
- work products, 60

Essence kernel
- actionability, 89
- activities, 72–75
- alphas, 68–72
- applying, 151–152
- competencies, 75–77
- extensibility, 90

growth from, 93–94
observations, 151
organizing with, 67–69
overview, 67
patterns, 77–80
practicality, 88–89
relationship to other approaches, 90–91
User Story Lite practice, 215–218
validity, 151
Essential Outline detail level in Use-Case Narrative work product, 235
Essentialized practices, 35–36
Essentializing practices
composition of practices, 283–284
description, 35–36
Essence, 298–299
for libraries, 329
monolithic methods and fragmented practices, 296–298
overview, 63–65
reusable, 299–302
sources, 295–296
Estimatable criteria in user stories, 205–206
Evolve Microservice activity, 255, 257, 269–270
Exchangeable packages, 345
Explicit approaches in Scrum, 173–174
Extensibility
Essence kernel, 90
software systems, 47
Extension practices, 279
Extreme Programming Explained, 86
Extreme Programming (XP)
introduction, 346
practices from, 296
user stories, 203

Feedback in Use Case Lite practice, 239
Find Actors and Use Cases activity, 229, 238–239
Find User Stories activity, 207, 212
Formed state in Teams, 311
Fortran programming language, 342
Foundation Established state in Way of working, 311
Fragmented practices, 296–298
Fulfilled alpha state, 57
Fully Described detail level in Use-Case Narrative work product, 235
Function-data paradigm, 344
Functionality in software systems, 46
Functions in structured methods era, 21–22
Future, dealing with
agility, 335–336
methods evolution, 338–339
methods use, 337–338
overview, 333–335
teams and methods, 337

Games
Chasing the State, 105–108
Checkpoint Construction, 111–113
Objective Go, 108–111
overview, 97–99
Progress Poker, 99–105
reflection, 113
General predictive theory of software engineering, 91–92
"Go to statement considered harmful" article, 86
Goal Established state in Use Case alpha, 230
Goals Specified work product, 183
Gregor, Shirley, 84–85

Hacking vs. programming, 6
Handle favorites use-case slice, 242–243
Happy day scenarios, 224
Health and progress
development journey, 146–148
Essence, 54
Microservices Lite, 271–272
use-case slices, 245–246
Hemdal, Göran, 344
Higher-level languages, 342
History of software and software engineering, 341–347

Hollerith punched card equipment, 341
Hopper, Grace Murray, 341–342

Identification of microservices, 251–252
Identified state
  Microservices Lite, 258
  user stories, 209
Identify Microservices activity, 255, 257, 267–268
IEEE (Institute of Electrical and Electronic Engineering), 342
Implementation phase
  activity space, 74
  iterative method, 21
  waterfall method, 19–20
Implemented state in Use-Case Slice alpha, 233
In Progress state in user stories, 209
Increment elements
  description, 177
  work products, 183–184
Increment Notes Described work product, 184
Incremental development in use cases slices, 226–227
Independent criteria in user stories, 205
Innovates achievement level in Development competency, 61–62
Institute of Electrical and Electronic Engineering (IEEE), 342
Interfaces Specified detail level in Microservice Design work product, 264
Internal Elements Designed detail level in Microservice Design work product, 264
Internal Structure Defined detail level in Microservice Design work product, 264
INVEST criteria for user stories, 205–206
ISO/IEC 12207 standard, 345
Items Ordered work product, 182
Iterative operations
  development, 127
  development journey, 147
  large and complex development, 319–321
  lifecycle methods, 20–21

Jackson, Michael, 344
Jackson Structured Programming (JSP), 344
Jacobson, Ivar
  component paradigm, 344
  method prison governing, 27
  OMG, 345
  RUP, 345
  SEMAT, 28, 346
  Use-Case Driven Development practice, 221
JSP (Jackson Structured Programming), 344

Kernel. *See* Essence kernel
Key elements of software engineering
  basics, 41–43
  endeavors, 48–50
  overview, 41
  value for customers, 43–45
  value through solutions, 45–48
Kick-starting development
  context, 118–121
  overview, 117–118
  scope and checkpoints, 122–123
  things to watch, 124–126
Kick-starting development with practices
  context, 158–159
  overview, 157–158
  practices to apply, 165–167
  scope and checkpoints, 159–165
  things to watch, 167–169
Kruchten, Philippe
  method prison governing, 27
  RUP, 345

Language of software engineering
  competencies, 61–62
  essentializing practices, 63–65
  overview, 53
  practice example, 53–54
  things to do, 62–63

things to work with, 54–61
Large and complex development
alphas, 311
common vision, 315–317
continual improvement, 321–323
Essence, 310–311, 322–324
iterative operations, 319–321
kick-starting, 309–315
large-scale development, 308–309
large-scale methods, 306–308
managing, 317–319
overview, 305–306
practices, 310–313
running, 315–322
scope and checkpoints, 310
things to watch, 313–315
Large-scale integrated circuits, 343
Large-Scale Scrum (LeSS)
agile scaling, 27
introduction, 346
monolithic methods, 297
practices from, 296
Larman, Craig, 346
Lawson, Harold “Bud,” 345
Leadership competency, 77
Leffingwell, Dean, 346
LeSS (Large-Scale Scrum)
agile scaling, 27
introduction, 346
monolithic methods, 297
practices from, 296
Levels of detail
Build and Deployment Script, 265
Microservice Design work product, 264
Story Card, 209
Test Case, 210
Use Case Lite work products, 233–236
Use-Case Narrative work product, 235
Use-Case Slice Test Case work product, 237
work products, 60–61
Libraries for practices, 328–330
Lifecycles, 19–21
Lines, Mark, 346
Lovelace, Ada, 341

Machine instruction level, 341
Make Evolvable activity, 255, 257, 268–269
Management competency, 77
Martin, Robert, 90
Masters achievement level in Development competency, 61–62
Mayer, Bertrand, 28
Measurable attribute in SMART criteria, 196–197
Method prison, 27
Methods
agile methods era, 25
component methods era, 22–25
consequences, 26–28
definition, 19
Essence, 32–34
evolution, 338–339
large-scale, 306–308
lifecycles, 19–21
people practices, 25–26
rise of, 18–19
structured methods era, 21–22
team ownership, 337
technical practices, 21–25
use focus, 337–338
Methods war, 22, 26–27
Meyer, Bertrand, 346
Microprocessors, 343
Microservice alpha, 254, 257
Microservice Build and Deployment work product, 254, 257
Microservice Design work product, 254, 257, 263–264
Microservice Test Case work product, 255, 257, 265–267
Microservices, 166–169
description, 250–252
Essence, 252–256
overview, 249–250
Microservices Lite practice
activities, 255–256, 267–270
alphas, 257–259

Microservices Lite practice *(continued)*
Build and Deployment Script, 264–265
description, 256–257
design model, 260–263
impact, 270–271
Microservice Design work product, 263–264
Microservice Test Case work product, 265–267
overview, 253–256
progress and health, 271–272
reusable practices, 299–300
work products, 259–267
Mini-computers, 343
Mini-methods, 19
Minimal state in Microservices Lite, 258
Modular approaches in Scrum, 173–174
Monolithic methods, 296–298
Mythical Man-Month, 84

NATO-sponsored conference, 342
Negotiable criteria in user stories, 205
NZ Transport Agency, 18

Object Management Group (OMG) standard
Essence, 29–30, 346
Essence kernel, 71
notation, 23–24
UML standard, 345
Object-oriented programming
acceptance, 344–345
components in, 23
Objective Go game, 108–111
On the Criteria to Be Used in Decomposing Systems into Modules, 86
Operational alpha state, 59
Opportunity
alpha state card, 72
customer area of concern, 69, 71
development context, 158
development endeavors, 42–43
development perspective, 119–120
development plans, 133–134
large and complex development, 311–312
scope and checkpoints, 161–162
value for customers, 43–44
Outlined detail level in Build and Deployment Script, 265

Pair programming teams, 26
Paradigm shifts, 22–23
Paradigmatic theories, 85
Paths in use cases slices, 228
Patterns
Essence kernel, 68, 77–80
essentializing practices, 63–65
Scrum, 178–179, 184–186
PBIs. *See* Product Backlog Items (PBIs)
People practices, 25–26
Performance in software systems, 47
Perlis, Alan, 92
PLA (product-line architecture), 24
Plan-Do-Check-Adapt cycle, 128–132
Planned alpha in sprints, 179
Plans
development, 132–138
Plan-Do-Check-Adapt cycle, 128–131
Scrum Lite, 188–192
POs (product owners)
description, 178
pattern cards, 184–185
Scrum, 172–173, 175
Possibilities in activity space, 73
Post-development phase in development endeavor, 79–80
Practicality in Essence kernel, 88–89
Practice separation in Essence kernel, 90
Practices
agile methods era, 25
background, 34
capabilities, 33–34
common ground, 34–37
component methods era, 22–25
composition of. *See* Composition of practices
consequences, 26–28
definition, 174
Essence, 32–34, 298–299

fragmented practices, 296–298
kick-starting development with. *See* Kick-starting development with practices
large and complex development, 310–313
libraries, 328–330
lifecycles, 19–21
people, 25–26
reusable, 299–302
rise of, 18–19
Scrum, 173–174, 177, 198–199
sources, 295–296
structured methods era, 21–22
technical, 21–25
types, 19
Pre-development phase in development endeavor, 79–80
Precision in Scrum, 200–202
Preparation in activity space, 74
Prepare a Use-Case Slice activity, 229, 242–243
Prepare a user story activity, 207, 212–213
Prepared state
Use-Case Slice alpha, 232–233
Work alpha, 215
Priorities in Scrum, 172
Problems in kick-starting development, 118
Product Backlog Items (PBIs)
alphas, 181
description, 172, 177
example, 176
identifying, 173
Scrum, 168
Product Backlog practice, 302
Product Backlog work product
activity cards, 190–192
description, 177
Scrum Lite, 182–184
Product-line architecture (PLA), 24
Product Management practice, 302
Product owners (POs)
description, 178
pattern cards, 184–185
Scrum, 172–173, 175
Product Ownership practice, 301
Product Retrospective practice, 302
Product Sprint practice, 302
Program backlog management, 318
Program practices, 302–303
Programming, defined, 4
Programming and software engineering
differences, 6–8
intern view, 8–10
overview, 3–4
professional view, 10–12
programming, 4–6
software engineering, 12–15
Progress and health
activity space, 74–75
development journey, 146–148
Essence, 54
Microservices Lite practice, 271–272
use-case slices, 245–246
Progress Poker game
benefits, 102
example, 103–105
overview, 99–102
Progressing
use-case slices, 232–233
use cases, 230–232
Provided interface, UML notation for, 261

Quality in software systems, 47–48
Quantifiable approach in software engineering, 14–15

Rapidly Deployable state in Microservices Lite practice, 258
Rational Unified Process (RUP)
development of, 24, 345
large-scale development, 306
monolithic methods, 297
Reaching out in scaling, 293
Ready for Development checkpoint, 80
Ready for Development state in User Story, 209
Ready requirement, 80

Ready state
PBIs, 181
Software Systems, 59
Recognized state for Stakeholders, 311
Relevant attribute in SMART criteria, 196–197
Reliability in software systems, 47
Required Behavior Defined detail level in Microservice Design work product, 264
Required interface, UML notation for, 261
Requirements
activity space, 74
alpha state card, 72
alphas, 56–58
development context, 158
development perspective, 120
development plans, 134–135
large and complex development, 311–312
Ready for Development checkpoint, 80
scope and checkpoints, 161–162
solution area of concern, 70
in solutions, 42–43, 45–46
thing to work with, 54–56
User Story Lite practice, 225, 227, 230
Requirements alpha
Progress Poker game, 100–101
User Story Lite practice, 215–217
Requirements engineering, 13–14
Requirements phase
iterative method, 21
waterfall method, 19–20
Retired alpha state, 59
Retrospective practice in Scrum, 33
Reusable practices, 19, 299–302
Reviewed alpha in sprints, 179–180
Roles in Scrum Lite, 184–186
Roles pattern, 77–78
Ross, Douglas, 344
Royce, Walker, 345
Rumbaugh, James, 345
RUP (Rational Unified Process)
development of, 24, 345
large-scale development, 306
monolithic methods, 297

SA/SD (Structured Analysis/Structured Design), 21
SaaS (Software as a Service), 8
SADT (Structured Analysis and Design Technique)
description, 21–22
development of, 344
Scaled Agile Framework (SAFe)
agile scaling, 27
introduction, 346
monolithic methods, 297
practices from, 296
Scaled Professional Scrum (SPS)
agile scaling, 27
introduction, 346
practices from, 296
Scaling
challenges, 289–291
dimensions of, 291–294
large and complex development. *See* Large and complex development
overview, 289
reaching out, 293
scaling up, 292–293
zooming in, 291–292
Scenario Chosen detail level in Use-Case Slice Test Case work product, 237
Scenarios in use cases slices, 228
Scheduled alpha in sprints, 179
Schwaber, Ken, 346
Scope
kick-starting development, 122–123
kick-starting development with practices, 159–165
large and complex development, 310
Scoped state in Use-Case Slice alpha, 232
Scripted detail level in Test Case, 210
Scripted or Automated detail level in Use-Case Slice Test Case work product, 237
Scrum
collaboration, 165–166, 174

components, 33
composite practices, 306–307
description, 168
with Essence, 174–179
fragmented practices, 297
introduction, 346
overview, 171–173
practices, 173–174, 198–199, 296
precision, 200–202
reflections, 198–202
Scrum Lite
activities, 188–197
alphas, 179–182
overview, 174–177
planning, 188–192
roles, 184–186
usage, 187–188
work products, 182–184
Scrum Masters
description, 173, 178–179
large and complex development, 321–322
pattern cards, 184–186
patterns, 175
Scrum of Scrums meetings, 320
Scrum Teams
description, 179
Essence, 175
pattern cards, 185–186
SDL (Specification and Description Language), 344
Self-organizing teams, 26
SEMAT (Software Engineering Method And Theory)
description, 28–29
founding, 346
Serious games
Chasing the State, 105–108
Checkpoint Construction, 111–113
Objective Go, 108–111
overview, 97–99
Progress Poker, 99–105
reflection, 113
Service-oriented architecture (SOA), 24
Simplest Story Fulfilled state in Use Case alpha, 231
Simula 67 language, 23
Slice the Use Cases activity
description, 229
working with, 241–242
Slicing use cases, 226–227
Small attribute
SMART criteria, 196–197
user stories, 206
Smalltalk language, 23
SMART criteria, 196–197
"So that" clauses in user stories, 206
SOA (service-oriented architecture), 24
Social issues, 330–331
Software as a Service (SaaS), 8
Software crisis, 18, 343
Software development, defined, 4
Software Engineering Method And Theory (SEMAT)
description, 28–29
founding, 346
Software engineering overview
challenges, 17–18
defined, 4–5, 14–15
history, 341–347
key elements. *See* Key elements of software engineering
language. *See* Language of software engineering
methods and practices, 18–28
OMG standard, 29–30
and programming. *See* Programming and software engineering
SEMAT initiative, 28–29
Tarpit theory, 92
theory, 84–87
Software Life Cycle Processes, 345
Software Systems
alpha cards, 58, 72
Demonstrable alpha state card, 100
development context, 158
development perspective, 120
development plans, 135–136

Software Systems *(continued)*
large and complex development, 311–312
Objective Go game, 109–111
scope and checkpoints, 161, 162
solutions, 42–43, 45–48, 70
thing to work with, 54–56
Soley, Richard, 28, 346
Solution area of concern
competencies, 76–77
development perspective, 120
development process, 139
Essence kernel, 68–70
kick-starting development with practices, 161
Solution-related practices, 19
Solutions
description, 42–43
value through, 45–48
Specification and Description Language (SDL), 344
Splitting User Stories activity, 207, 213–214
Sprint Backlog
activity cards, 190–191
description, 177
PBIs, 172
work products, 183
Sprint Planning activity
activity cards, 188–192
description, 178
Sprint Retrospective activity
activity cards, 195–196
Scrum, 178
Sprint Review activity
activity cards, 193–195
description, 172, 178
Sprints
alphas, 179–181
description, 177
Scrum, 172–173
SPS (Scaled Professional Scrum)
agile scaling, 27
introduction, 346
practices from, 296
Stakeholder alpha in Chasing the State game, 105–107
Stakeholder Representation competency, 76
Stakeholders
activity space, 74
alpha state card, 72
customer area of concern, 69, 71
as customers, 42–43
development context, 158
development perspective, 119
development plans, 133
large and complex development, 311–312
Objective Go game, 108–111
scope and checkpoints, 159–160
value for, 44–45
Started state in Work alpha, 311
States in alphas, 55–59
Stored program computers, 341
Story Card work product, 207, 209–210
Story practice, 166
Story Structure Understood state in Use Case alpha, 231
Structure and Approach Described detail level in Design Model work product, 260
Structured Analysis and Design Technique (SADT)
description, 21–22
development of, 344
Structured Analysis/Structured Design (SA/SD), 21
Structured detail level in Use-Case Model work product, 235
Structured methods era, 21–22
Student Pairs pattern card, 78
Sub-alphas, 124
Subsystems in UML notation, 261
Sufficient Stories Fulfilled state in Use Case alpha, 231
Support in activity space, 74–75
Sutherland, Jeff, 346
SWEBOK, 84–85
System Boundary Established detail level in Use-Case Model work product, 234
Systematic approach in software engineering, 14–15

Tarpit theory, 91–92
TD (test-driven development) in Essence, 36
TDD (Test-Driven Development) in Extreme Programming, 346
Team Backlog practice, 301
Team Retrospective practice
  description, 301
  large and complex development, 321–322
Team Sprint practice, 301
Teams
  activity space, 74–75
  agile, 26
  alpha state card, 72
  development perspective, 120
  development plans, 136–137
  endeavor area of concern, 42–43, 48–49, 70–71
  Essence, 36
  large and complex development, 311–312
  methods ownership, 337
  need for, 12–13
  scope and checkpoints, 163–164
Technical practices, 21–25
Technology stacks, 10
Test a Use-Case Slice activity
  description, 229
  working with, 243–244
Test Automated detail level in Microservice Test Case work product, 267
Test Case work product, 207, 209–210
Test Dependencies Managed detail level in Microservice Test Case work product, 266
Test-driven development (TD) in Essence, 36
Test-Driven Development (TDD) in Extreme Programming, 346
Test Scenarios Chosen detail level in Microservice Test Case work product, 266
Testable attribute
  SMART criteria, 196–197
  user stories, 206
Testing
  activity space, 74
  waterfall method phase, 19–20
Testing competency, 10, 77
Theory
  arguments, 85–87
  Essence, 87–91
  general predictive theory, 91–92
  growth from, 93–94
  overview, 83–84
  software engineering, 84–87
  uses, 87
Things to do
  activities, 62–63
  backlogs, 49
  composition, 279
  Essence kernel, 72–75
Things to watch
  kick-starting development, 124–126
  kick-starting development with practices, 167–169
  large and complex development, 313–315
Things to work with
  alpha states, 56–59
  alphas, 56
  Essence kernel, 69–72, 89
  overview, 54–56
  Use Case Lite practice, 230–234
  work products, 59–61
To Do alpha in PBIs, 181
Turing tar-pit, 92

UCDD (Use-Case Driven Development) practice, 221–222
Unified Modeling Language (UML) standard
  development of, 24
  introduction, 345
  Microservices Lite practice, 260–261
  primer, 260
  use cases, 222–223
Unified Process prison, 27
Unified Process (UP), 24, 345
Univac I computer, 341
University of Wisconsin, 18
UP (Unified Process), 24, 345
Usable alpha state, 59
Use Case alpha, 229–231

Use-Case diagrams, 24
Use-Case Driven Development (UCDD) practice, 221–222
Use Case Lite practice
activities, 238–244
alphas, 229–233
Essence, 227–230
impact, 244–245
kick-starting, 237–240
overview, 221–222
reusable practices, 299–300
use-case slices progress and health, 245–246
use cases description, 222–226
use cases slicing, 226–227
user stories vs. use cases, 246–248
work products, 233–236
working with, 240–244
Use-Case Model work product, 227, 229, 234–235
Use-Case Narrative work product, 227, 229, 235–236
Use-case narratives, 224–225
Use case practices, 166, 168–169
Use-Case Slice alpha, 229, 232–233
Use-Case Slice Test Case work product, 227, 229, 236–237
Use-case slices
process, 226–227
progress and health, 245–246
Use Cases
introduction, 345
practices from, 296
User experiences in Essence, 37–38
User interface, definition, 251
User stories
description, 204–207
Scrum teams, 166
User Stories practice
description, 168–169
vs. use cases, 246–248
User Story alpha in User Story Lite practice, 207–208
User Story for Extreme Programming, 346
User Story Lite practice
activities, 211–215
alphas, 207–209
Essence, 207–208
Essence kernel, 215–218
impact, 216–218
overview, 203
usage, 211
user story description, 204–207
work products, 209–210

Validity in Essence kernel, 151
Valuable criteria in user stories, 205
Value
for customers, 43–45
through solutions, 45–48
Value Established detail level in Use-Case Model work product, 234
Value Established state in Opportunity, 311
Value Expressed detail level in Story Card, 209
Variables Identified detail level in Use-Case Slice Test Case work product, 237
Variables Set detail level in Use-Case Slice Test Case work product, 237
Verification phase
iterative method, 21
waterfall method, 19–20
Verified state
Use-Case Slice alpha, 233
user stories, 209
Vodde, Bas, 346
von Neumann, John, 341

Waterfall method
description, 19–20
development of, 344
Way of working
adapting, 140–141
alpha state card, 72
development context, 158
development perspective, 120–121
development plans, 138

endeavor area of concern, 42–43, 49–50, 71
Essence kernel, 141–142
large and complex development, 311–312
scope and checkpoints, 163, 165
"Where's the Theory for Software Engineering?" paper, 84
Work activity
alpha state card, 72
development context, 158
development perspective, 120
development plans, 136–137
endeavor area of concern, 42–43, 49, 71
large and complex development, 311–312
scope and checkpoints, 163–164
Work alpha, 215–216
Work Forecast Described work product, 183
Work products
Essence, 54–55
Microservices Lite practice, 259–267
overview, 59–61
Scrum, 175, 177
Scrum Lite, 182–184
Use Case Lite practice, 229, 233–236
User Story Lite practice, 207, 209–210
Write Code activity cards, 62–63

XP (Extreme Programming)
introduction, 346
practices from, 296
user stories, 203

Zooming in in scaling, 291–292

Author Biographies

Ivar Jacobson

Dr. Ivar Jacobson received his Ph.D. in computer science from KTH Royal Institute of Technology, was awarded the Gustaf Dalén medal from Chalmers in 2003, and was made an honorary doctor at San Martin de Porres University, Peru, in 2009. Ivar has both an academic and an industry career. He has authored ten books, published more than a hundred papers, and is a frequent keynote speaker at conferences around the world.

Ivar Jacobson is a key founder of components and component architecture, work that was adopted by Ericsson and resulted in the greatest commercial success story ever in the history of Sweden (and it still is). He is the creator of use cases and Objectory—which, after the acquisition of Rational Software around 2000, resulted in the Rational Unified Process, a popular method. He is also one of the three original developers of the Unified Modeling Language. But all this is history. His most recently founded company, Ivar Jacobson International, has been focused since 2004 on using methods and tools in a smart, superlight, and agile way. Ivar is also a founder and leader of a worldwide network, SEMAT, whose mission is to revolutionize software development based on a kernel of software engineering. This kernel has been realized as a formal standard called Essence, which is the key idea described in this book.

Harold "Bud" Lawson

Professor Emeritus Dr. Harold "Bud" Lawson (The Institute of Technology at Linköping University) has been active in the computing and systems arena since 1958 and has broad international experience in private and public organizations as well as academic environments. Bud contributed to several pioneering efforts in hardware and software technologies. He has held professorial appointments at several universities in the USA, Europe, and the Far East. A Fellow of the ACM, IEEE, and INCOSE, he was also head of the Swedish delegation to ISO/IEC JTC1 SC7 WG7 from 1996 to 2004 and the elected architect of the ISO/IEC 15288 standard. In 2000, he received the prestigious IEEE Computer Pioneer Charles Babbage medal award for his 1964 invention of the pointer variable concept for programming languages. He has also been a leader in systems engineering. In 2016, he was recognized as a Systems Engineering Pioneer by INCOSE. He has published several books and was the coordinating editor of the "Systems Series" published by College Publications, UK.

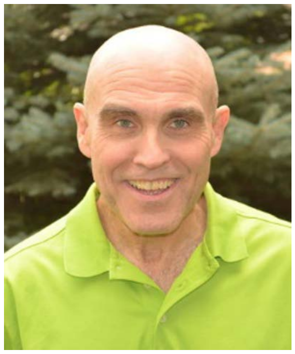
Tragically, Harold Lawson passed away after battling an illness for almost a year, just weeks before the publication of this book.

Pan-Wei Ng

Dr. Pan-Wei Ng has been helping software teams and organizations such as Samsung, Sony, and Huawei since 2000, coaching them in the areas of software development, architecture, agile, lean, DevOps, innovation, digital, Beyond Budgetings, and Agile People. Pan-Wei firmly believes that there is no one-size-fits-all, and helps organizations find a way of working that suits them best. This is why he is so excited about Essence and has been working with it through SEMAT since their inception in 2006, back when Essence was a mere idea. He has contributed several key concepts to the development of Essence.

Pan-Wei coauthored two books with Dr. Ivar Jacobson and frequently shares his views in conferences. He currently works for DBS Singapore, and is also an adjunct lecturer in the National University of Singapore.

Paul E. McMahon



Paul E. McMahon has been active in the software engineering field since 1973 after receiving his master's degree in mathematics from the State University of New York at Binghamton (now Binghamton University). Paul began his career as a software developer, spending the first twenty-five years working in the US Department of Defense modeling and simulation domain. Since 1997, as an independent consultant/coach (http://pemsystems.com), Paul helps organizations and teams using a hands-on practical approach focusing on agility and performance.

Paul has taught software engineering at Binghamton University, conducted workshops on software engineering and management, and has published more than 50 articles and 5 books. Paul is a frequent speaker at industry conferences. He is also a Senior Consulting Partner at Software Quality Center. Paul has been a leader in the SEMAT initiative since its initial meeting in Zurich.

Michael Goedicke

Prof. Dr. Michael Goedicke is head of the working group Specification of Software Systems at the University of Duisburg-Essen. He is vice president of the GI (German National Association for Computer Science), chair of the Technical Assembly of the IFIP (International Federation for Information Processing), and longtime member and steering committee chair of the IEEE/ACM conference series Automated Software Engineering. His research interests include, among others, software engineering methods, technical specification and realization of software systems, and software architecture and modeling. He is also known for his work in views and viewpoints in software engineering and has quite a track record in software architecture. He has been involved in SEMAT activities nearly from the start, and assisted in the standardization process of Essence—especially the language track.