A Pragmatic Guide to Business Process Modelling

Jon Holt

Business process modelling is plagued with complexity and communication problems. This highly accessible book addresses these issues by showing the benefits of using the Unified Modelling Language (UML) and alternative notations. This updated and expanded edition shows how effective and accurate modelling can deliver a more complete understanding of a business and its requirements. It has 5 new chapters and is ideal for management consultants, business and system analysts, IT managers and students.

- Measuring and mapping your business using UML (an ISO standard)
- Alternative notations included
- Analysis, specification, mapping, measurement and documentation
- Presentation of process information
- Business tools
- New material on teaching process modelling and Enterprise Architecture

About the author

Jon Holt is the founding director of a systems engineering consultancy and training company. He is an international award-winning author and public speaker and is a Fellow of the BCS and the IET. He has held various academic positions in the UK and the USA.

Jon Holt's clear and engaging style makes a potentially difficult subject highly accessible and the reader's progress is helped along by the mixture of good examples, humour and flair for explanation that we have come to expect from this author.

Paul McNeillis, Head of Professional Services, BSI
A Pragmatic Guide to Business Process Modelling
The British Computer Society

The British Computer Society is the leading professional body for the IT industry. With members in over 100 countries, the BCS is the professional and learned Society in the field of computers and information systems. The BCS is responsible for setting standards for the IT profession. It is also leading the change in public perception and appreciation of the economic and social importance of professionally managed IT projects and programmes. In this capacity, the Society advises, informs and persuades industry and government on successful IT implementation.

IT is affecting every part of our lives and that is why the BCS is determined to promote IT as the profession of the 21st century.

Joining the BCS

BCS qualifications, products and services are designed with your career plans in mind. We not only provide essential recognition through professional qualifications but also offer many other useful benefits to our members at every level. Membership of the BCS demonstrates your commitment to professional development. It helps to set you apart from other IT practitioners and provides industry recognition of your skills and experience. Employers and customers increasingly require proof of professional qualifications and competence. Professional membership confirms your competence and integrity and sets an independent standard that people can trust.

www.bcs.org/membership

Further Information

Further information about BCS can be obtained from: The British Computer Society, First Floor, Block D, North Star House, North Star Avenue, Swindon, SN2 1FA, UK.

Telephone: 0845 300 4417 (UK only) or +44 (0)1793 417 424 (overseas)

Email: customerservice@hq.bcs.org.uk

Web: www.bcs.org
A Pragmatic Guide to Business Process Modelling

Jon Holt
This book is dedicated to my beautiful wife, Rebecca
Contents

List of figures and tables xi
Author xvii
Foreword Paul MacNeillis xix
Acknowledgements xxiii
Abbreviations xxviii
Glossary xxv
Useful websites xxvi
Preface xxxi

1 Introduction 1
   The magic of processes 1
   Background 3
   Some basic definitions 4
   Risk 5
   The process 8
   Conclusions 15

2 The UML Diagrams 16
   Introduction 16
   Modelling 16
   The UML 18
   The class diagram 19
   The activity diagram 30
   The sequence diagram 33
   The use case diagram 35
   Consistency between the diagrams 41
   Conclusions 41

3 Requirements for Process Modelling 42
   Introduction 42
   Specific process modelling requirements 42
   Meeting the requirements through modelling 45


**Contents**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailoring processes</td>
<td>47</td>
</tr>
<tr>
<td>The process meta-model</td>
<td>50</td>
</tr>
<tr>
<td>Conclusions</td>
<td>52</td>
</tr>
</tbody>
</table>

4 The Process Meta-model Expanded | 53 |
| Introduction | 53 |
| Process concept view | 53 |
| Process realization view | 57 |
| The seven views of the meta-model | 59 |
| Consistency between views | 77 |
| Using the meta-model | 79 |
| Extending the process meta-model | 86 |
| Conclusions | 90 |

5 Process Mapping and Metrics | 91 |
| Introduction | 91 |
| A process for process mapping | 93 |
| Process mapping metrics | 100 |
| Application of metrics | 104 |
| Interpreting the results | 113 |
| Conclusions | 114 |

6 Case Study | 115 |
| Introduction | 115 |
| Background | 115 |
| The approach | 117 |
| Interpreting the process model | 118 |
| The case study process model | 119 |
| Process mapping | 143 |
| Conclusions | 146 |
| Exercises | 146 |

7 The Bigger Picture – Enterprise Architecture | 148 |
| Introduction | 148 |
| Enterprise architecture | 149 |
| Enterprise architecture structure | 150 |
| Requirements for enterprise architecture | 151 |
| Existing sources | 153 |
| Modelling an enterprise architecture | 154 |
| Conclusions | 159 |

8 Presentation | 160 |
<p>| Introduction | 160 |
| Presentation issues | 160 |
| Example mappings to different notations | 161 |
| Conclusions | 172 |</p>
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Teaching Guide</td>
<td>173</td>
</tr>
<tr>
<td></td>
<td>Introduction</td>
<td>173</td>
</tr>
<tr>
<td></td>
<td>Professional training</td>
<td>175</td>
</tr>
<tr>
<td></td>
<td>Teaching as part of an undergraduate or postgraduate course</td>
<td>176</td>
</tr>
<tr>
<td></td>
<td>Conclusions</td>
<td>183</td>
</tr>
<tr>
<td>10</td>
<td>Tools and Automation</td>
<td>184</td>
</tr>
<tr>
<td></td>
<td>Introduction</td>
<td>184</td>
</tr>
<tr>
<td></td>
<td>General capabilities of a tool</td>
<td>184</td>
</tr>
<tr>
<td></td>
<td>Specific capabilities of a tool</td>
<td>185</td>
</tr>
<tr>
<td></td>
<td>Business considerations</td>
<td>188</td>
</tr>
<tr>
<td></td>
<td>Automation tools</td>
<td>189</td>
</tr>
<tr>
<td></td>
<td>Conclusions</td>
<td>190</td>
</tr>
<tr>
<td>11</td>
<td>Answers to Exercises</td>
<td>191</td>
</tr>
<tr>
<td></td>
<td>Appendix A: Summary of the Process Modelling Meta-model</td>
<td>201</td>
</tr>
<tr>
<td></td>
<td>Appendix B: Summary of UML Notation</td>
<td>203</td>
</tr>
<tr>
<td></td>
<td>References</td>
<td>205</td>
</tr>
<tr>
<td></td>
<td>Further reading</td>
<td>207</td>
</tr>
<tr>
<td></td>
<td>Index</td>
<td>209</td>
</tr>
</tbody>
</table>
List of figures and tables

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 2.1</td>
<td>Graphical notation for class diagrams</td>
<td>20</td>
</tr>
<tr>
<td>Figure 2.2</td>
<td>Graphical notation of a class</td>
<td>20</td>
</tr>
<tr>
<td>Figure 2.3</td>
<td>Graphical notation of an association relationship</td>
<td>21</td>
</tr>
<tr>
<td>Figure 2.4</td>
<td>Naming an association</td>
<td>21</td>
</tr>
<tr>
<td>Figure 2.5</td>
<td>Showing direction on an association</td>
<td>21</td>
</tr>
<tr>
<td>Figure 2.6</td>
<td>Showing numbers on classes</td>
<td>22</td>
</tr>
<tr>
<td>Figure 2.7</td>
<td>Examples of attributes for the class ‘Cat’</td>
<td>23</td>
</tr>
<tr>
<td>Figure 2.8</td>
<td>Example of operations for the class ‘Cat’</td>
<td>24</td>
</tr>
<tr>
<td>Figure 2.9</td>
<td>Example of the aggregation relationship</td>
<td>25</td>
</tr>
<tr>
<td>Figure 2.10</td>
<td>Overlapping aggregations to tidy up a diagram</td>
<td>26</td>
</tr>
<tr>
<td>Figure 2.11</td>
<td>Example of the specialization relationship</td>
<td>26</td>
</tr>
<tr>
<td>Figure 2.12</td>
<td>Example of inheritance</td>
<td>27</td>
</tr>
<tr>
<td>Figure 2.13</td>
<td>Example of dependencies</td>
<td>29</td>
</tr>
<tr>
<td>Figure 2.14</td>
<td>Graphical notation for activity diagrams</td>
<td>30</td>
</tr>
<tr>
<td>Figure 2.15</td>
<td>Example of an activity diagram</td>
<td>32</td>
</tr>
<tr>
<td>Figure 2.16</td>
<td>Graphical notation for sequence diagrams</td>
<td>34</td>
</tr>
<tr>
<td>Figure 2.17</td>
<td>Example of a sequence diagram</td>
<td>35</td>
</tr>
<tr>
<td>Figure 2.18</td>
<td>Graphical notation for use case diagrams</td>
<td>36</td>
</tr>
<tr>
<td>Figure 2.19</td>
<td>Example of a use case diagram showing a context</td>
<td>38</td>
</tr>
<tr>
<td>Figure 2.20</td>
<td>Example of a use case diagram showing a decomposition of a higher-level requirement</td>
<td>39</td>
</tr>
<tr>
<td>Figure 2.21</td>
<td>The &lt;&lt;constrain&gt;&gt; relationship</td>
<td>40</td>
</tr>
<tr>
<td>Figure 3.1</td>
<td>The complexity of relationships</td>
<td>44</td>
</tr>
<tr>
<td>Figure 3.2</td>
<td>Simple definition of a process</td>
<td>46</td>
</tr>
<tr>
<td>Figure 3.3</td>
<td>Compact definition of a process</td>
<td>47</td>
</tr>
<tr>
<td>Figure 3.4</td>
<td>Example process: ‘System design’</td>
<td>49</td>
</tr>
<tr>
<td>Figure 3.5</td>
<td>Tailored processes</td>
<td>50</td>
</tr>
<tr>
<td>Figure 3.6</td>
<td>Process meta-model: Process concept view</td>
<td>51</td>
</tr>
<tr>
<td>Figure 3.7</td>
<td>Process realization view</td>
<td>52</td>
</tr>
<tr>
<td>Figure 4.1</td>
<td>Process meta-model: Process concept view</td>
<td>54</td>
</tr>
<tr>
<td>Figure 4.2</td>
<td>Process concept view with groupings</td>
<td>57</td>
</tr>
<tr>
<td>Figure 4.3</td>
<td>Process realization view</td>
<td>58</td>
</tr>
<tr>
<td>Figure 4.4</td>
<td>Example requirements view for an invoicing process</td>
<td>61</td>
</tr>
</tbody>
</table>
List of figures and tables

Figure 4.5 Simple process structure view 63
Figure 4.6 More detailed process structure view, highlighting types of ‘Process group’ 63
Figure 4.7 More detailed process structure view, highlighting life cycle concepts 64
Figure 4.8 Process structure view for the Welsh National Curriculum 65
Figure 4.9 Example of a potentially dangerous process structure view 66
Figure 4.10 Example of a dangerous process structure view 67
Figure 4.11 Process content view: Example process 68
Figure 4.12 Process content view: Warning signs 69
Figure 4.13 Process behaviour view for the ‘Meeting logistics’ process 72
Figure 4.14 Example information view showing relationships between artefacts 74
Figure 4.15 Generic stakeholder view 75
Figure 4.16 Process instance view 77
Figure 4.17 Example scenario: Analysing existing processes 81
Figure 4.18 Process instance view for creating a process model from scratch 82
Figure 4.19 Process instance for abstracting tacit process knowledge for a new system 84
Figure 4.20 Process instance for abstracting tacit process knowledge for an existing system 84
Figure 4.21 Process instance for process improvement 85
Figure 4.22 Typical generic Gantt chart 87
Figure 4.23 Extension to meta-model conceptual view 88
Figure 4.24 Extension to meta-model realization view 89
Figure 5.1 Simple requirements view 94
Figure 5.2 Stakeholder view 95
Figure 5.3 Process content view 96
Figure 5.4 Extended process content view 97
Figure 5.5 Process instance view for the mapping exercise 97
Figure 5.6 Process behaviour view for the ‘Process identification’ process 98
Figure 5.7 Process behaviour view for the ‘PM set-up’ process 98
Figure 5.8 Process behaviour view for the ‘Process analysis’ process 99
Figure 5.9 Information view for process mapping 100
Figure 5.10 New process for the process content view 101
List of figures and tables

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 5.11</td>
<td>Extended information view</td>
<td>102</td>
</tr>
<tr>
<td>Figure 5.12</td>
<td>Process behaviour view for the ‘Metric application’ process.</td>
<td>103</td>
</tr>
<tr>
<td>Figure 5.13</td>
<td>Process quagmire</td>
<td>105</td>
</tr>
<tr>
<td>Figure 5.14</td>
<td>Process structure views for ISO 15288 and 15504</td>
<td>106</td>
</tr>
<tr>
<td>Figure 5.15</td>
<td>Process structure views, with an emphasis on the grouping level, for the standards</td>
<td>107</td>
</tr>
<tr>
<td>Figure 5.16</td>
<td>Process content views for the standards</td>
<td>108</td>
</tr>
<tr>
<td>Figure 6.1</td>
<td>Process structure view</td>
<td>120</td>
</tr>
<tr>
<td>Figure 6.2</td>
<td>Further breakdown of the ‘Project’ process group</td>
<td>121</td>
</tr>
<tr>
<td>Figure 6.3</td>
<td>Process content view for the ‘Enterprise’ process group</td>
<td>122</td>
</tr>
<tr>
<td>Figure 6.4</td>
<td>Process content view for ‘Enterprise’ with an emphasis on ‘Personnel’</td>
<td>123</td>
</tr>
<tr>
<td>Figure 6.5</td>
<td>Process content view for the ‘Technical’ process group, with an emphasis on the ‘Training’ processes</td>
<td>124</td>
</tr>
<tr>
<td>Figure 6.6</td>
<td>Process content view for the ‘Technical’ process group, with an emphasis on ‘Product development’</td>
<td>125</td>
</tr>
<tr>
<td>Figure 6.7</td>
<td>Process content view for the ‘Technical’ process group, with an emphasis on ‘Maintenance’ processes</td>
<td>126</td>
</tr>
<tr>
<td>Figure 6.8</td>
<td>Process content view for the ‘Project’ process group, with an emphasis on ‘Management’</td>
<td>127</td>
</tr>
<tr>
<td>Figure 6.9</td>
<td>Process content view for the ‘Project’ process group, with an emphasis on ‘Support’</td>
<td>128</td>
</tr>
<tr>
<td>Figure 6.10</td>
<td>Process content view for the ‘Agreement’ process group</td>
<td>130</td>
</tr>
<tr>
<td>Figure 6.11</td>
<td>Stakeholder view with an emphasis on ‘Customer’</td>
<td>131</td>
</tr>
<tr>
<td>Figure 6.12</td>
<td>Stakeholder view with an emphasis on ‘External’</td>
<td>132</td>
</tr>
<tr>
<td>Figure 6.13</td>
<td>Stakeholder view with an emphasis on ‘Supplier’</td>
<td>132</td>
</tr>
<tr>
<td>Figure 6.14</td>
<td>Enhancing stakeholders with additional relationships</td>
<td>133</td>
</tr>
<tr>
<td>Figure 6.15</td>
<td>Defining skills and responsibilities for stakeholders</td>
<td>134</td>
</tr>
<tr>
<td>Figure 6.16</td>
<td>Simple context for training-related processes</td>
<td>135</td>
</tr>
<tr>
<td>Figure 6.17</td>
<td>Breakdown of the ‘organize course’ requirement</td>
<td>136</td>
</tr>
<tr>
<td>Figure 6.18</td>
<td>Requirements view for invoice-related processes</td>
<td>137</td>
</tr>
</tbody>
</table>
List of figures and tables

Figure 6.19  Information view for the 'Course set-up' process artefacts 138
Figure 6.20  Information view for the 'Customer invoice' process artefacts 138
Figure 6.21  Information view relating artefacts 139
Figure 6.22  Process instance view for the 'Ensure payment' requirement for a normal project scenario 140
Figure 6.23  Process instance view for the 'Ensure payment' requirement for the scenario of running a course 140
Figure 6.24  Process instance view including stakeholder instance 141
Figure 6.25  Process behaviour view for the 'Customer invoice' process 142
Figure 6.26  Process behaviour view for the 'Course set-up' process 142
Figure 6.27  Process behaviour view for the 'Meeting logistics' process 143
Figure 6.28  Process structure view for Prince II 144
Figure 6.29  Process structure view for ISO 15288 145
Figure 6.30  Process structure view for Prince II, with an emphasis on 'Component' 146
Figure 6.31  Process structure view for ISO 15288, with an emphasis on 'Process group' 146
Figure 7.1  Enterprise architecture meta-model 149
Figure 7.2  Generic requirements view for enterprise architecture 152
Figure 7.3  Example ontology 156
Figure 7.4  Ontology with area of interest for a competency view shown 157
Figure 7.5  Simple requirements view for a competency view 158
Figure 7.6  Example viewpoint definition showing an expansion of the 'Competency scope' element from the ontology 158
Figure 8.1  Process structure view for the BPMN language 162
Figure 8.2  Graphical representation of core modelling elements in BPMN 163
Figure 8.3  BPMN notation showing a process behaviour view 165
Figure 8.4  BPMN notation showing a process instance view 166
Figure 8.5  Process meta-model realization view with BPMN notation shown as stereotypes 167
Figure 8.6  Process structure view for the flowchart notation 168
List of figures and tables

Figure 8.7 Symbol legend for the flowchart notation 168
Figure 8.8 Flowchart notation showing a process behaviour view 170
Figure 8.9 Process meta-model realization view with flowchart notation stereotypes 171
Figure 9.1 Generic teaching or training context 174
Figure 9.2 Generic course structure for a university-type course 178
Figure 9.3 Example project description 182
Figure 11.1 Extended process structure view 191
Figure 11.2 A more populated requirements view 193
Figure 11.3 Possible stakeholder view 194
Figure 11.4 Another possible stakeholder view 194
Figure 11.5 Increased number of artefacts in an information view 195
Figure 11.6 A detailed breakdown of a single artefact 195
Figure 11.7 A populated process shown as a class 195
Figure 11.8 Increased number of processes on a process content view 196
Figure 11.9 A more populated process instance view 196
Figure 11.10 A new scenario shown as a process instance view for a single requirement 197
Figure 11.11 Expansion to the process meta-model realization view 197
Figure 11.12 Possible process behaviour view for a single process 198
Figure 11.13 Increased quagmire showing additional process models 199
Figure A.1 Process concept view 201
Figure A.2 Process realization view 202
Figure B.1 Graphical notation for class diagrams 203
Figure B.2 Graphical notation for activity diagrams 203
Figure B.3 Graphical notation for sequence diagrams 204
Figure B.4 Graphical notation for use case diagrams 204

Table 4.1 Structural consistency checks 78
Table 4.2 Mechanical consistency checks 79
Table 5.1 Basic terminology mapping 109
Table 5.2 Process grouping terminology mapping 109
Table 5.3 Process terminology mapping 110
Table 5.4 Process feature mapping 110
List of figures and tables

Table 6.1  Initial mapping between ISO 15288 and Prince II  144
Table 7.1  Comparison of terms between process modelling and enterprise architecture  155
Table 11.1 Consistency-checking table  193
Author

Jon Holt obtained his PhD from the University of Wales Swansea in 1991 in the field of real-time systems modelling. Since then, Jon has worked extensively in a wide variety of industries applying modelling techniques to many types of systems, including: requirements, process modelling, enterprise architecture, competencies and education systems.

Jon is the founder-Director of Brass Bullet Ltd, a consultancy and training company based in Swansea in South Wales. Jon is a popular public speaker and has won several awards, at both national and international levels, for his public speaking and writing. He also holds posts at several universities.

Jon currently lives in Swansea with his wife, three children and two cats. When not working, his interests include writing, martial arts and performing magic.
Foreword

Organizational design is one of the biggest challenges facing business in the 21st century. In the knowledge economy, the ability of the human intellect to solve problems and add value is the key source of competitive advantage. But most of the organizational structures in existence today were designed to add value through the processing of physical assets by labour. So how do you organize for success when your primary resources are intangible? How do you unleash the potential of knowledge workers to transform ideas into value? With so many mutations of organizational forms into networks, communities and collaborative ventures what will the organizational forms of the future look like? No one can be sure of the answers to these questions. But one thing is certain. Whatever the structures and forms of the organizations of the future, people will come together as stakeholders to apply their minds and efforts to the transformation of assets. In other words, they will take part in business processes.

The organizations of the future will face increasing complexity in the external environment. The speed of change will continue to increase as global markets open up all value propositions to ever faster cycles of innovation and imitation, fuelling fast, effective and aggressive competition. Demands on organization from stakeholders will also build. Sometimes it will be expressed through regulators; sometimes through more direct channels. Faced with this growing external complexity, organizations will require highly evolved internal and inter-organizational processes to cope with managing and balancing these multiple demands in transparent, effective and systemic ways. Achieving this will require a language that is up to the task and a discipline that has proven value.

Until recently the languages available for modelling processes were rather inadequate for this task. Neither was there a systematic discipline or approach that promised much. As a result, business process modelling has, to date, greatly underachieved its potential. The ground was ripe for an innovation. In Jon Holt’s first book, *UML for Systems Engineering*, he delivered that innovation by taking a language forged in the rigours of software development and opening our eyes to the potential of this language in a creative yet robust modelling approach. A lot of good work followed this innovation and the modelling approach has since been applied to processes as diverse as fishing, taxation, and the management of biodiversity.
Foreword

In this new volume, Jon builds on this experienced success and takes us further into a modelling approach that should have broad appeal to those with a stake in business processes. The book is a lesson in good practice on business process modelling with relevance to important areas such as risk management, dealing with complexity and the modelling and application of key business standards. Jon’s clear and engaging style makes a potentially difficult subject highly accessible and the reader’s progress is helped along by the mixture of good examples, humour and flair for explanation that we have come to expect from this author. A book that demonstrates what can be achieved with business process modelling would have been welcome in itself, but a book like this that teaches, inspires and gives real insight into the field will be a valuable catalyst for modelling businesses in all sectors and geographies.

Paul McNeillis MBA, PhD, MCIM
Head of Professional Services, BSI
Acknowledgements

First of all, thanks to everyone who bought the first edition of the book since it was first published in 2005. There are five new chapters in this new edition which reflect both my experiences since the first edition was published and the feedback and response that I have had from various people over the years. I have tried to keep everybody happy – even the academic world who wanted the answers to the exercises from the first edition!

The list of people who need to be thanked is way too long to include here, so I will mention only a few by name – as ever, apologies if I have missed you out. Thanks to Duncan and his team (Jon, Nicky and Steve) who have provided me with all sorts of feedback on the techniques discussed here. Thanks to everyone from the world of EA who contributed their opinions and a special mention for Nigel. Thanks to Alec (and his people) who has been a long-term supporter, despite his dodgy geography of the hostleries of Plymouth. Mick and Tracey also deserve a mention, who will hopefully spread the word in Oz.

Thanks to everyone involved with the IET Systems Engineering Professional Network and the good folk of INCOSE. A big thank you to everyone at the BCS who have not only been involved with the publishing of the books, but have also allowed me to air my views at various talks, papers and presentations under their Banner. Special mentions for Matthew and Elaine who continue to encourage me in all BCS matters. Also thanks to Sarah and her little pink cloud and Jessica from Sunrise.

Thanks to all at Brass Bullet Ltd who are always happy to give me the support and resources to actually write this book.

No book of mine would be complete without thanking Mike and Sue, who are always there for me. Mike and Sue celebrate 40 years of glorious marriage this year, so a big ‘congratulations’ and may you both share many more!

Finally, all my love goes to my wife Rebecca and my three children: Jude, Eliza and Roo. Unfortunately, my evil cat has died since the last edition, so a brief mention for Olive and Betty who have big cat-shoes to fill.
### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPMI</td>
<td>Business Process Modelling Initiative</td>
</tr>
<tr>
<td>BPML</td>
<td>Business Process Modelling Language</td>
</tr>
<tr>
<td>BPMN</td>
<td>Business Process Modelling Notation</td>
</tr>
<tr>
<td>BSI</td>
<td>British Standards Institution</td>
</tr>
<tr>
<td>CMM</td>
<td>capability maturity model</td>
</tr>
<tr>
<td>CMMI</td>
<td>capability maturity model integrated</td>
</tr>
<tr>
<td>CORBA</td>
<td>Common Object Request Broker Architecture</td>
</tr>
<tr>
<td>eGIF</td>
<td>Electronic Government Interoperability Framework</td>
</tr>
<tr>
<td>EMC</td>
<td>electro-magnetic compatibility</td>
</tr>
<tr>
<td>EN</td>
<td>European Normative</td>
</tr>
<tr>
<td>ESA</td>
<td>European Space Agency</td>
</tr>
<tr>
<td>HMRI</td>
<td>Her Majesty’s Railway Inspectorate</td>
</tr>
<tr>
<td>HSE</td>
<td>Health and Safety Executive</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standardization Organization</td>
</tr>
<tr>
<td>PAPS</td>
<td>pen and paper system</td>
</tr>
<tr>
<td>PBV</td>
<td>process behaviour view</td>
</tr>
<tr>
<td>PCV</td>
<td>process content view</td>
</tr>
<tr>
<td>PGI</td>
<td>process group index</td>
</tr>
<tr>
<td>PGR</td>
<td>process group ratio</td>
</tr>
<tr>
<td>PI</td>
<td>process index</td>
</tr>
<tr>
<td>PMI</td>
<td>process model index</td>
</tr>
<tr>
<td>PR</td>
<td>process ratio</td>
</tr>
<tr>
<td>RACI</td>
<td>responsible, accountable, consulted and informed</td>
</tr>
<tr>
<td>UML</td>
<td>Unified Modelling Language</td>
</tr>
<tr>
<td>XMI</td>
<td>XML modelling interchange</td>
</tr>
<tr>
<td>XML</td>
<td>extensible markup language</td>
</tr>
</tbody>
</table>
Glossary

Activity  The behavioural steps involved in a process that produce and consume artefacts and that are owned by stakeholders.

Artefact  Anything that is produced or consumed by a process or activity.

Assessment  A review of a process that is based on a standard. Assessments may be formal or informal and carried out either internally or externally to the organization.

Audit  A formal review of a process based on a standard. Audits are carried out by independent, third-party auditors.

Business process management  The coordination and management of a business process which will, invariably, involve some sort of business process modelling.

Business process modelling  Any process modelling exercise that is performed in order to enhance the overall operation of a business.

Business process re-engineering  Used specifically when business process modelling is applied to existing processes as part of a process improvement exercise.

Class  Used as template for something and usually a noun. For example, the class 'Person' would represent all people generally, rather than a specific person. Classes are represented graphically by rectangles and can be further described by identifying attributes and operations. Classes form the basic nodes in the class diagram.

Hazard  Anything that occurs that can lead to a risk. The terms 'hazard' and 'risk' are often confused, but there are subtle differences between them. It is possible for many hazards to lead to the same risk. For example, there is a risk in a hospital that a power failure will lead to many problems, perhaps even endangering the lives of some patients. There are, however, many hazards that may lead to this risk manifesting itself, such as: a lightening strike, terrorist action, not paying the utility bill, lack of maintenance, and so on.

Instance  A specific item within a class. A specific person, for example, Fred Smith, would be an instance within the class 'Person'.

Iteration  A self-contained set of process executions within a process. For example, different teams working on the same project will have their own iterations within the same process.
Glossary

Model   This book uses the classic UML definition of a model, which is ‘a simplification of reality’. In this way, a model may be an equation, a diagram, a physical model, a piece of text or any verbal description.

Operation   Usually represented by a verb that signifies something that a class does.

Operations management   Often used in the context of business and management courses and, although it has a wider scope than just process modelling, contains, and relies very heavily upon, process modelling.

Process   An approach to doing something that consists of a number of activities, each of which will produce and/or consume some sort of artefact. Each of these activities is the responsibility of a single stakeholder role.

Process group   A container for processes that is defined based on functionality of processes, rather than phases in a life cycle. Process groups are often abstract.

Process mapping   Refers to relating different processes to one another and forms an integral part of any audit or assessment exercise. Of course, in order to map effectively, all processes must be modelled in some way.

Process meta-model   A meta-model is a model of a model, and the process meta-model is a model of a model that is used for process modelling.

Process re-alignment   Often applied to existing processes that have, over a period of time, gone out of date for some reason – usually because the requirements for the process have changed and the process is no longer fit for its original purpose.

Relationship   Represents the identification of a conceptual relationship between one or more classes. A relationship is represented graphically by variations on a line, depending on the type of relationship. There are four types of relationship used for process modelling: the association, the aggregation, the generalization/specialization and the dependency. Relationships form the basic paths in the class diagram.

Risk   A product of the likelihood, or probability, of the risk occurring and the effect of the hazard. In many scenarios, risk is defined by a simple mathematical formula, where \( \text{risk} = \text{probability} \times \text{severity} \), or it is defined in terms of a simple matrix that has one axis defining the likelihood in words and the other axis defining the severity of the outcome.

Role   Part played by a person, place or thing that has an interest in the system or project. The term is often used interchangeably with the term ‘stakeholder role’.
Stakeholder  Refers to the role played by a person, place or thing that has some sort of interest in the system or project. Stakeholders should not be confused with people, as it is possible for a single person to have more than one stakeholder role and, conversely, it is possible for a single stakeholder role to have a number of individuals’ names against it. Stakeholders are often not actually people, but the roles of organizations, the environment, places, things, and so on.

Stereotype  A way of tailoring the UML language for a particular application.

System  Any entity or collection of entities that collaborate in some way to meet a set of requirements. In this way, a system can be a person, a group of people, a family, a computer, a network of computers, mechanics, electronics or just about anything else.

Swim lane  An area on an activity with a defined border, the contents of which are associated with a stakeholder. The stakeholder is then responsible for all activities within the swim lane.

UML meta-model  A UML model of the UML. This term is fully defined in the UML standard (see www.omg.org).

Validation  Refers to something that meets its original requirements or, to put it another way, that does what it's supposed to do. In order to understand validation, the question ‘am I building the correct system?’ may be asked. It is possible and, indeed, not uncommon for a system to be built that works but that does not meet the original requirements, which makes the system useless.

Verification  Refers to something that works correctly and without error. For example, this could be a system that has been tested and runs in an error-free fashion. In order to understand verification, the question, ‘am I building the system correctly?’ may be asked.
Useful Websites

www.bcs.org
The website of the British Computer Society, which provides useful information and from which you can purchase books on subjects related to process modelling.

www.bpmi.org
The website of the Business Process Management Initiative.

www.bsi-global.org
The website for the British Standards Institution, where standards may be purchased and from which there are links to other standards sites.

www.govtalk.gov.uk
The website of the UK Cabinet Office, which provides information on policies and standards for e-government.

www.iso.org/iso/en/ISOOnline.frontpage
The website of the International Organization for Standardization, from which you can order copies of the ISO standards referenced in this book.

www.omg.org
The Object Management Group website, from which you can download the original UML standard.

www.sei.cmu.edu/cmmi
Information about CMMI provided by the Software Engineering Institute.

The Systems and Software Consortium software quagmire.
Preface

Processes form the heart of any organization, regardless of its size, type or age. Any organization that actually does anything will, whether it realizes or not, follow processes. These processes may be formal, documented processes or may be informal processes that exist only inside people’s heads. Regardless of the nature of the processes, they will all exhibit three features: they will be complex, require a deep level of understanding and will need to be communicated. This is where the modelling fits in.

The process modelling approach adopted in this book is based on the most popular and widely used modelling language in the world – the UML (Unified Modelling Language), which was created as an open standard and is now an ISO standard.

The approach detailed in this book is the result of ten years of definition, refinement and application of such modelling techniques to all aspects of process modelling and to all types of process. This approach has been implemented in many fields, including: defence, government departments, transport, manufacturing, finance, food, IT, communications, education, aerospace and many more.

Process modelling is by no means a simple task and, therefore, to approach such a project requires the use of appropriate and powerful tools. The approach in this book provides a set of ‘sharp tools’ that may be employed in any process initiative.
1 Introduction

‘Process and procedure are the last hiding place for people who don’t have the wit or wisdom to do their jobs properly.’

David Brent, The Office, BBC

THE MAGIC OF PROCESSES

Processes are an integral part of everyday life. Every time we, as human beings, perform any kind of action, we are actually carrying out a process. This may vary from the way that we get dressed each morning, the way we cross the street on the way to work, to the way that we cook our food in the evenings. The key word used here is ‘way’ as, in essence, a process simply describes the way to do something or, to put it another way, an ‘approach’. It is possible to identify and relate processes for every single action that we take in life. However, this would clearly be a very large number, if not infinity!

Using processes effectively, however, is often not quite so straightforward. There is a big difference between observing a process and performing a process effectively. Consider the example of a magic trick being performed by a magician who is, quite clearly, following some sort of predefined process. It is easy to watch and follow a magic trick, such as a card trick. The magician shuffles the cards and asks a member of the audience to choose one. The audience member selects the card, memorizes it, shows it to the rest of the audience and then places back into the pack. The deck is then shuffled. After a few clever words and a bit of showmanship, the card reappears underneath a vase, or in a pocket or on the other side of the room. The crowd are impressed and give their applause, much to the pleasure of the magician.

A trick such as this is one that everyone can follow and appreciate, but one that most people cannot actually perform themselves. In fact, it is possible for someone to follow the exact steps that were carried out by the magician, but to fail utterly in producing the chosen card. There are a number of possible reasons for this:

- The layman, when trying to perform the trick, simply does not understand what has actually gone on. There is a big difference between what is perceived by an observer and what actually occurs. Invariably, this is deliberate on behalf of the magician but something that can be quite clear to a fellow magician who has the relevant domain knowledge. Such trickery may involve a deck that is
arranged into a particular order, the use of false cards or the pre-placing of copies of cards around a room.

- The trick itself is far more complex than it first appears. There are subtleties and nuances of the activities carried out by the magician – false cuts, double lifts, palmed cards and the like. The deception is not just limited to the cards themselves, but may also include sneaking looks at various cards, distracting the attention of the audience by waving the hands or orally catching people's attention. All of these activities are designed to look like natural actions to a casual observer.

- The information conveyed by the magician is not the true reality of what has actually happened. Deliberate distractions and misdirection techniques can be employed to send the wrong information to the audience.

The effective manipulation of processes is very much like the manipulation of playing cards, albeit without the deliberate intention to mislead. To capture a process is very often not as simple as just watching somebody perform a task and then copying the perceived actions. Without a good knowledge of what is actually going on, this task can be very difficult. If the process is not captured effectively and accurately, then it will be impossible to reproduce the results of the process. There are a number of ways to ensure that the process is captured correctly:

- The trick must be looked at from several points of view, rather than purely from the point of view of a casual observer. In fact, with a rigorous and structured approach to observing what is going on from a number of different perspectives, almost any trick can be worked out to some degree.

- The end result must be related back to the initial conditions of the trick and full traceability established. How is it possible to go from one set of conditions to another – if it does not seem possible then there is some key information missing.

- The role of all the participants must be examined, including the audience members and the magician. But it is not good enough to stop there, as there may be several other roles that exist that are not obvious – what about the possibility of the magician having an accomplice either in the audience or on the other end of a phone line or radio link? These are techniques that are regularly employed by magicians.

- Finally, and perhaps most importantly, it is essential to understand what the overall intention of the trick is and what effect it will have on the audience.

The intention of this book is to help you to master the magic of processes. It will increase your understanding of processes, enable you to
control complexity and to communicate your ideas effectively. This is achieved by identifying a number of ‘views’ that are required in order to model a process completely and fully. Seven views are identified and each one is described in detail. This approach has become known as the ‘seven views’ approach process modelling.

**BACKGROUND**

It is not just people that follow processes, as every organization in existence, whether it is a single-person company or a multinational organization, will rely on a number of processes to function effectively. Depending on the size of the organization and the complexity of its set up, the number of processes that a company uses can be huge – almost infinite, again.

Process modelling is arguably one of the most important aspects of any organization in terms of the management and control of all of the organizational activities. These activities will range from the high-level business activities, including mission statements, business processes and requirements, right down to very detailed technical processes that may be executed on a daily basis within the organization.

Business process modelling goes under many different names and labels so, in order to keep things simple, the term *process modelling* in this book may be replaced by any of the following terms:

- **Business process modelling**: any process modelling exercise that is performed in order to enhance the overall operation of a business.
- **Business process management**: the coordination and management of a business process which will, invariably, involve some sort of business process modelling.
- **Business process re-engineering**: used specifically when business process modelling is applied to existing processes as part of a process improvement exercise.
- **Operations management**: often used in the context of business and management courses and, although it has a wider scope than just process modelling, it contains and relies very heavily upon process modelling.
- **Process mapping**: refers to relating different processes to one another and forms an integral part of any audit or assessment exercise. Of course, in order to map effectively, all processes must be modelled in some way.
- **Process re-alignment**: often applied to existing processes that have, over a period of time, gone out of date for some reason – usually because the requirements for the process have changed and the process is no longer fit for its original purpose.
This book covers all of the above definitions at various points but, as should be clear from this list, all of these different concepts rely heavily on the fact that processes can be modelled in some way. As the book focuses on business process modelling, the modelling techniques can be applied to any or all of the above areas.

SOME BASIC DEFINITIONS

This section presents some definitions for the basic terminology that is used in this book.

- **Process:** although a term that is very widely used, the term ‘process’ is also one that, depending on the source, has many different interpretations. The following list contains just a few definitions:
  - a series of actions, changes, or functions bringing about a result (*Oxford English Dictionary*, 2002);
  - a series of operations performed in the making or treatment of a product (*Oxford English Dictionary*, 2002);
  - a set of interrelated activities, which transforms inputs into outputs (ISO/IEC 15504, 2004).

For the purposes of this book, a process is simply *an approach to doing something that consists of a number of activities, each of which will produce and/or consume some sort of artefact. Each of these activities is the responsibility of a single stakeholder role.*

There are many types of process that are defined, such as operational processes, business processes, technical processes, natural processes, biological processes, political processes, financial processes, and so on. For the purposes of this book, the term ‘process’ may be applied equally to any or all of these types of process.

- **System:** any entity or collection of entities that collaborate in some way to meet a set of requirements. In this way, a system can be a person, a group of people, a family, a computer, a network of computers, mechanics, electronics and just about anything else.
- **Artefact:** defined as anything that is produced or consumed by a process or activity.
- **Stakeholder:** refers to the role played by a person, place or thing that has some sort of interest in the system or project. Stakeholders should not be confused with people, as it is possible for a single person to have more than one stakeholder role and, conversely, it is possible for a single stakeholder role to have a number of individuals’ names against it. Indeed, stakeholders are often not actually people, but the roles of organizations, the environment, places, things, and so on.
• **Model:** in this book, the definition of ‘model’ is taken from the classic UML (Unified Modelling Language) definition, which is ‘a simplification of reality’. In this way, a model may be an equation, a diagram, a physical model, a piece of text or any verbal description.

• **Verification:** refers to something that works correctly and without error. For example, this could be a system that has been tested and runs in an error-free fashion. In order to understand verification, the question ‘am I building the system correctly?’ may be asked.

• **Validation:** refers to something that meets its original requirements or, to put it another way, that does what it is supposed to do. In order to understand validation, the question ‘am I building the correct system?’ may be asked. It is possible and, indeed, not uncommon for a system to be built that works but that does not meet the original requirements, which makes it useless!

Some of these terms will be redefined at other points in this book, as they are so fundamental and important to understanding process modelling, that they can never be defined too often.

---

**RISK**

Risk is something that affects every person, every day of their lives. Most activities carried out in life have some sort of inherent risk associated with them, for example, crossing the street, eating or travelling.

Businesses can be threatened in many ways, whether it is through physical means, such as acts of nature, sabotage or terrorism, or by more subtle means, such as financial mismanagement, lack of competence or basically getting everyday project activities ‘wrong’. In order to address these threats, there are several possible courses of action:

• **Elimination:** in some cases it is possible to eliminate the risk altogether. For example, if there is a risk involved with dealing with new companies for contracts with a value of over £10,000, then the simple way to eliminate this is, of course, simply not to deal with such organizations. Caution must be exercised, however, as very often one risk may be replaced by another. In the example above, there may then be a risk that it would be difficult to keep up-to-date with key technologies, as only new, dedicated companies, are exploiting them.

• **Replacement:** it is often the case that a risk may be addressed by replacing it in some way. This may be through the use of a different technology; for example, if there is a risk involved with using a specific design notation, due to possible obsolescence or limited expertise available, then replace the technique used with one that is more readily acceptable and accessible (such as the UML) which will address this problem.
Control: in many cases, the risks may not be able to be eliminated nor reduced by replacement, in which case it is necessary to minimize the risk by introducing controls. These controls will vary enormously, depending on the type of risk, for example, wearing appropriate safety clothing, taking regular breaks, using only established technologies, only dealing with preferred suppliers, and so on.

Transfer: transferring the risk onto a third party is considered by many as the easiest way to address risk. Although this seems like a good idea, extreme caution must be exercised, as the risk still exists and, regardless of who takes the rap, the project may fail anyway. For example, when using a financial software package for doing company accounts, there is a risk that the software will not perform the calculations correctly, in which case who takes the blame – the users or the software producers? Even in the scenario where the software producers are guaranteeing that the software will be fit for purpose, does it really help the company stay in business if the accounts system fails?

There are several key terms that must be defined so that risk management can be fully understood, managed and implemented, and these are:

- **Hazard:** anything that occurs that can lead to a risk. The terms 'hazard' and 'risk' are often confused but there are subtle differences between them; it is possible for many hazards to lead to the same risk. For example, there is a risk in a hospital that a power failure will lead to many problems, perhaps even costing the lives of some patients. There are, however, many hazards that may lead to this risk manifesting itself, such as: lightening strike, terrorist action, not paying the utility bill, lack of maintenance, and so on.

- **Risk:** defined as a product of the likelihood, or probability of the risk occurring and the effect of the hazard. In many scenarios, risk is defined either as a simple mathematical formula, \[ \text{risk} = \text{probability} \times \text{severity} \], or in terms of a simple matrix that has one axis defining the likelihood in words and the other defining the severity of the outcome.

An important aspect of risk is the responsibility associated with it. For example, if you started smoking in the 1920s and later, as a result, developed cancer, the responsibility for the risk, it may be argued, lies with the tobacco companies. This may be argued whether or not the tobacco companies were actually aware of the risks, as everyone has a duty of care to provide safe products. The argument is that when cigarettes were sold to the general public in the 1920s, the health risks were not known and potential smokers did not think it would cause any harm. Today, however, if someone starts to smoke and develops a smoking-related illness, the responsibility is firmly on the shoulders of
the smoker, as all cigarette and tobacco products now carry a government
health warning that describes the risks involved in smoking.

In the UK, the Health and Safety Executive (HSE) identify five steps that
are essential for any sort of risk assessment:

1. **Identification of hazards**: this can never be a complete and
   exhaustive list of hazards, as there are simply too many in most
   situations – even the most unlikely and improbable events may
   lead to problems. Take the smoking example: hazards will include
   smoking, being with smokers and being in smoky environments.

2. **Identification of who and how**: it is important to identify who or
   what is at risk and then to ascertain how they will be at risk. For
   instance, in the smoking example, the smokers will be affected
   directly, but what about other people who may suffer the effects of
   indirect passive smoking? Also, what about expectant mothers
   smoking and affecting their unborn children?

3. **Risk evaluation and control setting**: risk evaluation and control
   involves asking the question, ‘how serious is the risk and is there
   anything that can be done to minimize it?’ Consider the difference
   between someone walking through a smoky room, where the risk
   may be relatively small, compared to, say, spending three hours in
   a train carriage full of smokers with the windows closed. In terms of
   controls, consider air conditioning, opening windows, not inhaling
   (not recommended), and so on.

4. **Record findings**: it is important to be able to look at risks and learn
   from them in some way. In terms of smoking, many public places
   have now outlawed smoking from the premises (notice that they
   have not outlawed smokers, just the actual smoking activity),
   which is often due to customer responses, research suggesting
   health implications, and so on.

5. **Review**: it is important that all activities are reviewed periodically, as
   the hazards associated with risk often change along with the nature of
   the risk itself. As a final consideration of the smoking example,
   the hazards of smoking have shifted dramatically in the UK since the
   introduction of the country-wide smoking ban in public places. This
   means that whereas before the ban it was relatively safe to sit outside
   a pub in the fresh air leaving the smokers to their fume-filled interiors,
   the situation is now reversed. Pub gardens are now the places where
   the smokers are forced to lurk, whereas people with families are now
   often forced to go inside the pub itself to avoid them, hence, acclima-
   tising their children to going into pubs from an early age and increas-
   ing the chance of them drinking heavily. It never rains, yet it pours.

One way to reduce risk is to improve the way that things are done – or the
approach. There are many approaches to solving a single problem, some
of which will be higher in risk than others. If these different approaches
can be captured in some way, then it is possible that they can be compared and reviewed. In fact, the way to minimize or control a risk is very often to define processes on how to avoid the risk in the first place or, when necessary, define processes concerning what to do when the risk manifests itself. Therefore, process modelling is an essential part of any risk management exercise as the solutions are often the processes that are necessary to keep everyone safe and well.

THE PROCESS

Standards, processes, procedures and guidelines

In real life, processes can manifest themselves in many different shapes or forms. When a process is written down in some way, it will often take the form of, for example, a standard, a procedure, a set of guidelines or work instructions. Although there are no absolute, globally accepted definitions for any of these terms, it is important to consider the underlying concepts and to understand them. In fact, the difference in terminology often relates to the level of detail in the process itself. Consider the following:

- Very high-level processes, such as international standards: there are many international standards bodies, such as the International Standards Organization (ISO), International Electrotechnical Commission (IEC) and European Normative (EN). Some national bodies have also obtained recognition globally and sit at the same sort of level, such as the British Standards Institution (BSI).
- High-level processes, such as industry standards: an industry standard is one that is driven by the actual industry and does not have the formal recognition of international and national standards. An industry standard may have international recognition, such as the UML or Common Object Request Broker Architecture (CORBA), or may simply be two organizations agreeing to work in the same way.
- Medium-level processes, such as in-house company standards and processes: many companies, particularly large ones, have very well-defined process models and standards and, in some cases, these may even be published, as in the case of the European Space Agency (ESA) (Mazza et al., 1994).
- Low-level processes, such as in-house procedures: a typical procedure will describe how a process may be implemented. Indeed, it is possible for a single process to be implemented in different ways using different procedures.
- Very low-level processes, such as guidelines and work instructions: these will typically show a preferred or best-practice approach to carrying out a procedure. These may include specific methods and methodologies that may be applied, whether they are in-house, bespoke or commercial approaches.
The preceding list is not intended to be exhaustive, but provides a general idea of the scope of this book. The process modelling approach advocated in this book may be applied to any or all of these different types of processes.

Problems with processes

There are many problems associated with processes, which, unfortunately, often turn people off to the whole world of process modelling. In fact, mentioning processes or standards is often greeted with groans and sighs from people whose only experience has been one (or many) of disappointment. This really just goes to reinforce the fact that the whole world of process modelling is very badly affected by the three ‘evils of life’, described in detail in Chapter 4: complexity, lack of understanding and poor communications. So why are processes and standards so badly thought of by many people, and is this feeling justified? These two questions will be answered separately. Some of the reasons why people feel this way are discussed below:

- **Too long:** Some process descriptions are very long which, on first appearance, can be very off-putting to any potential users of the process. In fact, the length of the process description can often be misleading, as the number of pages is often not an indicator of the complexity of a process description, and it is the complexity of the process description, rather than the length of it that causes problems. However, this aside, being faced with a process description of several hundred pages is soul-destroying, regardless of how well written it may be. For example, two standards associated with process improvement are ISO 15504 (process assessment) (ISO/IEC, 2004) and CMMI (capability maturity model integrated) (Carnegie Mellon Software Engineering Institute, 2002), both of which stand at several hundred pages in length. The standard for the UML is also several hundred pages long. Although all of these standards are well written, bear in mind that, when printed out as hard copies, they each fill several volumes of folders. It is important, therefore, to be able to have a simplified representation of such a description that can be understood, at a high level, in a single glance. This will be supported by a number of other simple views, each of which can also be easily understood.

- **Too short:** Some process descriptions are very short and stand at only a few pages. Although, at first glance, such process descriptions can appear to be simple, this is often not the case. Take as an example ISO 9001 (ISO, 2000), which applies to quality systems for just about any type of organization that exists. When the standard is reduced to its actual contents (excluding front sheets, and so on) it stands at only 17 pages in length. The very fact that the standard
applies to many applications means that it needs to be generic, which leads to ambiguity, an indicator of the three 'evils of life'.

- **Written by committee:** according to the old adage, you can't keep all of the people happy all of the time, which is the *raison d'être* of committees. One of the basic requirements of a committee is that it represents the viewpoints of different stakeholders. Unfortunately, this has the potential to cause as many problems as it solves and too many different viewpoints, when expressed in an unstructured way, can lead to a fragmented, ambiguous and often inconsistent process description.

- **Too many:** it is very rare indeed to find a single process model that does not relate to, or rely on some other process model. In fact, it is also rare to find a process model that relates to one or two other process models as, in real life, the number of related process models tends to be very high. Consider the situation where a process model is being created for a particular industry. For the sake of the example, let's consider a process model relating to the rail industry, but it should be borne in mind that these same principles apply to any another process model, for example, the healthcare industry. In the case of rail, the process model may have to be compatible with generic international standards, such as ISO 9001 (ISO, 2000). Also, the process model will also have to be compatible with various national and international industry-specific standards. Alongside this, consider any government or country-specific standards, safety or security standards, best practice standards and legal requirements that may have to be met. Also, we have not yet even considered any standards or procedures within the organization itself, such as Her Majesty's Railway Inspectorate (HMRI) in the UK.

- **Unrealistic:** many process descriptions have little connection to reality, which often results in a process description 'gathering dust' on a shelf through lack of use. This may be because the process is asking for too much work to be done on top of the existing working practices, such as excessive documentation, replication of existing information or requiring too much input from too many different people. If the new process differs significantly from the existing process (even if it is an informal, undocumented one), there will be a natural level of resistance to the changes. It is essential that any new process definitions are connected to existing practice wherever possible.

- **Language:** the language used by the process definition must be the one that is already used by the organization. Many companies offer 'off-the-shelf' process descriptions which, in almost all cases may be destructive unless tailored appropriately for the organization. Terminology, technical nomenclature and even marketing
words and phrases must be embedded into the core process model wherever appropriate to ensure that the maximum number of people can understand the process in an unambiguous way.

- **Awareness**: for people to use a process, they must be aware of the process in the first place. This sounds like basic common sense, but the simple fact is that if a process description is printed out and left on a shelf then, in many cases, that is exactly where it will stay. With today’s technology and the ubiquitous nature of the internet and web browsers, it is a relatively simple matter to make process descriptions available to people via their desktops. Of course, this will only work in places where people sit at computers but, even if people do not have computer access, the fact remains that the process descriptions must be readily available to the people who are supposed to using them. The process descriptions should also make people’s lives easier, rather than being an overhead (in terms of time). It is not until people can see the benefit of having this information to hand that they will truly start to adopt the whole process ethos effectively.

- **Fear of failure**: a common complaint when it comes to any sort of process modelling and process description is that the whole exercise is a waste of time because ‘we tried it three years ago and it didn’t work’. Just because something has been attempted once and failed, does not mean that it will never work. The actual underlying cause of these failures needs to be investigated. In almost every case where this has happened, it is relatively simple to see that all the information required for the process description was not present or that the problems discussed in this section have occurred. One of the main aims of this book is to introduce and define a process meta-model that can be used as a checklist for ensuring a complete and effective process description. By using this meta-model as a basis for an investigation, it is very common to see exactly why the previous process exercise has failed – one or more of the views required by the process meta-model is missing or incomplete.

- **Perception**: the perception of the process is key. People must be aware of the value of effective processes. A lack of understanding here may be due to poor education in the application, use and consequent benefits of the process.

These are just some of the common reasons why the process modelling exercise fails. This book intends to minimize the potential time and effort that is wasted by many organizations in pursuit of their process modelling requirements. Remember, process modelling is not magic, but nor is it a mundane task. There is a deep level of understanding required in order to produce an effective process model and description.
Modelling techniques

There are many modelling techniques that have been used extensively, and with varying degrees of success, for many years. Many of these techniques are based on visual techniques or, to put it another way, drawing diagrams to represent processes. The list of these techniques includes, but is not limited to:

- **Flowcharts**: the classic graphical modelling language that most people have come across at some point in their lives, even if it has nothing to do with software. Although widely used, flowcharts are frequently misused and are poorly understood. The biggest problem with flowcharts, however, is that they only realize a single view of the process model and, as discussed later in this book, there are seven views required for effective and complete process modelling. See Chapter 8 for a more in-depth description of the application of flowcharts for process modelling.

- **RACI matrix tables**: RACI stands for ‘responsible’, ‘accountable’, ‘consulted’ and ‘informed’ and RACI matrix tables are used to relate process activity to stakeholder roles. According to the RACI approach, any activity within a process will have a number of stakeholder roles associated with it, and these roles may be responsible (they do the work for the activity), accountable (they are responsible for the success or failure of the activity), consulted (they are asked to participate in the activity) or informed (they have information concerning the activity distributed to them). Basic RACI matrix tables are just that – a simple table for cross-referencing between the roles and the activity. However, these tables are often used in conjunction with flowcharts but are often contorted to include some sort of behaviour which makes the tables more complex and adds little value.

- **BPMN**: the business process modelling notation. The BPMN is the result of the business process modelling initiative (BPMI), whose aim is to provide a notation that can be readily understood by all business users and that ensures that various business execution languages can be visualized (BPMI, 2002). The three main aims are to define the notation and its association semantics and to amalgamate all best practice modelling notations (interestingly enough, including the UML). Although this is an excellent initiative that has yielded very good results, the BPMN is far too narrow to meet the stringent requirements for process modelling identified in this book. The notation itself focuses entirely on the behavioural aspect of the process model which, although adequate for the scope identified in the BPMI, is not considered wide enough for the purposes of this book. Indeed, the introduction of the process meta-model will show that there are seven views that need to be
considered – four of which are realized by structural diagrams, for which the BPMN has no facility. Also, the BPMN does not consider the requirements for a process that are essential for any sort of process validation. This means that, in total, the BPMN could only be used to realize two of the seven views required for effective and complete process modelling. See Chapter 8 for a more in-depth description of the application of the BPMN for process modelling.

This is just a small sample of some of the techniques that are available for use. Although the technique adopted in this book is the UML, the main focus of the book is a series of concepts that can be realized using ‘any single notation or, indeed, combination of modelling notations’ that is capable of meeting the modelling requirements of the process.

The UML

This book uses diagrams to help to visualize and understand processes at many different levels. These diagrams are not random and are actually part of a larger ‘language’. The language chosen is the UML, which is a visual modelling language:

- **visual**: the results can be seen graphically or, to put it another way, it is a language of diagrams containing symbols;
- **modelling**: reality is simplified in some way so that it can be more easily understood;
- **language**: it is a means of communication.

The choice of the language itself has a certain rationale. The UML is the most widely used modelling language in the world today. Although the UML has its roots firmly in the software world, it is increasingly being used for wider, more systems-based applications.

There are also several pragmatic reasons for choosing the UML:

- **Widespread use**: the UML is the most widely used modelling language in the world. Up until relatively recently, there were more than 100 visual modelling techniques and notations available to software engineers. However, the UML has now superseded all of them – with the full assent of every methodologist in the world. Although the UML originated in the software world, the notation itself can be applied to almost any form of modelling.
- **Accepted internationally**: the UML is not just limited to a particular country or continent, but is a truly world-wide standard that is accepted just about everywhere. This means that when working with colleagues in different countries, there is a common medium on which to base discussions.
• **ISO standard:** the UML is now an ISO standard – ISO 19501 (2005), which gives it more credibility than it just being an industry standard. Many of the criticisms that were aimed at the UML were concerns about its lack of international credibility, which are now resolved.

• **UK government mandate, via eGIF:** as the UML becomes more widely accepted, it also becomes more formally accepted by world organizations, such as governments. One example of this is in the UK, where there is an initiative named *eGIF: The electronic government interoperability framework* (Cabinet Office, 2004). The main aim behind the eGIF is to define the technical policies and specifications governing information flows across government and the public sector. It covers interconnectivity, data integration, e-services access and content management. This initiative will apply not only to organizations who deal directly with government bodies, but also many of their subcontractors.

• **Intuitive:** the notation used by the UML is, when used properly, simple and intuitive. Some aspects of the UML are more intuitive than others, which is due in part to some elements of the UML looking like previous techniques, such as flowcharts and data flow diagrams. This familiarity increases the perception that something is easier to understand.

• **Extensive use in other aspects of the organization:** this final advantage of using the UML is often overlooked but can have a massive impact on issues such as training. Consider an organization where there are managers, engineers, technicians, quality assurers, marketers, directors and sales teams. If each of these has a very basic idea of the core elements of the language and is familiar with one or two of the diagrams, then there is a massive increase in communication effectiveness. Of course, different people in different jobs will naturally use different techniques and tools to perform their work, but if the core knowledge behind the work is defined in a common language, then this knowledge can be turned into effective value in the business. For example, using a single core notation in training will decrease the number of different techniques being used, hence enabling a single, common view to be communicated by and to all members of staff by an effective training unit or partner. Also, in the case of process modelling, if the core company knowledge is captured in a process model, then there is a ready-made training course for anyone who understand the basics of the UML language. After all, what better source for training material than the actual knowledge itself? The concept of modelling all parts of the organisation into a single entity is known as Enterprise Architecture and is discussed in more detail in Chapter 7 where it
will be seen that the same modelling techniques can be employed for both process and enterprise modelling.

Therefore, the notation used in this book is the UML. You do not have to be an expert in UML to appreciate how it is used, nor to start using it – the expertise will come with time. Also, the use of UML in this book is limited to a very small subset of the actual language, which minimizes the learning curve. Providing that the core concepts of the rationale for modelling is understood, the use of the notation is relatively straightforward.

**CONCLUSIONS**

This chapter introduced and explained the background of process modelling. It briefly explored the concept of risk and introduced the application of process modelling to control risk. Central to this, the chapter discussed the idea of processes and why they are so important, together with some problems that are often associated with processes. In fact, processes are far more complex than meets the eye; hence, the need for process modelling. If processes are going to be modelled, an appropriate language is required and, from the various languages and notations available, the Unified Modelling Language, or UML, was identified as the one used for the modelling in this book.

The remainder of this book builds on these foundations to create an entire approach to pragmatic business process modelling that is based on best modelling practice and uses an internationally recognized standard notation for its realization.
Index

Notation: *Italic* denotes figures and **bold** denotes tables

abstraction factors 17
activities
  BPMN 163–164
  process content view 67–71
  process structure view 119, 120
activity diagrams
  activity invocation 30–31, 71
  concepts 30–33
  control flows 31
  control forks and joins 31
  example 32, 32
  graphical notation 30–33, 30, 203
  object flows 31
  object nodes 31
  process behaviour view 71–73, 72
  process modelling 33
  start and end states 32
  swim lanes 32, 32, 71, 72, 73
  UML diagrams 30–33
activity invocation 30–31, 71
activity ratio 102–103
activity invocation 30–31, 71
activity diagrams
  activity 30–33, 71–73
  activity ratio 102, 102–103, 104, 112
  actors in use case diagrams 36
  aggregation
    overlapping 25, 26
    relationship 25–26, 25–26
  agreement processes group 120, 120,
    129–130, 130
  animating processes 184, 189–190
  ANSI/IEEE 1471-2000, 154
  appendices 201–204
  artefacts
    artefact ratio 102, 102–103, 104,
      111–112
    BPMN 164–166
    definitions 4
    information view 147, 194–195, 195
    case study 136–139, 138–139
    relationship 73–74, 74
    process content view 67–71
    process structure view 119, 120
  assessments
    process mapping 91, 92
    risk 7, 128
  association
    BPMN 164
    direction 21–22, 21
    graphical notation 21–22, 21–22
    relationship 21–22, 21–22,
      24–25, 24
  attributes, class 23–24
  audits 80, 91–92
  automation
    information view 73–74
    and tools 184, 189–190
  awareness factors 11
balance ratio 71
BPMI see business process modelling initiative
BPMN see business process modelling notation
business analysis, process model interpretation 119
business considerations, tools 188–189
business process management, definition 3
business process modelling, definition 3
business process modelling initiative (BPMI) 12–13
business process modelling notation
  (BPMN) 12–13, 161–167,
    162–163, 165–167
  background 162
  language 162–166
  populating 166–167, 167
  process meta-model 162–167
  business process re-engineering, definition 3
  capabilities, tools 184–188
  capability determination 90
  case study 115–147
  approach used 117–118
  background 115–116
  information view 117, 136–139,
    138–139
  introduction 115
  ISO 15288 144–146, 144, 145–146
  Prince II 144–146, 144, 144, 146
  process behaviour view 117,
    141–143, 142–143
  process content view 117, 120–130,
    121–128, 130
  process groups 120–130
  process instance view 118, 139–141,
    140–141
  process mapping 143–146, 144–146,
    144
  process meta-model 117–142, 147
  process model interpretation 118–119
  process modelling 116–147
  process structure view 117,
    119–120, 120
  requirements view 117–118,
    134–136, 135–137
  stakeholder view 117, 130–134,
    131–134
  training 124–125, 134–139, 138–139,
    141–142, 142
  choice of tools 188–189
  class
    attributes 23–24
    definition 19–20
    graphical notation 19–20, 20
    operations 24
    process concept view 54–55
    relationships 24–29, 25–27, 29
    representing 20–29, 20
    tailoring 49–50, 49
  class diagrams
    association relationships 21–22,
      21–22
    class representation 20–29, 20
    concepts 19–20
    graphical notation 19–20, 20, 203
    process content view 68
    process model metal model 29
    process modelling 29
    process structure view 62
    relationships 24–29, 25–27, 29
    stakeholder view 74
    UML 19–29
Common Object Request Broker Architecture (CORBA) 8
communication 55, 56
competency view 157–159, 157–158
complexity
  process concept view 55
  process model interpretation
    118–119
  process structure view 65–66, 66
  relationships 43–44, 44
  requirements for process modelling 43–45, 44
  compliance, process mapping 91–92
  consistency factors 41, 73, 77–79,
    89–90, 147, 192
<<constraint>> relationship 39–40, 40
control
  case study 128
  flows 31
  forks and joins 31
  risk 6, 7
  CORBA (Common Object Request Broker Architecture) 8
  coupling 44
  course structures 177–179, 178
  coursework and projects 181–182, 182
Department of Defence Architectural Framework (DoDAF) 154
dependency, example/uses/
  relationships 28–29, 29
diagrams 161
  activity 30–33, 71–73, 203
  class 19–29, 68, 203
  consistency between 41
  sequence 33–35, 77
  UML 16–41
  use case 35–40
  see also graphical notation
direction in association 21–22, 21
  documentation factors 80, 81–82, 81,
    185, 186–188
DoDAF (Department of Defence Architectural Framework) 154
element categories 163–166
elimination of risk 5
EN (European Normative) 8
Index

dependent factors 83
enterprise architecture 148–159
enterprise process group 120–123, 120–123
European Normative (EN) 8
evaluation of risk 7
events 163
execution paths 73
existing processes analysis 79–81, 81
existing source factors 153–154
 execution factors relationship 39, 147, 199
extensible markup language (XML) 189
extension factors 11, 80
flowcharts 12, 161–162, 167–172, 168, 170–171
background 167
language modelling 167–169, 168, 170
process meta-model 169–171, 170–171
stereotypes 169–170, 171
Gantt charts 87–88, 87, 161
gateways 164
graphical notation
activity diagrams 30–33, 30, 203
association relationships 21–22, 21–22
BPMN 163–167, 163, 165–167
class diagrams 19–20, 20, 203
classes 19–20, 20
sequence diagrams 33–35, 34–35, 394
text representation 161
use case diagrams 36–40, 36, 38–40, 204
guidelines, form of process 8–9
hazards definition 6
identification 7
Health and Safety Executive (HSE) 7
IEC (International Electrotechnical Commission) 8
IEEE 1471 154
ignorance factors 83
<<include>> relationship 39
information, missing 42
information view 29, 73–74, 74
artefacts 147, 194–195, 195
automation 73–74
case study 117, 136–139, 138–139
characteristics 73–74, 74
consistency 73
extended 101–104, 101–103
process mapping 100–104, 100–103
stakeholders 147, 196, 196, 197
inheritance in specialization 26–28, 27
inter-relationships 73–74, 74
interactions
process modelling 43–45, 44
sequence diagrams 33–34
International Electrotechnical Commission (IEC) 8
International Standardization Organization (ISO) 8
ISO 9001 105, 105
ISO 12207 105, 105
ISO 15288 105–111
ISO 19501 14
invoking 136–141, 137–139, 142
ISO see International Standardization Organization
knowledge abstraction 82–84, 84
lane elements 164
language
BPMN 162–166
flowcharts 167–169, 168, 170
processes 10–11
UML 13, 19
leaf processes 66–67
life cycles
concepts 64, 64
management 86–90, 87–89
life lines 34, 34, 35
maintenance, case study 125–127
management processes 127–128
mapping to different notations 161–172, 162–163, 165–168, 170–171
see also process mapping
marketing-related processes 147, 196, 196
marking schedules 182–183
message flow 164
messages, sequence diagrams 34, 35, 35
meta-model see process meta-model
metrics
application 104–113
interpreting the results 113–114
and process mapping 91–93, 100–114
Ministry of Defence Architectural Framework (MoDAF) 154
misdirection factors 83
missing information 42
MoDAF (Ministry of Defence Architectural Framework) 154
modelling
concepts 180
enterprise architecture 154–159
teaching guides 180–181
tool capabilities 184, 185–186
see also process modelling
notation 12–13
comparisons 171–172
issues in presentation 160–172
mapping to different notations 161–172, 162–163, 165–168, 170–171
teaching guides 180–181
see also graphical notation
object flows 31, 71
Object Management Group (OMG) 162
object nodes 31, 71
off-the-shelf process tailoring 48–49
OMG (Object Management Group) 162
ontology, enterprise architecture 150–151, 152, 155–159, 156–158
The Open Group Architectural Framework (TOGAF) 154
operations, class 24
operations management, definition 3
out of balance ratio 71
overlapping aggregations 25, 26
perception factors 11
Pert charts 88
PGL see process group index
PGR see process group ratio
PI see process index
PMI see process model index
pool elements 164
populating models/processes
BPMN meta-model 166–167, 167
process content view 147, 195–196, 195
postgraduate courses 176–183, 178, 182
PR see process ratio
presentation 160–172
introduction 160
notation issues 160–172
process modelling 160–172
Prince II 144–147, 144, 144, 146, 193–194, 193, 193, 198–199, 199
procedures, form of process 8–9
process 8–15
compact definition 47, 47
evolution 47–48
simple definition 46–47, 46
BCS Products and Services

Other products and services from the British Computer Society, which might be of interest to you include:

Publishing

**BCS publications**, including books, magazines, peer-review journals, and e-newsletters, provide readers with informed content on business, management, legal, and emerging technological issues, supporting the professional, academic and practical needs of the IT community. Subjects covered include business process management, IT law for managers and transition management. [www.bcs.org/publications](http://www.bcs.org/publications)

**BCS Professional Products and Services**

**BCS Membership.** By joining BCS you will become a part of the UK’s industry body for IT professionals, and the leading Chartered Engineering Institution for IT. Our aim is to be directly relevant to the priorities, needs and aspirations of our individual members at every stage of their career. [www.bcs.org/join](http://www.bcs.org/join)

**BCS Group Membership Scheme.** BCS offers a group membership scheme to organisations who wish to sign up their IT workforce as professional members. By encouraging their IT professionals to join BCS through our group scheme organisations are ensuring that they create a path to Chartered Status with the post nominals CITP (Chartered IT Professional). [www.bcs.org.uk/forms/group](http://www.bcs.org.uk/forms/group)

BCS promotes the use of the *SFIaplus™* IT skills, training and development standard in a range of professional development products and services for employers leading to accreditation. These include **BCS IT Job Describer, BCS Skills Manager** and **BCS Career Developer**. [www.bcs.org/products](http://www.bcs.org/products)

**Qualifications**

**Information Systems Examination Board (ISEB) qualifications** are the industry standard both here and abroad, and with over 100,000 practitioners now qualified, it is proof of their popularity. They ensure that IT professionals develop the skills, knowledge and confidence to perform to their full potential. There is a huge range on offer covering all major areas of IT. In essence, ISEB qualifications are for forward looking individuals and companies who want to stay ahead – who are serious about driving business forward. [www.iseb.org.uk](http://www.iseb.org.uk)

**BCS Professional Examinations** are internationally recognised and essential qualifications for a career in computing and information technology. At their highest level, the examinations are examined to the
academic level of a UK university honours degree and acknowledge practical experience and academic ability. [www.bcs.org/exams](http://www.bcs.org/exams)

**European Computer Driving Licence™ (ECDL)** is the internationally recognised computer skills qualification which enables people to demonstrate their competence on computer skills. ECDL is managed in the UK by the BCS. ECDL Advanced has been introduced to take computer skills certification to the next level and teaches extensive knowledge of particular computing tools. [www.ecdl.co.uk](http://www.ecdl.co.uk)

**Networking and Events**

BCS’s specialist groups and branches provide excellent professional networking opportunities by keeping members abreast of latest developments, discussing topical issues and making useful contacts. [www.bcs.org/groups](http://www.bcs.org/groups)

The society’s programme of social events, lectures, awards schemes, and competitions provides more opportunities to network. [www.bcs.org/events](http://www.bcs.org/events)

**Further Information**

This information was correct at the time of publication, but could change in the future. For the latest information, please contact:

BCS  
First Floor, Block D  
North Star House  
North Star Avenue  
Swindon  
SN2 1FA, UK.

Telephone: 0845 300 4417 (UK only) or + 44 1793 417 424 (overseas)

[www.bcs.org/contact](http://www.bcs.org/contact)
A Pragmatic Guide to Business Process Modelling
Jon Holt

Business process modelling is plagued with complexity and communication problems. This highly accessible book addresses these issues by showing the benefits of using the Unified Modelling Language (UML) and alternative notations. This updated and expanded edition shows how effective and accurate modelling can deliver a more complete understanding of a business and its requirements. It has 5 new chapters and is ideal for management consultants, business and system analysts, IT managers and students.

- Measuring and mapping your business using UML (an ISO standard)
- Alternative notations included
- Analysis, specification, mapping, measurement and documentation
- Presentation of process information
- Business tools
- New material on teaching process modelling and Enterprise Architecture

About the author
Jon Holt is the founding director of a systems engineering consultancy and training company. He is an international award-winning author and public speaker and is a Fellow of the BCS and the IET. He has held various academic positions in the UK and the USA.

Jon Holt’s clear and engaging style makes a potentially difficult subject highly accessible and the reader’s progress is helped along by the mixture of good examples, humour and flair for explanation that we have come to expect from this author.

Paul McNeillis, Head of Professional Services, BSI

This book is brought to you by the British Computer Society — the leading professional and learned society in the field of computers and information systems.