

# Table of Contents

<b>IMPPACT Project Overview .....</b>	<b>IX</b>
<b>1      Introduction .....</b>	<b>1</b>
1.1    Motivation .....	1
1.1.1   Open Systems Integration Requirements .....	2
1.1.2   General Requirements for the Reference Model .....	4
1.2    Organization of the Book .....	5
1.3    Intended Readers .....	6
<b>2      Framework for CIM System Development .....</b>	<b>7</b>
2.1    CIM System Framework .....	8
2.2    CIM System Modelling Tools .....	13
2.3    CIM System Development Plan .....	17
2.4    CIM Infrastructure .....	19
2.4.1   Principles of Information Sharing Technologies .....	20
2.4.2   IMPPACT Shared Database Architecture .....	23
2.4.2.1   The IMPPACT Data Manager .....	24
2.4.2.2   The Common Data Dictionary .....	25
2.4.3   Configuration of the IMPPACT Shared Database .....	25
2.4.3.1   Information Analysis and Information Modelling .....	27
2.4.3.2   Information Structuring .....	30
2.4.3.3   Information Structure Implementation .....	31
2.4.4   The CIM Functional Interface Concept .....	34
<b>3      IMPPACT Reference Model .....</b>	<b>37</b>
3.1    The IMPPACT Business Reference Model .....	40
3.2    The IMPPACT CIM Reference Model .....	48
3.2.1   Fundamentals of Information Modelling .....	48
3.2.2   General Concepts for Information Modelling of Discrete Parts Manufacturing .....	61
3.2.2.1   Representation .....	63
3.2.2.2   Presentation .....	64
3.2.2.3   Definition .....	65
3.2.2.4   Orthogonalization of Principles .....	80
3.2.3   Reference Model of Discrete Parts Manufacturing .....	83
3.2.3.1   Product Definition .....	83
3.2.3.2   Shape Definition .....	83
3.2.3.3   Features .....	97
3.2.3.4   Product Decomposition .....	100
3.2.3.5   Activity Model .....	101
3.2.3.6   Material .....	103

<b>4</b>	<b>Application of the IMPPACT Reference Model.....</b>	105
4.1	Requirements for CAD/CAM Integration .....	106
4.1.1	Requirements for Product Modelling .....	106
4.1.2	Requirements for Production Process Modelling .....	107
4.1.3	Requirements for Integrated Product and Production Process Modelling .....	109
4.1.4	Requirements for Modelling of Production Resources .....	110
4.1.5	Requirements for Feedback Handling .....	111
4.2	Use of Reference Models for CAD/CAM-Integration .....	118
4.2.1	Reference Models for Product Modelling .....	118
4.2.1.1	Functions for Product Modelling .....	118
4.2.1.2	Reference Models for Product Information .....	123
4.2.2	Reference Models for Production Process Modelling .....	127
4.2.2.1	The Functions for Production Process Modelling .....	127
4.2.2.2	Reference Models for Production Process Information .....	131
4.2.3	Integration of Product and Production Process Models .....	136
4.2.4	Factory Model .....	139
4.2.4.1	Production Mechanism .....	139
4.2.4.2	General Structure of a Factory .....	140
4.2.4.3	Work Station Model .....	141
4.2.4.4	Means of Transport and Carrying Support Model .....	142
4.2.5	Reference Models for Feedback Information.....	143
4.2.5.1	Functionality of Feedback .....	143
4.2.5.2	Integrated Data Model for Feedback Support .....	146
4.2.5.3	Feedback Data Model.....	151
4.2.5.4	Feedback System Concept.....	153
<b>5</b>	<b>Target Industries Implementation .....</b>	155
5.1	Innovations for Integrated Modelling of Complex Shaped Parts at LIPS .....	155
5.1.1	The Demonstrator LIPS .....	155
5.1.2	The Future Situation at LIPS .....	157
5.1.3	Description of the Product and Process Modelling of a Ship Propeller .....	159
5.1.4	Demonstration at LIPS .....	161
5.2	Innovations for Integrated Modelling of Sheet Metal Parts at HAI .....	172
5.2.1	The Demonstrator HAI .....	172
5.2.2	Innovations for an Integrated Modelling of Sheet Metal Part .....	173
5.2.3	Description of the Product and Process Modelling of a Sheet Metal Part .....	173
5.2.4	Demonstration at HAI .....	173
<b>6</b>	<b>Conclusions and Further Research.....</b>	193
<b>Appendices .....</b>		195
A	IDEF0 .....	197
B	NIAM .....	209
C	EXPRESS .....	219
D	Mapping NIAM to EXPRESS .....	227
<b>Abbreviations .....</b>		253
<b>References .....</b>		255
<b>Index .....</b>		259
<b>Authors' Addresses.....</b>		263