

The authors

Anna Amato is a Researcher working in ENEA- Italian National Agency for New Technologies, Energy and Sustainable Economic Development. She has been involved in research projects for the application of interoperability standards for several objectives and different sectors: projects aiming at innovative use of these standards to improve the eco-design, initiatives for the optimization of the management of product data among the enterprises, training and e-learning actions for raising the awareness of the stakeholders.

Roch Bertucat earned his Master of Science in software engineering at ISIMA, the College of Engineering in Computer Science, Modeling and Applications in Clermont-Ferrand, France.

From April 2005 till September 2009, he worked at the National Institute of Standards and Technology (NIST), in the implementation projects of the standards for the healthcare (HL7, IHE). He managed the development of Web services and Web applications. Since 2009, Roch develops STEP-based applications for the interoperability between companies.

He's one of the co-founders of Engisis, where he works as project manager and software developer. His industrial experiences include the usage of model-driven engineering and model transformation techniques, and the implementation of several standards, including ISO 10303-239, ISO 10303-242, ISO 10303-235, and ISO 15926.

Xenia Fiorentini earned a Master of Science in industrial engineering in the systems engineering college at the Politecnico di Milano, Italy. She earned a diploma from the Alta Scuola Politecnica, a school for the management of complex innovation projects. She worked as a guest researcher at the National Institute of Standards and Technology (NIST), USA for 4 years until September 2009. Her research topics included the development of ontologies for product modeling, the deployment of standards for product lifecycle management, and the modeling of requirements for validating product design.

She's one of the co-founder of Engisis (www.engisis.com), where she works as project manager and data/process modeler. Her industrial experiences in the application of standards include the usage of the ISO 10303-239, the DEXLib and PLCSLib frameworks, other STEP protocols, and the ISO 15926.

Ray Goult was educated as a mathematician at Kings's College London and at Warwick University. He was for many years a Senior Lecturer at Cranfield University in the Department of Applied Mathematics and Computing. He has written books on Applicable Mathematics, Applied Linear Algebra and Computational Methods in Linear Algebra. He first became interested in the problems of product data exchange when his department at Cranfield was a partner in the European Esprit project CAD*I (CAD Interfaces). This project coincided with the establishment of TC184 SC4 to develop the STEP series of standards. He has since 1985 been chairman of the Shape Representation Committee in SC4 and, in this role has been project leader for the development of part 42 – Integrated generic resources: Geometric and topological representation. Since leaving Cranfield University he has been a partner in LMR Systems and has been project leader for many other shape related STEP parts including AICs, modules and AP 204 Mechanical design using boundary representation together its associated Abstract test suite part 304. He has recently been responsible for developing the 4th edition of part 42 as a key component of STEP MOD. He is also a member of the BSI committee AMT/4 and of the NAFEMS CAD/FE integration working group and has contributed to NAFEMS technical publications in this area.

Jochen Haenisch, is Director of Product Development in Jotne, which he joined in 2001. He took a master's degree (Dipl.-Ing.) in Naval Architecture at the RWTH Aachen, Germany, in 1984. After having started his working career in Norway and initially in computer aided design, challenges in data exchange and their solutions in ISO 10303, STEP, moved soon into his focus. STEP became the red thread in his career, which began at Center for Industrial Research, followed by Det Norske Veritas and to his current position in Jotne EPM Technology, all located in Oslo. Jochen started to work with the ISO STEP committee, ISO TC 184/SC 4, in 1990. He was Head of the Norwegian delegation at most of the meetings since then and Deputy Convener for ISO TC 184/SC 4/WG 12, STEP Product Modeling and Resources, since 2001. He contributed to the STEP standards mainly in the domains of shape representation and life-cycle models, including PLCS. Combined with his skills in IT systems and data modeling Jochen has managed industrial implementation of solutions for data interoperability, quality assurance and archival for, among others, Airbus, EADS, ESA, Lockheed Martin, Norwegian Defence, Saab, Thales Alenia Space, US DoD, and many R&D projects.

Keith Hunten, now retired from Lockheed Martin Aeronautics Corporation Advanced Development programs, has worked on the ISO 10303 STEP Standard

since 1987. As an internationally recognized technical expert in the development and use of STEP, Mr. Hunten combined his Engineering Analysis domain experience with a full understanding of the standards development and methodology process. He has also managed the ISO TC184/SC4/WG12 STEP “Product Modeling and Resources” Working Group as the Convener for fourteen years, guiding SC4 through the detailed implementation and integration of over 500 Application Modules in six major Application Protocol projects. He has provided leadership and guidance in the maturation of the STEP Modular Architecture and associated STEPMod Modular Development and Publication infrastructure. As WG12 Convener he has provided guidance in the integration of Integrated Resource documents into the STEP standard, working with SC4 teams in the development of seven new Integrated Resource documents, and the revision of several more large existing Integrated Resource documents. He has also guided the development, adaptation and publishing of ISO 16739 Building Smart-Industry Foundation Classes, and 14306 Open JT.

Timothy King has worked on an extensive range of projects since joining LSC Group in 1998. This work has included customers such as Thales, Shell, Rolls Royce, the UK National Nuclear Laboratory, the UK Government and NATO. Typically, the projects have considered some aspect of the support network for complex, high value assets. His skills cover information and knowledge management, systems engineering, data quality and enterprise architecting. He has developed an international profile through becoming convener of the ISO working group that is developing ISO 8000 for Data Quality. The development of this standard is ongoing through the efforts of 150 experts worldwide. Tim is a member of the senior management team at LSC Group and is the principal consultant for information and knowledge management. He is a Chartered Engineer, Chartered IT Professional and Fellow of both the IMechE and British Computer Society. He is an international croquet player.

David Loffredo is a co-founder of STEP Tools, Inc. and serves as Vice President of Product Development. Dr. Loffredo has been developing engineering software that supports the ISO 10303 STEP standard since 1988. He is editor of the AP-238 integrated STEP-NC model and is also Convener of ISO TC184/SC4 Working Group 11, which develops the STEP implementation methods. He has contributed to the harmonization of STEP GD&T efforts, design of the STEP file exchange format, STEP Data Access Interface (SDAI) functional specification, as well as the SDAI C, C++, and Java programming language bindings. In addition to supervising eleven major releases of the ST-Developer tool suite, he has developed core libraries for managing STEP CAD design data, as well as libraries for validating and driving CNC controls from STEP-NC machining programs. He has authored technical papers, articles, and training courses on EXPRESS information modeling, the STEP,

STEP-NC, and CIS/2 standards, as well as other topics related to product data exchange and engineering database systems.

Howard Mason is Chair of ISO TC184/SC4 and works for BAE Systems PLC, the premier global defence and aerospace company in the United Kingdom, where he is responsible for information standards in the Corporate IT office. He has been involved with the development of industrial automation standards for over 30 years and has chaired ISO TC184/SC4, winner of the 2007 Lawrence D. Eicher Award, since 2000. He also chairs the OASIS consortium technical committee exploiting the ISO 10303 Standard and the management group of the Memorandum of Understanding on eBusiness between ISO, IEC, the International Telecommunications Union (ITU) and the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT).

Anna Moreno Chemical Engineer, senior researcher and project manager at ENEA, the Italian Agency for new technology, energy and sustainable economic development, She has been managing numerous European and national projects; winner of three European awards.

Since 1991 she is the Italian representative at ISO TC 184 SC4. She is the Leader of the Materials Team since 1994. During this time, the Materials Team has developed two important standards: ISO 10303-45 'Materials and other engineering properties' and ISO 10303-235 'Engineering properties for product design and verification'. She has also covered the role of liaison officer for ISO TC 207 dealing with environmental issues and VAMAS (Versailles Advanced Materials and Standards) dealing with Materials standards. In 2003 she has been appointed as chairperson for the outreach and education in order to promote the use of interoperable standards all around the world. She is now co-chair for the Implementation forum of ISO TC 184 SC4.

Being responsible for the ENEA e-Learning Platform she has developed about 20 e-learning courses on interoperability (www.formazione.ene.it) in collaboration with other ISO TC 184 experts.

She succeeded in obtaining EU funding to develop a multimedia handbook for the better comprehension of these standards among non-experts and the web site www.sc4-if.enea.it has been established at ENEA to be the main public web site for the dissemination of education and knowledge of these standards.

Hiroshi Murayama Chief Specialist at Toshiba Corporate R&D Center, Originally a nuclear engineer, then, he became a data modeling specialist of the company, covering geometry, topology and ontology, after having relearned Computer Science at Ecole des Mines in France. In ISO TC184/SC4, he is the project leader for several parts of ISO13584 series. Likewise, in IEC SC3D, project leader for several parts of IEC62656 and IEC61360-2. He is currently the Chairman of IEC SC3D, named

"Product property and classes and their identification", that is responsible for the ontologies of all electro-technical domains.

Olof Nyqvist is Senior Technical Sales Specialist at PTC in Stockholm, Sweden. He has studied at KTH Royal Institute of Technology and is specialized in Product Life-cycle Management, Product data, Information modeling, International standards for product data, Interoperability, Service Oriented Architecture. Since 1999 he has worked with product data and information modeling in different roles, often as a technical expert. During this time he worked within several different industries, Automotive, Aerospace, Discrete manufacturing, and Telecommunications. He has also worked at Eurostep AB as Senior Consultant and at Ericsson Group Process & IT, Business Information unit, assigned to the Master Data Management team with the role of Product MD Information Architect. The assignment has involved establishing a Product Core Generic Information Model for integration and distribution of product reference master data based on the PLCS standard. He worked together with Sandvik Coromant and Kennametal Inc on the development of the international standard for cutting tool information (ISO 13399) being responsible for the information modeling and technical architecture of the standard.

Norman Swindells has been Managing Director of Ferrodag Ltd since its formation in 1993. Ferrodag Ltd specialise in the development and application of product data technology standards for the representation of materials and other engineering properties and were responsible for the development of ISO 10303-45 and ISO 10303-235. Dr. Swindells was a consultant for the development of the dictionaries that are part of ISO 13399. Dr Swindells is a metallurgist with 20 years of experience of research at the University of Liverpool. He is a Chartered Engineer and a Fellow of the Institute of Materials, Minerals and Mining, London, where he founded the Sustainable Development Group. He has BSc and MSc from the University of Manchester and a PhD from the University of Liverpool.

Alessio Ubertini is Researcher for Rapid Prototyping and Reverse Engineering at the Enea –Italian National Agency for New Technologies, Energy and Sustainable Economic Development. His research field is 3D CAD and reverse modeling applied to industrial design, cultural heritage, mechanics and biomechanics. He worked also as mechanical designer at a multinational corporation for security systems and as post-doctorate researcher at the University of Rome “Tor Vergata”. He is, also, co-founder of TVK- Project srl, where he developed software applications for design and race simulation of go-kart. He has a Mechanical Engineer degree and PhD in “Design of Mechanical Systems” from the University of Rome “Tor Vergata”.

Steven Vettermann is General Manager of the ProSTEP iViP Association, an international association with 170 member companies from manufacturing, industry, IT and research. Additionally, he is one of the German Delegates within ISO

TC184/SC4, openness representative within the Global Automotive Advisory Group and coordinator of VDA's WG PLM.

Matthew West is a Director of Information Junction, which he cofounded in 2008, and has been a Visiting Professor at the University of Leeds. Before this he worked for Shell for 30 years. Since 1987 he has worked on the computing/business interface with a particular interest in information management, information quality, master and reference data, data modelling and ontology. He is a key technical contributor to ISO 15926 – “Lifecycle integration of process plant data including oil and gas production facilities” and is participating in the development of ISO 8000 – Data and Information Quality. Matthew is also author of “Developing High Quality Data Models”.

Wolfgang Wilkes is Senior Researcher for Computer Science at the University of Hagen, Germany, and co-founder of the company Semaino Technologies GmbH. He is interested in data modelling and ontologies, e-business and e-engineering, collaborative engineering, long term archival of engineering data and the application of big data for maintenance of products and manufacturing machines. His focus is on modelling and transferring product data of manufacturing companies with dictionary and classification standards. He has been actively participating in standardization, e.g. by leading the working groups ISO/TC 184/SC 4/WG 2 (PLIB, ISO 13584, 2001-2007) and ISO/TC 59/SC 13/WG 11 (ISO 16757, exchange of product data for building services products based on VDI 3805, since 2011) and by participating in the development of ISO 8000. He is member of the eCI@ss Scientific Advisory Board.