International Conference on Product Lifecycle Management

11-12-13 July 2007

KilometroRosso, Italy

Conference booklet

www.plm-conference.org

Welcome

Dear Participants,

welcome to PLM07!

This booklet illustrates the Program of the 4th International Conference on Product Lifecycle Management (PLM'07) in details. PLM07 has been organized in a joint initiative by the PLM Cluster of Politecnico di Milano and the University of Bergamo.
The conference is hosted by KilometroRosso, the newest Science and Technology Park, located in the Lombardy region, in Stezzano (between Milano and Bergamo). KilometroRosso is one of the most original and advanced initiatives in Italy regarding services and facilities for R&D.

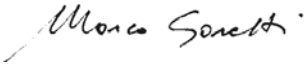
Since their first edition in Bangalore in 2003, the objective of this conference series is to bring together researchers and practitioners involved in product innovation, product development and product delivery in one forum to share their viewpoints on new product innovation, lifecycle management, and supply and service chain. As the interest around this conference demonstrated, PLM is becoming more and more relevant both in the industrial and in the scientific world. Many industrial experiences are available nowadays in the world, and many of them establish connections with research initiatives.

The conference is organized along 3 days. Day 1 (11 July) and Day 2 (12 July) are dedicated to scientific papers, while Day 3 (13 July) is an industrial day, with more than 10 experiences presented by the major PLM players.
85 papers have been selected and published in conference book, after a severe peer-review process. The selected papers cover a broad spectrum of PLM topics and are organized in four main streams, discussed in Day 1 and Day2.
During the conference, 6 keynote presentations are planned, plus a round table on the opportunities for funding PLM R&D.

An interesting social program has been organised, in order to amuse PLM07 participants and let you test a softly Lombard taste!

On behalf of the co-chairs of the conference, of the organizing committee and of the program committee, we thank you for your participation and your certain valuable contributions. We have also to thank the reviewers and the members of the conference program committee for their support in bringing this conference to reality. Organizations that participated in the product showcase, sponsors and the local organizing committee (especially KilometroRosso people) are thanked for their help and support for making PLM07 a successful event.

Have a nice PLM07!



Marco Garetti
Local Organiser Politecnico di Milano

Sergio Terzi
Local Organiser University of Bergamo

POLITECNICO
DI MILANO

Dear participants

In quality of rector of Politecnico di Milano, I'm very glad to welcome you in Italy and especially in Lombardy, in the Milano area, the financial and trade capital of Italy. The Politecnico di Milano, founded in 1863, is the most important technical University of Italy as a School for engineering, architecture and industrial design.

The Politecnico di Milano is organised in 17 departments and a network of 9 Schools of Engineering, Architecture and Industrial Design spread over 7 campuses in the Lombardy region. The number of students enrolled in Politecnico di Milano is approximately 40,000, which makes us the largest technical institution in Italy and let us be ranked as one of the most outstanding European technical universities.

There are several teaching and research areas in which the Politecnico has distinguished itself in the past, which have fuelled a tradition of excellence that has been progressively updated: developing excellence and striking alliances with other universities and research centres. These alliances are becoming increasingly important in Europe, where the Politecnico takes part in many research and training projects with the best qualified European universities, as well as expanding to other countries, from North America to South East Asia. In this way, we are proud to say that our students, researchers and professors are more and more citizens of the world, able to offer their high competences and skills to the global market.

I'm confident that you will enjoy your staying in Italy and you will have a very interesting experience in your PLM07 Conference. I'll be happy to join you in one of the social events. Meanwhile, I send you my best greetings for a successful conference.

Best regards

Rector of Politecnico di Milano

UNIVERSITÀ DEGLI STUDI DI BERGAMO

Dear PLM07 participants,

Welcome in Italy!

It is really an honour for me to welcome you in our land and region. Lombardy, and especially the Bergamo area, is one of the richest and blooming context of Italy. You will be fascinated by our working and productive atmosphere!

The University of Bergamo is a multidisciplinary reality, with its 6 faculties: Foreign Languages and Literature (founded in 1968), Economics and Business Administration (1974), Engineering (1991), Educational Studies (2001), Law (2004) and Human Sciences (2006). There are seventeen degree courses – 3 in Languages, 3 in Arts & Philosophy, 4 in Economics, 1 in Law, 5 in Engineering and 1 in the Science of Economic, plus eight post graduate diplomas and many new courses in Law, Pedagogy and Tourism. Enrolments, constantly on the increase, have passed from 7 thousand (1999) to more than 13.000 students!

Our University aims at playing a more and more relevant role in the national and international research panorama thanks to its close connection with the productive and economic community of our excellent region. University of Bergamo is the administrative seat for six research doctorates and it is more and more boasting international research initiatives, such your excellent conference on Product Lifecycle Management. We are oriented towards scientific research and - in particular with our young Engineering faculty - we are making original and fruitful relationships with the many business activities which exist in the Bergamo area. The successful liaison with KilometroRosso is a relevant example of such relationship network.

Finally, consider that we are in Italy, where history is usual! In the last years, the University of Bergamo has played an important role in recuperating some of the historic buildings in the Upper City of Bergamo: the palace of the Venetian Governor in Piazza Vecchia; the ex-Capuchin monastery in Piazza Rosate, the Rector's seat is in Terzi Palace of St. Agatha in Via Salvecchio, to name a few. During your social program events, take time to see them!

I send you my best greetings for a successful conference. Please take in mind our University!

Best regards

Prof. Alberto Castoldi

Rector of University of Bergamo

PLM07 Organisation

CONFERENCE CO-CHAIRS
Bouras A., Lumiere University of Lyon II, France
Dutta D., University of Michigan, Ann Arbor, USA
Gurumoorthy B., Indian Institute of Science, Bangalore, India

PROGRAM CO-CHAIRS
Garetti M., Politecnico di Milano, Italy
Han S., KAIST, S. Korea
Ball P., Cranfield University, UK

LOCAL ORGANIZING COMMITTEE
Terzi S. (co-chair), University of Bergamo
Marabini L., KilometroRosso Park, Italy
Sancin M., KilometroRosso Park, Italy
Rizzi C., University of Bergamo, Italy
Taisch M., Politecnico di Milano, Italy

INDUSTRIAL ADVISORY BOARD
Bauer P.J., Dassault Systèmes
Berkooz G., Ford Motor Company
Cheballah K., Assentium
Codrino A., PLM-Systems
Colombo N., Selerant
Graziani G., Autodesk
Lee T.J., Samsung Electronics
Levin D., Letas
Maroni M., SpazioSystem
Marzoni D., Parallaksis
Kim T.K., LG Electronics
Ohtomi K., Toshiba
Paeng J.K., Hyundai Kia Motors
Picard F., Airbus
Sacco G., Siemens
Signorelli L., Oracle
Tanaka T., Digital Process Limited
Vichi D., Intergraph

PROGRAM COMMITTEE
Ackermann R., SAP, Germany
Bandinelli R., University of Florence, Italy
Bernard A., Ecole Centrale de Nantes, France
Bronsvoort W., Delft University of Technology, The Netherlands
Cassina J., Politecnico di Milano, Italy
Cavalieri S., University of Bergamo, Italy
Chakrabarti A., Indian Institute of Science, Bangalore, India
Cho J., Electronics and Telecommunications Research Inst., S. Korea
Cugini U., Politecnico di Milano, Italy
Evans S., Cranfield University, UK
Eynard B., Troyes University of Technology , France

Fan I.S., Cranfield University, UK
Flores M., University of Applied Sciences (SUPSI), Switzerland
Fujita K., Osaka University, Japan
Fumagalli L., Politecnico di Milano, Italy
Gaiardelli P., University of Bergamo, Italy
Gao S., Zhejiang University, China
Gerosa M., Politecnico di Milano, Italy
Gupta S. K. , University of Maryland, College Park, USA
Hvolby H., Aalborg University, Denmark
Hwang H.J., Moeri-Kordi, S. Korea
Kiritsis D., Swiss Federal Institute of Technology in Lausanne, Switzerland
Lee H., Korean Institute of Machinery and Materials, S. Korea
Lombardi F., Politecnico di Torino, Italy
Lopez-Ortega O., Universidad Autonoma del Estado de Hidalgo, Mexico
Love D., Aston University, UK
Macchi M., Politecnico di Milano, Italy
Matsuki N., Advanced Industrial Science and Technology, Japan
Mendibil K., University of Strathclyde, UK
Noel F., Grenoble University (INPG), France
Noh S.D., Sungkyunkwan University, S. Korea
Panetto H., CRAN, Nancy University, France
Paredis C., Georgia Institute of Technology, USA
Rao P.V.M., Indian Institute of Technology - Delhi, India
Richard J., University of Applied Sciences of Geneva, Switzerland
Rishikesha T.K., Indian Institute of Management Bangalore, India
Saccani N., University of Brescia, Italy
Sapidis N.S., University of the Aegean, Greece
Shimomura Y., Tokyo Metropolitan University, Japan
Shin H., KAIST, S. Korea
Shpitalni M., Technion, Israel
Smirnov A., Russian Academy of Sciences, Russia
Song B., Singapore Institute of Manufacturing Technology, Singapore
Sperandio S., IMS LAPS - University Bordeaux I, France
Srinivas Y.L., Ford Motor Company, USA
Srinivasan V., IBM, Columbia University & UNC-Charlotte, USA
Subrahmanian E., Carnegie Mellon University and NIST, USA
Sudarsan R., George Washington University and NIST, USA
Suh H.W., KAIST, S. Korea
Thoben K.D., University of Bremen (BIBA), Germany
Tucci M., University of Florence, Italy
Whitfield I., University of Strathclyde, UK
Wu Z., University of Strathclyde, UK
Yang J., Ajou University, S. Korea
Yannou B., Ecole Centrale of Paris, France
Young B., Loughborough University, UK

PLM07 program at a glance

Day 1 (11 July 2007) and Day 2 (12 July 2007) are dedicated to scientific presentations. Day 3 (13 July 2007) is a day devoted to industrial presentations. The conference program for Day 1 and Day 2 has been organised in 4 main streams (A) Management Issues in PLM, (B) Technical and integration issues in PLM, (C) PLM support for product lifecycle phases and (D) Promise project. Posters are displayed during all the conference (from Day 1 to Day 3).

Day 1 – 11 July 2007 *Scientific Day*	**Day 2 – 12 July 2007** *Scientific Day*	**Day 3 – 13 July 2007** *Industrial Day*
8.30 Opening secretariat desk 9.00 **Plenary session** ▪ *Welcome and introduction, M. Garetti, S. Terzi, M. Sancin, L. Marabini, PLM07 Local Organisers* ▪ *Keynote 1: From CAD to PLM: evolution or involution?, U. Cugini, Politecnico di Milano*	8.30 Opening secretariat desk 9.00 **Research panel** ▪ *Research funding for PLM. EU FP7 and National programs, moderated by A. Bouras, Lumiere University of Lyon II*	8.30 Opening secretariat desk 9.00 **Plenary session** ▪ *Welcome and introduction, Brembo Group* ▪ *Keynote 5: The strategic roles and benefits of PLM in HKM, J.K. Paeng, Hyundai Kia Motors* ▪ *Keynote 6: Using PLM NPI to drive product re-use, ERP control, and process efficiency in a multi site manufacturing environment, S. Sack, Oracle*
10.30 **Coffee break & Exposition** ▪ Poster session 11.00 **Plenary session** ▪ *Keynote 2: How PLM change the playground, F. Picard, Airbus* ▪ *Keynote 3: The fast track to PLM, A. Kennington, Siemens*	10.30 **Coffee break & Exposition** ▪ Poster session 11.00 **Research panel** 12.00 **Plenary session** ▪ *Keynote 4: The key position of industrial design in product lifecycle management, F. Letzelter, T. Rouf, Dassault Systèmes*	10.30 **Coffee break & Exposition** ▪ Poster session 11.00 **Industrial panel** o *Business experiences, moderated by A. Codrino, PLM Systems:* o *Autodesk* o *Intergraph* o *Oracle* o *Siemens UGS PLM Sw*
13.15 **Lunch** 14.00 **Parallel sessions** ▪ *1.A.1, Management Issues in PLM* ▪ *1.B.1, Technical and integration issues in PLM* ▪ *1.D.1, Promise project session 1*	13.15 **Lunch** 14.00 **Parallel sessions** ▪ *2.B.3, Technical and integration issues in PLM* ▪ *2.C.2, PLM support for product lifecycle phases* ▪ *2.D.2, Promise project session 2*	13.15 **Lunch** 14.00 **Industrial panel** o *Business experiences, moderated by A. Codrino, PLM Systems:* o *Dassault Systèmes* o *Parallaksis* o *Selerant* o *SpazioSystem* o *PLMentor*
15.30 **Coffee break & Exposition** ▪ Poster session 16.00 **Parallel sessions** ▪ *1.A.2, Management Issues in PLM* ▪ *1.B.2, Technical and integration issues in PLM* ▪ *1.C.1, PLM support for product lifecycle phases*	15.30 **Coffee break & Exposition** ▪ Poster session 16.00 **Parallel sessions** ▪ *2.A.3, Management Issues in PLM* ▪ *2.B.4, Technical and integration issues in PLM* ▪ *2.C.3, PLM support for product lifecycle phases*	15.45 **End of the industrial day** 16.00 **Promise open workshop**
17.45 **End of Day 1** 18.45 Buses leave to Bergamo 19.30 **Cocktail in the Old Town**	17.45 **End of Day 2** 19.00 **Music concert & Gala dinner**	

PLM07 sessions at a glance

Sessions are identified by Day, Stream and a progressive number (e.g. 1.A.2 means the second session of stream A, performed in Day 1).

Sessions listed per day

Day	Time	Session Code	Stream Title	Session Title
1	14.00 – 15.30	1.A.1	Management issues in PLM	Organizational issues
1	14.00 – 15.30	1.B.1	Technical and integration issues in PLM	Data exchange
1	14.00 – 15.30	1.D.1	Promise project session 1	Promise – Day 1
1	16.00 – 17.45	1.A.2	Management issues in PLM	Business issues
1	16.00 – 17.45	1.B.2	Technical and integration issues in PLM	Tools
1	16.00 – 17.45	1.C.1	PLM support for product lifecycle phases	Concurrent development and engineering
2	14.00 – 15.30	2.B.3	Technical and integration issues in PLM	Interoperability
2	14.00 – 15.30	2.C.2	PLM support for product lifecycle phases	Middle and end of life issues
2	14.00 – 15.30	2.D.2	Promise project session 2	Promise – Day 2
2	16.00 – 17.45	2.A.3	Management issues in PLM	Industrial experiences
2	16.00 – 17.45	2.B.4	Technical and integration issues in PLM	Knowledge engineering
2	16.00 – 17.45	2.C.3	PLM support for product lifecycle phases	Lifecycle engineering and assessment
All	-	Poster	Poster presentations	Poster

Sessions listed per stream

Day	Time	Session Code	Stream Title	Session Title
1	14.00 – 15.30	1.A.1	Management issues in PLM	Organizational issues
1	16.00 – 17.45	1.A.2	Management issues in PLM	Business issues
2	16.00 – 17.45	2.A.3	Management issues in PLM	Industrial experiences
1	14.00 – 15.30	1.B.1	Technical and integration issues in PLM	Data exchange
1	16.00 – 17.45	1.B.2	Technical and integration issues in PLM	Tools
2	14.00 – 15.30	2.B.3	Technical and integration issues in PLM	Interoperability
2	16.00 – 17.45	2.B.4	Technical and integration issues in PLM	Knowledge engineering
1	16.00 – 17.45	1.C.1	PLM support for product lifecycle phases	Concurrent development and engineering
2	14.00 – 15.30	2.C.2	PLM support for product lifecycle phases	Middle and end of life issues
2	16.00 – 17.45	2.C.3	PLM support for product lifecycle phases	Lifecycle engineering and assessment
1	14.00 – 15.30	1.D.1	Promise project	Promise – Day 1
1	14.00 – 15.30	2.D.2	Promise project	Promise – Day 2
All	-	Poster	Poster presentations	Poster

Sessions Rooms and Chairmen

Day	Time	Session Code	Session Title	Room	Chairman
1	14.00 – 15.30	1.A.1	Organizational issues	Plenary	P. Ball
1	14.00 – 15.30	1.B.1	Data exchange	A	B. Gurumoorthy
1	14.00 – 15.30	1.D.1	Promise – Day 1	B	D. Kiritsis
1	16.00 – 17.45	1.A.2	Business issues	Plenary	A. Heimann
1	16.00 – 17.45	1.B.2	Tools	A	F. Lombardi
1	16.00 – 17.45	1.C.1	Concurrent development and engineering	B	S. Han
2	14.00 – 15.30	2.B.3	Interoperability	Plenary	M. Bordegoni
2	14.00 – 15.30	2.C.2	Middle and end of life issues	A	R. Sudarsan
2	14.00 – 15.30	2.D.2	Promise – Day 2	B	A. K. Parlikad
2	16.00 – 17.45	2.A.3	Industrial experiences	Plenary	V. Pagliarulo
2	16.00 – 17.45	2.B.4	Knowledge engineering	A	C. Rizzi
2	16.00 – 17.45	2.C.3	Lifecycle engineering and assessment	B	J. Richard

DAY 1 – 11 JULY 2007

Scientific Day				
Time	**Type of activity**		**Details**	**Location**
8.30		Secretariat	*Opening secretariat desk*	Desk
9.00		Plenary session	*Welcome and introduction, M. Garetti, S. Terzi, M. Sancin, L. Marabini, PLM07 Local Organisers* *Keynote 1: From CAD to PLM: evolution or involution?, U. Cugini, Politecnico di Milano*	Plenary
10.30		Coffee break	*Exposition and Poster session*	Poster area
11.00		Plenary session	*Keynote 2: How PLM change the playground, F. Picard, Airbus* *Keynote 3: The fast track to PLM, A. Kennington, Siemens UGS PLM Software*	Plenary
13.15		Lunch		Cafeteria
14.00		Parallel sessions	*Session 1.A.1, Management Issues in PLM*	Plenary
			Session 1.B.1, Technical and integration issues in PLM	Room A
			Session 1.D.1, Promise project session 1	Room B
15.30		Coffee break	*Exposition and Poster session*	Poster area
16.00		Parallel sessions	*Session 1.A.2, Management Issues in PLM*	Plenary
			Session 1.B.2, Technical and integration issues in PLM	Room A
			Session 1.C.1, PLM support for product lifecycle phases	Room B
17.45		End of Day 1		
18.45		Social Program	*Cocktail in Bergamo* *Buses leave to Bergamo at 18.45 from KilometroRosso*	Old Town

Keynotes Day 1

Keynote 1: From CAD to PLM: evolution or involution?

The technical community involved in the process of Product Development perceives PLM as a step forward from the CAD area. The presentation analyses the evolution of the process integrating methodologies and tools supporting Product Development. The analysis compares the CAD point of view with new and future needs that generate from the profound change of the concept of Product and the related evolution of technologies and tools aimed at supporting their development.

Umberto Cugini is currently Full Professor of Machine Design and Virtual Prototyping at Politecnico di Milano and coordinator a PhD program on Virtual Prototypes and Real Products. He is member of the Board of "Fondazione Politecnico" and president of the Consortium "Politecnico Innovazione". He is coordinator of the research group KAEMaRT (Knowledge Aided Engineering Manufacturing and Related Technologies - www.kaemart.it).
He has been chairman of IFIP Working Group 5.2. (Computer Aided Design) 2000-2006.

Keynote 2: How PLM change the playground

Implementation of the PLM concept within Airbus. The tangible implementation of the PLM concept renews not only the processes but drastically impacts the way the company addresses the customers needs and the Extended Enterprise. People mindset, business processes and toolset have to "co-evolve" at a consistent pace. PLM generates value but is also a major change driver shaping the company.

Frédéric Picard

- 2005 - Present: Head of PLM foundation and robustness, Airbus.
- 90': Engineering method & tools
- 80': Quality & Manufacturing UTC

Keynote 3: The fast track to PLM

The presentation will last from the definition of the main business requirements which demands for PLM in the modern companies, to the discussion of the main keys to success I the implementation of PLM projects. The presenter will discuss also several international success stories.

Prior to joining SIEMENS UGS PLM Software, **Andrew Kennington** joined SIEMENS UGS PLM Software in 1997 as a PDM consultant prior to moving into project management. During this time he has worked on various projects within the UK and EMEA (Jaguar Racing, Elta Electronics, Rolls-Royce). Currently he is Director EMEA Portfolio Marketing - Digital Lifecycle Management, responsible for marketing of the Teamcenter portfolio. Completed a MBA from Cranfield School of Management at the end of 2002 and in 2002 became a member of the Association of Project Managers.

Parallel sessions: 14.00 – 15.30

In the following program, papers are identified by Paper Code, Title and Authors.

Session 1.A.1, Management issues in PLM, Organizational issues
Room: Plenary
Chairman: P. Ball, Cranfield University, UK

137, Applying a benchmarking method to organize the product lifecycle management for aeronautic suppliers, J.O. Gomes, R. Vargas Vallejos, A.V. Borille
143, Metrics – The business intelligence side of PLM, A. Hahn, S.G. Austing, J. Strickmann
147, Collaboration in product design and PLM-based coordination, G. Pol, C. Merlo, J. Legardeur, G. Jared
206, Linking organizational innovation and product lifecycle management, M.K. Smith, P.D. Ball
214, A framework of PLM practices for multi-partner sourcing organization, D. Alse

Session 1.B.1, Technical and integration issues in PLM, Data exchange
Room: A
Chairman: B. Gurumoorthy, Indian Institute of Science, Bangalore, India

113, Data exchange interface and model for coupling simulation software in nuclear reactor simulation, T. Bonaccorsi, M. Daniel, J. Di-Salvo
132, PLM data acquisition to support LCI compilation, M. Recchioni, F. Mandorli, H.E. Otto
192, Semantic structures in the product data model, M.S. Stojkovic, M.T. Manic, M.D. Trajanovic, N.D. Korunovic
204, Implementation of a product data model to support variant creation process as a part of product lifecycle management, J. Feldhusen, E. Nurcahya, M. Löwer
220, A feature-based approach to integrate product and process architectures, J. Feldhusen, N. Macke, F. Bungert, M. Löwer

Session 1.D.1, Promise project, Promise – Day 1
Room: B
Chairman: D. Kiritsis, Swiss Federal Institute of Technology in Lausanne, Switzerland

125, Recycling of engineering thermoplastics used in consumer electrical and electronic equipment, E. Lazzaro, I. Sbarski, J. Bishop
163, Integrated assessment of recycling options for mixed waste plastics fractions, J. Bishop, C. Hans, I. Sbarski, M. Schnatmeyer, K.D. Thoben
165, Tracking and tracing in the end of life phase of product lifecycle management, C. Hans, K.A. Hribernik, D. Potter, P. Folan, K.D. Thoben
167, Design improvement method using product usage data in a closed-loop PLM, J.H. Shin, H.B. Jun, D. Kiritsis, P. Xirouchakis
187, Improving automobile parts recovery using product lifecycle information, A.K. Parlikad, P. Folan, J. Mascolo, D.C. McFarlane

Parallel sessions: 16.00 – 17.45

Session 1.A.2, Management issues in PLM, Business issues
Room: Plenary
Chairman: A. Heimann, SAP AG, Germany

117, Knowledge management in flexible supply networks: architecture and major components, A. Smirnov, T. Levashova, M. Pashkin, N. Shilov, A. Kashevnik
120, PLM design and delivery models: key issues and lessons learned from projects on the field, D. Morandotti
156, Integration of PLM with other concepts for empowering business environments, A. Moorthy, S. Vivekanand
197, Product lifecycle management opportunities in small medium enterprises, R. Cavarero, P. Chiabert
201, Stakeholders' influence and internal championing of product stewardship in the Italian food packaging industry, M. Bertolini, P. Colacino, N. Delnevo, A. Petroni
213, PLM in the strategic business management: a product and system co-evolution approach, S. Sperandio, V. Robin, Ph. Girard

Session 1.B.2, Technical and integration issues in PLM, Tools
Room: A
Chairman: F. Lombardi, Politecnico di Torino, Italy

114, Development of a tool to support the dissemination of information about knowledge in multilingual product development teams, D.J. Bradfield, J.X. Gao, H. Soltan
118, Machining processes simulation with the use of design and visualization technologies in a virtual environment, N. Bilalis, M. Petousis, A. Antoniadis
135, Graphonumerical parameters: collaborative parameters based on scenarios and ontologies, N. Gardan, M. Reimeringer, F. Danesi, Y. Gardan
151, Multi level configuration of ETO products, T.D. Petersen, K.A. Jørgensen, H.H. Hvolby, J.A. Nielsen
199, An implementation methodology of SOA based PLM system, T.J. Lee, J.G. Lim, J.H. Shin, S.H. Myung, M.Y. Choi, S.S. Baek, J. Kim, J.W. Oh, D.S. Lee, Y.D. Han
217, Computer aided consensus searching system for collaborative and distributed design process, E. Ostrosi, M. Ferney

Session 1.C.1, PLM support for product lifecycle phases, Concurrent development and engineering
Room: B
Chairman: S. Han, KAIST, South Korea

216, Exploring the relationship between after-sales service strategies and design for X methodologies, P. Gaiardelli, S. Cavalieri, N. Saccani
126, Aligning supply chain management and new product development: a general framework, A. Sianesi, M. Pero
159, Logistics and product lifecycle: towards a design for logistics approach, G. Confessore, G. Liotta, G. Stecca
183, Application of kansai engineering to product development, S. Kara, B. Kayis
184, Propagating engineering changes to manufacturing process planning: Does PLM meets the need?, M.A. El-Hani, L. Rivest, C. Fortin
191, Innovative product development in a concurrent engineering environment through the extended enterprise, M. Sorli, I. Mendikoa, A. Armijo

DAY 2 – 12 JULY 2007

Scientific Day				
Time	**Type of activity**		**Details**	**Location**
8.30		Secretariat	*Opening secretariat desk*	Desk
9.00		Research panel	*Research funding for PLM. EU FP7 and National programs, moderated by A. Bouras, Lumiere University of Lyon II*	Plenary
10.30		Coffee break	*Exposition and Poster session*	Poster area
11.00		Research panel	*Research Panel*	Plenary
12.00		Plenary session	*Keynote 4: The key position of industrial design in product lifecycle management, F. Letzelter, T. Rouf, Dassault Systèmes*	Plenary
13.15		Lunch		Cafeteria
14.00		Parallel sessions	*Session 2.B.3, Technical and integration issues in PLM*	Plenary
			Session 2.C.2, PLM support for product lifecycle phases	Room A
			Session 2.D.2, Promise project session 2	Room B
15.30		Coffee break	*Exposition and Poster session*	Poster area
16.00		Parallel sessions	*Session 2.A.3, Management Issues in PLM*	Plenary
			Session 2.B.4, Technical and integration issues in PLM	Room A
			Session 2.C.3, PLM support for product lifecycle phases	Room B
17.45		End of Day 2		
19.00		Social Program	*Music concert (Quintetto Salotto '800)* *Gala Dinner*	KilometroRosso

Panelists Day 2

Research panel is moderated by prof. A. Bouras, Lumiere University of Lyon II, France

ANR research programmes in ICT

Mr. Bertrand Braunschweig will present the recently created National Research Agency, a funding agency with a yearly budget of 825 M€ for research in France. He will present French research programmes in ICT with a focus on topics relevant for PLM, and on possible international cooperation.

Bertrand Braunschweig

- 2006 - Present: Programme Manager, Agence Nationale de la Recherche
- 2000 - 2006: Expert Director, IFP
- 1996 - 2004: Leader of the CAPE-OPEN worlwide activity
- 1989 - 2000: Senior Research Engineer, IFP
- 1977 - 1989: R&D Engineer, Elf Aquitaine

PLM research in US

Prof. Deba Dutta will discuss the status of PLM research in the US and provide an overview of federal funding in support of topics relevant to PLM.

Deba Dutta is currently Professor of Mechanical Engineering at University of Michigan, Ann Arbor and director of the PLM Alliance. He spent three years at the National Science Foundation serving in various roles in the directorate of Education & Human Resources. He has published over 150 papers in global product development, CAD and solid modelling, product lifecycle management and manufacturing planning. A Fellow of ASME, he serves on the editorial board of four journals. He received his Ph.D. from Purdue University.

PLM research at NIST

The speaker will introduce the main activities performed at NIST in the PLM area.

PLM research in EU

The speaker will introduce the main supports European Commission is providing to the PLM community.

ICT research in India

The panelist will introduce the main actions for supporting research in PLM in India, one of the most emerging counties in PLM context.

ICT research in South Korea

The panelist will introduce the main actions for supporting research in PLM in South Korea and Asia.

ICT research in Italy

The panelist will introduce the main actions for supporting research in ICT and PLM in Italy and in particular in Lombardy, the richest and most industrialised region of Italy.

Keynotes Day 2

Keynote 4: The key position of industrial design in product lifecycle management

New products allow to fully integrate the early industrial design steps into the PLM process. 3 views allow to present all the innovative aspects of these new capabilities: (i) the Technological view, (ii) the Product view and (iii) the Process view. The presenters will show the main contribution of DS solutions to such a kind of aspects.

Frederic Letzelter

- Industrial Design Product Manager
- Responsible for the development of FreeStyle Sketch Tracer and Imagine & Shape products
- Previously, development of Styling and Class A products in FreeStyle team for eight years

Thierry Rouf

- CMP competency leader
- Ten years of experience at Renault
- Ten years of experience at Dassault Systemes
- Located in Milano in charge of Italian's region

Parallel sessions: 14.00 – 15.30

Session 2.B.3, Technical and integration issues in PLM, Interoperability
Room: Plenary
Chairman: M. Bordegoni, Politecnico di Milano, Italy

101, How the architecture of a product can help managers to define the network of partners?, M. Zolghadri, C. Baron, P. Girard, M. Aldonondo, E. Vareilles
119, An UML model of the technical information system to enable information handling and recording during the product life cycle, Y. Keraron, A. Bernard, B. Bachimont
129, Proposition of a product information exchange framework: multiple viewpoint approach, H. Geryville , Y. Ouzrout, A. Bouras, N. Sapidis
138, Implementing the interoperability between virtual reality technologies and CAD applications, F. Bruno, M. Muzzupappa
170, An environment for collaborative design: a new approach to CAD tool interoperability, H. Chettaoui, F. Noel

Session 2.C.2, PLM support for product lifecycle phases, Middle and end of life issues
Room: A
Chairman: R. Sudarsan, NIST, US

146, An investigation into the early and retirement life-cycle stages: tools, requirements, G. Thimm, Y.S. Ma, S.G. Lee, D. Liu, K. Chua
150, An innovative framework for information flows collection in PLM environment, P. Lunghi, M. Botarelli, M. Ginocchietti
152, RFID technology in the life cycle of complex machinery and plants, G. Müller, K. Richter, C. Plate
190, Architecture for life cycle management of product and services, J. Tammela, V. Salminen, S. Laitinen
203, Product lifecycle management in the ubiquitous world, V. Serrano, T. Fischer

Session 2.D.2, Promise project, Promise – Day 2
Room: B
Chairman: A.K. Parlikad, University of Cambridge, UK

168, Tracking and tracing product lifecycle data in a closed-loop PLM, H.B. Jun, D. Kiritsis, P. Xirouchakis
176, Assessment of item-specific information management approaches in the area of heavy load vehicles, C. Corcelle, K. Främling, L. Rabe, J. Anke, J. Petrow
189, An approach to enhance product lifecycle management with intelligent sensors, D. Barisic, G. Stromberg, D. Bichler, M. Krogmann, M. Löw
210, An integrated approach to decision support for maintenance management: a case study for machine tools, R. Fornasiero, A. Zangiacomi, D. Panarese, J. Cassina, M. Taisch
215, A decision support system for lifecycle management: a cost evaluation approach to maintenance planning, R. Fornasiero, M. Sorlini, J. Mascolo, N. Francone
223, Proposal of a PLM standard for mass products, J. Cassina, M. Tomasella, M. Taisch. A. Matta, S. Terzi

Parallel sessions: 16.00 – 17.45

Session 2.A.3, Management issues in PLM, Industrial experiences
Room: Plenary
Chairman: V. Pagliarulo, Italy

102, Flexible PLM platform implementation for collaborative and simultaneous product development and management in injection moulding SMEs sector, A. Aurilia
105, Introduction to PLM of Hyundai Motor Company, S.J. Kim
181, Shifting lead as PLM introduction strategy - A case study in EE automotive development, D. Malvius, D. Bergsjö, S. Molneryd
185, Space products lifecycle management: new frontiers for PLM, J. Feyeux, M.A. El-Hani
195, PLM implementation at MAN Diesel A/S: A case study, R.K. John

Session 2.B.4, Technical and integration issues in PLM, Knowledge engineering
Room: A
Chairman: C. Rizzi, University of Bergamo, Italy

142, Knowledge integration and transfer at PLM: a crown gear case study, D. Guerra-Zubiaga, N. Penaranda, R. Magaña, L. Donato, A. Molina
144, A framework for ontology-based manufacturing support systems, M.H. Cho, C.G. Lee, D.W. Kim
193, Conceptual design knowledge management in a PLM framework, C. Rizzi, D. Regazzoni
207, Towards an ontology for open assembly model, X. Fiorentini, I. Gambino, V.C. Liang, S. Foufou, S. Rachuri, C. Bock, M. Mani
221, 2ODE-IPD: An object-oriented design environment for interdisciplinary product design, A. Gayretli
209, Product data and digital mock-up exchange based on PLM, E. Guyot, G. Ducellier, B. Eynard, P. Girard, T. Gallet

Session 2.C.3, PLM support for product lifecycle phases, Lifecycle engineering and assessment
Room: B
Chairman: J. Richard, University of Applied Sciences of Geneva, Switzerland

103, Lifecycle analysis aspects of biofuels, J. Richard, P. Leverington
175, Life cycle engineering, product lifecycle management and sustainability, A.G. Filho, H. Rozenfeld, A.R. Ometto
182, A design for environment product analysis, J. Dobbs, K. Cormican
200, A life cycle management guidance system for maritime industry, H. Gsell, N. Homburg, D.H. Mueller
205, Optimization of environmental and social criteria in the textile supply chain: European state of the art and perspectives of research, I. Boufateh, A. Perwuelz, B. Rabenasolo, A. Jolly-Desodt
212, EOL framework for design advisory, H.M. Lee, W.F. Lu, B. Song, R. Gay

DAY 3 – 13 JULY 2007

Industrial Day				
Time	**Type of activity**		**Details**	**Location**
8.30		Secretariat	*Opening secretariat desk*	Desk
9.00		Plenary session	*Welcome and introduction, Brembo Group* *Keynote 5: The strategic roles and benefits of PLM in HKM, J.K. Paeng, Hyundai Kia Motors* *Keynote 6: Using PLM NPI to drive product re-use, ERP control, and process efficiency in a multi site manufacturing environment, S. Sack, Oracle*	Plenary
10.30		Coffee break	*Exposition and Poster session*	Poster area
11.00		Industrial panel	*Business experiences, moderated by A. Codrino, PLM Systems*	Plenary
13.00		Lunch		Cafeteria
14.00		Industrial panel	*Business experiences, moderated by A. Codrino, PLM Systems*	Plenary
15.45		End of the industrial day		
16.00		Special workshop	*Promise open workshop*	Room A

Keynotes Day 3

Keynote 5: The strategic roles and benefits of PLM in Hyundai Kia Motors

The PLM capability is one of the core competencies for the manufacturing companies to transform themselves into the agile companies that react to the market changes promptly and respond to the customer needs quickly. One of the key initiatives in Hyundai Kia Motors is to realize the collaborative product life-cycle management. The strategic roles of PLM are defined along with rational and benefits that are associated with the PLM capability.

Jung-Kook Paeng

- 2000 - Present: Senior Executive Vice President & CIO, Hyundai Motor Company & Kia Motors Corp.
- 1997 - 1999: Director, Samsung Motors Inc.
- 1988 - 1996: Consultant, EDS
- 1982 - 1985: Ph.D. in Mechanical Engineering, The University of Iowa

Keynote 6: Using PLM NPI to drive product re-use, ERP control, and process efficiency in a multi site manufacturing environment

Consolidate product and bill of material data from multiple, disparate systems to create a single product master. Utilize a centralized data model to standardize product attributes for easy searching and comparison. Enable secured, authorized access for internal and external stake holders to view, manage new part introduction, and maintain product information. Glacier Garlock Bearings, an international Manufacturer of Bearings, headquartered in Germany, illustrates all that. In addition Implementation Phases and the Results of a ROI Study are explained.

Stefan Sack holds Degrees in Mechanical Engineering and Business & Administration. Stefan is part of the Nordic/German (NOG) Applications Management Team of Oracle. Stefan's focus and responsibility is also to support the Product Lifecycle Management (PLM) and Procurement Initiatives in the countries as an expert and business development person. Before starting to head up the NOG SCM Pre-Sales Team 2 years ago he worked 4 years in various business development roles around EMEA and Northern, Central & Eastern Europe. His focus was on PLM and Procurement within the SCM Area. Before working for EMEA he was a Manufacturing and Distribution Consultant in Germany for 2 Years.

Industrial Panel – Morning session

Industrial panel is moderated by Mr. A. Codrino, PLM Systems, Italy

Autodesk data management: Driving Innovation	*E. De Coster*	Autodesk
PLM software : application for plant design and asset information management	*F. Zerbini*	Intergraph
Oracle Customers' experiences in industrial manufacturing sector,	*L. Signorelli*	Oracle
Transforming the process of innovation	*G. Sacco*	SIEMENS UGS PLM Software

Industrial Panel – Afternoon session

PLM is innovation	*G. Gonella*	Dassault Systémes
An example of collaboration for engineering supply chain	*D. Marzoni, C. Petagna*	Parallaksis
PLM for the process Industry: Leveraging on automated Regulatory Compliance	*N. Colombo*	Selerant
Engineering collaboration system in Galileo Avionica	*A. Conficconi, R. Pozzoli, F. Vitale*	Spaziosystem
A no profit initiative for PLM knowledge sharing	*F. Beccari, N. Laghetti, M. Riccioni*	PLMentor

POSTERS – 11–13 JULY 2007

Posters might be displayed during all the conference in the provided poster area.

106, Assembly modeling approach including assembly process information for mechanical product, Z. Kai-fu, L. Yuan, Y. Jian-feng
109, Coupling product development and project management with constraint: a prospective work, E. Vareilles, M. Aldanondo, Y. Lahmar, C. Baron, L. Geneste , M. Zolghadri
128, Recycling electrical and electronic equipment: the recovery management system introduced by the WEEE Directive, C. Gobbi
130, A blended academia-industry learning model for product lifecycle management education, M. Richey, K. McPherson, T. Fuerst, D. French, C. Miller, D. Wittenborn, J. Mosier
131, A PLM Integrator for integrate product information management using commercial PDM systems, T.H. Yoon, S.S. Choi, S.D. Noh
136, CADFORSIM: methodology and tools to integrate CAD and simulation, M. Reimeringer, N. Gardan, F. Danesi, Y. Gardan
145, Proposal of integration of some methods to develop industrial products, F. Rosa, E. Rovida, R. Viganò
148, Aalborg industries - Engineer to order PLM, T.D. Petersen, J.A. Nielsen
155, Next generation PLM - an integrated approach to product development in the service industry, J.D. Golovatchev, O. Budde
166, CO-ENV project: collaborative environments and agile product development for modular and configurable products, M. Germani, M. Mengoni
169, Assessing complex product lifecycle management and technology development research projects, C.C. Røstad, I. Spjelkavik, L.C. Hald, B. Henriksen, B. Moseng
171, CAD automation and KB user interfaces for an efficient integration of topological optimization tools in the product development process, L. Barbieri, F. Bruno, U. Cugini, M. Muzzupappa
173, Life cycle analysis using product semantic model for reliability and maintainability assessment, A. Coulibaly, M. Gardoni, R. Maranzana
177, Customer centric PLM, integrating customers' feedback into product data and lifecycle processes, S. Schulte
202, Reference models – A key enabler for multi-life products, J. Feldhusen, F. Bungert
211, Toward a structured approach for the integration of lifecycle requirements in quality management systems, M.M. Savino, G. Nicchiniello, A. Bouras, L. Vigilante
218, Product lifecycle process analysis, J. Doyle, Q. Wang
222, Cost analysis in mechanical engineering production, D. Cazacu, F. Anghel, N.L. Carutasu, G. Carutasu
224, Life cycle assessment of an aspirator/compressor for zootechnical applications, M. Bertolini, G. Carmignani, N. Delnevo, A. Petroni

ABSTRACTS

Paper abstracts are hereafter reported, ordered per day and then session. The number in brackets (x) indicates the chapter of the proceedings where the paper can be found.

Day 1

1.A.1 Management issues in PLM, Organizational issues

137 Applying a benchmarking method to organize the product lifecycle management for aeronautic suppliers

(1) *J. O. Gomes, A.V. Borille – Instituto Tecnológico de Aeronáutica, Brazil*
R. Vargas Vallejos – Universidade de Caxias do Sul, Brazil

This work treats about the instantiation of the organisation of aeronautic part suppliers in order to attend the main Brazilian customer, who recently has been changing its concept of PLM. This experience is showed in terms of a benchmarking method description, which is used for measuring cost structures, processes and technological performance of those enterprises. The benchmarking method provides the enterprises with strategic information, which will lead to highest competitiveness.

143 Metrics – The business intelligence side of PLM

(1) *A. Hahn, S.G. Austing, J. Strickmann – Carl-von-Ossietzky-University, Germany*

In this paper we are proposing an ontology based approach to use the information base of PLM systems to support project analysis and management of development processes. The paper is focused on presenting meaningful metrics for the evaluation of PLM-data in a project management context based on a semantic integration model. We use semantic maps to translated technical information supplied by a PLM-system into meaningful key figures to bridge the gap between technical and organizational data. Then we introduce Permeter, a “semantic radar system” to pierce the thick mist of product complexity using ontologies and metrics. We will conclude with a summary and an outlook on further activities.

147 Collaboration in product design and PLM-based coordination

(1) *G. Pol – ESTIA/LIPSI Technopole Izarbel, France; SIMS, Cranfield University, UK*
C. Merlo, J. Legardeur – ESTIA/LIPSI, France; IMS - LAPS/GRAI, Bordeaux 1 University, UK
G. Jared – SIMS, Cranfield University, UK

This paper deals with the proposal of a framework for coordinating design process through a PLM system. Design coordination implies that project managers are able to structure their project, assign resources and define the schedule of the resulting tasks with specific objectives and performance criteria. In SMEs the design process is generally described at a macro-level which does not fully correspond to the complexity of the real process. To improve design coordination in SMEs a method for analyzing informal collaborative practices is introduced in order to help modeling detailed but flexible design processes. Then these processes are implemented by using PLM technologies.

206 Linking organizational innovation and product lifecycle management

(1) *M. K. Smith – University of Strathclyde, UK*
P. D. Ball – Cranfield University, UK

Innovation is an established factor for competitive success and has been linked traditionally to product and process technology. Research has established clear links between an organisation’s innovativeness and technology but reported research in, and links to, process innovation is relatively low. The ability of an organization to innovate in its business processes supported by technology such as PLM is examined in this paper. The literature shows strong links between technology and organizational innovation factors of culture, knowledge management and processes. This paper reviews the enablers for innovation in this context and how the use of PLM systems can influence these organizational innovation factors.

214 A framework of PLM practices for multi-partner sourcing organization

(1) *D. Alse – Wipro Technologies, Canada*

Multi Partner sourcing is a reality for most organizations now. The economics of cost and value addition require PLM teams to identify multiple partners and integrate them within the value chain for their product line. This process brings along with it issues like conflict of interests, collaborative knowledge management & ownership & protection of Intellectual Property. This paper presents a framework for PLM in a Multi Partner Sourcing Organization. The paper defines value configurations for various stages of the Product Lifecycle and proposes a system engineering perspective to the PLM process.

1.B.1 Technical and integration issues in PLM, Data exchange

113 Data exchange interface and model for coupling simulation software in nuclear reactor simulation

(4) *T. Bonaccorsi, J. Di-Salvo – CEA DEN Cadarache, France*
M. Daniel – LSIS, UMR CNRS, France

This paper deals with a structure and organization to handle nuclear reactor models and all the simulations. The phenomena involving in nuclear reactors are complex and often dependant to each other. However, the simulation of these phenomena requires a high precision in order to control the condition of irradiation. Frequently, physicists use different tools with several approximations at each interface. We propose a multi-physics data model describing geometries and materials. An application for an experimental device simulation in an experimental reactor demonstrates the feasibility of the proposed method.

132 PLM data acquisition to support LCI compilation

(4) *M. Recchioni, F. Mandorli – Università Politecnica delle Marche, Italy*
H.E. Otto – The University of Tokyo, Japan

Life-Cycle Assessment (LCA) is becoming more and more important as a tool to evaluate the environmental impact of developed products. The role of LCA could be improved if it could be applied during the development process of new products. In order to achieve this target, an important issue to be faced is the data acquisition phase required to compile the Life-Cycle Inventory (LCI). The objective of our work is the classification of the different types of data required to compile LCIs and the definition of suitable methods to identify and extract the required data from the data bases used by the PLM systems. To demonstrate, verify, and evaluate the proposed approach, the first results obtained with a prototype system for data acquisition are presented and discussed.

192 Semantic structures in the product data model

(4) *M.S. Stojkovic, M.T. Manic, M.D. Trajanovic, N.D. Korunovic – University of Nis, Serbia*

The paper presents a conceptual semantic data structure of product model. The proposed data structure aims to capture semantics of product and its components and features but also to provide semantic interpretation of, in such a way, structured data. The key feature of the semantic network is shown in a new data structure of associations between the concepts in the network. This new structure represents the semantics of relations between the concepts and provides analogy-based reasoning. Following the tendency in the knowledge management to model all product properties at a higher level of abstraction in order to capture and reuse product related knowledge, we found that this kind of semantic structure could respond to the most of PLM demands.

204 Implementation of a product data model to support variant creation process as a part of product lifecycle management

(4) *J. Feldhusen, E. Nurcahya, M. Löwer – RWTH Aachen University, Germany*

Nowadays the complexity in companies rises rapidly. Enterprises must be able to handle conflictive requirements: On one hand low internal variety in order to achieve low complexity within the company and on the other hand high external variety to cover as much customers as possible is aspired. The key concerning this complexity is to gain control of the variety in the product data to support the variant creation process. PLM provides the strategy to handle this problem by deploying a product data model. This paper describes a product data model and its implementation in a product data management system to support the variant creation processes as a part of the PLM strategy.

220 A feature-based approach to integrate product and process architectures

(7) *J. Feldhusen, N. Macke, F. Bungert, M. Löwer – RWTH Aachen University, Germany*

This contribution describes a feature-based reference model which integrates product and process architectures. A reference model is an abstract, commonly valid model from which an application model describing a certain scenario can be derived. To integrate the product architecture, which comprises the product and the functional structure, and a process architecture, which comprises the process and the organisational structure, a hierarchical feature structure will be applied. This approach aims at making as much product related knowledge reusable as possible. In general, only the data connected to the product structure can be reused as other knowledge is only of implicit character. This knowledge can be turned into explicit using the mentioned feature-based approach. It will be embedded into a reference model to ensure that only common knowledge is incorporated.

1.D.1 Promise project, Promise – Day 1

125 Recycling of engineering thermoplastics used in consumer electrical and electronic equipment

(11) *E. Lazzaro, I. Sbarski, J. Bishop – IRIS, Swinburne University of Technology, Australia*

Diminishing land fill capacity and increased volume of waste electrical and electronic equipment (WEEE) are the main drivers for the recycling of engineering thermoplastics. WEEE can be recycled in bulk or as separated components of a disassembled machine. Bulk recycling is the economically preferred option, however the blending of incompatible plastics without modification often limits the end use of the recycled plastics. The decision to apply expensive sorting techniques at the end of a products life should be based on mechanical properties and processability of the engineering thermoplastics contaminated by other polymeric materials. This paper investigates properties of various recycled thermoplastic blends to determine the degree of sorting required. materials, as well as selected virgin blends.

163 Integrated assessment of recycling options for mixed waste plastics fractions

(11) *J. Bishop, I. Sbarski – Industrial Research Institute Swinburn (IRIS), Australia*
C. Hans, K.D. Thoben – Bremen Institute of Industrial Technology and Applied W.S. (BIBA), Germany
M. Schnatmeyer – MS Engineering & Consulting, Germany

An important basis for a sustainable acting in the area of plastics recycling is the using and interpretation of data, achieved by balance sheets which take into account all steps in the life cycle of plastics waste. The paper will set the focus on plastic recycling in the plastics processing industry and the special impact of the treatment, logistics and storing process steps. This shall take into account economic, environmental and social aspects. The first part of the paper shall evaluate the recycling options of different case studies. The second part will be based on a discussion for appropriate methods for the assessment of such evaluation results.

165 Tracking and tracing in the end of life phase of product lifecycle management

(11) *C. Hans, K.A. Hribernik, K.D. Thoben – Bremen Institute of Industrial Technology and Applied W.S., Germany*
D. Potter – INDYON GmbH., England
P. Folan – Computer Integrated Manufacturing Research Unit National University of Ireland, Ireland

This paper addresses the need for tracking and tracing in the end-of-life phase of product lifecycle management.

It specifically addresses the recycling of plastic products, such as automobile bumpers. The paper begins by briefly describing the state-of-the-art in product lifecycle management in this field. It then presents an approach to product lifecycle management in a specific plastics end-of-life scenario in describing a proposal for a supporting system architecture. The scenario is then described in scene-by-scene detail, highlighting how the proposed approach is expected to modify and improve the current scenario.

167 Design improvement method using product usage data in a closed-loop PLM

(11) J.H. Shin, H.B. Jun, D. Kiritsis, P. Xirouchakis –Swiss Federal Institute of Technology in Lausanne, Switzerland

Recently, companies have been able to gather product usage data during middle of life (MOL) owing to newly developed technologies such as RFID, various sensors, wireless telecommunication, and so on. Even though the technological infrastructure for gathering product usage data is established, the application of newly gathered product usage data is still in its infancy. If MOL data can be transformed into suitable information and knowledge for product design improvement with appropriate methods, it will be fruitful. To this end, in this study, we propose a design improvement method based on product usage data which are gathered by product embedded information device (PEID) in a closed-loop PLM.

187 Improving automobile parts recovery using product lifecycle information

(11) A.K. Parlikad, D.C. McFarlane – Cambridge University Engineering Department, UK
P. Folan – CIMRU, National University of Ireland, Ireland
J. Mascolo – Centro Ricerche FIAT, Italy

The ability to enhance the quality of product information that is available to make decisions along the product lifecycle is the core output of the Promise project. One of the major impact areas of such a capability is in improving the effectiveness of decisions made during end-of-life product recovery. Using a probabilistic approach to quantify the link between product lifecycle information and product quality in the case of a major European automobile manufacturer, this paper illustrates how decision-making during end-of-life product recovery can be improved by collecting critical product information during the vehicle lifecycle and making it readily available to the decision-makers to optimise product recovery processes.

1.A.2 Management issues in PLM, Business issues

117 Knowledge management in flexible supply networks: architecture and major components

(2) A. Smirnov, T. Levashova, M. Pashkin, N. Shilov, A. Kashevnik – St.Petersburg Institute for Informatics and Automation of the Russian Academy of Sciences, Russia

New forms of production and collaboration caused by increasing market requirements have led to appearance of complicated and highly flexible supply networks currently recognized as a strategic issue of prime importance. Involving a high number of interacting participants supply networks require intensive knowledge sharing & exchange. The paper presents results of research conducted in this area. It proposes a knowledge management platform for a flexible supply network to support finding available suppliers. In build-to-order supply networks absence of suppliers that could provide required materials/components may require changes in the product structure thus affecting the PLM processes. Special attention is devoted to the ontology-based architecture of the knowledge management platform and competence profiling.

120 PLM design and delivery models: key issues and lessons learned from projects on the field

(2) D. Morandotti – Project Management Institute - Northern Italy Chapter, Italy

The paper describes the cultural issues and the fundamental practices required to manage effectively and efficiently PLM projects, as emerged from key lessons learned from projects on the fields and from author's experiences. Major topics presented are: scope definition and monitor, stakeholders' role and involvement, risk and communication management, the role of the project manager, and the overall ability to integrate all the previous aspects into a seamless project body. A key issue presented is the balance between two emerging design & delivery models: the spec-driven approach, where most of the concept and functional design is obtained through specifications and the pilot/prototype-driven approach, where most of the functional design is obtained thought iterative prototypes. Characteristics, advantages, disadvantages, trends and possible blends of the two models are discusses.

156 Integration of PLM with other concepts for empowering business environments

(2) A. Moorthy, S. Vivekanand – Geometric Software Solutions Co Ltd, India

Innovations for enterprises are essential to survive in this competitive global market. Being an innovative business not only means creating innovative products, but also improving the processes of a company uses to produce its products. It supports its products using innovative approaches to the complete product lifecycle. PLM plays a key role in this and also in today's rapidly changing business environments. Integration of PLM with other managerial and design concepts, certainly leads to successful business also worth products for customers. This paper briefly describes the growth of PLM and also how it suits for empowering business in various modes while integrating with other concepts.

197 Product lifecycle management opportunities in small medium enterprises

(2) R. Cavarero – PLM Systems - Altea Network, Italy
P. Chiabert – DISPEA - Politecnico di Torino, Italy

It is widely accepted that PLM represents a competitive edge for manufacturing enterprises. Time-to-market reduction and increased reactivity to market's demand are PLM most known fall-outs. A local survey on PLM penetration in SME demonstrates a substantial lack of interest of SME management regarding PLM opportunities. Authors deal with the problem analyzing reasons and solutions, thus highlighting the need of a simple tool to determine and clarify PLM advantages in the enterprise context. The first step towards the development of such a tool is the enterprise model proposed in the paper.

201 Stakeholders' influence and internal championing of product stewardship in the Italian food packaging industry

(2) M. Bertolini, P. Colacino, N. Delnevo, A. Petroni – Università degli Studi di Parma, Italy

Environmental management is becoming a top issue on managers' agendas in several industries. The adoption and implementation of a sound green strategy involves following product stewardship practices. Product stewardship is the idea that manufacturers, rather than consumers, governments, or waste companies, ought to take responsibility for the recycling and disposal of their products at the end of their life cycle. This article is aimed at investigating the relationships between the adoption of product stewardship practices and the involvement of different actors in the decision-making process. 120 firms have been classified into two different environmental profiles. Results indicate that firms that are more committed to product stewardship differ from less-committed firms in the influence exerted by different stakeholders and in the supportive role played by the management at different hierarchical and functional levels.

213 PLM in the strategic business management: a product and system co-evolution approach

(2) S. Sperandio, V. Robin, Ph. Girard – IMS, UMR CNRS 5218, département LAPS, France

The design system can be seen as the environment where design projects (product or system design) take place. The aim of this paper is to optimise the synchronisation and the coordination of the development of several design projects in the design system with limited resources and therefore satisfy the strategic performance objectives of the enterprise. With this intention, this paper deals with the role of the PLM in the system evolution management. In a first time, we analyse the PLM concept and we define the impact of the product along the system lifecycle. Then we identify the relations between the product and system co-evolution and the continual improvement process of an enterprise. We focus on the different natures of the product regarding to the decisional level during the strategic business management. Lastly, we present a prototype of software that integrates the PLM concepts and manages design system evolution.

1.B.2 Technical and integration issues in PLM, Tools

114 Development of a tool to support the dissemination of information about knowledge in multilingual product development teams

(5) D.J. Bradfield, H. Soltan – Manufacturing Department, Cranfield University, UK
J.X. Gao – School of Engineering, University of Greenwich at Medway, UK

New product development (NPD) represents a significant portion of the product lifecycle. Recent years have seen the adoption of cross-functional stage-gate NPD process models by manufacturers. These models demand the effective sharing of knowledge among individuals with different functional backgrounds and levels of experience. This scenario presents various knowledge sharing challenges. These challenges have been further complicated by the emergence of global product development, in which project teams may be comprised of individuals with no common language. This paper presents a methodology for building a mechanism that allows information about knowledge in the NPD process to be made available in a multilingual environment. The mechanism is a component of an ontology based NPD knowledge sharing developed by the authors.

118 Machining processes simulation with the use of design and visualization technologies in a virtual environment

(5) N. Bilalis, M. Petousis – Technical University of Crete, Greece
A. Antoniadis – Technological Education Institute of Crete, Greece

The development of PLM systems is closely related to the integration of the design process with the actual manufacturing process and the complete assessment of the operation at an early stage of the program development. Currently a lot of progress has been made on the application of Virtual Reality tools in the various stages of product development. Aim of this work is the integration of virtual environments with production design processes. Most of the existing systems are focused on the study of the machining process kinematics and do not provide information related to the process results. A production processes simulation system was developed for the determination of critical quantitative and qualitative processes parameters. The system provides realistic visualization of the processes in a three dimensional virtual machine shop environment.

135 Graphonumerical parameters: collaborative parameters based on scenarios and ontologies

(5) N. Gardan, M. Reimeringer, F. Danesi, Y. Gardan – Micado-Dinccs - ERT Gaspard Monge, France

The integration of the notion of extended firm in products development involves the use of knowledge from different skills. Yet, each profession develops its own thesaurus which contains a vocabulary used in a specific context. They are rarely explicit and are difficult to model. Nevertheless, it is essential to define the trade vocabulary in order to parameterize the numerical model, since the first phases of the project. In this way, this vocabulary has to be accompanied with its definition and its use in context. This notion is wide in the area of collaborative work with the setting of a common vocabulary which enables to define the collaborative processes. We suggest a structure, graphonumerical parameter, allowing to parameterize a model in a collaborative way.

151 Multi level configuration of ETO products

(5) T.D. Petersen, K.A. Jørgensen, H.H. Hvolby, J.A. Nielsen – Aalborg University, Denmark

The paper introduces and defines central concepts related to multi level configuration and analyzes which challenges an engineer to order company must deal with to be able to realize a multi level configuration system. It is argued that high flexibility can be achieved and focus can be directed in certain business processes if a multi level configuration system is realized.

199 An implementation methodology of SOA based PLM system

(5) T.J. Lee, J.G. Lim, J.H. Shin, S.H. Myung, M.Y. Choi, S.S. Baek, J. Kim, J.W. Oh, – Samsung Electronics, R&D IT Infra Group, Technology Strategy Office, Corporate Technology Operations, Republic of Korea
D.S. Lee, Y.D. Han – Samsung SDS, Electronics PLM Development Team, Republic of Korea

The range of IT systems and engineering solutions that fall under the terminology PLM system has been growing with constant introduction of new IT technologies and latest engineering needs. Consequently, a typical PLM system in a large manufacturing company is no longer represented by a single homogeneous IT system but a collection of several commercial packages as well as home grown applications. This paper describes a methodology to implement a PLM system by integrating hybrid legacy IT assets within service-oriented architecture using our best of breed service integration policy.

217 Computer aided consensus searching system for collaborative and distributed design process

(5) E. Ostrosi, M. Ferney – Université de Technologie de Belfort-Montbéliard, France

This paper proposes an approach for consensus identification during the real interactions in collaborative and distributed design process. For that, from real experiments, the process of collaborative and distributed design is analyzed. Then, based on this analysis, a formal model to represent the consensus is proposed. The analysis of design experiments shows that a design solution is a multiple of consensus solution-nucleus rather than a consensus solution. Based on the concept of consensus and its properties, the actors can be assisted to move towards the consensus improvement or towards the ideal consensus. The concept of consensus is used to evaluate the choice of a solution in terms of consensus and dilemmas; to assist the redesigning of a part or the whole solution according to consensual criteria and to capitalize and share the know-how of the various actors.

1.C.1 PLM support for product lifecycle phases, Concurrent development and engineering

126 Aligning supply chain management and new product development: a general framework

(8) M. Pero, A Sianesi – Politecnico di Milano, Italy

Competition in the global marketplace, evolving technologies, the need to satisfy more and more sophisticated customers and the shortening of product life cycles are some of the fundamental challenges that firms are facing. To remain competitive, firms should generate new products, while maintaining high supply chain performances. Therefore they should align the objectives of the processes of NPD and Supply Chain Management (SCM). An analysis of the literature shows that the “commonality-variety” trade-off is one of the main issue when addressing this topic, as it has strong impacts on supply chain, while being one of the most important decision taken during NPD. In this article we propose a framework for studying the possibility to align NPD process and SCM process by aligning the level of variety that is created during NPD and the variety that is/can be transported, in order to improve supply chain performances.

159 Logistics and product lifecycle: towards a design for logistics approach

(8) G. Confessore, G. Liotta, G. Stecca – ITIA CNR, Italy

The value of information exchanged among several actors involved in the supply chain can be exploited for gaining relevant advantages in operations efficiency and effectiveness but also for implementing the delivery of new or re-engineered added-value services associated with products. Logistic processes sustain many phases of Product Life-Cycle (PLC), from product design to dismissal and recycling. The paper provides an approach which identifies the main logistic processes performed throughout PLC. Process life-cycle and manufacturing sectors are introduced as further dimensions. Design for logistics is introduced as a systemic approach for the design of products and logistic processes as well. The objective is to lead to the integration of key logistic processes.

183 Application of kansai engineering to product development

(8) S. Kara, B. Kayis – The University of New South Wales, Australia

Extracting emotions and translating them to product development is crucial to balance the product’s design and performance attributes. Kansei Engineering (KE) can aid in the development of the complete product from its physical appearance to its required performance. The study conducted aimed to determine the effect of changes in the design parameters on the key emotions or adjectives commonly used to describe the product. A domain for an existing product was developed using several KE methods followed by a database comprised of appropriate semantic terms and product properties. The results show clear differences between the High type of users and Medium type of users. The factor analysis determined the four significant factors that are important when the clusters were combined. Regression analysis was carried out both on the Kansei-words and different factors from different clusters. The database was successfully validated at an Australian based company AB.

184 Propagating engineering changes to manufacturing process planning: does PLM meets the need?

(8) M.A. El-Hani, L. Rivest – Ecole de technologie superieure, Canada
C. Fortin – Ecole Polytechnique de Montreal, Canada

Manufacturing process planning is mainly based on information coming from engineering, on manufacturing data, and on the know-how of the process planner. When an engineering change is brought to the part, the process planner has to propagate its impact to the manufacturing work instructions (MWI). In spite of the increasing interest in the PLM approach and tools, propagation of engineering changes to the MWI has received very limited support from existing applications. The research presented in this paper builds on a case study conducted within the process planning department of a manufacturing company operating in the aerospace sector. First, the detailed investigation conducted to document the change propagation process from engineering to the MWI is described. Next, an activities model of the MWI development process is presented.

191 Innovative product development in a concurrent engineering environment through the extended enterprise

(8) M. Sorli, I. Mendikoa, A. Armijo – Foundation LABEIN-TECNALIA, Spain

This document compiles and presents the results from several years of research within Engineering Design Research Group in the lines of Product Development in the extended enterprise. The main business aim is to

produce a leap forward in industrial design performance in manufacturing Companies. The paper will present a model describing a new paradigm for the development process of new products and their manufacturing processes combining the concepts of Innovation, Knowledge Management and integrating tools and techniques from Total Quality Management, Concurrent Engineering and Information Technologies within a real working framework shifting towards the required cultural changes.

216 Exploring the relationship between after-sales service strategies and design for X methodologies

(8) *P. Gaiardelli, S. Cavalieri – Department of Industrial Engineering, Università di Bergamo, Italy*
N. Saccani – Department of Mechanical and Industrial Engineering, Università di Brescia, Italy
Modern industrial companies cannot consider their business role ending up with the transactional undertaking of product sale. They must indeed focus their efforts in ensuring a long-lasting and stable relationship with the final customer through the overall product life-cycle by providing a customized and value-added portfolio of connected services. In the western mature economies, the evolution of cultural and sociological models, along with the continuous breakthrough of the technological edges, are driving consumers to put more emphasis on the functional properties of a product. The transition from a product manufacturer into a service provider constitutes a major managerial challenge. The purpose of this paper is to evaluate how Design for X methodologies and practices can consistently enable the achievement of the objectives of specific after-sales strategic profiles. A model is proposed relating after-sales strategies with “Design for X” methodologies.

Day 2

2.B.3 Technical and integration issues in PLM, Interoperability

101 How the architecture of a product can help managers to define the network of partners?

(6) *M. Zolghadri, P. Girard – IMS-Labs Bordeaux, UMR CNRS 5218, Bordeaux 1 University, France*
C. Baron – LESIA-INSA, France
M. Aldonondo, E. Vareilles – Ecole des Mines d'Albi-Carmaux, France
Conducting locally and globally a network of partners is a hard task for every actor and especially for the company that initiates a product development project which necessitates close collaboration of partners. Some of these difficulties concern the run of the partners’ network while others are associated with the run of the project itself. Generally when a difficulty appears it is sourced somewhere else upstream in the process. We focus our study on one of these potential sources which is the product architecture. The idea is to use the product architecture and technical data, even incomplete, to identify the architecture of the network of partners as early as possible during the product development project.

119 An UML model of the technical information system to enable information handling and recording during the product life cycle

(6) *Y. Keraron, A. Bernard – IRCCyN, UMR CNRS 6597, Ecole Centrale de Nantes, France*
B. Bachimont – Heudiasyc, UMR CNRS 6599, Université Technologique de Compiègne, France
Information management systems play an essential role in the PLM. Data and documents as well are edited in a digital form and have both to be coherent along the lifecycle. A document must be preserved through time for its use through space. Difficulties observed on various industrial fields in the use of digital documents and more particularly concerning the updating issue conduct us to propose an UML model addressing on one hand the requirements for records keeping and on the other one the needs for easier using and more efficient updating with feedback information captured in operation, maintenance and dismantling activities. This model could be generalized to take into account the various business requirements and needs along the product lifecycle.

129 Proposition of a product information exchange framework: multiple viewpoint approach

(6) *H. Geryville, Y. Ouzrout, A. Bouras – LIEPS Laboratory - Team Lyon 2, IUT Lumière Lyon 2, France*
N. Sapidis – Dpt of Product and Systems Design Engineering, University of the Aegean, Greece
In the modern context, companies are considering that constraints are sustained to great product development by integrating the management of its entire lifecycle and its supply-chains. Achieving this goal requires an intense collaboration between multidisciplinary actors. The representation of the actors’ viewpoints is the underlying requirement of the collaborative product development. In this paper, a multiple viewpoints representation is presented. Product, process, collaboration, and organization information models are discussed. Based on XML, taking electric connector as an example, an application case, part of product information, is stated.

138 Implementing the interoperability between virtual reality technologies and CAD applications

(6) *F. Bruno, M. Muzzupappa – University of Calabria, Department of Mechanical Engineering, Italy*
Virtual Reality (VR) technologies are widely used by industries in several phases of the Product Development Process (PDP) and, in particular, in design review and CAE data analysis. Recently, other interesting VR applications are capturing the interest of the industries, but a wider diffusion of these technologies still founds an obstacle in the poor integration with other software employed in the PDP. The present paper starts with an analysis of some new VR applications in the PDP, aiming to define the main CAD-VR interoperability topics. Then the paper shows how the CAD API can be employed to resolve some of the most common interoperability problems.

170 An environment for collaborative design: a new approach to CAD tool interoperability

(6) H. Chettaoui, F. Noel – Laboratory G-SCOP, INPGrenoble, France

Today's complex design processes require the use of multiple CAD tools that operate in multiple frameworks making management of the complete design process difficult. In a collaborative design environment, designer interactions are assisted by sharing the common design information through a specific framework. In this paper the Product Process Organisation (PPO) meta-model framework is used to support information sharing. To share information issued from CAD systems is not easy because of the heterogeneity of used tools. To make collaboration efficient, each expert application or design tool should connect and interoperate with the shared framework. This paper illustrates the importance of interoperability as an issue for collaborative design. Then this work describes a meta-modelling architecture to synchronize heterogeneous models. A main step is the extraction of a model from an expert application in a readable format.

2.C.2. PLM support for product lifecycle phases, Middle and end of life issues

146 An investigation into the early and retirement life-cycle stages: tools, requirements

(9) G. Thimm, Y.S. Ma, S.G. Lee, D. Liu, K. Chua – School of Mechanical & Aerospace Engineering, Nanyang Technological University, Republic of Singapore

This publication discusses the integration of the conceptual design and the end-of-life stages in the management of a product. This is done by pointing out the influences of the end-of-life of a product on the cost of a product and investigating links between these two stages. Then, both stages and their interrelations are examined for possible needs in terms of their management. This knowledge is then used to evaluate the status quo of product life-cycle management. In particular, the gap between the "as-is" and "should be" functionality of PLM solutions with respect to these two stages is examined for two most popular PLM solutions.

150 An innovative framework for information flows collection in PLM environment

(9) P. Lunghi, M. Botarelli, M. Ginocchietti – University of Perugia, Department of Industrial Engineering, Italy

In this paper we propose an innovative framework with the purpose of promoting innovation in three main aspects: technological innovation, business models innovation and product innovation. The framework is based on the PLM methodology; in particular we are going to discuss the possibility of integrating innovative technologies like RFID and XML. By considering holistic property the proposed system achieves not only a valid and innovative framework for product innovation support, but also a framework that allows customer participation in the supply chain. The paper is supported by a case study of an Umbrian company.

152 RFID technology in the life cycle of complex machinery and plants

(9) G. Müller, K. Richter, C. Plate – Fraunhofer-Institute for Factory Operation and Automation IFF, Germany

RFID technology is entering ever more domains of logistics and engineering. RFID components are for example used in the manufacture of complex machinery and equipment and in their delivery to customers and commissioning as well as in the subsequent phase of maintenance by plant operators. Awareness is increasingly growing in companies that such holistic and cross-company process chains require new approaches to and methods for the integrated utilization of RFID components. This begins in the design engineering of components, which are outfitted with RFID components either permanently or only to support selected process steps, and ends with the removal of the transponder or the deletion of the data stored on a component's transponder. An issue parallel to the physical handling of RFID components is the use of RFID to support cross-company information exchange.

190 Architecture for life cycle management of product and services

(9) J. Tammela, V. Salminen, S. Laitinen – Lappeenranta University of Technology, Finland

Companies that are expanding their product offering to cover also lifecycle services in the customers' facilities are facing the increasing complexity to manage the information. The problem arises when the company is looking for growth by taking bigger role of the customers' process by providing the value added services on site.
The business critical information is described with items that are usually mastered in the ERP or PLM systems. Sharing the same information enables global operations and optimization. This article focuses on methodology how to manage product and product related information during lifecycles of the product. The article introduces product management architecture, which consists of harmonized and standardized business semantics, classified functional structures and interface definition. Using these elements any product or service, in the recognized class, can be semantically described and communicated through interface definition.

203 Product lifecycle management in the ubiquitous world

(9) V. Serrano, T. Fischer – WHU-Otto Beisheim School of Management, Germany

Ubiquitous availability of information-processing capabilities, computing-power, as well as networking-resources manifests itself in the creation of ubiquitous systems. In this paper, the possible contribution of these 'intelligent' systems to product lifecycle management is analysed. Potential characteristics of supporting systems are presented, which may empower already existing data management systems by functionalities of ubiquity; making in this way a proposal for a possible future development of the product lifecycle management approach.

2.D.2 Promise project, Promise – Day 2

168 Tracking and tracing product lifecycle data in a closed-loop PLM

(11) H.B. Jun, D. Kiritsis, P. Xirouchakis – Swiss Federal Institute of Technology in Lausanne, Switzerland

The efficient tracking and tracing method for product lifecycle data is essential for avoiding any delays and errors affecting accuracy and completeness of enterprise applications, especially in the closed-loop PLM where several partners and organizations are involved. To this end, we develop an overall framework for tracking and tracing product lifecycle data in the closed-loop PLM. It contains an RDF schema to manage huge amount of event data of product embedded information devices, and a processing mechanism to transform the huge data into

meaningful information. Based on them, simple tracking and tracing examples are presented with RDF query language. To show the effectiveness of the proposed approach, a simple case study is introduced.

176 Assessment of item-specific information management approaches in the area of heavy load vehicles

(11) C. Corcelle – Caterpillar France S.A.S, France
K. Främling – Helsinki University of Technology, Finland
L. Rabe – Bremen Institute of Industrial Technology and Applied W.S., Germany
J. Anke – SAP AG, SAP Research CEC Dresden, Germany
J. Petrow – Trackway, Finland

PLM is often considered an inter-organizational issue, where only organizations produce product information. This view fails to take into account the products themselves as information providers, which occurs mainly during the product's usage phase. The required item-specific information management infrastructure may be a challenge for traditional information systems. In this paper, we study how different approaches of centralized versus distributed information management are suitable for item-specific information management. A real-life PLM application is used for deriving generic assessment criteria. These criteria are then used for assessing the different approaches against the specific application.

189 An approach to enhance product lifecycle management with intelligent sensors

(11) D. Barisic, G. Stromberg, D. Bichler, M. Krogmann, M. Löw – Infineon Technologies AG, Germany

In traditional PLM systems product information is acquired during manufacturing, transport and storage by sensory deployed throughout the production facilities. This information provides a valuable basis for process optimization or even to early recognize design flaws. The resulting requirements for products and PLM systems differ significantly from traditional approaches. First, the responsibility to acquire and store information now lies with the product and its integrated sensory itself. Second, diverse sensor types will be needed in order to provide satisfactory usage information. Third, product information is available only irregularly e.g. when a product is in a service garage and in changing location. As a result, a much more dynamic PLM system is needed. In this paper we propose a service oriented approach to meet the requirements of this emerging PLM concept.

210 An integrated approach to decision support for maintenance management: a case study for machine tools

(11) R. Fornasiero, A. Zangiacomi – ITIA-CNR, Italy
D. Panarese – Fidia, Italy
J. Cassina, M. Taisch – Politecnico di Milano, Italy

This paper presents a case study of maintenance management applied to the field of the machine tools. Maintenance has become a key factor for the machine tools business, giving competition advantage both to the machine manufacturer and the user. The first will be able to provide a life long maintenance service, at competitive prices, the other will have the benefits for the reduction of the costs of the breakdowns and of the maintenance contracts. The result of the work carried out by the authors is an integrated maintenance decision support system; it aims to predict the breakdowns measuring key parameters of the machine behaviour and to support the service provider to interpret the data in order to plan the optimal maintenance action.

215 A decision support system for lifecycle management: a cost evaluation approach to maintenance planning

(11) R. Fornasiero, M. Sorlini – ITIA-CNR, Italy
J. Mascolo, N. Francone – CRF, Italy

The aim of this work is to propose a Decision Support System to manage product lifecycle in the Middle of Life phase in order to obtain data which may impact on the whole value chain. In particular a new maintenance approach based on the integration of information gathered from different actors is taken under consideration and the evaluation of residual lifecycle costs are used to define and plan maintenance actions. The system permits to create new value by transforming information into knowledge available for all phases of the lifecycle improving product and service quality, efficiency and sustainability.

223 Proposal of a PLM standard for mass products

(11) J. Cassina, M. Tomasella, M. Taisch. A. Matta – Politecnico di Milano, Italy
S. Terzi – University of Bergamo, Italy

This paper presents the semantic data model behind a new-generation closed-loop PLM system. The model s able to fully address the requirements of a real-world closed-loop approach to PLM. In this approach, data on product instances, gathered from the field via smart embedded information devices, are used both to manage the lifecycle of existing product units, and to create, update and manage proper knowledge about the product, useful for the improvement of the future product generations. An exhaustive overview of the semantic model is carried out in order to describe how the model addresses the requirements cited above.

2.A.3 Management issues in PLM, Industrial experiences

102 Flexible PLM platform implementation for collaborative and simultaneous product development and management in injection moulding SMEs sector

(3) A. Aurilia – Università Politecnica delle Marche, Italy

Developed by five injection moulding's SMEs of Marche industrial district, Co-Mould project primary aim was Collaborative and Simultaneous Product Development platform analysis and creation, focused on product knowledge management and effective sharing. The project led to PLM software platform implementation with a typical "three layers architecture", perfectly tailored to the involved enterprises needs; server systems connection "foundation layer" is made up of two secure data storing databases. Moreover a workflow management software was installed. It completely integrate with SharePoint as well, assuring right web visibility to all common clients.

In order to complete third "layer" and to allow collaboration and simultaneousness among geographically distributed enterprises, a videoconferencing and desktop sharing system was installed.

105 Introduction to PLM of Hyundai Motor Company

(3) S.J. Kim – Information Technology Center, Hyundai Kia Motors, Korea

Hyundai Motor Company (HMC) is a leading automobile company in Korea producing more than 2.6 million passenger and commercial vehicles a year. This paper addresses the progress of HMC's PLM, focusing on product development process aiming at shortening development period and improving quality.

181 Shifting lead as PLM introduction strategy - A case study in EE automotive development

(3) D. Malvius, S. Molneryd – Integrated Product Development, Royal Institute of Technology, Sweden
D. Bergsjö – Product and Production Development, Chalmers University of Technology, Sweden

This paper deals with the complexity of providing support for electrical and electronics development in a global PLM system. State-of-practice based on a case study performed in the automotive industry is reported on. A new approach named shifting lead is presented. Applied in IT/IS introduction projects this approach allows user groups or departments with dominating need to take lead in customization and pre-study projects. By balancing disciplinary needs this way a means to obtain process mapping, adapted IT/IS functionality and improved efficiency in the PLM system is obtained. Shifting lead is suggested as a way to create PLM support scalable to a majority of users. The approach is further elaborated to incorporate system integration approaches towards the emerging enterprise PLM system.

185 Space products lifecycle management: new frontiers for PLM

(3) J. Feyeux – Processia Solutions, Canada
M.A. El-Hani – S.C.I.P.E., Canada

This paper aims at putting PLM in perspective in a non-traditional field, such as space. Maturing sectors like Aeronautics and Automobile have much in common with the space industry. The article will build upon these similarities to identify differences and provide recommendations based on the experience gained in more traditional sectors.

195 PLM implementation at MAN Diesel A/S: A case study

(3) R.K. John – Tata Consultancy Services, Salarpuria GR Tech Park, Jal Building, India

A leading supplier of large diesel engines for ship propulsion systems, stationary power supply and rail traction, MAN Diesel A/S felt the need for effective management of data and empowerment of their vision for "Lifetime Management of Engines". Prior to PLM implementation, the design and service data of products were being managed by several home grown mainframe-based data management systems.

2.B.4 Technical and integration issues in PLM, Knowledge engineering

142 Knowledge integration and transfer at PLM: a crown gear case study

(7) D. Guerra-Zubiaga, N. Penaranda, R. Magaña, A. Molina – Tecnológico de Monterrey, CIDyT, México
L. Donato – Ecole d'ingénieurs et d'architectes, Lab. de Développement de Produits, Switzerland

PLM integrates the information and knowledge generated during a product's lifecycle to improve it and make the collaborative work easier. A case study is presented to see how knowledge integration using CAD and CAE tools is required for PLM to support a crown gear design at a Swiss metal-working company. This paper focuses on knowledge integration at collaborative workspace as an issue required at product design stage using a PLM concept. This paper argues that it is required information and knowledge structures along the project life cycle using new methods to obtain product design knowledge integration at PLM.

144 A framework for ontology-based manufacturing support systems

(7) M.H. Cho, C.G. Lee, D.W. Kim – Chonbuk National University, Republic of Korea

Conventionally, design data originally produced in the design department of a company is modified and/or changed by the subsequent departments, such as production, purchase, quality control, and marketing & sales. Each department extracts or saves its necessary information from the product information of a design stage, then, modifies it so as to reflect the characteristics of the department. However, existing commercial systems do not sufficiently provide functions such as the representation of the relationships and/or features. Ontology is an information model technology that can be used for many purposes, including enterprise integration, database design. This paper addresses a framework for ontology-based manufacturing support systems, which models the relationships among design data, as well as the information in each department.

193 Conceptual design knowledge management in a PLM framework

(7) C. Rizzi, D. Regazzoni – Università di Bergamo, Italy

The capability of managing product development is the basis to success the global competition. Successful product development requires improved approaches to organize the development process, reducing any kind of waste, and providing goods to meet customer explicit or hidden needs. Lean product development, short time-to-market and an effective quality approach are key elements to respond to the competition in our own markets as well as to compete on a global scale. All these aspects must be taken into consideration from the very first steps of the product lifecycle management to gather optimal results. To accomplish this goal methods and tools coming from the systematic innovation field for the management of product knowledge can be adopted.

207 Towards an ontology for open assembly model

(7) X. Fiorentini, I. Gambino, V.C. Liang, S. Foufou, S. Rachuri, C. Bock, M. Mani – National Institute of Standards and Technology, USA

In any industrial scenario, most products are assemblies composed of either parts or subassemblies produced by different companies. Traditionally assembly information model contain information regarding parts, their relationships, and its form. But it is important that the model also represent the function and behavior. This paper addresses the development of an Ontological Assembly Model in the broader context of PLM. A model like this

can help in achieving various levels of interoperability as required to enable the full potential of PLM. In this paper we present an Ontology Web Language version of the Core Product Model and subsequently Open Assembly Model based on previous NIST versions.

221 2ODE-IPD: An object-oriented design environment for interdisciplinary product design

(7) A. Gayretli – Afyon Kocatepe University, Turkey

Electromechanical products such as electrical toothbrushes and robots carry multi-technological characteristics. Owing to limitations on available expertise, and reach-ability of experts, and engineers and academics, designing these products is a very complicated and time-consuming process. In this research paper, a new object oriented product development approach has been proposed for integrating mechanical design with electronic design to improve design and manufacture of electromechanical products within given requirements. The proposed approach has been implemented in a Delphi based environment integrated with a CAD system. To firmly understand relationships between each component in a complex system some existing products have been examined and modeled in terms of constraints, rules and frames.

209 Product data and digital mock-up exchange based on PLM

(4) E. Guyot, T. Gallet – Snecma - Groupe SAFRAN, France
G. Ducellier, B. Eynard – Troyes University of Technology, France
P. Girard – University of Bordeaux 1, France

Nowadays, aeronautics manufacturers work in close partnership to increase competitiveness and to share risks. The digital mock-up aims at providing the same product view to all the partners of the same engine project. It requires intensive data exchange between the partners. This paper presents Snecma's strategy to exchange data with all the partners of one project and to reduce the development to adapt exchange mechanisms. It consists in the encapsulation of generic functions, reusable applications and adaptable translators. It appears that this solution is adaptable to all engine projects, it offers robustness and a lot of possibilities, but the implementation is difficult.

2.C.3 PLM support for product lifecycle phases, Lifecycle engineering and assessment

103 Lifecycle analysis aspects of biofuels

(10) J. Richard, P. Leverington – University of Applied Sciences of Geneva, Switzerland

An experiment done in Geneva on the river Rhône with a push boat gave the practical frame of a comparative study between 3 fuels: diesel, biodiesel and vegetable oil. Further more in this concrete case the VO used, came from frying oil waste constitutes an interesting illustration of industrial ecology. The asset of this study on environmental impacts analysis done here is to have used practical measurements of emissions from an engine in function on the push boat in complement to bibliographic sources and database.

175 Life cycle engineering, product lifecycle management and sustainability

(10) A.G. Filho, H. Rozenfeld, A.R. Ometto – University of São Paulo, São Carlos School of Engineering, Brazil

The reduction of product lifecycle-related environmental impacts is prerequisite to sustainability. Life Cycle Engineering (LCE) can be defined as engineering activities focused on the design and production of products that have minimal environmental impact during their entire life cycle. Despite the promised opportunities for competitive advantage resulting from sustainability, the implementation of PLM concept has not reached companies worldwide, mainly due to the gap between product-oriented and environment-oriented research. The goal of this paper is to explore the complementarities between LCE and PLM by presenting them as complementary knowledge areas influencing the main business processes that deal with product lifecycle.

182 A design for environment product analysis

(10) J. Dobbs, K. Cormican –CIMRU, National University of Ireland, Ireland

Environmental legislation is holding electrical and electronic manufacturers accountable for the disposal of their products at end of life. In order to reduce disposal costs, manufacturers are seeking to optimise product design. Supporting tools are essential at this stage in managing environmental information in order to reduce the products environmental impact. This paper presents findings from an environmental product redesign case study. Specifically, it presents the findings of the Design for Environment Workbench (DFE Workbench) software, in redesigning a torch.

200 A life cycle management guidance system for maritime industry

(10) H. Gsell, N. Homburg, D.H. Mueller – Bremen Institute of Industrial Technology and Applied W.S., Germany

Today, there are missing a manageable over-all solution for a ship's life cycle management as well as an organizational and a software integration of life cycle management systems. A so called life cycle management system combining and analyzing the appropriate data supports a reduction of costs for the ship's operation, servicing, maintenance and repair. By using such a system, servicing cycles can be adapted tailored to the ship's needs and maintenance activities can be executed quick and targeted.

205 Optimization of environmental and social criteria in the textile supply chain: European state of the art and perspectives of research

(10) I. Boufateh, A. Perwuelz, B. Rabenasolo, A. Jolly-Desodt – Laboratoire Génie des Matériaux textiles (GEMTEX), Ecole Nationale Supérieure des arts et Industries Textiles (ENSAIT), France

Sustainable development in the textile industry is not a recent issue. Nowadays, an analysis of the whole supply chain is needed to locate the most polluting parts and main social impacts, and to learn where and how it is preferable to intervene. Various methods and guidelines for a simplified and balanced LCA for textiles are proposed by European organisations. The authors' main research objective is the definition of a decision support system based on multi criteria analysis to evaluate environmental and social considerations within the whole textile chain. In this paper, the traditional textile production chain is presented and its critical points analysed following the sustainable development point of view. Then the paper proposes to design a green textile supply

chain.

212 EOL framework for design advisory

(10) *H.M. Lee, R. Gay – Nanyang Technological University, Singapore*
W.F. Lu – National University of Singapore, Singapore
B. Song – Singapore Institute of Manufacturing Technology, Singapore

Sustainable product development has risen to be a concern of many product manufacturers in recent years. Manufacturers are adopting the lifecycle approach in managing the development of products and they are in favor of closing the product lifecycle loop by incorporating the end of life stage into the design process. With this, there is the urgency to fill up the knowledge gap between the end-of-life stage and design stage. More tools and methodologies for Design for End-of Life are needed to assist designers to design products with better end-of-life performance. In this paper, a novel methodology for capturing, representing, classifying, retaining and analyzing the knowledge from the end-of-life stage to be made available for the designers is proposed.

Posters

106 Assembly modeling approach including assembly process information for mechanical product

(4) *Z. Kai-fu, L. Yuan, Y. Jian-feng – The Ministry of Education Key Lab of Contemporary Design and Integrated Manufacturing Technology, Northwestern Polytechnical University, China*

Product assembly sequence is directly influenced by API: assembly fixture, assembly tools, assembly operation, and so on. It is important that API is expressed in assembly model in order to achieve good assembly sequence. This paper presents an approach of assembly modeling including API. The basic idea of the approach is to express API in assembly model by building prior relationship and constraint relationship between assembly-cells and API. We analysis and define prior relationship between assembly-cells and API when assembly-cells and API come into and come out from assembly environment. Assembly model including API is built by connected-graph model based on directed graph and undirected graph. The approach is validated by an example.

109 Coupling product development and project management with constraint: a prospective work

(2) *E. Vareilles, M. Aldanondo, Y. Lahmar – CGI -EMAC, France*
C. Baron – LESIA -INSAT, France
L. Geneste – LGP -ENIT, France
M. Zolghadri – LAPS -UBX-1, France

This communication is a prospective work trying to gather aiding tools relevant to product development and project planning. For each domain and associated tool, we show how the aiding process can be considered as a constraint satisfaction problem. We then propose to link the two domains in order to permit simultaneously on both problems constraint filtering and optimisation. After a short introduction, the second section addresses product development, project planning and constraint-based approaches. The presentation of the principle of co-operation is then described.

128 Recycling electrical and electronic equipment: the recovery management system introduced by the WEEE Directive

(10) *C. Gobbi –Technical University of Denmark, Denmark*

This contribution focuses on the product recycling management system introduced by the WEEE Directive in order to recover electrical and electronic waste. By underlying that the recovery network is in continuous evolution and the difficulty to reach a consensus between stakeholders is one of the major problems, we try to address what are the main critical factors at the institutional, configuration and operational level. The possibility to measure performances and plan improvements is strictly related to a stabilization of the system. The Danish WEEE implementation process is used as a case study.

130 A blended academia-industry learning model for product lifecycle management education

(3) *M. Richey, K. McPherson, T. Fuerst, D. French – Boeing Learning, Training and Development, USA*
C. Miller, D. Wittenborn – Department of Computer Graphics Technology, Purdue University, USA
J. Mosier – Edmonds Community Collage Workforce Development, USA

This paper describes a university/industry project for the development and operation of a PLM certificate program for Boeing engineers and technologists. This collaborative project between The Boeing Company, Purdue University, Edmonds Community College, and Dassault Systemes is currently being implemented using traditional and distance learning strategies. The program will be evaluated by an industrial advisory board which will include PLM subject experts, instructional system designers, distance learning experts, and curriculum evaluation experts.

131 A PLM Integrator for integrate product information management using commercial PDM systems

(5) *T.H. Yoon – Production System R&D Team, Daewoo Shipbuilding & Marine Engineering Co., LTD, Korea*
S.S. Choi – VR/CAD Team, Institute for Graphic Interfaces, Korea
S.D. Noh – Dept. of Systems Management Engineering, Sungkyunkwan University, Korea

In order to achieve the integrate product information management with many different commercial PDM systems, it is important to define a neutral standard data file format and develop the supporting system. First, we define neutral file refers to the PLM services using XML. This provides a standard to exchange product information such as BOM and Geometry information. Then, we develop the PLM Integrator which supports data exchanges between commercial PDM systems.

136 CADFORSIM: methodology and tools to integrate CAD and simulation

(5) *M. Reimeringer, N. Gardan, F. Danesi, Y. Gardan – CreSTIC / ERT Gaspard Monge / DINCCS MICADO, IFTS, Pole de haute technologie, France*

Actually design is often done without tacking into account the subsequent steps. This implies several iterations to modify the Digital Mock Up. This paper presents a new methodology which allows to take into account the different steps. It introduces different categories of important parameters and tools in order to manage the information. It also manages the different actors which are implied into the development of a product.

145 Proposal of integration of some methods to develop industrial products

(8) *F. Rosa, E. Rovida, R. Viganò – Dipartimento di Meccanica, Politecnico di Milano, Italy*

A wide variety of design methods are available to the engineer, who wants to develop innovative industrial products. The aim of the proposed paper is an attempt to make a step toward the integration of all these methods. In order to include also the modern appreciable tendency to accomplish a more and more strict integration and interaction between product and communication in all phases of the life cycle, it is possible to consider the corresponding communication too, introducing, in analogy to the Design for X concept, the Communication for X concept. In this paper, a general schema of the above summarized integrated design process will be proposed and deeply analyzed.

148 Aalborg industries - Engineer to order PLM

(3) *T.D. Petersen, J.A. Nielsen – Aalborg Industries A/S, Denmark*

This paper described PLM considerations at Aalborg Industries, a producer of engineer to order heat and steam generating systems, which is currently facing a number of challenges due to globalization, development of organisation structure and high product complexity. The product definition happens over a long period, which also introduces challenges related to managing product information. Aalborg Industries is expecting to meet these challenges by implementing a PLM system; however a number of issues must be addressed to ensure a successful PLM implementation which relate to the current information, product and process structure.

155 Next generation PLM - An integrated approach to product development in the service industry

(8) *J.D. Golovatchev – Detecon International GmbH, Germany*
O. Budde – Research Institute for Rationalization and Operations Management at Aachen University, Germany

Consistent definition and categorization of products delivered to global markets and customized for different buyer segments are some of the major challenges for PLM in the service industry. It can be argued that process supporting technologies/solutions exist nowadays for the creation of a seamless environment for accessing and reasoning about product information that is being produced in fragmented and distributed environment. A holistic approach that is suitable for aligning the PLM business requirements to the potentials of new technology driven concepts in the information management such as SOA is nevertheless still missing. The authors give reasons why the holistic view on the PLM as well as the link between an inter-company wide information management is critical for an efficient PLM and present an integrated approach taking these aspects into account.

166 CO-ENV project: collaborative environments and agile product development for modular and configurable products

(5) *M. Germani, M. Mengoni – Università Politecnica delle Marche, Italy*

The extended enterprise concept proposes a new way to approach the product development organization. The methodologies and tools for knowledge sharing and for collaborating in real time along the supply-chain have to be evermore improved and they have to be customized in the specific applicative fields. The CO-ENV research project moves in this context. The aim is the study of methodologies and the development of dedicated software tools usable in heterogeneous groups of companies to realize the dynamic collaboration. The research will be dedicated to modular and configurable products according to the required paradigm of mass customization.

169 Assessing complex product lifecycle management and technology development research projects

(11) *C.C. Røstad, I. Spjelkavik, L.C. Hald, B. Henriksen, B. Moseng – SINTEF Technology and Society, Norway*

This paper explores how complex R&D projects working in an iterative way and is in progress, can be assessed and how the assessments can be used in the projects in order to ensure success. Based on experiences from the PLM-related Promise and IT-development Prime projects we will present how such processes have been carried out, and present a framework for assessment of complex R&D projects with feedback loops to the stakeholders and the project itself.

171 CAD automation and KB user interfaces for an efficient integration of topological optimization tools in the product development process

(7) *L. Barbieri, F. Bruno, M. Muzzupappa – Università della Calabria, Dipartimento di Meccanica, Italy*
U. Cugini – Politecnico di Milano, Dipartimento di Meccanica, Italy

This paper presents a methodology that defines the guidelines to obtain an efficient use of topological optimisation in the Product Development Process. This methodology is described referring to a specific case study which concerns the design of a plastic moped wheel. The possibility of focusing on a specific case-study allows us to demonstrate how the use of SDKs, allowed by the CAx tools employed in the process, improves the efficiency of the methodology. The methodology is supported by a Knowledge Based user-interface, which allows the user to execute a logical sequence of operations, following the rules defined in the procedures.

173 Life cycle analysis using product semantic model for reliability and maintainability assessment

(9) *A. Coulibaly, M. Gardoni – LGECO: Laboratoire du Génie de la Conception, France*
R. Maranzana – ETS, Canada

Product Life Cycle Design is a global design approach aimed to take into account the different factors that may influence the product technical performance. This approach attempts to bring solutions to enhance classical CAD

systems that are mainly geometry and topology oriented. This evolution is due to the need to validate the product functionalities and to take care of the impact of the design solutions on the product behaviour with respect to the different criteria like maintainability, reliability. Such criteria are semantically specified and there evaluation evolves the use of approaches that can provide indicators at the early stage in the design process.

177 Customer centric PLM, integrating customers' feedback into product data and lifecycle processes

(1) S. Schulte – Department of IT in Mechanical Engineering, Ruhr-University Bochum, Germany

To optimize customer satisfaction, an integration of the customers' voice into product development is necessary. For this a methodology was developed, which enables acquiring prospective customer feedback for future (virtual) products and retrospective customer feedback on existing products. A web-based feedback assistant was designed and prototypically realised, which allows customers to evaluate product concepts based on customer oriented product test models for extracting feedback. The extracted feedback is mapped on technical product structures using an extended QFD approach and advanced methods for measuring customer satisfaction. The core of the integration concept is the extension of PLM functions, processes and metadata models, whereby technical product data, customer requirements and customer satisfaction indices can be linked context sensitively.

202 Reference models – A key enabler for multi-life products

(6) J. Feldhusen, F. Bungert –RWTH Aachen University, Germany

Reference models are an approach which is commonly applied to support the design of processes and information systems for business applications. They can be seen as a guideline to develop proper product and process structures. A reference model comprises generic components which can be concretised to represent a certain scenario. In the domain of PLM, reference models have not been commonly applied yet. This paper describes in detail the concept of reference models and current approaches of applying them. Further, aspects concerning the application of reference models to PLM are discussed.

211 Toward a structured approach for the integration of lifecycle requirements in quality management systems

(10) M.M. Savino – Department of Engineering, University of Sannio, Italy
G. Nicchiniello, L. Vigilante – Bruno Srl - Generators, Italy
A. Bouras – University of Lyon, Lyon II, LIESP Lab, France

The fast and continuous markets' change and the growing needs of product quality and efficiency during the entire lifecycle require deep transformations in terms of product quality and quality management. In this context, enterprises should consider a continuous Customer Satisfaction, optimising the entire product lifecycle to be sure to remain competitive in the global worldwide market. The proposed work aims at realizing a structured approach, able to embed the actions to be done to establish a Lifecycle Management point of view inside a QMS of a certain enterprise.

218 Product lifecycle process analysis

(1) J. Doyle, Q. Wang – Durham University, School of Engineering, UK

In our research, life cycle analysis of a product is viewed as a superset of analysis methods focused on individual life cycle stages. Each of the analyses seeks to qualitatively and quantitatively measure product performance both at the local life cycle stage as well as across the total product life cycle. MP3 player has been identified to highlight the broad application of PLM techniques. Based on the findings, new life cycle scenarios can be designed improving on the current situation of the markets, with the proposed scenarios being similarly analyzed with PLM tools.

222 Cost analysis in mechanical engineering production

(2) D. Cazacu, F. Anghel, N.L. Carutasu – Politehnica University of Bucharest, Romania
G. Carutasu – Romanian American University, Romania

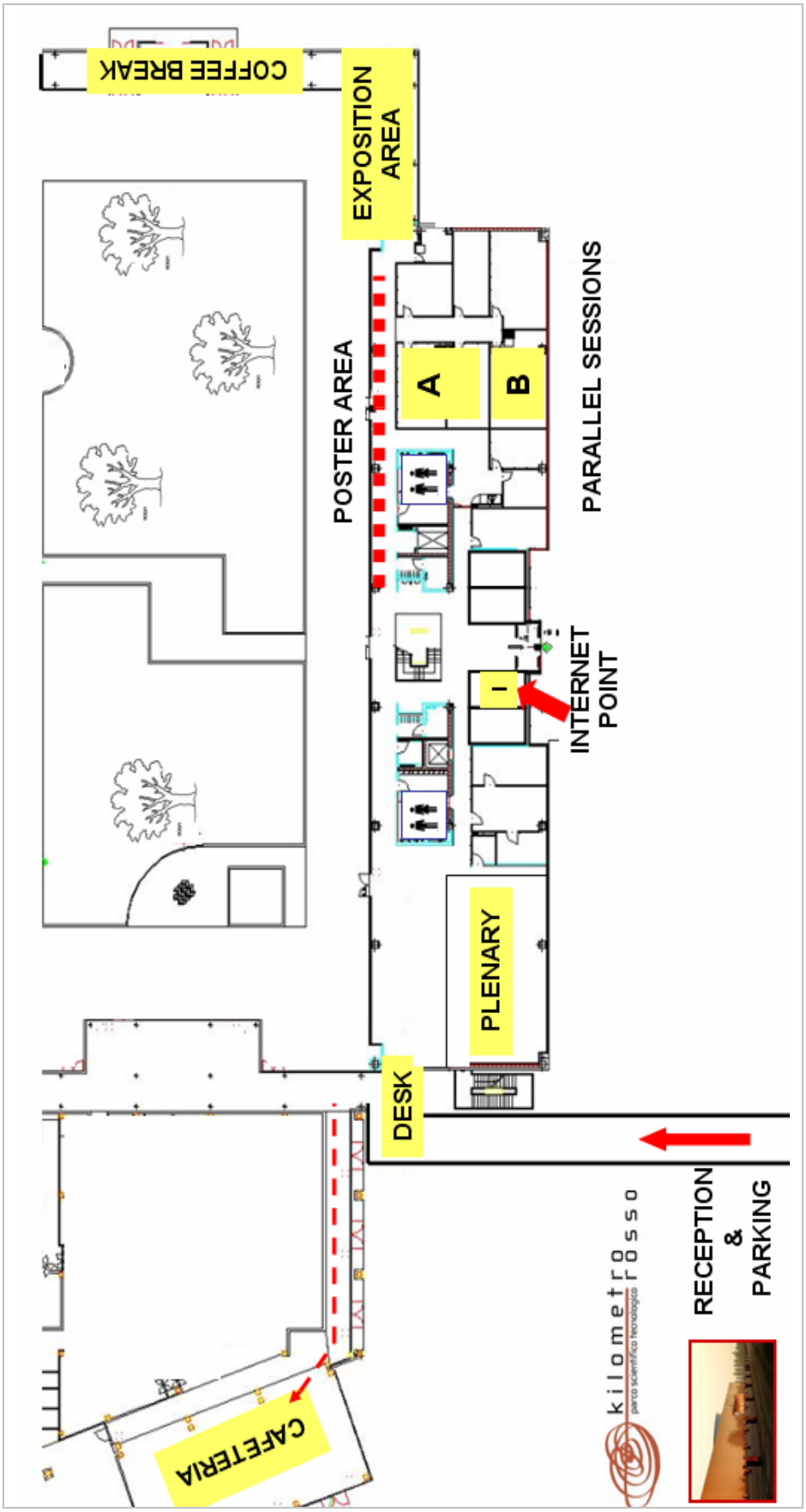
This article consists of a cost analysis for the production of a main cinematic chain for a drilling and milling machine. We considered that all technological processes would be done using numerical control machines. Starting with the necessary costs that are required for the production of the same cinematic chain using classical machines, we are going to compare these costs with the ones we get by using numerical control machines, for the same production unit of one piece.

224 Life cycle assessment of an aspirator/compressor for zootechnical applications

(10) M. Bertolini, N. Delnevo, A. Petroni – Dipartimento di Ingegneria Industriale, Università degli Studi di Parma, Italy
G. Carmignani – Dipartimento di Ingegneria Meccanica Nucleare e della Produzione, Università di Pisa, Italy

In this paper, the Life Cycle Analysis methodology is applied to asses the environmental performance of the production and usage of an aspirator/compressor for zootechnical application. The processes were analysed to investigate the whole production system from "cradle to grave", considering the main phases. All the input-output streams of energy and mass were analysed and the environmental impact was rated with the aim of "Eco-Indicator '99" assessing method.

Location details



Organizers

POLITECNICO DI MILANO

UNIVERSITÀ DEGLI STUDI DI BERGAMO

with the support of

Cranfield UNIVERSITY

KAIST

hosted by

Gold sponsors

ORACLE

SIEMENS

Silver sponsors

Autodesk

INTERGRAPH

selerant

Supporting communities