IMS ANNUAL REPORT
2010
PREFACE

Intelligent Manufacturing Systems (IMS) is an industry-led, research and development (R&D) program that facilitates research in advanced manufacturing through international cooperation. IMS is the world's only government-supported multi-lateral program for manufacturing research and development. It was established in order to provide a framework for cooperative R&D to share costs, risks, and expertise leading to improved manufacturing operations, enhanced international competitiveness, and technology breakthroughs via industrially driven R&D and innovation.

As IMS marks its fifteen-year anniversary, the paradigm for industry has changed dramatically. Industry today requires fast-paced, results-driven, research-development-innovation projects to meet global challenges in manufacturing products in a sustainable way. Industry must consider the entire value chain for its products while under constant pressure from dwindling resources, rapid time-to-market, and increasing costs. Lean, interoperable, and sustainable manufacturing technologies must be developed quickly and as efficiently as possible. Because these types of technologies and supporting standards for value chains are global in nature, international solutions are required by industry today. In response to those needs, IMS has developed the Manufacturing Technology Platform Program (MTP) for research and innovation where industry-led consortia can set up quickly and effectively collaboration platforms that help them share knowledge and R&D effort without onerous procedures.

After a successful pilot program in 2009, IMS officially launched its MTP Program in the spring of 2010 and added support programs such as project facilitator services, workshops, forums, and a collaborative website. We are excited about these new services and have already seen some initial success in the form of new projects coalescing. IMS has also increased its visibility through expanded outreach activities from presenting IMS at various forums and workshops and expanding its network.

A summary of this year’s milestones and the project portfolio are included in this report. We also invite you to visit the IMS website (www.ims.org) for additional information about our organization.

Thank you for your interest in IMS and its objectives.

Sincerely

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THE ORGANIZATION

WHAT IS IMS?
The IMS program provides the framework and support for conducting international research among large business enterprises, small-to-medium enterprises, universities, and research institutions. IMS makes it easy to become involved in global research through its support activities. Participants may join an existing or developing project consortium, or initiate their own project. To join a project, the organization maintains a web portal where researchers may browse the database for projects seeking partners and contact the originator, or an IMS Secretariat for assistance. Researchers that have an idea for research and want to initiate their own project will find all the necessary tools on-line including an interactive collaborative website, procedures, available assistance, and templates for submitting a proposal.

The IMS organization consists of an International Steering Committee (ISC) headed by a Chairman, Regional Secretariats in each member country/country group (Participant Region), and an Inter-Regional Secretariat. IMS provides an international collaborative environment for a robust exchange of ideas and synergy creation. The IMS organization is currently comprised of five Participant Regions including the European Union, Korea, Mexico, Switzerland, and the United States of America. In total, IMS serves over 30 countries throughout the world. IMS is open to new members and encourages governments to join as a full Participant or as an Associate.

IMS offers, through its Manufacturing Technology Platform program, the possibility for industrial research to share experiences, best practices, and to develop a common vision. Each Region has a host for IMS that supports the Regional Secretariat office and local activities. The organization is directed by the ISC that supports the Regional Secretariat office and local activities. The organization is directed by the ISC that comprises delegations from the Region. Each delegation is led by a Head of Delegation (HoD), and comprises industry and government observers. The ISC holds regular meetings and workshops to promote research. The Regional Secretariats are the backbone of the program, as they implement program objectives and make recommendations to their delegation to help steer the organization. The Inter-Regional Secretariat (IRS) is the administrative arm of IMS, and is directed by the Chairman and the ISC. Chairmanship rotates every 30 months and is currently held by the European Union.

THE VISION
As global manufacturing capacity is ever-increasing, manufacturers are facing pressures from increased competition, government regulation, scarce resources and ever-demanding customer requirements to provide innovative product and services. Solutions often lie in non-competitive areas where research investment can be pooled and innovation shared. The supporting governments in the Intelligent Manufacturing Systems program (IMS) recognize that multi-lateral research in advanced manufacturing is an opportunity to share resources and bundle efforts to addressing the global challenges.

The rationale for carrying out collaborative research at international level, involving partners from the major industrial economies of the world, stems from the following considerations:

*The need to address global-scale problems jointly:* The environmental impact of manufacturing and consumption is global in scale and necessitate a global approach to address it. Without an internationally consorted strategy, a sustainable balance between manufacturing and the environment cannot be effectively achieved.

*Making use of dispersed knowledge:* Tackling global problems requires access to manufacturing knowledge, environmental knowledge and global market knowledge. These are not concentrated in one particular region or country but are globally dispersed. A research program that is capable of utilizing such knowledge must involve all concerned regions and countries.
Globalization needs call for joint efforts: Manufacturing is no longer of national or regional concern only. The opening of national markets, the strengthening of world trade bodies, and consumers’ desire for a free flow of products and services, require a global approach to research and development of new products and manufacturing technologies.

Global collaboration made feasible through ICT: Recent advances in information and communication technologies, as evidenced by advanced electronic networks, multi-media transfer of information and knowledge, and the internationalization of research, make global-level collaborative research feasible for the first time in human history. Such an opportunity should be utilized to advance the living standards and the knowledge level of human society.

WHY IMS?
Global manufacturing represents twenty-five percent (25%) of world GDP with over twenty million enterprises, and twenty-eight percent (28%) of world employment. Manufacturing is still a key economic driver world-wide. In a more integrated global market, the competition is not among companies but among global supply chains and business networks. Global value chains are increasing in complexity and competition. Supply chains and networks are no longer regional; therefore development of common international standards and methods help to master value chains on a global scale. Through international collaboration, IMS provides an opportunity for value-chain participants to develop world-class solutions. The accelerated pace of technological change is racing to keep up with new and increasing customer expectations. This is why many companies and research institutions join under the banner of IMS because IMS offers the only portal for international collaboration to address these needs and expectations of customers.

Collaboration as Win-Win
In many cases it can be more advantageous to collaborate than to “go it alone”. Some research and development activities are of such a scale that no single country can provide the necessary resources and expertise. Collaborative R&D projects can help achieve the required “critical mass”, while lowering commercial risk for participants and generating a leverage effect for private investment. International IMS consortia bring together resources and expertise from many countries and various research actors. Typical IMS projects have budgets of around 2-4 million USD and involve on average 10 participants from 6 countries. They bring together universities, public research centers, SMEs and large enterprises.

Participation in collaborative research offers access to a wider network of knowledge. This enables participants to increase their know-how by being exposed to different methods, and to develop new or improved tools. Being part of an international consortium of highly qualified researchers triggers spillover effects that are more important than the monetary investment. The experience from European framework programs shows that while all participating countries enjoy knowledge multiplier effects, the size of these effects is related to the country’s total number of participations in the program.

Leveraging Private Sector Investment
Another feature of collaborative research is that public R&D funding leads to what is called a “crowding-in” effect on investment. In other words, it stimulates firms to invest more of their own money in R&D than they would otherwise have done. A recent study conducted in Europe estimates that a € 1 increase in public R&D investment induces € 0.93 of additional private sector investment. It is therefore reasonable to conclude that the attractiveness of collaborative research induces firms to invest more of their own funds.

International R&D projects enable participants to access a much wider pool of firms in their own industry than would be possible at purely national level. This mechanism offers clear advantages to enterprises compared with national level schemes. It broadens the scope of research, and allows for a division of work according to each participant’s field of specialization. It also considerably reduces the commercial risk because involving key industry players helps ensure that research results and solutions are applicable globally, it enables the development of international standards and offers the potential for exploitation world-wide.
Improving Innovation Performance

Many projects lead to patents, pointing to an intention to exploit research results commercially. Firms that participate in collaborative research, irrespective of their size, tend to be more innovative than those that do not participate. Participating enterprises are also more likely to apply for patents than non-participants. A wide range of evaluation studies show that as a result of collaborative research program participation firms are able to realize increased turnover and profitability, enhanced productivity, improved market shares, access to new markets, reorientation of a company’s commercial strategy, enhanced competitiveness, enhanced reputation and image, and reduced commercial risks.

Results of econometric modeling further indicate that international collaborative research generates strong benefits for industry. A recent study in the UK used an econometric model developed at the OECD to predict international collaborative program effects on total factor productivity. It was found that such research generated a manifold return on the UK government’s investment in it.

MTP PROJECT FORMATION

Research and innovation projects are conducted under the Manufacturing Technology Platform (MTP) Program, developed to reduce or eliminate duplication in research. Through this innovative program, projects with overlapping research may easily join to find common solutions to manufacturing challenges in a simple and flexible way. To participate in an IMS MTP initiative (project), researchers identify where they can collaborate, briefly define the research to meet IMS requirements, and sign a simple Memorandum of Agreement to start their work in one of the established MTP platforms: sustainable manufacturing, energy efficiency, key technologies, standards and interoperability, and education and safety.

The MTP application process is both lean and effective –
1. The proposed initiative must be related to manufacturing or process technologies.
2. The initiative should address an ambitious issue with a critical mass, typically equivalent to a USD 1 million investment and a runtime of two or more years.
3. A simple two-page description of the initiative must be submitted on a provided template.
4. Companies or researchers from at least three IMS Regions must sign a Memorandum of Agreement to participate in the proposed initiative.
5. IMS Regional Secretariats provide assistance throughout the process and the IRS markets the initiative proposal in all IMS Regions (of 30 countries) and on the web portal.

Support services for project formation are offered through IMS MTP project facilitator staff (coaches), available in every IMS Region, under the direction and assistance of each Regional Secretariat. These coaches provide assistance through partner search and other activities. They can also help interested researchers to find existing projects and facilitate networking. IMS also offers its new collaborative website designed as a work and meeting place for project participants to share information.
IMS FINANCIAL STATEMENT

Regional IMS offices are funded by local government agencies and are audited and reported according to their national regulations. Regional budgets supports the local IMS program including personnel, marketing, office, and travel expenses. Each regional IMS budget also supports IMS global operations through contributions to the Inter-Regional Secretariat. The Inter-Regional Secretariat coordinates global networking and marketing, and uses the contributions for IMS programs, meetings, workshops, forums, publications, marketing, staff, and office expenses.

The Inter-Regional Secretariat operates as a non-profit registered in Switzerland and reports to a Board of Directors consisting of appointees from each IMS member contribution region. The Board of Directors adheres to decisions and policies made by the IMS International Steering Committee, the governing body of IMS. A principle operating policy is that the Inter-Regional Secretariat conducts an internal annual audit of expenses followed by an independent external audit. The independent audit for 2010 was conducted by Progressia of Fribourg, Switzerland, and the financials were found to conform to Swiss law.

All financials are reported in Swiss Francs (sFr).

Revenue

<table>
<thead>
<tr>
<th>CONTRIBUTIONS</th>
<th>EXPECTED</th>
<th>RECEIVED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>European Union</td>
<td>225,000</td>
</tr>
<tr>
<td></td>
<td>Japan</td>
<td>56,250</td>
</tr>
<tr>
<td></td>
<td>Korea</td>
<td>140,625</td>
</tr>
<tr>
<td></td>
<td>Switzerland</td>
<td>140,625</td>
</tr>
<tr>
<td></td>
<td>United States</td>
<td>225,000</td>
</tr>
<tr>
<td></td>
<td>Mexico</td>
<td>140,625</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>928,125</strong></td>
<td><strong>928,942</strong></td>
</tr>
</tbody>
</table>

Contributions from each IMS region is based on annual Gross Domestic Product (GDP) sales and IMS established tier levels. Contributions are paid in Swiss Francs, so no currency exchange gains or losses are reported.

For 2010, total contributions received were sFr. 928,125. The organization received sFr. 816 in interest, and the total revenue for 2010 was sFr. 928,942. The contribution for Japan is for a partial year from January to March, 2010.

Expenses

<table>
<thead>
<tr>
<th>EXPENSES</th>
<th>EXPENSES</th>
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<tbody>
<tr>
<td><strong>SALARY &amp; RELATED PAYMENTS</strong></td>
<td>445,840.70</td>
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<tr>
<td><strong>TRAVEL &amp; HOSPITALITY</strong></td>
<td>108,894.73</td>
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<tr>
<td><strong>IT &amp; COMMUNICATIONS</strong></td>
<td>15,088.36</td>
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<tr>
<td><strong>OFFICE SERVICES</strong></td>
<td>31,971.55</td>
</tr>
<tr>
<td><strong>MARKETING</strong></td>
<td>52,990.60</td>
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<tr>
<td><strong>MEETINGS, CONFERENCES, FORUMS</strong></td>
<td>71,756.50</td>
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<tr>
<td><strong>CONTINGENCY</strong></td>
<td>3,675.00</td>
</tr>
<tr>
<td><strong>TOTAL EXPENSES</strong></td>
<td>730,217.44</td>
</tr>
</tbody>
</table>

The Inter-Regional Secretariat expenses are controlled by an annual budget set by the IMS International Steering Committee (ISC). For 2010, the ISC adjusted the budget from prior year to decrease operating expenses and increase resources for IMS programs and workshops.
Although proportionally “Salary and Related Payments” is reported at 61% of the overall budget, 39% was expensed for Inter-Regional Secretariat (IRS) staff, consultants, and related salary expenses representing a 17% reduction over prior year. The remaining 22% was used to initiate the MTP Project Facilitator program. Four staff were hired for this new program to provide project formation and marketing services as described above under “IMS Services”. Overall, “Salary and Related Payments” was reduced for the third consecutive year.

“Travel and Hospitality” includes expenses for the ISC Chairman, IRS staff, and one meeting of the five IMS Heads of Delegation to the ISC. Expenses were the same compared to prior year, but included a Head of Delegation meeting that was not held in 2009.

“IT & Communications” and “Office Services” are for IRS operations including phones, internet, rent, insurance, and supplies. These services were reduced by 67% over prior year due to cost saving measures including relocation of the IRS offices and shared services.

“Marketing” includes publications and promotional items. IMS published new project and marketing brochures for global distribution in 2010, and other meeting publications. Promotional items included pop-up banners, folios, and eco-friendly spiral notebooks and pens distributed at workshops.

Bi-annual workshops and/or forums are held in conjunction with IMS International Steering Committee and Regional Secretariat meetings. “Meetings, Conferences, Forums” line item supported two workshops in Lugano and Brussels. Because IMS sponsors a major bi-annual forum and 2010 was an “off” year, the line item represents a 70% reduction over prior year.

“Contingency” is used for Directors and Officers liability insurance for the Heads of Delegation and Board of Directors.

Expenses were less than revenue by sFr. 198,725 due to lean management as directed by the IMS International Steering Committee.

MILESTONES IN 2010

With the addition of Mexico as a new member of IMS, the chairmanship passing from Switzerland to the European Union, and the addition of new services to support the Manufacturing Technology Platform program for research, development, and innovation, and its commitment to hold a major international forum in 2011, IMS had an exciting year of accomplishment in service to its members and the industry it represents.

MTP PROGRAM DEVELOPMENT

The Manufacturing Technology Platform program for industrial research, development, and innovation sprang from the IMS Vision Forum held in Korea where top industries and policy makers discussed their vision of the direction of innovation and growth engines for innovation. The goal was to find how IMS could support this vision. In response to these recommendations, the MTP program was developed. The first MTP projects were brought to IMS three years ago, and a pilot phase was begun building the project portfolio over the next two years. The response was greater than expected, and a decision was made to support the MTP program exclusively in the early part of 2010. Upon this commitment, the IMS International Steering Committee directed additional resources for services to support the program.

Through the MTP program, IMS provides a global framework for research. This framework allows new projects to coalesce rapidly due to a simplified submission procedure and excellent support services to meet industrial demand. Support services for project formation are offered through IMS MTP project facilitator staff, available in every IMS region, under the direction and assistance of the Regional...
Secretariats. These coaches provide assistance through partner search and other activities. They can also help interested researchers to find existing projects and facilitate networking. IMS also offers its new collaborative website designed as a work and meeting place for researchers to share information.

The IMS organization holds project meetings semi-annually so that researchers may share their findings and learn about research being conducted. Newly forming research projects are presented and provide an opportunity for researchers to discuss and develop their consortium.

Throughout the year, the MTP portfolio continued to expand by efforts of the IMS Regional Secretariats (Annex 1) and the MTP Project Development Coaches. In 2010, four new MTP projects were submitted (iNET, INDPACKPHARMA, MATECS, CoReNet), and another three are pending submission. A recent survey shows that there are a total of seventeen (17) active MTP projects seeking partners, and nine (9) are approved and running. Since the program’s inception, there have been 49 submissions in total with an overall project formation success rate of 73.4%. This high success rate is attributed to the screening process at regional level by the secretariats.

**IMS SERVICES**

The MTP services were created to facilitate client access to international resources, technologies and markets through IMS. These services are based on an understanding of two types of approaches to research, development and innovation (RDI), top-down technology push innovation and bottom-up driven value generation. The clients are enabled to design and maintain such projects and global partnerships in a way that is consistent with their business plans, innovation strategies, and long-term resource development ideas.

Together with the highly flexible MTP concept and the collaborative web facilities, the IMS coaching strategy completes the service portfolio aiming to attract SMEs in particular and to boost industry driven co-operations.

In order to facilitate project formation, the IMS International Steering Committee decided to add programs that would help shepherd the development of nascent MTP projects through IMS coaching services, web-based collaborations (www.ims.org), workshops, and forums.

**MTP Project Facilitators**

Support services for project formation are offered through IMS MTP project facilitators (coaches) and available in every IMS region under the direction and assistance of the local Regional Secretariat. The MTP facilitators (Annex 2) were selected by each IMS Region based on their experience within the IMS framework and their ability to facilitate project formation and to assist in partner search activities. Coaches may also introduce existing project opportunities to potential partners, and even thread running projects together in order to increase efficiency and expertise. The coaches work in concert with the IMS Regional Secretariats in identifying opportunities to provide personalized one-on-one service, and activities to raise awareness of IMS programs and activities to industry, industry associations, funding agencies, and research institutions.

**Web-based Collaboration**

This year IMS launched a new collaborative website to assist researchers in creating their own MTP research community. In it researchers can host their own MTP “micro-site”, promote their project, events, and publications. By establishing such a project-specific micro-site, researchers create and establish a network that is tailored to their own interest. Files may be posted and calendars kept up-to-date, and the toolset will automatically tell each partner what is new since their last visit in the “What’s New” section, so members won’t waste their time. Users may also define what information they want to receive, how other users may contact them, receive “push” notifications, join other micro-sites, and manage their own services.
Workshops
IMS conducts project workshops semi-annually and a major forum on a bi-annual basis. The workshops are intended to promote formation of new projects, review ongoing research, and disseminate results of research conducted. The IMS Regional Secretariats and MTP project facilitators listen to new project proposals to understand them and the types of partners they seek. This understanding helps IMS to provide custom service to the project proponent in the critical development stage.

The June 2010 workshop was conducted in Lugano, Switzerland, with nine projects presenting to the IMS community. As the PROMISE project had completed their research, Dr. Dimitris Kiritsis gave a review of their research results and outlined next steps for the consortium. Indeed, many IMS consortia find value in their established network and continue to build on their achievements. New projects were also reviewed including “Improving Productivity Automation Systems Design Process” by Dr. Antonio Valentini of O3Neida (EU), “Long Term Archival and Retrieval of Digital Product, Technical, and PDM Data in a Global Industry” by Dr. Steve Ray of IMS MTP Project Facilitator (USA), “Quality Assurance in Customized Pharmaceuticals Packaging & Delivery” by Dr. Georgios Imanides, Institute of Pharma Technology (CH), “Project IMS2020: Roadmap Update” by Prof. Marco Taisch of Politecnico di Milano (EU), “Customization & Production Technology & Paradigms for Healthy & Sustainable Consumer Centered Products’ by Dr. Emanuele Carpanzano of ITIA-CNR Institute of Industrial Technologies and Automation (EU), “Standardisation of Machine Tool Error Functions Representative and Compensation” by Dr. Renato Ottone of Alesamonti (EU), “Intelligent Non-Hierarchical Manufacturing Networks” by Dr. Luca Canetta of SUPSI (CH), and “Industrial Materials Smart Applications” by Dr. Thomas Messervey of D’Appolonia (EU).

In Brussels, Belgium, the second workshop was conducted at the Sofitel Europe Hotel in November. The newly appointed IMS coaching staff opened the workshop including Dr. Tom Messervey (EU), Mr. Allan Martel (CH, MX), and Dr. Steve Ray (U.S.). Appointed just days before the meeting, Dr. Bo Hyun Kim of the Republic of Korea was also present but did not speak. The coaches presented their experience in facilitating formation of consortiums and project management, and discussed some opportunities that were coalescing. Three MTP projects presented their research to date including Dr. Zeevi Maor (SKINTREAT), Dr. Emmanuele Carpanzano (CORENET), and Dr. Paolo Pedrazoli (S-MC-S). Following the workshop, Mr. Zoran Stancic, Deputy Director-General, DG Information Society and Media, European Commission discussed the importance of European Union chairmanship of IMS and the need for global cooperation.

Prof. Marco Taisch, Politecnico di Milano, Department of Management, Economics and Industrial Engineering discussed “The R&D perspective for a global Manufacturing: Vision and Strategy” including results from the IMS2020 roadmap activity. Mr. Herbert von Bose, Director, “Industrial Technologies”, DG Research, European Commission and IMS Head of Delegation for the European Union, gave an overview of goals for the organization during its chairmanship, and introduced the new IMS Chairman, Mr. Fred-Holger Günther.

Mr. Günther gave an overview of his career and what led him to IMS. Formerly, he was President of the Division Automation Technology (AT) and Senior Vice President of Robert Bosch GmbH. His division had about 5000 employees and sales of two billion Deutsche Mark. The product range contained electronic controls, robots, hydraulics (mobile and industrial), pneumatics, and assembly technology. A major part of the division produced test and assembly equipment for Bosch worldwide captive use.
World Manufacturing Forum 2011

The forums include the above objectives with a wider scope to include other research-related topics. These forums are an opportunity for IMS to understand current challenges and trends in industry. For example, at the next major event IMS will ask for industry and government input to explore current industrial policies to see if they are relevant to industrial innovation. IMS will be co-sponsoring the World Manufacturing Forum 2011 under the title “Innovation in Global Manufacturing” together with the IMS2020 roadmap project (www.worldmanufacturingforum.org). The Forum will be held 16-17 May 2011 at the Villa Erba, Cernobbio, Como Lake, Italy. According to the Forum’s scenario, companies cannot postpone any longer the implementation of strategies to deal with sustainable development, and policy makers have to take an active role in creating an environment for innovation in manufacturing. These dual challenges are proceeding too often in isolation – each group responding to its own set of pressures, operating with its own sets of biases.

On the first day, top-level representatives from leading industries and trade associations, and government officials will discuss whether government policies relate to industry needs and whether they have kept pace with the current global realities. According to a recent McKinsey survey (“How companies manage sustainability: McKinsey Global Survey results.” McKinsey Quarterly. March 2010. <https://www.mckinseyquarterly.com/How_companies_manage_sustainability_McKinsey_Global_Survey_results__2558> ), more than 50 percent of executives consider sustainability - the management of environmental, social, and governance issues - “very” or “extremely” important in a wide range of areas, including new-product development, reputation building, and overall corporate strategy.

On the second day, parallel sessions will further explore the issues and projects will be discussed. The event is open to non-IMS countries and organizations. The World Manufacturing Forum will not be a stand-alone event, it aims to be a long-term platform for debate among the decision-making community focused upon the most relevant topics surrounding the manufacturing sector.

MEMBERSHIP ENLARGEMENT

IMS has continued its strategy of enlargement by successfully bringing Mexico into IMS as member. Under Prof. Claudio Boër’s initiative as Chairman and with support from the IRS and efforts by the European Union and United States, IMS had conducted outreach to new Participant Regions. With the help of researcher Dr. Myna Flores from Cementex, a Mexican company operating in Switzerland, making introductions to Dr. Arturo Molina and Mr. David Romero at the Tecnológico de Monterrey’s Mexico City Campus back in August of 2009, IMS was successfully introduced to government, academia, industry association leaders who influenced Mexico’s decision to join IMS. The strategy pursued by IMS was to listen to the local needs and to help decision makers understand how the program could benefit their industry. Mexico is a business-innovation-driven and SME-dominated country. The IMS MTP project facilitation program is best suited for Mexico’s globalization-minded industry, and SMEs in particular, to build new international partnerships and networks. Mexico’s Tecnológico de Monterrey is already working with their Swiss counterpart, SUPSI, on a project for education, and they have collaborated in setting up this year’s ICE2010 conference (http://www.ice-conference.org) at which IMS was a sponsor.

Under the Chairman’s initiative, the Chair and IRS conducted other outreach activities to new Participant Regions along with efforts by the European Union and United States. The outcomes from this activity are briefly described below.

The Swiss and EU Chairmen, Prof. Claudio Boër and Mr. Fred-Holger Günther respectively, have continued their efforts on Brazil which have prompted positive response. Recent IMS activities presented by Mr Günther at a conference in Brazil this year, as well as those at an international event in Germany, have helped strengthen contacts further.
IMS2020 ROADMAP

The European Union has sponsored a roadmap project titled "IMS2020" with the objective to strengthen international co-operation under IMS, to provide an effective interface with ongoing European road-mapping activities, and to create research synergies through the establishment of international manufacturing communities in key areas.

The project has successfully completed a coherent roadmap (2020) for future manufacturing research in the five IMS MTP key thematic areas and has set up an interface to ongoing road-mapping activities of European Technology Platforms and similar initiatives outside Europe. The roadmap provides a list of topics suitable to IMS cooperation (www.ims2020.net).

Further project objectives include the identification of new schemes and frameworks to support IMS research by enhancing and favoring inter-regional cooperation projects, the identification of specific measures to increase SME participation in international R&D collaborative projects in IMS, and to build and consolidate a number of international and inter-regional communities in the five MTP thematic areas ensuring an effective exchange of results and knowledge. As a result of the above, the final major objective was to prepare the ground for new IMS projects.

OUTREACH

The organization continued its efforts for outreach to industry and organizations involved in industrial research at regional workshops and forums. The goal was to raise the visibility of IMS, in its member regions, the IMS collaborative opportunities and its services.

The first major event that IMS has co-sponsored was the International Concurrent Enterprising (ICE2010) Conference, held in Lugano, Switzerland, where the then IMS Chairman Claudio Boër was also the chairman of the event (www.ice-conference.org). IMS projects were presented and discussed during the Conference sessions. Under “Advances in Concurrent Engineering” Dr. Marco Sacco of ITIA-CNR presented the IMS “Virtual Factory Framework” project, and in the session “Concurrent Enterprising and Education”, Mexico’s Dr. Arturo Molina and Mr. David Romero of Tecnológico de Monterrey presented an emerging IMS project. An entire session was devoted to IMS project “Digital Factory” (DiFac) with presentations including “Towards a Collaborative Approach to Sustain Engineer-to-Order Manufacturing”, “Factory Layout Planner”, “A Shoe Design Module for Mass Customization”, and “Determining the CODP Position by Value Network Modeling and Simulation”. There were about 200 attendees at the event.

A European event with strong IMS presence was the “Industrial Technologies Conference”, held in Brussels (www.industrial-technologies 2010.eu) with over 1,000 attendees. Under the “International Dimension” track of the conference, Mr. Dan Nagy of the IMS Inter-Regional Secretariat gave an overview of IMS projects and services, and IMS MTP project facilitator, Dr. Thomas Messervey, gave a speech on industrial innovation. IMS also sponsored an exhibit at this conference. The IMS Chairman, Mr. Fred-Holger Günther, was engaged in several discussions with conference participants.

IMS is also developing links with research associations such as the European Factories of the Future Research Association and the ManuFuture network in the European Union, as well as with the 30,000 member International Society for Automation (ISA) in the United States.
THE PROJECTS

IMS has successfully launched its Manufacturing Technology Platform (MTP) program designed to help researchers form global collaborations in new and ongoing research more easily. This “fast track” method to project formation of the MTP scheme aims to assist them to form consortia rapidly and more easily and thus meet the fast-paced challenges of today’s international research and innovation landscape. The new program has exceeded expectations with many new project submissions, strong presence at MTP workshops, and increased interaction within the IMS community.

IMS invites manufacturing researchers from across the globe to participate in its MTP workshops. If their institution resides in one of the IMS member regions, the European Union, Mexico, South Korea, Switzerland, or the United States, they are encouraged to also submit research ideas or join an MTP project. If they are new to IMS, they are invited to browse through the IMS web site and discover how they can add value to their own research through global collaboration.

Conceptually well ahead of its time, IMS thus strives to remain relevant to manufacturing research and to the research community.

THE ADDED VALUE OF MTPs

The Manufacturing Technology Platform program offers an opportunity to projects that run on a national or regional scale to bundle efforts at international level and thus save costs and time in avoiding duplication of activities that “re-invent the wheel”. MTPs are valuable knowledge sharing platforms for researcher groups that are already engaged in a specific R&D domain. In their unique way, they bring them together to address R&D specific challenges in manufacturing and spark new ideas by creating larger networks with more impact.

As an example of how this can happen, three projects have met recently in Lausanne, Switzerland, to discuss product lifecycle management by means of intelligent devices embedded in products (PEID). Upon their discovery that multiple synergies could be created through a wider R&D collaboration between them, researchers of IMS project PROMISE met with their colleagues in EU projects BRIDGE and DYNAMITE to discuss how they could effectively link up their research activities and share results. The group hopes to be able to present their project idea at one of the upcoming MTP workshops. Other potential joint activities include scientific and technical publications and global-level recommendations on standards, skills, and policy.

FOCUS ON FIVE MANUFACTURING TECHNOLOGY PLATFORMS

Established manufacturing technology platforms are focused in five thematic areas:

**Sustainable manufacturing and occupational safety:** This is a platform for the development of innovative manufacturing technologies that address world-wide resources shortages and excess environmental load to enable an environmentally benign life cycle. Work includes measurement technologies and assessment methodologies to ensure occupational safety including ergonomics, industrial disaster prevention and mitigation and in particular the safety with respect to nanomaterials and associated manufacturing processes.

**Energy efficiency:** Work under this platform aims to improve efficiency and reduce the carbon footprint in energy utilization for manufacturing and operational processes. The energy efficiency platform will result in reduced manufacturing costs and global warming impact.

**Key technologies:** This platform develops technologies that will yield a high impact in the next generation of manufacturing. They include the model-based enterprise, nanotechnology, smart materials and innovative process and production technologies.
Standards and interoperability: This platform focuses on manufacturing research issues that can benefit from standardization to create open manufacturing and product standards that are accessible to everyone and enhance innovation globally. IMS involvement in standards would also focus on key areas where the lack of standards is impeding progress in any of the other MTP areas.

Education: Educational and vocational training programs designed for an information-based knowledge worker environment that supports manufacturing in the future. Research listed under this platform will contribute to the development of a coherent vision of manufacturing education and vocational training across the whole professional community.

ONGOING PROJECTS

The following projects are actively engaged in research and are generally closed to new partners.

CO2PE! - Cooperative Effort on Process Emissions in Manufacturing
The objective of the CO2PE! initiative is to cluster forces in different continents, involving machine builders as well as academics, to analyze existing and emerging manufacturing processes for their ecological impact in terms of direct and indirect emissions. Possible measures for systematic reduction in the footprint of a wide range of manufacturing processes will be identified.

The involvement of a large number of parties will assure an appropriate, statistical approach, covering multiple machine types and process-material combinations.

An important goal is to derive eco-design guidelines for machine tool builders and best practice reference specifications for future generations of machine tools.

IADP - Improving Productivity in the Automation Systems Design Process
This project aims to provide a design environment that will enable description of control strategies, communications schemes and automation hardware at a domain expert's level in a common domain language. This initiative will include the following activities:

- Activity 1: Discussion Forum on Standards Harmonization. This activity began a year ago at an IEC Technical Committee meeting and will continue. A collaboration platform, wikis and blogs will be developed to allow the community to share information and discuss distributed industrial automation related topics.

- Activity 2: Workshops & Dissemination. Several international workshops have been carried out with members of the initiative organizing sessions in known relevant conferences, special issues in scientific journals etc.

- Activity 3: Targeted experts' exchanges. This activity involves visits of experts to other places with concrete targets, for example, common work on a specific task of a project of the hosting organization, writing of a common paper, preparation of a new project etc.

ISMA - Industrial Smart Materials Applications
IMSA intends to expand upon POLYTECT by growing from a European consortium of partners to the development of an international platform, and by expanding from textiles targeted at geotechnical and masonry applications to include all materials for all applications of interest to the collaborating partners. The objective of this MTP project is to create an international IMS community that will discuss aspects, disseminate knowledge and initiate new actions along the following points:

- Identification of exploitable industrial applications for sensor embedded materials, acquisition systems, and management software where structural health monitoring and lifecycle management are both desirable and feasible

- Development of rugged sensing technologies, able to withstand industrial manufacturing, construction demands, and environmental conditions over long periods of time

- Development of cost-effective data acquisition systems
• Cost effective integration of sensing technologies into materials such as technical textiles (e.g. used for stabilization of embankments or seismic reinforcement of elements), smart concrete/mortar (with self-sensing and/or self/repair functions), smart composites, and others
• Development of simple SHM algorithms and data interpretation methods specific to the targeted application
• Development of assessment methods and prediction models specific to the targeted application that enable life-cycle management actions

iNET - Intelligent Non-Hierarchical Manufacturing Networks
In the new global market, competitiveness and growth of industry highly rely on the move toward innovative high-performance industrial systems and agile networked enterprises through the creation and consolidation of non-hierarchical manufacturing networks of multi-national SMEs in front of networks based on powerful large-scale companies.

Traditional hierarchical manufacturing networks are based on centralized models, where some of the involved actors must adapt to the constraints defined by the dominant players. Real-world experiences of such models have revealed some major problems due to the centralized vision of the supply chain and the sub-optimal performance of centralized decision making. For current, highly dynamic, markets this generates major inefficiencies in the operation of the whole supply chain.

Centralized network performance can be significantly improved through more harmonious and equitable peer-to-peer inter-enterprise relationships, conforming to a decentralized and collaborative decision making model. The objectives of the iNet-IMS initiative are:
• Analyze the needs that arise from the interactions and relationships between SMEs belonging to non-hierarchical manufacturing networks
• Analyze recent technological innovation trends (mainly in terms of IS and IT) to support decentralized decision making
• Analyze existing standards for information exchange to support collaborative processes
• Define a framework for collaboration in the non-hierarchical manufacturing network context

INTERCOATINGS - Development & Implementation of Novel International Standards for Testing of Barrier Coatings
The main objective of the project is to create a world-wide network for development and implementation of new international standards for testing of barrier coatings, including thermal barrier coatings (TBC) for different applications, particularly for power generation and transport. This target will be achieved via intermediate objectives:
• Setting up a network of research institutions and industrial partners carrying out worldwide research activities in the field of integrated, holistic design, modeling, production and application of innovative barrier coatings
• Development of respective modeling, simulation and experimental testing tools, both conventional (analytical, FEM) and innovative (hot burner test, thermo-sonometry etc.), in order to make quantitative prediction of lifetime of barrier coatings for different conditions
• Preparation respective ISO drafts and proposals for a worldwide recognition based on integrated chain “design & modeling, manufacturing and testing for improvement” (DEMMATEST approach)
• Apply this innovative knowledge of new testing methods to specialists and engineers and disseminate

M4SM - Maintenance for Sustainable Manufacturing
Maintenance can play a crucial role for achieving sustainability in manufacturing, especially when considering the whole lifecycle of the manufactured product. This approach requires adoption of an integrated point of view, i.e. maintenance has not to be addressed as a specialized technique, but as a comprehensive system approach. Under this view, cost, performance, energy consumption and safety are the parameters to be addressed by maintenance, that should be seen as a corporate function to be handled in tight connection with the company strategy.
The objective of this MTP project is to create an international IMS community that will discuss aspects, disseminate knowledge and initiate new actions along the following points:
- Promote the role of maintenance to support manufacturing sustainability from a technical and social point of view
- Develop new maintenance business models (MBM) for successfully implementing new ICT and non ICT technology in maintenance operation and management
- Develop and disseminate the concept of e-maintenance and related technology supporting it

TIPSS - Tools for Innovative Product-Service-Systems for Global Tool and Die Networks within the IMS Community
The main objective of the TIPPS-IMS project is to develop and establish innovative business models in which the toolmaker becomes the manager of customer and partner networks to satisfy all customer needs as well as to handle his own cost-effective value-based management. The enabler for these global tool and die networks are so-called “smart tools” developed in the TIPSS project. “Smart tools” represent injection moulds equipped with state-of-the-art sensor technology delivering real-time data from the production process. A newly developed electronic toolkit will collect, store and transmit this data. By using algorithms developed in the TIPSS project the transmitted data will be evaluated by the toolmaker. The toolmaker becomes capable of monitoring the process and to offer unique product related services for his customers, such as an optimized preventive maintenance, which can be scheduled to non-production times. The operational availability of both tool and machine can be increased.

MOSS - Material Off-shore Sourcing
The project aims to streamline the information exchange process so as to reduce cost and reduce uncertainty in shipping durations for international manufacturing supply chains through appropriate use of international standards, and to enhance innovation globally, enabling worldwide supply chain integration and real-time decision making in manufacturing networks.

PROJECTS SEEKING PARTNERS
The following projects are seeking partners to complete their international consortia. Interested industry and researchers should contact their IMS office in their Region or inquire at www.ims.org.

A-FOOTPRINT - Technologies for Intelligent Customized Orthotics and Prosthetics
This initiative is motivated by the desire to research the underpinning technologies which will be key to the development of orthotic and prosthetic (O&P) devices over the next decade. The vision for O&P devices is:
(i) that they will become intelligent: able to guide and assist users in their use and inform clinicians of their effectiveness in achieving the desired outcome; and
(ii) that they will be customized to the user and their condition but delivered within a very short timeframe

CORENET - Customer-Oriented and Eco-Friendly Networks for Healthy Fashionable Goods
The R&D objectives of this MTP project are based on the implementation of the following major breakthrough innovations for TCFI (Textile, Clothing and Footwear Industry) companies:
- A reference model as a toolset of new services based on business process proactive synchronization for demand-driven supply networks value creation based on three dimensions, e.g. organization, ICT and knowledge aspects
- Collaborative product design and configuration tools with simple-to-use, interoperating, modular design tools and advisor, facing both the traditional channels, as well as the significant growing online shopping and consumer communities
- Synchronization and seamless communication and interoperation among design, manufacturing and delivery of complementary products across supply networks by means of an open, service-oriented and event-driven infrastructure, exploiting the full potential of next generation ICT technologies
• Development, scale-up, and integration of innovative manufacturing technologies and processes for TCFI production which follow the rapid manufacturing paradigm with reference to laser engraving and digital printing operations for efficient production of personalized small series of leather and fabric based fashion products

Health and fashion will be conjugated to provide comfort and wellbeing to special social niches like elderly, obese, diabetics and disabled people by means of high value-added, eco-friendly consumer goods.

CSEM - Design of Customer-Driven Shoes and Multi-Site Factory System
The goal of the initiative is to stimulate the introduction of micro-factory solutions into an industrial environment. A consistent introduction of micro-factories as a standard tool in production should be a goal to improve the overall efficiency of manufacturing of microproducts. Several micro-factory initiatives have already been launched in Europe and Asia. The main benefits of introducing micro-factories will be:
• Cost reduction and environmentally friendliness of production through low material effort, low footprint, possibility to work in local clean rooms, less power consumption
• Easy re-configurability, set-up and commissioning of a production plant
• Re-usability of components for versatile manufacturing and assembly purposes
• Introduction of new business models in production – such as production “on the fly”, production at the customer, thereby reducing transportation effort and increasing flexibility

ECOFIT - Dematerializing Manufacturing Systems for Sustainable Manufacturing
The aim of this project is to dematerialize machine tools and manufacturing systems by transforming European machine builders from currently producing heavy, long-delivery-time and high-energy-consuming machines to proposing tailored combinations of extremely light-weighted, non-stiff, skeletal and low-environmental-impact machines integrated with appropriate total lifecycle services based on innovative win/win business models.

The underlying idea behind this concept is that machine builders conceive machines as combinations of easily exchangeable modules consisting of ultra-light and adaptive skeletal structures. These skeletal structures will be designed considering structure, control strategies and processes in an integral way with the aim of satisfying the functional requirements and of assuring the optimal global robustness and reliability of the machine. This dematerialization approach will thus break the link between production results and the material structure of machines and will reduce the total-life-cycle impacts and costs of machines in a radical manner. Then, by integrating dematerialized machines with other similar machines, innovative business models and total-lifecycle-services, machine builders will be able to realize dematerialized manufacturing systems with customized flexibility.

This holistic approach for designing, producing and using dematerialized manufacturing systems integrated with total-life cycle services will coin a new concept in manufacturing: dematerialized manufacturing solutions will pave the way to transforming the machine-tool industry into a knowledge-based, competitive, sustainable value-adding sector.

FIT4U - Customization and Production Technologies and Paradigms for Healthy and Sustainable Consumer-centered Products
The main area addressed by this project is the consumer-oriented product personalization paradigm, to be achieved through “human-centered” innovation of products, processes and ICT.

The core values and themes driving the innovation process are:
• Health and comfort - ensuring the wellbeing of consumers
• Customization – include consumer-subjective tastes and needs for to define final good realization
• Environment and sustainability – aiming at a single-consumer, societal dimension

Within such a context, the MTP project aims to create a knowledge-sharing platform for researcher groups that are already engaged in R&D domains related to customization and production paradigms for user-centered products.
GIPP - Global Infrastructure Performance Project
Manufacturing in its global aspects relies on well functioning infrastructures. These infrastructures are characterized by high fixed costs, high public investments and a long economic life. The combination of engineering principles with sound business practices and economic theory is required for successful asset management. The detailed R&D objectives at the start of the project are the following:

- Development of a real-time decision support system based on knowledge
- Development of a sustainable approach for infrastructure asset and risk management
- Establishment of procedures for bridge monitoring and assessment to increase the safety of the transportation infrastructure
- To improve the state-of-the-art in structural health monitoring (SHM) and damage detection
- Establishment of a full-scaled test bed for the calibration of methodologies
- Global dissemination of the results and standardization activities

INDPACKPHARMA - Quality Assurance in Individualized Pharmaceuticals Packaging Processes
To improve the quality assurance (QA) of the individualized pharmaceuticals dispensing process as much as is reasonably possible with a focus on incoming supplies and on outgoing deliveries. The project aims to prepare for and perhaps even lead, regulation in the individualized distribution pharmaceuticals packaging field.

In 2009, as the project idea developed, it became increasingly clear that quality assurance improvement is required at the incoming and outgoing stages of the packaging process. In 2009 information about a supplier delivery error and subsequent product recall were received too late resulting in the dispensing of the wrong products to patients. To correct this situation, the QA processes must be improved at the de-blistering phase of the packaging operation. BurgerMetrics and Büchi are combining their efforts with those of Medifilm to develop a spectrum-based database of individual pharmaceutical products as the basis for an improved QA process.

The goal of LOTAR is to specify auditable processes for long-term archiving of 3D-CAD and PDM data since no adequate procedures exist today. For digital data, the challenge is that it is often stored in a proprietary, native format and will most likely become un-interpretable over time. The use of a neutral archiving format safeguards the interpretability of the data for a much longer period of time, perhaps its entire retention period. Neutral forms make it easier to migrate the data based on the way that the Application Protocols (APs) are structured. In addition, their life expectancy (obsolescence cycle) is significantly longer in duration. Digital archives mandate that information is captured and preserved in such a way that it can be accessed and presented at any time in the future.

LOTAR is a joint project between ASD-STAN and the AIA. PDES, Inc. and the ProSTEP iVip association support this development and standardization effort. The goal of LOTAR is to specify auditable processes for long-term archiving of 3D-CAD and PDM data since no adequate procedures exist today. The following activities are within the scope of the project:

- Requirements for archiving
- Methods
- Scenarios
- Detailed process descriptions and process modules
- Suitable data models
- System architecture framework
- Recommended practices
- Pilot projects
MATECS - Standardization of Machine Tool Error Functions Representation and Compensation

The MATECS – MTP project focuses on three main objectives: 1. Standardization of machine tool geometric error functions and parameters identification and terminology; 2. Standardization of error functions representation output from different measuring systems and sensors system; 3. Definition of standard compensation tables to be interpreted by different Computer Numerical Controls (CNCs) to allow uniform implementation of machine tool geometric error functions and parameters compensation strategies.

The standardization activity shall conform to the ISO/IEC directives within the work of ISO/TC39 – Machine tools and, specifically, within the work program of ISO/TC39/SC2 – Test conditions for metal cutting machine tools. Participants shall attend all ISO/TC39/SC2 meetings in order to establish/maintain the required credibility within the subcommittee, which will be indispensable for the successful outcome of the planned standardization work.

Research activities will consist in: 1. State-of-the-art analysis and appraisal of the existing ISO 230 series of standards (11 existing standards) with specific indispensable attention and deep understanding of the following documents:

- ISO 230-1:1996 Machine tools – Test conditions for machine tools – Part 1: Geometric accuracy of machines operating under no-load or quasi static conditions. This document is currently under going deep revision work; the current stage is Draft International Standard (DIS) and is out for public enquiry
- ISO 230-2:2006 Machine tools – Test conditions for machine tools – Part 2: Determination of accuracy and repeatability of positioning numerically controlled machine tool axes. This document is now being revised; the NWIP project leader within ISO is Mr. Renato Ottone, technical coordinator of EU project SOMMACH – Self Optimizing Measuring MACHine Tools
- ISO 230-3:2007 Machine tools – Test conditions for machine tools – Part 3: Determination of thermal effects. This document will undergo periodic revision starting year 2010
- ISO/DIS 230-10 Machine tools – Test conditions for machine tools – Part 10: Determination of the measuring performance of probing systems of a numerically controlled machine tool. This document is under preparation; the project leader within ISO is Mr. Renato Ottone. The current stage is DIS and the document is out for public enquiry
- ISO/CD/TR 230-11: Machine tools – Test conditions for machine tools – Part 11: Measuring instruments and their application to the machine tool geometry tests. This document is under preparation; its actual stage is Committee Draft (CD) and will still need a lot of work

Research on the existing machine tool error functions measurement file format of state-of-the-art instrumentation, specifically including:

- Laser interferometers for linear displacement and angular accuracy measurements
- Laser interferometers for straightness measurements
- Multi-axes sweeping alignment lasers
- Laser tracers for multi-lateration measurements
- Inclination measuring systems

Significant research activity related to (i) data collection and validation, (ii) development and (iii) follow-up of the NWIP to be promoted and prepared under the proposed title: ISO/TR 230-12: Machine tools - Test conditions for machine tools. Part 12: Determination, representation and compensation of numerically controlled machine tool geometric errors.

MBE - Model-based Enterprise

To define and demonstrate an integrated environment that enables multi-disciplinary decision making, addressing requirements across a product's lifecycle.
MIGOODS - Manufacturing Intelligence for Consumer Goods
The total integration of design and manufacturing technologies (CAD/CAM/CAE) to support the production of consumer goods (i.e. footwear and sporting goods) based on human data modeling and consumer interaction.

This proposal is motivated by research topics addressed by EU project SSHOES that go beyond the project scope. The SSHOES R&D effort is based on the development of an academic and industrial engineering and medical framework for both footwear products and processes that combine new diagnostic techniques, knowledge-based design and production technologies using new functional high-tech devices/components and advanced materials, for achieving comfort, health, welfare, affordability and sustainability; the quality and customer service attributes to be targeted.

The MIGOODS approach can be defined as the total integration of design and manufacturing technologies (CAD/CAM/CAE) to support the production of consumer goods (i.e. footwear and sporting goods) based on human data modeling and consumer interaction. The objective of MIGOODS is to research technologies and methods to fill the gaps between knowledge, motivating the conception of consumer goods designed specifically for individuals and their materialization through adequate industrial manufacturing processes and sustainable materials (intelligent customization).

MOBITEST - Model-based Interoperability and Testing
MOBITEST will analyze Model-based Enterprises (MBE) in evolutionary dynamic environments, throughout the application of intelligent interoperability monitoring. As well, it will manage semantics in federated industry and business registries for manufacturing data and knowledge (i.e., semantics, ontologies) from a multilingual, multi-domain, and multi-purpose perspective, enabling open company’s resources selection and interaction with other companies. MOBITEST objectives can be divided in:

• Definition of a framework for global model harmonization (including MBE sustainability over time)
• Analysis of Model-based Enterprises (MBE) in evolutionary dynamic environments
• Specification of the morphisms and respective tools to enable easier expansions and integration with MBE
• Implementation of intelligent monitoring in complex MBE
• Definition of a framework for interoperability checking (IC) and conformance testing (CT)
• Application of the results to a set of scenarios

MYCAR FUTURA - Flexible Assembly and Processing Technologies in Automotive
Project MyCar develops flexible assembly concepts and tools aiming to support the production of the highly customized vehicle, and FUTURA develops vehicle production setups of the future, by integrating cost-validated, up to proof-of-concept level, production technologies of MFMs. The objective of this MTP initiative is to establish an international cooperation under IMS to elaborate on modern R&D aspects, disseminate knowledge and initiate new actions along the following points:

• Flexible production technologies and tools and their environmental impact
• Virtual manufacturing and human factors evaluation
• Networked production
• Knowledge-based manufacturing
• Development of processing technologies for new materials
• Integration of new processing technologies to the assembly plant production configurations

NANOBOND - Integration of Emerging Soft-Nanotechnology for the Functionalization of Textiles
Easy-to-clean, soil release and anti-microbial properties are aspects of great importance to comfort and freshness in consumer apparel; reduction of spoilage or wastage during storage and transport; increase of the useful lifetime of articles; maintenance of health and avoidance of cross-contamination in medical textiles. These benefits further contribute to the overall goals of sustainable product development, and, through reducing in-built disposability, to reducing energy demands and the protection of our water resources. Such properties can be introduced into product through surface functionalization. Many surfaces, however, have zero or very few reactive groups on the surface thus the introduction of any functionality requires the prior activation of the surface in some way.
Taking into account the needs of consumers and environmental protection, this MTP initiative aims to develop a "soft nanotechnology" bonding concept, that is, a nanotechnology that does not rely on nanoparticles, but on molecular structuring at the nanoscale. The new technology will offer a system consisting of:

(i) The chemical activation of the fiber surface with a polymeric nanocoating for durable binding of functional molecules and

(ii) The effective incorporation of selected functional finishes for permanent modification of the textile properties, in the first instance a non-leaching antimicrobial agent.

**NIDIATA - Education Network on Integrated and Multi-Scale Design of Innovative Light Alloys Castings for Transport Applications**

The main objective of the project is to accelerate the process of knowledge transfer in the field of light alloys castings for transport applications. Such a target will be achieved via some intermediate objectives:

- Set up a network of research institutions and industrial partners carrying out worldwide research activities in the field of integrated design and production of innovative light alloys castings.
- Set up educational tools, both conventional (meetings, students and personnel exchange) and innovative (web-based), to make available materials and design "frontier" information to students and engineers.
- Supply, by means of the above mentioned tools, innovative knowledge to students and engineers.

These actions will finally lead to an efficient exchange of information and knowledge among partners having, in their respective region, a key role in light alloy casting, design, and engineering, product optimization.

**NADIA** is an EU project aimed at improving competitiveness of 13 SMEs engaged in simultaneous engineering and production of novel high-technology transport components to exploit the potential of light multifunctional alloys for cars and trucks.

**SAAS - SaaS-based MES Using Wireless Sensor Network**

This project is motivated by recent achievements of EUREKA project No. E!4177-0806:PRO-FACTORY UES (Ubiquitous Embedded Systems for globally distributed factories of manufacturing enterprises) and a Korean IT next growth-engine project titled "SaaS based MES" that delivers the next generation of methods and means for development and production in small manufacturing enterprises that lack resources from information and production technology.

The objective of this MTP project is to create an international (IMS) community that will discuss aspects, disseminate knowledge and initiate new action along the following points:

- A wireless sensor network communication platform for digitization of 4M resources in production need to be developed.
- New cost-efficient models and methods for improving competitiveness of lacking resources from information and production technology in SMEs.
- New business models along that direction will need to be supported by appropriate software systems and associated ICT infrastructure for collaborative working processes among SMEs.

**TAILORCRETE - Tailor-made Manufacturing in the Construction Sector at Mass-customized Prices**

To initiate a transition from the rectangular monotony of today's industrialized mass construction that dominates the landscape to new industrialized production of unique concrete structures without the need for expensive and labor-intensive manual construction processes based on traditional craftsmanship, this project will develop and demonstrate industrial processes for producing unique tailor-made concrete structures using robotics or semi-automated processes to replace the use of traditional formwork and thus enable greater flexibility in producing singular concrete structures with different geometric designs. This includes the following:
• Review and assessment of parametric design tools that give architects new design possibilities
• Development of new formwork systems and formwork materials that can be processed using partially automated processes or robot technology
• Development of new reinforcement types and techniques suitable for formwork with complicated geometries
• Development of digital fabrication techniques for singular formwork suitable for industrialized production with a high degree of automation
• Lifecycle assessment in terms of cost, environmental impact, durability, safety, security and aesthetics
• Identification of any technical obstacles from international standards or regulations
• Demonstration of the new technologies

**VFF-MTP - Virtual Factory Framework**
The EU-VFF promotes major time and cost savings while increasing performance in the design, management, evaluation and reconfiguration of new or existing facilities, supporting the capability to simulate dynamic complex behavior over the whole lifecycle of the factory. This approach identifies four key R&D pillars:

I. Reference model for factory planning. The concrete outcome is a reference model for factory planning having as foundation element a factory data model that takes into account the needs of holistic and scalable modeling and real-time management of manufacturing data and of collaborative engineering networks

II. VF manager core. It is meant to handle the common space of abstract objects representing the factory. This representation is based on the common factory data model defined in Pillar I

III. Functional modules. The decoupled functional modules implement the various tools and services for the factory design, reconfiguration, management. These modules operate independently on the same common space of factory abstract object, defined in Pillar II

IV. Integration of knowledge at different layers as engine for the Pillar III modules. The primary objective is to use contextual knowledge to model a wider range of complex systems and support greater comprehension of the modeled phenomenon

**The Successes**

**OVERVIEW**
IMS project outcomes have contributed to the advancement of manufacturing across the entire value chain. These research results have been applied to help companies toward goals of sustainability, improved processes, reduced waste and costs, and improved human interaction.

For example, the recently completed PROMISE project delivered a new type of closed-loop product lifecycle management (PLM) based on product embedded information devices (PEID), which allows tracking of product information at all times and in any location in the world. Such a PLM system enables product users, maintainers and manufacturers to manage the lifecycle information of their products seamlessly over all lifecycle phases: beginning-of-life (BOL), middle-of-life (MOL) and end-of-life (EOL).

Implementing the PROMISE technology enables process improvements, increases understanding of product life cycles and makes rebuilding and recycling choices more precise with direct environmental benefits, raises the supply chain efficiency and the competitive advantage. Therefore PROMISE PLM provides important benefits to reduce product total costs, to increase product quality & sustainability and to improve competitiveness.
Another recently completed project, DiFAC (Digital Factories), explored concurrent product design, prototyping and manufacturing, worker training, support for data analysis, visualization, advanced interaction and presence within a virtual environment, ergonomics analysis, and collaborative decision-making. The AMITERM project developed two unique mould technologies to dramatically improve the energy balance in the production of large thermoplastic composite parts by heating mainly the resin and textile and not the metal mould. In chemical and petrochemical process industry, CHEM developed and implemented an advanced decision support system for process monitoring, data and event analysis, and operations support.

**SUMMARY ACHIEVEMENTS BY PROJECT**

The following projects completed their research and submitted a final report to IMS. These project outcomes are summarized below, but full reports may be downloaded at http://www.ims.org/ims_completed.

**Digital Die Design System (3DS)**
- Developed digital die design system for sheet metal forming
- Developed “Spring-back (2D) evaluation method” and “Surface strain evaluation method” to quantify evaluation. (Preamble for 3D methods)
- Evaluated different models and selected the best model for predicting spring-back
- Discussed the role and future research needed to understand the influence of friction and its representation in simulation

**Acceleration of Innovative Ideas to Market (AIM)**
- Developed a means of stimulating the creation of innovative ideas and collecting them from people involved with the products and processes
- Developed a method for processing ideas and storing them into a structured knowledge repository
- Developed a means of analyzing knowledge to determine which is useful, and which is not in order to enable the viability of ideas to be assessed
- Developed the best means of delivering the innovative ideas to product and process designers for maximum effect

**Development of Advanced Microwave and Light-weight High-speed Thermo-response Mould Technology for Woven Textile-reinforced Thermoplastic Components (AMITERM)**
- Developed two new mould technologies for thermoplastic composite parts which allows for high-speed production
- JETex process developed for low-viscous pre-polymers using dynamic heating for polymerization
- HTex process developed for high performance materials which are heated and compressed forming a thermoplastic composite

**Advanced Decision Support System for Chemical/Petrochemical Manufacturing Processes (CHEM)**
- Developed decision support system (DSS) for process monitoring, data and event analysis, and operations support in chemical and petrochemical process plants
- Simulation toolboxes were developed to improve operations
- Developed tools should reduce pollution and accidents

**Coaching Support Tool to Better Identify Working Process Improvements through Introduction of IMS Solutions (COST-WORTH)**
- Developed toolbox to coach SMEs for coaching oriented business process re-engineering/improvement
- Toolbox helps select the most appropriate methodology with regard to their actual business situation and objectives
- Available at "no charge" to SMEs at http://www.cost-worth.net/
Digital Factory for Human Oriented Production System (DiFAC)
- The DiFac toolset is able to support collaboration among people in different places
- Users can design, prototype and manufacture through an interactive environment for delivering better quality products and services results of international collaboration
- The use of new technologies reinforce SMEs' reduction in complexity, reduction of physical mock-ups, enhanced organizational intelligence, and others

Eco-Efficient and High Performance Hard Chrome Process (ECoCHRoM)
- Develop an environmentally and economically acceptable process for harder, thick, corrosion-resistant coatings of chromium
- Present guarantees of safety towards employees and environment
- Present performances comparable to dry techniques (projection, PVD, ionic nitration, etc.)

Next Generation Environment-friendly Soldering Technology (EFSoT)
- Developed next-generation technology through evaluation of different solder formulas
- Evaluation included a “total impact assessment” of four formulas
- Recommendations were given for use of solders

Intelligent Manufacturing of E-Music: A Musical Application Standard Using the XML Language for Intelligent Manufacturing of Music for CDs, DVDs, Web (EMUSIC-XML)
- Develop IEEE Standard P1599 to combine listening, visual, and intellectual experience under one software tool
- P1599 considers a musical structure to consist of different layers, each of which represents an aspect of the piece
- Built at the University of Milan’s Laboratory for Musical Informatics, this browser application illustrates the power of the standard and how it works
- Provides an enabling technology that can serve as the basis for realizing an unending stream of new applications

Global Cape-Open (GCO)
- Established a set of software standards to allow various pieces of Computer Aided Process Engineering (CAPE) software used in chemical manufacturing to communicate with each other
- Established guidelines on how to integrate software
- Developed software prototypes of simulation software
- Established the self-funded CAPE-OPEN Laboratories Network (Co-LAN) to manage and advance the standards

Global Education in Manufacturing (GEM)
- Researched and defined the needs of the manufacturing industry for training and education in manufacturing strategy on a global basis
- Developed curriculum to comply with the concept of digital business and extended products
- Developed a framework (detailed specifications) for a manufacturing strategy curriculum focusing both manufacturing and business administration topics

Global Manufacturing in the 21st Century (Globeman21)
- Developed a virtual manufacturing environment to reduce lead times from production line planning to design and production
- Developed distributed autonomous manufacturing technology for flexible manufacturing
- 14 demonstrators developed
- Businesses are changing their business practices as a result of the project

Global Engineering and Manufacturing in Enterprise Networks (GLOBEMEN)
- Builds on the completed Globeman21
- Management of globally distributed manufacturing businesses
- Produced guide that describes global and dynamic IT infrastructures and encourages industry and vendor development
Knowledge Systematization: Configuration Systems for Design and Manufacturing (GNOSIS)
- Enables new forms of highly competitive manufactured products and processes which are environment-conscious, society-conscious and human-oriented
- Used to design of next generation apartments and environmentally conscious factories
- Used to enhance ecological designs
- Improved logistics and speed up the design-to-market flow
- Improved the configuration process for customized products and production
- Used to test new tools and application areas

Coping with the Complexity of Business Innovation (HARMONY)
- Developed a business incubator for SME business innovators
- Articulates SME business plans for to key stakeholders and potential investors
- Includes commercialization and networking tools

Highly Productive and Re-configurable Manufacturing System (HIPARMS)
- Developed Agile Manufacturing System
- Reduced non-processing time
- Developed reconfigurable tools
- Developed high-speed cutting processes

Holonic Manufacturing Systems (HMS)
- Developed discrete, continuous and batch manufacturing systems using reusable modular design
- Developed intelligent modules that reconfigure based on demand
- Developed adaptive systems which can “plug and play”
- Provides capability to integrate manufacturing and supply chains
- Offers a migration path from legacy systems to fully distributed manufacturing systems

Organizational Aspects of Human-Machine Coexisting System (HUMACS)
- Developed “Info-ergonomics”
- Developed bone-based human model for 3-D ergonomic studies
- Established human-oriented production systems to reduce labor accidents and health damage

Human Sensory Factor for Total Product Life Cycle (HUTOP)
- Development of working optimization based on human factors for working evaluation system in human-oriented production
- Computer graphics and visual recognition technologies developed to reduce development costs
- Developed new product life cycle concept “HUTOP Cycle”

Innovative and Intelligent Field Factory (IF7)
- Researched assembly methods for large-scale structures, like houses, ships, etc.: From “construction” to “manufacturing”
- Mechanization systems for assembly of large-scale structures
- Application of autonomous agent to construction management in field factory
- Construction of database to manage parts

Intelligent Composite Products (INCOMPRO)
- Global, systematic refined solutions for the design and production process based on product morphology analysis
- Detailed evaluation and analysis related to production method of composite materials
- Personalization/development of software tools for finite element analysis of composite materials
- FEM simulation results matching, sensitivity analysis of FEA/FEM data obtained by practical laboratory experiments
- Development and improvement of production processes for all project partners
- Systemization and exploitation of composite technical knowledge
Intelligent Manufacturing of Wood Products Using Color, X-Ray, and Computer Tomography-Based Quality Control (INTELIWD)
- Treats wood as a precious raw material
- Developed comprehensive on-line quality inspection system
- Moved from 2-D visual inspection to 3-D mechanical inspection
- From appearance grading to strength grading

A Configurable Virtual Reality system for Multi-Purpose Industrial Manufacturing Application (IRMA)
- Integrates research and developments in VR, simulation, CAD, etc., to create a suite of technology solutions for the Total Life Cycle modeling of the industrial enterprise
- Developed and demonstrated computer based VR systems for improving the factory operations of process and product design, plant monitoring and control and training
- Addresses the organizational and personal issues relating to methods for improved training, working conditions, effects on the environment, skills, etc., through the application of VR technology

Modeling and Simulation Environments for Design, Planning and Operation of Globally Distributed Enterprises (MISSION)
- Supports the Manufacturing System Engineering (MSE) process by integrating modeling and simulation platforms
- Supports engineering and systems integration
- Allows sharing of information generated by any one component amongst all components that may have an interest in that information

Metamorphic Material Handling System (MMHS)
- Researched metamorphic material handling systems which respond to varying demands in a flexible manufacturing system.
- Developed prototype automatic guided vehicle (AGV) and support software
- Method of Path-planning and Guide-planning will raise efficiency of manufacturing systems

Next Generation Manufacturing Systems (NGMS)
- A blueprint for the integration of future manufacturing systems into the new forms of manufacturing enterprises
- Competitive advantage from a more rapid adoption of advanced systems, processes and technologies
- More rapid and “right first time” establishment of manufacturing processes and networks of autonomous units through the application of new types of simulation methodologies and tools
- Greatly improved response times to changing customer needs through the adoption of new forms of modeling and simulation systems
- Defined the scope of the “Digital Factory” concepts
- Developed an integrate-able set of models and simulators merging a bottoms-up view of the factory floor as found in NGMEs with a top-down view of the globally distributed virtual enterprises

Plant Automation Based on Distributed Systems (PABADIS)
- Developed “plug and participate” IT infrastructure from the enterprise level down to the shop floor
- Combines Java-based Jini technology with mobile and residential software agents
- Minimizes time for set-up of new machines
- New methods in job control enhance efficiency
Product Lifecycle Management and Information Tracking using Smart Embedded Systems (PROMISE)
- Developed closed-loop product lifecycle management (PLM) based on product embedded information devices (PEID)
- PEID allows tracking of product information at all times and in any location in the world
- Enables product users, maintainers and manufacturers to manage the lifecycle information of their products seamlessly over all lifecycle phases: beginning-of-life (BOL), middle-of-life (MOL) and end-of-life (EOL)
- Enables process improvements, increases understanding of product life cycles and makes rebuilding and recycling choices more precise with direct environmental benefits, raises the supply chain efficiency and the competitive advantage

Advanced Real-Time Multimedia and Networking Execution Platform and Development Environment (REMUNE)
- Developed a group communication protocol stack in SDL, the Specification and Definition Language
- implementation was a first-of-a-kind, prototype implementation providing new insight on the composition of group communication protocol stacks

Systematization of Quality Engineering and Development of Software for Its Application (ROBUST)
- Development or transfer of technology made easier because of systematization and standardization for quality engineering method as general technology
- Contributes to the efficiency of extended technology development by utilizing quality engineering software
- Allows for production development that improves customer satisfaction (CS)

Rapid Product Development (RPD)
- Accelerate product development processes for mechanical parts by providing tools and methods for rapid manufacturing of virtual, physical and hybrid parts in distributed environments
- Developed a substantially improved process chain starting with physical or digital product models and leading to validated physical, virtual and hybrid parts in small or medium sized series
- Developed innovative CAD-based tooling software and rapid tooling technologies and formation of a Rapid Virtual Enterprise

Sensor Fused Intelligent Monitoring system for Machining (sIMon)
- Developed on-line calibration and optimization of machining process during prototype machining
- Developed in-process detection of tool wear and breakage to reduce down time and scrap rate
- Developed in-process compensation of work-piece and tool deformations for precision machining

Self-learning Model for INtelligent Predictive Control System for Crystallization PROcesses (SINCPRO)
- A tool for the rigorous and hybrid modeling of crystallization processes that can be used (a) for parameter estimation (b) for optimization of design and operation (c) starting point for model-based control applications
- An observer/feedback system based on hybrid models made of a rigorous mechanistic model and an empirical model (e.g. Extended Kalman filter; horizon approach, self-learning, intelligent (learning) operating system)
- A control toolbox consisting of a Model Predictive Control applicable to a wide range of crystallization processes
A Standards-Compliant Framework to Support Complete Integrated Product Lifecycle Information Management and Electronic Commerce for the Furniture Manufacturing (fm) Industry, in the Advent of Smart Enterprises (SMART-fm)

- Developed and established ISO 10303-236, the Standard Application Protocol (AP) for the Exchange of Furniture Product Data
- Created the fun-STEP Interest Group
- SME-focused with large enterprises participating
- www.funstep.org

STEP-Compliant Data Interface of Numerical Controls (STEP-NC)

- Extended an existing data model for turning and milling processes
- A prototype for a turning CNC was developed
- Tested and implemented new measuring equipment

A Dynamic Management Methodology with Modular and Integrated Methods and Tools for Knowledge Based, Adaptive SMEs Controls (SYMPHONY)

- Created software to help SMEs develop and increase their capabilities to grow
- Developed management methods and tools that facilitate the constant creation, exploration and exploitation of business opportunities within strategic networks
- Symphony product portfolio consist of seven products including SymStrategy, SymResources, and SymCockpit

Recycle System for Composite Material Waste: Thermal Elutriation System (TES)

- Developed method for recycling materials without dismantling
- Developed a logistics system for collection of disused materials

Virtual Heat Treatment tool for monitoring and optimising HT process (VHT)

- Predict distortion resulting from quenching, carburizing and nitriding of steel parts both qualitatively and quantitatively
- Optimize time and operating condition of heat treatment materials
- Uses databases (Material, Process & Generic) and process simulation by the Finite Element Analysis

Virtual Production Enterprise Network (VIPNET)

- Provides effective means for a virtual enterprise to successfully network in a virtual mode via Intranet and Internet
- Shared technological data, information, and knowledge to create advanced products, technologies and services
OTHER PROJECT-RELATED ACTIVITIES

IMS-RELATED ORGANIZATIONS

Other organizations have been spun off from a past program called the “Communities of Common Interest” or CCI. They concerned manufacturing safety, die and mould design, nanotechnology, and industrial automation. While some of the CCI's were absorbed into other activities, the die and mould design community evolved into a project. The industrial automation community continues as an on-going entity supported by its membership and sponsors.

The OOONEIDA (O³nida) operates as a network of networks focused on fostering distributed industrial automation based upon open standards, and is a not-for-profit corporation incorporated in Canada, operating as O³nida Inc.

One of the main goals of O³nida is to respond rapidly to emerging market and industry driven requirements by mounting research efforts or collaborating in existing research efforts mounted by others. These efforts might consist of: developing compliance profiles for emerging standards; examining impediments to the automation of smart assembly processes; developing an automation objects framework for developers; mounting open source standards elaboration projects, etc.

O³nida is partnered with several associations, networks, universities, research institutes and firms with respect to these activities. It operates at any and all levels of the industrial value add chain from the tools, platforms and devices level up to enterprise integration issues such as Service Oriented Architectures. Depending on the structure of the collaboration, O³nida will hold the Intellectual property emerging from the project or allow it to be held by other partners.

O³nida operates in both an active and a reactive mode responding to industry requirements defined through its partner networks, standards bodies, trade associations, and industrial automation research conducted at universities and research institutions. For more information about the O³nida, please visit www.oooneida.org.
Annex 1. IMS Regional Secretariats

IMS Regional Secretariats
IMS support services were created to facilitate client access to international resources, technologies and markets through the IMS platform. These services include IMS Regional Secretariats to assist nascent projects, promote bi-annual workshops and forums, and to disseminate information.

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IMS Inter-Regional Secretariat
The IMS Inter-Regional Secretariat is the administrative and international coordinating office for the organization. It also handles inquiries from non-IMS regions.

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Annex 2. IMS MTP Project Facilitators (Coaches)

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Dr. Thomas Messervey is a civil engineer who specializes in the use of sensor technologies in the engineering sciences for energy efficiency, increased security, performance monitoring, and management. He is a 1994 civil engineering graduate of the United States Military Academy at West Point, received his M.Eng. degree from Stanford University in structural engineering, and his Ph.D. degree from the University of Pavia, Italy in the use of structural health monitoring for the life-cycle management of highway bridges. He holds dual American Italian citizenship and is currently a project manager in the Industrial Innovation Division of the Italian engineering consulting company D’Appolonia S.p.A. headquartered in Genova, Italy.

Since 2009, Dr. Messervey has been associated with the IMS program through forming and leading the MTP project Industrial Smart Material Applications (ISMA). He has since become involved in the European Technology Platform Manufuture, the Public Private Partnership Factories of the Future, and the IMS2020 Project. In 2010, he was appointed as the EU Regional Facilitator to counsel, guide, and coach European companies who want to form their own MTP projects.

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Dr. Kim received his Ph. D in August 1998 from the Industrial Engineering Department at KAIST, and from his graduation to 2001 was a researcher at the CIM Research Center at KAIST. He has been involved with the development of Computer Aided Process Planning system for molding dies and design and Implementation of Virtual Manufacturing System for Order-adaptive Manufacturing Industry. He also was involved as a post-doctoral researcher, CTC at DaimlerChrysler working on development and maintenance of a generative pattern machining system and Implementation of die structure machining system. In 2001, he became a Senior Researcher at Korea Research Institute of Ship and Ocean Engineering working in design and construction of ship navigation simulator systems using virtual reality technology and has experience in the construction of virtual 3D environment database systems. Currently he is a Principal Researcher, Korea Institute of Industrial Technology in the field of digital manufacturing and manufacturing information systems for SMEs.

His areas of expertise include the development of Internet-based VMS key technologies, construction of 3D environments for virtual simulation, development of internet-based CAD/CAM systems, process design of industrial development software, and information technology applications to the manufacturing industry.
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Allan Martel operates a consulting firm specialising in the building and subsequent management of international research teams developing leading edge solutions in the field of distributed industrial automation and other advanced manufacturing process technologies.

Mr. Martel is also the Chief Operating Officer of O3neida inc. and the VP Operations of O3neida Europe, both not-for-profit firms that operate as networks of networks of automation specialists world wide.

Mr. Martel is past President of IMS Canada, the Canadian component of an international R&D program in manufacturing process R&D which conducted about $250 million CAD in R&D annually between 1997 and 2007. Mr. Martel travels extensively in his consulting practice with the vast majority of his clients made up of companies, both large and small.

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Dr. Steven Ray specializes in information integration consulting services and is a Distinguished Research Fellow at Carnegie Mellon Silicon Valley, where he researches information interoperability and standards in application domains including the smart electrical grid, disaster management, electronic business, supply chains, and manufacturing. He has a twenty-seven year track record of initiating and leading system integration and other technical R&D projects at the National Institute of Standards and Technology in Gaithersburg, Maryland.

For the past decade, he was responsible for the management of a $10-13M division of 60 staff and visiting researchers dedicated to the solution of national problems related to measurements and standards supporting systems interoperation in the manufacturing sector. In addition to his consulting support for local technology companies, Dr. Ray’s current activities include the establishment of new research programs at Carnegie Mellon Silicon Valley in smart grid interoperability and in disaster management, chairmanship of the Ontology Summit and chairmanship of the OASIS Quantities and Units of Measure Ontology Standard (QUOMOS) TC. He has a B.Sc. in Physics (honors) from the University of Bristol, England, a Ph.D. in Mechanical and Aerospace Engineering from Princeton University, and is a member of ASME and SME.