

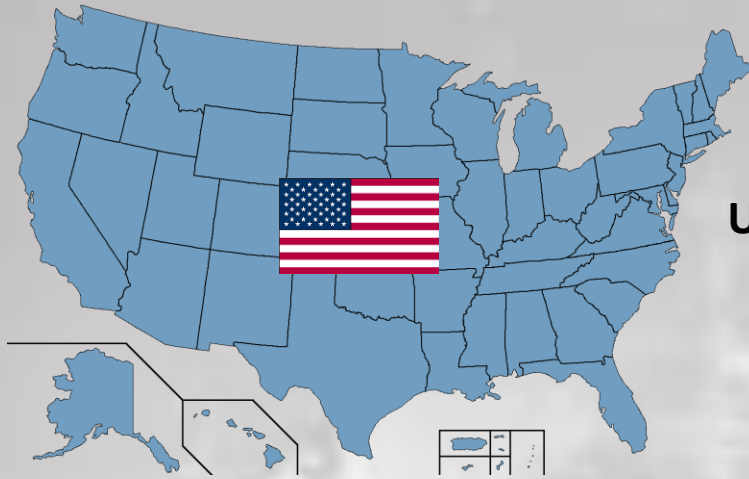
# *International Collaboration Tools for Industrial Development*

**6<sup>th</sup> CSIR Conference**  
**5-6 October, 2017**

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IMS International  
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INTELLIGENT  
MANUFACTURING SYSTEMS



**U.S. DEPARTMENT OF  
COMMERCE  
(NIST)**



**28 Countries**

**NATIONAL COUNCIL FOR SCIENCE  
& TECHNOLOGY  
(CONACYT)**



**INTELLIGENT  
MANUFACTURING SYSTEMS**

**EUROPEAN COMMISSION  
(DIRECTORATE GENERAL RESEARCH,  
DIRECTORATE GENERAL COMMUNICATION  
NETWORKS, CONTENT AND TECHNOLOGY)**



**DEPARTMENT OF SCIENCE AND  
TECHNOLOGY  
(Advanced Manufacturing Technologies)**



**Pierre Nanterme, CEO of Accenture**

“Digital is the main reason just over half of the companies on the Fortune 500 have disappeared since the year 2000.”

**Klaus Schwab, Founder and Executive Chairman, World Economic Forum**

“We must develop a comprehensive and globally shared view of how technology is affecting our lives and reshaping our economic, social, cultural, and human environments. There has never been a time of greater promise, or greater peril.”

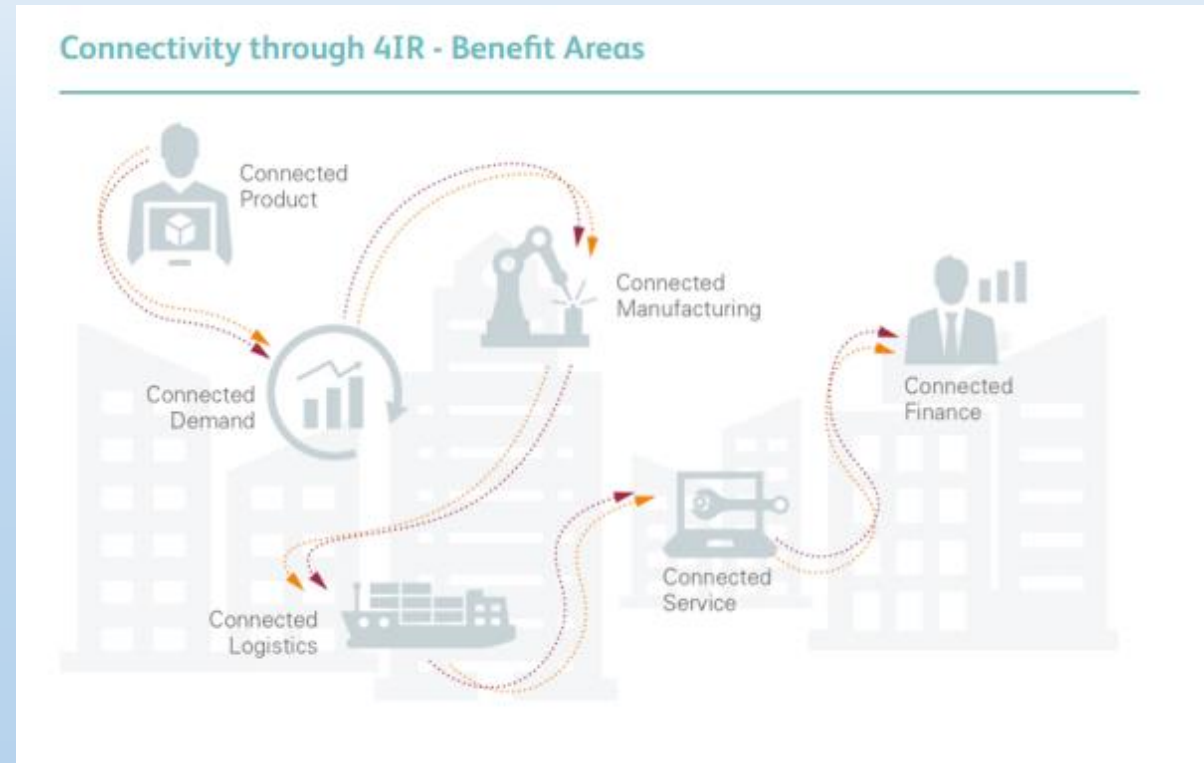


## The Benefits of 4IR in Manufacturing

**Smarter supply chains** – greater coordination and real-time flow of information across supply chains and relationships allows better tracking of assets and inventory and integrated business planning and production. This unlocks new ownership and collaboration models across supply chains.

**Smarter production** – the use of data analytics and new production techniques and technologies (such as autonomous robots, multi-purpose production lines and augmented reality) helps to improve yield and speed up production. This allows new business models to be pursued such as mass customization.

**Smarter products** – Rapid innovation and a faster time to market are enabled by data collected from products along with user feedback, whether direct or collected via social sentiment on the internet. This data also allows remote diagnostics and remote/predictive maintenance.



[Source : The 4th Industrial Revolution \(4IR\): A primer for manufacturers](#)



# ***IS SOUTH AFRICA READY FOR INDUSTRY 4.0?***

*- Dr. Thulani Dlamini  
6<sup>th</sup> CSIR Conference*



## Top 10 countries that are ready for Industry 4.0

World Economic Forum investigated different countries and scored them on a 7-point scale. This is the top 10 countries scored on the ability to capitalize on the digital revolution:

### Network Readiness Index

- Overall environment
- Readiness in terms of infrastructure
- Affordability and skills
- Usage by individuals, businesses and the government.

1. Singapore: 6,04
2. Finland: 5,96
3. Sweden: 5,85
4. Norway: 5,83
5. United States: 5,82
6. The Netherlands: 5,81
7. Switzerland: 5,75
8. United Kingdom: 5,75
9. Luxembourg: 5,67
10. Japan: 5,65

1. Is there something to be learned from manufacturers in other countries?
2. How can MNEs drive I4.0 technologies through their supply chain, especially SMEs?

Scandinavian countries score high on the NRI. Germany, being one of the leading countries in Industry 4.0, only takes the 15<sup>th</sup> position on the list. China does have the right ambitions, but the country finds itself on a 59<sup>th</sup> place in the NRI. Whether this has an impact on their current number one position as a manufacturing country and their ambitions as stated in Made in China 2025, depends on how quickly they can improve their networks. In addition, the question is whether having the right circumstances as a country is enough to boost competitiveness.

### Sources

[World Economic Forum Report WE Forum](#)





## 1. *Is there something to be learned from manufacturers in other countries?*

### Industry 4.0 for SMEs - EU Horizon 2020 RISE program

**Goal:** A great challenge for the future lies in the transfer of Industry 4.0 expertise and technologies in small and medium sized enterprises (SME). Although the high potential of Industry 4.0 in SMEs, the main limitation is a lack of concrete models for its implementation and application in small and medium enterprises. Thus, this research project titled “SME 4.0 - Smart Manufacturing and Logistics for SMEs in an X-to-order and Mass Customization Environment” aims to close this gap through the creation of an international and interdisciplinary research network. Identifying the needs and enablers for a smart and intelligent SME-Factory, creating adapted concepts and design solutions for SME production and logistics systems and developing suitable organisation and business models will be the main objectives of this research network. The research network includes partners from all over the world (Italy, Slovakia, Austria, Thailand, USA, India).

80 Billion Euros earmarked for projects in H2020



Susanne Altendorfer-Kaiser added an update

Feb 22



Group photo Kick Off meeting 8-9 February 2017 - Free University of Bolzano (Italy)

76 Reads



2. How can MNEs drive I4.0 technologies through their supply chain, especially SMEs?
- Understanding benefits
  - Learning about applications relevant to their processes
  - Provide/join a platform to share best practices for integration
  - Involve SMEs in RDI projects

Challenges:

- Competing companies don't want to share
- SME's have difficulty committing resources
- SME's may lack capabilities to transform

EXHIBIT 1 | Nine Technologies Are Transforming Industrial Production





***IS UNITED STATES INDUSTRY READY FOR INDUSTRY 4.0?***

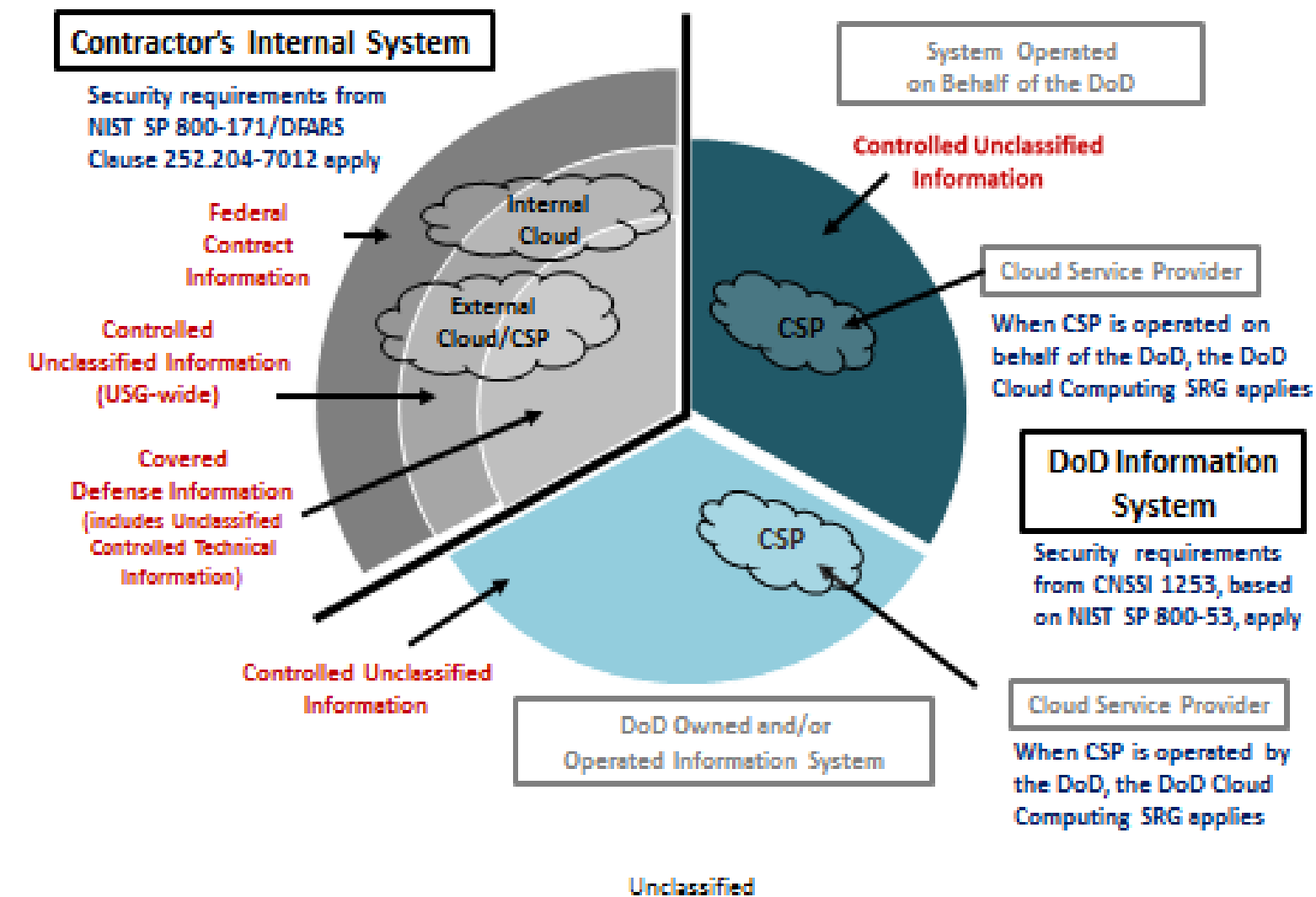


## Protecting the DoD's Unclassified Information... Information System Security Requirements

### CASE-IN-POINT

#### *New DoD Requirements for Cyber Security*

- *Defense industry MNEs are mostly consolidators*
- *Supply chains have large percentage of SMEs*



Unclassified

## *What we believe...*

- *It is critical that SMEs adopt I 4.0 technologies*
- *SMEs cannot do it alone*
- *Collaboration is essential*



## *What we offer to collaborators...*

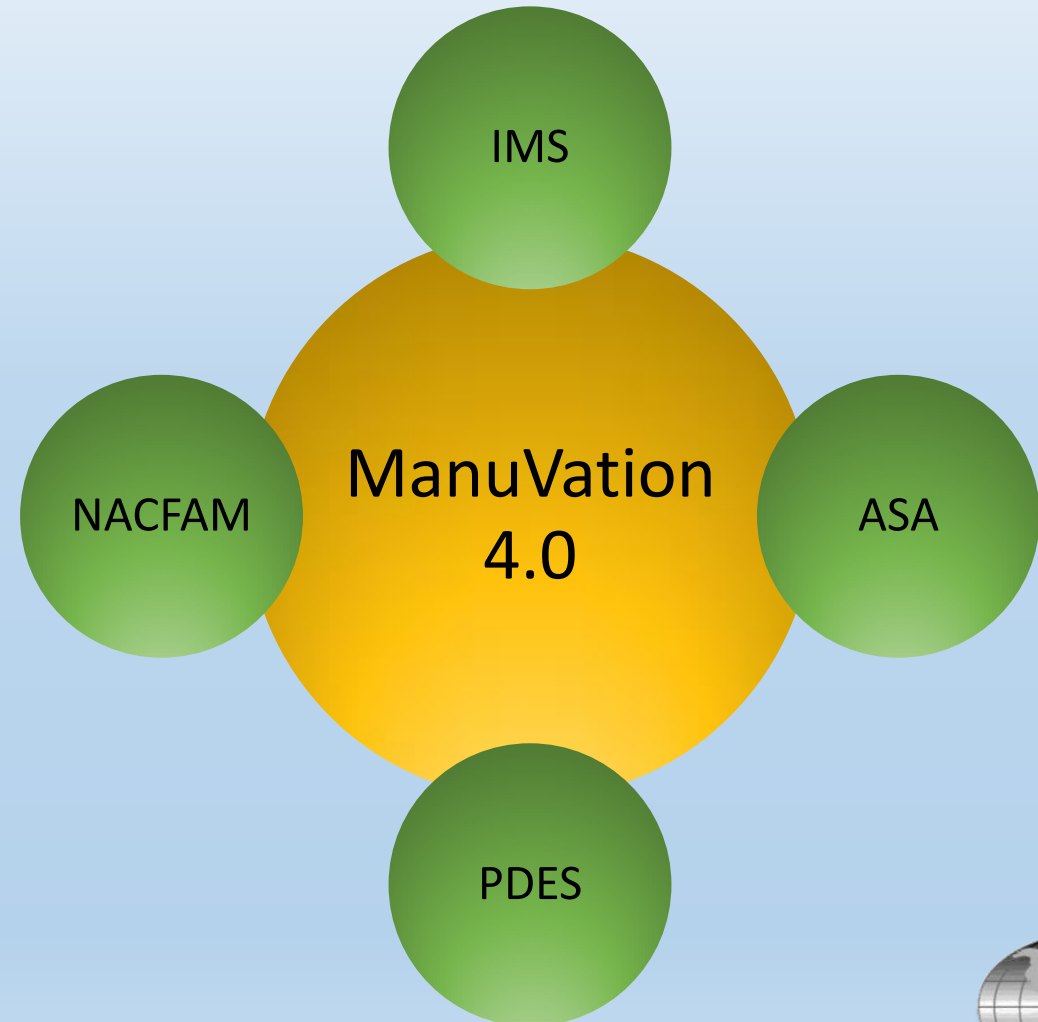
- *Help in formation of collaborative federations*
- *Expert-assisted clustering activities*
- *Platform to assist SMEs adoption of I4.0*
- *World Manufacturing Forum - global platform to discuss manufacturing challenges*



## *Collaborative Federations*

### *What's a federation?*

- A formation of complimentary organizations working together towards a common goal





## IMS - U.S. Launches ManuVation 4.0

- U.S. Aerospace States Association, NACFAM, PDES Inc. and IMS are partnering to focus on SME sustainability and growth
- Piloted an industry driven workshop in March 2016 on Additive Manufacturing with follow on participation in IMS international workshop May 2016
- Using the Additive Workshop model held an Industry 4.0 workshop March 2017, partnering with the state of California A&D sector
- Developed an industry survey to get a sense of SME business issues
- Another workshop is scheduled for October 26, 2017 in the Quad Cities of Iowa and Illinois
- An international workshop will be held during the World Manufacturing Forum November 9, 2017 in Monterrey, Mexico







## *Expert Assisted Clustering Activities*

- IMS Project Clustering Platform

- Adds the international dimension to take advantage of global RDI
- New platform for project clustering to leverage R&D, reduce risks, provide global solutions
  - Facilitators
  - International project matching
  - Regional workshops
  - International workshops
  - Proven methodology for cluster formation
  - *No charge for IMS services or workshops!*

- IMS is an industry-led program for international collaboration
- Established networks for 22 years.



# Methodology Example

## Additive Manufacturing Platform

- Additive Manufacturing Project Cluster Workshop
  - 2 May 2016, Barcelona Spain
  - 38 projects attended worth an estimated 100 million in R&D from the European Union, Mexico, South Africa, and United States
  - 6 new project research clusters formed under IMS







## Workshop Methodology

- Topic selected
- Project search
- Request project summaries, top 3 exploitable results, TRL levels
- Circulate summaries and request cross interest (weighted)
- Weighted interest levels charted
- Themes emerge, workshop held





Expression of Interest - All Projects

2023 Intelligent Manufacturing System Awards Round 1

NOBIDING CLASS INTEREST 1-DIMENSIONAL INTEREST 3-DIMENSIONAL INTEREST 4-DIMENSIONAL INTEREST 5-DIMENSIONAL INTEREST

Project ID	Project Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000
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Strength of Interest (ER)

Strength of Interest (project)



# Spreadsheet created from 38 submissions

- Request project summaries, top 3 exploitable results, TRL levels
- Circulate summaries and request cross interest (weighted)
- Weighted interest levels charted
- Themes emerge, workshop held

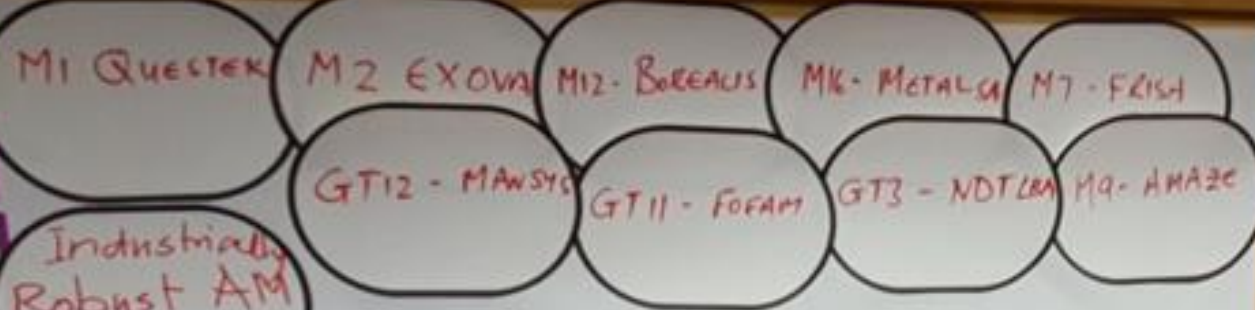








PROJECTS TO BE CLUSTERED



CLUSTER NAME

Industrially Robust AM Chain

CHAMPION

PRABIR CHAUDHURY

REGIONAL LEADERS

US - Jeff  
SA - Hardus  
EU - Paolo  
MX - Dante

GOALS & OBJECTIVES

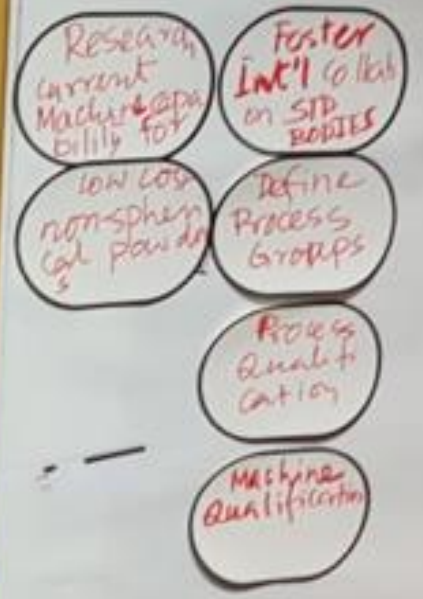


11:00-12:00	WORK PLAN
14:00-16:30	ACTION PLAN
18:00	PLANNING

WORK PLAN

KEY ACTIVITIES & SCOPE

ACTION PLAN



CLUSTER NAME

WHAT STEPS

HOW

BY WHOM

BY WHEN

HOW MEASURE SUCCESS



## Outcomes

- AM Cluster workshop had access to 38 projects worth an estimated 100 million in R&D. Shared R&D conducted at a fraction of the cost.
- Expand knowledge networks beyond borders.
- 3 New Project clusters to be formed, next Industry 4.0. Similar activity expected.
- Global networking for your institution to elevate visibility.
- Companies involved in IMS projects often become part of supply chains
- New project: Global AM Material Properties Database

### ***How can I get involved?***

#### 26 October

- I 4.0 Workshop, Quad Cities

#### 7-9 November

- AM Metals Cluster to hold workshop at the World Manufacturing Forum
- I 4.0 international Workshop





## *Platform to assist SMEs adoption of I4.0*

### ***New program under consideration***

- Designed to enable SMEs to take their first steps towards Industry 4.0. SMEs in particular are often lacking the necessary resources to implement these new, technically demanding processes.
- Intent to set up Centers of Excellence
  - Learn about new I 4.0 technologies
  - Learn how to apply these technologies to their company
  - Share best practices







MONTERREY - MEXICO  
7-9 November 2017

"Towards a Digital Market &  
Connected Manufacturing Ecosystems"

[www.worldmanufacturingforum.org](http://www.worldmanufacturingforum.org)

The World Manufacturing Forum brings together policy experts, industry leaders of large multinationals and small to medium-sized enterprises, as well as academic leaders across the globe to discuss the economic, social and technical challenges that will impact global manufacturing in the near future.

## KEY FACTS



30+  
SPEAKERS



400+  
ATTENDEES



20+  
COUNTRIES

## 25+ Qualified Speakers • 6 Challenging Sessions • Industrial Tours • Workshops & Exhibitions

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**OVERVIEW:** The fifth edition of the World Manufacturing Forum will assemble in Monterrey, Mexico on 7-9 November 2017 at the Parque Fundidora to explore the theme “*Towards a Digital Market and Connected Manufacturing Ecosystems*”. Global policy experts and industry leaders from large multi-nationals to small-to-medium sized enterprises, and academic leaders will discuss the policy, economic, social, and technical challenges that influence global manufacturing. The sessions will explore:

**Opening Session:** Mexico’s Manufacturing Competitiveness & Global Partners  
Mexican authorities will provide an overview of the influence of design, engineering and advanced manufacturing activities at the WMF host country, Mexico, as strong drivers for economic prosperity, highlighting infrastructure development, job creation, and contribution to the GDP. Such overview will include the presentation of national industrial and trade policies as well as science & technology policies.

**Session 1:** *Industrial Policies for Digital & Interconnected Manufacturing Market.*  
The Digital Marketplace, which forms the “digital thread”, is expected to connect and drive future manufacturing supply chains. This marketplace will further drive rapid innovation, efficiency, and global collaboration. Cross-border policies and cooperation are needed to enable ecosystems of this scope and size.

**Session 2:** *Connected Factories and Value Chains*  
Platforms for connected factories along a value chain ecosystem must be developed in a standardized way so that those entering or exiting a value chain may easily participate or disconnect. What are the reference architectures currently in development and how can they be implemented in create a value chain ecosystem?

**Session 3:** *Digital Workforce & Future Manufacturing Jobs*  
Connected manufacturing ecosystems will drive new architectures, but will also change how we utilize our workforce. The future company workforce will

extend beyond its walls to also become interconnected as a shared resource. These employees will need to be agile, highly trained, and able to address rapid-fire challenges and changes. How do we train for such a workforce?

**Session 4:** *Energy and Resource Efficient Manufacturing*  
Efficient use of resources will continue to drive manufacturing from business and social drivers. What are the major barriers for further efficiencies in manufacturing ecosystems? How can value chains drive these efficiencies in a cooperative way to spur innovation, reduce costs, and be environmentally responsible?

**Session 5:** *New Business Models & Service Engineering*  
The distinction between products and services has blurred as they are integrated into global manufacturing value chains. This major evolution will continue to expand and innovate thanks to powerful digital networks transforming regional businesses to globally integrated enterprises, and global enterprises to reach regional resources. What are the requirements and barriers for this new business model?

**Session 6:** *Technology Trends for the Factory of the Future*  
New manufacturing technologies to enable production of innovative products, drive resource efficiencies to lower costs, and provide better communication and satisfaction with customers. What are these technologies, materials, and processes on the horizon?

Speakers are expected to present policy views supporting and defining manufacturing megatrends such as the digitalization of industry, challenges for SMEs in the global marketplace, manufacturing intelligence, social innovation as a driver for new products, services, and technologies, financial challenges that affect industrialized and emerging economies, the circular economy and zero waste, and other disruptive technologies.

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## ***IMS can...***

- ***Help in formation of collaborative federations***
- ***Provide expert-assisted clustering activities***
- ***Create new platforms to assist SMEs adoption of I4.0***
- ***World Manufacturing Forum - global platform to discuss manufacturing challenges***

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***Thank you!***