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Drivers of Digitalisation: What is Digitalisation and Why can it Change so much?

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DHBW
Duale Hochschule Baden-Württemberg

Abstract
Digital Transformation is often misunderstood as a mere collection of computer-based technologies which allow for more efficient processes and possibly new product or service features. The change brought about by digitalisation however is more fundamental. The keynote will present and discuss the underlying powers of change which drive the digital transformation and which need to be understood in order to grasp and utliize its full powers of “creative destruction”.

Biography
Prof. Dr. Gregor Hopf received his PhD at the London School of Economics and is Professor for Digital Transformation at Baden-Württemberg’s State Cooperative University. In his research he specialises on questions of digital transformation namely online business models and online communication. Until 2016 he was the Head of the Taskforce for Digital Transformation of the State of Baden-Württemberg, coordinating all aspects of the government’s digital transformation agenda directly reporting to the prime minister.

How can a supplier help its customers fight climate change in the semiconductor industry? -The Air Liquide case-

D. Meneses
Group VP Sustainability
Air Liquide, Paris, France

Abstract
Air Liquide is a world leader in gases, technologies and services for industry and health. Its strategy for profitable growth over the long-term is that of a customer-centric transformation. It is based on operational excellence and the quality of its investments, on open innovation and the network organization already implemented by the Group worldwide. **Air Liquide's ambition is to be a leader in its industry, deliver long-term performance and contribute to sustainability.**

Air Liquide's performance and its sustainability commitment go hand in hand. This commitment is key for both motivating the Group's teams, nurturing the long-term trust of stakeholders and the Company's long-term sustainability. All of the Group's businesses are rolled out in a way that contributes to major environmental and societal challenges, providing industrial, transportation and healthcare solutions. **These challenges, such as the climate and air quality, are growth drivers for Air Liquide.** The Group is a responsible industry player, and at the end of 2018 **committed to reducing the carbon intensity of its operations.** Air Liquide contributes through its business and its commitment to reach certain Sustainable Development Goals (SDGs) introduced by the UN to eradicate poverty, protect the planet and guarantee prosperity for all by 2030. To illustrate this contribution, environmental and societal achievements are associated with the relevant SDGs in the performance section of this report.
As part of its global approach to the climate, **Air Liquide has set the most ambitious objectives in its sector.** Known as ACE, these objectives break down as follows:

Assets (A)
Within its activities, including production, distribution and services, Air Liquide is committed to reducing its carbon intensity (a) by 30% by 2025, based on its 2015 emission levels.

Customers (C)
With its customers, the Group is also committed to a sustainable industry by promoting low-carbon solutions and developing new solutions.

Ecosystems (E)
With ecosystems, via an active dialog with all players (public authorities, industrial partners, NGOs, etc.), Air Liquide is contributing to the development of a low-carbon society, notably by developing biomethane for industry and transport and promoting hydrogen which, in both terms of mobility and energy, will play a key role in the fight against climate change and energy transition.

For Air Liquide, strengthening dialog with Group employees, customers and patients, shareholders, suppliers, local communities and the public sphere is a strategic objective which contributes directly to the responsible growth that the Group seeks to implement. Through these ongoing discussions, the Group is committed to take into account their issues, identify priority development issues and share its ambition to contribute to a more sustainable world.

In particular, with its customers, the Group is committed to working towards a clean and sustainable industry. Thanks to its essential molecules management (oxygen, hydrogen, carbon dioxide…) and the in-depth knowledge of its customers' processes, Air Liquide offers technologies which allow them to improve

the energy efficiency of their industrial processes and reduce their emissions.

Air Liquide has identified two key drivers to reach this objective:

(1) Rolling out low-carbon offerings and solutions
Air Liquide provides its customers with the possibility of outsourcing some of their processes in order to pool assets and thus reduce the amount of energy used by up to 20%. The Group is also developing offerings which will reduce transport related emissions, in particular through small production units installed at customers' sites and new-generation cylinders which are 40% lighter than those made of steel. To improve the energy efficiency of combustion in the steel and glass industries, Air Liquide provides oxy-combustion solutions. This process consists of enriching air with oxygen to reduce energy consumption.

(2) Co-developing innovative processes with its customers
Air Liquide is working in partnership with its customers to introduce new solutions that will reduce the environmental footprint in various business areas:
either by reducing, where possible, the CO2 emissions of its customers by offering innovative solutions (EnScribe offer for semiconductor industry, for example);
or by capturing CO2 to give it a second life (CCUS – Carbon Capture, Utilization and Storage)
or by storing it permanently (CCS – Carbon Capture and Storage, in depleted offshore natural gas reserves, for example).

Biography
David Meneses joined Air Liquide in 1996 and is **currently Group Vice-President Sustainability.** Based in Paris, he reports to Guy Salzgeber, Executive Vice-President and member of the Group's Executive Committee. Throughout his career at Air Liquide, David has always been engaged in environmental protection and in his current position, his commitment is a determining factor in structuring the Group's Sustainability decisions and in particular setting and deploying the Group's climate objectives.

In 2016, David worked on the Airgas project (acquisition of 13 billion dollars in the United States), in charge of integrating all our Packaged Gas activities into the Airgas structure in the United States. From 2014 to 2015, David was responsible for Air Liquide's Packaged Gas business in the US. Prior to joining Houston, he was Managing Director of Air Liquide's Caribbean & Central America business, based in Santo Domingo, Dominican Republic, where he oversaw Air Liquide's activities in Panama, Costa Rica, the French West Indies and the Dominican Republic.

David began his career at Air Liquide in 1996 in R&D in France and Japan. He then held numerous positions of increasing responsibility in business development, sales and marketing, operations control and strategic planning, both in France and Japan.
David holds a Master of Science with a major in Chemistry and a minor in Physics of the École Supérieure de Physique et Chimie Industrielles de la Ville de Paris (ESPCI) and a Post-Graduate in Process Engineering from Paris University, where he finished top of the year.

AMLS Hybrid Implant Technology and Product

G. Horn
Director
Middlesex Industries SA, Sorengo, Switzerland

Abstract
Automated **M**aterial **L**ogistic **S**ystems (AMLS) are the infrastructures of modern manufacturing. In semiconductor factories there have been a) **M**anual **D**iscrete **L**ot (**MDL**), b) **A**utomated Discrete **V**ehicle (**DV**), and c) **A**synchronous **T**rack (**AT**) Work in Process transports employed. DV and AT systems span the 200 to 300 mm Wafer format manufacturing. Capabilities and shortcomings characterize each of the above. Integrating the two is superior to either one alone. A new technology c) Hybrid, is the implantation of AT networks into existing DV installations.

b) DISCRETE VEHICLE (DV) AMLS. Conceptually simple discrete vehicle delivery is popular. Discrete vehicles delivering wafer lots is easily understood. It is exactly as manual delivery before, but automated. Also easily understood is the dropping of wafer lots from overhead. Therefore, AMSL systems combining these concepts are dominant. They simply automate the manual delivery method. But discrete delivery logistics has no absolute mathematical solution. It works with heuristics. Capacity constraints and system instability, requiring storage, are the draw backs.

c) AT NETWORKS. Asynchronous Track AMLS is based on continuous flow of work, massively parallel, and asynchronous. Such networks are always, and immediately available to transport, without capacity constraints. And can respond to load spikes, eliminating instability. And so, reduce fab cycle times. However, they need external hoists to connect to tools.

d) DV & AT HYBRID AMLS. Asynchronous Track (AT) network island implants into Automated Discrete Vehicle (DV) AMLS impart greatly increased fab capacity, (balanced process capacities).

Ref: Nonlinear growth of Variance in the Process Gaps. A cause of long Cycle times. G. W Horn, W. Podgorski, PhD, CSTIC, 2020

Biography
George W. Horn

Mr. Horn received his BA degree from Harvard University in 1961, and his BS/MS degree in Applied Physics in 1963, also from Harvard University. He spent 7 years working at Ilikon Corporation in space technology. The company was a contractor for the Gemini and Apollo space programs. Later he focused on manufacturing science and statistical process control. He is a past director of the Washington based Automation Forum.
During his years at Ilikon he served as Director of Applied Physics (Special Applications of Kinetic Theory). In 1970 Mr. Horn joined Middlesex General Industries as a founder, and served there as Applications Manager. In 1998 He founded Middlesex Industries SA, Switzerland and Middlesex Industries KK in Japan. He now serves as Chairmen for all Middlesex corporations. Mr. Horn has several publications and holds patents related to upper atmosphere simulation, and manufacturing technologies. He has developed the guiding principles for AMHS in Clean manufacturing industries such as Disk Memory Media, Pharma, and primarily Front end Semiconductors, concurrently developing the principles for conveyor based transport of Silicon Wafer Carriers. Globally first, his design was used to build integrated AMHS, direct tool to tool method, in IC manufacturing. His latest studies in AMHS are published in IEEE transactions. He is holder of numerous recent US, China, Taiwan, EU, and Korea patents in AMHS technology.

Mr. Horn is a 20-year resident of Switzerland, where he lives today.

Cost-effective Automation for Legacy Factories

D. Suerich
Product Evangelist
PEER Group, Kitchener, Canada

Abstract
The Industrial Internet of Things (IIOT) and rise of 5G have increased demand for electronics, and have introduced renewed need for automation at existing 200mm facilities. These “legacy” factories already run at full capacity and have little or no room for expansion, so manufacturers are seeking innovative ways to introduce Smart Manufacturing initiatives, increase productivity, and optimize throughput and yield to meet the increased demands. New facilities built to support older nodes sizes also want to capture market share, and have the same needs as their legacy counterparts.
Although older node sizes and technologies are back in fashion, that doesn’t mean these facilities are limited to outdated manufacturing paradigms. Ambitious factories are looking at hyper-automated 300mm facilities to learn best-in-class methods for deploying automation and advanced manufacturing techniques. The SEMI® automation standards related to 300mm manufacturing describe efficient ways to implement automation, and these same models can be used in any facility, new or retrofit, to achieve major gains.
PEER Group® provides products and solutions (including our PEER FACTORY® Station Controller, PFSC™) to rapidly update factory-wide connectivity, data collection, and control systems and allow any factory to integrate new and existing equipment efficiently. We help customers leverage best practices for factory automation and enable the latest advancements in analytics, scheduling, advanced process control, and predictive maintenance.

Biography
Doug Suerich is Product Evangelist at The PEER Group Inc., the semiconductor industry’s leading supplier of factory automation software for smart manufacturing and Industry 4.0. Doug focuses on big data and remote connectivity solutions that help manufacturers collaborate securely on tools and data in production environments. A passionate advocate for smart manufacturing, Doug serves as an active member of the SEMI® SMART Manufacturing Technology Community, Americas Chapter.

Doug has over 20 years of experience leading software teams for a variety of industries including semiconductor, manufacturing, and transportation. Most recently, he was involved in architecting PEER Group’s remote connectivity solution, Remicus™, and he was a champion in promoting the use of cloud computing and latest-generation web technologies.

Prior to joining PEER Group, Doug was a software development manager, automation engineer, information systems specialist, and consultant. He has extensive experience designing and integrating robust automation software solutions. Doug holds a Bachelor of Applied Science with Honours in System Design Engineering from the University of Waterloo.

Correct Material Selection and Life-Time Prediction of Elastomer Parts Using FEA Simulations

M. Gulcur
Material Development Manager
Trelleborg Sealing Solutions, Tewkesbury, United Kingdom

Abstract
Choosing the right elastomer sealing material has utmost importance to maintain vacuum integrity in semiconductor processes therefore keeping the tool downtimes at minimum. Qualification of a new elastomer sealing material brings some risks for the end user as installing a new material can cause contamination or premature failures which can cause more damage than the benefits of the new sealing material. At this point, it is important for an elastomer part manufacturer to provide relevant data to prove the suitability of the material to the application such as plasma exposure tests in various different process gasses, outgassing, trace metal and extractables analyses results and to help understand other factors like the damping behaviour of the material.
During a new material qualification another important topic is to determination of the lifetime of the sealing materials. It is extremely important for semiconductor OEMs to specify the right sealing material and microchip manufacturers to maximize the mean-time between cleans (MTBC). Sealing force created by a sealing part and its decrease over time. By using correct tests on this behaviour for input in advanced Finite Elemental Analysis (FEA), it is possible to predict the lifetime of the sealing parts by simulation. Such an analysis allows to capture the influence of both material properties and seal design on the lifetime. By combining data measured at elevated temperatures, a lifetime prediction for long time scales can be carried out based on test data of short time scales. The FEA will provide a prediction on the loss of sealing force over years and these results allow to estimate how many years the function of the seal can be fulfilled.

Biography
Murat Gulcur is Material Development Manager at Trelleborg Sealing Solutions UK. He has 17 years of experience in the field of elastomer technology and semiconductors, mainly single molecule/organic electronics. He holds a PhD degree in chemistry from Durham University (UK), has co-authored research papers in renowned journals and holds several patents.

Technology and Equipment Roadmaps Enabling the More-than-Moore Wave

M. Rosa
Sr Director, Technical Marketing
Applied Materials, Santa Clara, United States

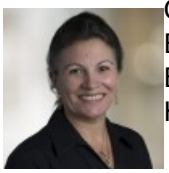
Abstract
During the past 20 years, the semiconductor industry has seen multiple transitions in enabling technologies supporting the growth of new markets, from what was the PC era to the era of Mobility and Social Media to what has now come to be defined as the era of AI, Industry 4.0, and Big Data. With each transition, these enabling device technologies also evolved—some moving to smaller nodes or larger wafer sizes, others requiring new materials or new unit process technologies. And, while the advanced-node devices continue to scale in support of these transitions, the growing segment of device technologies known as More-than-Moore (MtM) has swelled in volume to the point where none of the MtM market segments today (IoT, communications, automotive, power, and sensors) would be possible without these enabling device technologies.

This presentation addresses the pivotal role MtM device technologies have played amidst the waves of industry transition. Through a lens of nine distinct megatrends currently shaping our society, it looks at what the future holds for this growing class of enabling device technologies. Along the way, it also discusses on-wafer technology inflections and their impact on product roadmaps of equipment providers in this space. Finally, it highlights several key device-level industry segments and discusses the key material or unit process technologies enabling next-generation capabilities in each, together with the role Applied Materials' 200mm/300mm MtM equipment plays delivering them.

Biography
Mike and his team are responsible for defining strategic and technical product marketing and communications, technology inflections, and roadmap requirements for the continued development of ≤200mm and 300mm semiconductor equipment and processes for More-than-Moore (MtM) device technologies. Mike also supports the MtM Equipment group in a strategic business development capacity, focusing on M&A and inorganic revenue generation. With over 20 years of technology-focused product and business development experience Mike brings to his role significant MtM domain knowledge and technology commercialization expertise. Before joining Applied Materials, he held various contributor level and senior leadership positions within the United States and Australia, working for technology-focused companies that include Xerox Corp., PARC Inc., Australian Microelectronics Centre (AMC) and National ICT Australia (NICTA).

He holds a Ph.D. in MEMS / Microsystems design and fabrication and an MBA with dual majors in Marketing and Business Strategy. He has authored more than 40 journal and conference publications and holds more than 28 U.S. patents concerning various applications of MtM technology.

Successful Strategies to Attract Young Professionals



C. Pelissier
Business Line Manager EMEA
Edwards Ltd, Semiconductor, Burgess Hill, United Kingdom

Abstract
At Edwards we believe that the successful attraction of talented young professionals to our industry comes from listening and understanding what is important to young people and what they want to achieve in their careers. Our attraction strategy aims to connect with our audiences in more meaningful and emotional ways – we know young people want to learn and opportunities for career development are crucial, but they also want to make a difference, and sustainability has never been more important.

Today's young adults are having to deal with a range of issues which can impact the career choices they make. From the impact of COVID-19 and action on climate change, to challenging cultural attitudes, including those related to gender, racial, mental and physical health discrimination – we believe that businesses who are committed to improving people's everyday lives, as well as protecting our planet offer the most appeal to young people.

Our engagement with the next generation of young professionals focuses on the important issues that matter to them. At Edwards we look to do this through our:
- targeted outreach and social media brand engagement and its real connection to protecting the environment
- global career and development opportunities offered both in our organisation and the semiconductor industry
- promotion of diverse role models representing the wide fabric of the Edwards community and the different careers available

Biography
Christine Pelissier is Business Line Manager EMEA at Edwards Vacuum. She has over 25 years' experience successfully growing markets and customers in a high-tech environment and has broad international experience building networks in North America, Europe, and Asia. Prior to joining Edwards, Christine has held senior strategic marketing positions, business development, operations and applications roles with Applied Materials, KLA-Tencor and Soitec.

Skills in the Workforce and People in Processes

A. C. Zimmer
Executive Search & Selection Consultant
ZIAN & Co industrial consulting and recruitment,
Munich, Germany

Abstract

Optimizing people and teams for semiconductor fab manufacturing processes
• Go away from vertical structures and organizations, move into horizontal organizations
• Relocate responsibility to where it is sensible, i. e. to the front-office people handling the job currently at hand
• Create specific, cross-functional teams to deal with specific tasks
• Make sure the best prepared person will lead the team, not the most senior
• Everybody should be aware of the fact that he/she might be asked to step down, if somebody else is better prepared to handle the job at hand
• Stop penny-pinching!

Strategies in attracting young professionals to the semiconductor industry
• Go into schools and universities
• Invite young “high potentials” into the company
• Encourage external support by supporting your local school /university
• Describe exactly why semi is attractive, but tell them: You’ll become addicted, once you’ve joined the branch!
• Communicate, communicate, communicate!

Discussions about critical new skills needed in the microelectronics workforce
• Obviously, the willingness to follow up with the development and the requirements in new technologies and applications
• Furthermore, the willingness “never stop learning”; open communication; flexibility, both horizontally and vertically; give orders and take orders; listen to people: colleagues, clients, suppliers; give and accept remuneration packages which will consider the performance of the company, of the team, and of yourself

Talks on transferring skills from leading experts to younger people and new hires as part of succession planning
• Start implementing new ideas and visions into the educational, long-term plan of new hires and internal “high potentials”
• Support external schooling, if necessary
• Plan for enough time for classes “on the job”
• Bring in retired people, who might be happy to lend a helping hand
• Discuss the career path with employers at least once a year AND STICK TO IT!

Business insights for anticipating future skills needs
• Home office work
• New communications
• Faster decisions, locally, not at HQ

• More responsibility delegated
• More room for improvement suggestions in terms of organizational and decisional processes
• Stop controlling, let the people do their job

Biography
Personnel and industrial consultant with 20+ years experience. Specialist for High-End technologies (LED, PV, semiconductor, electronics, test & measurement, etc.). Active throughout Europe. Customers in Europe, USA, Asia. Permanent visitor of leading exhibitions and conferences ww (INTERSOLAR [EU, USA, PRC], EU PV SEC, SEMICON, LIGHT&BUILDING, ELECTRONICA, PRODUCTRONICA). Excellent international peer-network (Web 2.0). Fluent in three languages, written and spoken. Experienced sales & project manager, coach, used to handle budgets and lead personnel. Customer, target and solution oriented. 10 years professional international industry experience in controlling, marketing, sales, change management, re-engineering. Team builder