Industry 4.0 and Workforce for Tomorrow

Non-Technical, Career-Sustaining Competencies for a Workforce of a Digitally Transforming Manufacturing Enterprise

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Panel – Industry 4.0 and the Workforce of Tomorrow

Chaired by Holger Stamm

Director at PwC Strategy

- ***Jean-Paul Nauzin, Vice President Marketing & Technology, Fives' Steel Business unit and Sales Director of Fives Stein, Fives***

- ***Jose Favilla, Worldwide Executive Director & Partner, Industry Solutions, IBM***

- ***Eric Vitse, Chief Technology Officer, Liberty House Group***

My role is to frame the discussion that is to follow

Digitization is the transformation from analog to digital or digital representation of a physical item with the goal to digitize and automate processes or workflows.

Digitally Transforming Enterprise

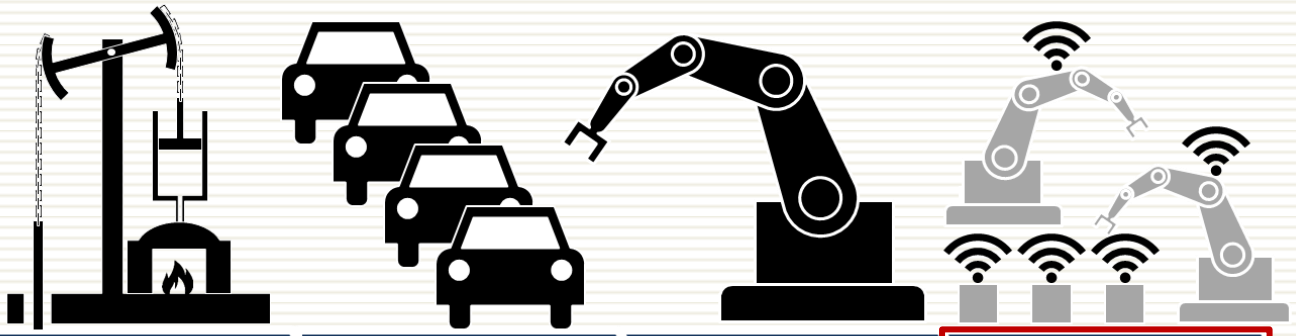
Digital Business is the creation of new business designs by blurring the digital and physical worlds. It promises to usher in an unprecedented convergence of people, business and things that disrupts existing business models - even those born of the Internet and e-business eras

https://www.forbes.com/sites/gartnergroup/2014/05/07/digital-business-is-everyones-business/#660921477f82

Digital Transformation is the novel use of digital technology to solve traditional problems. These digital solutions enable - other than efficiency via automation - new types of innovation and creativity, rather than simply enhance and support traditional methods. Success is anchored in both digital business and digitization.

https://cn.bing.com/search?q=https://en.wikipedia.org/wiki/Digital_transformation&PC=MENEPB

Industry and Manufacturing Revolution



Industrial Revolution	1st	2nd	3rd	4th
	Mechanization, water power, steam power	Mass production, assembly line, electricity	Computer and automation	Cyber Physical Systems

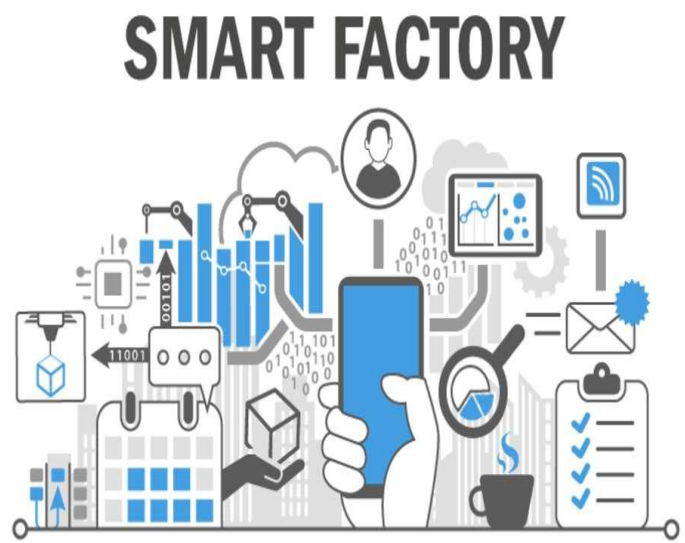
Source: en.wikipedia.org/wiki/Industry_4.0

Manufacturing Revolution	1st	2nd	3rd	4th
	Henry Ford`s moving assembly line, mass production, dedicated manufacturing	Invention of NC, CNC, flexible manufacturing	Rise of global competition, reconfigurable manufacturing	Mass customization, globalization, interconnectivity, smart manufacturing

Question for reflection

What are the ramifications for what a workforce needs to know to succeed in a digitally transforming enterprise?

Ramifications of Digitization



- **Interoperability**: The ability of machines, devices, sensors, and people to connect and communicate with each other via the Internet of Things (IoT) or the Internet of People (IoP).
- **Information transparency**: The ability of information systems to create a virtual copy of the physical world by enriching digital plant models with sensor data. This requires the aggregation of raw sensor data to higher-value context information.
- **Technical assistance**: First, the ability of assistance systems to support humans by aggregating and visualizing information comprehensibly for making informed decisions and solving urgent problems on short notice. Second, the ability of cyber physical systems to physically support humans by conducting a range of tasks that are unpleasant, too exhausting, or unsafe for their human co-workers.
- **Decentralized decisions**: The ability of cyber physical systems to make decisions on their own and to perform their tasks as autonomously as possible. Only in the case of exceptions, interferences, or conflicting goals, are tasks delegated to a higher level.

Upskilling in a Non-Digitally Transforming Enterprise

Enhancing talent involves improving the skills of a person, usually through training, so that they will be better at firefighting and policing.

Talent = Experience + Skills + Training

Upskilling in a Digitally Transforming Enterprise

In addition to being able to adapt to advances in technology, the person needs to be able to communicate and relate to people (from different disciplines, cultures, values) who may not be co-located. Talent in a digitally transforming enterprise (**$Talent_{dt}$**) can loosely be expressed as follows:

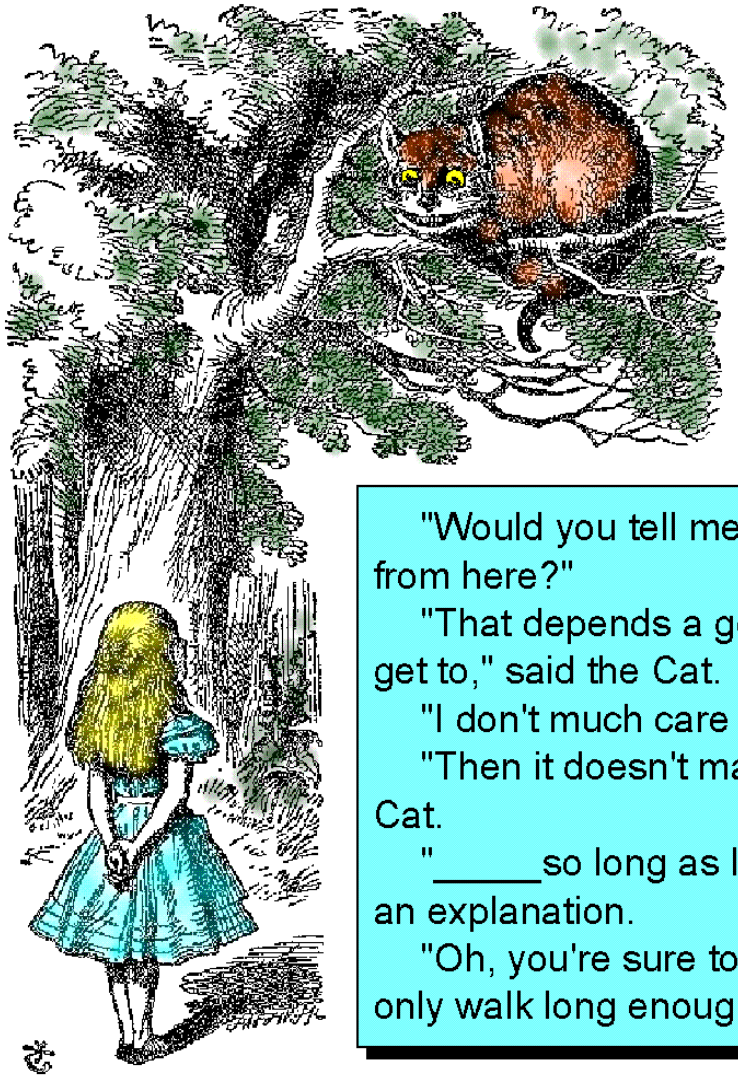
$Talent_{dt}$ = Talent + Generative Learning

Generative learning is learning that enhances our capacity to innovate and create. Foundational to it is the active integration of new ideas with the learner's existing schemata.

We cannot teach people how to learn what is needed, unlearn what is no longer relevant and re-learn that which is still needed.

We can provide an opportunity for people to learn by reflecting on doing (Experiential Learning).

Generative Learning
Tool User and Tool Maker



Lewis Carroll, *Alice in Wonderland*, 1865.

"Would you tell me, please, which way I ought to go from here?"

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where_____" said Alice.

"Then it doesn't matter which way you go," said the Cat.

"_____so long as I get *somewhere*," Alice added as an explanation.

"Oh, you're sure to do that," said the Cat, "if you only walk long enough."

TAKE AWAYS

1. Importance of having a goal.
2. Tool User facilitates execution
3. Tool Maker frames the problem
4. Both are valued in industry, government and academia.

DECISION

What non-technical, career-sustaining competencies are foundational to generative learning?

Career-Sustaining Competencies for Generative Learning

1. *The ability **to learn, unlearn and relearn** through reflection on doing and the associated creation and articulation of knowledge.*
2. *The ability **to speculate** about the future and to identify gaps in state of the art or state of practice in ways that may lead to innovation.* One cannot innovate without being able to identify gaps that are foundational to generative learning.
3. *The ability **to ask questions, actively listen, reflect** and identify opportunities worthy of further investigation.* Questions embody gaps in a person's knowledge and the answers may lead to generative learning.
4. *The ability **to make decisions** to move forward using incomplete information.* Innovation involves risk. Generative learning has utility only when a decision is made to move forward.
5. *The ability **to assess and think critically** (deductive reasoning and inductive speculation) and identify a way forward.*

Panelists – Prompts to Start the Dialog

1. What is specific to the steel industry as the backbone of the industrial value chain, highly integrated and as central building block for the modernization of the economy and society?
2. What is the role of the steel industry and what needs to be addressed to the education system to create “digital engineers”?
3. What is needed to motivate the people that constitute the IoP to join/form a generative learning organization? And how does the culture of the steel industry has to change to support this?
4. Taking into account that the steel industry in the past was very conservative and reluctant to change how can steel companies can position themselves as attractive employers on the market, even vis-à-vis global IT groups?

Mistree, F., Allen J.K. and Mistree D.F., “Non-Technical, Career-Sustaining Competencies for a Workforce of a Digitally Transforming Manufacturing Enterprise,” 2019 Future Steel Forum, Budapest, Hungary, September 25-26, 2019.

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