Industry X: Products for the Future

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Abstract

The authors of this paper are introducing a new concept for definition of the future of Industry 4.0 and are presenting details and characteristics of the concept Industry X in regard to the current global digitalization of Automotive Industry. Starting from the Mechanical Age (Industry 1.0) and until the Digital Age (Industry 4.0) which is already ongoing, the authors are identifying and defining the shape of the nearby future through the so called "Quantum Age" or the next step in the Industrial Revolution: Industry X.

Keywords: industry, digitalization, automotive, future, industry 4.0, smart products, predictions, concepts

1. Industry X and the "Legend of X"

The main and most important question that is nowadays on all stakeholders from all the industries is "How to define the future?" We look around and everything is more and more digitalized. Starting from our satellite alarm clock in the morning, going to work in autonomous vehicles, shopping everyday goods with help from a digital assistant and delivered by drones and up to automatically creating night scenes in our smart homes, we are surrounded by technology which was already envisioned by humans a few years ago and included in the Industry 4.0 or the "Digital Age" Can we go further with this development? Which is the next step? What is future? Is the future already here?
The logical step after Industry 4.0 is Industry 5.0, but still the number is too small in comparison with the leap that the technology is taking. How many increments to have for this? Since the future is still not clearly defined and in constant change then why not to use a general variable to define the "Quantum Age": Industry X.

What is legend behind the letter "X"? Let's remember together when we first encountered this letter in a context outside of learning the alphabet. It is clear for most of us, "x" was the "mysterious" symbol used in the mathematical equations to mark the undefined value which actually represented the goal of the operation. Basically X is a symbol of a discovery waiting to be made, and in this mathematical example, this discovery can be done through algorithms. How can we apply any algorithms to discover the X from the Industry?
Until we discover the concept let's look at telecommunication industry. From 0G which was the analog wheel telephones (pre-cellular devices), 2G GSM networks, 3G GPRS

and EDGE networks, 4G and nowadays high speed 5G protocols we are asking one question how many G's are going to be?

Coming back to the Industry we are have the same question: How many X's are there in the "Industry"?
Therefore, ***the "X" from "Industry X" represents the same undefined value towards which we all must evolve!***

1.1 How many "X-s"?

How many X's are there in the "Industry"? If we look at the timeline starting with the 18th century all the way to the present day and peeking into the future, we can say for certain that there could be no upper limit for what value X could take in regard to defining the Industrial Ages.
What is certain is that the frequency with which X was incremented increased significantly in the XXI century.

And who knows, maybe in the more-or-less near future, jobs like quantum computer scientist, quantum communication (or quantum encryption), cognitive computing or brain-machine interface could be more than just "Buzz-words". And are we as Humanity be in our second version? Will we be Humanity 2.0 or Humanity X, mirroring the evolution of the Industry? Can we also increment our society in order to be prepared for The Future?

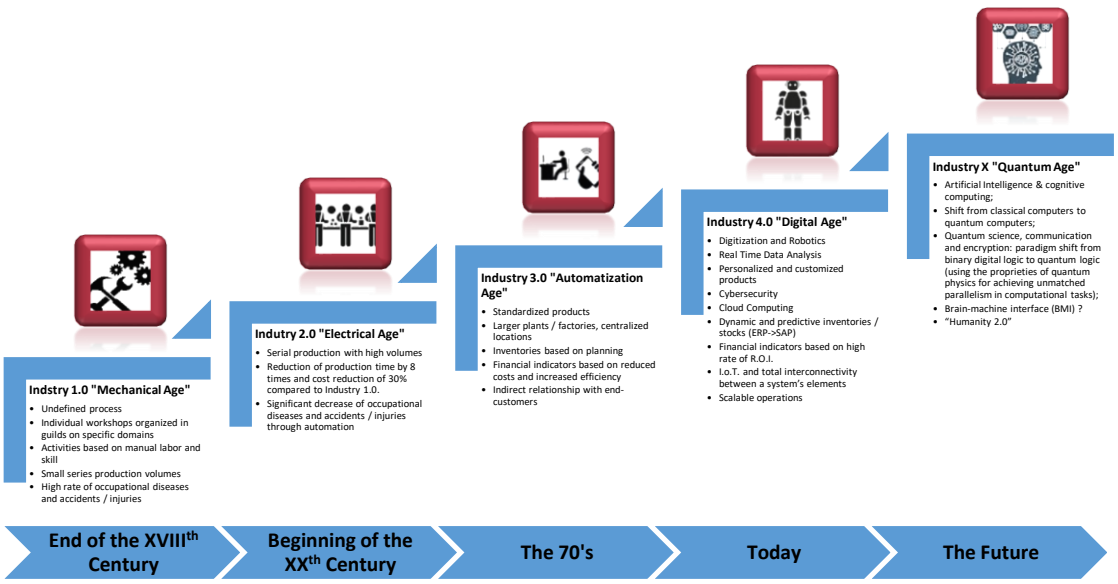


Figure 1. History of Industrial Evolution

And of course, the Future is not fully predictable but there are a few emerging theories in regard to new careers or specialized roles inside Organizations, such as:

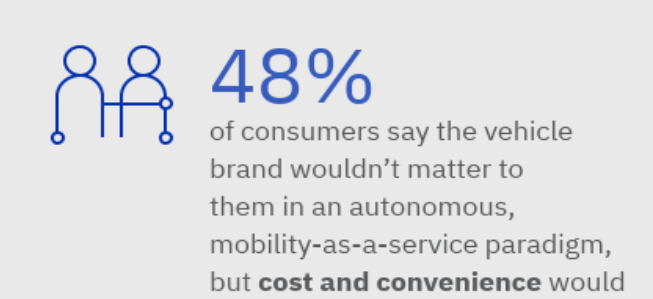
- Artificial Intelligence (AI) scientists (experts beyond the current level of A.I. development);

- Augmented Reality (AR) and Virtual Reality (VR) engineers / designers / architects;
- Quantum (computer) scientist, Quantum computer architect;
- Internet of Things (IoT) consultants / experts.

2. Industry X – Predictions about Automotive Industry

Although 2030 doesn't seem like so far in the future right now, according to the data acquired in 2019 by IBM Institute for Business Value - IBV (through a twin-survey program - one addressed to Automotive Executives and one addressed to Automotive Consumers), we are about to face significant changes in this dynamic industry, even though we might not realize this just now (even though the recent sanitary and semiconductor crisis might have *hinted* to us that change is coming).
In this regard, there are some interesting predictions for the Automotive Industry for the 2030 *landmark*, of which we can mention a few key points[1]:

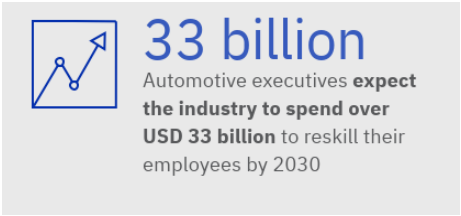
- **Reinvigorating the brand:** both consumers and automotive executives put less emphasis on the well-established brands in an *soon-to-be* Autonomous era: manufacturers and brands need to prioritize in-vehicle digital experiences in order to stand out "from the crowd", because having a world-wide recognized logo on the front of the radiator grill will not be sufficient if the experience of the user will be stuck in the "analog" era. Given the fact that 48% of consumers say that vehicle brand wouldn't matter to them in an autonomous era, but cost and convenience would matter says a lot about the shape that the consumer market is predicted to take by the end of this decade.



- **Reinventing the experience - for both consumers and employees:** applying digital technologies to optimize processes and reduce costs won't be enough as this is already a well-known strong point of today's Industry paradigm. What is essential is to use the current and upcoming digital technologies to reinvent experiences, focus, and create new ways to work thus bringing previously unattainable value.

- **Reinforcing the expertise:** the shortage of expertise already impacts the industry today and this should come to no surprise: finding the right skills in house while also accessing them throughout the ecosystem are critical to a company's success in the upcoming years. That is why, half of the automotive

executives that took part in IBV's survey state that in order to succeed or even **survive**, their organization will have to "digitally reinvent themselves". The same executives estimate that the industry will spend at least 33 billion USD to reskill their employees by 2030: that means over 4 billion dollars annually by the end of the decade.



Citing the same source from IBV, the predictions for Automotive Industry for 2030 include also the following points:

- Every person will own 15 connected devices;
- Up to 15 percent of new cars sold could be fully autonomous by 2030;
- Software will account for 90 percent of innovations in the vehicle and lines of code will be a hundredfold what they are today;
- Car-sharing could make up 26 percent of global miles traveled.

What is especially interesting for us from this list is the statement that "*software will account for 90% of the innovations*" which signals the fact that from the physical (or construction) point of view, vehicles could have reached their pinnacle in regard to innovation - and let's be honest, this can be seen nowadays too: there is little improvement or innovation room for the physical layout of a vehicle, since everything is standardized and streamlined and premium car lines really use state-of-the art materials for their products.

However, in regard to the software of the vehicles, "the sky is the limit" and only time will tell how many innovations and technologies we will have embedded in our vehicles. For example, imagine that even though we'll still have the classical "front and rear" seats layout, who says that we won't be able to use this setup in creative ways, like having front seat passengers facing the rear-seat passengers around an "*in vehicle* coffee table" while the car autonomously drives itself to the next destination. Who will need a dashboard if the vehicle can recognize voice commands and drive autonomously to the designated place? Do we need a total redesign of a vehicle's construction process to achieve this? No. Do we need hundredfold lines of code, intelligent technologies and intelligent regulations to achieve this (by 2030)? Yes!

Coming back to IBV's survey, as shown in the infographic below, we can see that for consumers, configuring their vehicles in a personalized manner and having "healing functions" for their vehicles represent one of their highest interest levels. Additionally, vehicles will have to have learning capabilities to adapt themselves on-the-go, according to their current exploitation environment. This information emphasizes the idea that automotive manufacturers will have to "Reinvigorate the brand" and "Reinvent the experiences".

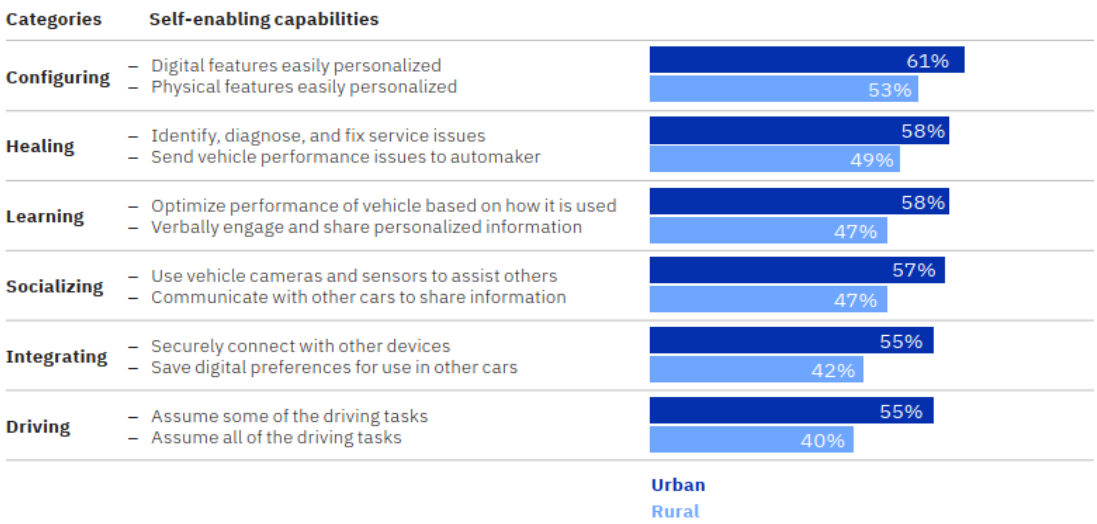


Figure 2. Consumer Interest in new capabilities for the future vehicles (according to IBV Survey)

3. Products for the future: what can we learn from fiction and how can we create these products

What about products for the future? Let's see what we can learn from fiction, more specifically from the science-fiction movies of the past that had an impact on our culture. Let's see how we perceive this movies today, considering the technological advancements of the 21st century.

Moreover, we would like to invite you to a thought experiment: try to imagine how the present day youth will see this movies. Or better still, ask them!
Will they understand why "*Star Trek*" (1966) and "*2001: A space Odyssey*" (1968) seemed so ground-breaking at their time? (Except the interstellar space travel of-course, which is still SF for us even today). Can they understand that in 1966 having a hand-held device that allowed you to connect with your acquaintances seemed to be science-fiction? Can they understand that back in 1968 having an A.I. that recognizes and responds to voice commands seemed to be "out of this world"? And indeed, video phone calls were a S.F. element in 1968. Try explaining that to them, especially if they had online-school in the past year. Will today's youth ask "Alexa", "Cortana" or "Google Assistant" for an instant search of these movie's synopsis over the web? Will they realize that this gadgets were only fiction a few decades ago?
Could they understand that the self-driving cars shown in "*Total Recall*" or "*Demolition Man*" seemed to be a "sci-fi" idea by the time this movies were shot? Or will they dissconsider today's actual self-driving cars saying that they were present since a movie shot in the '90s?

Our point is that we must take into consideration the perception that today's younger generation has over technology and to realize the fact that they will be much more tech-savvy than any generation before: and this is important to understand because we will

have to create, design and implement products that will fit their needs too and it's safe to assume that their needs will be much different from what most of us were accustomed to. Also, today's younger generation will soon join the professional workforce of the tech-industry: now we are not sure if any of this sides is prepared for each other's vision.

Besides the already mentioned movies, other notably influencing motion pictures of the past that represent nowadays mundane gadgets and technologies are:

- "*Metropolis*" (1927): early humanoid robot prototypes
- "*Blade Runner*" (1982): digital billboards, interactive holograms (flying cars not quite "usual" yet ☺)
- "*The Terminator*" (1984): fully autonomous humanoid robots, military drones
- "*Enemy of the State*" (1998): mass surveillance
- "*Minority Report*" (2002): targeted advertising

Leaving the fiction and cinematography behind, there are a few tools at our disposal which we could use in order to create the needed products for the Future. This tools include, but are not limited to:

- Analysis of today's "success stories" and pushing them to the next level;
- Using the lessons-learned concept at its full potential, having comprehensive processes derived from this concept and truly learning from past mistakes;
- Innovating continuously in a scalable manner, while keeping the industry environmentally conscious;
- By using market studies and trends and by adhering to human behavior psychology.

3.1 "We put the future at your fingertips"

So how does our Company put the future at your fingertips? [2]

The products developed and manufactured by us have state of the art technology and materials embedded in their design, and the their area of appliance ranges from "drive authorization systems" (high-tech remote controls with customer specific design and multiple bandwidth capabilities), "haptic feedback touchpads" that seem no different from the precision and sensitivity of a smart device touch-screen, "display switches" that enable the customer to personalize their interface in a variety of ways or the flexible "knob switch" which can be customized to control any household appliance.

For the next years or decades, the "Future Car Concept" created by our Company brings a new meaning to the term "functional environment" by being able to basically transform any surface of the car's interior into a control module. This can be realized using the interactive projection module which will use a light beam to project the desired control interface on any surface and will also recognize the human's input over that light beam. In addition to this the ambient lighting, functional lightning and human-machine-interface modules will be integrated into a single package which can be accessed through a new operation and function concept.

4. How can we futureproof our organizations

Future-proof is a "*buzzword*" nowadays, but besides sounding modern and technical we have to admit that its message is powerful and meaningful: future-proofing is the key process an Organization must establish now in order to exist in the future.

Below, we will discuss seven key points that we think are essential for any Organization that aims to "futureproof" itself in the near future [3], [4].

Watch ever-changing dynamics of their customer's expectations
Admittedly, behind and in front of every digital device is "a" human, today and tomorrow. Talking about humans and studying the human nature hidden behind and in front of these glass (capacitive?) screens and finding the target audience is the base of future-proofing any digital strategy. A "future-proof" digital marketing strategy aims at anticipating, analyzing and defining a buyer profile that would prevail in the future. In simple words, the strategy should aim at identifying and anticipating the change in needs that the customer may experience in the coming time.

No one can possibly predict the future change in customer behavior but a significant amount of change in usage pattern and user's expectations can be defined with meticulously watching the triggers that lead them to purchase and their adaption rate to newer, advanced technologies over time. Once these triggers have been successfully identified, businesses can formulate a future-proof digital strategy that would connect with them and trigger them to convert in future as well.

Rethink past strategies to anticipate future strategies
Looking back at the evolution of the digital landscape, many technologies have changed the way businesses work and many others seem like a far-fetched dream. No technology emerged abruptly out of nowhere; they all evolved from their preceding technologies. A look back at the past strategies can help businesses analyze the patterns of digital evolution and anticipate the future advancements. Like Henry Ford analyzed the consumer demands and came up with a revolutionary idea of the car in the era of horses, we need to use our past experience to think what digital strategies may work for our business in the coming time. Also, follow the digital trends to find a pattern of the digital transformation so that we can formulate future-proof strategies for our business.

Leverage data and information in our advantage
Over the years, businesses have accumulated (at least) trillions of bytes of data surrounding customer behavior. Right from storing and generating data to recognizing the patterns and coming up with unique strategies, data can help the businesses become intelligent and assure success. Leveraging this data into actionable insights can help businesses fool-proof their digital strategies. Business Intelligence systems can also do all the work related to big data and assist the businesses in making informed business decisions. Investing in Business Intelligence systems that analyze stored as well as real-time data can help businesses in future-proofing their digital strategies.

Incorporate the latest mobile technologies
With the unprecedented penetration of mobile phone technology and applications in everyday life (personal and business-wise) not paying heed to mobile technologies might hamper with the digital strategies. Businesses should focus their digitizing efforts around mobile phone offerings. It is crucial to ingrain the latest mobile technologies in business's core strategy to safeguard the efforts in coming time. From the internet of things (IoT) connecting things and people together to other evolving technologies like private clouds, contactless payments, BYOD (Bring Your Own Device), MDM (Mobile Device Management), and block chain for cryptocurrency transfer, there are many technologies that must be included in the digital business strategies to ensure it is ready and future-proof for the mobile age.

Increase scalability and flexibility
Whether the business operates in healthcare, financial services, retail, or government, there is no question that fragmented legacy systems continue to pose a barrier to innovation and action. This puts a strain on both their infrastructure and operational efficiency.
By increasing integration between isolated systems and fragmented data, Organizations will have a more connected foundation enabling them to scale along with new technologies into the future. Whether they would like to add machine learning, AI, or VR technology into the mix, deployment is much easier with this strong foundation in place.

Streamline operations
Having an integrated data platform reduces the overall complexity of the business' operations, team, processes, and solutions. This sets a new baseline for their operating procedures, making it more efficient and freeing-up capacity to execute on new initiatives into the future.

Strategic innovation
In today's business landscape, guessing is no longer an option when it comes to making the next move. Designing an integrated data platform gives an Organization access to insights on how to better serve their customers, identifies areas that are slowing them down, and enables the stakeholders to forecast impacts based on previous results, setting up for long-term success.

4.1 The Lifelong learning Continuum

One way of futureproofing our organizations is by assuring a strong and synergic collaboration with the Educational Institutions, being that at a local, national or global-level. Let's call this collaboration the **Lifelong Learning Continuum** [5]. And why continuum? Because this process has to be a constant positive reaction loop, not a "one-time" event.
Besides this, this iterative process will have a constant positive impact on the Organizations, on the newly formed workforce and on the Educational Institutions,

which can provide well-prepared new generations of personnel by staying in contact with the current and future industry needs, demands and trends.

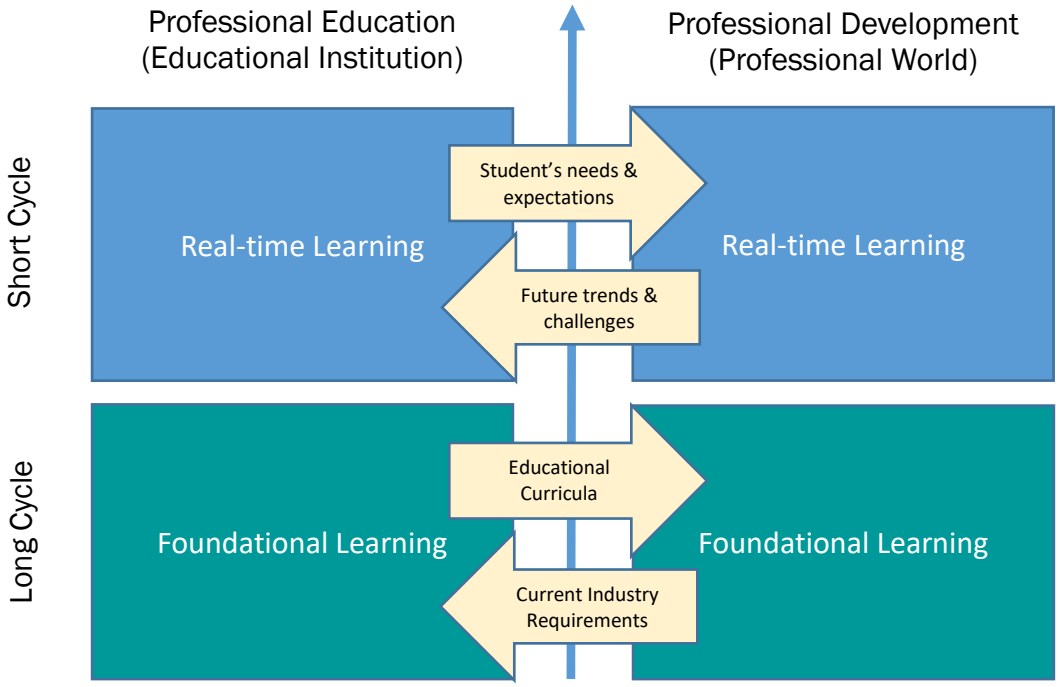


Figure 3. Diagram of the Lifelong Learning Continuum

The Continuum can be implemented in two discrete cycles:

- One "Short Learning Cycle", representing the real-time learning "on the site" of the Organization, with several increments over one year (for example): in this short cycle the communication channels are driven by the student's needs and expectations and future trends and challenges;
- One "Long Learning Cycle", representing the essential foundational learning, provided by the Educational Institution and by Professional World: the communication channels in this cycle are driven by the educational curricula and by the current industry requirements.

As interfaces and communication channels for each cycle, we can define the following:

1. For the "*Short Cycle*" from the "*Professional Education*" to the "*Professional Development*" we have the **Student's needs & expectations** channel, consisting of:
    - Direct communicaiton between Institution and Company;
    - Specific interfaces designed to optimized information flow;
    - Meetins with students' representatives for obtaining information and input.

From the "*Professional Development"* to the "*Professional Education"* we have the **Future trends and challenges** channel, which consists of:

- Inform Educational Institution about the futureContinous updates regarding the Industry evolution and standards;
- Present opportunities and requirements from Industry;
- Provide feedback in regard to student's progress and performance at work.

2. For the "*Long Cycle*" from the "*Professional Education*" to the "*Professional Development*" we have the **Educational Curricula** channel, consisting of:

- Communicate the current educational curricula to the Company;
- Offer a transparent review of student's skill through specific qualification metrics;
- Offer a plan for future improvement and update of Educational Curricula based on the feedback received from the Company

From the "*Professional Development"* to the "*Professional Education"* we have the **Current Industry Requirements** channel, which consists of:

- Continous updates to the Educational Institution in regard to actual Industry requirements;
- Include employees & professionals in the day-to-day teaching cycle of students (double-role personnel);
- Establish dedicated communicaiton teams, channels & interfaces with the Institution.

Of course, this lifelong learning continuum can work only if the two cycles rely on each other and evolve continuously.

5. Conclusions

As we see, there are still many unknown parameters and variables that will form the future – framework of the industry and there are maybe almost as many possible paths for the organizations, the consumers and the society itself to take into that direction. What remains to be seen is which of this paths is the most efficient or sustainable, and unfortunately we cannot rely on the GPS to find it out. What we can rely on is on the never-failing capability of humans to adapt to new environments, new situations and new challenges as well as on the ingenuity of our species which we developed over the countless generations and which helped us not only to overcome obstacles but to shape our ecosystems to our needs.
Maybe for a smooth transition to the next Industrial Age (which is, by the way, "*knocking at our doors*") we won't need to go to huge efforts and "*reinvent the wheel*", but rather just use today's tools and know-how and facilitate and empower the integration of younger generations into the professional world. After all, what better

baseline than this can one have for the strategic development of their Organization for the future?
So, in the end, the "X" remains a mystery, remains the goal of the discovery, just like in the mathematical equations. Weather we are close to find it out or not, remains to be seen.

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