

## EF Trip summary, Dr. Fredrik Bruhn, Eisenhower Fellowships Global Program 2017

Fredrik Bruhn, CEO of Unibap AB (publ) [NASDAQ First North: UNIBAP] and adjunct Professor in Robotics and Avionics at Mälardalen University (MDH) is a recipient of Eisenhower Fellowships Global Program 2017 and has been on Fellowship from April 2 to May 19 of 2017. After completion of the Fellowship, Fredrik was selected as the 2017 James Hovey Fellow as a result of the demonstrated energy and commitment to making the world a better place.

Fredrik's focus for the Fellowship was twofold;

- 1) Understanding an outlook on short, medium, and long term aspects of Artificial Intelligence, Robotics, and Automation and
- 2) Investigate market and societal trends with special focus on displacement of work, wealth concentration, and education associated with "Technological Unemployment".

The Fellowship included 12 cities, around 100 meetings distributed over 9 different states, during 7 weeks. Figure 1 illustrates graphically the itinerary of the Fellowship.

Overall, almost every meeting has strengthened the notion and anticipation that society is facing a major work displacement process, with rapid expansion coming beyond 2025 which will likely lead to societal challenges. The meetings have also largely highlighted a frightening unawareness amongst policy and lawmakers about the rate of change in terms of introduction of AI and applications thereof. The educational gap for workers to participate in the future workforce is rapidly increasing and the educational system is clearly not preparing at the same pace. However, a great deal of awareness is found with individuals, not-for-profit organizations, non-government organization, and philanthropist which establish a base for discussion and action. The EF network and fellows are heavily engaged in the area of Future of Work.

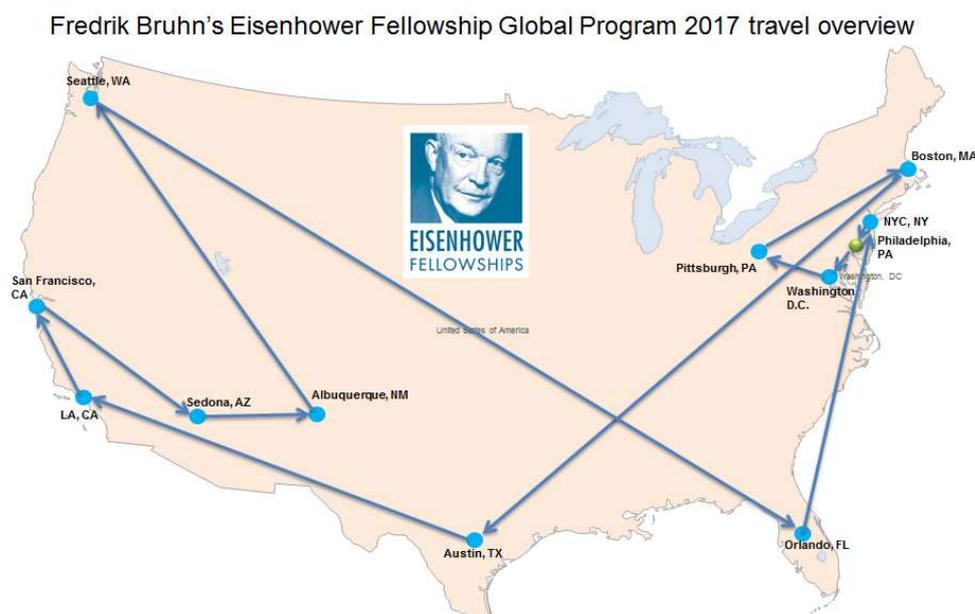


Figure 1. Illustration of Fredrik Bruhn's EF travel over 7 weeks starting and ending in Philadelphia, Pennsylvania (PA).

Much discussion has circulated around the expected future markets, innovation, and commercialization of AI, robotics and automation. A few general comments from the meetings is that the number of very large companies is expected to level out somewhere around 20 to 40 and these companies will likely generate about 90% of the global revenues. Huge giants on the market fueled by massive amount of data generated from human behavior and processes which in turn is used to mine information from. Big Data is the new gold rush.

It is anticipated that technology start-ups, and even existing companies not involved in AI today will have a difficult time surviving 10-20 years in the future. It is expected that a sweeping wave of merger and acquisitions will occur during the time span, given the assumption that most of the generated revenues will be controlled by a few large companies. Hence, the likely scenario for start-ups in the short to medium term is that the best will be acquired and incorporated in a faster pace, while most will fade away. The platform complexities to mine information from the vast amount of data generated will make it increasingly difficult for new players to act on the market.

One very interesting question to analyze further is whether the societies, governments and people will allow a future market ruled by a few giant companies and whether the current legislation regarding market monopolies are strong enough. Some have voiced the idea of completely removing intellectual property rights to create a better level playing field. Although, it is unclear how this could actually be done.

### Why AI now?

The 20-30 year outlook goal for the Fellowship has indeed served to stimulate very interesting discussions, allowing both me and the people I have interviewed to dwell on our wildest fantasies and fears for the future, in reflection of the knowledge we currently possess. This write up represents a summary of the large number of discussions held and basic observations and reflections.

It is generally good to look back through history before looking forward. Looking back 30 years takes us to 1987, to a time where the cold war was still ongoing and the Soviet Union still intact. Industrial Business Machines (IBM) introduced the PS/2 personal computer based on Intel 80386 (386) chip, Mitsubishi introduced the Movemaster RM-501 robotic gripper, GSM was approved as a mobile standard, and the 3.5" hard drive was introduced. The European Union only consisted of Belgium, Germany, France, Italy, Luxembourg, the Netherlands, Spain, and Portugal, and the Euro currency was not implemented. Turkey applied to join the European Communities. China GDP was \$327 Billion USD in contrast to U.S. \$8,290 USD. A maybe the biggest differentiator of them all, to our children's surprise, no internet, WiFi, Bluetooth, Zigbee, USB, or other today commonly used protocols.

The world today is quite different with advanced cell phones, direct connectivity, internet-of-things, autonomous self-driving vehicles (AV), automated international flights (although the pilots are still in the cockpit), global internet through satellites, autonomous physicians, and much more.

Several things have happened that have enabled AI and the application of robotics and automation that can help answer the question, “Why now?”

1. The amount of data generated today is extremely large and is increasing every day. Just Chevrolet alone collected 4,220,000 Gigabytes (4.2 PetaByte) of data from customer’s cars during 2016 [1] which is an enabler of Big Data (AI) processing as well as an example of a growing huge market of intelligently mined data. Maybe as high as \$750 Billion USD by 2030.
2. Compute power is still today growing with Moore’s Law and doubling every 18<sup>th</sup> month. The processing power available already today can run 50-year-old AI algorithms at a rate beating the human capability. We are on the brink of widespread adoption of quantum computers and neuromorphic computing.
3. Publication of a lot of good freely available AI tools that allow an exponentially growth of people involved in developing new AI applications and algorithms
4. Big breakthroughs in algorithms (e.g. natural language processing). Yet, it should be remembered that Artificial Intelligence is not smart or intelligent as human intelligence. However, AI can analyze much larger sets of data very quickly and reason good enough to support automation in many cases.

Yet, a simple case than prove very difficult for a machine to understand for a long time ahead. Assume, the localized expression “Is the Pope Catholic!” to underline that something is obvious and true. This culturally driven expression is very difficult for a machine to understand and related to. Consider a software program that would autonomously define imaginary numbers to solve the mathematical challenge of square root of -1. The machines are not at the level of human intelligence and abstract thinking.

My interviews have given a very conclusive result in that the amount of net jobs created will be significantly reduced over the coming decades and that we must relate to a society where the masses don’t have to work in a classical sense. Technological Unemployment by AI and robotics is most likely a fact and has the potential of causing major societal unrest. In some regards, a new meaning of life must be designed and thought in societies heavily defined by work.

Distribution of wealth will be extremely important in a future where classical work is becoming more and more obsolete. Hence, ideas like taxing robots and automation by Bill Gates and others will likely be amongst the tools that will be needed [2]. Although, this reform alone will not solve the challenges. It is clear that a much broader international tax and wealth distribution reform is needed, but unfortunately highly unclear how it can be tackled. The U.S. under the Trump administration seems to be striving backwards in time at a time when the society is inevitable changing in a pace never seen before.

The hashtag #ChangeAgents is starting to spread and being used by people committed to contribute to the transformation of businesses, societies, and government in light of the Future of Work, or maybe, Future of unknown Work presented by the rapid infusion of AI, robotics, and automation.

Interestingly, the trip discussions have clearly shown that there is a big gap in understanding between the public, government, the academics, and industry. AI is in some regards perceived as magic and that the scientists and people involved are demons. Hence, it seems to be of great importance to define an experiment that acquaint people with AI to remove the magic about it and reduces the unknown. This was an impression that grew stronger throughout the Fellowship and not what I expected to come out so strongly.

The second major takeaway for the trip is the uniform insight that the educational systems are not prepared for the future. It is of great importance that the education is changed to reflect a faster changing world where continuous and life-long learning is imperative. To provide a better optimized personal educational experience AI should be explored for automated generation of learning materials together with micro-credits derived from skill modules.

It is clear from the interviews that people will have more free time in the future and hence the chance of improving the quality of life and health if desired to.

We as an AI community and industry should reword or rephrase Artificial Intelligence to something else, perhaps Extended Intelligence (EI) to reduce the confusion for the people struggling to comprehend and understand the machines that will work side by side with them.

#### [List of hosting organizations in alphabetical order](#)

I wish to thank the following organizations and a large number of individuals who have taken the time to meet with me, reflecting and discussing the outlook of the future in a 20-30 year perspective.

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- City of Pittsburg, Department of Innovation and Performance
- City of Seattle, Department of Transportation
- David Eisenhower, University of Pennsylvania
- Florida High Tech Corridor
- Florida State Senate
- Gabriel Investments
- Harvard University
- Hattaway Communication
- Humanistic Robotics
- K&L Gates
- Lutron Inc

- Mass Robotics Inc
- Massachusetts Institute of Technology (MIT)
- National Center for Simulation, Naval Support Activity, Naval Base
- New York University (NYU)
- Piviting Corp
- RAND Corporation
- SaraniaSat Inc
- Stanford University
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- U.S. Department of Defense
- U.S. Department of Labor
- U.S. Department of Transportation
- U.S. Federal Communications Commission (FCC)
- U.S. Small Business Administration
- UBER
- United Against Poverty Orlando
- University of Central Florida
- University of New Mexico
- University of Pennsylvania
- University of Pittsburg
- University of Texas - Austin
- University of Washington - Seattle
- Various taxi drivers, uber drivers, and waitresses at restaurants.
- White House Correspondents Association
- X Prize Foundation