Business and Work in the Era of Intelligent Tools

Highlights of the BRIE-ETLA Conference Held on August 30, 2018 in Helsinki

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Abstract

This report summarizes the BRIE-ETLA conference held on August 30, 2018 at Hotel Kämp, Helsinki. It follows the structure of the event; after a short lead-in, it summarizes the session keynotes and provides some discussion points (the slides used by the presenters are available in the Appendix of the report). The report highlights that recent technological advances span a whole range of complicated policy issues. Data ownership, access, and portability are central in the context of digitalization; privacy, security, bias, and liability are related but nevertheless separate policy issues. It is also noted that technology does not determine outcomes: people – and their aggregations as teams, organizations, and countries – use technology as a tool and ultimately determine outcomes. Having technology augment humans – rather than replace them – is a choice we can collectively make.

Table of Contents

Introduction

BRIE-ETLA, a research collaboration ongoing since 2001 between BRIE, the *Berkeley Roundtable on the International Economy* at the University of California at Berkeley, and ETLA, *The Research Institute of the Finnish Economy*, has – for nearly two decades – influenced societal and business strategies in Finland, the EU, and the US.

In the early 2000s, BRIE-ETLA was among the first in Finland to promote the view that telecommunication was not separate from computer networks and that the digital world would soon converge to an all-IP (internet protocol) world. Privacy, security, and location-based services were among the topics of the very first BRIE-ETLA meeting in 2001 at UC Berkeley. BRIE-ETLA helped Finland to formulate its strategies towards 3G mobile telephony standardization. Over the years, BRIE-ETLA has repeated the same pattern. It was among the first to consider the implications of the Silicon Valley-driven disruption of the mobile telephony ecosystem and transition to smartphones. It also highlighted the importance of cloud computing for Finland. It brought the issue of digitalization-induced labor market turmoil to the attention of policymakers. The BRIE-ETLA team wrote some of the original papers observing that digital platforms were becoming critical organizers of a new economy. The team has since explored competition-related issues as platforms dominate or reorganize ever more segments of the economy.

> **In this global tech-infused context, how should business and governments best respond to new possibilities and threats?**

Over the years, BRIE-ETLA has minted approximately two hundred scholarly articles and reports. In addition to written communications, findings and insights have been shared with business and research communities and with decision-makers via formal and informal seminars, workshops, meetings, and researcher visits. The Stanford University Press book – *How Revolutionary was the Digital Revolution?* (Zysman & Newman, 2006) – concluded the first round of BRIE-ETLA collaboration. Much of the research conducted in the second round came out in a double special issue of the *Review of Policy Research* (an international peer-reviewed journal of *Blackwell Publishing*). The third round came to its conclusion with a special issue of the *Journal of Industry, Competition and Trade* (a scholarly journal by *Springer*) and a conference on August 29, 2011 at *Nokia House* (Espoo, Finland). The fourth round also concluded with a special issue of the *Journal of Industry, Competition and Trade*, and a conference was held at Hotel Kämp on August 29, 2014.

The ongoing round of BRIE-ETLA collaboration – *Work and Wealth in the Era of Digital Platforms* – concluded at the end of 2018. The accomplishments in this round consisted of approximately 20 public events, 40 written publications (including one PhD and two Masters theses), 50 international research visits, 200 talks and other public appearances, and innumerable private meetings with business leaders and policymakers. In the context of this round, a special issue of *Industry & Innovation* (a peer-reviewed journal by *Taylor & Francis*) – guest-edited by Kenney, Rouvinen, Seppälä, and Zysman – is forthcoming in 2019.

Plans for a 2019–2022 round of BRIE-ETLA have been made, and negotiations for financial support are ongoing as of this this writing.

BRIE-ETLA has operated as an early warning system, detecting disruptions to the economy, identifying conundrums and challenges and generating debate and solutions. The conference held on August 30, 2018 at Hotel Kämp in Helsinki, Finland, was a tribute to this legacy. This report summarizes some discussions and findings of the event.

This report follows the structure of the event on August 30. For each session, we provide a lead-in, summarize the session keynotes, and provide some discussion points. The slides used by the presenters are available in the Appendix of the report.

Conference opening

John Zysman introduction Hal Varian
(30 August 2018, Hotel Kämp; photo by Juuso Heinonen)

Lead-in

Intelligent tools empower – but also nudge or even force – individuals and organizations to change their behaviors, which in turn shift economic, political, and social outcomes. As Schumpeter (1942) noted, "Economic progress, in capitalist society, means turmoil." We are in the midst of a particularly turbulent period with major disruptions in key industries. It thus timely to study some of the key drivers and debate their implications for the future.

Ongoing digital transformations hold the promise of improving lives worldwide. That promise has yet to be fulfilled (in full). This lack of fulfillment may be due to a variety of reasons, including uneven uptake of key technologies, inability to use technology efficiently, abating creative destruction, and time lags.

A shift from largely community-led open internet development to only partially open corporate ecosystems took place in the new millennium. In the course of the past decade, we have witnessed an unprecedented emergence of global corporate digital platform giants. The growing power of several companies is an increasing concern. FTC Commissioner Terrell McSweeny (with Brian O'Dea) notes that "An incumbent firm may have a significant advantage over entrants if it possesses a valuable database that would be difficult, costly, or time consuming for a new firm to match or replicate. In those situations, competition enforcers can and should assess the competitive implications of data."[1] On the EU side, Competition Commissioner Margrethe Vestager has concerns about the large volume of data being collected by big tech: "In some areas, these data are extremely valuable. They can foreclose the market – they can give the parties that have them immense business opportunities that are not available to others."[2]

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1   https://www.ftc.gov/system/files/documents/public.../cpi-mcsweeny-odea.pdf

2   https://www.wsj.com/articles/eu-competition-chief-tracks-how-companies-use-big-data-1514889000

John Zysman (BRIE, UC Berkeley): Opening remarks

In his opening remarks, John Zysman – the co-leader of the BRIE-ETLA effort on the US side – introduced a dozen international members of the BRIE-ETLA team who were participating the conference. He emphasized the long and successful legacy of the BRIE-ETLA collaboration and noted that productive work relationships have also turned into personal friendships. Then, John went on to introduce his colleague and friend Hal Varian, Google's Chief Economist, his fellow professor emeritus at UC Berkeley, and the founding dean of the school of information.

Hal Varian (Google, UC Berkeley): Keynote – Computer mediated transactions

In his keynote, Hal Varian returned to a concept he coined approximately eight years ago, *computer mediated transactions*. The simple idea behind the concept is that in most economic transactions today, there is a computer between a buyer and a seller, a worker and a firm, or in other sorts of arrangements. From these arrangements, data can be extracted and analyzed, which among other things enables customization in the form of Amazon or Netflix recommendations, for example. While accumulation of (big) data and intelligent tools for exploiting it (including Artificial Intelligence, AI) are of great interest, Hal went on to elaborate on two other important aspects:

(a) the role of *experimentation and continual improvement* enabled by a computer in the middle, and

(b) *contractual innovation*, i.e., digital arbitration or enforcement of contracts.

Every year, Google runs approximately 10,000 experiments, which are roughly split between the ad side and the search side. Thus, when one uses Google, one might see a slightly different variation from another user. In these randomized controlled trials (RCT), the differences between user groups are analyzed to improve the services. The ability to run experiments since 2003 has been crucial to Google's success. Facebook and every other company in the Silicon Valley does something similar today. RCTs' ability to gain causal inference on aspects of a service ties nicely with advances in machine learning, which is commonly thought to yield "just" predictions, but which can be tweaked to detect causality (as compared to just prediction or correlation, a much stronger claim on what causes what). With this, one has an enhanced ability to make decisions, as their outcomes can be foreseen with reasonable certainty.

Even a simple transaction may not be agreeable to all parties. Abraham Lincoln, who had just tasted a hot beverage, responded reported: "Madam, if this is coffee, please bring me tea; if this is tea, please bring me coffee." On such occasions, a computer in the middle could improve on contractual performance. Consider an "old world" advertisement in a printed newspaper: the contract is that the advertiser pays the newspaper with the assumption that readers will see the ad and some of them will be lured into buying. Due to the unmeasured and inexact nature of this path, the contract between the advertiser and the newspaper could only be made in coarse terms. In today's world, the contractual arrangement can be made directly on the desired outcome – a purchase induced by an ad, which makes it much more attractive to both parties due to lower risks and better understanding of the value pie that can be shared. With deepening digitalization, contractual relationships thus become much richer, in turn leading to digitalized trust, one incarnation of which is blockchains.

Readings

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Session I:
Platforms Spawning New Business Models and Forms of Work

Martin Kenney wonders, what is Europe's vision when it comes to intelligent tools?
(30 August 2018, Hotel Kämp; photo by Juuso Heinonen)

Lead-in

A digital platform is a cloud-based software stack enabling multifaceted interaction. The first party, the platform provider, facilitates interaction of two or more other parties that are not directly under its control (e.g., buyers, sellers, and advertisers).

Parker, Van Alstyne, and Choudary (2016) summarize "The platform's overarching purpose: to consummate matches among users and facilitate the exchange of goods, services, or social currency, thereby enabling value creation for all participants." In this quote, they overlook the detail that the platform owner is particularly advantaged, as it can "tax" the ecosystem participants and, often, can absorb particularly valuable functionality from them.

Looking at what are currently the most popular platforms suggests that, thus far, we have largely seen a "Silicon Valley" version of platforms (with the exception of China), in which startups are structured to pursue growth at all costs, as they endeavor to achieve market domination.

Even if a person is not participating on platforms, or a business is neither a platform provider nor a user/customer of at least one, both people and companies are in a situation in which they must position themselves in a world that is increasingly organized around platforms. Platforms have considerable virtues, but as they grow, and they very often become *de facto* monopolies in their domains, they may start to resemble (global) toll booths that tax the ecosystems they have managed to lock in.

Petri Rouvinen (ETLA): Introductory remarks

Upon opening the session, Petri Rouvinen, co-leader of BRIE-ETLA on the EU side, introduced Martin Kenney, co-leader on the US side, and Timo Seppälä, his fellow co-leader on the EU side.

According to Petri, in the currently prevailing "Silicon Valley approach", the platform owner attempts to give various sides just enough value to make them participate, while extracting the maximum amount of resources from them. While this does not have to be the case – platforms could, for example, be co-operatives possibly controlled by all parties involved without a central authority – alternatives to the Valley model have yet to gain significant traction in the market place.

Petri noted that, in terms of active users, the biggest current platforms are bigger than any one nation in terms of inhabitants (Figure 1), including China. They clearly influence all consumer-facing activities, but their power often extends to surprising domains in the context of business-to-business markets as well. One subtype of platform spans online labor markets, where labor input is traded electronically, although currently the most popular types – including Airbnb and Uber – tend to have some physical link. The situation in business-to-business platforms is still unsettled and some early leaders, such as GE's Predix, have experienced major setbacks.

Source: McKinsey Global Institute (https://v.gd/dsL59U)
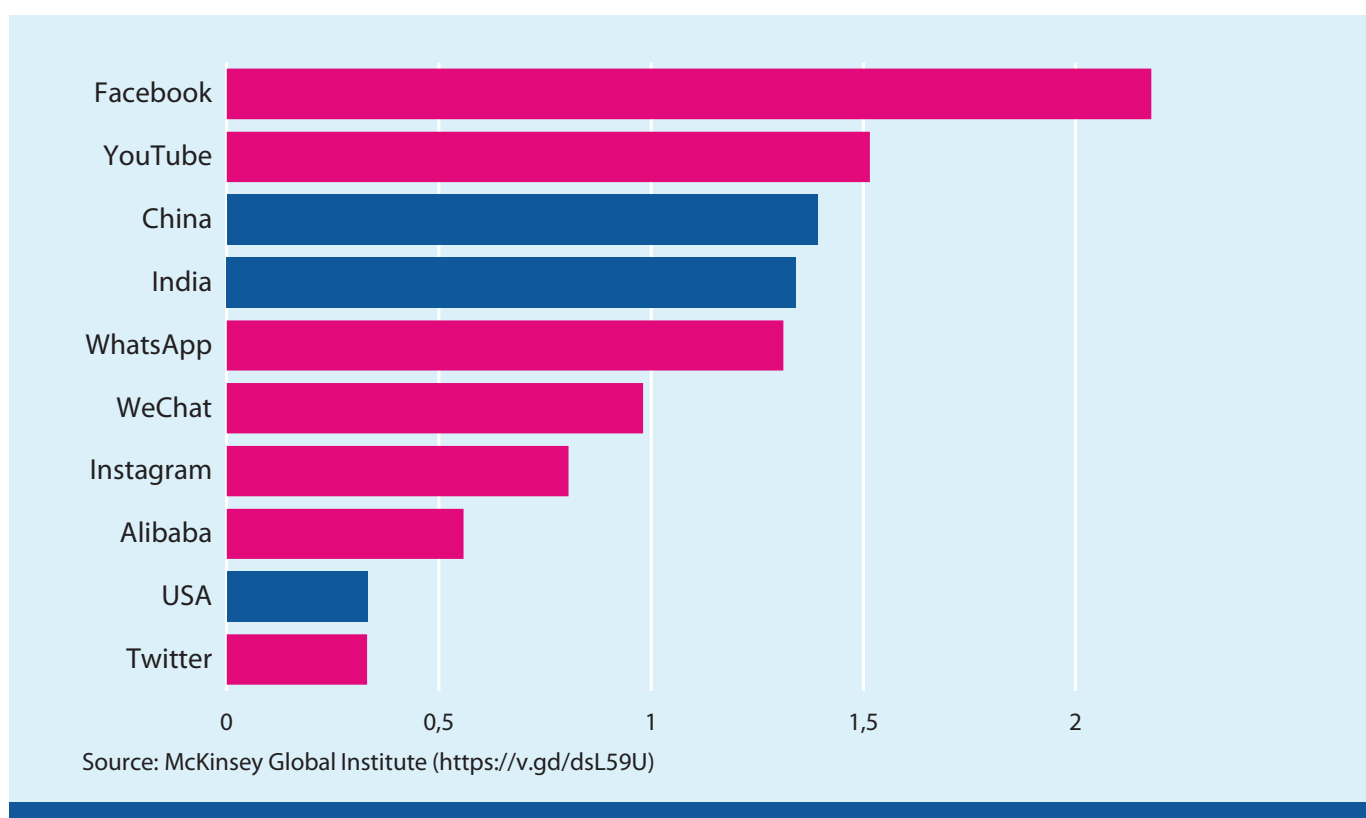
Figure 2   Active platform users vs country populations, billions of people in 2017

Petri pointed to several issues that make platforms in a business-to-business context different:

- First, firms are keenly aware of platform power games and the strategic implications of joining a platform. In other words, firms anticipate market outcomes with and without joining a platform and make decisions based on comparing these two trajectories.

- Second, most consumer platforms monetize data users either provide or generate in the process of using the service. Most consumers do not think about the value of their data or are perfectly happy to trade it for free services. Most firms think of data differently, i.e., they treat it as a capital asset and do not share it by accident or for less than its perceived full value. Thus, often independent business-to-business platforms must seek alternative busi-

7

ness models, at times leading them to resemble enterprise software or extranets. Although consumer platforms have reached one "market equilibrium" for the time being, Petri suggests that business-to-business platform space remains wide open. He mentioned one interesting German-led effort – the International Data Spaces Association – which is a cooperative aiming to establish platform-like structures to assist in digital industrial transformation.

- Third, network effects and other benefits associated with platforms may simply be smaller in business-to-business contexts. For instance, in the market for fighter jets, there is only about half a dozen potential suppliers globally and the only potential buyers are national air forces worldwide.

Martin Kenney (BRIE, UC Davis): Talk – The "big picture" on platforms

Martin Kenney opened his talk with several examples of how the world is different with platforms, e.g., in terms of media consumption, and how information has oftentimes turned to a commodity. He also discussed algorithmic management. Yelp is a supervision system; you go to a restaurant, and if Joe the server pours soup on you, an online complaint will be felt by Joe and the restaurant. Through this link, any customer can assist in managing a restaurant.

Martin discussed how rapidly platforms can emerge and how valuable they have become. In 2002, just one of ten most valuable companies in the world was a platform company; in 2018, seven out of ten were. Google Search started at zero in 1994 and now has over two billion users; Google Drive started in 2015 and is now approaching one billion users. The point here is that infrastructure is there for new applications and new software to grow and be massively adopted extremely rapidly.

The expansion of Amazon illustrates how power in the online world extends to power in the offline world (see Figure 2). Amazon has physical and digital infrastructure to host its 400 million stock keeping units; in areas marketed in red in Figure 2, Amazon rents out its platform to others. A shop can have Amazon keep its inventory and do its delivery; at its Marketplace, Amazon controls the customer interface and has visibility to its sellers' supply chain. With this, for example students can launch online brands via social media and, if they take off, use Amazon for delivery and tap into global supply chains,
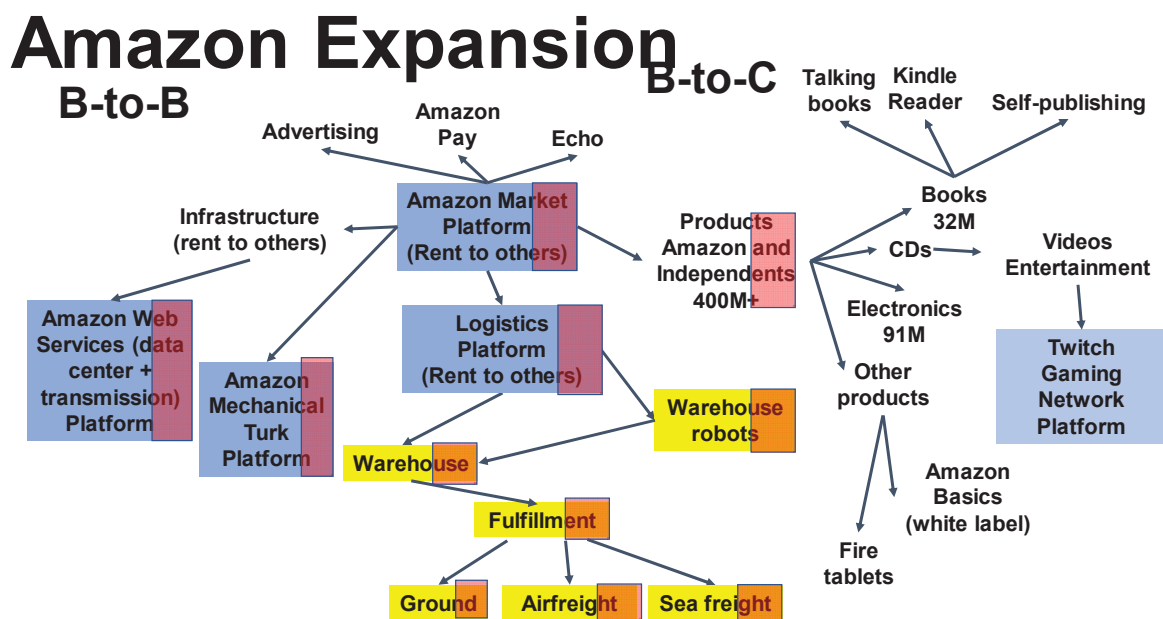
Legend: Highlighted in yellow fulfilled by Amazon or its contractors, blue are platforms.

Figure 2   The expansion of Amazon

particularly in China, to get the products delivered. This kind of dynamics make it difficult for established retailers to know where (future) competition is coming from.

One might ask whether business-to-business industries and industrial machinery in particular differ from retail markets when it comes to platforms. Yes and no. One might say "yes" because digital and analog are different; up until now, aspects of industrial software have been largely proprietary, and these businesses might have such specific skill requirements that entry by established outside players is unlikely. On the other hand, software is an increasing part of any and every industry – promoting digitalization-induced dynamics across industries – and customers may force conformity of digital practices and standards across industries.

Martin concluded by emphasizing how powerful platform owners have become. They can "tax" the ecosystems the support. For example, in becoming a dominant retailer, Amazon controls 45% of all e-commerce in the United States. Through its own delivery system, it can squeeze UPS and FedEx (Amazon uses its own system for the base load and simply outsources the peaks, increasing variability and making capacity optimization harder for others); this outcome in turn may make it more difficult for e-commerce outside Amazon and its Marketplace to compete.

Finally, Martin discussed Europe's vision. Is it possible to build platforms based on a specific set of social values? Are privacy and social solidarity some of the core tenets of European platform values? Are West Coast US tech firms the main luminaries in the platform values system, or is the other main alternative the Chinese model? Does Europe have its own alternative? If so, what is it?

Timo Seppälä (ETLA, Aalto Univ.): Talk – B2B platforms: not yet a reality?

Discussion on the fourth industrial revolution was initiated by Evans and Annunziata on General Electric's report on the Industrial Internet (Industrial Internet of Things, IIoT) in 2012. Their future Industrial Internet of Things has smart, connected products and service-based systems at its core (Porter & Heppelmann, 2014; Ailisto et. al., 2015).

However, the elements of legacy enterprise software systems do not support the IIoT vision. They have been built from disconnected elements piece by piece, layer after layer. They have emerged as separate pockets of lifeforms, slowly evolving into separate species that are no longer able to interconnect (Seppälä & Mattila, 2016). These systems leave a lot to be desired, as the full potential of digitalization can only be reached if the data can be shared and used as a basis for larger systems (Porter & Heppelmann, 2014; Shrouf et al., 2014; Ailisto et. al, 2015; Rajala et. al, 2018).

As stated by Fitzgerald (2013), "Today the Industrial Internet of things is still more of an Industrial Intranet of Things—most information and/or data never leaves a factory or a company's firewall."

To fuse enterprise software into platforms, and eventually into one (ubiquitous) Industrial Internet of Things, a shared method (e.g., an operating system for autonomous vehicles) of free communication is needed in which all product and service systems of different providers can communicate effectively (Seppälä & Mattila, 2016; Jordan, 2018).

The research question for IIoT thus becomes: "How could enterprise software become a platform?", where a platform is defined as "an evolving system made of interdependent pieces that can each be innovated upon" (Gawer & Cusumano, 2002).

Our analysis suggests that Siemens MindSphere, IBM Watson IoT, or GE Predix do not meet the definition of a platform, although each of them could certainly evolve into one. All of them can be used for data collection and exploitation and they provide some boundary resources. However, they need to become more open in order to serve as evolving systems "… of interdependent pieces that can each be innovated upon".

As prerequisites for openness, users of enterprise software must recognize that data are an unlimited multifaceted production factor (Nikander et. al., 2018). Second, within the freedom of contract, it can be specified to whom data belong, what kinds of access rights there are to data, and whether these rights

are exclusive, parallel, etc. (Ailisto et. al., 2015 p. 15-16). Currently, enterprises are reluctant to share their data, in part because they are insecure about their data; this reluctance to share must change.

As for Siemens MindSphere, IBM Watson IoT, and GE Predix, they demonstrate a low level of interoperability; overall, the market is dominated by companies that provide conventional enterprise software rather than platforms in the above-discussed sense.

Given the low penetration of Industrial Internet of Things enterprise software, the decisions, strategies, and successes of users continue to be "in the dark". For scholars interested in the Industrial Internet of Things, enterprise software, and respective industrial convergences, the dynamics in this space can provide important contributions to industrial platform theory building.

Discussion points

Do we need to consider what it means to own something in the context of platforms?

Ownership is a tricky issue. Is what defines value who does/does not have access?

Hal Varian:
Data are like sunlight – they are a non-excludable public good. We shouldn't think about them in terms of "ownership" but instead in terms of rights and access rights. It is not about content ownership. The critical issue is "how can the data be utilized well by us all?"

Martin Kenney:
Who owns the machinery to *process* data is the key question. If you own superior machinery to extract and analyze the data, then that data gain value. If we think of data as oil, then it is the *refinery* we need to think about – who can do that extraction process most effectively. Google and Facebook do this the most effectively at the moment.

Readings

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Session II:
Artificial Intelligence Driving the Next Societal Transformation

Artificial intelligence (AI) is a broad and evolving term, which in most practical applications concerns machine learning (ML). ML is a branch of computational statistics and, in essence, a prediction technology (Agrawal, Gans, & Goldfarb, 2018b): "Prediction takes information you have, often called "data," and uses it to generate information you don't have." ML eats data – preferably in large volumes, even if, at some point, data exhibits decreasing returns to scale in a given application (Varian, 2018).

Predictions precede most decisions, albeit often tacitly. Thus, having a sizable AI-/ML-induced change in the quality-adjusted cost of prediction has potentially large societal consequences. McKinsey Global Institute (Dobbs et al., 2015) likens the AI-induced changes to the original industrial revolution. According to this view, the ongoing revolution is happening ten times faster and at a scale that is three hundred times larger. Among economists, e.g., Aghion, Jones, and Jones (2019) suggest that AI could generate exponential growth by accelerating the generation of new ideas – particularly in the needle-in-a-haystack type of inquiries (Agrawal, McHale, & Oettl, 2018).

In the context of BRIE-ETLA, we agree on the disruptive potential of AI/ML but make every effort to separate hype from reality. We also ponder which forces may hinder technological advance:

- Technological possibilities do not necessarily imply widespread diffusion and exploitation.
- Truly benefiting from new technologies may take years or even decades.
- Attitudes, culture, preferences, and regulation may create long-lasting or even permanent hurdles.
- There is still a range of tasks that are difficult or do not make sense to turn over to computers.
- Any knowledge that is tacit (or is otherwise not suitably digitally coded) will not be suited for AI-/ML-type problem solving.

Kenji Kushida (Stanford Univ.): Introductory remarks

Kenji Kushida talked about artificial intelligence and how the algorithmic revolution is driving the next industrial transformation. He explained what AI is in simple laymen's terms by stating that a working conception of AI centers around pattern recognition – such as finding underlying relationships in data, images, audio, and video – that is applied to enable a software system to improve its capabilities, or "learning." Although a considerable amount of software is being marketed as AI, Kenji noted that the essential question in this regard concerns "the pattern being recognized from what data, and how the learning is occurring and feeding back to the pattern recognition ability".

Kenji also illustrated the exponential growth of computing power through the analogy of a Volkswagen Beetle, saying that if the development of the Beetle had been as fast as with semiconductor microchips from 1971 to 2016, the present-day Beetle have a top speed of 3,000 mph, a fuel efficiency of 2 million miles per gallon, and a price of 4 cents. What's also noteworthy is that the training runs of deep learning increased by 300,000 times between 2012 and 2018.

Despite the rapid growth in capabilities, Kenji stated that for any technology, the pattern in which it diffuses is determined not primarily by attributes of the technology itself, but by the context. This context includes related complementary technologies, industry dynamics, regulations, politics, and other social factors, such as relative cost and availability of labor. Rules and regulations do not exist in a vacuum but rather are the product of political processes, which differ across countries. The question, then, is which country or region will invest how much into what form of solution; the answer to this question may profoundly affect the trajectory of development.

Kenji also presented a perspective of artificial intelligence versus intelligent augmentation. On the one hand, it is difficult to say how many jobs will be made obsolete by artificial intelligence; on the other

hand, it is also difficult to predict how many new opportunities for inexperienced workers will be created by intelligent augmentation.

In conclusion, Kenji stated that the next phase of AI is likely to empower people without specialized knowledge of AI itself to ask valuable questions and design solutions. Hence, companies need to ask themselves whether they are preparing for commodity AI tools and whether the decisions they are currently making follow the logic of computing power abundance or fly in the face of it.

Mark Nitzberg (UC Berkeley): Talk – AI's hype and reality

Mark Nitzberg spoke about the hype and the reality of artificial intelligence. He explained that much of the fear related to AI is not due to runaway computing but rather to runaway anthropomorphism. However, Mark noted that it is worth paying some attention to ensure that the systems do not have the quality of running away and that the system is able to remain aligned with all the different considerations and values that its creators may or may not have.

The hype around artificial technology, in turn, according to Mark, is due to machine learning breakthroughs: image recognition, speech understanding, language translation, and imitation learning. However, there are limitations to what can be done with these. For example, in understanding the customer shopping experience with AI, in reality many people are looking at the data and filling in the gaps where artificial intelligence fails to perform. Respectively, in healthcare diagnostics, whereas doctors may be wrong with their diagnostics and replacing them with AI systems could increase reliability overall, AI systems can be wrong in odd ways, thus requiring human intervention.

Respectively, with self-driving vehicles, the problem is not so much that we cannot get self-driving cars to stay on the road; rather, the true problem is that social context is a huge part of intelligence. In other words, self-driving vehicles also need to be able to interpret human signals and anticipate human behavior. Rather than looking at AI as something to which tasks can be delegated, we should embrace the perspective of intelligence augmentation—not to look at artificial intelligence as something superhuman, but rather as a tool that can make us humans superhuman.

Andrea Renda (CEPS): Talk – AI in Europe

Andrea Renda spoke about the progress of artificial intelligence in Europe. Andrea stated that the current wisdom is that Europe is well positioned in AI due to past EU and national investments in high performance computing and well-developed academic environments. However, Europe lags the US, China and Japan, and needs to boost public and private investments in the next few years in order to catch up.

While the European Union has delved deeply into ethical considerations regarding AI as a way to stay relevant, to a large extent these efforts seem to be slightly misguided. Rather than trying to solve the trolley problem of self-driving vehicles, Andrea argued that in fact the surrounding questions are much more important when considering the regulatory standpoints of artificial intelligence in Europe. He called this approach "the crime-scene investigation of the trolley problem". Instead of considering how we should regulate the ethical decision-making of the AI algorithm, we should be asking who put the car there and who made the decision that the algorithm would potentially make life-or-death decisions on collateral individuals.

Currently, many European policymakers look at the matter from the perspective that AI is something that is done to and suffered by Europeans but largely conceived, shaped, and implemented by Americans or the Chinese. So what could Europe do about this? According to Andrea, one possibility is that Europe tries to set a global standard for how AI should behave and interact with humans. Second, Europe should boost its investment in a way that goes in the direction of endorsing artificial intelligence in Europe.

Discussion points

Pekka Ala-Pietilä, the chair of the EU's High-Level Expert Group on Artificial Intelligence (AI HLG), had several reflections on the session on AI. He said that we need to understand how the discussion on AI and ethics could be consistent with and support the competitiveness of businesses. He noted that Europe's competitiveness in business applications of platforms and AI is a delusion; Europe is losing the race on the business-to-consumer side; business-to-business side is still open, and the AI HLG group should pay special attention to digital ecosystems in domains in which Europe has clear strengths, such as automotive.

Readings

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Session III:
Blockchains and the Feasibility of Decentralized Market Structures

Lead-in

Blockchains are associated with Bitcoin and other cryptocurrencies. However, this association is not the primary reason why we have studied them extensively in the ongoing round of BRIE-ETLA.

Blockchains enable the creation of decentralized and hard-to-tamper-with digital ledgers, which potentially have a wide range of applications. Blockchains can be an alternative to centrally controlled platforms in nurturing network effects, and they could facilitate a more bottom-up approach to establishing technological frameworks.

Blockchains may be a way to establish new social constructs, and this establishment has led to many minds racing (blockchains replacing governments, etc.); however, currently we have seen little in terms of practical utility in this regard. The very features of the technology, e.g., its nonhierarchical distributed nature, make its real-world applications challenging; blockchains seem to be cheap to establish but costly to maintain.

The Economist (30 June 2018) suggests that "blockchain technology may offer a way to re-decentralise the internet". While that is uncertain, the technology's virtues – transparency, traceability, and trust – do have a host of economic uses ranging tracking sources of origin in global value chains to identifying genuine pharmaceuticals. Businesses increasingly see blockchain-like structures as an alternative to platforms, i.e., as a way to achieve network effects (in narrow domains) without establishing a centrally controlled platform.

Martin Kenney (BRIE, UC Davis): Introductory remarks

Martin Kenney noted that it is currently hard to separate hype from reality when it comes to distributed ledgers, since this technology is associated with Bitcoin and other cryptocurrencies. Are distributed ledgers transformative or just another tool relatively deep in the digital stack? Martin introduced Juri Mattila of ETLA and Aleksi Grym at the Bank of Finland, who addressed this question.

Juri Mattila (ETLA, Aalto Univ.): Talk – Blockchain technology: a platform perspective

In his keynote, Juri Mattila talked about the blockchain phenomenon from a platform perspective. While often lacking an owner or a single clearly defined platform provider, blockchain networks seem to exhibit characteristics of platforms: they are established in multisided markets; they live and die by network effects. Furthermore, they rely on a protocol with clearly defined technical and social boundary resources—as well as some new kinds of intraplatform boundary resources between one platform provider and another.

It seems then that in principle, blockchain technology has enabled an alternative way of creating multisided platforms and fostering their growth in a distributed fashion. However, if we ask the question, for what kinds of social constructs these platforms are used, we see that this approach is not without its problems. Fully decentralized and synchronized systems do not scale well in terms of speed and capacity. Instead, their scalability is expressed in terms of robustness and immutability. In addition, indeed, the past decade has shown that building critical mass for a social innovation on a technological platform that does not scale well for capacity runs a high risk of being a fool's errand.

In recent years, the development around blockchain technology has focused on finding ways to increase the scalability for capacity, while sacrificing as little decentralization and synchronization in return as possible. While the work is still in progress, as different approaches and scaling solutions are being explored, some generalizations can be drawn at this point regarding the properties of the new kinds of social innovations, which this technology space could eventually enable in a wider scope.

First, blockchain-enabled platforms would imply a transition from platform cohesion towards more dynamic networks where even the platform itself, along with all the platform provision functions, are put out to open tender and provided in a very dynamic manner in a free market environment. From an IT perspective, this also reflects the idea of computing as utility, requiring a different approach to building applications, with meticulous attention to resource efficiency in system design.

A move can also be anticipated from a service-structured view to a network value perspective. The first working prototype applications have provided a glimpse of the new kinds of business models and monetization mechanisms that could be harnessed to build social innovations and foster growth in an open-source environment. Rather than forming contractual obligations between parties, these models tend to rely on aligning game-theoretical incentives by enforcing workflows in a distributed manner, so that the same end-result of collaboration and trust is feasible.

Aleksi Grym (Bank of Finland): Talk – Blockchains in finance

In his presentation, Aleksi Grym discussed blockchain applications in finance. He noted that while there are many blockchain experiments under development in finance, in many of these applications, it is not clear what benefit decentralization will bring compared to a standard cloud-based solution. As of today, as far as we know, there are no commercially viable applications in active use; all applications are still in an experimental stage.

From this starting point, Grym presented the question of why we are discussing blockchains in the first place. He noted that many of the common conceptions regarding the capabilities of blockchains are misguided and that blockchains re a case of confusing a very specific technology that can be applied to many things. Moreover, in many areas, such as money and banking, centralization versus decentralization is a false dichotomy.

Many of the ideas that have been presented about blockchains are actually much more related to platform economics, and while blockchains are part of that story, they are probably not disrupting per se.

Readings

Grym, A. (2018). *The great illusion of digital currencies*. Bank of Finland Economics Review, 1/2018.

Hukkinen, T., Mattila, J., Seppälä, T., Smolander, K., & Goodden, T. (2019). *Skimping on Gas – Reducing Ethereum Transaction Costs in a Blockchain Electricity Market Application*. Proceedings of HICSS-52: 52th Hawaii International Conference on System Sciences.

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Panel:
The Future of Digitalization and
Viable Avenues for Supporting Research

Panel: John Zysman (chair; in the far corner), Yves Doz, Erkki Ormala, and Pekka Ylä-Anttila
(30 August 2018, Hotel Kämp; photo by Juuso Heinonen)

Lead-in

Agrawal, Gans, and Goldfarb (2018a) note that – when it comes recent technological advances – "… near consensus among economists is optimism for the long-run prospects of jobs and growth; however, the long run can be a very long time." Short- and medium-term considerations relate to how both the deployment of intelligent tools and their societal consequences are handled.

> **Having technology augment humans – rather than replace them – is a choice we can collectively make.**

Even if the impacts of technology are often thought to be globally uniform, earlier BRIE-ETLA work across countries suggests that national incarnations will be quite different. In the context of small open economies in particular, shifts in countries (and their businesses) relative global positions may well dominate the direct effects of technological advance.

If the upcoming set of intelligent tools is indeed as revolutionary as some expect, the political and economic impacts of major societal transformations should not be forgotten. If large groups of people are made permanently worse off with industrial upheaval, then there will be social and political consequences.

Even though the current structures of industries providing ICT goods and services seem stable, in the context of BRIE-ETLA, we have learned time and again that one should not fall into the end-of-history

illusion. To be sure, the current tech giants have very strong market positions, which they are defending with complementary investments and disruption-obsessive business strategies, but digitalization has rarely remained still for extensive periods of time.

Recent technological advances span a whole range of complicated policy issues. Data ownership, access, and portability are central in the context of digitalization. Privacy, security, bias, and liability are related but nevertheless separate policy issues. Some regulation is undoubtedly needed, but knowing what, when, and how to regulate is often exceedingly tricky. In addition, even when one gets all the answers right, a piece of regulation may either be circumvented or become irrelevant, even before it is enacted. with the following:

- large economies of scale and scope,
- considerable learning by doing effects,
- skill hoarding by big tech,
- indirect or asymmetric business models,
- network effects, and
- the domain-agnostic nature of data/ICT,

a policymaker should have a keen eye for curbing excessive market power.

Technology does not determine outcomes; rather, people – and their aggregations as teams, organizations, and countries – use technology as tools. The outcomes of their actions may or may not make "a dent in the universe" (in the words of late Steve Jobs).

As for human labor, companies make choices about how they combine humans and intelligent tools in their processes (and markets determine which combinations command a premium and which are not economically viable).

John Zysman (BRIE, UC Berkeley): Introduction to the panel

John Zysman opened the panel by elaborating on the history of BRIE-ETLA and the panelists' links to it. He also told that some of the BRIE-ETLA efforts contributed to a new campus-wide effort at UC Berkeley, Work and Intelligent Tools and Systems (WITS, http://wits.berkeley.edu/), which is about "staying stable in the wake of change".

John defined the purpose of the panel as follows: As we go forward with research and discussion, in which direction should we be going? Where do we go next? He pointed out that as we look into the literature on changes induced by digitalization, we observe profound confusion – we don't know how many jobs will be created/destroyed, in which sectors, and when. There has been considerable debate, but no sound answers. To understand what's ahead, we need to understand the distinction between machine learning, imitated intelligence, and human knowledge. On this, John noted that "we don't need more facts and figures, we require more narrative! Context, choices, and the way stories are told matter."

As John noted, unfortunately a bulk of technology development and discussion has been about replacing and displacing human effort; John called for more focus on how technologies could augment humans. Socially, the crucial aspect is how intelligence tools are being deployed. In the context of ongoing discussions in Europe, John suggested starting with currently competitive sectors and then asking, how intelligent tools will shape competitive advantage and innovation in them. In industrial space – where things get made –, there aren't yet globally established digital standards – what are the future tools that allow competition to take place?

Remarks by Erkki Ormala (Aalto Univ.)

Erkki Ormala started by noting that BRIE-ETLA has contributed greatly to his earlier roles at Nokia and subsequently, he expressed his wish that the collaboration would continue in years to come.

As Erkki noted, for some fifty years now, digitalization continues to "change everything" repeatedly, sector after sector; he discussed several examples in, e.g., retail, media, traffic, city planning, and finance. Overall, ICT is clearly more important than the invention of electricity! Unfortunately, the bigger picture gets overlooked by having overly siloed angles on various details.

All the issues discussed in the earlier sessions – AI, blockchains, and platforms – are potentially transformative tools, and only through comprehensive research efforts can we understand their future implications.

Erkki noted that Europe is severely constraint by the lack of skills. In fact, as the problem has accumulated, Europe would currently need 450,000 additional digital professionals and, since the educational system is not keeping up, the issue is about to get even worse. Currently, Europe lacks a vision (and actions) to utilize and promote digitalization. Specifically, he elaborated on the potential of 5G but noted that the current EU competition policy rules hinder technology roll out.

Remarks by Yves Doz (INSEAD)

In reference to his extensive work on business strategy, Yves Doz elaborated on the discussed issues from a micro perspective. Many of the changes discussed take place within business organizations. While there is considerable emphasis on Schumpeterian (creative) destruction and replacement, organizational changes must be induced by top and middle management, and they come with huge adjustment costs and are far from being friction-free. In fact, most major adjustments fail; ultimately organizations are unable to adapt. Barriers to implementing changes fall into the two main categories: (i) cognitive and intellectual, (ii) issues with the organization and its (internal) politics, and personal challenges – is this change going to make my skills/self-efficacy less effective and less valuable? If so, then I will be likely to resist.

Overall, issues of great interest: What is the future of management? How do we induce organizations to adapt to this new future? How does technology change organizational boundaries and how do they best nurture external ecosystems? Yves discussed several practical examples in the context of these questions.

Yves noted that, as we emphasize skills in general, we should note that they are quite unevenly distributed, when it comes to nurturing and building ecosystems and platforms. We truly do not understand how imagination and execution come together, in regard to commercializing new-to-the-world ideas. We need to think more carefully about "what does innovation mean"? Maybe the European Union is going too far, too fast to develop regulatory frameworks, which may not even apply.

Remarks by Pekka Ylä-Anttila (ETLA)

Pekka Ylä-Anttila opened his talk by highlighting how far "ahead of the curve" BRIE-ETLA was in its opening seminar in 2001: location-based services and privacy/intimacy were among the half a dozen of topics, all of which became subjects of general debate perhaps a decade later. In addition, the pattern has been repeated since!

Pekka summarized his key observations of the BRIE-ETLA legacy (so far) as follows: In every technology, there are unintended and unpredictable consequences; in order to uncover them (in due time), truly multidisciplinary research is needed. Political performance, in regard to adapting to major changes, has been inadequate in the past decade; one role of international research collaboration is to make sound policy suggests and to promote their understanding and uptake among policymakers.

In looking ahead, Pekka suggested several domains that should be emphasized in future research efforts including appropriate design and impact of regulatory frameworks, societal consequences of digital transformation on work and otherwise, and – especially for Finland, Germany, and certain other places in Europe – the evolution of business-to-business/industrial platforms, which are still in their infancy.

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The Future of Work: Hal Varian's keynote and a panel

After lunch at Hotel Kämp, the discussion continued at Uusi Ylioppilastalo with approximately two hundred guests. As a lead-in to a panel, Hal Varian open the afternoon/evening event with his "bots and tots" keynote. This event is summarized here:

https://www.etla.fi/en/latest/technology-changes-future-jobs-googles-hal-varian-as-etlas-guest/

A warm thank you to all participants of the BRIE-ETLA events on August 30, 2018! We hope to continue the dialog in BRIE-ETLA 2019-2022!

The day was continued with a companion event, attended by some 200 key stakeholders, at Uusi ylioppilastalo. The panel (after Hal's keynote): Professor Hal Varian (left), Minister of Transport and Communications Anne Berner, the chair of EC's high-level AI expert group Pekka Ala-Pietilä, and Petri Rouvinen and Vesa Vihriälä (panel chair) of ETLA.

(30 August 2018; photo by Juuso Heinonen)

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Appendix: The slides used by the presenters of the conferences

Session I:
Introductory remarks by Petri Rouvinen (ETLA)

BRIE · ETLA · Business and Work in the Era of Intelligent Tools

Session I
Platforms Spawning New Business Models and Forms of Work

Petri **Rouvinen**
ETLA

"The platform's overarching purpose: to consummate matches among users and facilitate the exchange of goods, services, or social currency, thereby enabling value creation for all participants."

Parker, Van Alstyne, and Choudary (2016)

Yes, BUT:
... the platform owner is particularly advantaged, as it can "tax" the ecosystem participants & absorb particularly valuable functionality from them.

Where are we with platforms?

- **Consumer platforms**
  - Bigger than any one nation
  - Influences all consumer-facing activities
  - Platform power spills over to other domains

- **Online labor markets**
  - The ones with most "traction" bundle digital & physical (*Airbnb*, *Etsy*, *Uber*)...
  - ... although many purely digital labor platforms (*Amazon Mechical Turk*, *UpWork*)

- **B2B**
  - Lot of effort/experimentation
    - GE/Predix, IBM/Watson, Industrial Data Space, Komatsu, Siemens/MindSphere
  - Platforms?
    - Perhaps rather extranets or enterprise software?
  - Bottomline: no clear "home runs" in B2B space

Platform Economy: Implications for Competition and Labor*

Martin Kenney
Distinguished Professor
University of California, Davis
&
Berkeley Roundtable on the International Economy

Prepared for 24th ICE/IEEE International Technology Management Conference, Stuttgart, Germany (June 18, 2018)

Outline of Talk

- Introduction
- Platform giants
- Industries affected
  - Case Study: Retail
  - Case Study: Automobiles
- Concluding thoughts

Life Is Being Reorganized

- Way people are getting "news/information" is being rewired
  - Old channels broken, new ones forming
  - Wikipedia
- Dating (33% of US marriages started online)
- Supervision (rating systems)
  - Yelp example
- Privacy disappearing
  - Face etc. recognition

The Platform Giants

Stock Market Valuation – Top 10

Nov 2017		2002
• Apple	$881B	• Microsoft
• Alphabet	$821B	• General Electric
• Microsoft	$726B	• ExxonMobil
• Amazon	$676B	• Wal-Mart
• Tencent	$571B	• Pfizer
• Facebook	$552B	• Citigroup
• Berk Hath	$536B	• J&J
• Alibaba	$526B	• Shell
• J&J	$390B	• BP
• ExxonMob	$377B	• IBM

Google Services: MAU by Date of Introduction
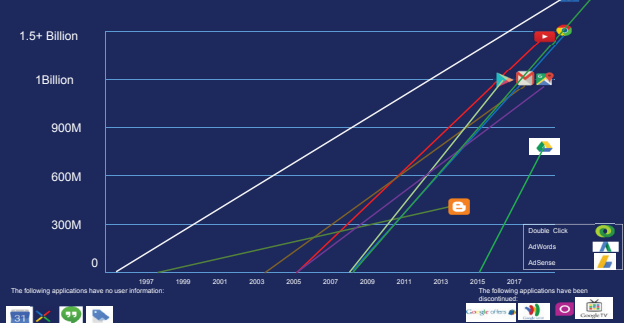
Messages per Day, Various Platforms

Source: Meeker 2018
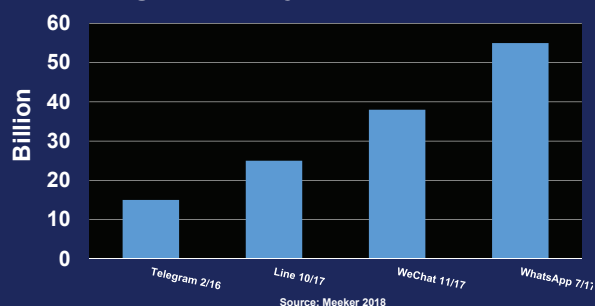
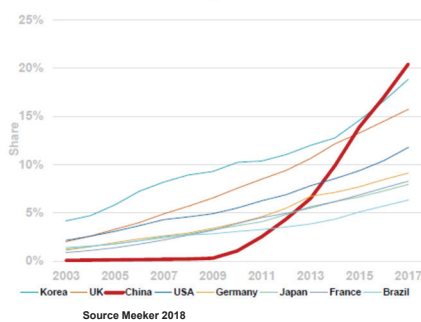**Amazon Expansion**
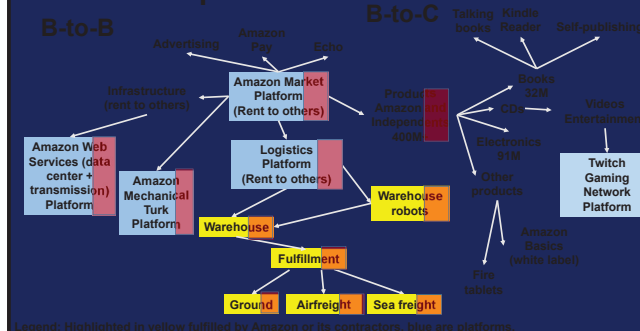
Industries Reorganized

Retail

New Online-Only Retail Brands

- Shoes – Zappos
- Glasses – Warby Parker
- Car insurance – CarInsuranceOnline
- Clothing – American Giant, The Arrivals, Bonobos
- Sneakers – Allbirds, Koio
- Luggage – Raden
- Etc…

E-Commerce % of Retail Sales

Source Meeker 2018

Machinery Industries in Platform Economy

Is the Machinery Industry Different?

No	Yes
• SW increasingly important part of machines	• Digital and analog are different
• All SW will be open source	• Proprietary SW will be the norm
• Customers will force conformity	• Firms with specialized skills can resist
• No AI can substitute for worker skills	• Skilled, trained labor remains vital
	• We need skilled labor, but our tools will deskill our customers

Automobile Value Chain – Vectors of Change

- Supply chain platforms (assembler-supplier)
- From 3D-design to 3D-printing (prototyping and beyond?)
- Car sales – Internet-mediated
- Didi, Uber, Lyft, and Blablacar
- Baidu maps/navigation
- Data upload/download from the cloud – diagnostics, tracking, etc.
- Autonomous vehicles

Value Chain Will Change therefore Value Creation and Capture Are Likely to Change

Concluding Thoughts

Profound Shifts in Inter-Firm Power
- Platform owners have great power over those in their ecosystem
  - E.g., Chinese payment systems becoming duopoly
    - Affects not only merchants but also banks
  - E.g., Amazon becoming dominant retailer
    - Affects not only retailers but also Fedex and UPS
- Industry boundaries become blurred due to data
  - New entrants – incumbents from other places or new firms
- Value chains can receive new intermediaries
  - May resegment or integrate

What Is Europe's Place?
- Is it just reining in the West Coast firms
  - Is that a positive vision?
  - Protecting old models of competition?
- European champion – Spotify?
- No reason that a European competitor will be better than US giants

Is a European Vision Possible?
- Is it possible to build platforms based on another set of social values?
  - Privacy, social solidarity

Session I:

Talk – B2B platforms: not yet a reality? By Timo Seppälä (ETLA, Aalto Univ.)

BRIE   ETLA   Business and Work in the Era of Intelligent Tools

B2B platforms – Not yet a reality?

Timo **Seppälä**
ETLA/Aalto Univ.

Industrial Internet Platforms – Silos?

MANUFACTURER → SUPPLIER → CUSTOMER

Siemens / MindSphere

IBM / Watson IoT

Kaa IoT Technologies / Kaa IoT

Microsoft / Azure IoT suite

Source: Tähtinen, 2018; Tähtinen, Seppälä, Menon, Kärkkäinen & Wuest (revise and resubmit, 2018)

ETLA

Industrial Internet Platforms? Are they platforms?

> They are not platforms (in the sense of Gawer & Cusumano, 2002), but enterprise software.
>
> The enterprise software were never platform constructs to start with.
>
> When platform literature does discuss software, it is in the context of operating systems.

Source: Tähtinen, Seppälä, Menon, Kärkkäinen & Wuest (revise and resubmit, 2018)

ETLA

Industrial Internet Platforms – Silos?

> What are the operating systems of different industries?

Source: Tähtinen, Seppälä, Menon, Kärkkäinen & Wuest (revise and resubmit, 2018)

January 16, 2019

ETLA

As Enteprise Software Platforms…

> …IIoT Platforms will collect a lot of data.
>
> …Reluctance of industrial companies to share data.
>
> …Data ownership and access become vital.
>
> …Data may become the core resource that makes these IIoT platforms valuable?

Source: Tähtinen, Seppälä, Menon, Kärkkäinen & Wuest (revise and resubmit, 2018)

ETLA

Industrial Internet Platforms – Platforms?

> How can these enterprise software platforms become platforms a la Gawer & Cusumano, 2002?

Source: Tähtinen, 2018; Tähtinen, Seppälä, Menon, Kärkkäinen & Wuest (revise and resubmit, 2018)

ETLA

Hypothesis for data sharing

Calculating Value Added	Value Added

• Operating Revenue
  – 152.452.899
• Cost of Personnel
  – 34.626.901
• Depreciations and amortizations
  – 2.541.154
• Operating Profit
  – 4.588.547
	• -> 41.756.602
	
	• **27%**

ETLA

Sharing data leads to new forms of networks contructs…

- Propriatory data (Company)
  - Company internal use only data repository. Access to data maintaned by the company
- Inner circle data (Platform)
  - Shared data repositories. Access to data maintained collectively with boundary resources.
- Distributed data (Industry)
  - Controlled by a third-party actor. Shared practices and technology to access and share information.
- Open data (Open)
  - Distributed, accessible by publicly auditable rules. Programmable interfaces as a key boundary resource.

Source: Rajala, Hakanen, Mattila, Seppälä & Westerlund, 2018

ETLA

Access to data leads to new business models…"Licensing of the Products"

Source: Rajala, Hakanen, Mattila, Seppälä & Westerlund, 2018

ETLA

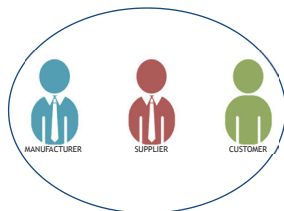### Industrial Internet Platforms?
Other considerations

> 1. Industrial users' uncertainty of the purpose of IIoT Platforms?
>
> 2. Low level of interoperability
>
> 3. Dominance of the enterprise software and platform providers?

Source: Tähtinen, 2018

ETLA

Slide 1

Industrial Digital Platforms?
Distributed Governance? An Opportunity?

MANUFACTURER SUPPLIER CUSTOMER

The platform is produced by all parties together as equally privileged and equipotent participants.

ETLA

Slide 2

B2B platforms – Not yet a reality…but they could be platforms…

Timo Seppälä

@EtlaNews @AaltoUniversity @timoiseppala

January 16, 2019   34

Session II:
Introductory remarks by Kenji Kushida (Stanford)

Slide 3

Artificial Intelligence Driving the Next Societal Transformation

Kenji Kushida
Stanford University
kkushida@stanford.edu

Slide 4

A few points from Kushida 2018

Stanford | APARC
SILICON VALLEY – NEW JAPAN PROJECT

Stanford | APARC

SVNJ Working Paper
2018-2

Artificial Intelligence:
The Algorithmic Revolution Driving the Next Industrial Transformation

Kenji E. Kushida, Stanford University

Stanford University

Slide 5

What is AI? Simple Laymen's Terms

simple working conception of AI centers around
pattern recognition—such as finding underlying relationships in data, images, audio, video—that is applied to enable a software system to improve its capabilities, or "learning."

- eg., natural language processing, motion and manipulation for robotics, etc

Is it AI?
what is the pattern being recognized from what data, and how is the learning occurring and feeding back to the pattern recognition ability

Stanford University

Slide 6

Why is AI developing so rapidly now?

Computing resources—the ability to compute, store, and transmit information—has recently transformed from a scarce to an abundant resource for the first time in human history.

Stanford University

Exponential Growth

Intel's first semiconductor chip, 1971 "4004" compared to Intel chip in 2016
- Performance = 3,500x
- Energy efficiency = 90,000x
- Price performance = 60,000x

- If a 1971 improved along the same trajectory, the 2016 model would look like this…
- Max speed 3000 mp/h (4828kph)
- Fuel efficiency 1gallon = 2,000,000 miles (3,000,000km)
- Price = 4 cents!

- But training runs of deep learning increased 300,000x from 2012-2018 (only 12x if Moore's law alone)

Cite :Thomas Freedman: "Thank You for Being Late", Open.ai

Stanford University

Complementary Enabling Technologies: Cloud Computing, Sensors, Smartphones

Technological change→ rarely a single breakthrough technology that shapes its diffusion

Rather, *it is when complementary technologies are implemented, each through their own market or industry dynamics, that the technologies in question reveal their potential.*

Stanford University

The Impact of AI: How will it unfold?

An important perspective moving forward is how to effectively collect the data you want in clever ways by using sensors, and then using AI tools to identify patterns, feed those outcomes into services, products, or other value-added offerings.

In Industry:
- **Frontier companies**
- **Specialized tool and industry companies**
- **Ubiquitous AI**

Stanford University

Technology Diffusion relies on context

- ***For any technology, the pattern in which it diffuses is determined not primarily by attributes of the technology itself, but by the context.***

- Context includes:
  - related complementary technologies,
  - industry dynamics,
  - regulations,
  - politics
  - other social factors such as relative cost and availability of labor

- "Rules matter"

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"Rules matter"

- *Rules and regulations do not exist in a vacuum*
- *→ the product of political processes, which differ across countries.*

- **The question is which country or region will invest how much into what form of solution—which may profoundly affect the trajectory of development.**

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AI vs IA

Intelligence Augmentation (IA), in which people remain at the core, with their abilities amplified.

The question is *how many new opportunities for inexperienced workers will be created by IA, and how does that compare with jobs automated by AI?*

*Taken as a paradigm, **it is fundamentally unknowable at this time how many jobs that are currently high skilled can be performed by low skilled workers**, since companies around the world, large and small, are rushing to create such IA systems.*

Stanford University

Conclusions and Implications (1)

- **For companies**: are you preparing for commodity AI tools?
- **The next phase of AI is likely to empower people without specialized knowledge of AI itself to ask valuable questions and design solutions.**

- **For places**: what are the technological choices that you are wittingly or unwittingly supporting?

- **For companies as well as places**: are the decisions you are currently making following the logic of computing power abundance, or flying in the face of it?

Compiled by CB Insights

Stanford University

Conclusions and Implications (2)

For everybody: What are portions of tasks that are best automated, and how are employment and labor systems able to harness it (not simply automating people, but amplifying people)?

Are you consciously avoid the trap of "Weapons of Math Destruction" – blind faith in algorithms?

O'Neil, C. (2016). Weapons of math destruction : how big data increases inequality and threatens democracy. New York, Crown

Stanford University

Hype and Reality

Mark Nitzberg

BRIE-ETLA Conference
Business and Work in the Era of Intelligent Tools
Helsinki, 30 August 2018

The Berkeley Roundtable on the International Economy

1981
1991
2001

What is AI?

Technology that

1. [narrow] gives the appearance of intelligent behavior
2. [general] matches human performance at all tasks

Why the fear?

runaway computing
vs.
runaway anthropomorphism

Why the hype?

Machine Learning breakthroughs

1. Image recognition
2. Speech understanding
3. Language Translation
4. Imitation Learning

The reality

Let's look at

1. Checkout-free shopping
2. Medical diagnosis
3. Conversational assistants
4. Autonomous vehicles

1.

Google 3/2017

Tumor localization: Doctors: 73% Machines: 89%
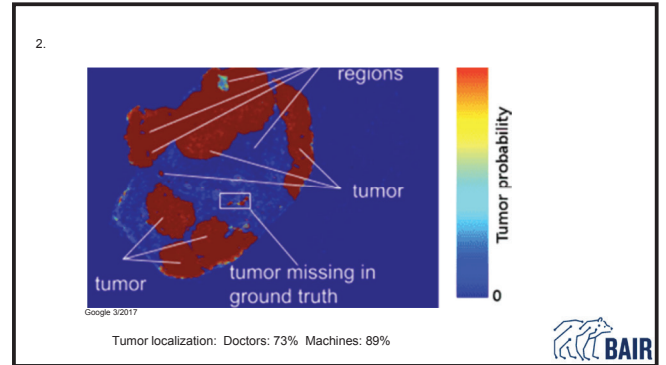
Replacing the doctor would increase reliability
... but the machine is wrong in odd ways

Siri — Google Assistant — Hey Cortana — amazon alexa
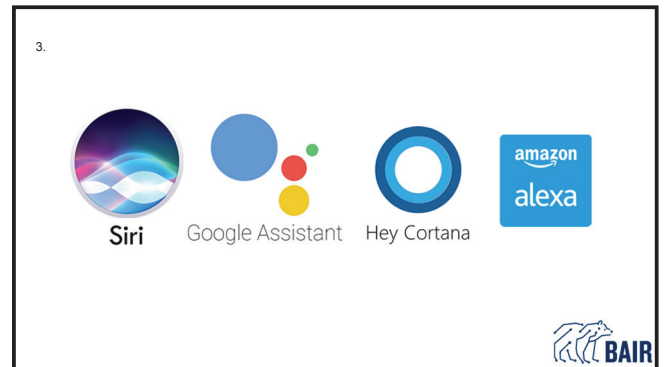
Google Assistant is Smarter Than Alexa and Siri, but Honestly They All Suck

AJ Dellinger
4/27/18 10:37pm · Filed to: GOOGLE ASSISTANT

79.7K   64   3

200 meters
18 degrees

Stereo camera

90 degrees   130 meters

Camera

Camera

Short-range radar systems   Stereo camera
Long-range radar systems   Camera

Illustration: John MacNeill
Sensors of different capabilities cover 360 degrees, with overlapping fields of view.

30
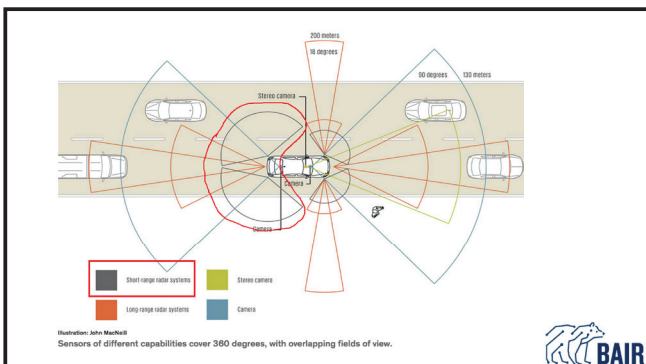
The reality

1. Social context is a huge part of intelligence
2. Delegation is the wrong paradigm
3. Tools make us superhuman

AI in Europe
A progress report

Andrea Renda

Helsinki, 30 August 2018

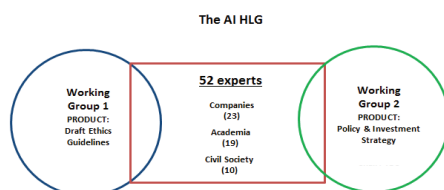## Towards Europe's "secret AI sauce"?

- **Current wisdom**
  - Europe is well positioned in AI, due to past EU and national investment in high performance computing and a well-developed academic environment
  - However, Europe lags behind the US, China and Japan, and needs to boost public and private investment in the next few years to catch up
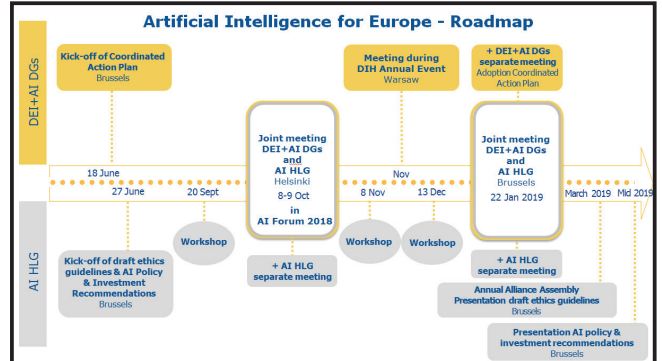
- **A combined strategy**
  - AI as the new GDPR? Ethics as a way to remain relevant
  - Must be backed by investment and 'sufficient' competitiveness

The High Level Expert Group on AI

The AI HLG

Working Group 1
PRODUCT: Draft Ethics Guidelines

52 experts
Companies (23)
Academia (19)
Civil Society (10)

Working Group 2
PRODUCT: Policy & Investment Strategy

Artificial Intelligence for Europe - Roadmap

DEI+AI DGs

Kick-off of Coordinated Action Plan
Brussels

Meeting during DIH Annual Event
Warsaw

+ DEI+AI DGs separate meeting
Adoption Coordinated Action Plan

Joint meeting DEI+AI DGs and AI HLG
Helsinki
8-9 Oct
in
AI Forum 2018

Joint meeting DEI+AI DGs and AI HLG
Brussels
22 Jan 2019

18 June   20 Sept   Nov   13 Dec   March 2019 Mid 2019
27 June   8 Nov

AI HLG

Kick-off of draft ethics guidelines & AI Policy & Investment Recommendations
Brussels

Workshop

+ AI HLG separate meeting

Workshop   Workshop

+ AI HLG separate meeting

Annual Alliance Assembly
Presentation draft ethics guidelines
Brussels

Presentation AI policy & investment recommendations
Brussels

First impressions

- AI is a means, not a goal: the agenda should be rooted in SDGs
- Ethics as a process: a "from farm to fork" approach?
- Promoting EU-certified AI through procurement and regulation
- Certification and the EU AI "mark": how will it work?
- Liability for AI-generated torts: how strict?
- Input, throughput, output, outcome accountability?
- Should Europe invest in less data-hungry AI?
- Towards an AI agency, a "Mission on AI", a CERN for AI?
- Agenda on jobs and skills totally obscure for now
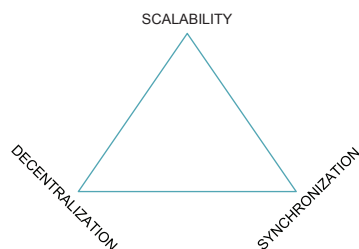
BLOCKCHAIN TECHNOLOGY
A Platform Perspective

Juri Mattila
30.8.*2018*

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*Blockchain networks exhibit all the characteristics of **digital multi-sided platforms**.*
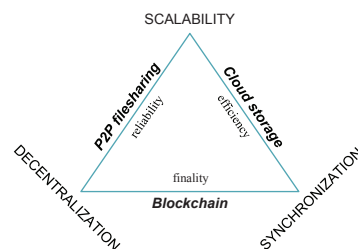
So what do they mean for <u>the platform economy</u>?

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THE NETWORK DATABASE TRILEMMA

SCALABILITY

DECENTRALIZATION

SYNCHRONIZATION

Source: Adapted from McConaghy (2016)

© Juri Mattila 2017

THE NETWORK DATABASE TRILEMMA

SCALABILITY

P2P filesharing — reliability

Cloud storage — efficiency

finality

Blockchain

DECENTRALIZATION

SYNCHRONIZATION

Source: Adapted from McConaghy (2016)

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TOOLS FOR SOCIAL INNOVATIONS

© Juri Mattila 2017

THE CONVERGENCE

SCALABILITY

P2P filesharing — reliability

Cloud storage — efficiency

finality

Blockchain

DECENTRALIZATION

SYNCHRONIZATION
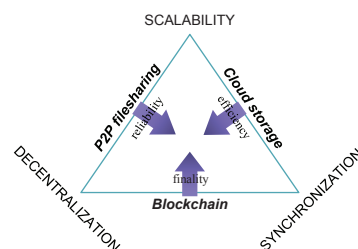
Source: Adapted from McConaghy (2016)

© Juri Mattila 2017

CASE: COINHIVE

A Crypto Miner
for your Website

Monetize Your Business With Your Users' CPU Power

INTEGRATE COINHIVE ON YOUR WEBSITE

Source: www.coinhive.com

© Juri Mattila 2017

TRANSFORMATION OF VALUE CAPTURE
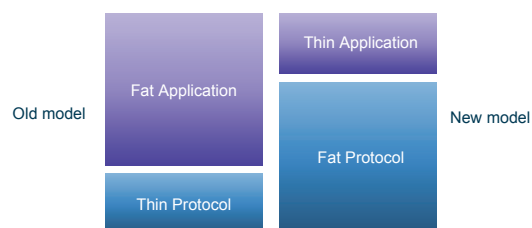
Old model

Fat Application

Thin Protocol

Thin Application

Fat Protocol

New model

Source: Monegro (2016)

© Juri Mattila 2017

Session III:
Blockchains in finance by Aleksi Grym (Bank of Finland)

Aleksi Grym
Suomen Pankki

Blockchain in finance

BRIE-ETLA seminar 30.8.2018

30.8.2018   Sisäinen   62

Blockchain applications under development

- Interbank cross-border payments
- Securities clearing and settlement
- Cross-border supply-chain management
- Land registries and other registries
- Identity management
- Provenance management
- P2P lending
- Smart insurance products

➡ **REVOLUTION? DISRUPTION?**

30.8.2018   Aleksi Grym   Suomen Pankki – Finlands Bank – Bank of Finland   Sisäinen   63

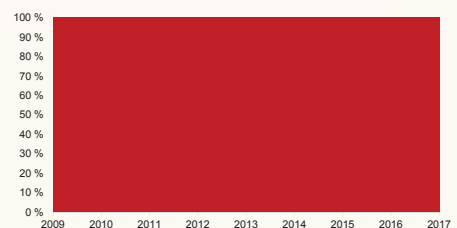Revenue from commercial blockchain applications by segment
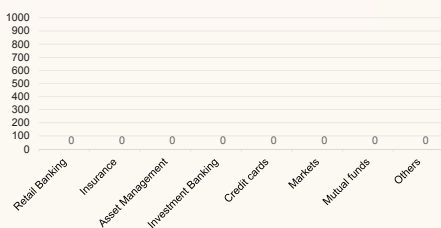
30.8.2018   Aleksi Grym   Suomen Pankki – Finlands Bank – Bank of Finland   Sisäinen   64

■ Cross-border payments using blockchain
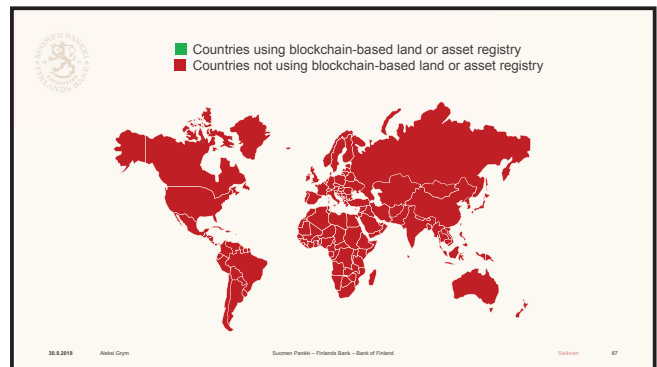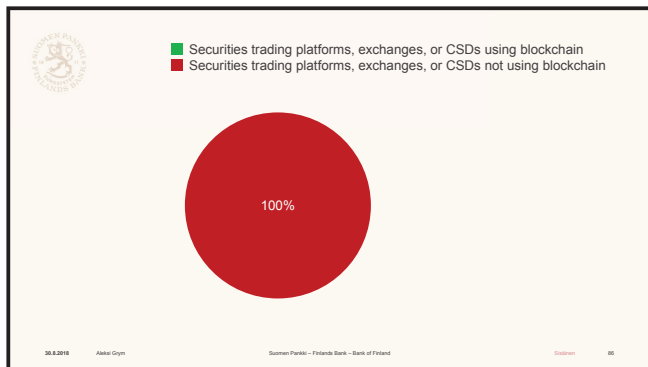■ Cross-border payments not using blockchain

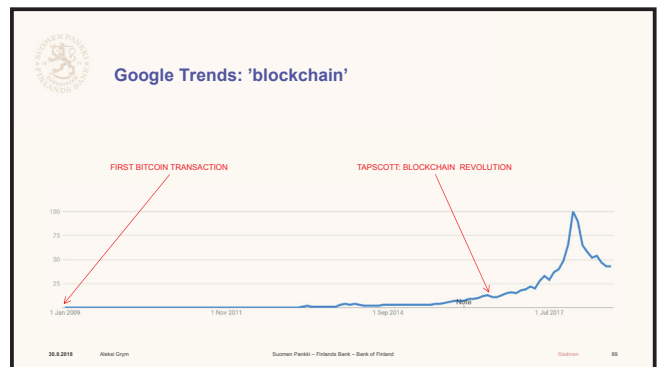30.8.2018   Aleksi Grym   Suomen Pankki – Finlands Bank – Bank of Finland   Sisäinen   65

Slide 1:

- Securities trading platforms, exchanges, or CSDs using blockchain
- Securities trading platforms, exchanges, or CSDs not using blockchain

100%

Slide 2:

- Countries using blockchain-based land or asset registry
- Countries not using blockchain-based land or asset registry

Slide 3:

Why are we discussing blockchain and decentralisation?

Slide 4:

Google Trends: 'blockchain'

FIRST BITCOIN TRANSACTION

TAPSCOTT: BLOCKCHAIN REVOLUTION

Slide 5:

Blockchain "revolution"

- Blockchain solved the "double-spending" problem
- Blockchain is the next generation of the Internet
- Blockchain enables the "Internet of Value"
- Assets can now be digitised and sent over the Internet like email
- The problem with intermediaries like banks is that they are centralised
- Cross-border payments are slow and expensive
- Blockchain solved the problem of immutable records
- Any kind of asset can be put on a blockchain
- Blockchain is great for micro-transactions and IoT
- Blockchain can replace platforms like Uber or Airbnb

Slide 6:

What is Bitcoin?

- Bitcoin is both an **accounting system** and an **accounting unit** (BTC)
- Bitcoin accounts are managed using encryption keys
- The system is decentralised into a peer-to-peer (P2P) network

HOWEVER…

- Bitcoin transactions are not P2P transactions, in the sense that transaction data would flow from sender to recipient without going through intermediaries
- Bitcoin, for all intents and purposes, has a centralised ledger
- The governance of the network is not particularly decentralised either

Slide 7:

Bitcoin's distributed ledger

ACCOUNTS

Account number	Balance
1BvBMSEYstW3	0.023174
1AuF4m4GFg7x	13.990880
1m4GFg7xJ5aN	0.000013
1YstWetSqTF4m	4.290005

TRANSACTIONS

Sender	Recipient	Amount
1BvBMSEYstW3	1m4GFg7xJ5aN	0.000550
1AuF4m4GFg7x	1m4GFg7xJ5aN	1.000000
1m4GFg7xJ5aN	1YstWetSqTF4m	0.252505
1AuF4m4GFg7x	1YstWetSqTF4m	0.000108

How is this different from a traditional ledger?
In essence, it's not.

BLOCKCHAIN DIDN'T SOLVE THE DOUBLE-SPENDING PROBLEM, LEDGERS DID

Server-based   P2P-network

Slide 8:

Bitcoin unit (BTC)

ACCOUNTS

Account number	Balance
1BvBMSEYstW3	0.023174
1AuF4m4GFg7x	13.990880
1m4GFg7xJ5aN	0.000013
1YstWetSqTF4m	4.290005

TRANSACTIONS

Sender	Recipient	Amount
1BvBMSEYstW3	1m4GFg7xJ5aN	0.000550
1AuF4m4GFg7x	1m4GFg7xJ5aN	1.000000
1m4GFg7xJ5aN	1YstWetSqTF4m	0.252505
1AuF4m4GFg7x	1YstWetSqTF4m	0.000108

Key question:

WHAT IS THE SYSTEM KEEPING ACCOUNT OF?

There is no such thing as 'Internet of Value'

"Economic value is a **measure** *of the benefit provided by a good or service to an economic agent"*
- Wikipedia

Value is not a thing, it's an attribute!

- There is only one kind of Internet, the Internet *of data*
- The Internet is a *messaging network*, it can only relay messages, nothing else
- Valuable things like money, share certificates, and land deeds are kept in *depositories and managed by custodians* (banks, CSDs, land registries, etc.)
- Depositories and bank accounts *record ownership of assets*
- Assets are not messages and cannot be digitised
- Instructions to transfer ownership are messages and can be digitised
- Messages get sent around, but the assets stay where they are

---

Centralisation vs. decentralisation is a false dichotomy

Sometimes there are good reasons to centralise things
- Efficiency, security
- Cloud is up to 10 million times more cost-efficient than blockchain (Nikander)

Sometimes things are not as centralised as you think
- The Eurosystem consists of 3500+ banks, 20 central banks, 25 GC members
- Independent of any sovereign state

Sometimes things are not as decentralised as you think
- Bitcoin mining is controlled by 4 entities and 1 equipment maker in 1 country
- Bitcoin source code written by about two dozen developers

Is there anything unique about blockchain?

"Blockchain solved the problem of immutable records"
"Any kind of asset can be put on a blockchain"

- Some merit can be given to these statements
- Blockchain is indeed a very secure and immutable record-keeping technology, but the question is, who needs it?
- Moreover, the cost of that immutability is extremely high

- In theory, any kind of asset could be put on a blockchain, but why would we?
- How would we govern that ledger?
- There is no trust problem with designated custodians of assets, they are working just fine – the world economy is living proof of that

---

IoT doesn't need blockchain

- Internet of Things means there will be more devices connected to the Internet
- Many of these devices perform tasks autonomously, and some of the tasks involve financial transactions
- Some have argued the IoT needs a distributed payment network to settle these transactions, but this is simply not true
- Transactions don't need to be settled immediately, it suffices to "run a tab" and settle later
- Settlement can take place in any bank and can be automated over an API
- To have a blockchain do the same thing means each and every device would carry with it the entire ledger of the entire network – that would be insanely inefficient

---

Let's talk about platforms instead

- Many of the ideas attributed to blockchain are actually related to platforms
- Platforms enable direct interaction between economic agents
- Marketplaces are one of the earliest examples of economic platforms
- *Digital* platforms are important because they enable direct interaction between economic agents far away from each other
- Unlike blockchain, platforms are a real and significant phenomenon:
  – Many technology companies are based on platforms and have become extremely large, valuable, and powerful: Facebook, Google, Amazon, Apple, Airbnb, Uber, etc.
- What is the difference between a blockchain and a platform?
  – Blockchain would mean the actual operation of the platform is open and distributed
  – Platform businesses are run on cloud infrastructure which is much more scalable and cost-efficient
  – Platform businesses are governed as normal corporations

Will blockchain revolutionise finance?

If it will, it has had a very slow start

Concluding thoughts

- Blockchain is a case of confusing a very specific technology as something that can be applied to many things
  – As of today, it only has one major application, Bitcoin
  – There are a some other P2P networks widely in use (mostly file sharing), and it would be a gross exaggeration to say that P2P networks have many uses
- If blockchain is removed from the P2P context, what remains is a distributed database, the technology for which has been around for a long time
  – If a distributed architecture would improve a system, it would already have been built that way
- In many areas, like money and banking, centralisation/decentralisation is a false dichotomy
- Blockchain is part of a wider phenomenon of platform economics, and has inspired some new thinking – but it's not in itself a disruption