The introductory message to the *10th Global Peter Drucker Forum* reveals a palpable fear of machine intelligence:

> *"[T]he human perspective has been increasingly sidelined in the way we think about and enact the relations between technology and society, leaving the most precious, human, potential undervalued and underused. … The relentless encroachment of machine intelligence into domains that were previously human raises important issues around the role of individuals in decision making, improvisation in the face of sudden events, and innovation."i [emphasis supplied]*

However, this line of thinking not only reflects a misrepresentation of Data Science in general—it is also antithesis to the very principles Drucker stood for. To begin with, by reading Drucker's book, *The Practice of Management (1968),* it is clear that Drucker never believed "new technology"ii would reduce our humanity. Instead, he claimed that new technology would *require* knowledge, responsibility, and decision-making—traits that make us human:

> *"[T]he new technology demands that the least productive worker be capable of a good deal of planning… [T]o maintain the equipment, to programme it, to set it and to control it, all demand of the worker in the new technology knowledge, responsibility, and decision-making—that is, planning."iii*

If anything, the need for planning has *increased* because of Artificial Intelligence (AI). To understand why, the average reader will first need a deeper understanding of Data Science. Second, various applications of AI must be classified in a framework compatible with Drucker's principles. Afterwards, Drucker's framework can be applied.

So let's start. What is AI? Data Science? Machine Learning? Network Science? How do these differ? Definitions for these buzzwords have not been globally unified, although there has been some convergence. However, we can draw on definitions used by leading academic institutions and practitioners. Data Science, for example, is defined by the UC Berkeley School of Information as a field "emerging at the intersection of the fields of social science and statistics, information and computer science, and design."iv In other words, Data Science is a hodgepodge of established disciplines. But it is a highly synergistic interdisciplinary

hodgepodge that has given birth to other subfields, including AI,[v] according to our lectures at the Asian Institute of Management. More formally, according to a 2016 Stanford University Study Panel Report, AI can be seen as "a branch of computer science that studies the properties of intelligence by synthesizing intelligence."[vi] Going a level deeper, one subfield of AI is Machine Learning,[vii] which "gives computers the ability to learn without being explicitly programmed."[viii] Don't get it wrong—there is *a lot* of programming involved in Machine Learning. What this classic definition means is that the answer is not hard-coded. Through the magic of math and statistics, Machine Learning has enabled innovations such as "self-driving cars, practical speech recognition, and effective web search."[ix] Then there is also Network Science, a field where networks are studied. It is described by Albert-Laszlo Barabasi as "indispensable for those who wish to understand today's interlinked world."[x]

All these subfields have at least one thing in common: they are applied most successfully when a specific and compelling need exists.[xi] In this sense, Data Science has never sidelined the human perspective, since it is the societal or organizational objective that drives any successful Data Science project, not the reverse. If anything, AI has heightened human perspectives—both the good and bad.

For a Druckerian essay, however, a focus on the managerial impact of AI applications is needed. To simplify our analysis, we will categorize AI applications by two broad measures: First, **the degree to which AI performs a specific job or set of jobs <u>better, about the same, or worse</u> than a human**. Admittedly, "better" or "worse" here is subjective, although efficiency is one metric. The second measure is **whether or not AI <u>displaces, competes with, or complements</u> humans**.

Table I – AI Applications Classified by Job Performance and Complementarity

	Displaces Human Counterpart	Competes with Human Counterpart	Complements Human Counterpart
Better than Human	Ride-hailing services (Uber, Grab)	Chess Algorithms (Deep Blue)	Modeling Population Displacement and Spread of Disease (Flowminder Foundation)
Same as Human	Superior Customer Service Chatbots	Automated-Teller Machines	Art Work Craquelure Classification (Crisologo, Soriano, Monterola, 2011)
Worse than Human	Personal Shopper AI	Inferior Customer Service Chatbots	*None come to mind.*

Table I is populated with samples of AI applications. Note, however, that these classifications could change. For example, presently, even if humans are generally better conversationalists than inferior chatbots, cost savings are driving competition from AI. However, eventually, chatbots will become good conversationalists, and wider displacement in call centers can occur. Also, we see that former Fed Chairman Volcker's favorite financial innovation, the ATM, is in the middle of the table. Although calling this an AI application is somewhat of a stretch, it is a tongue-in-cheek example of how managerial principles apply to both blue-collar and white-collar machines. It also demonstrates that decades after the invention of the more "efficient" ATMs, bank tellers still exist, so technological advancement is not necessarily the only factor for displacement.

In any case, the main point of the above table is to emphasize that not all AI applications are created equal. A lot of good has also come out of Data Science. For example, Flowminder Foundation, a not-for-profit organization, has "pioneered the use of de-identified data from mobile operators to follow population displacement."[xii] They have worked with the UN, relief agencies, and state governments to more quickly and effectively reach displaced victims of earthquakes. In Africa, they have similarly "integrate[d] data from mobile phones, household survey data and satellite data to model and predict infectious diseases spread."[xiii] This has led to better approaches to "malaria elimination and for near real-time outbreak

response of cholera."[xiv] In their case, the human perspective has been placed at the forefront. Machine intelligence has given a life-saving *alternative* to domains that were previously purely executed by humans: locating displaced earthquake victims, or identifying individuals exposed to malaria and cholera. Machine intelligence has brought to fore innovation, and enabled humans to make quick and better decisions in the face of sudden emergencies. There is no better counterexample to the worrying generalization of AI posed at the Drucker Global Forum introduction: The most precious and human potential are brought forth when humans are in good health, and when they are given a second chance to live despite an earthquake. Besides, Drucker does not mince his words about mechanizing jobs:

> *"[T]echnological changes… give us the means to make fully mechanical those jobs in which the human being is used as an adjunct to a machine tool. … [W]herever work can effectively be organized on the one-motion, one-job concept, we have prima facie evidence of its being capable of being mechanized with a consequent increase in efficiency and productivity. Anything short of mechanization in such work should be considered a stop-gap and evidence of incomplete or imperfect engineering rather than an example of human organization for work."* [xv]

The blunt truth is that *certain jobs* of domain specialists will continue to be outsourceable, and this reality is fully congruent with Drucker's framework. This does not mean, however, that the specialists will be made entirely obsolete. On the one hand, by Drucker's own philosophy, the domain specialist is defined by more than just the job outsourced to a machine. There will be other jobs only he or she can perform, and learning new skills is always an option. On the other hand, and quite ironically, the domain specialist will be necessary to support the development of the very algorithms that threaten to take over specific jobs of that domain specialist. Simply put, there are insights the domain specialist knows that even a computer science wizard will never know. To paraphrase Drucker, the application of data science is too complicated to be performed by an individual and must therefore be done by an organized team.[xvi]

Unsurprisingly, an integrated multi-disciplinary team is always behind any successful data science endeavor.[xvii] Take for example, again, Flowminder. It is staffed by "economists, geographers, medical doctors, epidemiologists, public health specialists and computer scientists."[xviii] Each brings unique expertise to perform a specific job that is then integrated

into a whole, as Drucker prescribes.[xix] Simply put, the principles for organizing work found in Drucker's classic model of a surgical team are present in Flowminder. [xx] Ultimately, beyond being technically complementary to each other, these individuals are united by a common purpose: saving lives. They prove that even in the age of AI, Drucker's vision of human coordination is alive and well:

> *"[I]ndividuals must be organized as a true group, organized for working together rather than against each other… proud of themselves, of each other and of their performance."*[xxi]

Given the above, has AI truly "divorced planning from doing?"[xxii] Drucker always maintained that a person should be empowered to both plan and do.[xxiii] Additionally, are humans left to plan nothing and merely follow that which an algorithm recommends? More fundamentally, are humans left to do nothing at all? The answer to these questions is a resounding no.

Why? Simple. A supervised algorithm will always have a margin of error, no matter how small. This is a universal statistical law that cannot be overcome except in highly limited situations. In this sense, a human has leeway to go against an algorithm, if not a responsibility to correct it altogether. Even unsupervised and self-learning algorithms, for the more initiated, will need periodic review to ensure relevance. In this new world, Drucker's emphasis on *planning* and *doing* applies to developing and maintaining algorithms, managing the requisite hard infrastructure, ensuring effective communication of results to stakeholders, and above all, driving the goal of AI applications. Remember, Drucker said that analysis and organization "applies not only to manual and clerical but equally to mental work."[xxiv]

So have corporations maximized the potential of AI by keeping the above in mind? Surely, AI is causing sweeping changes to society through these companies, no?

Well, yes and no. Yes, practically every corporation worth its salt is bragging about dipping its feet in AI. Everywhere we turn, there is a conference or training opportunity about Big Data. However, according to a September 2017 study published by Ransbotham et al at the MIT Sloan Management Review, the adoption of AI at companies has actually been

terribly low.[xxv] They surveyed "more than 3,000 executives, managers, and analysts across industries" and performed "in-depth interviews, with more than 30 technology experts and executives" to objectively measure institutional adoption of AI:[xxvi]

> *"The gap between ambition and execution is large at most companies. Three-quarters of executives believe AI will enable their companies to move into new businesses. Almost 85% believe AI will allow their companies to obtain or sustain a competitive advantage. But only about one in five companies has incorporated AI in some offerings or processes.* **Only <u>one in 20 companies</u> has extensively incorporated AI in offerings or processes.***"[xxvii] [emphasis supplied]*

Yes. Only about 5% of companies surveyed had extensively incorporated AI in what they do. Thus, instead of "shaking the very foundations of society"[xxviii], the impact of AI has been a bit more limited, although quite powerful when legitimately applied, at least in the diverse industries Ransbotham and colleagues surveyed. Although mind you, their industry list is comprehensive: Technology, Media, Telecom, Consumer, Financial Services, Professional Services, Health Care, Industrial, Energy, and the Public Sector.[xxix] What is more relevant to the Drucker conference, however, is that the Pioneers of AI identified by Ransbotham and colleagues—those "that both understand and have adopted AI"[xxx]—"not only have a much deeper appreciation about what's required to produce AI than laggards, they are also more likely to have senior leadership support and have developed a business case for AI initiatives."[xxxi]

For example, the study highlights the second-largest insurer in China, "Ping An, which employs 110 data scientists, [and] has launched about 30 CEO-sponsored AI initiatives that support, in part, its vision 'that technology will be the key driver to deliver top-line growth for the company in the years to come.'" [xxxii] The study then laments how superficial AI initiatives are at the rest of the insurance industry.[xxxiii]

Sadly, even in other industries, not all data scientists are given real attention by upper management. There have been notable examples such as Google's 20% time program, in which employees use creativity for product development. However, extending true empowerment to employees is as a big of a problem during Drucker's time as it is in today's age of AI. It is not technology that sidelines the human perspective; it is inept managers. At

best, managers must study data science themselves, but at the least, must genuinely empower data scientists to make meaningful changes for the company.

As we end this essay, we ask: Are we closer to the "push-button factory"[xxxiv] Drucker mentioned?

> *"[L]urid 'science fiction' is being written today about Automation. The 'push-button factory' is the least fantastic of them… The coming of the new technology has revived all the slogans of the 'planners' of the thirties. It is producing a new crop of penny-dreadfuls purporting to give us a glimpse of that nightmare, the technocrat's paradise, in which no human decisions, no human responsibility, no human management is needed, and in which the push button run by its own 'electronic brain' produces and distributes abundant wealth."[xxxv]*

Unsurprisingly, he viewed speculations of a fully automated factory as propaganda for a centrally planned economy.[xxxvi] He loathed the notion that only pure technicians—and no managers—would be needed.[xxxvii]

Ladies and gentlemen, as a student of data science *and* business, I implore you to loathe that notion with just as much vigor and passion.

Yes, there will be displacement:

> *"The popular belief that the new technology will replace human labour by robots is utterly false… Actually, the new technology (though there will certainly be problems of displacement) will employ more people and, above all, more people who are highly skilled and highly trained."[xxxviii]*

Therefore, reeducation of (soon-to-be and already) displaced employees into scientific or mathematical disciplines is important. Safety nets for those who can no longer be reeducated is even more critical. However, the need for human organization—and therefore, management—shall never disappear. More importantly, the need for ethical decision-making will remain. If the survivors of World War II had nuclear technology to worry about, we in the new millennium have Data Science. In this light, as Einstein helped with the birthing of the International Atomic Energy Agency to avoid nuclear war, leading data scientists such as

Andrew Ng of Stanford will undoubtedly one day be crucial to the establishment of an International Body on Data Science tasked with avoiding harm caused through AI.

On a lighter note, how would Drucker react in meeting his android twin? Sadly, a true android does not yet exist. Still, I suppose Drucker would be happy. For what better joy is there for an author who sought to immortalize his thoughts in books, than to find a comrade that can spread his message for all eternity? **/J**

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[ii] Drucker, P. (1968) *The Practice of Management*. London: Pan Books Ltd. p. 345.

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[ix] Ng, A. (nd). Machine Learning by Stanford University on Coursera - About this Course [Online Learning Videos]. Retrieved May 10, 2018 from, https://www.coursera.org/learn/machine-learning/home/info

[x] Barabasi, A. (nd). *Network Science. Section x.1 – Teaching Network Science*. Retrieved May 14, 2018, from http://networksciencebook.com/11#teaching-network-science

[xi] A point reinforced by virtually every subject matter expert I've heard speak, and most authoritative publications on the matter. Too many to cite!

[xii] Flowminder. (nd). Disaster Response [Web Page]. Retrieved May 14, 2018, from http://www.flowminder.org/practice-areas/disaster-response

[xiii] Ibid, Precision Epidemiology [Web Page].

[xiv] Ibid.

[xv] Drucker, P. (1968) *The Practice of Management*. London: Pan Books Ltd. p. 352.

[xvi] Ibid, p. 358.

[xvii] A point repeated by various lecturers at the Asian Institute of Management from March to April 2018.

[xviii] Flowminder Foundation. (nd). People [Web Page]. Retrieved May 14, 2018, from http://www.flowminder.org/people accessed

[xix] Drucker, P. (1968) *The Practice of Management*. London: Pan Books Ltd. p. 354.

[xx] Ibid, p. 353.

[xxi] Ibid, p. 352 and 358.

[xxii] Ibid, p. 342.

[xxiii] Ibid, pp. 341-342

[xxiv] Ibid, pp. 354

[xxv] Ransbotham, S et al. (2017, September 06). *Reshaping Business with Artificial Intelligence: Closing the Gap Between Ambition and Action*. MIT Sloan Management Review. Retrieved May 11, 2018, from https://sloanreview.mit.edu/projects/reshaping-business-with-artificial-intelligence/

[xxvi] Ibid.

[xxvii] Ibid.

[xxviii] Peter Drucker Society Europe. (nd). Peter Drucker Challenge [Web Page]. Retrieved May 11, 2018, from http://www.druckerchallenge.org/home/

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[xxx] Ibid, Disparity in Adoption and Understanding.

[xxxi] Ibid, Executive Summary.

[xxxii] Ibid, Disparity in Adoption and Understanding.

[xxxiii] Ibid.

[xxxiv] Drucker, P. (1968) *The Practice of Management*. London: Pan Books Ltd. p. 31.

[xxxv] Ibid.

[xxxvi] Ibid, pp. 31-32.

[xxxvii] Ibid.

[xxxviii] Ibid, pp. 34-35.