

# The Inevitable: Understanding the 12 Technological Forces That Will Shape Our Future<sup>1</sup>

Reviewed by Major Justin C. Barnes\*

[T]he average expert was roughly as accurate as a dart-throwing chimpanzee.<sup>2</sup>

## I. Introduction

Forecasting the future with any degree of accuracy is a tough business. To borrow a phrase from Thomas Hobbes, such forecasts tend to be “nasty [and] brutish”; therefore, they are generally better when they are “short.”<sup>3</sup> Even trustworthy weather forecasts “become increasingly less accurate three, four, and five days out.”<sup>4</sup> It seems that few things forecasted really are inevitable—especially over a thirty-year horizon.

Not so, apparently, for Kevin Kelly, the author of the aptly, if inappropriately, titled book *The Inevitable: Understanding the 12 Technological Forces that Will Shape our Future*. Drawing on his thirty years of “living online,” Kelly “wade[s]”—or leaps, often head first—into the “myriad [of] technological forces” shaping the next thirty years.<sup>5</sup> The portrait that emerges is one in which humanity has been freed from labor and is able, through technology-enabled collaboration, to continually re-define what it means to be human by creating unique experiences, which, in a new era of “superabundance,” just also happens to be the last scarcity.<sup>6</sup>

As professional military officers, judge advocates have an obligation to think about the future.<sup>7</sup> Officers prepare for—in order to avoid—the next war. That task requires a

view of the environment in which that war will be fought. Kelly’s forecast is a useful contribution to that effort because it challenges a certain common assumption; specifically, Kelly suggests—albeit with little elaboration—that war may become obsolete.<sup>8</sup>

Vivid portrait it is, but there is cause for skepticism regarding Kelly’s forecast. History suggests that human agency should not be discounted as Kelly implies.<sup>9</sup> More importantly, Kelly’s “myriad of technological forces” really are just one type of technology: information technology (IT). And common perception notwithstanding, there is reason to question the extent of IT’s influence, including its impact on today’s and tomorrow’s standard of living. Regardless, though, any thirty-year forecast is educated speculation; and for Kelly’s forecast, like all such forecasts, only time will ultimately tell.

## II. One Force to Rule Them All

To discover the future, Kelly has “waded through the myriad technological forces erupting into the present and . . . sorted [them] . . . into 12 . . . [p]resent participles, the grammatical form that convoys continuous action.”<sup>10</sup> These

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<sup>1</sup> KEVIN KELLY, *THE INEVITABLE: UNDERSTANDING THE 12 TECHNOLOGICAL FORCES THAT WILL SHAPE OUR FUTURE* (2016).

<sup>2</sup> PHILIP E. TETLOCK & DAN GARDNER, *SUPERFORECASTING: THE ART AND SCIENCE OF PREDICTION* 4 (2015).

<sup>3</sup> See THOMAS HOBBS, *LEVIATHAN* (1651), <https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/748/leviathan.pdf>; see also TETLOCK & GARDNER, *supra* note 2, at 5 (discussing experts’ forecast and concluding that it is “easiest to beat chance on the shortest-range questions that only required looking one year out” but that “accuracy fell off the further out experts tried to forecast—approaching the dart-throwing chimpanzee level three to five years out”).

<sup>4</sup> TETLOCK & GARDNER, *supra* note 2, at 13.

<sup>5</sup> KELLY, *supra* note 1, at 3-4, 7.

<sup>6</sup> See *id.* at 176, 188 (discussing post-scarcity and the fundamental limitation of human attention and noting that producing “this explosion of superabundance . . . is the compounding cheapness of stuff”).

<sup>7</sup> Paul R. Norwood et al., *Capturing the Character of Future War*, U.S. ARMY WAR C. Q. PARAMETERS, Summer 2016, at 81, 90, [http://strategicstudiesinstitute.army.mil/pubs/parameters/issues/Summer\\_2016/Vol46No2.pdf](http://strategicstudiesinstitute.army.mil/pubs/parameters/issues/Summer_2016/Vol46No2.pdf) (“[T]he profession of arms needs a more vibrant and competitive marketplace of ideas that invests uniformed personnel with the responsibility to describe the changing character of war.”).

<sup>8</sup> KELLY, *supra* note 1, at 274-75 (“‘Everyone knows’ that humans are warlike, but I would guess organized war will become less attractive, or useful, over time as new means of social conflict resolution arise at the

global level.”).

<sup>9</sup> Earlier in the introduction Kelly goes so far as to argue that “while culture can advance or retard . . . [technological] expression, the underlying forces are universal.” *Id.* at 4. One is tempted to respond to Kelly’s diminishment of culture’s role by pointing to China’s Treasure Fleet and its Admiral Zheng He, which “made seven epic voyages” across much of the globe. LOUISE LEVATHES, *WHEN CHINA RULED THE SEAS: THE TREASURE FLEET OF THE DRAGON THRONE, 1405-33* loc. 119-124 (1994) (ebook) (noting also that as a result of the Treasure Fleet, “[h]alf of the world was in China’s grasp, and with such a formidable navy the other half was easily within reach, had China wanted it”). Yet despite this impressive achievement, “after the last voyage . . . , the Chinese emperor forbade overseas travel and stopped all building and repair of oceangoing” ships. *Id.* loc. 124. This decision meant that “[w]ithin a hundred years the greatest navy the world had ever known willed itself into extinction and Japanese pirates ravaged the Chinese coast.” *Id.* Apparently for China’s Treasure Fleet, culture had a say.

<sup>10</sup> KELLY, *supra* note 1, at 2, 7-8. The twelve present-participle categories are: becoming, cognifying, flowing, screening, accessing, sharing, filtering, remixing, interacting, tracking, questioning, and beginning. *Id.* at 8. As a further matter, Kelly essentially re-defines the word inevitable from “[a] situation that is unavoidable” to something that looks an awful lot like: a situation that is highly likely. See *Inevitable*, OXFORD LIVING DICTIONARY, <https://en.oxforddictionaries.com/definition/inevitable> (last visited Jan. 20, 2017) (defining “inevitable” as a noun). Ditching a description of the word that has the virtue of a consistency with the dictionary, Kelly defines “inevitable,” at least in the technological context, as reflecting a “bias in the nature of technology that tilts it in certain directions.” KELLY, *supra* note 1, at 3. “These tendencies,” Kelly asserts, “exist primarily in the aggregate forces that shape the general contours of technological forms,” and thus, “the form of an internet—a network of networks spanning the globe—was inevitable, but the specific kind of internet we chose to have is not.” *Id.* Thus, to Kelly, inevitability is really “momentum,” that is the “momentum

twelve present-participles categories—or “megatrends”—are “inevitable,” Kelly asserts.<sup>11</sup> Why? Kelly argues that “[p]articular technological processes will inherently favor particular outcomes.”<sup>12</sup> For instance, in the case of IT, the “bias [is] toward cheap ubiquitous copies.”<sup>13</sup> “[B]ecause [those outcomes] are rooted in the nature of technology, rather than in the nature of society,” Kelly concludes, these trends are inevitable.<sup>14</sup>

Despite the use of the adjective “myriad” and the plural “forces,”<sup>15</sup> Kelly really discusses only one technology: IT.<sup>16</sup> Indeed, Kelly’s future is characterized by IT-enabled human collaboration and IT-powered—i.e., artificial intelligence—robots. But by minimizing the importance of other technologies, this focus will ultimately become the book’s weakness.

First, regarding IT-enabled collaboration, Kelly relates an anecdote in which he met with executives at the television network ABC to talk about “Internet Stuff.”<sup>17</sup> For the executives, “all the sharing, all the free stuff seemed too impossible . . .”<sup>18</sup> Yet, as Kelly states, the “the big story” of the internet was just that: “[n]either old ABC nor startup Yahoo!” created the content;<sup>19</sup> it was “billions of users” who did that.<sup>20</sup>

Kelly argues that the “online public has an incredible willingness to share.”<sup>21</sup> He lauds this IT-enabled “new kind of participation,” one that, in Kelly’s words, “has since developed into an emerging economy based on sharing.”<sup>22</sup> In other words, gone are the days of “national production” and “government . . . subsidies,” and in come the days of “peer production” and “a bounty of free commercial goods and

services.”<sup>23</sup>

Setting aside the fact that even today much of the internet’s content is not created by volunteers,<sup>24</sup> in Kelly’s future, presumably someone is paying these billions of users’ bills. After all, one cannot eat (non-monetized) “Likes.” But that poses no big obstacle for Kelly because of the second type of IT: This will be an IT-powered, robot-built post-scarcity world.<sup>25</sup>

To support this assertion, Kelly argues that there has been an “explosion of superabundance,” which comes from the “the compounding cheapness of stuff.”<sup>26</sup> This explosion will expand as IT-powered—namely, artificial intelligence—robots “consolidate their gains in already automated industries” and “continue their migration into white-collar work.”<sup>27</sup> As a consequence, humanity will be freed from labor. Indeed, Kelly asks rhetorically: “Isn’t the whole idea that in a highly evolved advanced society work is over?”<sup>28</sup> Perhaps.

### III. Economics Strike Back: There is no Such Thing as a Free Lunch

Kelly’s view of the future is compelling, but it raises two inter-related questions. First, despite the apparent glamor of the iPhone generation, recent research casts into doubt the IT revolution’s actual impact on standards of living. And if that is so today, it calls into question IT’s impact on standards of living tomorrow. Second, technology’s influence on the economy now also suggests that future technology-driven benefits may not be relatively equally distributed, as Kelly

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of an ongoing technological shift.” *Id.* at 4. Momentum seems like another word for a trend. And here, Kelly quibbles a little bit: first Kelly notes the “broad historical trends” that have shaped the “technological convergence between communication and computation,” and then he states that “[t]here is nothing on the horizon to decrease” those trends. *Id.* at 2. Perhaps. But if there could be something on the horizon that is capable of diminishing those trends, there may also be something on that horizon that could blunt that Kelly’s “momentum” in which case the *unavoidable* seems more like just the *likely*.

<sup>11</sup> *Id.* at 7.

<sup>12</sup> *Id.*

<sup>13</sup> *Id.*

<sup>14</sup> *Id.*

<sup>15</sup> *Id.*

<sup>16</sup> This becomes fairly clear in the very beginning of the book. There Kelly states that since the 1980s, the “technological convergence between communication and computation has spread, sped up, blossomed, and evolved” and that “it is very clear that there have been large-scale trends governing what has happened.” *Id.* at 2. Understanding “[t]hese broad historical trends [is] crucial because the underlying conditions that birthed them are still active and developing, which strongly suggests that these trends will continue in the next few decades.” *Id.* Further given Kelly’s background, it is perhaps unsurprising that his focus is on information technology. *Id.* at 4 (describing Kelly’s “three decades” of “living online,” as both “a pioneer in a rather wild empty quarter” and, “later, as a builder who constructed parts of this new continent”).

<sup>17</sup> *Id.* at 16.

<sup>18</sup> *Id.*

<sup>19</sup> *Id.* at 19.

<sup>20</sup> *Id.*

<sup>21</sup> *Id.* at 130.

<sup>22</sup> *Id.* at 19.

<sup>23</sup> *Id.* at 137.

<sup>24</sup> For instance, “[a]s of July 2016, YouTube has paid out \$2 billion to rightsholders who have chosen to monetize claims since Content ID first launched in 2007.” *Statistics*, YOUTUBE, <https://www.youtube.com/yt/press/statistics.html> (last visited Jan. 20, 2017). Further, “The number of channels earning six figures per year on YouTube is up 50% . . .” *Id.*

<sup>25</sup> KELLY, *supra* note 1, at 176 (“This is the curse of the postscarcity world: We can connect to only a thin thread of all there is.”).

<sup>26</sup> *Id.* at 110, 189 (identifying two examples, namely, the falling price of copper—and commodities in general—and the ever-more efficient beer can).

<sup>27</sup> *Id.* at 50-51.

<sup>28</sup> *Id.* at 281.

implies.<sup>29</sup>

It can certainly seem like technology is progressing at an ever faster rate. Kelly asserts that human knowledge and information is doubling every two years.<sup>30</sup> In support of that assertion, Kelly notes that the number of scientific articles published, and patent applications filed, each year has been increasing.<sup>31</sup> This has led to accelerations in technology's "rate of graduations" and the "cycle of obsolescence."<sup>32</sup> It can feel like everything is moving faster.

But measuring technological progress is hard. In *The Rise and Fall of American Growth*, Robert Gordon argues that the "best measure of the pace of innovation and technical progress is total factor productivity (TFP), a measure of how quickly output is growing relative to the growth of labor and capital inputs."<sup>33</sup> And unfortunately, TFP growth has lately been less than dazzling.

Specifically, according to Dr. Gordon, "TFP grew after 1970 at barely a third the rate achieved between 1920 and 1970."<sup>34</sup> Further, "advances since 1970 have tended to be channeled into a narrow sphere of human activity having to do with entertainment, communications, and the collection and processing of information."<sup>35</sup> But, as Dr. Gordon notes, "[f]or the rest of what humans care about—food, clothing, shelter, transportation, health, and working conditions . . . —progress slowed down after 1970, both qualitatively and quantitatively."<sup>36</sup> In other words, much of what those soon-to-be-mundane bills buy has not shared in IT's explosive growth.

The appearance of progress may not be the reality of progress. As Dr. Gordon argued,

The wonders achieved by computers and, since the

mid-1990s, by the Internet have misled many analysts into believing that the current rate of economy-wide progress is the fastest in human history and will become even more rapid in the future. The basic flaw in this faith in an acceleration of technological change is that even if the contribution of computers to economic growth were increasing, the share of total GDP represented by computers is too small to overcome the great majority of economic activity where the pace of innovation is not accelerating and, indeed, in many respects is slowing down.<sup>37</sup>

Put simply, the IT-revolution has had a relatively limited impact on economic growth, which raises questions regarding its effect in the future.<sup>38</sup>

But for sake of argument, assume both that IT continues to grow<sup>39</sup> and that it, eventually, results in a massive increase in productivity, leading ultimately to a world of "superabundance."<sup>40</sup> Even if that is so, Kelly's forecast runs into one further problem. Specifically, Kelly does not explain why that abundance—super or not—will be reasonably equally shared.

As an initial matter, wealth is not evenly distributed today. For instance, one study found that the wealthiest 10% of Americans own approximately 76% of all wealth in the United States.<sup>41</sup> And it is simply not clear why, in Kelly's view, further IT growth will result in a more equitable distribution of that wealth.

More importantly, robots are capital.<sup>42</sup> And lately, the owners of capital have been doing pretty well—often at labor's expense. In economics, the "labor share" is that portion of national income that goes to labor.<sup>43</sup> From 2001 to

<sup>29</sup> See, e.g., *id.* at 137-38 ("When masses of people who own the means of production work toward a common goal and share their products in common, when they contribute labor without wages and enjoy the fruits free of charge, it's not unreasonable to call that the new socialism.").

<sup>30</sup> *Id.* at 283.

<sup>31</sup> *Id.*

<sup>32</sup> *Id.* at 10-22.

<sup>33</sup> ROBERT J. GORDON, *THE RISE AND FALL OF AMERICAN GROWTH: THE U.S. STANDARD OF LIVING SINCE THE CIVIL WAR* loc. 186 (2016) (ebook).

<sup>34</sup> *Id.*

<sup>35</sup> *Id.* loc. 179-85.

<sup>36</sup> *Id.*

<sup>37</sup> *Id.* loc. 8545.

<sup>38</sup> Indeed, Dr. Gordon argues that "the power of [information and communications technology]-related innovations to boost productivity growth petered out after 2004," noting that "[f]or the decade 2005-2014, average trend productivity growth was just 1.30 percent and by the end of 2014 had reached only 0.6 percent per year." *Id.* loc. 6419.

<sup>39</sup> This may be an unwarranted assumption. See Tim Cross, *Technology Quarterly: After Moore's Law*, *ECONOMIST*,

<http://www.economist.com/technology-quarterly/2016-03-12/after-moores-law> (last visited Jan. 20, 2017) (noting that "[a]fter a glorious 50 years, Moore's law—which states that computer power doubles every two years at the same cost—is running out of steam" and identifying potential replacements).

<sup>40</sup> To be fair, Kelly implicitly recognizes one additional problem in this era of plenty: logistics. See KELLY, *supra* note 1, at 53 (discussing that as a consequence of a reduction in manufacturing costs, "the costs of transportation become a far greater factor").

<sup>41</sup> Christopher Ingraham, *If You Thought Income Inequality Was Bad, Get a Load of Wealth Inequality*, *WASH. POST: WONKBLOG* (May 21, 2015), <https://www.washingtonpost.com/news/wonk/wp/2015/05/21/the-top-10-of-americans-own-76-of-the-stuff-and-its-dragging-our-economy-down/>.

<sup>42</sup> See *Capital and Interest*, *ENCYC. BRITANNICA*, <https://www.britannica.com/topic/capital-economics> (last visited Jan. 20, 2017) (defining capital as "a stock of resources that may be employed in the production of goods and services").

<sup>43</sup> *ORG. FOR ECON. CO-OPERATION & DEV., THE LABOR SHARE IN G20 ECONOMIES 2* (Feb. 2015) [hereinafter *OECD*], <https://www.oecd.org/g20/topics/employment-and-social-policy/The-Labour-Share-in-G20-Economies.pdf>. National income is "the sum of all income available to the residents in a given country in a given year," while the capital share is "the part of national income going to capital." *Id.*

2014, the United States' labor share—which for the fifty years before 2001 was right around 62%—fell to 56%.<sup>44</sup> Yet from 2000 to 2007, the world's advanced economies' capital share grew.<sup>45</sup> Although the cause for this transition is disputed, several theories posit a role for technology.<sup>46</sup>

Put simply, since 2001 at least, increases in the productivity of capital through technology has arguably led to a less equal society. Kelly's vision of the future seems to rely on even more massive increases in that productivity. But he does not explain how (or why) any gains from those increases will be more equally distributed than they are now. Put another way, Kelly does not explain why, if his future will be built by robots, its benefits will not, in the end, disproportionately go to the people who own the robots.

#### IV. Conclusion

The future is uncertain. Indeed even in a deterministic universe,<sup>47</sup> forecasters face two significant constraints, both of which were famously identified by former Secretary of Defense Donald Rumsfeld: known unknowns and, worse yet, unknown unknowns.<sup>48</sup> As a forecast's time horizon increases, even the "known knowns" can become unknowns. Consequently, there should be a relatively low degree of confidence in all forecasts. For a thirty-year forecast, that degree of confidence should amount to little confidence at all.

Yet, forecasting remains essential to planning, especially for the military officer.<sup>49</sup> Preparing for the next war requires forecasting the circumstances under which, and in which, that war will be fought. It is here that Kelly's work is valuable for a judge advocate. His view of the future—especially its forecast regarding the potential end of war—is likely very different from the forecasts mostly commonly considered by those officers. Yet, for that very reason, it is even more important to evaluate these ideas. Without such viewpoints,

officers can start seeing what they expect, as opposed to what is actually there.<sup>50</sup>

Kelly paints a positive view of a future of collaboration, one in which people are freed from labor and are able to pursue those activities that are uniquely human. But in so doing, Kelly must necessarily ignore many of the past effects of the technology he trumpets: both in terms of their actual impact in the standard of living and in terms of the distribution of their material gains. In the end, this forecast—like any forecast—cannot be proven wrong today, but that does not make it right about tomorrow.

<sup>44</sup> Brian I. Baker, *The Laboring Labor Share of Income: The "Miracle" Ends*, BUREAU OF LAB. STATS. (Jan. 2016), <http://www.bls.gov/opub/mlr/2016/beyond-bls/the-laboring-labor-share-of-income-the-miracle-ends.htm>.

<sup>45</sup> OECD, *supra* note 43, at 12.

<sup>46</sup> Baker, *supra* note 44 (summarizing a research paper on theories, and noting that two of the three theories involve technology's effect on the labor share).

<sup>47</sup> Interestingly, this is not the version of inevitable that Kelly claims. KELLY, *supra* note 1, at 3 (discussing a "classic rewinding thought experiment" in which outcomes are deterministic and stating that the author "mean[s] inevitable in a different way").

<sup>48</sup> In response to a reporter's question regarding a link among Iraq, weapons of mass destruction, and terrorists, Secretary of Defense Rumsfeld stated:

Reports that say that something hasn't happened are always interesting to me, because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns—the ones we don't know we don't know. And if

one looks throughout the history of our country and other free countries, it is the latter category that tend to be the difficult ones.

*DoD News Briefing – Secretary Rumsfeld and Gen. Myers*, DEP'T OF DEF. (Feb. 12, 2002, 11:30 AM), <http://archive.defense.gov/Transcripts/Transcript.aspx?TranscriptID=2636>; see also TETLOCK & GARDNER, *supra* note 2, at 12 ("How predictable something is depends on what we are trying to predict, how far into the future, and under what circumstances.").

<sup>49</sup> It is worth noting that all forecasters also share a significant advantage, namely, when a forecast is made, it cannot be proven wrong. But sometimes accuracy is not the goal. See TETLOCK & GARDNER, *supra* note 2, at 4-5 (noting that forecasters are, "[w]ith few exceptions, . . . not in front of the cameras because they possess any proven skill at forecasting" and that "[a]ccuracy is seldom even mentioned").

<sup>50</sup> See, e.g., *id.* at 38 (discussing confirmation bias). This is hardly the only bias to which human judgment is subject. For a good overview of those heuristics and biases, see HEURISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT (Thomas Gilovich et al. eds., 2002).