

Intangible Assets: The Key To Improving Construction “Productivity”

An Industry White Paper

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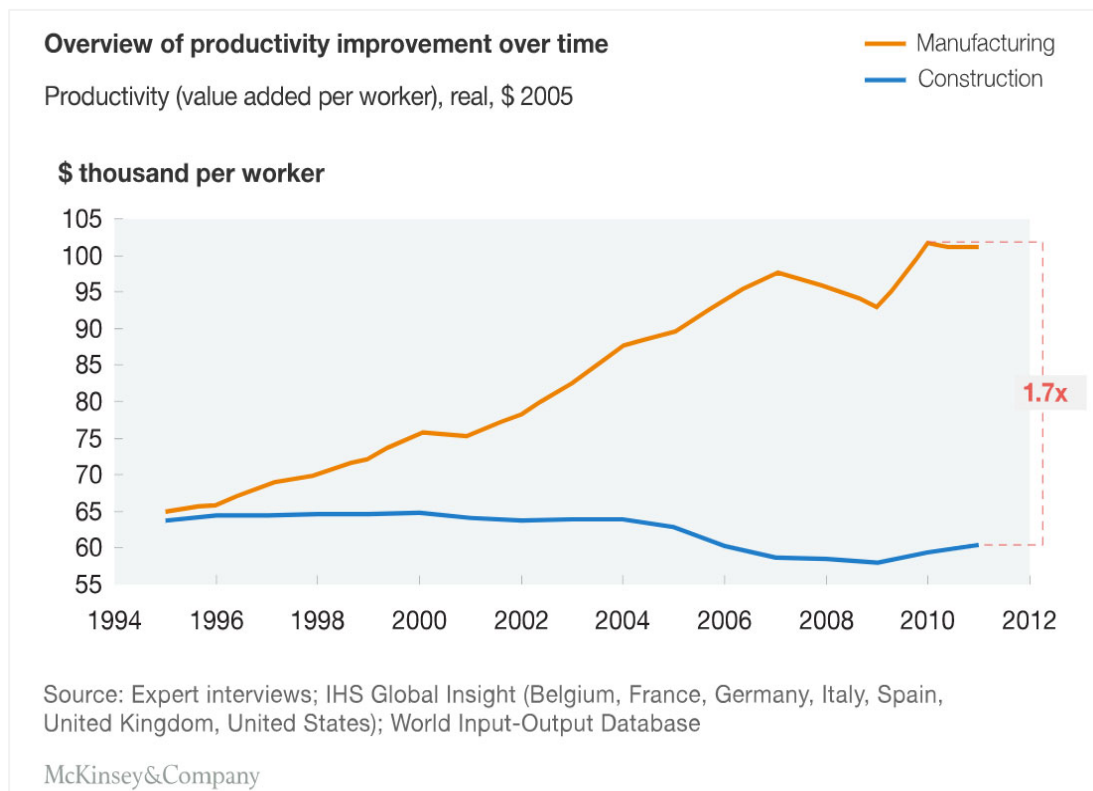
Abstract: In July 2015, McKinsey published an article titled, *The Construction Productivity Imperative*. In it was a chart comparing “Productivity” in the construction and manufacturing industries. This white paper seeks to correct some common misconceptions about the chart—by highlighting one of the key drivers of “Productivity” (or gross value added) in manufacturing: *Intangible Assets*. We’ll talk about examples of Intangible Assets in construction, the growing trend of Intangibles in the global economy, strategies to close the gap between construction and manufacturing, some of the consequences of misinterpreting the chart, select AEC industry players who are currently investing in Intangibles, and finally where some of the opportunities still lie.

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1. McKinsey's Famous (And Often Misinterpreted) Productivity Curve

In July 2015, McKinsey published an article titled, [The Construction Productivity Imperative](#). In it was a chart comparing “Productivity” in the construction and manufacturing industries. Most of you reading this are likely familiar with the article—which to this day is frequently referenced in industry webinars and pitch presentations. **The purpose of this white paper is to correct some common misconceptions about the chart, for the benefit of the construction industry (...aka the blue line below).** For those who are not familiar with the McKinsey productivity chart, it looks like this:



The McKinsey article was essentially a call to action: **“Better project management and technological innovation can improve the chances of success.”** The baseline? McKinsey cited research that 98% of megaprojects suffer cost overruns of more than 30%—and 77% are at least 40% late. Having spent a good chunk of my career analyzing problem projects, I’m confident those numbers are well-supported.

So, what? What’s the point? Well, I have one minor issue with the article. And that is, the *word* “Productivity.” Actually, I take that back. My issue isn’t with the article at all. Since “Productivity” is defined explicitly as *value added per worker*—it’s right there on the chart. **My frustration, for lack of a better term, is with how the world has interpreted the article ever since—this idea that construction is somehow “unproductive.”** Construction is *very* productive...it’s just not manufacturing.¹

¹ Among the many goals of this article is to highlight certain key differences between productivity in manufacturing and construction to help put the McKinsey chart in proper context. That said, one thing this article is not trying to do is explain the reasons for declining productivity in construction (blue line). There are several great articles out there that explore that topic, including ones by McKinsey and the [Construction Users Roundtable \(CURT\)](#).

2. “Productivity” Is A Misnomer, When Comparing Construction To Manufacturing

The McKinsey article defines Productivity as “value added per worker.” I wouldn’t be surprised if most people glossed over that. And I guarantee few, if any, took the time to read page 153 of 168 in the [technical appendix](#).² *Full disclosure: It’s entirely possible that I was reading this technical appendix on a Friday night during the stay-at-home orders last year. Maybe I should’ve kept that part to myself...*

Anyway, in the technical appendix, McKinsey defines productivity as the “*output achieved by a given input.*” But, in this case, the measure of output is important. McKinsey uses gross value added. Gross value added is essentially the value of outputs minus the value of inputs. Applied to construction, it’s the “*final value of the construction good (for example, the house) minus the value of the inputs required to build that house (for instance, wood and bricks [...and labor, obviously]).*”³

Here’s the challenge. Gross value added is fundamentally different for construction firms than it is for manufacturing firms. I understand it’s a general measure of economic activity. But, in this case, it may be too general. And I think it’s causing some confusion...due in part to *the word, “Productivity.”* For example, in construction, “Productivity” is arguably a term of art—one involving a company’s historical unit rates, jobsite factors, direct labor, installed quantities, etc. In manufacturing, gross value added (...aka “Productivity”) is a completely different animal. And we know that by looking at some of the top manufacturing companies—and the key drivers of gross value added within those firms.

3. A Look At The Top Manufacturers (i.e., The Orange Line)

Manufacturing can mean a lot of different things. And, admittedly, I didn’t have time (...or the budget) to analyze all the data McKinsey did.⁴ But let’s start by looking at the top 10 manufacturers globally, regardless of goods, just to get a sense of what’s likely included in the orange line. Not too surprising—the **top 10 manufacturers are generally automotive, electronics, and pharmaceuticals companies.**⁵

Rank	Company	Goods
1	Volkswagon	Automotive
2	Toyota	Auto/Various
3	Apple	Electronics
4	Samsung	Electronics
5	Daimler AG	Automotive
6	General Motors	Automotive
7	Ford	Automotive
8	Foxconn	Electronics
9	Honda	Automotive
10	Cardinal Health	Pharmaceuticals

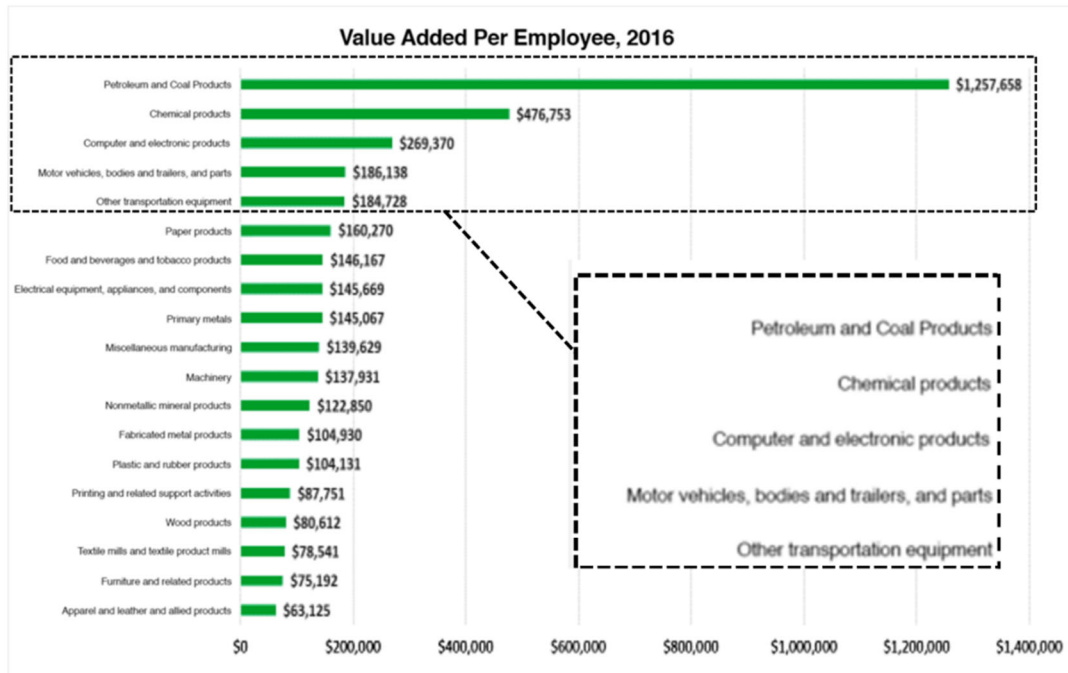
² The technical appendix is actually in reference to a subsequent McKinsey article in February 2017 (...part of the same construction productivity series though) which included a full 168-page report and technical appendix.

³ <https://www.mckinsey.com/business-functions/operations/our-insights/reinventing-construction-through-a-productivity-revolution> (February 2017 article).

⁴ To be clear, the purpose of this white paper is not to verify (or refute) the McKinsey analysis. Review of the technical appendix and other related McKinsey sources was simply in an effort to better understand the curve.

⁵ <https://www.manufacturingglobal.com/> Note: All cited sources in this white paper are meant to be illustrative, not authoritative—meaning that even alternate sources shouldn’t affect the conclusions of the white paper.

Another interesting look at manufacturing is essentially the same metric McKinsey uses, “value added per worker”—but by good or product, instead of by company. The chart below is from the National Institute of Standards and Technology (NIST), part of the U.S. Department of Commerce. The chart highlights a few more important takeaways regarding gross value added in manufacturing. First is that the top two bars, petroleum and coal products (e.g., the processing of crude oil) and chemical products, are outliers when considering that metric—in fact, they’re *major* outliers.⁶ And second is that rounding out the top five are electronics, automotive, and other transportation.⁷ As you can see, we’re starting to see a trend here with electronics and automotive.



To recap...the largest global manufacturers (i.e., biggest contributors to McKinsey’s orange line in terms of revenue) are generally automotive, electronics, and pharmaceuticals companies. And the biggest outliers in terms of *gross value added per employee*...the metric used in the article...are generally oil and chemical products, followed again by electronics and automotive goods. **Therefore, the big drivers of “productivity” in manufacturing appear to be generally: (1) electronics, (2) automotive, (3) pharma, (4) oil, and (5) chemical products.**

⁶ <https://www.commerce.gov/sites/default/files/migrated/reports/petroleum-and-coal-products-manufacturing-profile.pdf>. The petroleum and coal products industry grew tremendously over the last decade, due primarily to price increases. Further, according to the article, “[d]espite being the largest industry in terms of shipments, manufacturing of petroleum and coal products comprised less than 1 percent of manufacturing jobs in 2013.” In other words, in general, petroleum and coal products have high margins relative to the number of employees.

⁷ <https://www.nist.gov/blogs/manufacturing-innovation-blog/what-industry-your-wallet>

4. Manufacturing Derives Significant Value From Intangibles

Thanks to Shark Tank, the general public understands the importance of having a patent. Patents are one of the more well-known forms of intellectual property (IP), also known as intellectual capital. In this article though, we're going to broaden the definition of IP even further—by referring to these things as *Intangible Assets*. Intangible Assets, also known as Intangibles, include patents, trademarks, copyrights, trade secrets, and know-how. But, for the purposes of this article, we're going to **define Intangibles as anything that adds value to a company...but is not tangible or physical**. For example, certain things that a company does very well like Design and Branding could be Intangibles—since these functions lead to patents and trademarks, among other outputs. In fact, in general, functions like Design and Branding and their resultant outputs (e.g., award-winning designs, patents, trademarks) are integral—it's hard to separate the function from the output.

In construction, trade secrets and know-how are some of the more intuitive examples of Intangible Assets—since many architecture, engineering, and construction (AEC) firms exhibit expertise on some level. **Trademarks are very prevalent too**, thanks to the well-established designers and builders that have been around for decades—including several large, privately-owned and operated businesses. In manufacturing, intangible assets are critical to value creation—and to protecting that value once it's created. Once the value for a given product is created and protected, manufacturing that product at scale can generate tremendous returns. The combination of these steps and other important factors including, for example, a global supply chain, results in shareholder gains...*aka steep orange lines*.

It's not surprising, therefore, that manufacturing is very IP-intensive relative to other industries. In fact, according to the United States Patent And Trademark Office (USPTO), in the U.S. alone, manufacturing was *“responsible for almost 99% of IP-intensive merchandise exports in 2010, with oil and gas extraction and software ... accounting for the rest.”*⁸ **The largest categories of products on the list of IP-intensive merchandise exports were: (1) semiconductors and electronic parts, (2) chemicals, (3) automotive, and (4) pharma. It's essentially the same list as the previous section.**

But again, what's the point? Well, the point is that “gross value added” in manufacturing is largely driven by these Intangible Assets, as we will see. Or, at a minimum, the two are highly correlated. And, not surprisingly, Intangible Assets that scale (i.e., selling 200 million well-designed iPhones per year) can generate a tremendous amount of value. This concept, by the way, is not only true for physical products (i.e., products that rely on patents and/or great design for protection). It's also true for “products” that are just really hard to “manufacture” (i.e., that require significant *know-how*), such as extracting and/or processing crude oil...or simply building really great software. Those things are hard to do well.

5. Intangible Assets In Construction

Research and development (“R&D”) is a very common term in manufacturing and consumer good-type companies...but it's not very common in construction. **R&D in construction is not a department. It's more like a shared responsibility across the entire construction company.** While there may be a small group responsible for developing, evaluating, and/or adopting new technologies, it's really everyone's responsibility to be constantly evaluating the best way to do their job—which, by the way, is probably

⁸ https://www.uspto.gov/sites/default/files/news/publications/IP_Report_March_2012.pdf

why some of the more forward-thinking AEC firms today, like DPR or Mortenson, for example, are now crowdsourcing “innovation” ideas from their employees—and they’re not afraid to share that.

Because “R&D” isn’t very common in construction, we’re not going to force that term into this article. Instead, we’re going to focus on R&D *outputs*. **In other words, we’re going to focus on the outputs from any R&D process—which can take one of many different forms.** Some are obvious, like patents that lead to new product launches. Others are less obvious, like lessons learned. That’s right, learning is a major R&D output—including, for example, what not to do next time. We don’t typically think of knowledge gained as an “asset”—but it does have value. Perhaps not as much as a new product line. But knowledge is, nonetheless, an R&D output, and therefore an asset. It’s just hard to measure.

Since most R&D outputs consist of things like new product ideas, IP, data, or knowledge, R&D outputs are essentially synonymous with *Intangible Assets*. **In other words, any R&D effort is guaranteed to lead to Intangible Assets, in one form or another.** R&D outputs, or Intangible Assets, may range in value from zero to nonzero. An example of zero value Intangible would be knowledge gained by a team member who immediately leaves the company. An example of high value Intangible Asset would be a new product whose design is novel (i.e., unique), nonobvious, and useful. And is therefore, according to the USPTO, protectable via a patent—at which point that product is then commercialized.⁹

Now, as we said earlier, the term *Intangible Asset* isn’t very common in construction either. Finance and accounting folks know it because it shows up on balance sheets. But most of the “Intangible Assets” on a balance sheet for publicly traded construction firms like AECOM and Skanska, for example, appear (...based on my shoestring research budget) to be Goodwill. Goodwill, by the way, is essentially the value added to a company through an acquisition. You can think of it simplistically as an accounting vehicle to spread the purchase price of a company over time. The only reason we mention it here is to clarify that **when we refer to Intangible Assets in construction, we do not mean the accounting vehicle. We mean knowledge, proprietary data, lessons learned, strong project controls, tech culture, etc.**

Ideally, Intangibles are owned. But they don’t have to be necessarily. For example, an Intangible Asset could be the *knowledge* of an employee who is proficient in a hard-to-use software (i.e., a “superuser”). Superusers can amplify the value of certain off-the-shelf software tools by doing things in a fraction of the time it would take the rest of us. Although the company doesn’t “own” the superuser, that person’s knowledge is an intangible because the company *benefits* from it, by paying the superuser (aka the at-will employee) a salary and benefits. This is a common example of an Intangible Asset in construction.

Before closing this section, we should address one other fundamental characteristic of construction Intangibles versus Intangibles in other industries—and that is *scalability*. Scaling anything in a project-based industry is hard, it seems. And anyone who’s ever attempted to scale anything in construction (e.g., rolling out new tech) knows as much. **We raise it here because construction Intangibles would, seemingly, need to scale massively to generate the same “gross value added” that manufacturing does.** And that’s hard to do. But we should try. And that’s what the rest of this article is about. *Trying*. But before going there, let’s delve further into the notion of construction Intangibles by taking a closer

⁹ As one of the peer reviewers of this article rightfully pointed out, there is also such a thing as an “Intangible Liability.” In other words, certain counterproductive intangibles (e.g., a negative corporate culture or toxic work environment that causes low morale) could be intangible liabilities. And, in the same way that intangible assets can range in value from zero to nonzero, the value of intangible liabilities would be negative.

look at the inspiration for this white paper—a book titled, *Capitalism Without Capital*, by Jonathan Haskell and Stian Westlake, which is about the increasing role of Intangibles in the global economy.

6. Capitalism Without Capital: Intangible Investment Is Only Increasing

I'll try to avoid summarizing the book in this section, but the main takeaway is that *"an intangible heavy firm can outperform its rivals. ... [and] if ... [that] story holds up, then the rise in intangible investment might be part of the explanation for the rise in the performance/productivity spread."*¹⁰ That quote was written about the comparison between leading firms and laggard firms, in general—not construction versus manufacturing. But the concept is similar. The following are select excerpts applied to the comparison between construction and manufacturing (in no particular order):

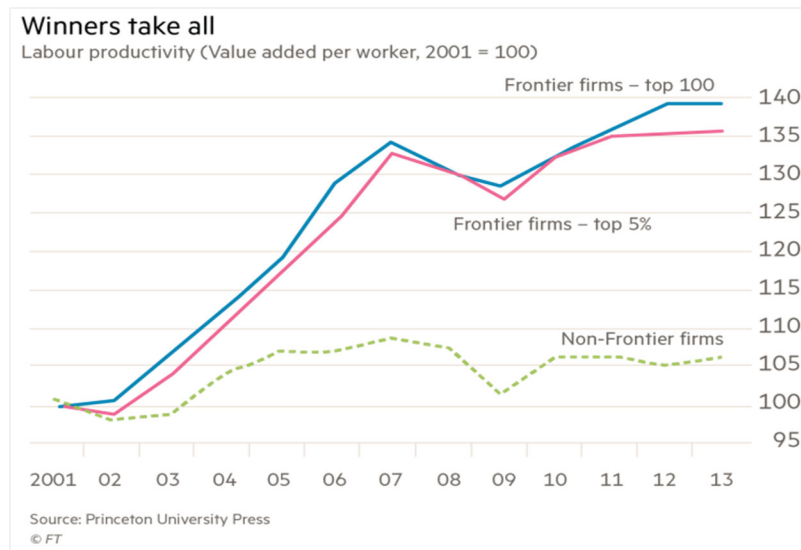
- **The Role of Information Technology (IT)**—On the question of the role of IT as an Intangible Asset: *"Modern information technology developed as it did because of an overwhelming need to control production and operations. First ... [in] the military. And then in the world of business."*¹¹ This may be the reason why, in construction today, the lines among IT, project controls, virtual design and construction, and innovation are becoming increasingly blurred, it seems. But it also highlights yet another example of a construction Intangible, which is how well a company controls its production or operations, regardless of what you call it. Project controls discipline can easily create a competitive advantage for contractors who take on riskier projects.
- **Measuring Intangible Investment**—In support of the idea that Intangible Assets are among the biggest drivers of value in the manufacturing sector: *"Remarkably, the manufacturing sector is more intangible intensive than tangible intensive ... The manufacturing businesses that tend to thrive ... invest a lot in intangibles—from the R&D programs of Pfizer or Rolls Royce to the lean production techniques of the Japanese motor industry."* As mentioned earlier, in manufacturing, it's very difficult to separate Intangible Assets from tangible assets. For example, *"Toyota invests millions in its lean production systems, but it would be impossible to separate these investments from their factories and somehow sell them off."*
- **Organizational Development Investment**—An example of out-of-the-box thinking applied to a company's Intangible investments: *"It seems over the top to claim that successful organizational development should not be classified as an asset. The objection to treating training as an intangible investment is not that it's not valuable or lasting, but that it is an asset of the employee, not of the firm. ... But it is important to remember ... [that] ownership is not one of the criteria. What matters is who benefits [from the intangible]."* Thinking back to our superuser example where the company benefits from the superuser's knowledge but does not "own" the superuser. It follows that, in many cases, while an employee may also benefit from training, there are several examples of training being an asset of the firm and not the employee.
- **Spillovers**—One result of Intangible investment is spillovers. This is where competitor firms in the same industry benefit from a leading firm's investment into Intangibles. Spillovers can come

¹⁰ All quotes in this section are sourced to the book, *Capitalism Without Capital*, unless noted otherwise.

¹¹ Quote is in reference to the work by Historian James Beniger.

in the form of copying what others are doing, or, perhaps more egregiously, when an employee leaves to join a competitor. It could also be the development of new technologies or innovative approaches that yield benefit to the company that employs them initially. But over time end up benefiting the entire industry—because they are not protectable. An example from sports that many people would recognize is *Moneyball* in Major League Baseball. Billy Beane is credited with developing the blueprint, but now several teams use some form of statistical analysis in their decision-making. An example from the more conventional business world might be the high-profile litigation between Apple and Google over its smartphone patents, including the development of the Android operating system which Steve Jobs called a “stolen product.”¹²

- **Intangible Investment Generally**—*“So in a world where intangible investment is very important, we would expect to see the best firms—firms that own valuable, scalable intangibles and that are good at exacting the spillovers from other businesses being highly productive and profitable and their competitors losing out. This is indeed the case. The rise in the spread between the top and bottom firms tends to be in industries with a lot of intangibles.”* This quote wasn’t referring to manufacturing versus construction specifically, but it seems applicable. Especially since the below chart from a Financial Times article¹³ looks very similar to the McKinsey curve. The below chart compares “frontier firms” (i.e., top-performing firms) to “non-frontier firms.”



Admittedly, I struggled (...on my shoestring budget) to find the cited Princeton University Press source. But I did find a related article¹⁴ on “frontier” and “non-frontier” firms’ productivity that defined “frontier” firms as the top 5% of companies in terms of productivity, or value added per worker. What was also interesting from that article is that among the characteristics that differentiated high-performing firms was their “*success in tacitly **combining various intangibles***”

¹² <https://www.reuters.com/article/us-apple-google-settlement/apple-google-settle-smartphone-patent-litigation-idUSBREA4F0S020140517>

¹³ <https://www.ft.com/content/a01e7262-d35a-11e7-a303-9060cb1e5f44>

¹⁴ <https://www.brookings.edu/wp-content/uploads/2016/08/andrews-et-al.pdf>

– e.g. computerised information; innovative property and economic competencies – in production processes.”¹⁵ [Emphasis added]. We’ll come back to this point later.

- **Superstar Markets**—On the topic of who benefits most from Intangibles, “One group is the superstars—people who are personally associated with very valuable intangibles that scale massively.¹⁶ ... [In many cases, t]he job of one person can be done by others or a combination of others—so a fast hamburger server’s job can be done by two slower ones. But in superstar markets, this is not true. The best opera singer or football player cannot be replaced by two not quite so good ones—when technology, say broadcasting, raises the reach of such ... [performers or athletes], their earnings can potentially rise very sharply. The intangible version of this story is that many superstars have privileged access to very valuable, scalable intangibles that reap vast rewards. In some cases, this is by outright ownership—for example, the tech billionaires who own significant equity stakes in companies they founded. In others, the superstar has special privileges to create more of a certain type of intangible. Only J.K. Rowling can write new Harry Potter books, for example. But of course, most rich people aren’t stars or tech entrepreneurs. A significant portion of the very rich are simply senior managers. ...” Construction firms would be wise to identify their superstars, whatever “it” is that makes them superstars, and find a way to scale that—externally, if possible, but at a minimum internally, within the company. Companies could, for example, encourage interaction between that superstar and middle management, or even underperforming teams—effectively “scaling” the Intangible Assets of the superstar.
- **Value Of Intangibles To Others**—It should be clear by now that Intangible Assets in construction are not necessarily traditional forms of Intangibles (e.g., patents). While contractors can and should pursue IP when it’s an available option, the identification and development of Intangibles in construction could be simply a firm’s culture—which is typically more valuable to the firm itself than it is to others. An example from the book is how Starbucks “codifies its operations into a voluminous handbook that its branches and franchises follow. And the homogeneity and customer experience it engenders seem to increase its profitability. But it’s hard to imagine the handbook would be as valuable to someone else.” While Intangible Assets may be difficult to value on the open market (relative to tangible assets), they are likely more valuable to the firm who created them than they are to anyone else. And, therefore, companies should be more concerned with consistently doing things to reinforce the value of its Intangibles, as opposed to worrying about other industry players taking advantage of its spillovers.
- **Synergies Are Important**—In closing out this section, it’s worth talking about the approach to developing scalable Intangibles in an industry like construction. For example, synergies are important, including “creating the conditions for ideas to come together.” Easier said than done, but finding a way to combine “different ideas and intangible assets sits at the heart of successful business innovation.” That includes the pursuit of industry-specific innovation like construction means and methods, but it could also be the collaboration tools used. This is potentially where leading construction firms can thrive in the coming years. By finding a way to combine multiple

¹⁵ The Brookings article also referenced research by Corrado, Hulten and Sichel, 2009, in reference to this quote.

¹⁶ Developed by economist Sherwin Rosen.

Intangible Assets in a unique way that truly differentiates them from their competition. Doing so would, ideally, create a better customer experience for owners, including long term partnerships and higher margins.

7. Closing The Gap Between The Blue (Construction) And Orange (Manufacturing)

Returning now to the McKinsey article...I think most people, myself included, interpreted the article to be focused primarily on project delivery. The article included eight (8) factors that account for poor productivity and cost outcomes¹⁷ and fifteen (15) practices that can help improve productivity¹⁸, spread across three (3) project phases: concept and design, contracting and procurement, and execution.

To be clear, the article is spot on—and the list is a comprehensive one. It's also aspirational. **Most if not all industry players would agree that, in an ideal world, all 8 factors and 15 practices are important to focus on.** But anyone whose ever been involved in a construction project (...of any size, really) knows how difficult it is to get them all right, every time—especially on a mega-project. And, while some of the factors would clearly help contractors lower their risk and *preserve* margins, others come with an added cost—which, in a competitive bid environment, may or may not be recouped at the end of the day. So, it's probably arguable whether certain others on the list would be guaranteed to *improve* margins.

I don't think it's controversial though to say that construction processes have room for improvement—a lot of room, apparently—given that the article identified 8 factors and 15 practices across three project phases. I also don't think it's controversial to say that yes, if a contractor were to implement some or all of these practices, it would improve its chances of success, no doubt. Perhaps it'd save superintendents and general foreman and project managers time in their busy day. But that's a lot of things to get right, with the hope that by adding up those time savings, we're going to close the gap as an industry.

The question the construction industry should be asking itself is whether adding up those labor savings we hear about in pitch presentations are ever going to get you to the 1.7x orange line—no matter how many minutes per day we save a foreman. Unfortunately, I think the answer is clear: it won't. It doesn't mean that time savings' steps are not worth doing either. Optimization is important. But if we're talking about closing the gap between construction and manufacturing, we may need more out-of-the-box thinking, that's all. And we need to stay laser-focused on one thing: *improving margins*.

Interestingly, this idea of optimization is among the common misconceptions about manufacturing—the notion that manufacturing derives most of its value from labor-saving equipment and automation. It

¹⁷ The article cited the following factors that account for poor productivity and cost outcomes: poor organization, inadequate communication, flawed performance management, contractual misunderstandings, missed connections, poor short-term planning, insufficient risk management, and limited talent management.

¹⁸ The fifteen practices were: (1) build only what is needed, (2) maintain a life-cycle perspective, (3) strengthen scenario planning, (4) optimize around site constraints, (5) think modular design and standardization, (6) consult construction and procurement teams, beginning in the design phase, (7) optimize engineering processes and choices, (8) integrate risk allocation into the contract, (9) set up an efficient process for claims and change order management, (10) align interests of owners and contractors, (11) develop the owner's perspective on costs, (12) overinvest in planning, (13) use prefabrication and preassembly methods, (14) build structures to cooperate on project performance, and (15) minimize waste. And lastly, the article cited organizational skills broadly as an additional factor to consider.

adds tremendous value, don't get me wrong. But also consider this 2014 research from the W.E. Upjohn Institute for Employment Research:

*Growth in U.S. manufacturing's real value-added [i.e., the slope of our orange line] has exceeded that of aggregate GDP, except during recessions, leading many to conclude that the sector is healthy and that the 30 percent decline in manufacturing employment since 2000 is largely the consequence of automation. **The robust growth in real manufacturing GDP, however, is driven by one industry segment: computers and electronic products.** In most of manufacturing, real GDP growth has been weak or negative and productivity growth modest. The extraordinary real GDP growth in computer-related industries reflects prices for computers and semiconductors that, when adjusted for product quality improvements, are falling rapidly. **Productivity growth in these industries, in turn, largely reflects product and process improvements from research and development, not automation.**¹⁹ [Emphasis added]*

Said another way, companies like Apple and other electronics manufacturers benefit significantly from lower cost of goods (i.e., the components that go into its devices)—oh, and robust, global supply chains. But for the largest manufacturers in the world, supply chains are, arguably, table stakes. So, on the heels of the above observation, what can we conclude about Apple and other manufacturers? I think exactly what it says in the last sentence, that “*productivity growth in manufacturing largely reflects product and process improvements from research and development, not automation.*”

In the next few sections, we'll build on the above finding about electronics products by taking a closer look at Intangible Assets in manufacturing, and specifically Apple...*because Apple case studies are fun.* **Then we'll talk about the process of creating “R&D outputs” including specifically the creation of *scalable, Intangible Assets* in both construction and manufacturing.**

Quick note: Just so we're clear, before moving onto the next section. I'm not suggesting that contractors can mimic Apple, not at all. There are lots of things that make Apple an outlier in any industry, including manufacturing. But construction firms can learn from Apple, by choosing to adopt a similar mindset. For example, AEC firms can ask: how might we go about creating and protecting scalable, Intangible Assets? Then using that mantra to drive margins up over the long term. That's where we are heading...and we're going to close the article by identifying some AEC players who are doing it already.

8. For Every iPhone Sold, Apple's Value Capture Is 42% Of The Retail Price

According to a [World Intellectual Property Organization \(WIPO\) report](#) from 2017, for every iPhone sold, Apple's value capture is 42% of the retail price. That's right...42%. In other words, for every dollar of iPhones sold, Apple keeps 42 cents. That's insane. That would almost be like a construction company building a \$100M project and taking \$42M in margin. What makes Apple so good at driving up high margins? Well, let me start by saying I know this is up for debate. And I realize I'm biased having gone to design school...and that my MBA friends may disagree. But life is short, so here goes.

¹⁹ https://research.upjohn.org/up_workingpapers/209/

Apple is very strategic about reaping the benefits of its Intangible Assets—by amplifying the value brought by its design team, and its suppliers. And I know that’s a lot. So, to put it in a simpler way: while the parts or components of an iPhone are valuable individually, or on their own, they’re not as valuable as when they’re inserted into an iPhone. Why? Well, in part, because Apple products have a *perceived* value associated with them that is driven primarily by incredible design and user experience.²⁰ Design is and always has been among Apple’s most important Intangible Assets.

For example, the *feeling* you get when you first interact with an Apple product...even the packaging. That feeling is not by accident. That experience was literally designed for you. And it was the result of a lot of time, care, and effort invested. And again, just to be clear, manufacturing an iPhone and sourcing it in the most efficient way imaginable takes a tremendous amount of skill and knowledge too. And it’s equally (if not more) important for any business case. I’m not discounting that at all. But, if the product is not intuitive or hard to use, no one is going to buy it. You have to get that part right from the start.

So, back to Apple’s 42% value capture and the WIPO article—which contained a few other staggering conclusions as well. For example, the article concluded that **Intangible Assets, including Branding and Design, contribute to almost one-third of the value of manufactured products globally**. It also stated that from 2000 to 2014, essentially the same time period as shown on the McKinsey chart, income from Intangibles in manufacturing increased by 75%. In other words, arguably among the most significant drivers of the steepness of the manufacturing curve (i.e., the orange line) are Intangible Assets.

9. Consequences Of Misinterpreting The McKinsey Productivity Curve

Coming back to construction now. There is little question that the McKinsey article has done far more *good* than bad for the industry as a whole. It was a prompt, and a much needed one for construction. Although admittedly, if I were a Project Manager in construction, I’d be a little offended by some of what’s been written about construction ever since. But, **regardless of how you interpreted it, the McKinsey article brought a tremendous amount of investment and focused attention to construction**; and so, undoubtedly, the good has far outweighed the bad since the article’s publishing in 2015.

Since 2015, the construction industry has seen an influx of capital that it’d never seen before—in terms of technology and innovation. And we’re better off for it. Investments from insiders and outsiders alike have been, in general, very positive. Success stories like PlanGrid and Rhumbix—to name a few of my personal favorites that identified a pain point and absolutely crushed it—put construction tech on the map, along with dozens of other successful products, companies, and individuals.

Startups like PlanGrid and Rhumbix leveraged technology in a very thoughtful way—and brought about meaningful change to an industry that needed it. And, contrary to popular belief, yearned for it. **People like to portray construction as a laggard industry. But the truth is it’s much more innovative than outsiders think**...given the number of parties involved in a project, the number of contracts, and the minimum expectations for safety, quality, cost, and schedule.

Also, on the topic of technology in construction, people like to portray a so-called, “adoption problem.” Some might argue a more accurate assessment is that many failed technology products have a “design

²⁰ I realize this is a gross oversimplification of how Apple creates and maintains value. But the point is that Apple is great at design—and it has been for decades.

problem.” And that’s true for any industry really. If a truly *effective* solution isn’t being adopted, it’s worth revisiting the user experience. Successful technology products like PlanGrid and Rhumbix don’t seem to have had the same “adoption problem” that others talk about. And I assume it’s because their founding teams designed the user experience to remove that friction. Okay, so growth in construction tech is all good. What about the *bad*?

Well, the significant investment following the 2015 McKinsey article (*...together with [the 2016 article that ranked Construction second to last in digitization, just above Agriculture and Hunting...](#)*) resulted in a seemingly high number of tech solutions still searching for problems. I don’t think that’s a controversial statement. **Contractors today are often overwhelmed by the number of solutions out there**—and have been for some time. That said, being overwhelmed with choices is much better than the alternative. It just requires more scrutiny by AEC players when selecting new technologies.

But now for the *ugly*...which, in my opinion, is potentially far worse than the bad. The ugly part about misinterpreting the article is it **may be setting the construction industry on a course to *try and become manufacturing*—instead of simply learning from it**. And unfortunately, if that happens and we fail, the risk for AEC players is significant. Unfortunately, I’ve seen it firsthand on at least two projects I’ve been involved with...where a reputable AEC firm bet the company on a large-scale, modular-type project that went sideways. But I’ve also read about it in the headlines. Including high profile examples like Katerra who recently filed for bankruptcy after raising over \$2 billion since its launch in 2015.²¹ And just to be clear, that’s not a criticism of those companies—*not at all*. It’s just an acknowledgement that success in manufacturing (*...aka steep orange lines*) is about more than optimizing processes.

Now, to be clear, regarding modular and prefabrication in general, I also know of successful companies including specialty subs who’ve worked hard to master an offsite fabrication process that works. We absolutely want to tell those stories and always be looking for opportunities to prefab. But we should also be very deliberate in what it means to *learn from manufacturing*. And, in addition to implementing process improvements like automation and labor-saving equipment, consider prioritizing arguably the most important piece of the puzzle that is “gross value added” in manufacturing—which is *scalable, Intangible Assets*.

10. AEC Firms Leveraging Intangibles Today—And Future Opportunities

I should’ve led with this—but a lot of AEC companies are investing in Intangibles. And have been for years—at an increasing pace, it seems. **Several are even working hard to combine those Intangibles in a strategic way that differentiates them**. The hope is that by continuously investing in those Intangibles and combining them in unique ways will lead to synergies, significant returns, and higher margins. *This, by the way, is the humbling part of the white paper where, as the author, I’m starting to wonder if I’m just telling you all what you already know? Maybe I am. But let’s at least hope that we’re adding to the awareness. Or, at a minimum, giving it a new name or identifier: Intangible Assets.*

²¹ <https://katerra.com/2021/06/06/katerra-commences-u-s-court-supervised-process-to-implement-financial-restructuring/> and <https://techcrunch.com/2020/12/31/after-burning-through-2-billion-katerra-gets-a-200-million-softbank-lifeline-to-escape-bankruptcy/>

Below are select examples of industry players and a few brief words on what they're doing. It's worth noting that the way in which different AEC firms are going about their Intangible investments makes for a very interesting dynamic across the industry.

- **Thornton Tomasetti (TT)**—Here's a short list of TT's ongoing efforts: funded and fully staffed incubator, focus on IP commercialization, leveraging its core competencies (i.e., engineering and computational modeling), and selling its products to other technical/engineering companies. They're also opening their doors for the industry to learn from them—check out AEC Tech.
- **Suffolk Construction**—Suffolk rebranded recently as Suffolk Capital. The company launched Boost, an accelerator whose goal is to bring new ideas into the company, incubate them, and grant them access to Suffolk jobsites. I saw a post on LinkedIn quoting someone from the company who said, “[s]ometimes I forget that I work for a construction company.”
- **Clayco**—*The Art And Science Of Building*. Clayco is vertically integrated which is a competitive advantage in and of itself (aka Intangible Asset). In a fragmented industry like construction, it's hard to imagine a better opportunity to create the conditions for combining Intangibles across a project's lifecycle. Culture is an Intangible too, by the way—check out the *Job Is The Boss* tour.
- **Bechtel**—It's possible that the Bechtel trademark may be the most valuable Intangible Asset in construction. In addition to its reputation as being among the most sophisticated and capable contractors in the world, Bechtel leverages a large number of Intangible Assets—way too many to list in this article. Check out its innovation blog and recent focus on design thinking research.
- **Falkbuilt**—The relatively new construction startup by the former DIRTT founders. If DIRTT was any indication, Falkbuilt's focus on *design for manufacturability* will yield significant competitive advantages, not just in the overall cost of construction but also in aesthetics. Oh, and again culture is of great importance, as evidenced by the employees who are all “Falkers.”
- **PT Blink**—“A new vision for property.” As a global partner of Trimble, PT Blink leverages its technology platform to design multi-story structures for offsite manufacture and integrated onsite assembly, substantially reducing delivery time and cost. In a video posted on Trimble's website, the founder described the business model as “an intellectual property company.”
- **PCL**—When another contractor is using your product, you're doing it. PCL developed its Job Site Insights™ platform a few years ago and announced last September that Webcor chose to adopt it as well. According to PCL, its “*technology team ... invested in the research, development and right product and partner mix to enable an ... incredible platform for construction.*”²² This is consistent with the notion of combining select intangibles in a very strategic way.
- **Brick & Mortar/Building Ventures**—The above examples are primarily AEC firms. But another growing construction Intangible Asset for contractors is venture investment. Brick & Mortar and Building Ventures are two examples of leading built world investors who offer their portfolio companies capital and a robust network, among other benefits. But what doesn't get as much

²² <https://www.prnewswire.com/news-releases/webcor-chooses-pcls-job-site-insights-smart-construction-platform-to-enable-the-next-generation-job-site-301139071.html>

attention is the cultural effect that these funds have on the companies who participate. While financial returns are the primary goal for investors, in the end, the culture being created among these forwarding thinking companies will likely far outlast any one exit opportunity.

- **BuiltWorlds**—Every movement needs a community. And yes, like everything else in this article, the BuiltWorlds network is an Intangible Asset—one that any AEC firm can add to its Intangible Asset portfolio by joining. BuiltWorlds provides members with information on the latest trends, high-quality connections, and inspiration. Information and connections are self-explanatory for most industry organizations. But the inspiration piece is unique—since it essentially functions as a spillover opportunity for AEC firms to keep tabs on the latest industry trends, and participate in genuine, focused, peer-based discussions about moving the industry forward.
- **Specialty Subs**—It's worth mentioning two significant examples of specialty subs who are doing it. There are several. But one is Hill Mechanical who, through partnerships and investing heavily in offsite modular construction techniques, has created a competitive advantage for itself. And second is the story of MSuite being borne out of Modern Piping, a Des Moines-based specialty subcontractor. MSuite is a prefab software suite that was spun out as a separate company, and recently announced a new round of funding as well as some key board appointments.
- **Non-Obvious Example**—We'll close this section by offering a rather non-obvious example of a construction Intangible that everyone can relate to: Storytelling. Stories are arguably the most primitive versions of *scalable, Intangible Assets*. Since they: (1) have been around forever, and (2) are universally understood. The first example is what F.H. Paschen has done over social media recently, posting videos profiling its workforce. Here's an [example](#). Second is a COVID silver lining story.²³ At the height of the pandemic here in Chicago, Clark Construction led an effort along with Perkins & Will and several specialty subs to revive a 585-bed hospital for the U.S. Army Corps of Engineers in just 22 days. The takeaway? Not a lot of people could've done that. And I don't mean the expertise required. Because I know a lot of GCs are capable—in fact, there are many stories just like this one about AEC firms from coast to coast. When we say not a lot of people could have done *that*, we mean *execution at the local level*...including leveraging long-standing relationships. Relationships among industry players shouldn't be overlooked when talking about intangibles—in fact, they may be some of the most valuable assets in the industry. Scaling them beyond the local level is the challenge.

Conclusion

Hopefully it's clear by now that construction Intangibles may not take the same form as manufacturing Intangibles. The two may look very different. But that's okay—because it's the mindset or approach that matters most. And, while contractors can and should take advantage of traditional IP protection when they can, it may not always be an option. Now, having said that, **the idea of investing in the development of Intangible Assets—and then scaling or combining select intangibles in a way that differentiates a firm from its competitors—that is very doable**. And, as evidenced above, several AEC firms are already doing it, and many have been for decades.

²³ <https://www.enr.com/articles/50053-metrosouth-hospital-was-revived-as-a-covid-19-alternate-care-facility>

In the end, the most valuable Intangible Asset is the organization itself—which is a combination of both tangible and intangible assets. I would guess, however, that the ratio of intangibles to tangibles in most firms is only increasing—especially in a post-COVID environment. The keys are to develop them, protect them (if possible), and combine them. If companies choose not to invest in Intangible Assets, there’s a good chance they may end up an Intangible Asset themselves. **Not the type we talked about in this white paper though; rather, it’ll be in the form of Goodwill on someone else’s balance sheet.**

Author Bio:

Dave Hettinger focuses his consulting practice on the construction industry and the broader built environment. He spent the first 15 years of his career analyzing problem projects—helping owners and contractors recover from cost overruns and schedule delays. He was fortunate during that time to learn from experiences with Fortune Global 500 corporations, including several multinationals, over half of the top 20 contractors, and many of the top owners, architects, engineers, GCs, subcontractors, construction attorneys, and consulting experts in the industry—on over 100 different projects.

Last year, he started Entropy to help those same clients leverage their data and technology to prevent problem projects, for the benefit of the industry as a whole. Doing so will help industry players lower risk, preserve or improve margins, and avoid significant future costs that follow from problem projects.

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