

China's Past. China's Future. Is Innovation On The Rise?

Independent Study - Topics In China's Development

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Abstract

From cost cutting manufacturer to innovation leader. Can China rethink, reposition, and retrain its citizens after thirty years as the low cost provider? Does it have the infrastructure, commitment, and patience for this strategic change?

This paper delves into the seven forms of innovation, namely cost, process, supply chain, business model, technological, product, and application as it seeks to identify the most appropriate transformative plan for China to adopt. It addresses the economic and public policy impact on the nation's workforce, investment and government programs including minimum wage, the One Child Policy, and the One Belt, One Road Initiative. The paper will also discuss the burgeoning tech cities along with the exodus from China of widely respected multi-national companies, e.g. Apple, Seagate, and Panasonic, further fueling the need for China to alter its approach. No exploration of China's drive for technological innovation would be complete without considering the treatment of intellectual property in the country.

Unveiling the social, religious and cultural mores that must be addressed at this precipice of innovation has an important place in the development of sustained creativity. With a teaching environment still focused on the obligatory *gaokao* exam, education objectives will need realignment, students must be challenged to reassess their goals, and government actions will require redirection. We will evaluate education and its role in achieving innovation leadership.

A far-reaching concerted effort to become the world leader in innovation must take into account the entire makeup of the country and its citizens. The reader will be left with a sense of where China has been, where it is today, and where it can go in the future.

Innovation Defined

While there are many forms of innovation not all are suitable for a given market. As the landscape changes in China, from a manufacturing economy to a market economy, there is a paradigm shift in the types of innovation that succeed. We will explore seven common types of innovation and how each applies to China.

The first three apply to the country's well-documented, low cost, manufacturing approach that enables a reduced end product price to consumers.¹

1. Cost innovation - the ability to make changes in a product's design or materials that generally increase profit margin
2. Process innovation - the implementation of a new or significantly improved production or delivery method
3. Supply chain innovation - streamlining and improving the product manufacturing process all while operating at mass capacity

¹ <https://www.forbes.com/sites/ceibs/2014/09/19/chinas-many-types-of-innovation/#20f47e04a668>

Following the low cost approach, technological innovation is slowly emerging as a growth driver in the hope of stimulating the economy. This new outlook is transitioning a deep-rooted philosophy of 'Made in China' to 'Made by China'.

4. Technical innovation - as a result of technological advancements, products or components are reimagined changing the way a product functions

Creating new technology demands a large amount of capital, researchers, and a competitive advantage – all difficult to achieve in China (reference *Intellectual Property* section). While the government seeks to foster technical innovation to sell overseas, this tactic is seldom pursued by businesses due to its high cost and low reward. Rather, successful innovation in China generally stems from a creative business model that drives a product(s). Most of China's high tech companies succeed because of the lack of what is known as the 3 L's: Land, Loans, Legislation. These businesses don't require land or local capital, both of which are heavily regulated, and demand limited government oversight for their products. Their viability relies on business modeling.

5. Business model innovation - developing new models to support the financial viability of the company's product(s)

Many argue China is simply 'displacing' rather than 'disrupting' products and industries — often embracing Western business models to find applications in new sectors of the economy. Some successful companies have adapted Western products to address the needs of the Chinese people through innovative (re)imagining. Although these products are often adaptations they are innovatively (re)engineered and built for the needs of the Chinese people.

6. Product innovation - the development of a good or service that is unique or significantly improved upon
7. Application innovation - existing goods or services are combined in a new way to potentially produce a new product

Technologically innovative products don't generally penetrate the Chinese market as deeply as overseas. Particularly the Chinese market has a need for adapted products; they need simpler, cheaper solutions than those that exist in the West. Therein lies the opportunity for companies with fresh ideas to tap into this unsaturated market. In China, based on the current *economics* behind *public policy*, *intellectual property rights*, and *education*, companies reach great success when business model innovation, product innovation, or application innovation is obtained. However, there is either an inability or in many cases an undesirability to chase after true technical breakthroughs given the likelihood the product(s) will be immediately copied and cost reduced. This is further exacerbated by the fact that in China patents are not widely protected.

Don't Trust the Numbers

China is eager to improve their slowing economy through innovation. It is important to investigate every aspect of China's approach, understand each number that's put forth, and study the root cause and effect of all directives the government executes.

Often a country's innovation is judged by spending on R+D, patent portfolio, and number of journal publications. In 2012, although ¥1 trillion RMB was allocated towards research, only 40% actually went to its original intention. Of China's 2011 patents just one-third of those applied for represented true innovation; the remainder were modifications on existing technology. Last year, from the intellectual property, China collected \$1 billion USD in royalties but paid \$18 billion USD, in contrast the US collected \$82 billion USD. Lastly, China's scientific publications represent 10% of all worldwide; however, the government recently launched 200 English language international academic journals that are CPC peer reviewed.²

China has a tendency to over-inflate statistics as well as shape policies to provide room to change objectives and financial allocation after announced. While most of the statistics in this document are from credible third party sources, portions rely on government policies that have yet to be implemented or were based on state media.

Economics

For three decades, from 1979 to 2009, China's GDP averaged 10% a year growth as 440 million people migrated from the rural countryside into cities making it the largest human migration in history.³ The last time China's GDP grew at over 10% was in 2010. Since then, from 2011 through 2016, the GDP grew at slowing rates of 9.3%, 7.7%, 7.7%, 7.4%, 6.8%, and 6.7% respectively. The potential economic growth rate (PEGR), which is the highest possible expansion assuming all resources are allocated (capital, labor, productivity), shows China's slowing GDP is an irreversible trend for the near future. In May 2014 Chairman Xi Jinping declared this was the 'New Normal', urging China to remain calm as the country adapts to the current development phase of the economy. Ultimately, we will see China's answer is to pivot to a market economy that relies on exports of Chinese innovation.⁴

The declining economy stems from policies put in place during the early Mao period. Family planning policies were first introduced in 1953 but never were fully implemented as a result of The Great Famine.⁵ With a rapidly growing population, China continued to adopt slogans in an effort to curb childbirth. The One Child Policy officially went into effect in 1979. Thirty-three years after this policy was first implemented the nation began feeling its repercussions. The working population (15-59 year olds) began declining in 2012 thus resulting in the rise of China's minimum wage due to a reduced labor supply. Additionally, Chinese customs urge

² <https://qz.com/136012/china-is-investing-more-than-ever-in-science-but-its-not-paying-off/>

³ <http://onlinelibrary.wiley.com/doi/10.1002/9781444351071.wbeghm124/abstract>

⁴ http://www.chinadaily.com.cn/opinion/2014-10/10/content_18716671.htm

⁵ <https://www.theguardian.com/world/2013/nov/15/china-one-child-family-policy-timeline>

children to care for their elders. With only one child, a larger burden than ever has been placed on the younger generation to pay for elder care.

The increasing cost of labor has directly affected manufacturing costs; this has resulted in some companies exiting China. In 2015, Panasonic ceased manufacturing televisions in China. Apple in 2013 moved Mac Pro production to Austin, Texas with larger migrations of their assembly lines slated in the future. Seagate, the world's largest manufacturer of hard drives, closed their factory in Suzhou laying off 2,000 people and simultaneously made an investment of \$470 million USD in Thailand.⁶ This has left many factories deserted; the government hopes to foster innovation and through homegrown efforts utilize these factories again. While wages will not be as low as they were in the past, additional education, reasonable costs, and engineering could create opportunities to allocate more hours to R+D thus developing innovations too expensive elsewhere. China will push their export economy agenda by designing and producing goods demanded by other nations and in response to domestic latent needs.

Government funding as of now does not seek long-term investments such as R+D, further limiting the potential for technical advancements. Western companies have opened R+D facilities in China to support their manufacturing operations for a variety of reasons:

1. The Chinese government, depending on the sector of the economy, will require a percentage of the parts used to create a given product slated for the Chinese market to be manufactured in the country.
2. Tailoring products for China and tapping into the workforce minimizes relocation costs and enables significant gains in the company's China market experience.
3. R+D facilities receive large tax breaks of 150% on expenditures, and an achievable tax reduction from 25% to 15% if the intellectual property is tied to China and licensed to a Chinese subsidiary.⁷

One specific area where new foreign technological pursuits are succeeding is in the medical space, specifically for manufacturing and clinical research. Fewer regulations on both medical devices and pharmaceuticals result in expedited human clinical trials and thus increased breakthroughs. Additionally, the cost to innovate is dramatically less in China. A trained chemist is paid one-tenth the wage and benefits of his/her counterpart in the US⁸; hence large US pharmaceutical companies like Johnson and Johnson have engaged in contracts with drug research companies such as WuXi Pharma Tech.⁹ While investment is strong from international companies looking to develop strategic government relations and contracts in the second largest prescription drug market in the world, most domestic R+D firms would not survive without Western business. The economic backing needed for such long term projects is often unavailable for Chinese companies.

⁶ <http://www.zdnet.com/article/seagate-closes-chinese-factory-cuts-2000-jobs/>

⁷ <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Tax/dttl-tax-global-rd-survey-aug-2014.pdf>

⁸ <http://www.pacificbridgemedical.com/news-brief/pharmaceutical-companies-investing-in-r-d-to-facilitate-entry-into-china-s-medical-market/>

⁹ <http://www.outsourcing-pharma.com/Preclinical-Research/J-J-gets-tighter-with-WuXi-PharmaTech>

China's current economic standing can also be contributed to the 2008 financial crash. Unlike most other countries, China's first 12 companies on the *Fortune* Global 500 list are all State Owned Enterprises (SOE) and most of them are banks; ranking 4th is Industrial & Commercial Bank of China (ICBC), followed by China Construction Bank ranking 5th, Agricultural Bank of China ranking 6th, and Bank of China (BOC) ranking 8th. A benefit of the government having a firm grip on investments was its ability in 2008 to inject funds so the country did not suffer as greatly from the global financial crisis. China's closed financial system ensures the economy is mostly independent from other nations, but the recovery time is longer.¹⁰ From the end of 2007 to 2008 during the economic recession, since one-third of China's trade was with the US, the Shanghai Stock Exchange plummeted 67%. In response, the government injected ¥4 trillion RMB (\$588 billion USD) into infrastructure projects from the end of 2008 through the end of 2010. This large stimulus plan was exploited by local governments who sought to get their projects approved and funded by the central government. Eighteen provinces proposed over ¥25 trillion RMB worth of projects. Local governments paired down the projects and were expected to contribute \$600 billion USD (slightly more than ¥4 trillion RMB) close to matching the government's investment. Because local governments only had half the needed funds, the central government:

1. granted \$200 billion USD (about ¥1.3 trillion RMB) worth of treasury bonds
2. reduced bank loan interest rates
3. permitted the growth of corporate debt

During the first quarter of 2009 alone total outstanding bank loans increased by ¥4.6 trillion RMB. While some of these loans were paid back, the government is still struggling to collect the trillions lent a decade ago. Total non-financial debts (which includes loans to other government agencies) reached 250% of the GDP by the end of 2015 and proceeded to grow to 270% of the GDP just one year later.¹¹

Innovation Public Policy

Much of China's early innovation success came about when Deng Xiaoping created a handful of Special Economic Zones (SEZs) on China's coast in an attempt to bolster innovation and drastically increase exports. In 1980, China was emerging from the Mao period when people were granted almost no freedom. Notoriously afraid of giving too much freedom to its citizens, the government felt a nationwide plan to implement the revolutionary SEZ open door policy which inspired trade and other benefits would produce instability; it was therefore decided to limit exposure to select areas. This is a pattern frequently seen in Chinese policy making, to institute a special pilot project to test an economic reform. The zones provided tax incentives, greater independence when it came to foreign trade, and aimed to encourage foreign investment.

The most successful SEZ, Shenzhen, in under a decade morphed from a coastal fishing village of 30,000 into a metropolis with an excess of 10 million people. Shenzhen promised incentives such

¹⁰ <http://www.economist.com/blogs/economist-explains/2015/03/economist-explains-8>

¹¹ <https://www.theguardian.com/business/2017/jan/20/chinese-economic-growth-dips-to-67-the-slowest-for-26-years>

as more freedom, equality, food coupons, and clothing. Now Shenzhen is home to the largest number of technology manufacturers anywhere in the world. Notably, Foxconn, the manufacturer of the Apple iPhone, is located there along with many other producers of well known brands. But Shenzhen is more than just manufacturing; it is the birthplace to one of the largest Maker Movements in the world (a community of hobbyists and tinkerers) with the government investing \$106.5 million USD to help facilitate grassroots innovation.¹²

The Maker Movement has been influential in propelling small and large companies such as DJI (Da-Jiang Innovations Science and Technology Company) – the industry leader in the drone marketplace holding 70% of the world’s market share. Launched in 2012 with a single product for hobbyists and tinkerers alike, the company has since moved into new verticals from professional photography to recreational drones for amateur enthusiasts. (It should be noted some of DJI’s machine vision silicon is from US based Intel Corporation.¹³) Pinnacle to DJI’s success according to company executives has been its close proximity to the Shenzhen manufacturing ecosystem where engineers can rapidly prototype. Innovative products have brought the company great financial gain, recently closing the last round of funding the Chinese company had a valuation of \$10 Billion USD. Meanwhile DJI’s competition, namely GoPro, Parrot, and Lily Robotics, have been riddled with technical and manufacturing issues leading these established technology companies to either cope with heavily delayed launches or exit the drone space.¹⁴ When it comes to hardware innovation (physical device innovation rather than software) many Chinese based companies are simply providing incremental innovation to consumers; here again, DJI stands out as a Chinese company far ahead of its global counterparts as they continue to technologically innovate.

In an effort to sustain China’s growth in cities that foster innovation while synchronously coping with overpopulation the CPC announced the building of *Xiongan*, a new massive city north of Beijing. When complete, it will be almost three times larger than New York City. Chairman Xi hopes it will help China sustain growth for the next millennium specifically declaring it “a demonstration area for innovation development...”¹⁵ Many are skeptical and don’t believe this feat can be achieved. Shenzhen was successful because at the time the policies there were novel, sparking a massive wave of migration. Although Beijing is an overcrowded city, people don’t have any incentive to move 100 kilometers away. If there is a silver lining that comes out of such a massive undertaking (having a quasi-central economic system that invests in cities, schools, infrastructure, etc.), typically innovation emerges during large government funded projects (e.g. China’s high speed rail project).

In 2014, Hangzhou (the home of Alibaba) setup Dream Town, an incubator with 710 startups. Economic incentives include subsidized rent, cash handouts, and special training.¹⁶ Companies offered benefits on par with those in other designated high tech areas in China such as

¹² <https://www.youtube.com/watch?v=SGJ5cZnoodY>

¹³ <https://www.theverge.com/2016/9/28/13088086/here-comes-china-silicon-valley>

¹⁴ <http://fortune.com/2017/05/27/the-worlds-best-consumer-drones-arent-just-made-in-china-theyre-designed-and-developed-there-too/>

¹⁵ <https://www.theguardian.com/world/2017/apr/04/china-plans-build-new-city-nearly-three-times-the-size-of-new-york>

¹⁶ <https://cn.nytimes.com/business/20160905/venture-communism-how-china-is-building-a-start-up-boom/en-us/>

Zhongguancun — Beijing's tech hub. The CPC does not put a lot of stock in capitalism so it often personally funds companies. To execute funding the decentralized Chinese government (at the provincial level) gives financial decision making power to a local official. Often local economic growth determines the official's career path. This generates a competitive atmosphere amongst officials in other cities and provinces who compete for party seats.¹⁷ A consequence of competition occurs in the selection of companies to participate in incubators such as Dream Town. Often a short term investment is preferred for a quick return on investment (ROI) thus dictating the type of innovation that will most likely be pursued.

Each day in 2015 an astonishing twelve thousand companies were founded in China. There is growing concern with over \$49 billion USD in investments alone last year that the country is spending too much in new companies focused solely on innovation. The government's strong backing is akin to their former support for the manufacturing industry which led to the building of an excessive number of factories which are now abandoned. To avoid the forming of an 'innovation bubble' the government has attempted to put a plan in place that only funds startups once revenue targets have been met and rent is based on the amount of private capital raised.

The large burden put upon China stems from Chinese investment firms investing outside the country rather than supporting domestic innovation. Firms in 2015 invested \$96.3 billion USD abroad. Investments reached \$145.6 billion USD in 2016 while foreign direct investments in China remained flat at \$103.1 billion USD.¹⁸ Despite the majority of China's outward foreign direct investment (OFDI) concentrated in the developing world there have been some large investments in the US. For example, Sinopec Group, China's largest *Fortune* 500 company albeit an SOE has invested \$2.5 billion USD in five shale oil and gas fields, China's Dalian Wanda Group made a \$2.6 billion USD acquisition of movie theater operator AMC Entertainment Holdings, and a \$5 billion USD investment in a solar energy project was made by another investment group. Interestingly, Chinese OFDI as of 2012 was in 35 of 50 US states.¹⁹ This rise in OFDI has caused a weakening yuan. Chinese regulators in the future will bar blind and irrational investment in property, entertainment, sports, and other sectors. Any investments in line with China's new One Belt, One Road Initiative will be encouraged.²⁰

Efforts to further force domestic investment are evident through the government's restrictive actions on imports. Hoping to reduce reliance on foreign goods in 2002 the government mandated 70% of the parts used in a wind farm project were sourced from within China.²¹ Similarly now with the country aggressively pursuing the electric car market, China set a goal of doubling battery production by 2020. In 2016, the government set forth a list of companies permitted to supply car batteries forbidding any foreign suppliers for autos intended to be sold in the Chinese market. This still permits foreign companies such as Samsung to manufacture batteries for non-domestic use in China, however an additional restriction was put in place

¹⁷ <http://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.31.1.49>

¹⁸ <https://www.theguardian.com/business/2016/dec/26/china-to-rein-in-foreign-investment-as-domestic-growth-stalls>

¹⁹ <http://www.chinabusinessreview.com/the-rise-in-chinese-overseas-investment-and-what-it-means-for-american-businesses/>

²⁰ <http://fortune.com/2017/03/21/china-outbound-investment-capital-control/>

²¹ <https://hbr.org/2014/03/why-china-cant-innovate>

requiring any manufacturer looking to qualify for subsidies to reach a production capacity of 8GWh, something only BYD and Contemporary Amperex Technology Ltd (CATL), both Chinese companies, have done.²²

In addition to funding and economic incentives, designated innovation areas usually have more favorable regulations for employing foreigners. CPC, China Central Committee, and the State Council have recently released new guidelines for those seeking permanent resident status in China. In the 13-5 they expressed a desire to attract more talent and raise international competitiveness. Through new policies, the government is making it easier to allow those already in China, even if just attending graduate school, to convert their temporary visas to permit resident cards. While this may not be a large draw for international talent, it is a short term solution to China's lack of creative individuals (reference *Education* section).²³ The government already recruits engineers, scientists, and researchers compensating them with housing and laboratories.

Much of China's efforts lie in fostering an entrepreneurial spirit in both individuals and small startups, although the government hasn't turned a blind eye to their SOEs. Since SOEs lack proper managerial and monetary incentives along with decision making mechanisms to promote innovation, management is content with complacency. Managers of SOEs are often politically appointed so they place job security above innovation often avoiding risk when possible. Putting innovation aside these companies have no need to grow as they are insulated from competition.²⁴ China's State Council has established a ¥200 billion RMB venture capital fund to greater promote and incentivize innovation in SOEs.²⁵

Intellectual Property

One of the largest problems facing China's gleaming aspirations for technological innovation lies in the government's insufficient protection of intellectual property (IP) rights. Although there has been a sharp increase in patent and trademark applications in recent years compared to Western countries enforcement has been limited. In 2013 there were 55 thousand IP cases which resulted in 59 thousand arrests leading to \$25.5 million USD in seized goods leaving the country.²⁶ In the US during the same fiscal year there were 24.3 thousand seizures that culminated in \$1.7 billion USD being recouped.²⁷ Intellectual property or the lack there of has greatly shaped the manner in which China innovates.

Chinese companies don't have the ability to dwell on a single idea or invest too much time/resources in any one area. In the copycat China era if a business does not keep diversifying its offerings, competitors will almost instantly clone these ideas. Tencent and Alibaba, two of the largest internet companies in China, are very different from their US counterparts. Tencent,

²² <https://www.ft.com/content/8c94a2f6-fdcd-11e6-8d8e-a5e3738f9ae4?mhq5j=e1>

²³ http://usa.chinadaily.com.cn/opinion/2016-02/22/content_23580697.htm

²⁴ [https://doi.org/10.1016/S0883-9026\(99\)00056-7](https://doi.org/10.1016/S0883-9026(99)00056-7)

²⁵ <https://www.forbes.com/sites/sarahsu/2016/08/22/china-innovation-state-owned-enterprises/#7c934c001d39>

²⁶ <http://internshipschina.com/truth-intellectual-property-protection-china/>

²⁷ <https://www.cbp.gov/sites/default/files/documents/2013%20IPR%20Stats.pdf>

known for the social networking app WeChat, enables 750+million daily active users to message, socialize, hail a taxi, rent a bike, buy dinner, send money to friends, have digital loyalty cards and the list goes on. While there are companies such as Facebook, Slack, Venmo, and Uber in the US, no platform has been able to combine these services, although there have been valiant efforts. Similarly, Alibaba has Taobao, most like ebay, Alipay, akin to Venmo, and recently Ant Financial, an arm of Alibaba that offers loans based on online shopping history on Taobao and Tmall. This can be characterized by business model innovation as well as application innovation; nothing is unique yet it is packaged in a way that serves the needs of their consumers better than any existing platform.

Companies with physical products are not the only ones monitored by the government. Chinese public policy puts large companies in China at a disadvantage. Under CPC laws any company with 50+ employees is required to have a CPC representative and in a company with 100+ employees a CPC cell reports directly to the party or local municipality. Crosstalk amongst CPC members is extremely common especially when developing cutting edge products that may not be covered by existing legislation thus warranting further party discussions. This often compromises the novelty of any new product. Even before the product can make its way into a consumer's hands, a competitor has the potential to beat them to market. Whether intentional or not, compromising the strategic direction and competitive advantage of a company puts their economic success in jeopardy. Any long term projects requiring large installments of capital are shied away from due to the lack of IP protection.

Although laws stiffening legal ramifications around IP protection could change easily, there is a culture in China that fosters information sharing. *Shanzhai*, a play on Shenzhen, refers to the sharing of generic electronics parts that can be used by many — ‘innovation spirit’. For example, any person can purchase a reference circuit board *gongban* and a case *gongmo* to piece together their new product or modification. Typically, many products on the market will use the same *gongban*, but to users the UI/UX interface will appear completely different; the board under the hood makes little difference. This sharing culture is what initially sparked the Maker Movement, however for companies that seek to compete at a higher level with IP this culture works against them. There is little incentive to develop innovative products that are capital intensive for fear of not reaping the benefits once it is ripped off; this shapes the products companies create.²⁸

Some brands do still pursue the Chinese market albeit among this plethora of intellectual property infringement. Companies designing unique products for high-end consumers have fewer cases of IP fraud simply because the products they create may not have a demand outside of the community that takes pride and care in the quality of the items' craftsmanship. A high-end company designing leather watch bands would easily have its designs stolen but the same company developing furniture would have less of a struggle.

Hèrmes, founded 180 years ago in France, is the first Western fashion company to establish an entire sub-brand dedicated to the Chinese market – Shang Xia. Unlike Hèrmes, the focus of Shang Xia is on housewares and furniture; the brand bears no visible association to the parent company. The full line of products has been created by Chinese designers, manufactured using

²⁸ <https://www.theatlantic.com/technology/archive/2014/05/chinas-mass-production-system/370898/>

locally sourced materials, and marketed exclusively to the Chinese consumer. Central to Shang Xia's mission is conveying China's heritage and emotion through modern designs and craftsmanship.²⁹ Traditional objects such as baskets might be crafted from leather resembling bamboo offering a contemporary spin on a Chinese classic. Having started in 2008, Shang Xia is still young making it difficult to project the company's long term success. It has yet to be seen how Chinese consumers will value the brand; although generally foreign brands tend to perform better than those 'designed for China'. Compared to Hermès the brand should, however, face minimal risk of counterfeiting since it is currently too small for corporate pirates to invest in reverse engineering its products.

In recent years the government has pledged to crack down on more illegal counterfeiting operations. Statics show an increase in raids on all illegal goods from Hermès bags to Apple iPhones; patent infringement cases have climbed 167.6% (2015) and patent counterfeit cases (65.4%).³⁰ This recent upswing has not gained much traction relative to the number of fraud incidences that plague Chinese businesses looking to innovate. Similar to the rationale as to why China doesn't divest from coal which causes grave levels of pollution, the counterfeit industry employs too many people. While these actions are illegal, the government will never willingly leave millions unemployed.³¹ A solution has yet to be proposed to successfully combat IP fraud in China.

Education

Regardless of government policies, incentives toward businesses, or intellectual property, China needs creative talent. Although boasting a population of 1.4 billion, only a quarter of China's citizens have completed high school which ironically is about equal to the total population of the US. While higher education is not a prerequisite for creative individuals, the majority of those who consider themselves entrepreneurs in the US have a college degree. Business is the most popular field of study at 20%. Low college enrollment rates in China therefore may contribute to a lack of entrepreneurship.

Important to innovation is cultivating a creative mindset. Schools in China place a strong emphasis on testing from an early age, culminating in the *gaokao* — China's notorious college entrance exam. Due to a sizable population with a large economic divide, parents of Chinese students value greatly their children's education, often using high grades in school as a predictive measure of their success later in life.

Contrary to traditional Chinese beliefs, being academically competitive in one's formative years does not actually increase intelligence and work ethic later on. In a survey conducted in China (with 10,000 of the country's students) it was found that Chinese students entered college with a higher or equal intelligence level when it came to math, physics, major specific knowledge, critical thinking, quantitative literacy, and creativity than three years later. Whereas in the same study American students entered with a lower intelligence level but after three years surpassed

²⁹ <https://jingdaily.com/5-things-we-know-about-hermes-new-china-brand-shang-xia/>

³⁰ http://www.infopatent.com.cn/en/news-detail-cnstrengthens_efforts_on_crackdown.html

³¹ <http://www.reuters.com/article/us-china-counterfeit-idUSTRE69P1AR20101026>

their Chinese counterparts. It appears once Chinese students reach college they feel their path has been determined so they don't work as hard. A combination of poor, non-holistic, test driven education early on and a lack of motivation during the later phase of education causes a deficiency in creativity when compared to US students.

A student's creativity is greatly shaped by environmental factors such as society, family, and school. A setting that encourages autonomy and/or exploratory learning bodes well for innovation as it will enrich a person's creative performance. In a study performed by Yale University (albeit with a small sample size) it was found Chinese students studying under the education system in China are less creative than American undergraduates studying at US colleges and universities. Regardless of race or descent (including those that are Chinese), students in the US fared better on the creativity test than students in China. It should be noted although creativity is context dependent both Chinese and American judges concurred the US education system's students' work was more creative.

Different social values have historically played a role in raising creative individuals. In the West it is encouraged to have individualist thoughts (e.g. chasing the American Dream), which is different from the Eastern hemisphere's focus on collectivism. Both societies have always had a notion of creativity but it emerged at different times and in varying capacities. If we turn to religious influences, primarily in the Americas and Europe with populations that mostly follow the Old or New Testament, previously it was believed God was the sole creator. It was not until the Enlightenment Period that individuals could 'create'. Once this idea was embraced creativity was defined as novelty.³²

While the West has embraced the notion of novelty and uniqueness to define creativity for over a century the East still associates creativity with the arts and not inventiveness. Creativity is often grounded in calligraphy, traditional puppet shows, and song; these are physical interpretations of Chinese beliefs and customs in Confucianism and Taoism. Recently with the country's innovation push novelty has begun to emerge in China.

With China's seemingly apparent creativity deficit and lack of understanding how to develop and nurture this asset, the country has been put at a disadvantage when it comes to this type of growth opportunity. This is not to say China does not have creative individuals. However, relative to the size of the population, it is very small vis-à-vis other countries with far fewer people.

This shortfall in creativity has prompted three action points:

1. A push for students to study abroad
2. Incentives to break cultural stigmas held in the Chinese household
3. Curriculum changes for future generations

Students studying abroad have increased exponentially over recent years. Last year the Ministry of Education reported 544.5 thousand students went abroad, a sharp uptick from 2008 when only

³² <https://www.researchgate.net/publication/229734477>

179.8 thousand studied overseas. The number is expected to peak over the next five years at between 700-800 thousand students and will then fluctuate with the annual birth rate and economy. This results from a limited capacity in international schools to host foreigners. However, Chinese students are generally favored (especially after the 2008 recession) since a large percentage do not require financial aid; in 2016 only 10% received financial assistance. China's recent change in the One Child Policy in 2015, allowing for a second child, will further cause the number of students going abroad to increase.³³

Statistics show of those who go abroad to study 80% return to contribute to China's economy. More students are coming back due to tightening immigration policies and a rapidly growing China they want to be a part of. Upon returning, however, reported wages are only ¥500 RMB/month higher than those with domestic schooling (although they do, on average, get promoted more quickly leading to higher salaries).³⁴ While studying abroad is often encouraged it does limit some opportunities upon return to China. Most government jobs are not obtainable as there is suspicion of the individual being corrupted by spending an extended amount of time out of the country.

Now we turn to fears associated with entrepreneurship in traditional households. Most parents of current students grew up in a *danwei*. This social organization was often tied to a workplace delivering an economic reward and promised citizenry needs such as housing, free medical care, and child care; it supplied a social guarantee and welfare services. On a higher level the *danwei* was a way of living that provided a sense of belonging and social identity for those who were a part of it. Although these work communities have mostly disbanded, there is still a longing for job stability. Traditional families do not approve of the great instability entrepreneurship brings and the uncertainty of available resources on college campuses to start these ventures.

In a survey of students from Peking University, Tsinghua University, Beijing Normal University, and Stanford University, 22% of American students responded they planned to found or join a new business in comparison to only 3% of Chinese students. Of the students who reported they would join or start a business venture, one-third of American students actually went on to do so compared to only 5% of Chinese students. While 52% of Chinese respondents planned to join the government or state sector post graduation, only 5% of US students expressed a similar desire. Due to cultural stigma, China's students inherently lack confidence in their entrepreneurial abilities leading to high numbers working for State Owned Enterprises (SOEs) or the government.

China Daily reports, the Ministry of Education has issued new documents permitting a suspension from school to start a business.³⁵ A small part of the population may also respond positively to this action as it could potentially result in increased marriage prospects. (In the 2010 census, China recorded 51 million more males than females and a birth ratio of 120 boys for

³³ http://www.chinadaily.com.cn/china/2017twosession/2017-03/08/content_28470916.htm

³⁴ http://www.chinadaily.com.cn/business/2017-03/25/content_28675123.htm

³⁵ http://usa.chinadaily.com.cn/epaper/2017-02/21/content_28289604.htm

every 100 girls³⁶). By starting a company males would portray themselves as less risk averse, hard working, and possessing an entrepreneurial drive.³⁷

The government has become increasingly aware that the curriculum in China's schools place students at a disadvantage when it comes to creativity and entrepreneurship. Going back as far as 1995 China provided specific recommendations for improving education in the Decision on the S&T Development. Over the past two decades at the Session of the CPC National Congress, the focus on creativity in education has increased dramatically. A lexical analysis was conducted using keywords such as creativity, innovation, spirit of creativity, and independent innovation. Beginning with the 14th session in 1992 these keywords appeared 8 times, during the 15th session 10 times, 16th session 41 times, and by the 17th session 65 times. Education policy was specifically brought up beginning at the 16th session in 2002. Similarly, China's 5 year plans introduced "cultivating students' spirit of creativity" in 2001 and in the 12th - 5 year plan (12-5) it specifically expressed a desire for "the development of students' scientific spirit, creative thinking and innovation abilities."³⁸

Most recently in the 13th - 5 year plan (13-5) the government pivoted away from shaping primary and secondary education, targeting collegiate and post college vocational education. The goal is to establish training centers in China to foster 'outstanding college students' linking the 'talent cultivation chain' with 'industry chains' and 'innovation chains'. Additionally, China will train 10,000 current business executives and entrepreneurs, recruit 10,000 'high-caliber' talented individuals from overseas to make innovation or start businesses, and match these efforts by supporting 10,000 'highly talented individuals' from China as well. Long term, China plans to nationally develop refresher courses for one million professionals and technical personnel each year as well as build master studios and 1,200 training centers to train ten million 'highly skilled' workers. Furthermore, the government will select the highest performing secondary school and college graduates each year to receive advanced training at first-class universities outside China and track their progress.³⁹

In the most recent policy we see China attempting to address the current deficit of creative individuals. Unfortunately, policies of this type fail to plan for future generations. China still needs to address how young students of today can propel an innovative China of tomorrow.

The Future

Through industrialization China has leaped arguably as far in three decades as the West traveled in a century. Although China is in the process of determining how it ultimately will transition from a manufacturing economy to a market economy, harnessing innovation is clearly a viable solution but demands time and patience. China's policies are promising, from looking to 'import' foreign talent to kick-start innovative efforts, to establishing vocational schools to retrain the population, to sending students abroad while education systems are reformed; these are all

³⁶ <http://www.businessinsider.com/country-rankings-of-sex-ratio-at-birth-2013-11>

³⁷ <https://www.aeaweb.org/articles?id=10.1257/jep.31.1.49>

³⁸ <https://www.researchgate.net/publication/264466838>

³⁹ <http://en.ndrc.gov.cn/newsrelease/201612/P020161207645765233498.pdf>

attainable objectives. However, these efforts will only succeed if the other secondary and tertiary hurdles are addressed such as the enforcement of intellectual property rights and commitment to investing in R+D even if it will only produce long term results. As of now no other emerging country is close to becoming the 'next China'. Combined the US and China, the first and second largest economies, hold over 45% of the world GDP.⁴⁰

⁴⁰ <http://nationalinterest.org/commentary/who-will-be-the-next-china-9809>