

The virtuous circle:

Putting Korea's Startup
Ecosystem on a Path to
Sustainable Long-run Growth

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Preface

This report examines the strengths and limitations of Korea's startup ecosystem, and offers ideas for bolstering that ecosystem and putting it on a path towards sustainable long-term growth.

High-technology and Internet-related businesses account for a significant portion of Korea's economy. And yet we found that, in recent years, Korea's large corporations have struggled to maintain the dynamism for which they have long been known. In the modern economy, small companies, especially startups, play a crucial role in spurring innovation. But in Korea, new ventures face a host of obstacles that prevent them from living up to their full potential.

In seeking a better understanding of Korea's startup ecosystem, McKinsey consultants conducted in-depth interviews with nearly 50 industry experts, venture capitalists, and venture entrepreneurs. Those conversations helped us to identify and analyze a host of complex, inter-related problems and probe those problems' common roots. In formulating potential solutions to those problems, we embarked on an exhaustive study of local and global success cases. We also sought to quantify the degree to which a more vibrant ecosystem for new ventures could create new jobs and add to growth of the broader Korean economy.

This report does not include all the solutions for every problem that Korean startups face. In fact, as for other issues not covered in this report, we believe existing reports and studies did a good job of presenting necessary solution. Overall, the focus of this report is on mapping out a solution that should be considered first and foremost to break up the vicious cycle created by mutually correlated problems found in the Korean startup community.

This report is an independently authored McKinsey report that draws from research by McKinsey's Technology, Media, and Telecom Practice, academic and public sources, research conducted with Google as well as research by the McKinsey Global Institute (MGI) to better understand Korean startup community.

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Executive Summary

Innovative new ventures are key to the next stage of Korea's economic development. Such ventures will provide a source of growth in their own right and play an increasingly positive role in supplying new ideas and methods that can rejuvenate the nation's established corporate giants. But startups require a balanced ecosystem to grow and thrive. Korea's startup ecosystem, as presently structured, falls short in many respects.

The total number of Korean startups has grown steadily to a record 30,000 at the end of 2014, a fourfold increase over the number of Korean startups in 2003, the low point of the dot-com crash. At Korean universities, the number of students enrolled in entrepreneurship classes has jumped 60 percent since 2012. New government measures—including a 2013 program providing more than \$90 million in government funding for early stage startups and \$270 million for mid-stage startups—have spurred a jump in new ventures. The Park administration reduced taxes for angel investors and simplified M&A procedures for new ventures. In a series of extensive interviews with Korean entrepreneurs, McKinsey found startup CEOs reported relatively little difficulty in securing seed stage funding of \$30,000 to \$70,000.

But those positive developments may not translate into vibrant ecosystem for Korean startups. McKinsey found that, while it may be relatively easy to obtain seed funding in Korea, it is far too difficult to secure second-stage “angel investment” needed to achieve sustained growth. Korean entrepreneurs reported significant difficulty in obtaining funding in the \$90,000 to \$300,000 range generally regarded as necessary to develop and market new products. In Korea, too few startups make it across the “death valley” between inception and venture capital funding.

A key reason for the dearth of angel funding in Korea is the lack of attractive “exit” options for investors. In other markets, a significant percentage of new ventures are purchased through merger or acquisition with a larger, established firm. In Korea, fewer than 1 percent of Korean startups achieve “exit” through M&A. For Korean startups, the only viable path to exit is through a public share offering. But in Korea, the average interval between launch and IPO is about 13 years—an eternity compared to Silicon Valley, where time to IPO is typically less than seven years.

A related deterrent for venture capital investors is the parochial outlook of Korean startups. McKinsey found that a large proportion of Korean startups have crowded into the Internet and mobile services sector where barriers to entry are low and profits meager, and that few have the confidence, technical skills or operating savvy needed to pursue strategies for growth beyond the Korean market.

McKinsey estimates that if Korea could match the level of startup activity in Israel, it should be able to boost sales from startups to \$300 billion by 2020, a 32 percent increase over 2014 sales of \$173 billion. Growth of that magnitude would raise sales of Korean startups to 5.2 percent of Korean GDP, up from 3.8 percent in 2014, and create hundreds of thousands of new Korean jobs.

But if Korea is to attain those goals, government, entrepreneurs and investors must work together to put Korea's startup community on a new path towards a sustainable circle of virtuous growth. Stakeholders must find a way to breathe life into Korea's moribund M&A market and shorten the interval between inception and IPO. Korean entrepreneurs must be encouraged to look beyond Korea's borders and pursue global strategies, while at the same time, Korea must invite expertise and investment from overseas players. Embracing a more global outlook for Korea's startup community is the nation's best hope for assuring its future dynamism and success.

Introduction

In the latter half of the last century, South Korea's economy was well served by a model of state-guided capitalism focused on export-led manufacturing. In the first decade of the 21st century, Korea's large conglomerates played a key role in driving growth. In recent years, however, the traditional engines of Korean growth have begun to sputter. Changes have been notable in the information technology sector, where export growth has slowed to 1.9 percent in 2014, down from 9.1 percent in 2013. We expect further deceleration in IT exports in 2015 with growth slipping below 2.5 percent, less than a half of the growth rate of the global IT market (5.2 percent).¹ Many factors, including several broad developments beyond the control of Korea's firms or government planners, have contributed to the deceleration of Korea's IT sector. Within Korea, however, one of the most frequently noted issues is the lack of innovation within Korea's largest firms. Many experts have argued that, as the global economy becomes "flatter" and more open, big companies with large internal R&D divisions, will find it more and more difficult to compete with smaller, more nimble ventures.

"Korea's traditional growth model, based on labor and capital-intensive manufacturing by conglomerates, is approaching its limits... For future growth, we need to establish an innovation-driven model led by small companies."

— Joohyung Kim, LG Economic Research Institute

The next phase of economic growth for Korea will depend on ensuring these small companies grow. Korea needs more, and more dynamic new ventures, not only to become successful enterprises in their own right, but also to supply new ideas and methods for the nation's established corporate giants. The key to fostering such innovation is a vibrant startup community—an ecosystem capable of attracting programmers, designers, engineers and managers with world-class talent empowered with the skills, resources and connections capable of transforming creative and disruptive ideas into lasting, high-impact enterprises. Currently, the Korean startup community falls far short of this ideal.

Startups and Korea's Internet economy

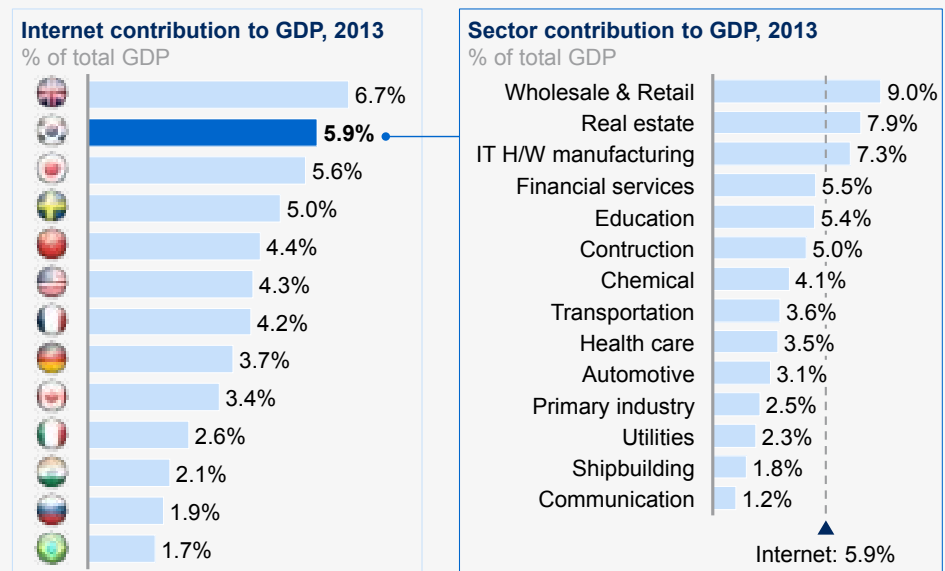
Over the past decade, the Internet has come to play a central role in the development of Korea's economy. The Internet is already a big part of our economy and the contribution has been increasing. In 2013, the Internet contributed 5.9 percent of Korea's GDP, according to McKinsey Global Institute, up from 4.6 percent in 2006. The Internet contributes a higher percentage of economic activity in Korea than in most of the other countries analyzed by the McKinsey Global Institute. If the Internet were an industrial sector, it would be bigger than many major Korean industries such as financial services (which contributed 5.5 percent of GDP), construction (5 percent of GDP), and automotive (3.1 percent of GDP).

¹ Hyundai Research Institute; Gartner.

A 2011 McKinsey study² found that Internet utilization had significant positive impact on economic growth, and suggested the magnitude of that positive would increase as more people got online. The study found that small and medium-sized enterprises with high utilization of Internet technologies grew more than twice as fast as those with minimal web presence. The study also found that roughly 75 percent of the additional growth attributable to Internet utilization occurred in more traditional industries in the form of improved productivity. We believe broader Internet utilization has significant potential for further growth of the Korean economy.

Exhibit 1

Internet contributed 5.9% of Korea GDP in 2013, a greater contribution than in many other economies and many other key Korean industries



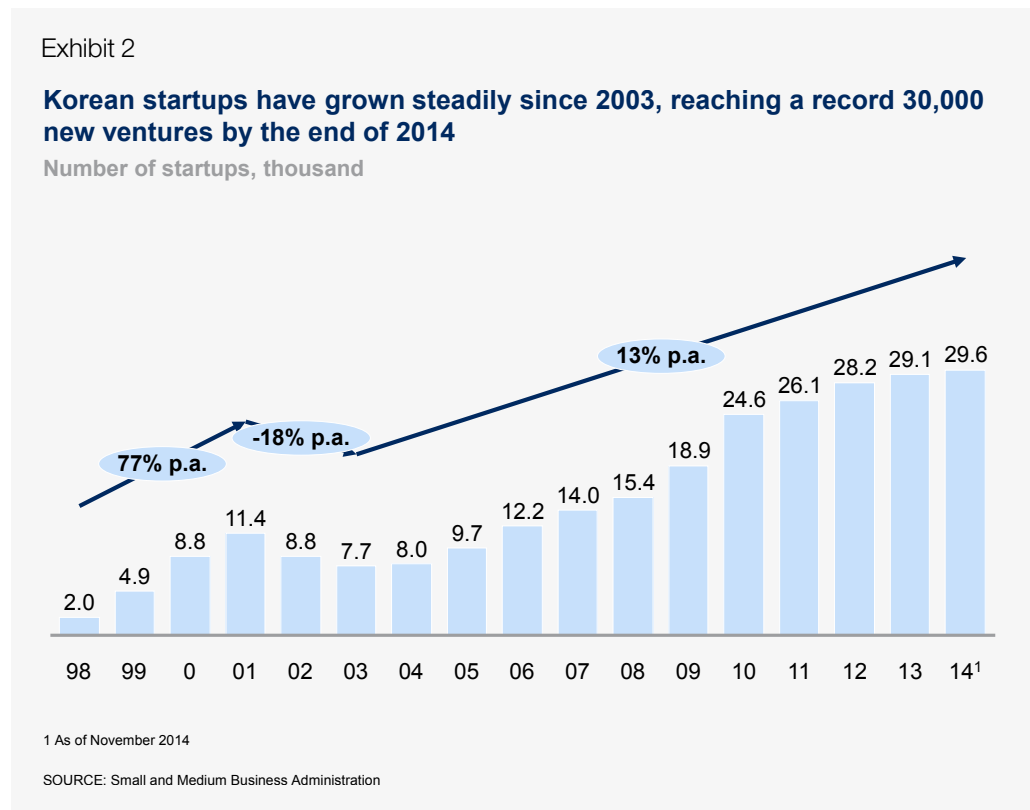
SOURCE: McKinsey Global Institute

² 2011 McKinsey's Global SME survey of 4,800 SMEs in 12 countries of G8 (United States, United Kingdom, Germany, France, Italy, Canada, Japan, Russia), Korea, China, India and Sweden.

1. Korea's startup ecosystem: a snapshot

Steady startup growth, especially in IT

As of November 2014, the number of Korean startups³ was 29,561, a significant increase from 7,702 in 2003, the lowest point after the implosion of the global Internet bubble in the early 2000s. Since the dot-com collapse, Korea's startup community has experienced a cumulative annual growth rate of 13 percent. In 2012, 416 Korean firms launched after 2003 grew to more than KRW 100 billion (\$91 million) in revenue.



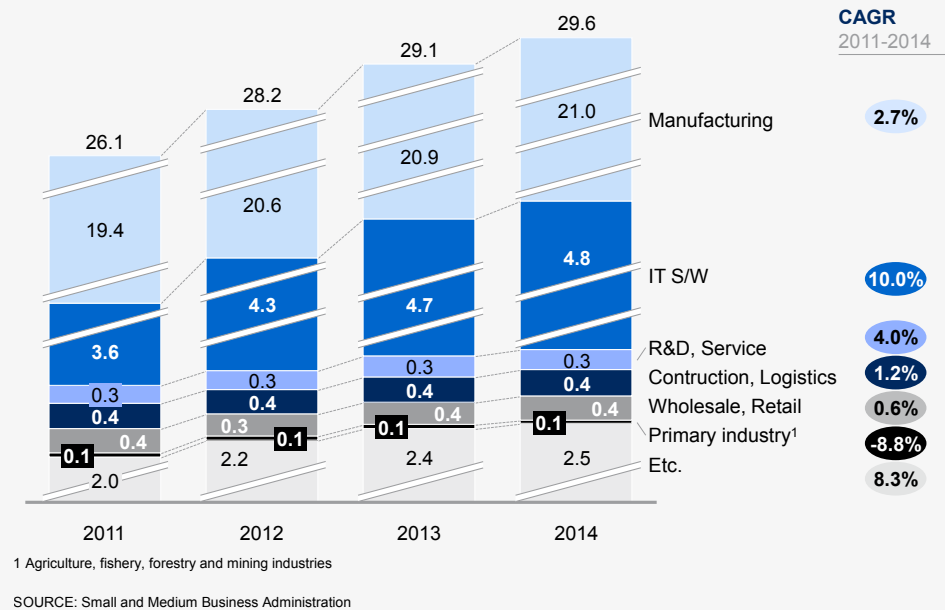
Korea's information and technology sector outpaced other sectors such as manufacturing, construction and retail. There were more manufacturing-related startups than IT startups, but between 2011-14, IT startups grew by an average of 10 percent, far exceeding the 2.7 percent growth rate of manufacturing-related startups.

³ In this report, we decided to conduct our quantitative analysis based on the group of startups registered to Small and Medium Business Administration (SMBA) as of November 24th, 2014.

Exhibit 3

Growth of IT software startups outpaces that of startups in other sectors

Number of startups by sector, 2011-2014



One reason for the higher growth rate for IT startups was that IT startups face lower barriers to entry, especially compared to traditional manufacturing startups. As David Day, the director of the University of Florida's Office of Technology Licensing, observed: "You can start a new tech venture with four people and four laptops working out of Starbucks." The wide accessibility and convenience of information technology has made it possible for almost anyone to become an innovator, translating small ideas into ventures with great impact.

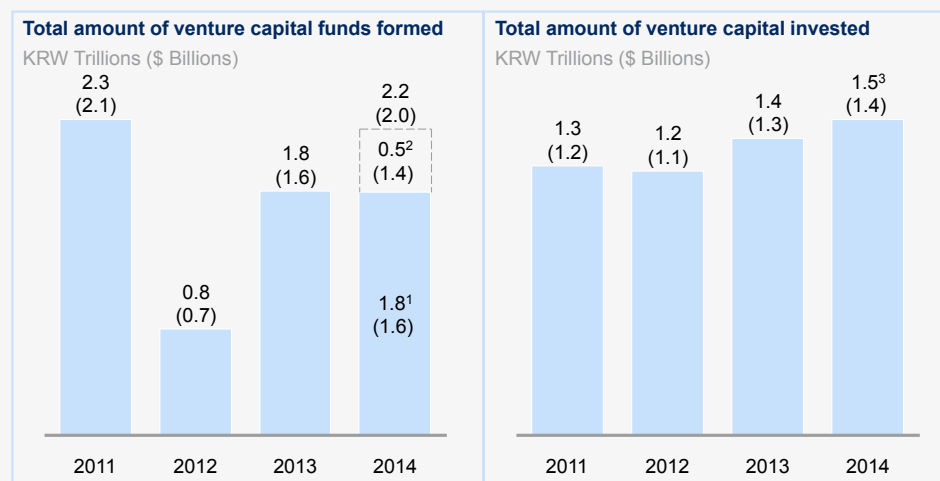
Expanding startup capital

In 2013, President Park Geun-hye's administration implemented a new program designed to encourage startup growth through increased public investment. The program increased government funding for new ventures in various stages of startup development. The program included an "angel matching fund," (KRW 100 billion, \$91 million) for early stage startups, and a "future creation fund" (KRW 300 billion, \$272 million) for mid-stage startups. The government also introduced new support measures for the overall startup ecosystem, such as tax deductions for angel investors and simpler M&A procedures for new ventures.

The government's program has directly and indirectly contributed to an increase in the formation of new funds and actual investment in Korean startups. In the first ten months of 2014, new venture capital funds formed in Korea totaled KRW 1.8 trillion (\$1.6 billion). The total for the full year was expected to reach KRW 2.2 trillion (\$2 billion), a 65 percent gain over total venture capital funding formed in 2012. During the same period, venture capital investment was expected to rise to KRW 1.5 trillion (\$1.4 billion), up from KRW 1.2 trillion (\$1.1 billion) the previous year, for a one-year increase of 25 percent. The proportion of venture capital investment in early stage companies—those established within the last three years—was KRW 0.3 trillion (\$272 million), accounting for 31 percent of total investment. That was an increase of nearly 7 percent over 2013. Together, the total amount of venture capital funds formed and invested in 2014 may reach a new peak in startup community history.

Exhibit 4

In 2014, Korean venture capital funding, both formed and invested, reached historic highs



1 Total amount of venture capital funds actually formed by Oct. 2014
 2 Expected total amount of funds to be formed in Nov. and Dec. 2014 based on historical patterns
 3 Annualized amount based on the accumulated investment by Oct. 2014

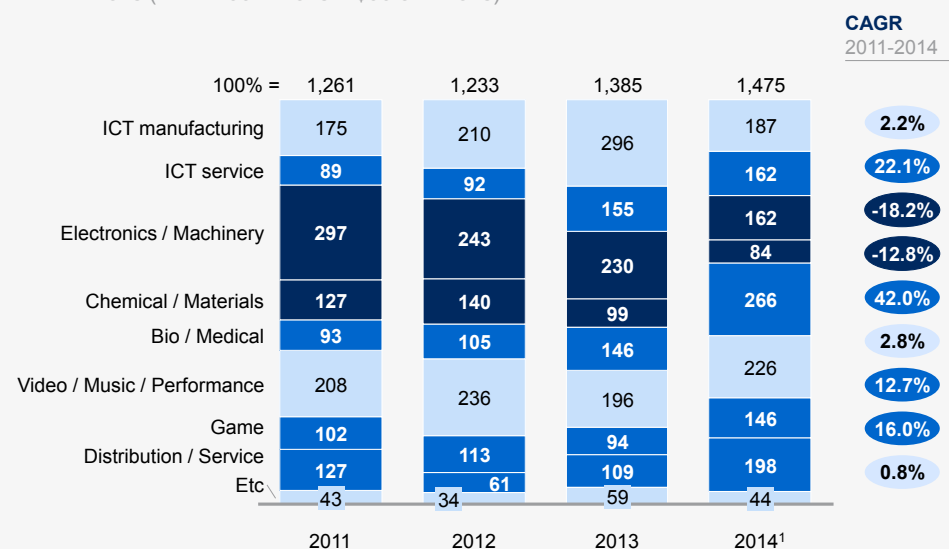
SOURCE: Korean Venture Capital Association

Investment in the electronics/machinery and chemicals/materials sectors—industries traditionally considered the backbone of Korea’s economy—declined to 17 percent of total investment in 2014, down from 34 percent in 2011. In contrast, startups in information communications and technology services, digital games, bio/medical products, and the distribution and service sectors all reported double-digit growth rates over the last three years. Specifically, bio/medical and ICT service startups experienced the strongest growth, with gains of 42 percent and 22 percent respectively. This shift away from Korea’s traditional industries suggests venture capital funds are identifying new sectors with high growth potential.

Exhibit 5

Venture capital investment is moving away from traditional industries

Total amount of venture capital invested by sector
 KRW Billions (KRW 100 Billions = \$90.5 Millions)



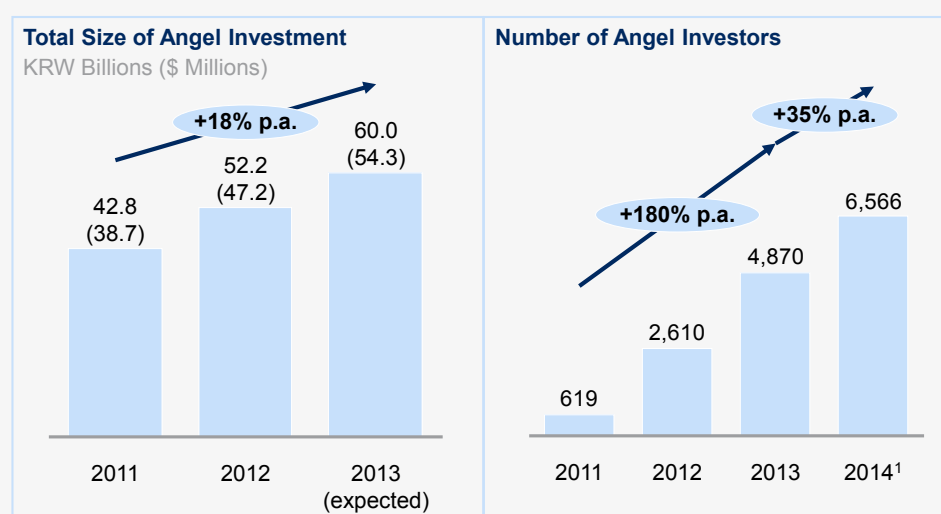
1 Annualized amount based on the accumulated investment by Oct. 2014

SOURCE: Korean Venture Capital Association

In 2013, Korea's Small and Medium Business Administration (SMBA) launched a program aimed at promoting the growth of angel investment. As part of that initiative, the SMBA, working with Korea's Angel Investors Association, established an angel investment matching fund of KRW 87 billion (\$79 million) and implemented new tax deductions for angel investor. This program, helped raise the total pool of angel investment in Korea to an estimated KRW 60 billion (\$54 million) in 2013, up from KRW 52 billion (\$47 million) in 2012. Growth in the total of angel-stage funding in Korea has been matched by an increase in the number of investors. In 2013 alone, the number of angel investors and angel investment clubs in Korea has nearly doubled. However, in 2012 and 2013, growth in the number of investors outpaced growth of funds actually committed, suggesting that the new program had not achieved its aim by the end of 2013.

Exhibit 6

The number of angel investors is growing rapidly, but the amount of actual investment is rising at a slower pace



¹ As of Aug. 2014

SOURCE: Small and Medium Business Administration, Korean Capital Market Institute

Our in-depth conversations with more than 30 leading Korean entrepreneurs, venture capitalists and small business experts found that, within Korea's startup community, there is broad agreement that, thanks to new government policies, there is more funding available to new Korean ventures than was the case even five years ago.

“We’ve seen a big increase in money in the market. But there aren’t enough startups worthy of investment. Therefore, if a startup shows any traction in the market, there is stronger competition among VCs to investment.”

— from an interview with a Korean venture capitalist

Universities and entrepreneurs

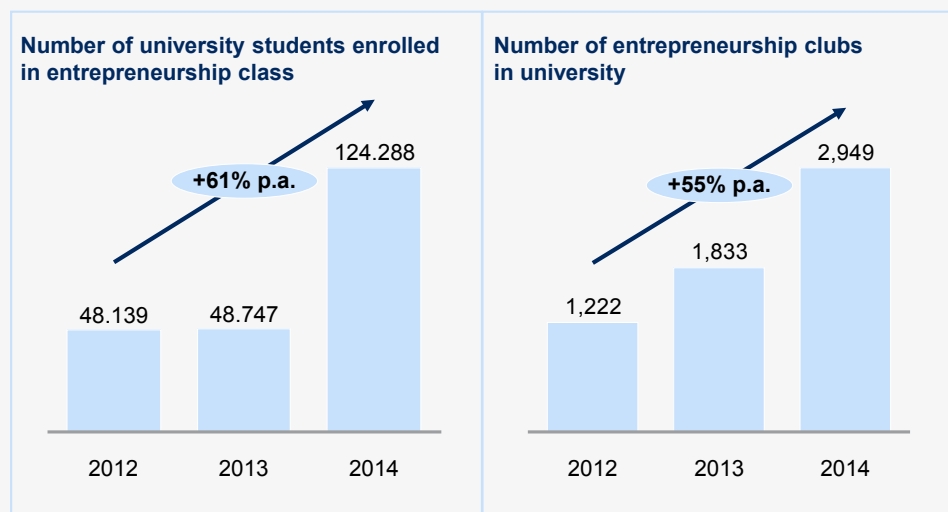
Korea's new enthusiasm for startups is apparent on the nation's campuses. Between 2012 and 2014, the number of college students enrolled in some form of entrepreneurship class grew at an average rate of 61 percent, according to research by the SMBA. Over the same period, the number of "entrepreneurship clubs" in Korean universities rose 55 percent to 2,949. About half of those clubs were dedicated to software, mobile or IT services, ahead of clubs dedicated to manufacturing (36 percent of the total) and others (16 percent). Students' preference for software, mobile and IT service sector reflects lower entry barriers in those sectors and the fact that so many students already are familiar with mobile/IT devices.

Korean universities have sought to encourage this interest in entrepreneurialism. At least 80 universities now offer students the option of taking an "entrepreneurial leave of absence," allowing students up to four semesters off to pursue their startup endeavors.

Korean entrepreneurs do not appear to be turning to startups because they're unable to find jobs elsewhere. Startup activity hasn't grown as a result of increasing unemployment rates; a 2014 survey of Korean IT startups by the Born2Global center revealed that less than 3 percent of respondents claimed failure to find a job in the traditional economy as the reason for starting their own business.

Exhibit 7

Korean students show greater interest in entrepreneurialism



SOURCE: Small and Medium Business Administration

2. Areas for improvement

Increased government support has provided a much-needed boost to Korea's startup scene. But raising the number of new ventures alone is not enough. Korea needs to strive for greater diversity and quality of its new enterprises.

Enough to start, but not to grow

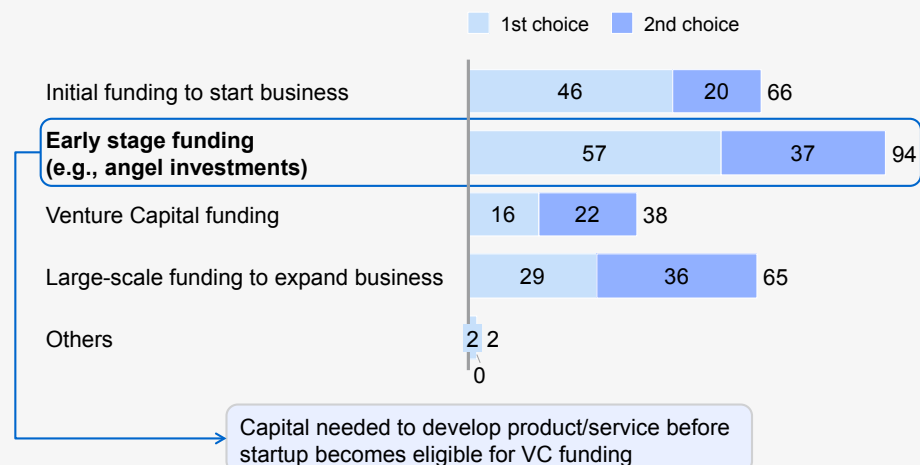
The expansion of government-backed programs for early-stage startups has made it relatively easy for first-time entrepreneurs with few resources other than a good business idea, to obtain initial funding of up to KRW 50 million (\$45,000). Indeed, many startup CEOs said they could secure KRW 30-70 million (\$27,000-63,000) seed funding at the inception phase by applying to one or two government programs. At the same time, however, many founders said it was difficult for them to secure funding in later stages of growth—in KRW 100-300 million (\$91,000-272,000) range generally considered necessary to develop and market a product after it has received venture capital funding. In other words, entrepreneurs said they found it easy to start a company, but hard to sustain growth. Many reported facing financial distress with six to twelve months of launch. This time period, between inception and VC funding, can be thought of as “Death Valley” for Korean startups.

Exhibit 8

A dearth of angel investing creates a “death valley” for Korean ventures

What type of funding is most difficult to source?

Responses (N = 150); based on 2014 McKinsey survey on ICT startup founders

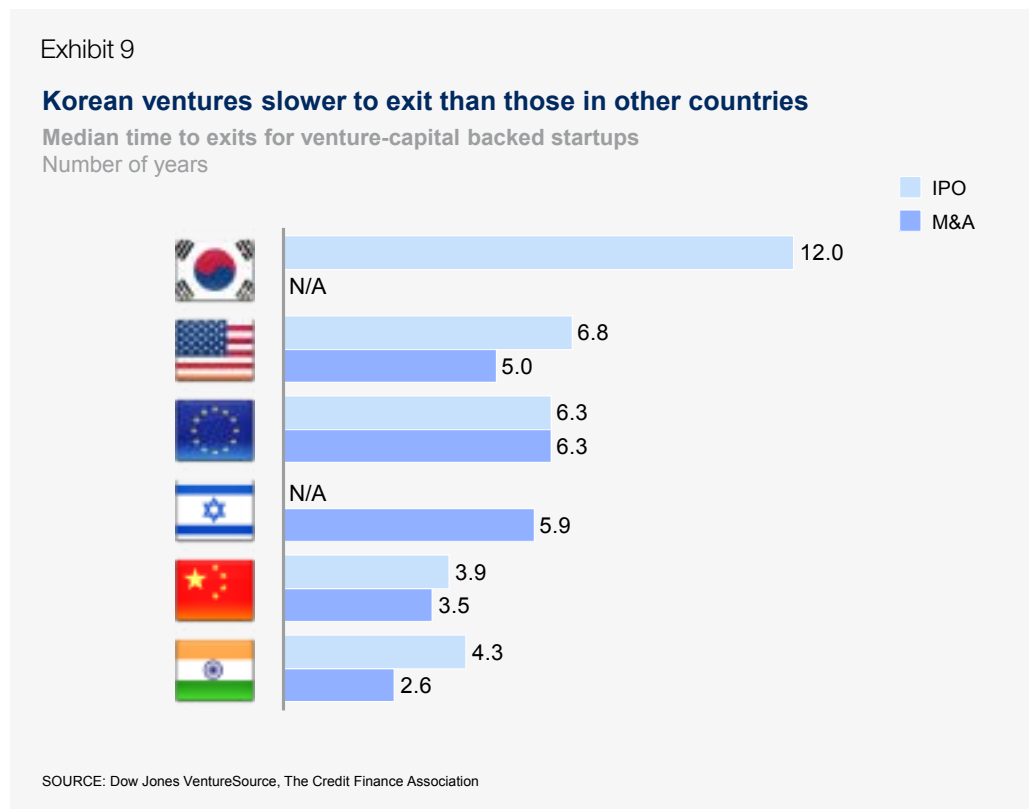


SOURCE: McKinsey survey on ICT startup founders (2014)

Private angel investors can play a critical role to fund this phase of startup development. Angel investment in Korea has risen to increased to KRW 60 billion (\$54 million) in 2013, up from KRW 42.8 billion (\$39 million) in 2011. But Korean entrepreneurs face a significant financing gap between the inception and the development phase.⁴ In the U.S., angel investment accounts for about 44 percent of total venture investments, while the remaining 56 percent is covered by venture capitals.⁵ In Korea, however, angel investment only accounts for 4 percent of total investment.⁶ One of the major reasons for the dearth of angel investment in Korea is an inactive exit market. Hardly any Korean startups (fewer than 1 or 2 percent) exit via merger or acquisition. In Korea, currently the only viable exit route is an initial public offering, but the wait for such an event is long and discouraging. In Korea, the average interval between launch and IPO is 13 years—an eternity compared to Silicon Valley, where the average time to IPO is typically 6 or 7 years. The long journey to IPO discourages Korea's angel investors and venture capitalists alike. But an extended wait poses a particular deterrent to angel investors, who typically have less capital and narrower portfolios.

“[In Korea] it takes about 12 years for a startup to be listed in the stock market. That is too long for angel investors. What we need is an active M&A market where investors can achieve returns within 5-7 years.”

—from an interview article with Woojin Kim, Korea Institute of Finance



⁴ Small and Medium Business Administration (SMBA), press release.

⁵ Hana Institute of Finance, weekly publication.

⁶ Korea Venture Investment Corp, 2014 KVIC Yearbook; Small and Medium Business Administration (SMBA), press releases.

Startup incubators and accelerators can also make significant contributions to maximizing survival and success rates of first-time entrepreneurs. Both incubators and accelerators, while their operating models differ, provide financial and non-financial support for startups. Non-financial support might include office spaces or in-depth mentoring from experienced entrepreneurs or managers. Korea has a few prominent accelerators, including Primer and K-startup. The government provides financial support for a number of accelerators. But in Korea, incubators and accelerators remain at a nascent stage and are themselves in need of incubation.

“The services provided by Korean incubators are fairly limited. They provide office space for early-stage startups, but few can help with networking and mentoring.”

—from an interview with Nari Lee, a former center head of D.Camp

“Korea needs more incubators run by entrepreneurs, especially for technology-based startups. But because we’ve had only a handful of successful tech-based startups in the past 5 years, we don’t have enough mentors.”

—from an interview with Jung-hee Ryu, a CEO of Future Play

The “herding effect”

Ease of early-stage financing attracts a number of first-time entrepreneurs with no technological expertise. Novice entrepreneurs often prefer consumer-facing ventures providing Internet or mobile service sectors, which have lower barriers to entry and for which first-time founders have greater familiarity. Mobile/Internet service startups account for the largest portion (31 percent) of total ICT startups.⁷ Given that nearly half of all entrepreneurship clubs in universities are focusing on mobile/software/IT, the concentration toward mobile/internet services seems certain to continue.

“Many young people with access to government funding think of mobile/internet service startups and indeed there has been a significant increase in the number of new ventures in that area. Nevertheless, few founders of such companies are well-prepared. Despite the increased number, there are limited number of high-quality startups to invest in.”

—from an interview with a venture capitalist

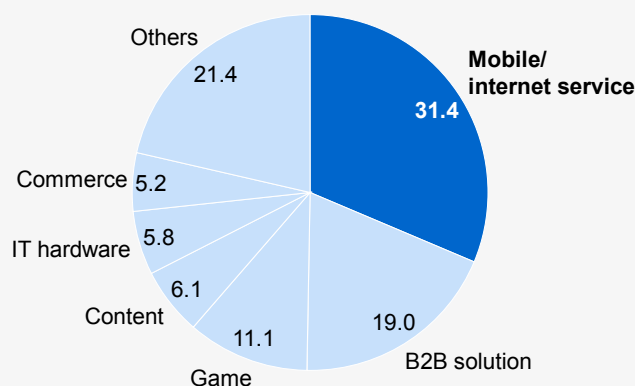
⁷ Born2Global global startup center, 2014 ICT startup survey.

Exhibit 10

Mobile/internet service startups account for the largest share of Korean ICT startups

Target business areas of Korean ICT startups

Percent (N = 575); based on 2014 survey by Born2Global center



SOURCE: Born2Global global startup center survey (2014)

The Internet and mobile services sectors are among the most vibrant for startups globally. Most of the recently emerged billion-dollar startups (such as Uber and Airbnb) have targeted these sectors. But it is considerably more difficult to launch a billion-dollar company from Korea than from a big market like the United States. We estimate that, in order to achieve the annual sales of KRW 5 billion (\$4.5 million) through advertising revenue, a Korean startup would need roughly 5 million registered customers or 1 million active (10 views per day) customers. That implies that, for most sectors of the Korean market, there will be room for no more than one or two dominant players with meaningful revenues. Other players may find niche markets, where customers are willing to pay high premiums—but such strategies make it even less likely that a Korean venture will breakout and become a billion dollar company.

“My team has established a dominant position in domestic market. Nonetheless, even with full penetration, it will be hard for us to achieve more than KRW 20 billion (\$18 million) sales.”

—from an interview with a startup COO

Despite the limited scope for success from a strategy targeting Korea's domestic market exclusively, many of the Korean government's recent initiatives to support new ventures have had the perverse effect of pushing of young entrepreneurs into domestic businesses. Many Korean entrepreneurs launch new ventures based on “new” ideas that can easily be copied by competitors. Of respondents to a McKinsey survey of 150 Korean startup founders, 40 percent cited the uniqueness of their venture's idea as the key factor differentiating it from rivals. The reality, however, is that many seemingly “original” ideas are quickly copied the moment they begin to get some traction in the marketplace.

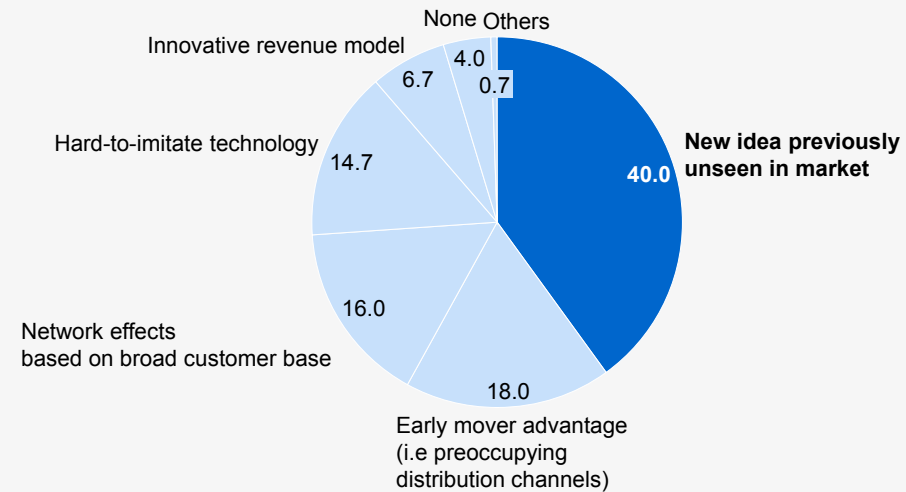
For instance, Korea has more than 20 local delivery applications, but only two of them, Baedal Minjok and Yogiyo, earn significant profit. The market for social dating applications is saturated with more than 150 players.

Exhibit 11

Founders believe the uniqueness of their idea is what differentiates their ventures from competitors

What is your startup's key differentiating factor from competitors?

Percent (N = 150); based on 2014 McKinsey survey on ICT startup founders



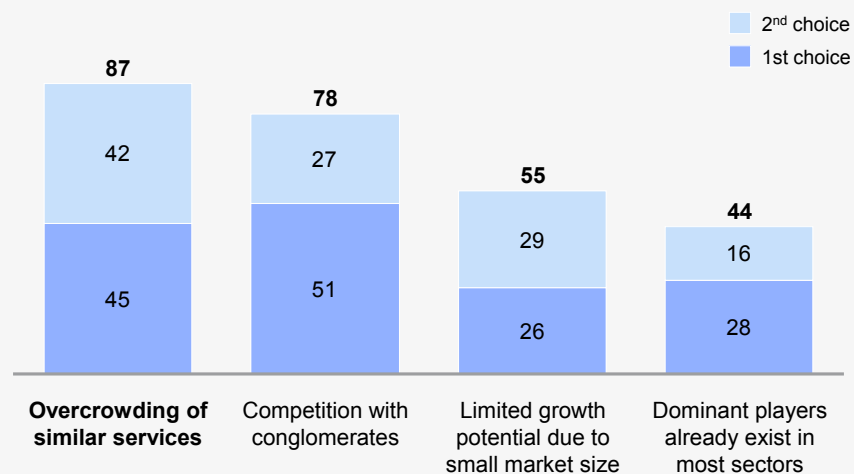
SOURCE: McKinsey survey on ICT startup founders (2014)

Exhibit 12

Ease of imitation and lack of differentiation leads to overcrowding of similar services in the Korean venture market

What is the biggest problem of the domestic market?

Responses (N = 150); based on 2014 McKinsey survey on ICT startup founders



SOURCE: McKinsey survey on ICT startup founders (2014)

A bigger problem is that early movers already have claimed many of the opportunities for service startups in Korea's home market. After 2011, the proliferation of smartphones opened new frontiers for startup firms. The result was several notable successes including Kakao and Baedal Minjok. But in the years that followed, "low-hanging fruit" in this sector had been thoroughly plucked.

"If companies are looking only at opportunities in the Korean market, I do not expect to see another three or four Kakao or Coupang emerge here."

—from an interview with a venture capitalist

Areas offering the greatest opportunity for future growth in the Internet and mobile services sectors—notably financial services technology—are more accessible to large, established ventures than small startups. One of the complexities of the financial services sector is that it is much more strictly regulated than other business areas.

"Even business models that have been tried and tested in other countries (for example, crowd-funding) can't be replicated in Korea because regulation here is so strict. I personally see a huge opportunity in financial services, yet the current regulatory environment is a significant challenge."

—from an interview with an entrepreneur preparing
for a financial services startup

Challenges and opportunities for mobile game startups

Korean startups in the mobile game sector confront many of the same challenges Korean startups in the mobile game sector confront many of the same challenges faced by ventures in financial services. A number of Korean firms—among them 4:33 Creative Lab, SundayToz, Devsisters—designed iOS-based mobile games even before the Korean launch of the iPhone. Those ventures grabbed high-growth opportunities and grew quickly into large, established players. But the window of opportunity is smaller today than it was three years ago. In the early days of smartphone adoption, consumers downloaded a variety of games out of curiosity. There was ample opportunity for new entrants to get discovered and gain popularity. But consumer behavior has evolved quickly in years since. In recent years, mobile games have lost some of their initial novelty. Consumers have grown less interested in experimenting with new games. Consumers more conservative approach to choosing what games to play is reflected in the rankings of Korea Apple App stores Top 10 chart for games, which have not changed significantly since 2011.

Exhibit 13

In mobile games, Korea's new entrants face diminishing odds of success

List of companies within Top 20 game chart in Apple App Store (Korea); 2012 and 2014



SOURCE: Appanie

We believe overseas markets offer significant opportunities for mobile game developers. China and Southeast Asian markets, for example, remain at an early stage in smartphone adoption. Subscribers to 3G or 4G mobile services account for 33 percent of the population in China and only 18 percent in Indonesia. By contrast, 3G and 4G subscribers account for 92 percent of the US population and 85 percent of the Japanese population.

We believe Korea's mobile game developers can be globally competitive. Even in the pre-mobile era, when consumers played games mostly on their personal computers, Korea was considered as one of the world's leading developers of high-quality games. Mobile game providers in some economies, notably China, have developed innovative products of their own, even in China, market leaders such as Tencent remain avid consumers of Korean games and demonstrated a willingness to acquire Korean game developers. In 2013, Korean firms exported KRW 167 billion (\$151 million) worth of mobile games.⁸ Korea's game industry is rich in talent, with world-class designers and developers who have produced some of the world's most popular products.

Korea also boasts global distribution platforms that are either Korea-based or Korea-related. Recently, messaging services like Kakaotalk and Line have emerged as major distributors and platforms for mobile games, especially in Asia. For instance, Line Corp's Line platform is one of leading players in Japan, Taiwan and many Southeast Asia countries. With the business partnership with Line, an early-stage startup can rapidly expand into other Asian countries. Several of the gaming experts we interviewed argued that the fact that Kakao is a Korean company and many of Line's management are Koreans increases accessibility for Korean startups to those global platforms. The relative universality of gaming interface across countries makes it globalize in the gaming sector than in other internet/mobile service sectors.

⁸ Korea Creative Content Agency.

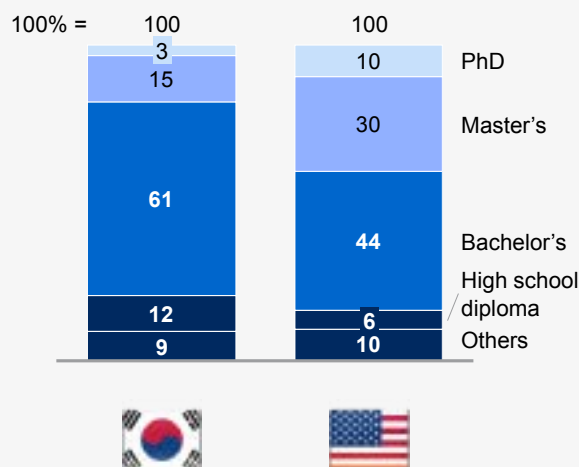
In search of experience and technological know-how

Recent research by Born2Global, a consultancy for Korean ICT startups, found that 61 percent of Korean entrepreneurs only hold a bachelor's degree. The proportion of Korean entrepreneurs with PhD degrees is only 3 percent.⁹ In the U.S., the proportion of bachelor's degree holders is 44 percent while that of PhD holders is 10 percent—over three times higher than in Korea.¹⁰ It's not impossible for an entrepreneur without a graduate degree to launch a successful company—as the examples of Facebook, Apple and Microsoft will attest. But we believe that, in the Korean case, having a founder with an advanced degree can provide a big advantage, particularly in areas such as search or data analysis. We believe Korean startups are missing opportunities because they lack sufficient technical talent.

Exhibit 14

In Korea, founders are far less likely than counterparts in the US to have advanced academic qualifications

Terminal academic degrees of founders
Percent



SOURCE: Born2Global global startup center survey (2014), Kauffman foundation (2008)

At least half of Korean small and medium-sized ICT firms surveyed by Korea's Ministry of Science, ICT and Future Planning in 2014 reported difficulties recruiting experienced mid-level managers. By contrast, only about a third of firms surveyed reported difficulty in attracting entry-level employees. McKinsey conversations with the chief executives of Korean ventures confirmed the importance of finding experienced managers capable of developing junior members and providing genuine market insight as their businesses move into the expansion phase. CEOs said it was difficult for them to provide sufficient incentives to recruit such managers from established Korean IT companies like Daum Kakao or Naver. Stock options, typically an important financial incentive for highly skilled workers in the U.S. tech sector, are not highly valued by experienced tech workers in Korea. Indeed, employees in only 59 out of 29,000 registered startups in Korea have exercised stock options.¹¹ In addition to the low possibility of exercise, Korea's limited exit market delays the opportunity for exercising options and limits the size of rewards. As a result, many Korean startups must fall back on emotional appeals to experienced recruits.

⁹ Born2Global global startup center, 2014 ICT startup survey.

¹⁰ Kauffman foundation, Education attainment of U.S.-born tech founders (2008).

¹¹ Special committee for creative economy, the National Assembly of Korea, press release.

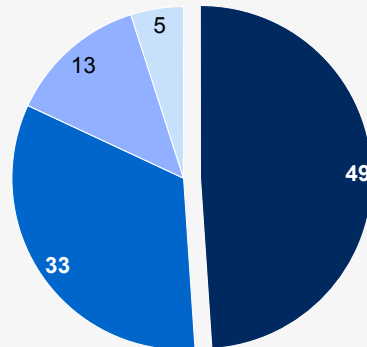
Exhibit 15

The top recruiting challenge for Korean startups: hiring qualified mid-level managers

What is the biggest challenge in recruiting talent?

Responses (N = 150); based on 2014 McKinsey survey on ICT startup founders

- Recruiting highly capable mid-level managers in growth stage
- Finding highly capable founding members due to low preference in founding startup
- Low capability level of junior members
- Recruiting junior members



SOURCE: McKinsey survey on ICT startup founders (2014)

“The lack of mid-level developers and managers is a widely known challenge for Korean startups. With few experienced hires, my team is focusing on grooming junior members internally. It takes more time and effort, but that is the only solution for us.”

— from an interview with a mid-level developer of an established IT company

“Developers do not believe in stock options. I would ask for a risk premium of at least 20-30 percent of salary move to a startup... If one is passionate enough to pursue startups despite limited upfront financial incentives, he will certainly start his own as a founder rather than joining others as an employee.”

— from an interview with a mid-level developer of an established IT company

Korean startups can also seek to find capable managers among “returning” entrepreneurs — whether those who successfully exited an earlier venture or took refuge from failed startups. On average, a Korean entrepreneur starts a new company 1.8 times, compared to the US average 2.8 times.¹² The fact that Korean startups must wait an average of 13 years for IPO deters experienced workers from changing firms.¹³ The fact that so many Korean startups rely on debt rather than equity for their original capital contributes to a culture of risk aversion.¹⁴

For technology ventures, it is even more important to hire workers with technology expertise than those with general experience. Workers with specialized technology expertise, particularly those with an understanding of algorithms, allow startups to differentiate themselves with advanced core technologies. Such technologies are far more valuable to potential foreign acquirers than products that are only successful in the Korean market. For example, Olaworks, founded by computer science professor from Korea Advanced Institute of Science and Technology, developed advanced face recognition technology and was acquired by Intel for KRW 35 billion (\$32 million) in 2012.

Despite such success stories, startups founded by PhD degree holders account for only 3 percent of total startups in Korea, compared to 10 percent in the U.S. Technology based startups tend to target core technologies that will become important three to five years into the future and therefore require patient investment. Many industry experts complain that Korean venture capital investors are too risk-averse when it comes to funding long-term technology-based startups.

“Top-notch R&D engineers with the potential to develop high-value core technologies are currently all working in Samsung or LG. A shortage of talent in the startup community makes it hard for successful tech-based startups to emerge in Korea.”

—from an interview with a venture capitalist

The exit bottleneck

Korea’s small M&A exit market slows the circulation of capital and human resources. In 2013, M&A exits for Korean startups accounted for only 0.4 percent of total exit cases,¹⁵ compared to 61.4 percent in the U.S. M&A generally enables earlier exits than IPOs and thus facilitates reinvestment of exit proceeds and reentries of experienced workers back to the startup community. Korea’s extremely low frequency of M&A transactions means the only real exit option for Korean startups is through an IPO which, as noted, takes average of 13 years.

¹²Small and Medium Business Administration (SMBA).

¹³Korea Exchange.

¹⁴National Research Council for Economics, Humanities, and Social Sciences.

¹⁵Korea Venture Capital Associations.

Why is Korea's M&A market so sluggish? In part, the problem can be attributed to a mismatch between the major business areas of startups and those of potential buyers, particularly Korea's conglomerates. Korea has experienced a sharp increase in the number of Internet and mobile service startups in recent years. No doubt some of these new ventures will emerge as important new players. Even so, Korean conglomerates prefer to focus on manufacturing and chemical sectors. The conglomerates see little advantage to acquiring Internet or mobile service startups with no strategic synergies to their core businesses. Some of Korea's established IT corporations, for example Naver or Daum Kakao, have engaged in M&A transactions in recent years. Yet, with the limited competition in M&A market, the range of price premium is rather narrow, resulting in few examples of successful exit.

For Korean startups, the prospects of exiting via the overseas M&A market is not much better than via the domestic market. In shopping for Korean companies, global acquirers look for two things: core technology with potential for global application, or an established presence in the Korean market that might shorten time-to-market in other countries. The Korea startup community remains at an early stage. Few Korean companies offer products or technologies that are ready for global rollout. The Korean market, meanwhile, is small compared to markets of China or Indonesia.

“Global IT companies are not likely to pay KRW 100 billion (\$91 million) just to gain access to a small Korean market, while they will for China or Indonesia market. Korean mobile/internet startups need to quickly expand its global coverage outside Korea to aim for global M&A.”

—from an interview with a venture capitalist

The number of IPOs on Korea's KOSDAQ has fallen to 23 in 2013, down from 35 in 2011. The decline reflects stricter listing criteria and depressed investor sentiment toward KOSDAQ market resulting in low valuation.¹⁶ KONEX market was opened in July, 2013 to increase capital access and provide earlier exit options to late-stage startups with lowered listing criteria. In size, it has shown positive growth with the number of listed companies almost tripling to 62 in October of 2014, up from 21 in July, 2013.¹⁷ Nevertheless, in the first half of 2014, average daily transaction volume remained only about 37,000 stocks, down from about 61,000 in the second half of 2013. Unless KONEX can improve liquidity, it will have little effect in revitalizing Korea's IPO market.

¹⁶Korea Venture Capital Association.

¹⁷Korea Exchange.

“There are so few transactions on the KONEX even a few trades can result in big fluctuations in the price of the entire index. So few companies pay much attention to their share price. It’s not feasible to raise capital on the KONEX.”

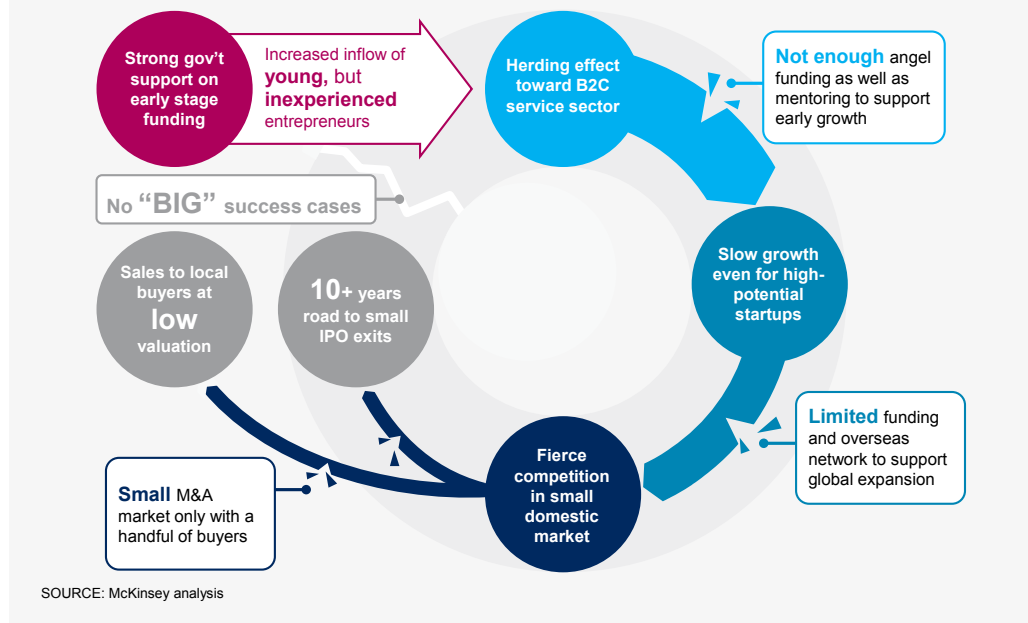
—from an interview with a venture capitalist

In search of “big winners”

The government’s push to establish a “creative economy” in Korea has significantly lowered entry barriers for startups. In recent years, there have been a flurry of new ventures and the overall size of the startup community has grown. But it remains unclear how many of these new businesses will survive, let alone succeed. The government can’t continue supporting startups indefinitely. The market needs “big winners” to bolster investor confidence and create a virtuous cycle in which more capital brings more talent, and new talent attracts more capital.

Exhibit 16

More government support for startups has created more new ventures, but has yet to create “big winners” or foster a virtuous cycle of venture growth

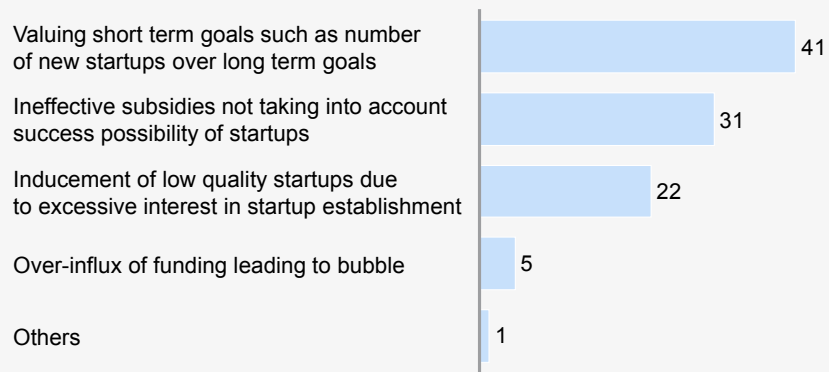


As currently structured, conditions in Korea's startup ecosystem do not favor the emergence of such big winners. The reality, for now, is that the startup community is dominated by young entrepreneurs with limited expertise whose businesses lack sufficient early-stage infrastructure needed to mentor staff. In addition, many new ventures have clustered in B2C service sectors with limited domestic market opportunities. When startups aim for global expansion, neither the government nor domestic VCs can offer them much help. Lacking overseas networks and overseas experience, Korean venture capital investors are reluctant to fund startups with global expansion plans. The result is that startups are pitted against each other in fierce competition in Korea's tiny domestic market. And even if they survive and emerge as a dominant domestic player, their prospects for exit are bleak: acquisition by one of Korea's handful of domestic IT companies or a decade-long wait for a chance to list on Korea's stock exchange.

Exhibit 17

Startups are mostly concerned that government policies focus on short-term goals rather than creating a sustainable ecosystem

Why do you negatively view current government's startup stimulus policies?
Percentage (N = 85); based on 2014 McKinsey survey on ICT startup founders



SOURCE: McKinsey survey on ICT startup founders (2014)

If the current situation continues, the recent spike in the number of new ventures will likely generate many more failures, and few to no representative successes. The hoped-for revitalization of the startup community is unlikely to occur.

3. Case study and implications

Local success case study I – Technology-based startup (Olaworks)

The experience of Olaworks, a Korean computer vision technology venture, demonstrates that Korean startups can achieve global success when tech-savvy founders are provided sufficient funding. Olaworks was founded in 2006 and acquired in 2012 by Intel at KRW 35 billion (\$32 million).

Four factors played a role in Olaworks' success:

- Founded by technology specialists from academia and industry.
- Targeted a technology expected to prove valuable over 3-5 year horizon.
- Secured sufficient venture capital funding to focus on technology development.
- Involved overseas investors and stakeholders with global networks.

The co-founders of Olaworks, CEO Jung-hee Ryu and CTO Junhwan Kim, hold PhD degrees in computer science from KAIST and Cornell University respectively. The focus of CTO Kim's PhD thesis was computer vision, the technology he later sought to develop at Olaworks. Both men had previous startup experience in academia and the high-tech industry. CEO Ryu had founded Iconlab, a bar code recognition solution for mobile devices, in 2000 and was a professor at KAIST. Prior to founding Olaworks, CTO Kim was a senior researcher in the Telecommunication and Network division of Samsung Electronics. Both men had a firm grasp of the latest technology trends and were able to recruit computer science graduate students from KAIST to join their founding team.

Olaworks deliberately sought to invest in technologies that would be of value within a 3-5 year time frame. From its inception in 2006, Olaworks believed the rise of computer vision and image recognition technology would have increasing importance for the function of cameras in mobile phones and smartphones.

“Even in 2006, it was clear to us that smartphones, small mobile device with high computing power, would soon be popular products. At that time, mobile phone with cameras were just gaining popularity and we naturally thought about what kind of camera would be required in the smartphone era. We concluded that one key function would face detection/recognition technologies.”

—from an interview with Jung-hee Ryu, the founder and CEO of Olaworks

Olaworks started to supply its face detection and photo filter technology (e.g., putting a shiny crown on top of a face in a photo) to LG and Pantech's feature phones in 2008, and the company's technologies were widely used by several mobile handset makers like HTC.

Exhibit 18

Image detection and recognition technologies of Olaworks

EXAMPLES

Face detection/tracking



Smile detection



Face recognition



3D head tracking



SOURCE: TechNode

Olaworks benefitted from ample early funding which enabled it to focus on technological development. In 2007, about a year after founding, Olaworks received an investment of \$4 million from three investors—Skylake Incuvest (\$1.99 million), Intel Capital (\$1.99 million), and WSGR (\$0.02 million). \$4 million series-A funding is common in the U.S. but for Korea, where even the concept of early-stage funding was not widely accepted, this was considered a substantial investment. In fact, even by the standards of Korea today, this sum was a bold investment. Typically, early-stage investors in Korea put up KRW 100-300 million (\$91-272 thousand) for series-A and KRW 0.5-2 billion (\$453 thousand-1.8 million) for series-A/B for more proven startups. With enough initial venture capital funding, Olaworks was free to improve and expand its core technologies with no additional funding until its exit.

It is worth noting that a key source of Olaworks' funding was provided by Intel Capital, which has a long history of startup investments and a comprehensive global network of potential buyers and business partners. From the very beginning, Olaworks sought after investments from global venture capitals and urged its lead investor, Skylake Incuvest, to bring in a global investor to the series-A funding round.

“I did not believe it possible for technology-based startups to succeed by targeting Korea’s domestic market only. I therefore specifically looked for a top-tier investor in Silicon Valley...Being a portfolio company of Intel Capital has provided a tremendous support for a small startup like ours to connect with global players like Vodafone.”

—from an interview with Jung-hee Ryu, the founder and CEO of Olaworks

Intel Capital, a corporate venture arm of Intel Corp, is one of the biggest corporate VC funds in the world, and invests in technology startups relevant for Intel across countries. The fund sponsors Intel Capital Technology Day, an event that brings together all its portfolio companies and lets them present to big global corporations like Vodafone and Google. Intel Capital also hosts the Intel Capital Global Summit, which brings together CEOs of portfolio companies and big corporations and helps them to make global connections across borders. In one of these meetings, Olaworks met Silicon Hive, another company in Intel Capital’s investment portfolio. Silicon Hive had worked on multimedia digital signal processing. Executives from the two companies discussed the idea of a business partnership. The resulting alliance led to a successful M&A exit for Olaworks after Intel acquired Silicon Hive in early 2011. Seeking investment from a global VC firm like Intel Capital proved instrumental to Olaworks successful exit.

Local success case study II – Targeting global markets (Memebox)

Given the limited size of Korea’s domestic market, any Korean startup aspiring to become billion dollar company has a global strategy. Memebox, an ecommerce platform specializing in Korean cosmetics, offers an excellent case study of how a Korean company can go global. Memebox was founded in 2012 by Dino Ha and Doin Kim. Dino Ha, a graduate of the Parsons School of Design, had worked for Korean ecommerce startup, Ticket Monster, which was acquired by Living Social in 2011. Doin Kim was a former retail broker at Samsung Securities. The venture expanded to the U.S. market in early 2014, and has recently launched service in China. By December, 2014, transactions in the U.S. and China accounted for more than 20 percent of Memebox’s global sales.

Three factors contributed to Memebox’s global success:

- Memebox focused on a product, Korean cosmetics, in which it had a strong competitive advantage.
- Memebox pursued an aggressive, hands-on strategy of global expansion.
- To bridge the gap in its understanding of a key market, the U.S., Memebox joined Y Combinator, Silicon Valley-based incubator, and used that association forge links with U.S. investors and business partners.

Korean startups expanding into overseas markets often find themselves in competition with local ventures with deep knowledge of their home market, including consumer segments, buying habits, preferred sales channels, effective promotion strategies. Local rivals also have a home field advantage when it comes to access to capital and resources. For instance, the pool of series-A funding in China is five to ten times larger than in Korea and local Chinese firms have the inside track on recruiting skilled employees in their home market. Memebox overcame those obstacles by developing the idea of “Korean beauty” into a strong value proposition—one that was almost impossible for overseas rivals to imitate. Buoyed by the “Korean Wave”—the swelling popularity of Korean TV shows, movies and popular culture—Korean cosmetics in recent years have won over customers not only in Asian countries but in the United States. Memebox positioned itself as a showcase for global customers seeking Korean beauty products. A key to its business model is the site’s deep knowledge of the latest cosmetics trends in Korea. Memebox sources its products from hundreds of Korean cosmetics companies and offers more than 600 Korean brands, and its sourcing network for Korean products is constantly expanding. That network serves as a strong entry barrier to non-Korean rivals. Memebox’s subscription-based cosmetics business model also contributed to its early global success.

Memebox co-founders Dino Ha and Doin Kim made a firm commitment early on to expand into the American and Chinese markets. Unlike many other Korean startups, which assign global expansion to junior staff with little prior overseas experience, Memebox sent its most senior executives to oversee operations in its target global markets. Indeed, CEO Dino Ha himself moved to the U.S. with three team members to gain a better understanding of the American market, and personally built Memebox’s operations there. Co-founder and COO Doin Kim moved to China with a team of five people to understand that market. By sending core executives to its two most important overseas markets, Memebox assured that its Korean corporate culture and sales knowledge gained from its domestic market were transferred to its global operations.

“The expansion team from Korea fully understood the business and thus could be quicker to build a viable product to launch in the U.S. market. After that, we had no trouble recruiting staff from our target markets with local knowledge. Made our first local hire in the U.S. eight months after we entered the market there.”

—from an interview with COO Doin Kim, Memebox

Memebox also benefited from its relationship with Y Combinator, a Silicon Valley accelerator program. Y Combinator helped Memebox build a relationship with successful U.S. entrepreneurs like Andrew Mason, CEO of Groupon, and introduced Memebox founders of Y Combinator's e-commerce "playbook" outlines step-by-step formulas for evaluating the number of active users, sales per user and other crucial metrics to zero in on the most effective methods for product promotion at each stage in the venture's development, from launch to billion-dollar business. After Memebox presented its business model to investors and media at Y Combinator's bi-annual "Demo Day", the company received more than 200 emails from U.S. venture capitalists offering to introduce Memebox to potential business partners, suggesting cross-promotion strategies, and offering help with logistics or payment transactions in the U.S. Memebox also is seeking similar partnerships with venture capital investors and private equity firms in China.

Global Case Study

Recruiting and developing talent

Korea's education system, particularly the nation's universities, can play a critical role in preparing more talented students for careers as entrepreneurs. In Finland, Aalto University was established in 2010 as a merger between the Helsinki University of Technology, Helsinki School of Economics, and the University of Art and Design Helsinki. The Finnish government sought to emphasize innovation through multi-disciplinary education on business, technology, and design. Aaltoes, which stands for "Aalto Entrepreneurship Society," is Europe's largest state run entrepreneurship community; the organization hosts the Startup Sauna accelerator program for startups, which saw a participation of 500 teams in 2011, 65 percent of which hailed from companies outside Finland.¹⁸ Aalto alumni have created startups like "Kippt," which have gone on to win funding from major accelerators like Y Combinator.

Sweden provides another example of grooming startup-oriented talent. The Entrepreneurship and New Business Development Programme (ENP), started in 1994, offers university students training, mentorship, and supervision to start a business. The program has seen positive results. Three-fourths of its participants start new ventures during the course of the program, and of those new businesses, three-fourths are still in operation after three years and 20 of those ventures employed more than five people. Over the last 18 years, the program has helped launch more than 500 businesses.

Besides grooming talent, attracting talent with expertise and experience is also important. In 2008, the average and median age of key tech founders in the U.S. was 39, of whom, about half had earned master's degrees or higher, and 10 percent were Ph.Ds. This relatively high percentage of advanced degrees among startup founders (compared to Korea) suggests that the U.S. is able to attract those with expertise and experience into the startup playing field.

At the University of Minnesota, professors have the option to apply for a one-year entrepreneurial leave of absence every four years. This entrepreneurial sabbatical program offers no salary support, but there is no limit to the amount of outside compensation available to faculty. The program facilitates temporary leave for faculty inventors who want to help an external organization commercialize the university's R&D efforts. Similar programs are offered on various university campuses, such as the University of Louisville, Ohio State University, National Cancer Institute, Northwestern University, and Michigan Tech. The university can gain from increased faculty knowledge for teaching and improved commercial research focus.

¹⁸Recent Changes in the Finnish Startup Ecosystem.

Technological Incubators Program (Israel):

Our survey of Korean startups found that the number one reason cited for joining an accelerator program was “to get access to capital investment.”¹⁹ However, because investing in early stage startups often involves high risk and drawn-out time until potential exit, private players tend to avoid this stage. Funding from government can help, but it is not enough. One shortcoming of early-stage public-sector funding is that it can’t provide the sort of hands-on advice and guidance that is the hallmark of sophisticated private venture funding.²⁰ Government funding is more effective when it functions as a magnet, attracting greater participation in the early stage market by private funds and accelerators.

A key player in the Israeli startup ecosystem is the Technology Incubators Program (TIP), a national network of incubators dedicated to fostering the growth of technology-based startups. The program was launched by the Israeli government in 1991 (but privatized in 2002 for more efficient management). Startups with a technology base are strictly screened and admitted into a 18-24 month program under 26 incubators (23 technology incubators, 2 industrial technology incubators, and 1 biotech incubator).²¹ The incubators are VC-led consortia, supported by a wide range of technology experts and specialists: former engineers with technical expertise in the specific sector, intellectual property specialists, VC investors, corporate R&D experts, foreign market marketing experts, and previously successful entrepreneurs.

TIP shows a high success rate: between 1991 and 2013, over 1,900 technology-based startups were incubated, and approximately 1,600 startups matured and “graduated” from the program to strike out on their own. 60 percent of participating startups were able to receive further funding or succeed in M&A or IPO. Of the program’s 1,600 graduates more than a third remain in business. Total cumulative private investment in those graduates exceeds \$4 billion.

The Israeli government’s generous funding scheme has played a key role in attracting private players into Israel’s early-stage market. Startups selected for TIP receive full funding of up to \$500,000 for two years, of which 85 percent comes from government and 15 percent comes from TIP. The incubator has an incentive to participate, as it can gain up to a 50 percent stake in return for its initial 15 percent investment. TIP startups bear no financial responsibility if they fail.

Another incentive for private players to participate and invest in the TIP program is its focus on technology-based startups. TIPs limit their portfolio to startups with a high technology base, which are deemed to have better access to the global market and increased M&A possibilities compared to startups with no core technology. Their higher chance of successful commercialization makes them attractive targets for private funds. Between 1991 and 2013, the Israeli government invested over \$730 million dollars cumulatively in TIP, and succeeded in attracting more than \$4 billion in private investments in TIP graduate companies. In other words, for every \$1 investment by the Israeli government, the TIP program attracted an additional \$5 for participating ventures from the private sector.²²

¹⁹ Accelerator Achievements and Success Factors, p14.

²⁰ The Vito Program Mid-Term Evaluation, p30.

²¹ Characterization and Implications from Israel’s Technology Incubator Program.

²² Israel Technological Incubators Program.

Market Readiness and Sector Specific Accelerator (Singapore):

International Enterprise Singapore, a government agency under Singapore's Ministry of Trade and Industry, oversees a "Market Readiness Assistance" (MRA) program to help startups reach the global market. The MRA program supports startups pushing into overseas markets by providing market intelligence reports and market data. The program offers an in-depth training program designed to help entrepreneurs learn about operating a business in specific countries, and provides financial assistance to subsidize up to 50-70 percent of international marketing costs for participation businesses.

The Singaporean government also plays a role in identifying new sectors for growth through its Sector Specific Accelerator (SSA) program. As a part of that program, the government has created four accelerators focused on the medical technology sector (Clearbridge BSA, Singapore Medtech Accelerator, Zicom MedTacc, and Medtech Alliance) and has committed \$70 million in funding via its investment arm, SPRING Singapore, to boost medical technology startups. When accelerators invest in such startups, the government provides matching funds up to \$140 million.

Innovation Mill (Finland) and Illinois Corporate Startup Challenge (U.S.)

Finland's Tekes, a government-based VC, launched the Innovation Mill project in 2009. The project aims to commercialize what is sometimes called "surplus R&D"—intellectual property (IP) developed by large corporations that might go unused because it is no longer aligned with company's broader business strategy. As part of that program, large corporations such as Nokia share unused IP with new ventures selected through a careful screening and matching process. Tekes provides financing of up to EUR 100,000. Between 2009 and 2013, the program transferred 110 different types of intellectual property to startups, spawned 81 new ventures, and generated more than 1000 new jobs. Tekes supported participating ventures with more than \$95 million in funding.

"Illinois Corporate Startup Challenge," a regional initiative, aims to connect leading Illinois-based companies such as Motorola, Hyatt, Molex, and ADM, with local startups able to provide them with technology. In 2013, the Startup Challenge team sourced technology from 200 local startups through a "highly curated matchmaking process" involving universities, VC firms and incubators/accelerators. Those ventures were narrowed to 45 by the corporations seeking technology, and then invited to pitch to corporations. Over 50 percent of the ventures selected received some form of follow-up engagement. Participating corporations are required to establish "Chief Startup Offices" to engage with startups. Typically the large companies worked with 3-5 local startups over a period of three to six months, providing mentoring, partnership, and business opportunities.

"Large corporations like ours typically don't work with entrepreneurs because we don't have time. But programs like this can open our eyes to other opportunities."

—VP Marketing, Molex

“We’re always meeting with entrepreneurs and new companies. But typically we engage them one-on-one. Through this program, we were able to talk to 15 companies in 4 hours.”

—Chief Procurement Officer, Motorola Mobility

Similarly, TechStars, a major US accelerator, has recently begun partnering with established corporate brands to establish three month accelerator programs built around the large companies’ specific areas of interest. For example, Barclays asked for startups building personal finance apps, and Kaplan for education technology. Once large firms choose the startups they want to work with, TechStars provides accelerator services, such as organization, management, and back-office services, while the hosting corporation provides access to senior executives to act as mentors and offer industry experience. Several small ventures have won funding from Kaplan and Microsoft. Among them: “Degreed,” an education app that raised \$2.7 million, and Mobilligy, a mobile bill-paying cloud service that has raised \$1.5 million. Startups participating in this program have an incentive to focus on technology development because they have a clearer path to commercialization.

4. Enablers and recommendations

Exhibit 19

Challenges for Korean ventures

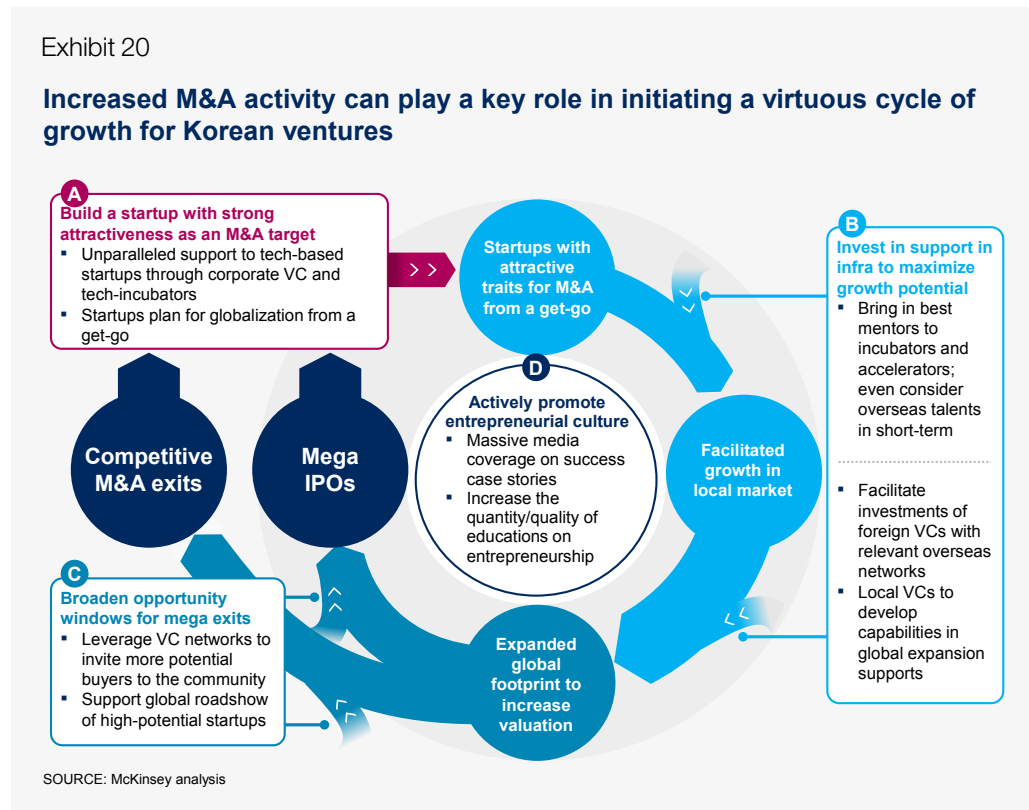
Improvement areas	Root causes
1 Not enough early support to turn ideas into business	<ul style="list-style-type: none"> No mid-point exit options to realize the return for angel investors Limited number of successful entrepreneurs to provide mentoring and advice in incubators and accelerators
2 Concentration in B2C service sector targeting small domestic market	<ul style="list-style-type: none"> Increase of young first-time entrepreneurs with little experiences and expertise partly due to gov't support Little to no supporting infra to facilitate global expansion VCs cautious to invest in global expansion Limited funding toward tech-based startups
3 Limited inflow of talents with expertise	<ul style="list-style-type: none"> Small financial rewards not enough to compensate risk Few success cases to serve as a role model to motivate top talents' entry to the community
4 Crippled exit market with few M&A exits	<ul style="list-style-type: none"> Not many target companies to expect strategic synergy with Korean conglomerates Reluctant culture of conglomerates toward local M&As Limited network of startups and local VCs to identify and connect with overseas buyers

SOURCE: McKinsey analysis

The challenge of improving Korea's startup ecosystem has been widely debated in recent years. There are several schools of thought about what must be done. One often-heard argument is that the problem resides in Korea's education system. Proponents of this view argue that Korea's educational institutions must change to instill the spirit of entrepreneurialism in the nation's students. Another camp sees the problems in Korea's capital markets. Those subscribing to this view insist Korea's capital markets advocate changes that would allow Korean investors to accommodate more risky but innovative companies. Recommendations of this second group focus on helping new ventures raise enough money to grow, not just launch. We agree with both views: Korea needs to transform its educational institutions to make it easier for startups to recruit more talented engineers, and it must introduce new measures to reform its capital market both by increasing the flow of mergers and acquisitions and shortening the time required for new ventures to float their shares on the stock market.

We believe no single solution can solve the current stalemate of Korea's startup ecosystem. The systems' problems are intertwined. There is not enough angel funding because there are too few exit opportunities. There are too few exit opportunities because there is too little financial support available to early stage ventures. We believe that several cycles of successes must be "engineered" to initiate a virtuous cycle for Korea's startups. We believe that the focused approach to maximize M&A possibilities is the key lever that can generate such cycles of success.

We believe Korean startups need to be encouraged to embrace, from early on, business models with two key characteristics: differentiated core technology and a plan for global expansion. Other players in the startup ecosystem, including accelerators and venture capital firms, need to develop non-financial support capabilities to facilitate such development. Korean startups need to seek out additional potential buyers including foreign conglomerates and overseas global players such as Intel, Google, Facebook, Microsoft and IBM.



Creating M&A appeal

If Korea is to develop a successful startup ecosystem it needs to increase the speed and volume of ventures that achieve a successful “exit” whether via sale or merger, or via selling shares to the public. In Korea, both paths to exit are constricted. Mergers and acquisitions account for only about 1 percent of total exits from Korea’s venture market, and the average interval between launching a new venture and IPO, the only viable exit in Korea, is more than a decade. For most major stakeholders—entrepreneurs, angel investors and venture capital investors—ten years is far too long to wait to be rewarded. Investors must have other ways of realizing earlier returns.

In the short term, the government can play a role in stimulating M&A activity in the Korean venture market by introducing new tax incentives. Over the long term, however, this approach is unlikely to prove sustainable. Startups need to make themselves more attractive as M&A targets toward potential buyers. This does not mean startups should favor M&A as their exit strategy over going public. But the two goals are not mutually exclusive. To say a venture is an attractive M&A target is to say that outsiders place a high value on that venture—a perception which would translate into higher share price in a public share offering.

But how can Korean startups evaluate their attractiveness as M&A targets? Our survey of 150 Korean founders in the ICT sector found that 42 percent see little chance of M&A as a viable exit path for their businesses.

“The reason why only few of venture capitalists are willing to invest in Korean ventures is that it’s too difficult for Korean ventures to reach a successful exit market via IPO or M&A.”

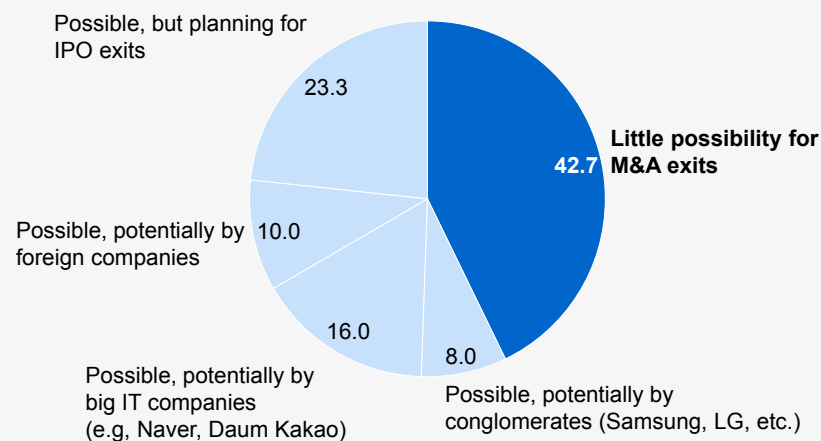
—from an interview with Hyungsoo Kim,
Managing Director of Korea Venture Capital Association

Exhibit 21

Few Korean entrepreneurs see M&A as a realistic path to successful exit

What do you think of M&A possibilities of startups you are currently working at?

Percent (N = 150); based on 2014 McKinsey survey on ICT startup founders



SOURCE: McKinsey survey on ICT startup founders (2014)

Our conversations with startup CEOs and venture capital investors suggest two key traits sought by potential acquirers: differentiated core technology and a well-considered plan for expansion beyond Korea. As noted in the case of Olaworks, big corporations are willing to spend money for advanced technologies that can be leveraged across business units. The issue is that too few experienced engineers and managers are willing to join a new venture given the high risks and relatively small financial rewards for doing so. One remedy for this problem is to encourage more corporate VCs to invest in areas where they have a particular interest in a key technology. Corporate VCs tend to invest strategically compared to investors seeking only financial returns. Moreover, corporate VCs are more likely to invest in technology-based startups, whose products may have strong strategic synergy with their parent company. Korea has a few corporate VCs like Samsung Ventures and Doosan Neoplux, but there are too few such investors.

The Korean government could also speed development of the nation's startup ecosystem by supporting incubators and accelerators focusing on technology ventures. As noted in the global case studies, the Israeli government launched its Technology Incubator Program (TIP) in early 1990s and opened 26 technology incubators to promote development of tech-based startups. Technology-based startups in those incubators typically receive the investment of \$500,000 to \$800,000 for a two-year term, and the government supports 85 percent of the investment in the form of grants to be paid back only upon success.²³ The Korean government launched a similar program, called Tech Incubator Program for Startup (TIPS), in 2013 in association with ten venture capital firms and accelerators. To date, TIPS has supported more than 40 technology-based startups and the startup sector would be well served by continued government investment and support of this program.

Korean startups need to be encouraged to look beyond the domestic market to global opportunities. Focusing on overseas markets is especially important for startups that are more idea or execution-focused than technology-focused. Typically, Korean corporate investors see little reason to acquire a new venture lacking a global business plan; they know that in most cases they will be able to catch up with early-movers in their home market simply by leveraging their own resources. Nor will domestically focused ventures appeal to global corporate investors. Why invest in a business whose model is limited to the Korean market when there are larger, more rapidly scalable opportunities in China, Japan and Southeast Asia?

“Global companies typically will not pay KRW 100 billion (\$91 million) for a service startup with coverage only in Korea. However, they are more than willing to pay KRW 100-200 billion (\$91-181 million) for a business that covers both Korea and major Southeast Asian countries.”

—from an interview with a venture capitalist

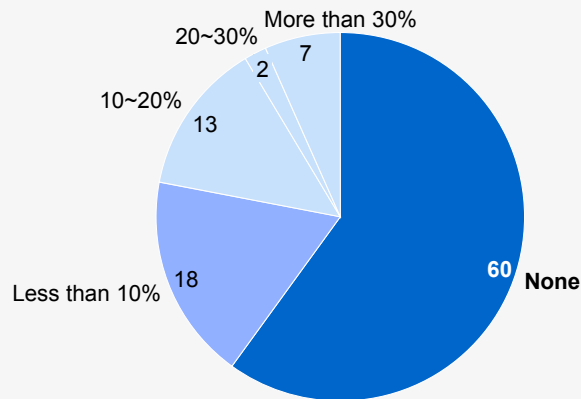
²³Technology Incubators Program Office (Israel), Website.

Exhibit 22

Korean startups too focused on the domestic market, overlook overseas opportunities

What percentage of your startup's revenue comes from foreign markets?

Percentage (N = 150); based on 2014 McKinsey survey on ICT startup founders



SOURCE: McKinsey survey on ICT startup founders (2014)

Invest in supporting infrastructure to maximize startups' growth potential

In recent years, with government support, Korea has expanded the number and size of incubators and accelerators aiding startups. Still, many industry experts see a need for more mentoring and networking. In countries like the U.S., mentoring and networking is provided by entrepreneurs who successfully exited from their own startups. In the Korean startup community, few people can play that guiding role because there have been so few successful exits. In the short-term, the only way to reverse this vicious cycle is to import startup mentors from other countries. There are a variety of ways to do that. Public or private incubators in Korea could invite overseas mentors as “entrepreneurs in residence.” The government could support such invitations financially. Alternatively, Korea might invite foreign incubators and accelerators to Korea. For instance, Tribeluga, a Chinese incubator, recently opened an incubator program in Seoul. Tribeluga plans to provide mentoring in areas such as go-to-market strategy for China, and offer guidance on how to rapidly scale businesses.

“One striking difference between Korea and the U.S. is the level of non-financial support available from accelerators and venture capital firms.

Y Combinator and Sequoia Capital have their own ecommerce playbook and provide advice on every major decision point in scaling up the business. This was something I could not expect from VCs in Korea.”

—from an interview with Doin Kim, COO of Memebox

Korea's venture capital investors offer too little non-financial support for new ventures in their portfolios, and are particularly ill-equipped to provide advice and guidance on global expansion. Few Korean VC firms have established networks overseas. Developing such networks organically will take time. Fortunately, quite a number of foreign VC firms have shown interest in investing Korean startups and signaled their willingness to provide overseas networks for new Korean ventures. Recently, a handful of Korean VC firms have invited foreign venture capital investors to join their funding rounds in Korea. Korea would benefit from even greater foreign participation in its startup community.

“When we decided to expand into Japanese market, our VC investors with Japanese origin connected us with key local personnel and that connection has served as a basis to build business networks in Japan.”

—from an interview with a startup CEO whose company expanded into Japan

Broadening the opportunities for “mega exits”

Part of the reason so few Korean startups exit via the M&A route is a lack of competition among potential buyers. For the majority of ICT startups, there are only a handful of potential buyers: Naver, for example, or Daum Kakao. As a result, startups have little bargaining power. The emergence of Yello Mobile, which has been called a “startup alliance”, has created a new source of competition among buyers—but not enough. We believe Korea's best hope for breathing life into its startup ecosystem is inviting broader participation from foreign companies as well as local.

But how to increase foreign participations in Korea's M&A market? We believe a first step would be to solve the problem of information asymmetry. Foreign companies lack familiarity with Korea and Korean startups. Meanwhile Korean startups have little knowledge of foreign investors, and limited ability to identify and reach out to potential buyers overseas.

For local conglomerates, the challenge is different. Korean corporate investors see little reason to purchase Korean startups with narrow, domestically focused business models. We don't expect local conglomerates to play as significant a role as foreign players in stimulating the development of the venture M&A exit market.

“Considering Korean companies' conservative attitudes toward startup M&As, the vitalization of M&A exit market can only be started by foreign buyers. Active M&A transactions by foreign companies will stimulate Korean companies to act more proactively on local acquisitions.”

—from an interview with Seokheun Kang, a partner of BonAngels Venture Partners

Promoting entrepreneurial culture

To build a truly vibrant and sustainable startup ecosystem, Korea must find a way to encourage more people with talent and expertise to become entrepreneurs. Currently, many obstacles deter Korea's best and brightest from starting their own ventures. The risks are too high, and the prospect for financial rewards is too slim. Koreans with talent and skills see too few "role models" who have succeeded as entrepreneurs.

"The best way to draw new talent into the venture community is be able to point to examples of success. If you can show someone that a former classmates or coworker just sold a business for KRW 100 billion (\$91 million), that gets their attention."

—from an interview with a senior developer in a big IT company

Korea can do more to celebrate its startup success stories. Successful venture exits, whether in the form of overseas M&A deals or mega-IPOs, should be publicly supported by the government. In some cases, the government could help focus public interest on successful entrepreneurs by conferring upon them official recognition. There should be no distinction between a sale to a domestic or foreign buyer. A successful exit should be celebrated as a successful exit, no matter the nationality of the acquirer. The Korean public should be reminded that, no matter who buys a Korean startup, the majority of proceeds from the acquisition will flow back to the Korean community as angel investment or venture capital. Korean founders who "graduate" from successful startups will contribute significantly to the Korean community no matter who buys their business. They will likely return as serial entrepreneurs, advisors, mentors and investors. All exits will help to set in motion the virtuous cycle of entrepreneurialism.

Exhibit 23

Each stakeholder needs to play its role to create success cases

	Government	Entrepreneurs	Investors ¹
A Build a startup with strong attractiveness as an M&A target	<ul style="list-style-type: none">Strong support on tech incubatorsSelective early funding on startups aiming global markets	<ul style="list-style-type: none">Plan for globalization from a get-goEarly-on engagement with people with overseas networks	<ul style="list-style-type: none">More corporate VC investmentsPromote more investments for tech-based startups
B Invest in support in infra to maximize growth potential	<ul style="list-style-type: none">Subsidize invitations of top mentorsHost top-tier overseas incubatorsOpen for foreign VCs	<ul style="list-style-type: none">Actively seek for investors with mentoring and networking capabilities	<ul style="list-style-type: none">Consider invite other VCs with networks as a co-investorDevelop own playbook for global expansion
C Broaden opportunity windows for mega exits	<ul style="list-style-type: none">Lift up regulations for cross-border M&AsTax incentives for local companies making acquisitions	<ul style="list-style-type: none">Reach out to build relationships with potential buyersParticipate in global events to connect	<ul style="list-style-type: none">Look globally when considering exit options (e.g., global IPO)
D Actively promote entrepreneurial culture	<ul style="list-style-type: none">Nationally recognize success cases (even for global M&A cases)	<ul style="list-style-type: none">Serve as a role model for next-generation entrepreneursContribute back to the startup community	<ul style="list-style-type: none">Become advisors rather than just investorsActively seek and invest in high-potential entrepreneurs

¹ Include incubators, accelerators and venture capitals

SOURCE: McKinsey analysis

5. Aspirations

Economic impacts

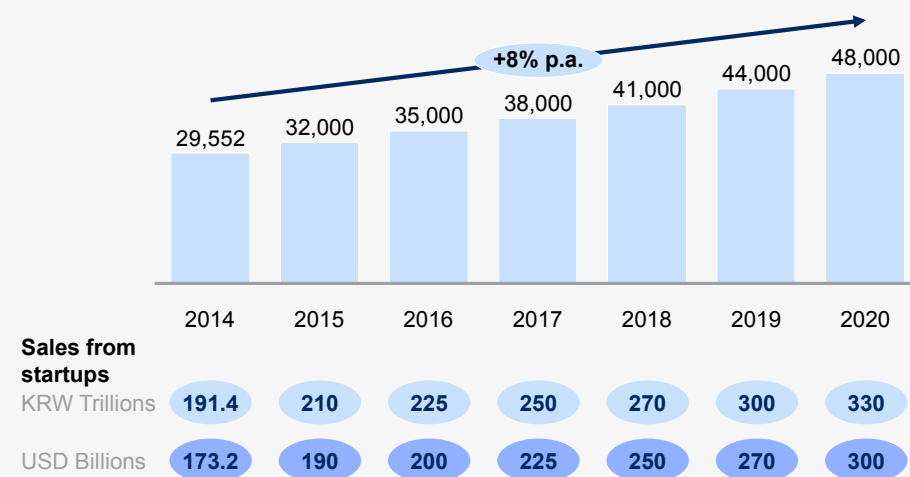
As of 2014, the Korean startup community had about 29,600 companies with estimated total revenue of KRW 191.4 trillion (\$173.2 billion). A concerted effort by stakeholders—government, entrepreneurs and investors—to generate representative success cases could have significant positive impact on Korea's economy. If Korean startups capitalize on opportunities overseas as well as home, we think it possible for their average annual sales to increase more than 30 percent by 2020. By that year, Korea could aspire to match Israel's level of startup activity. Crossing that threshold would enable the Korean startup community to achieve a self-sustaining virtuous cycle of capital and talent. To reach that goal, the number of Korean startups would need to rise at an annual rate of 8 percent through 2020, reaching a total of 48,000 startups with sales of KRW 330 trillion (\$300 billion).

Exhibit 24

By 2020, number of startups in Korea could rise by 62%

Startup #s in Korea and total sales from startups

Units; KRW Trillions, \$ Billions

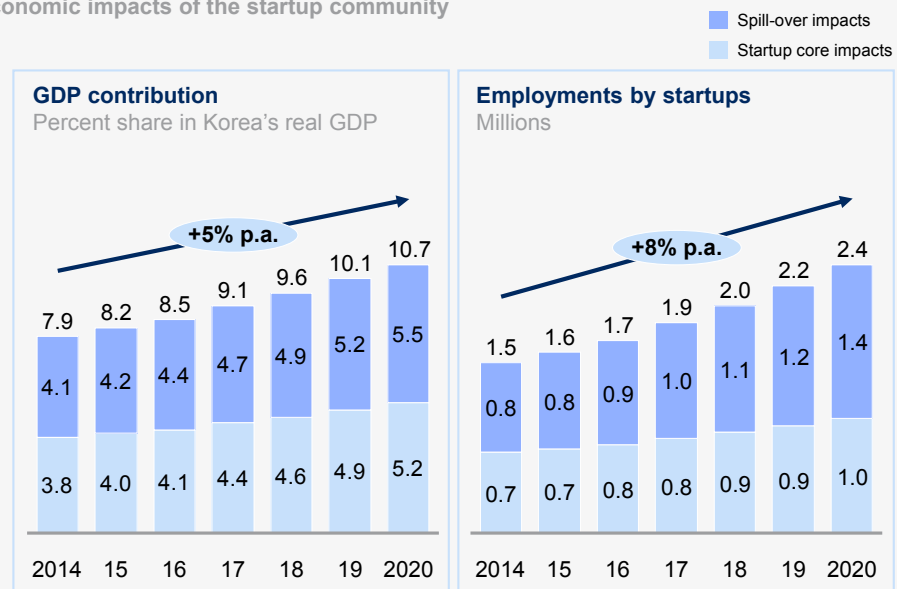


SOURCE: McKinsey analysis

We estimate that, by 2020, an increase of that magnitude would raise sales of Korean startups to 5 percent of Korea's GDP, up from 3.8 percent in 2014. In addition to the net value that would be added to the economy by the startups themselves, the expansion and prosperity of the startup community would create spill-over effects across many industries. We estimate such second-order effects could account for an additional 6 percent of GDP in 2020, compared to 4.1 percent currently. All told, a revitalized startup community could contribute as much as 11 percent of Korean GDP in 2020, a gain of 2.9 percentage points above the contribution from startups in that year in a "base case" scenario in which no new action is taken. A GDP gain of that size would create hundreds of thousands of new jobs. Currently, Korean startups employ about 1.5 million people. We believe that with concerted action, by 2020, startups could employ 2.4 million Koreans, adding 850,000 jobs, nearly double the 470,000 gain in startup jobs that would be added in a "base case" scenario in which no new action is taken.

A revitalized Korean startup community could contribute 10.7% of GDP and create more than 850,000 new jobs by 2020

Economic impacts of the startup community



SOURCE: McKinsey analysis

Number of jobs created by the App Economy

The App industry consists of platform providers (such as Google's Android, Apple's iOS, Facebook's API), and large and small companies that produce apps for these platforms.

The App Economy is measurable by the number of jobs created by the App industry. From an economic viewpoint, each app and platform represents jobs—the engineers, user interface designers, and support staff, such as marketers and managers, as well as spillover jobs in other industries.

Because the App industry remains in its infancy, there are no official data on the number of people it employs. Michael Mandel's methodology, which has been used to measure the App Economy of the U.S., U.K., Australia, and even Apple, quantifies the three types of jobs below for total number of jobs in the App Economy:²⁴

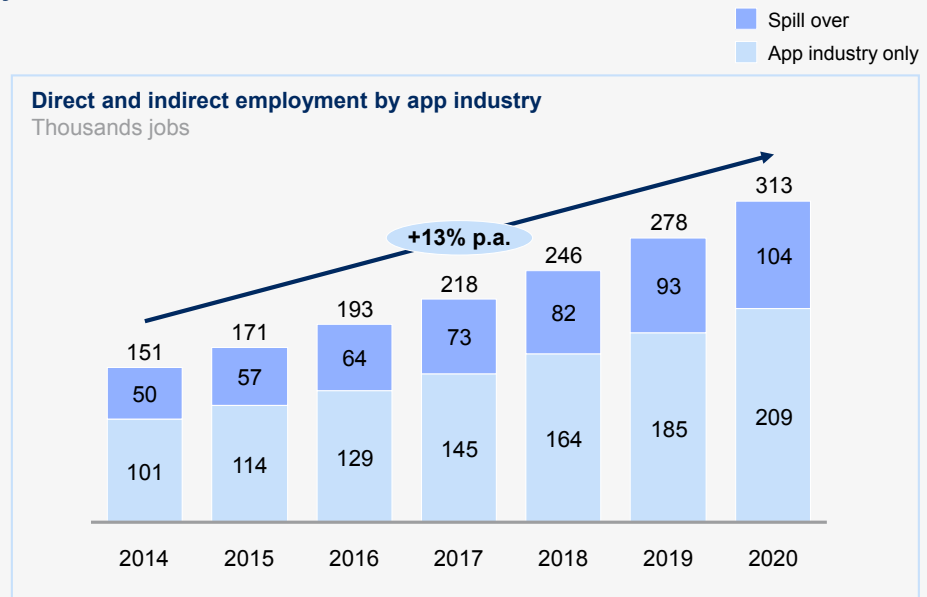
- Direct jobs: In the App Economy, this relates to "tech-related" app jobs dedicated to building and maintaining apps and related infrastructure, such as app developers.
- Indirect jobs: In the App Economy, this relates to "non tech-related" app jobs, meaning roles such as HR, marketing, and sales within app-related companies.
- Spillover jobs: In the App Economy, this refers to jobs created outside of the App industry due to spillover effects.

²⁴See Appendix for detailed methodology.

As of December 2014, Korea's App Economy employed approximately 151,000 people. The number of startups is rising, and within total startups, the share of information processing/software startups has increased to 16.4 percent of total startups in 2014, up from 13.4 percent in 2010.²⁵ This growth can be interpreted as the growth of "App Startups," as there are no official categories for "App Startups" thus far, and most will currently be categorized as "information processing/software startups." We forecast that this increase of "App Startups" and their workforce will be a main driver of App Economy job growth, resulting in 313,000 jobs by 2020, a two-fold increase over the number of current App Economy jobs.

Exhibit 26

Growth of Korea's app economy could create 160,000 thousand new jobs by 2020



SOURCE: McKinsey analysis

²⁵Small and Medium Business Administration (SMBA).

6. Conclusion

Over the years, Korean entrepreneurs have worked in tandem with government to strengthen and develop Korea's startup ecosystem. One successful entrepreneur opened an incubator to help the next generation of young founders avoid the hardship he experienced and discover the joy of launching a venture of benefit to society. A venture capitalist we know spends weekends mentoring entrepreneurs, even those in whom he has no financial interest. Such individual efforts have great value. But we believe government, entrepreneurs, and investors can work together to transform those individual efforts into a systemic change and put Korea's startup community on the path towards a sustainable virtuous circle of growth. The recent proliferation of startups in Korea suggests now is the time to make that change happen.

Over the last five years, Korea's small exit market and dearth of success ventures had discouraged the nation's best and brightest from joining or launching new businesses. To break the stalemate, Korea desperately needs several cycles of high-profile successes —successes that won't happen without a coordinated systemic effort. We believe Korea needs to pursue a focused approach to building and nurturing startups. That approach much include measures to boost activity in the M&A market and raise the attractiveness of Korean ventures to more buyers, whether they hail from Korea or overseas. While the government has already done a great deal to support Korea's startup community, it can do more. In the long term, the Korean community itself can build more incubators and accelerators. In the short term, Korea can draw upon the expertise and networks offered by overseas players to generate more successes. It is essential that Korean stakeholders recognize the necessity of foreign participation in Korea's startup market and refrain from the view that foreign purchases of Korean startups will drain national wealth and industrial assets. Korea needs more examples of successful venture exits, regardless of whether those exits come in the form of sale to non-Korean investors. Without such success stories, it will not be possible for Korea to entice its most talented workers to take on the risk of starting or joining a new business. A more vibrant startup ecosystem will strengthen Korea's global competitiveness, accelerate growth of the boarder economy and create hundreds of thousands of new jobs. We believe that is a future that is both desirable and possible.

Appendix: Methodology and approach specifics

1. The internet's contribution to GDP

Although there are three different methods for calculating the contribution a sector makes to GDP, none take into account the total value contributed by the Internet to the overall economy of a country or a society. These are the three common methods:

- Production method measures the value added by companies by producing goods and services.
- Revenue method measures the gross revenues of institutional sectors, including employee pay.
- Expenditure method measures the total spending by consumers and government on goods and services.

The contribution a sector makes to GDP is usually measured by calculating production. However, to quantify the Internet's contribution in detail using this method, we would have had to obtain data on the proportion of revenue attributable to the Internet with associated margins for all companies in all sectors. Such an approach would have required too many unreliable estimates.

We therefore decided to use the expenditure method based on OECD data.

This method looks at four factors: private consumption, public expenditures, private investment, and trade balance. We included for the contribution of each of these factors all categories of goods and services enabled by the Internet and attributed an underlying portion of this to the Internet.

We tried as much as possible to use a same data source for each category across the 13 countries in our study to provide comparable figures. These were:

- **Private consumption.** This is the total consumption of goods and services by consumers via the Internet or needed to obtain Internet access, including electronic equipment, e-commerce broadband turnover of telecoms operators on the retail market, mobile Internet market, hardware and software consumption, and smartphone consumption.
- **Public expenses.** These include Internet spending for consumption and investment by the government (software, hardware, services, and telecoms) at pro rata of Internet.
- **Private investment.** This is private-sector investment in Internet-related technologies (telecoms, extranet, intranet, Web sites, etc.).
- **Trade balance.** Trade balance includes exports of goods, services, and Internet equipment, plus B2C and B2B e-commerce, from which were deducted all associated imports. We estimated B2B e-commerce based on numbers provided by academic studies, and we developed a methodology based on overall size of e-commerce, Internet maturity of a country, and offline trade balance. We estimated B2C overall trade balance based on academic studies as well as on Internet maturity of a country and size of e-commerce.

For each component of the contribution to GDP, we then looked at the assumptions regarding the underlying portion related to the Internet:

- For electronic equipment (computers and smartphones), we applied a ratio based on the overall time spent on the Internet against the total time using the product.
- For goods and services sold on the Internet, we recognized them at their full e-commerce value because they indicate the importance of the Internet industry as a link in the distribution chain, even though certain Internet transactions might have occurred even in the absence of the Internet.
- For Internet mobile and fixed subscriptions, we took 100 percent of individual expenses.
- For ICT goods and services investments and trade balance, we used a bottom-up analysis based on the description of each subcategory (software, hardware, services, and telecoms) made by McKinsey TMT database. This allowed us to allocate the part of Internet within ICT goods and services (70 percent for software and services, 40 percent for hardware and telecoms).

All exchange rates used were extracted from Organization for Economic Cooperation and Development StatExtracts database.

2. Startup community's economic impact

The definition of startup varies by organizations but in general it is defined by its qualitative traits like innovation, scalability and uncertainty. However, in order to quantify its number and economic impacts, definite criteria is required. In this report, we decided to conduct our analysis based on the group of startups registered to Small and Medium Business Administration (SMBA) as of November 24th, 2014. It is noteworthy, however, that this statistics contains several limitations to capture the most accurate snapshot of the Korean startup community.

- **Coverage on seed to early-stage startups.** A startup need to satisfy a set of prerequisites to register itself (e.g., Over KRW 50 million or \$45 thousand investments from venture capitals). Thus, many of early-stage startups are excluded from the statistics.
- **Established companies maintaining registered status.** Qualifications for registrations do not include limitations in the age of company. Within the registered group, more than 30 percent are past 10 years after their founding.

Despite its own limitations on accuracy, nevertheless, the statistics from SMBA is considered as one of the most credible public statistics on the Korean startups and is widely used by relevant stakeholders including the government, Korea Venture Capital Association, Korea Venture Business Association and media. Moreover, most of preceding surveys and researches on the Korean startups have been conducted based on this statistics. Accordingly, the selection on the SMBA statistics was considered the most appropriate to achieve the consistency of the analysis' base group when adopting the previous research results and statistics to the financial modeling.

In order to estimate the number of startups and their total sales/employments in 2020, we built our model using four key growth levers: 1) number of new entrants, 2) survival rates by company ages, 3) average annual sales by company ages, 4) average number of employees by company ages. Key assumptions for each lever are following.

- **Number of new entrants.** The three-year average of new registration from 2011 to 2013 was used as a starting base, accounted for the proportion of company ages at the registration time. As an aspiration, we made a benchmark on the level of early-stage entrepreneurial activities in Israel (from 2013 Global Entrepreneurship Monitor report). Our assumption was that the level in Korea reaches to that in Israel by 2020 and the number of new entrants increase gradually proportional to index increases.
- **Survival rates by company ages.** Referred Korea Small Business Institute's previous research data on the historical survival rates of registered startups. Assumed the survival rates will stay the same as the suggested recommendations focus on facilitating the growth of high-potential startups rather than increasing the average survival rates.
- **Average annual sales by company ages.** Considerable sales increase is expected as more startups actively expand into global markets. In order to quantify the benefit of globalization, we assumed the proportion of sales in global markets reaches to that of game industry in 2013 (29.0%) by 2020.
- **Average number of employees by company ages.** Small and Medium Business Administration and Korea Venture Business Association conducts comprehensive survey on registered startups annually. We adopted 2013 data on average number of employees by company age tiers and assumed it stays the same until 2020.

In order to measure the direct and indirect economic impact of the startup community, we decided to conduct an inter-industry analysis by using the value-added inducement coefficient table and employment inducement coefficient table.²⁶

- **Value-added inducement coefficient.** The amount of value-added across all industries, induced by an increase in final demand of a particular industry.
- **Employment inducement coefficient.** The number of employment across all industries, induced by an increase of KRW 1 billion (\$0.9 million) in final demand of a particular industry.

This method allows us to measure employment and value-added creation across all industries, induced by an increase in final demand of a particular industry.

Total projected revenue generated by startups was allocated across industries according to the industry proportion of startups published by the Small and Medium Business Administration in 2013.

We then matched product categories of the inter-industry table to the industries startups are classified to and calculated the average of inducement coefficients for each industry. The startup industries' proportions and corresponding product categories are:

- **Energy industry, medical industry, and precision instrument industry (5.9%):**
 - 1) Electric power, gas, and steam, 2) Precision instrument
- **Computer device industry, semiconductor industry, electronic component industry (11.0%):**
 - 1) Computer and peripheral devices, 2) Semiconductor, 3) Other electronic components, 4) Electronic display devices

²⁶Bank of Korea, 2014.

- **Communication device industry, broadcasting device industry (4.0%):**
 - 1) Communication and broadcasting devices
- **Food and beverage industry, textile industry, metal and non-metal industry (22.3%):**
 - 1) Food, 2) Beverage, 3) Textile and clothing, 4) Primary metal, 5) Metal products, 6) Non-metallic mineral
- **Machinery industry, manufacturing industry, automotive industry (29.5%):**
 - 1) Machinery and equipment, 2) Other manufacturing, 3) Automotive
- **Software development industry (10.2%):**
 - 1) Software development and distribution
- **Information and communications industry, broadcasting service industry (5.8%):**
 - 1) Information service, 2) Broadcasting service, 3) Communication service
- **Other industries (11.3%):**
 - Average of inducement coefficients in all product categories

Then, we calculated the inducement coefficients to estimate the direct and indirect economic impact of the startup economy:

- **Startup community.** The industries where increase in final demand is created by startups. Inducement coefficients of other industries with no increase in final demand are excluded to measure the direct economic impact of startups.
- **Spill over.** The industries that are affected by the increase in final demand of other industries. To measure spillover effect, inducement coefficients of industries with increase in final demand are excluded.

3. App Economy's economic impact

The number of jobs created by the App Economy is the total of the three following categories:

- **Direct jobs:** In the App Economy, this relates to “tech-related” app jobs dedicated to building and maintaining apps, such as app developers).
- **Indirect jobs:** In the App Economy, this relates to “non tech-related” app jobs, meaning roles such as HR, marketing, and sales within app-related companies.
- **Spillover jobs:** In the App Economy, this refers to jobs created outside of the App industry due to spillover effects.

Michael Mandel's methodology employs the following steps to quantify the three categories above, which is applied to measure Korea's App Economy for 2014:

- Identify number of “tech-related” app jobs through converting the number of job postings to actual employment rates.

We first calculated the number of want ads for tech-related App Economy jobs on “indeed.co.kr,” a comprehensive online want ad aggregator. Using 9 keywords: “Android” “iOS” “Facebook API” “Blackberry” “Swift” “App development” “App developer” “Mobile App” “Web App”, we filtered 3,498 want ads in the 15 day period between November 25th and December 9th, 2014, and assumed that twice that number (6,996 ads) would be posted in a 30 day period.

Next, we identified how many people were actually already employed in the same duration per ad posted. To figure out this ratio, we filtered the number of “software ICT” job ads in the same period from the same website through 23 keywords,²⁷ and found the actual number of people employed in a “software ICT” job through data from the National IT Industry Promotion Agency.²⁸ Because the most recent figure available was the total number of software ICT workers at the end of 2013, we approximated the figure for December 2014 by applying the monthly trend for “computer programming system integration and management” jobs as a proxy, which were available as monthly data between 2013 and 2014.

The ratio of people actually employed per job posting in December 2014 was 7.21. As “tech-related app workers” would mostly be categorized under “software ICT” workers in current data, we assumed that the ratio of want ads to employment derived from “software ICT” jobs would apply to “tech-related app” jobs, giving us 50,462 tech-related app jobs.

- Add the number of “non-tech related app jobs” for total App industry jobs.

Non-tech jobs include human resources, sales, marketing functions, which supports app developers in the same company. Mandel’s assumption is that on average, the number of non-tech jobs at app companies was roughly equal to the number of tech jobs; tech-heavy startups increasingly add non-tech jobs as companies grow, and mid-size app companies’ ads suggests that a 1 to 1 ratio between tech and non-tech jobs is reasonable.²⁹ Thus, we used a multiplier of 2 to go from the number of tech-related app jobs to tech plus non-tech related app jobs, for the total number of 100,923 jobs within the App industry.

- Identify spillover jobs created in the rest of the economy by the App industry.

Spillover jobs can be jobs created at businesses that supply App developers, and jobs created as a result of App industry employees and supplier business employees’ spending.³⁰ We used a spillover multiplier to estimate the number of jobs created in the rest of the economy by App industry jobs. In his US (2011) and Australia (2014) models, Michael Mandel applied a conservative multiplier of 0.5 jobs created per App industry job, meaning 0.5 jobs created in the rest of the economy per 1 App industry job. Using the same coefficient, this led us to the total of 151,385 jobs created by the App Economy in Korea as of December 2014.

²⁷ 23 keywords are: “software develop” “java” “python” “mysql” “linux” “ruby” “ruby on rail” “programmer” “si developer” “db modeler” “network modeler” “web engineer” “network engineer” “information security engineer” “game developer” “android” “iOS” “mobile app” “web app” “facebook api” “blackberry” “swift” “app developer” “app develop”.

²⁸ “Software” employment data was available only as of December 2013 from the ICT Labor Force Report from the Korea Statistics Portal. Analysis of monthly data between December 2013 and October 2014 for employment numbers of “computer programming/system management” jobs (Source: Ministry of Employment and Labor) revealed insignificant variation between December 2013 and October 2014, so we assumed same rate of variation for “software” employment numbers to between December 2013 and December 2014.

²⁹ Michael Mandel, “Where the jobs are: The App Economy”, TechNet 2012.

³⁰ The Facebook App Economy, 2011.

Then, we identify the main driver of growth for the Korean App Economy as the growth of startups, particularly the rising growth of startups that make Apps. App startups lie at the core of the Korean App Economy, and their increase in the coming years will correspond with the increase of App industry jobs.

- Identify growth rate of App startups in Korea.

To calculate the growth of App startups, we use the growth of total number of startups, as well as the increasing share of information processing/SW startups within the total number of startups. Information processing/SW startups are used as a proxy for App startups,³¹ as App startups do not yet exist as a category in official data, and most App startups will be categorized under information processing/SW startups.

The proportion of information processing/SW startups within total startups is growing at 5.1% per year between 2010 and 2014, and we forecasted this growth rate to continue until 2020. By 2020, 22.1% of total startups are expected to be information processing/SW startups, as opposed to 16.4% of total startups in 2014. We apply this percentage to the total forecasted number of startups in 2020 to reach 10,566 information processing/SW startups in 2020. The annual growth rate of information processing/SW startups, and by proxy App startups, is 12.9%.

- App startup growth will correspond with growth in App industry jobs.

All hires by App startups will be App industry jobs; hence, we approximate the growth of App industry jobs to correspond with the growth of App startups. A 12.9% annual growth rate from current 100,923 jobs in the App industry will result in 208,932 App industry jobs in 2020.

- Spillover effects of jobs created in the rest of the economy by the App industry.

We apply the 0.5 spillover variable to the number of App industry jobs in 2020, leading to a total of 313, 398 jobs created by the App Economy.

³¹ Categorization monthly number of registered startups can be found through the SMBA website.

