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**Study on emerging markets, with
special focus on Asia**

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Executive summary

This deliverable gives some basic information about emerging markets which become more and more interesting and relevant for the robotics industry. It starts with a brief introduction into the BRICS states, currently seen as the general emerging markets. The deliverable continues with an overview about the latest statistical data about the world's robotics sales and stock presented by the International Federation of Robotics and other sources of information.

The relevant third chapter informs about the previously main drivers for robotics industry in the BRICS states, especially China, and also details some of the political strategies that have lead to this impressive development. Furthermore, data from other emerging countries, e.g. India, is presented as well as from the known BRICS states Brazil, Russia and South Africa.

Readers should have in mind that this deliverable was written as a "contingency measurement" and under time constraints. That is why the intention of the deliverable is just to give the most basic information about emerging markets for robotics with a focus on market data collected by the IFR and presented in the market study World Robotics.

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1. Introduction

Be it the investment of the Chinese electrical appliance manufacturer Midea Group in the well-known German robot manufacturer Kuka, the rising automation market in particular pushed by the initiative “Made in China 2025” or the increasing demand of consumer products that, among others, offers one of the world’s biggest e-commerce platforms Alibaba Group: China is the most accelerating emerging market which generates a significant impact on the robotics and automation market.

But not just China is in the focus of the world’s economy. Generally named as “BRICS” states, it is Brazil, Russia, India, China and since 2010 also South Africa that act more and more as industrialized countries. Despite their in general successful way within the last years, their improved position in the world market is not as stable as it could be and as forecast in the past decade. This can recently be said about all these five emerging markets, as summarized the online business journal “Knowledge@Wharton” on the occasion of the World Economic Forum in Davos 2016: “Undeniably, these countries [BRICS] have changed the face of global business over the past twenty years. Yet lately, the BRICs have been crumbling a bit, sparking many reports about their lacklustre performance.” [Kowledge@Wharton, 2016] Similar information gave the Wall Street Journal, where Ian Talley stated:

“Weak global consumption, plunging commodity prices and a host of other economic and political problems have pushed two of the countries – Russia and Brazil – into recession and fuelled the biggest investor exodus out of emerging markets in more than two decades, with investors pulling a net \$500 billion out over the past year. Their economic future is now uncertain. And their efforts to form a bloc challenging the collective power of the Group of Seven largest industrial economies have largely been viewed with healthy dose of scepticism, doubt catalysed now by an increasingly grim outlook for the group.” [Talley 2016]

Bearing in mind the political and economic status quo of the BRICS states as well as their economic ambitions, investments and knowledge management is of significant importance to the European Community. This is due to two main factors: The first one is that BRICS states are already an important partner for European export activities and thereby have a big influence on the development of European industries, e.g. robotics and automation. The second factor is that these countries might come up with strategies to strengthen their home industries, as just can be observed by the mentioned Midea Group acquisition of Kuka. It is just one example how BRICS states will not only rely on the import of core technologies but how they will invest in boosting “home-made” knowledge and technologies.

This deliverable tries to give some insights into market situations, ongoing projects and cooperation. Please have in mind that this version is a draft. It has been written as a “contingency measurement” to help out another RockEU project member. That is why the intention of the deliverable is just to give the most basic information. It could maybe set the scene for an activity in RockEU2.

2. Worldwide Robotics market 2015: Overview

The worldwide market for robotics and automation is on a path of success. In addition, there is still a high market potential but this is quite diverse. Whereas in some countries the density of robots (which means the number of installed robots per 10,000 employees) is already very high, in many other countries this proportion is still rather or extremely low. In general, in the “traditional” industrialised countries that form the G7 (the seven most advanced economies in the world) the density of industrial robots is expectedly higher than in the emerging markets as can be seen by the latest statistics published by the International Federation of Robotics (IFR). At this year’s trade fair AUTOMATICA, the IFR presented the market situation for 2015 as follows [IFR 2016]:

- The worldwide sales of industrial robots increased by 12% in 2015 compared to 2014. This means that the global boom since the crisis 2009 continues. Whereas 2009 one million robots were deployed on factory floors the IFR assumes that this number will be 2,3 million in 2018.
- In 2015, the five main markets with the highest number of newly installed industrial robots are (in this order) China, Republic of Korea, Japan, United States and Germany. 75% of the global supply 2015 was sold in these five countries.

- It is important to consider that this boom is both “driven by highly automated emerging countries, and by regions that are already highly developed economically.” [IFR 2016]
- In Europe, the sales of robots rose by 10%: main markets are Germany (20,000 units sold), Italy (6,700 units sold) and Spain (3,800 units sold).
- Other important markets in the world: USA (plus 3% and 27,000 units sold), Mexico (sales more than doubled and 5,500 units sold).
- The world’s strongest growth market is Asia (plus 16% and 156,000 units sold).
- China is the main driver: 68,000 units were sold which means that “China alone surpassed the total market volume for Europe.” [IFR 2016, see for more details chapter 3 in this document]
- Industrial robots are mainly used in these industries: automotive, electrical/electronics, metal, rubber and plastics and food.

One of the main driver of this positive development is the need to increase productivity. A study by Boston Consulting states:

“For the past few decades, the scramble for competitive advantage in manufacturing has largely revolved around finding new and abundant sources of low-cost labor. Rapidly rising wages in most big emerging markets are bringing the era of easy gains from labor cost arbitrage to a close. A little more than a decade ago, for example, Chinese labor costs were about one-twentieth of these in the US. Today the manufacturing cost gap between China and the US has nearly disappeared for many products that are sold in the US.” [Sirkin et. al. 2016]

For Sirkin et. al., the development towards more automation will mainly depend on two factors: “How cost-effective is it to submit machines for human labour? And how easy is it to automate production tasks?” After having analysed the 25 major good-exporting economies in the world, the authors conclude that China, the US, Japan, Germany and South Korea “will account for about 80% of robot shipments over the next decade; China and US alone will account for around half of those shipments” and can be mentioned winners of the robot revolution. [Sirkin et. al., 2016] This prognosis already points out that China has a leading role among the emerging markets. In contrast, Mexico and India will not benefit that much from automation because the wages will stay rather low and thus tasks mainly be done manually.

3. Emerging markets: Focus Asia

The aforementioned BRICS states are to be counted as emerging markets from a general economic point of view thanks to remarkable growth rates during a significant time. However, they are not automatically growing markets for robotics and automation. China definitely is continually growing what will be outlined in the following sub-chapter 0. Other countries try to play a more important role in the robotics market or have a special focus or ‘niche’ which gains in importance. This is for example the agricultural sector in South Africa as detail Acha Leke et. al. in their McKinsey Study. The other four still more relevant domains that complete South Africa’s “Big Five” should be in the future: advanced manufacturing, infrastructure and productivity, natural gas and service exports. [Leke et. al. 2015, p. vi]

Becoming a key player in the global manufacturing is normally a long and difficult way. This is due to a complex interplay of factors and often related to national strategies like “Made in China 2025” or “Make in India”. Another report outlines how China is performing and how other emerging markets are more slowly ‘climbing the ladder’: Since 1980, China moved from rank seven to rank two in 2010 on the list of the top 15 manufacturers by share of global nominal manufacturing gross value added. India moved from rank 15 (1980) to ten, and Russia from rank 21 (2000) to eleven in 2010. [Manyika et. al. 2012, p. 2] Also Brazil (1980 and 1990 rank eight, 2000 rank twelve, 2010 rank six) and Indonesia (2000 rank 20, 2010 rank 13), important for the Asian focus of this deliverable, are listed under the top manufacturers.

The World Robotics 2015 [Litzenberger et. al. 2015] details on pages 146-154 the Asian and Australian robotics demand and market for 2014 as follows:

- Sales:
 - o 139,344 new robots installed, 41% more than in 2013
 - o CAGR 2010-2014: + 19%
 - o Shares of total supply: handling operations 45%, welding 27%

- Industries: automotive 39%, electronic/electrical 30%, metal 8%, plastic/chemical products 6%
- Stock of operational robots:
 - About 785,000 units which means 14% more than in 2013
 - CAGR 2010-2014: + 11%
 - Shares of total supply: handling 39%, welding 29%, assembly 14%
- Robot density in manufacturing industry: 54 robots per 10,000 employees (worldwide 66)

With these numbers, Asia held a new record in 2014. Almost all industries invested in more robots and China is the main driver with a share of 41% of the total supply.

Asia's importance for robotics also lead to a recent event organized by the initiative ROS-Industrial which focusses on bringing the open source Robot Operating System ROS into industrial applications. Two consortia with about 40 members both from industry and research organizations in North America and Europe exist since few years. According to the growing interest shown by Asian countries, there was the inaugural meeting in Singapore in July 2016 that laid the foundation for the third consortium. [Yeo 2016] ROS-Industrial Asia Pacific will strengthen the networking activities in the region and further promote ROS as becoming the standard framework for the efficient development and integration of robot systems.

3.1. Emerging market China

The already cited IFR press release from June 2016 mentions the important points concerning China's impressive development within the last few years: [IFR 2016]

- The annual supply of industrial robots in China grew by 17% in 2015
- Foreign-based robotic manufacturers profit with a 69% share of the total market. At the same time, domestic competitors have, by now, significantly expanded their market share to 31% (2013: 25%).

The following paragraphs give more details about the market situation as well as about strategies and political plans behind.

3.1.1. Market situation in China

The World Robotics 2015 [Litzenberger et. al. 2015] details on pages 155-166 the Chinese robotics demand and market for 2014 as follows:

- Sales:
 - 57,096 new robots installed (thereof about 16,000 from Chinese suppliers), 56% more than in 2013
 - CAGR 2010-2014: + 40%
 - China has position no. 1 worldwide
 - Shares of total supply: welding 36%, handling operations 35%
 - Industries: automotive 36%, electronic/electrical 29%, metal 12%,
- Stock of operational robots:
 - About 189,400 units which means 43% more than in 2013
 - CAGR 2010-2014: + 38%
 - China has position no. 3 worldwide
 - Shares of total supply: welding 40%, handling 35%
- Robot density
 - manufacturing industry: 36 robots per 10,000 employees
 - automotive: 305 per 10,000 employees
 - all others: 17 robots per 10,000 employees

These data demonstrate that China beat all records in 2014.

3.1.2. Strategies and developments in China

However, these impressive numbers have to be seen within the context that the robot density in China is still very low and the positive development still has a long way to go until it reaches at least the average robot density in the world which is 66 robots per 10,000 employees. In about 20 countries

worldwide, the number of robots was higher than the average (with Republic of Korea and 478 robots per 10,000 employees on top) whereas China had only 36 units in 2014. Already in 2020, it is planned to have a robot density of 150 units per 10,000 employees which implicates a tremendous growth in automation. [IFR 2016]

Two main points influence the Chinese plans to become one of the main leaders in robotics, as Lars Balzer presented in his analysis about China at the European Robotics summit 2015. [Balzer 2015] The first one is the societal situation. Compared to other Asian countries, the average wages in China are quite high and a way for being more competitive must be found. Also, the population is ageing and less people offer productive labour force what may rise the wages as well: "Partly because of the one-child policy, formally phased out in 2015, China's working-age population is expected to fall from one billion people last year to 960 million in 2030, and 800 million by 2050." [Bland 2016] The second point is the so far high dependency from foreign robot suppliers and their knowledge.

Therefore, the government started much effort to thoroughly organize and structure innovation politics that concerns robotics. Three ministries are involved (Ministry of Industry and Information Technology, Ministry of Finance and the Ministry of Science and Technology) as well as two academies, one office on intellectual property rights and a National Commission. They define key targets, monitor the achievements and identify hurdles in order to continuously improve the innovation process. The measurements are not only implemented by the state government but also by the provinces to give financial or other support to the local industry partners. Last but not least, industry clusters are built that facilitate the knowledge and technology transfer between research institutions and robot manufacturers. The home-market is becoming stronger and companies like Ningbo with its subsidiary E-Deodar is a relevant competitor to established manufacturers. [Bland 2015] Another aim is to strengthen the home industry by investing in competitors to have access to new markets and to enrich technology and R&D knowledge. [Whole paragraph Balzer 2015] It is thus not surprising at all that Midea Group acquired Kuka, in contrast, it is part of a well-grounded strategy. [More information also in Demaitre 2016]

The ambitions are bundled in the ten-year national plan "Made in China 2025" that has been publicly presented in 2015. The plan proposes "a 'three step' strategy of transforming China into a leading manufacturing power by the year 2049, which marks the 100th anniversary of the founding of the People's Republic of China". [Press release 'Made in China 2025' plan issued, 2015] Nine tasks in ten key sectors shall in particular benefit from the plan. In a speech printed in the World Robotics 2015 [Litzenberger et. al. 2015, pp. 446-447], Mr. Wang Weiming, Vice Department Head of Industry Equipment Department of the Ministry of Industry and Information Technology detailed the robot-related aspects:

- "Establish and launch the 13th 5 year plan of the robotics industry in China.
- Actively promote and popularize the application of robots;
- Deploy research & development of the next generation of robots as soon as possible;
- Strengthen public relations and promotion of the robotics industry." [Litzenberger 2015, p. 447]

3.1.3. Focus Service Robotics in China

So far, this deliverable has outlined the market situation for industrial robots. For China, a short insight into the service robotics sector shall be given as well. This sector is of special interest with respect to the ageing society and rising wages and has, of course, already attracted the interest of investors: "Sun Ye, president of Shanghai Kuailu Investment Group, said that the company has recently invested in a robotics program in anticipation that service robotics will become a mainstay for Chinese families in the future. 'Currently, our investment is still focused on the development of industrial robotics. However, the application of robotics is gradually extending from such industries of automobiles and electronics to the service sector such as medicine,' he said, 'the market of service robotics will surpass that of industrial robotics in the future.'" [Website http://news.xinhuanet.com/english/2015-11/24/c_134850942.htm, 2015]

Pushing service robotics to a high and attractive market level is also part of the recent five-year plan. The government aims at "tripling the annual production of robots in manufacturing to 100,000 in five years, and sell over US\$4.6 billion worth of service robots by 2020, thanks to surging demand in healthcare, education and entertainment. In addition to industrial robotics, service robotics hold great potential as well, including almost 50 mainly new Chinese companies, such as Shenzhen DJI

Innovations which projected sales of US\$1 billion of its devices in 2015.” [Steinbock 2016] Important market players are also: Segway (personal transportation devices), Turing Robot (software for semantic recognition), Ecovacs (cleaning robots), UBTECH (robotic assistance) and Rokid (smart home technologies). [<http://www.roboticstomorrow.com/news/2016/05/10/the-5-chinese-robot-companies-that-cannot-be-overlooked/8137/> and <https://www.cbinsights.com/blog/china-robotics-startups/> 2016]

Notwithstanding these positive prognoses, China still has to strengthen its home industry: “Despite the rosy prospects, experts and industry insiders say three barriers stand in the way of China’s long-term development of service robots: a lack of core technologies, high development costs and brand cultivation.” That is why a professor in robotics gives the advice to “cultivate famous brands by supporting several fast-developing firms in their competition against foreign rivals” and to “speed up the developments of service robots”. [Tang 2015]

But there are also some critical voices about the quality of the service robotics’ status quo. Some see a ‘hype’ whose expectations cannot yet be fulfilled or are even overestimated, so that “some worry about a robot bubble”. [Chen 2016]

Main Chinese service robot suppliers and their distribution among the main application areas are as follows, see also Figure 3.1:

Company name	Link
Beijing (BJ Robot) Zhi Neng Jia Tech	http://www.bjrobot.com
Beijing Tiddler (Ainimo) Science & Tech	http://www.zaijia.com
Ceres Imaging	http://www.ceresimaging.net
DJI	http://www.dji.com
Dobot	http://dobot.cc/en
Dongguan Robstep Robot	http://robstep.en.made-in-china.com
Ecovacs Robotics	http://www.ecovacsrobotics.com
Googol Technology	http://googoltech.com
Guangzhou Walkera Technology	http://www.walkera.com
Hangzhou Favor Robot Technology (DENNA)	http://robotmower.en.made-in-china.com/
Harbin Greatest Interest Guest Technology	http://ruilongmaker.cc
Hunan Grand-pro Robot Tech	http://www.grand-pro.com
INMOTION Technologies	http://www.imscv.com/en/inmotion
Jornco Info Tech Co	http://en.jornco.com/
Moneaul	http://www.china-moneual.com/
Ningbo Huihang Intelligent Technology	http://nbhuihuang.en.made-in-china.com/
Robstep	http://www.robstep.com/
UBTECH	http://www.ubtrobot.com/
Shanghai Keenlon Intelligent Technology	http://en.gbot.cn/
Shanghai New Century Robot Co., Ltd ICP	http://www.x-robot.net/
Shanghai xPartner Robotics (Abilix)	http://xpartner.cn/
Shaoxing Wankeda Intelligent Technology (iMower)	http://www.imower.cc/en/
Shenzhen Hoba Robot Ltd	http://www.hobarobot.com/
Syma Toys	http://www.symatoys.com/
Wowwee	http://wowwee.com/
WowWee Group Ltd	http://wowwee.com/
X robot	http://www.xrobots.co.uk/
Xiamen AmTidy Intelligent	http://www.amtidy.com/

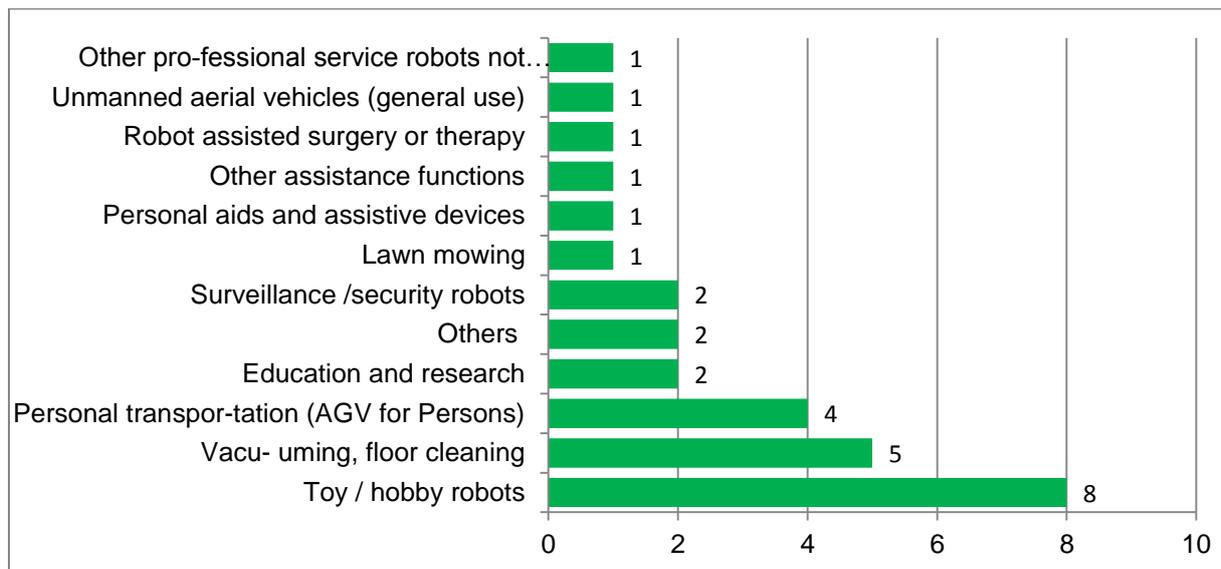


Figure 3.1: Number of service robot suppliers in China for respective application areas (professional service robots and service robots for domestic/private use).

3.2. Other emerging markets in Asia

The development of other emerging markets except China is also quite successful, although they are not really comparable to the Chinese ambitions. An article in the Financial Times gives some insights into the status quo:

“Countries such as Indonesia are already suffering from something that the Harvard economist Dani Rodrik has dubbed “premature de-industrialisation”. This describes a trend where emerging economies see their manufacturing sector begin to shrink long before the countries have reached income levels comparable to the developed world. Despite rapid economic growth over the past 15 years, Indonesia saw its manufacturing industry’s share of the economy peak in 2002. Analysts believe this is partly because of a failure to invest in infrastructure, and the country’s uncompetitive trade and investment policy, and partly due to globalisation. Rodrik believes the country will never be able to grow at the kind of rapid rate experienced by China or South Korea. “Traditionally, manufacturing required very few skills and employed a lot of people,” he says. “Because of automation, the skills required have increased significantly and many fewer people are employed to run factories. What do you do with these extra workers? They won’t turn into IT entrepreneurs or entertainers; and, if they become restaurant workers, they will be paid much less than in a factory.” [Bland 2016]

3.2.1. Market situation in India

The World Robotics 2015 [Litzenberger et. al. 2015] details on pages 167-174 the Indian robotics demand and market for 2014 as follows:

- Sales:
 - o 2,126 new robots installed, 11% more than in 2013
 - o CAGR 2010-2014: + 29%
 - o India has position no. 13 worldwide
 - o Shares of total supply: welding 62%, handling operations 24%
 - o Industries: automotive 71%, metal 8%
- Stock of operational robots:
 - o About 11,800 units which means 22% more than in 2013
 - o CAGR 2010-2014: + 25%
 - o India has position no. 14 worldwide
- Robot density
 - o Manufacturing industry: 2 robots per 10,000 employees
 - o Automotive industry: 58 robots per 10,000 employees

- All others: 1 robot per 10,000 employees

The IFR sees the automotive sector as the main driver for robotics, since between 2010 and 2014, robot installations in this sector increased by 104% on average. The states shows a high potential for more automation, however, problems with infrastructure and bureaucracy prevent a stronger increase so far.

Also, the state initiative “Made in India” is seen in a double-edged manner: On one hand, it shall strengthen Indian economy and on the other hand it promised many manufacturing jobs for the many young people living in India: Prime Minister “Modi’s “Make in India” laudably aspires to triple manufacturing jobs to 150 million by 2022 – the Boston Consulting Group forecasts 62 million – which leaves little to no room for the government to invest in any large-scale national robot-driven innovation programmes, as the nations of East Asia have.” [Website <http://www.asianroboticsreview.com/india2.html>, without date]

3.2.2. Market situation in Indonesia

The World Robotics 2015 [Litzenberger et. al. 2015] details on pages 175-177 the Indonesian robotics demand and market for 2014 as follows:

- Sales:
 - 1,152 new robots installed, 1% less than in 2013
 - CAGR 2010-2014: + 34%
 - Indonesia has position no. 22 worldwide
 - Shares of total supply: welding 52%, handling operations 42%
- Stock of operational robots:
 - About 5,200 units which means 28% more than in 2013
 - CAGR 2010-2014: + 42%
 - Indonesia has position no. 27 worldwide
- Robot density
 - Manufacturing industry: 39 robots per 10,000 employees
 - Automotive industry: 342 robots per 10,000 employees
 - All others: 20 robot per 10,000 employees

Main industries for robotics in Indonesia are automotive and rubber and plastics industry. It is interesting to mention that Japan car manufacturers are engaged in Indonesia. They see the country as a coming production hub for the future ASEAN free trade zone AEC. ASEAN stands for “Association of Southeast Asian Nations” and has the following goals: “To accelerate the economic growth, social progress and cultural development in the region through joint endeavours in the spirit of equality and partnership in order to strengthen the foundation for a prosperous and peaceful community of Southeast Asian Nations.” [Website asianroboticsreview, without date] One focus of ASEAN will be to create an infrastructure appropriate for applications in the context of Internet of Things. [Gian 2015]

3.2.3. Market situation in Malaysia

The World Robotics 2015 [Litzenberger et. al. 2015] details on pages 202-204 the Malaysian robotics demand and market for 2014 as follows:

- Sales:
 - 852 new robots installed, 8% more than in 2013
 - CAGR 2010-2014: + 6%
 - Malaysia has position no. 25 worldwide
 - Shares of total supply: handling operations 44%, welding 20%
- Stock of operational robots:
 - About 5,700 units which means 11% more than in 2013
 - CAGR 2010-2014: + 12%
 - Malaysia has position no. 26 worldwide
 - Shares of total supply: handling operations 44%, welding 21%
- Robot density
 - Manufacturing industry: 28 robots per 10,000 employees

- Automotive industry: 275 robots per 10,000 employees
- All others: 19 robot per 10,000 employees

3.2.4. Market situation in Singapore

The World Robotics 2015 [Litzenberger et. al. 2015] details on pages 205-207 the Singapore robotics demand and market for 2014 as follows:

- Sales:
 - 1,228 new robots installed, 3% more than in 2013
 - CAGR 2010-2014: + 12%
 - Singapore has position no. 20 worldwide
 - Shares of total supply: Cleanroom applications 69%, assembly 13%
- Stock of operational robots:
 - About 7,400 units which means 19% more than in 2013
 - CAGR 2010-2014: + 19%
 - Singapore has position no. 21 worldwide

4. Other emerging markets outside Asia

4.1. Market situation in Russia

The World Robotics 2015 [Litzenberger et. al. 2015] details on pages 269-273 the Russian robotics demand and market for 2014 as follows:

- Sales:
 - 339 new robots installed, 45% less than in 2013
 - CAGR 2010-2014: + 10%
 - Russia has position no. 35 worldwide
 - Shares of total supply: handling operations 47%, welding 24%
 - Industries: automotive 43%, metal 14%
- Stock of operational robots:
 - About 2,700 units which means 13% more than in 2013
 - CAGR 2010-2014: + 26%
 - Russia has position no. 35 worldwide
- Robot density in manufacturing industry: 2 robots per 10,000 employees

These low numbers reflect the political and economic difficulties in the country. Political engagement focusses on other industries than automation technologies. "However, planned projects of Chinese companies which include also automotive projects may result in some investments in robotics. These robots will possibly come from China", concludes the IFR.

4.2. Market situation in Brazil

The World Robotics 2015 [Litzenberger et. al. 2015] details on pages 114-118 the Brazilian robotics demand and market for 2014 as follows:

- Sales:
 - 1,266 new robots installed, 9% less than in 2013
 - CAGR 2010-2014: + 19%
 - Brazil has position no. 17 worldwide
 - Shares of total supply: handling operations 47%, welding 38%
 - Industries: automotive 65%, metal 8%
- Stock of operational robots:
 - About 9,600 units which means 12% more than in 2013
 - CAGR 2010-2014: + 14%
 - Brazil has position no. 16 worldwide
 - Shares of total stock: handling operations 41%, welding 40%,
- Robot density:
 - Manufacturing industry: 10 robots per 10,000 employees

- Automotive industry: 106 robots per 10,000 employees
- All others: 4 robots per 10,000 employees

“The Brazilian robot market is still seen as an emerging market for robot installations although the development of sales is disappointing”, states the IFR. This development reflects the unstable political and economic situation.

4.3. Market situation in South Africa

The World Robotics 2015 [Litzenberger et. al. 2015] details on pages 401-404 the South African robotics demand and market for 2014 as follows:

- Sales:
 - 358 new robots installed, 45% less than in 2013
 - CAGR 2010-2014: + 14%
 - South Africa has position no. 31 worldwide
 - Shares of total supply: Welding 68%, handling operations 22%
- Stock of operational robots:
 - About 3,450 units which means 10% more than in 2013
 - CAGR 2010-2014: + 17%
 - South Africa has position no. 33 worldwide
 - Shares of total stock: Welding 50%, handling operations 34%
- Robot density: 22 robots per 10,000 employees (worldwide average: 66)

About 80% of the annual robot supply go to the car manufacturers and automotive parts suppliers. Recently, the “Automotive Production and Development Programme” (APDP) has been launched to further strengthen this sector. It replaced the “Motor Industry Development Programme” in January 2013. Since many car manufacturers plan to increase production capacities in South Africa, the demand of robots is likely to grow. [Press release *South Africa's automotive industry*, 2016] Furthermore, it is interesting to see that the cooperation between China and South Africa has a rising impact on the car manufacturing industry in the African state, for example supported by the Forum on China-Africa Co-operation FOCAC. [Press release *Chinese boost for South African auto manufacturing*, 2016]

5. Conclusion

In general, the automation and robotics industry is on a very successful path and will change the economic landscape remarkably. “We estimate that, as a direct result of installing advanced robots, and depending on the location, output per worker in manufacturing industries will be 10% to 30% higher in 2025 than it is today. The impact on cost is likely to be just as dramatic: the total cost of manufacturing labour in 2025 could be 16% lower, on average, in the world's 25 largest goods-exporting economies than they would be otherwise. All manufacturers and economies will not share these benefits equally, however, because the adoption rates of advanced robotics will vary sharply.” [Sirkin et.al. 2016]

The success is, as was mentioned above, due to both very stable and highly automated markets and also due to the rising demand of the emerging markets. However, the success of robotics in the latter ones does not happen by itself. In every market, the specific societal and economic backgrounds have to be considered and special governmental strategies are an important enabler for more automation. China gives proof that a so-called “robot revolution” is predictable, if the circumstances are beneficial and this path is driven by an extensive effort from governmental institutions.

6. References

Balzer, L., *China: New market and competitor – success factors and challenges*, 2015 [presentation held at 1st European Robotics Summit, not published]

Bland, B., *China's robot revolution*, Financial Times, 2016 [06-06-2016, <http://www.ft.com/cms/s/2/1dbd8c60-0cc6-11e6-ad80-67655613c2d6.html>, visited 08-08-2016]

Chen, T. *In China, a Robot's Place Is in the Kitchen*, Financial Times, 2016 [24-07-2016, <http://www.wsj.com/articles/in-china-a-robots-place-is-in-the-kitchen-1469393604>, visited 10-08-2016]

Demaitre, E., *China Continues to Invest in European Industrial Automation*, robotics business review, 2016 [<https://www.roboticsbusinessreview.com/china-continues-invest-european-industrial-automation/>, visited 09-08-2016]

Gian, Y., *ASEAN Smart Network Initiative Offers IoT Opportunity for Manufacturers*, Future ready Singapore, 2015 [<https://www.futurereadysingapore.com/2015/asean-smart-network-initiative-offers-iot-opportunity-for-manufacturers.html>, visited 10-08-2016]

International Federation of Robotics (IFR), *World Robotics Survey: Industrial robots are conquering the world*, Website IFR, 2015 [<http://www.ifr.org/news/ifr-press-release/world-robotics-survey-industrial-robots-are-conquering-the-world-773/>, visited 08-08-2016]

International Federation of Robotics IFR, *World record: 248,000 industrial robots revolutionising the global economy*, Website IFR, 2016 [Press release, <http://www.ifr.org/news/ifr-press-release/world-record-816/>, visited 08-08-2016]

International Federation of Robotics IFR, *China seeking to join the Top 10 robotics nations by 2020*, Website IFR, 2016 [Press release referred to with 2016b, <http://www.ifr.org/news/ifr-press-release/china-seeking-to-join-the-top-10-robotics-nations-by-2020-823/>, visited 09-08-2016]

Knowledge@Wharton, INSEAD Knowledge, *Have the BRICs Hit a Wall? The Next Emerging Markets*, Website Knowledge@Wharton, 2016. [<http://knowledge.wharton.upenn.edu/article/98411/>, visited 08-08-2016]

Leke, Acha, et. al., *South Africa's Big Five: Bold priorities for inclusive growth*, Website McKinsey, 2015 [<http://www.mckinsey.com/global-themes/middle-east-and-africa/south-africas-bold-priorities-for-inclusive-growth>, visited 08-08-2016]

Litzenberger, G. et. al., *World Robotics Report 2015 Industrial Robots*, 2015

Manyika, James et. al., *Manufacturing the future: The next era of global growth and innovation*, Website McKinsey, 2012 [<http://www.mckinsey.com/business-functions/operations/our-insights/the-future-of-manufacturing> visited 08-08-2016]

Mooney, A., Williams, A., *Growth of robotics in emerging markets captures fund investors' imaginations*, Financial Times, 2016 [02-03-2016, <http://www.ft.com/cms/s/2/f777ae08-da22-11e5-a72f-1e7744c66818.html#axzz4GRqYXus1>, visited 09-08-2016]

Sirkin, H. L., Zinser, M., Rose, J. R., *The Robotics Revolution – The next great leap in Manufacturing*, Website Boston Consulting, 2016 [Inside Ops – Are you ready for a digital revolution? pp. 15-22, <http://media-publications.bcg.com/BCG-Inside-OPS-Jul-2016.pdf>, visited 08-08-2016]

Steinbock, D., *The coming revolution of Chinese robotics*, ejinsight.com, 2016 [11-05-2016, <http://www.ejinsight.com/20160511-the-coming-revolution-of-chinese-robotics/>, visited 10-08-2016]

Talley, Ian, *Brics' New World Order Is Now on Hold*, Wall Street Journal, 2016 [<http://www.wsj.com/articles/brics-new-world-order-is-now-on-hold-1453240108> visited 08-08-2016]

Xia, Chenan, *Cross-Border E-Commerce is luring Chinese Shoppers*, Website McKinsey, 2016 [McKinsey Quarterly No. 2, pp. 22-23. <http://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/mckinsey-quarterly-2016-number-2-overview-and-full-issue>, visited 08-08-2016]

Yeo, N., *First ROS-Industrial Asia Pacific Workshop 2016*, Website rosindustrial.org, 2016 [<http://rosindustrial.org/news/2016/7/22/first-ros-industrial-asia-pacific-workshop-2016>, visited 10-08-2016]

Yuankai, T., *A Robotic Boom*, Beijing Review, 2015 [10-12-2015, http://www.bjreview.com/Lifestyle/201605/t20160527_800057965.html, visited 10-08-2016]

(Without autorship) *'Made in China 2025' plan issued*, The State Council The People's Republic of China, Website Chinese Government, 2015 [Press release http://english.gov.cn/policies/latest_releases/2015/05/19/content_281475110703534.htm]

(Without authorship) *South Africa's automotive industry*, SouthAfrica.info, 2016 [Press release, <http://www.southafrica.info/business/economy/sectors/automotive-overview.htm#.V6nYx0Z0o7y>, visited 09-08-2016]

(Without authorship) *Chinese boost for South African auto manufacturing*, SouthAfrica.info, 2016 [Press release, <http://www.southafrica.info/business/Chinese-auto-manufacturing-021215.htm#.V6nWuEZ0o7x>, visited 09-08-2016]

(Without authorship) *ASEAN Economic Community (AEC)*, asianroboticsreview.com [<http://www.asianroboticsreview.com/east2.html>], visited 09-08-2016]

(Without authorship), *Robots for India: Industry's Troubling Headwinds*, asianroboticsreview.com [<http://www.asianroboticsreview.com/india2.html>], visited 09-08-2016]

(Without authorship), *Bright market prospect for China's service robotics*, news.xinhuanet.com, 2015 [http://news.xinhuanet.com/english/2015-11/24/c_134850942.htm], visited 10-08-2016]

(Without authorship), *The 5 Chinese Robot Companies That Cannot be Overlooked*, Robotics Tomorrow, 2016 [09-05-2016, <http://www.roboticstomorrow.com/news/2016/05/10/the-5-chinese-robot-companies-that-cannot-be-overlooked/8137/>], visited 10-08-2016]

(Without authorship), *The Rise Of Robotics In China: 9 Startups To Watch This Year*, CB INSIGHTS, 2016 [25-07-2016, <https://www.cbinsights.com/blog/china-robotics-startups/>], visited 10-08-2016]