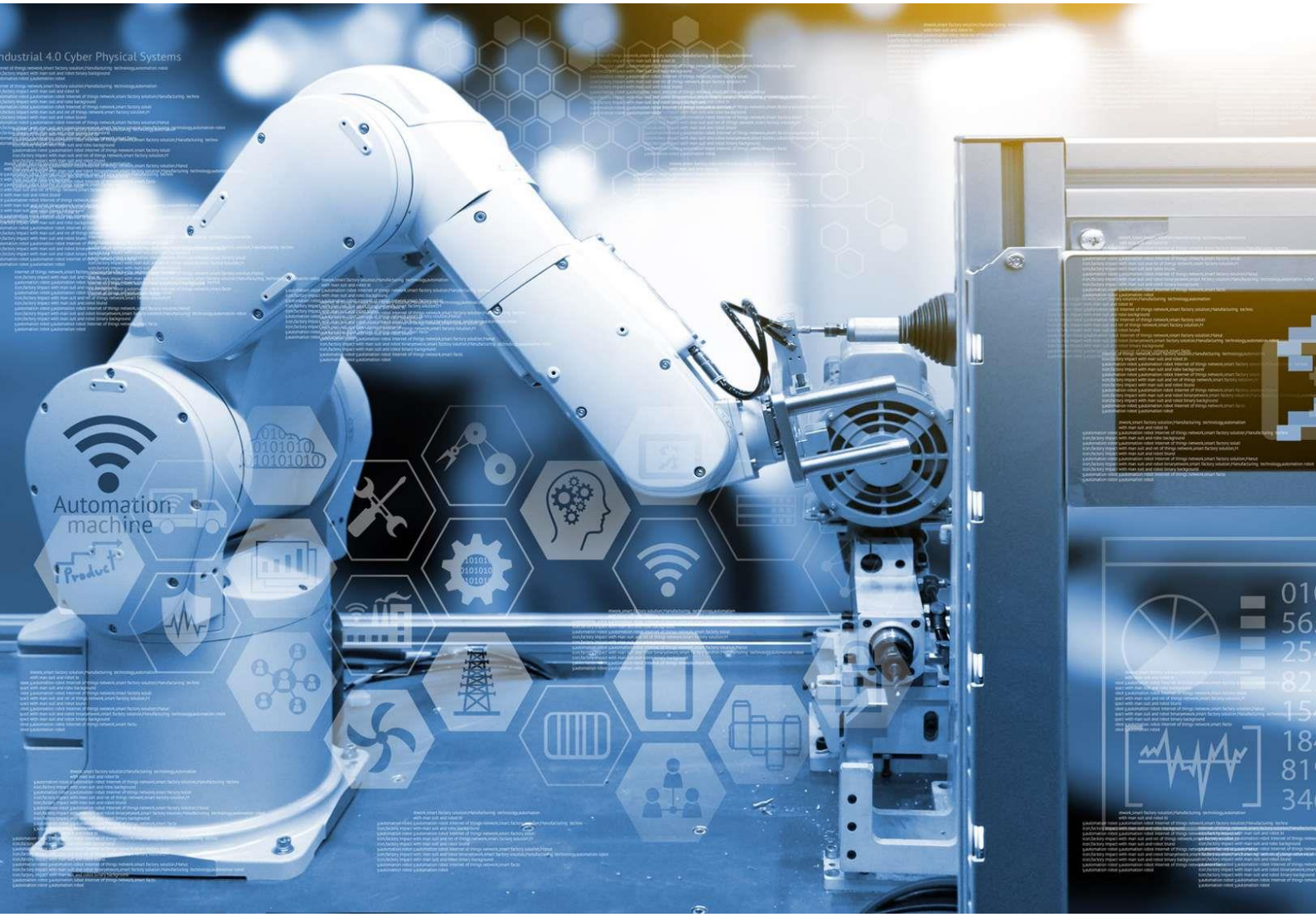

Industry 4.0 in Myanmar

Leapfrogging across sectors and how to overcome the barriers!

A whitepaper jointly conducted by Roland Berger, Myanmar Survey Research and the Delegation of German Industry and Commerce in Myanmar (AHK Myanmar)

May, 2019

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Dear readers,

Digitalization presents one of the biggest future economic challenges but at the same time also provides ample opportunities. It will enrich our way of thinking, working and interacting. Even today we witness public debates about artificial intelligence, smart homes and autonomous driving. Many German companies are specialized in high-tech areas. They are already actively benefitting from current digital developments and thus getting ready for the future. The German government which highly prioritizes digitalization and “Industry 4.0” firmly supports the private sector in this transition.

I am therefore very pleased that a conference on “Industry 4.0 in Myanmar – Leapfrogging across sectors” will be held in Yangon. And I am proud that the German Embassy Yangon has the opportunity to strongly support this unique event, which was initiated and organized by the Delegation of German Industry and Commerce together with the German private sector in Myanmar. All conference stakeholders as well as the Embassy know that Myanmar has a huge potential when it comes to “Industry 4.0”. Even though digitalization is still at an early stage, companies in Myanmar are already able to benefit from a fine telecommunication infrastructure and a population ready to embrace new technologies. I am convinced that the title of the conference “Leapfrogging across sectors” will lead the way for Myanmar’s economy in the upcoming years.

The present whitepaper presents many valuable insights from companies which are already active in implementing “Industry 4.0” solutions. I hope that the show cases will provide incentives and ideas for further business endeavors and would like to express my gratitude to all who have contributed.

I hope that you will enjoy the paper and the conference

Dorothee Janetzke-Wenzel
Ambassador, Federal Republic of Germany

လုပ်ငန်းစဉ် အကျဉ်း

မြန်မာနိုင်ငံ နှင့် Industry 4.0 သည် ပူးတွဲသုံးလေ့မရှိသောဝေါဟာရများ ဖြစ်ကြသည်။ မြန်မာနိုင်ငံသည် အခြေခံအဆောက်အအုံမပြည့်စုံသေးသည့်နိုင်ငံ တစ်နိုင်ငံဟုလူသိများပြီး Industry 4.0 အဖြစ် ကူးပြောင်းနိုင်မည့် အခြေအနေ ဆိုသည်မှာ အလှမ်းဝေးနေသေးသည်ဟု ဆိုရပေမည်။ မြန်မာနိုင်ငံရှိအသေးစားနှင့်အလတ်စား ကုမ္ပဏီများမှလတ်တလော ကောက်ယူထားသည့်စစ်တမ်းများအရ ဖြေဆိုသူများ၏ ရာခိုင်နှုန်း ၈% သည်သာလျှင် Industry 4.0 အကြောင်း ကြားဘူးလေသည်။[1] သို့သော်လည်း ဤစက္ကူဖြူစာတမ်းတွင် မြန်မာနိုင်ငံရှိ ကုမ္ပဏီကြီးများသာမက အသေးစားနှင့် အလတ်စားကုမ္ပဏီများကပါ ကနဦးခြေလှမ်းတစ်ရပ် အဖြစ် ၎င်းတို့၏စီးပွားရေး လုပ်ငန်းများတွင် data အချက်အလက်များကို အသုံးပြုခြင်းသည် ပိုပြီးအရေးပါလာမည်ဟု နားလည် သိရှိထားသည်။ မြန်မာနိုင်ငံသည် လွန်ခဲ့သည့်ဆယ်စုနှစ်ပေါင်းများစွာ အတွင်း စက်မှုခေတ်အဖြစ် တိုးတက်ပြောင်းလဲရာတွင် အနည်းငယ်မျှသာ ပါဝင်နိုင်ခဲ့သော်လည်း နည်းပညာဟောင်းများကို ကျော်လွှားပြီး စက်ပစ္စည်းအစားထိုး သုံးသည့်ခေတ်ကာလနှင့် Industry 4.0 စနစ်သို့ အလျင်အမြန်ပင်ကူးပြောင်းရန် အခွင့်အလမ်းများစွာ ရှိနေပါသေးသည်။

ဤစက္ကူဖြူစာတမ်းသည် အဆိုပါအခွင့်အလမ်းများကို အစိုးရအခန်းကဏ္ဍသာမက ကုမ္ပဏီများကပါမည်သို့ ကိုင်တွယ် အသုံးပြုနိုင်ကြောင်းကို သုံးသပ်ပေးထားပြီး မြန်မာနိုင်ငံအတွက် Industry 4.0 က ပေးအပ်နိုင်မည့် အကျိုးကျေးဇူးများကို မီးမောင်းထိုး ဖော်ပြထားကာ Industry 4.0 နည်းပညာများကို အသုံးပြုသည့်အခါ ကျော်ဖြတ်ရမည့်အဓိက အတားအဆီးများကိုပါ လေ့လာဖော်ထုတ်ပေးထားသည်။ ထို့အပြင် မြန်မာကဲ့သို့သော ဖွံ့ဖြိုးဆဲနိုင်ငံတစ်ခုတွင် Industry 4.0 ၏ သဘောတရားကို ပိုမိုကျယ်ကျယ်ပြန့်ပြန့် အဓိပ္ပါယ်ဖွင့်ဆိုပေးရန်လိုအပ်ပြီး သုံးစွဲသူဗဟိုပြု လုပ်ငန်းသုံးပရိဂရမ်များလည်း ပါဝင်သင့်သည်။

ထိုစက္ကူဖြူစာတမ်းကို ဂျာမန်-မြန်မာ စီးပွားရေးလုပ်ငန်းရှင်များအသင်း (AHK Myanmar)၊ Myanmar Survey Research (MSR) နှင့် Roland Berger ကုမ္ပဏီတို့မှ ပူးပေါင်းလုပ်ဆောင်ထားခြင်း ဖြစ်သည်။ ၎င်းစက္ကူဖြူစာတမ်းတွင် Industry 4.0 နှင့်ပတ်သက်သည့် အသိအမြင်များ၊ အလျှင်းသင့်ပုံနှင့်

[1] ၂၀၁၉ မတ်လတွင် မြန်မာနိုင်ငံ၏အကြီးဆုံးစီးပွားရေးအချက်အချာမြို့ကြီး ၂ မြို့ဖြစ်သည့် ရန်ကုန်နှင့်မန္တလေးရှိအသေးစားနှင့်အလတ်စားကုန်ထုတ်လုပ်မှုကုမ္ပဏီ ၁၅၄ ခုအား မြန်မာဆာဗေးသုတေသန (MSR) မှလေ့လာမှုလုပ်ဆောင်ခဲ့သည်။

အဟန့်အတားများကို ရန်ကုန်နှင့်မန္တလေးရှိ (SME) အသေးစား၊ အလတ်စားထုတ်လုပ်ရေးကုမ္ပဏီပေါင်း ၁၅၄ခုဆီမှ တိုင်းတာ၍ကောက်ယူဖော်ပြထားသည်။ ထို့အပြင် MSR သည်လွန်ခဲ့သောနှစ်အတော်ကြာကတည်းက မြန်မာနိုင်ငံတွင် ဒစ်ဂျစ်တယ်စနစ်လက်ခံသုံးစွဲမှု ဖွံ့ဖြိုးတိုးတက်လာသည့်ပမာဏနှင့် စာတတ်မြောက်သည့်လူဦးရေနှုန်းကို တိုင်းတာခဲ့သည်။[2] Industry 4.0 ကို ဦးဆောင်လျက်ရှိသည့် ဂျာမန်ကုမ္ပဏီများနှင့် မြန်မာကုမ္ပဏီများမှလည်း ၄င်းတို့တတ်ကျွမ်းထားသည့်ပညာရပ်များကို အဆိုပါစက္ကူဖြူစာတမ်းအတွက် ကူညီထောက်ပံ့ပေးထားသည့်အပြင် အရှေ့တောင်အာရှနိုင်ငံအချို့မှ တိုးတက်မှုဖြစ်ရပ် လေ့လာမှုများလည်း ထည့်သွင်းပေးထားသည်။ ကော်ပိုရေးရှင်းလုပ်ငန်းကြီး ၁၃ ခုကိုလည်း ယခုစာတမ်းအတွက် အင်တာဗျူးထားသည်။

AHK မြန်မာသည် မြန်မာနိုင်ငံရှိဂျာမန်စက်မှုနှင့်ကူးသန်းရောင်းဝယ်ရေး၏ တရားဝင်ကိုယ်စားလှယ်အဖွဲ့ဖြစ်ပြီး ဂျာမန်အစိုးရထံမှအထောက်အပံ့ရရှိထားသည်။ AHK မြန်မာသည် စီးပွားရေးပေါင်းကူးဆက်သွယ်မှုများ ပိုမိုအားကောင်းစွာတည်ဆောက်ရန် ရည်ရွယ်ချက်ဖြင့် ၂၀၁၄ ခုနှစ်ကတည်းကစတင်၍ ဂျာမနီနှင့် မြန်မာကြားတွင် စီမံကိန်းများ၊ အခမ်းအနားပွဲများနှင့် ဝန်ဆောင်မှုများဆောင်ရွက်ပေးလျက်ရှိသည်။

MSR သည် မြန်မာနိုင်ငံတွင် စျေးကွက်နှင့်လူမှုရေးသုတေသနပြု ပုဂ္ဂလိက အေဂျင်စီတစ်ခုအဖြစ် ဦးဆောင်ရပ်တည်နေသည်ဖြစ်သည်။ MSR သည် ဆက်သွယ်ရေးနှင့်ဘဏ္ဍာရေးနည်းပညာကဏ္ဍအပြင် နည်းပညာအခြေပြု စီးပွားရေးလုပ်ငန်းများမှ အလုပ်အပ်သူများအတွက် သုံးစွဲသူစိတ်ကြိုက်နှင့် B2B (လုပ်ငန်းမှလုပ်ငန်းဆီသို့) သုတေသနများဆောင်ရွက်ပေးလျက်ရှိပြီး ၂၀၁၂ ခုနှစ်မှစ၍ ဒစ်ဂျစ်တယ်စနစ်လက်ခံသုံးစွဲမှုကိုလည်း သုတေသနပြုပေးနေသည့် ကုမ္ပဏီဖြစ်သည်။

Roland Berger ကုမ္ပဏီသည် နိုင်ငံပေါင်း ၃၄ နိုင်ငံတွင် လုပ်ကိုင်ဆောင်ရွက်နေပြီး စီးပွားရေးနည်းဗျူဟာ ဆွေးနွေးအကြံပေးသည့် နိုင်ငံတကာလုပ်ငန်း တစ်ခုဖြစ်သည်။ Roland Berger ကုမ္ပဏီသည် ၂၀၁၃ ခုနှစ်မှစ၍ မြန်မာနိုင်ငံတွင်စတင်လုပ်ကိုင်နေပြီး ပြည်တွင်းပုဂ္ဂလိကကုမ္ပဏီများ၊ နိုင်ငံတကာ ရင်းနှီးမြှုပ်နှံသူများအပြင် မြန်မာအစိုးရ၏ စျေးကွက်အတွင်းဝင်ရောက်ရေး ဗျူဟာနည်းပညာများ၊ ဗျူဟာနည်းပညာများဖြစ်ထွန်းခြင်း၊ စွမ်းဆောင်ရည်တိုးတက်ခြင်း စသည့် ကဏ္ဍမျိုးစုံကို ဆွေးနွေးအကြံပေးလျက်ရှိသည်။ ဥပမာအားဖြင့် Roland Berger ကုမ္ပဏီသည် ဆက်သွယ်ရေးနှင့်ဘဏ်လုပ်ငန်းကဏ္ဍများတွင် liberalization အောင်မြင်စွာလုပ်ဆောင်နိုင်ရေးအတွက် မြန်မာအစိုးရအား ကူညီပံ့ပိုးပေးခဲ့သည်။

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[2] MSR ဒစ်ဂျစ်တယ်မြန်မာလေ့လာရေး၊ ၁၈-၅၅ အရွယ်များတွင် ၂၀၁၇ တွင် n=၁,၂၀၀၊ ၂၀၁၉တွင် n=၁၀၀၀။

1. Introduction

Myanmar and Industry 4.0 are not often used in the same context. Myanmar has been rather known for its infrastructure gaps and one could argue the country is far away from a transition towards Industry 4.0. A recent survey, which was conducted as part of this whitepaper with small & medium sized manufacturing companies reveals that only 8% of survey respondents have heard of Industry 4.0.[3] However, this whitepaper also shows a high openness across Myanmar companies to automate their business activities as a first step. Moreover, 84% of the surveyed companies indicate that the usage of data will become more important for their business in the next 5 years. Since Myanmar has hardly participated in the industrialization of the past decades, there is vast potential for the country to leapfrog older technologies and shift immediately towards an era of automation and Industry 4.0.

This whitepaper assesses how companies and the public sector could leverage this potential, highlights the advantages that Industry 4.0 could entail for Myanmar and explores the main barriers that would need to be overcome to foster Industry 4.0 technologies. It also shows that in a developing country such as Myanmar, the concept of Industry 4.0 needs to be defined more broadly and also include customer centered applications.

This whitepaper has been jointly developed by the Delegation of German Industry and Commerce in Myanmar (AHK Myanmar), Myanmar Survey Research (MSR) and Roland Berger. The whitepaper includes insights from two surveys that haven been conducted among 154 SME manufacturing companies in Yangon and Mandalay to measure their awareness, readiness and barriers to engage with Industry 4.0. Additionally, MSR has measured over the years the development of the digital adoption and literacy within the population.[4] Leading German and Myanmar companies in the field of Industry 4.0 have contributed to this paper with their expertise and case studies from other countries in Southeast Asia and Europe. Last but not least, 13 large corporations have been interviewed for this paper.

The AHK Myanmar is the official representation of German Industry and Commerce in Myanmar with a mandate from the German government. The AHK Myanmar aims at building and strengthening business relationships between Germany and Myanmar through projects, events and services since 2014.

MSR is the leading independent market and social research agency in Myanmar. MSR conducts customized consumer and B2B research for numerous clients including from the telecom and fintech sector as well as app-based businesses and has researched digital adoption and barriers since 2012.

Roland Berger is a global strategy consulting firm active in 34 countries. Roland Berger has been present in Myanmar since 2013, advising local private companies, international investors as well as the government on various strategic topics such as market entry strategies, growth strategies, performance improvement and the liberalization across various sectors. For example, Roland Berger has supported the Myanmar government in the successful liberalization of the telecom and banking sectors.

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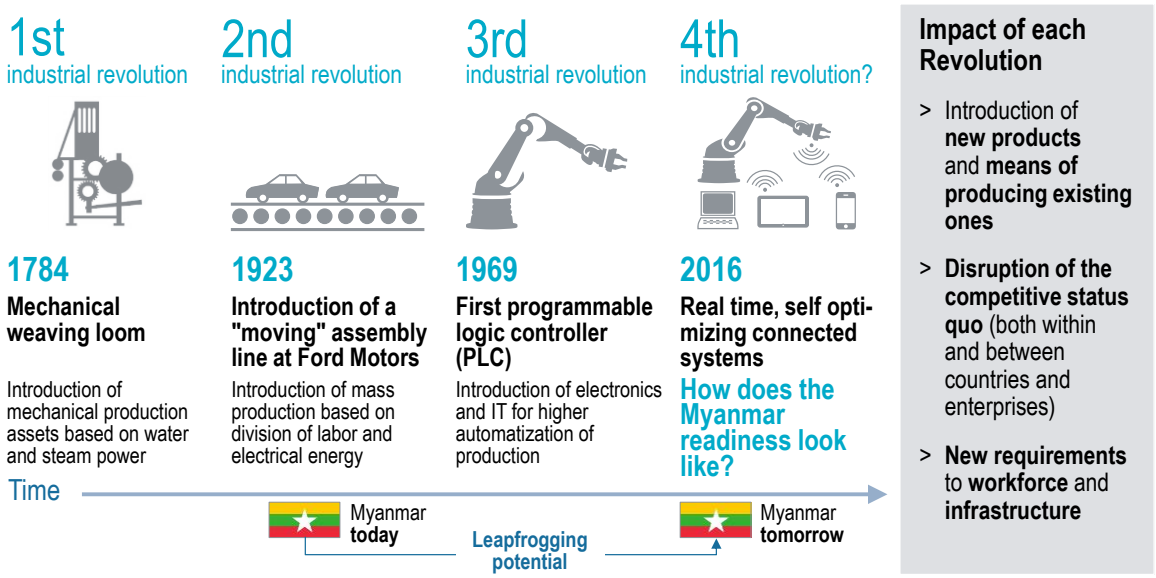
[3] Study conducted by MSR in March 2019 among n=154 small and medium sized manufacturing companies in Yangon and Mandalay, the 2 largest economic hubs of Myanmar.
[4] MSR Digital Myanmar Study, n=1200 in 2017, n=1000 in 2019 among those aged 18-55.

2. The concept of Industry 4.0

Multiple countries around the world have already witnessed three industrial revolutions, which could also be described as disruptive leaps in industrial processes, resulting in significantly higher productivity. The first revolution improved efficiency through the use of hydropower, the increasing use of steam power and the development of machine tools. The second brought electricity and mass production (assembly lines), and the third and most recent further accelerated automation using electronics and IT. The fourth industrial revolution is already on its way. However, Myanmar has not even fully participated in the third industrial revolution, meaning that many production lines still rely on a significant share of manual labor and are not even partly automated. Hence, Myanmar has the potential to leapfrog semi-automated production lines and jump straight into the era of Industry 4.0.

Figure 1: Development stages of industrial manufacturing



Source: Roland Berger

Industry 4.0 needs to be differentiated from smaller concepts such as the "Internet of Things", "Maker Movement" or "Factory 4.0". Industry 4.0 emphasizes the idea of consistent digitization and linking of all productive units in an economy. German companies, being known for high-tech machinery and equipment manufacturers, are leading the development and promotion of Industry 4.0 in the manufacturing sector of the future. They have already started to develop the first strategies on high-tech and digitalization in 2006.[5]

[5] UNIDO (2018): What can policy makers learn from Germany's Industrie 4.0 development strategy.

The key characteristics of a new industrial landscape under the concept of Industry 4.0 are:

1. **CYBER-PHYSICAL SYSTEMS AND MARKETPLACE**. In developed countries, ICT systems are already at the heart of the production system. In Industry 4.0, those systems will be far more connected to all sub-systems, processes, internal and external objects, the supplier and customer networks. Complexity will be much higher and will require sophisticated marketplace offerings. ICT systems will be built around machines, storage systems and supplies that adhere to a defined standard and are linked up as cyber-physical systems (CPS). These can be controlled in real time. Plants and systems will have clearly defined, similar interfaces. Cyber-physical systems allow for flexibility in replacing machines along the value chain in which production processes can be changed at short notice and downtime can be offset.

2. **SMART ROBOTS AND MACHINES.** Machines have already partly replaced human workers in the last revolution. In the future they will become more intelligent, which means they will be able to adapt, communicate and interact. In Industry 4.0 smart robots will not necessarily replace humans in increasingly complex workflows but rather work hand in hand with humans, using human-machine interfaces with smart sensors. The use of robots will increase across various functions like production, logistics, office management (to distribute documents). These robots can also be controlled remotely. If a problem occurs, the worker will receive a message on the smart phone, which is linked to a web cam, so the employee can give instructions to let the production continue. Thus, the plant could operate 24/7 without the continuous presence of workers. Theoretically a head of production does not need to commute through traffic to the production site every day, but can occasionally stay at home, monitoring the workflow.

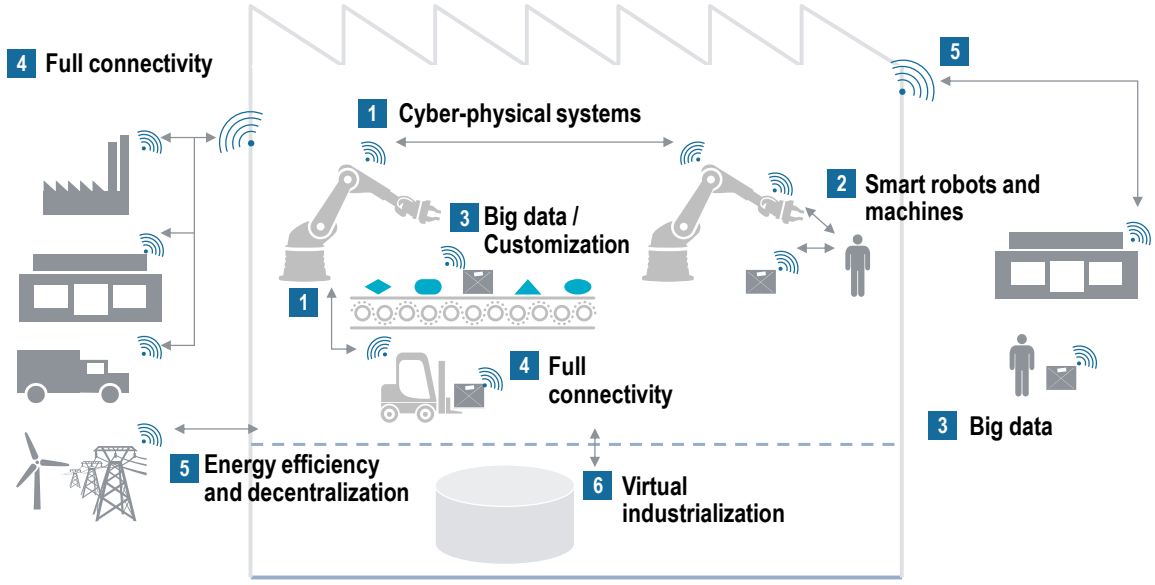
3. **BIG DATA.** Data is often referred to as the raw material of the 21st century. Indeed, the amount of data available to businesses is expected to double every 1.2 years because plants of the future will be producing a huge amount of data that needs to be saved, processed and analyzed. Big data also allows companies to introduce mass customization, individually adapting products depending on customers' preferences on a large scale. Hence, innovative methods to handle big data and to tap the potential of cloud computing will create new ways to leverage information and satisfy customer needs.

4. **NEW QUALITY OF CONNECTIVITY**. In Industry 4.0 the digital and real worlds are truly connected. Machines, workpieces, systems and human beings will constantly exchange digital information via Internet protocol. This means physical things will be linked to their data footprint. Production with interconnected machines becomes very smooth: one machine is immediately informed when the part is produced by another machine, as well as the conveyor or the logistic supply robot. Machines automatically adapt to each production step, coordinating almost automatically any adjustments in the production unit of the series to be manufactured. Even the product may communicate when it is produced and ask for a conveyor to be picked up, or send a message to the ordering system to say "I am finished and can be delivered".

5. **ENERGY EFFICIENCY AND DECENTRALIZATION**. Climate change and scarcity of resources are megatrends that will significantly impact Myanmar. Industry 4.0 enables energy decentralization for plants, triggering the need for the use of carbon-neutral technologies (e.g., solar power) in manufacturing. Using renewable energies will be more financially attractive for companies, particularly considering the fluctuating prices for gasoline to run a generator, which is still common practice for many companies due to existing power outages in Myanmar.

6. **VIRTUAL INDUSTRIALIZATION.** There is nothing more difficult than launching a new plant or a new product in an existing plant: hours of adaptations, trials, pre-series testing requiring a high-caliber launch team and numerous unexpected cost overruns. A day lost through a standstill of production means a huge revenue loss for many businesses. Industry 4.0 will use virtual plants and products to prepare the physical production. Every process is first simulated and verified virtually; only once the final solution is ready is the physical mapping done – meaning all software, parameters and numerical matrixes are uploaded into the physical machines that control the production. Some initial trials have made it possible to set up an automotive part production unit in three days – as opposed to the three months it requires today. Virtual plants can be designed and easily visualized in 3D to show how the workers and machines will interact.

Figure 2: Industry 4.0 functional characteristics – Endgame scenario



Source: Roland Berger

The fourth industrial revolution will transform the economic paradigm and the mechanisms for creating value that underpin it. Manufacturing has, in effect, switched from a mindset of mass production to one of mass customization. No longer is it based on scale and volume effects but on flexible and localized production situated close to centers of demand. The production site of the future manufactures "on demand" and no longer creates inventory, but instead dynamically adapts itself to demand. It is more predictive and auto-corrective, and it involves less trial and error. Its logic is focused on using a product rather than on the product itself. The industrial model today is still based on the principle of decreasing product costs through the volume of products manufactured: the higher the volume produced, the lower the unit costs become. This paradigm is likely to change in the future, where companies are more concerned with optimizing the capital required to produce their goods.[6]

[6] Roland Berger study: The industry 4.0 transition quantified

3. Digital leapfrogging in Myanmar

For decades, Myanmar has ranked among the world's least industrialized nations.[7] Agriculture still accounts for more than 23% of its economic output (2017), compared to less than 9% in the neighboring country Thailand.[8] The main reason for Myanmar's low level of industrialization is its economic and political isolation which lasted for decades, until the 2010 general election. While the country is still in clear need of reforms and upgrades, significant improvement has already been achieved in some sectors over the past nine years. Among these are the telecommunication sector, banking sector, retail space and initial smart city attempts. In all four areas mentioned, the progress has largely been made through digitalization and automated solutions. Thus, digital leapfrogging across various sectors in Myanmar is not a utopian idea, but already happening right now.

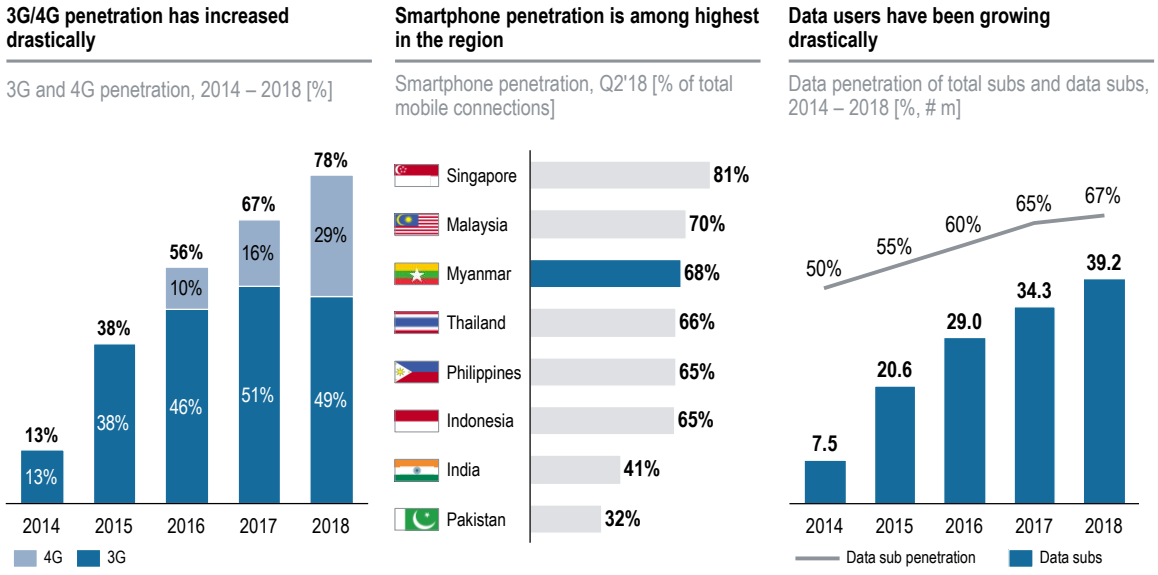
3.1 Telecommunication

Ten years ago, the internet penetration in Myanmar was less than 0.3% of the population, equivalent to approximately 130,000 users.[9] By the end of 2018, Myanmar's four mobile network operators (MPT, Telenor, Ooredoo, Mytel) combined had over 27.5 million unique mobile subscribers.[10] Over 73% of these subscribers (subs) had access to mobile internet. Unlike in many other least developed countries, most users in Myanmar use smartphones instead of feature phones.

Myanma Posts and Telecommunications (MPT) was the first provider to offer mobile services. In 2013, after the Myanmar government called a competitive international tender, supported by Roland Berger, Ooredoo and Telenor were granted licenses to provide mobile services in early 2014. They had to commit to cover remote and difficult to access areas. German DEG supported the construction and operation of Myanmar's network with a USD 31.8 million loan in 2015. In 2018, a fourth provider, Mytel, joined the landscape.

[7] UNCTADStat Database, United Nations Conference on Trade and Development
[8] Worldbank
[9] Myanmar Times (2018): Upgrading Myanmar's internet access.
[10] GSMA

Figure 3: Mobile penetration development in Myanmar



Source: GSMA, Industry 4.0 whitepaper

Over the last six years, Myanmar has seen unprecedented growth in telecommunications and technology. The government's liberalization of the sector led to a significant drop in SIM card prices which boosted the access to affordable telecommunication. The majority of consumers entered the market via a smartphone resulting in a rapid increase of digital technologies including a rising tech ecosystem built by Myanmar companies. They built products for a large variety of socio-economic and business purposes: from eliminating fake education documents to storing medical records, and from telemedicine for rural areas to mAgri (mobile Agriculture) solutions with live weather reports and price information, such as e.g. Greenovator or Impact Terra's Golden Paddy application.[11]

On the consumer side, digital literacy skills have grown across age groups, fostering other app-based businesses e.g., mobile money.[12] In 2019, 95% of households own at least one smartphone (up from 83% in 2017).[13] Internet usage is growing among all age groups. Over 80% of adults under 30 years report to have accessed the internet in the past four weeks. The average daily usage time of the internet has increased from 1 hour 54 minutes in 2015 to 2 hours and 50 minutes in 2019.[14] In Myanmar, Facebook has become the synonym of the internet which means that almost all businesses have a Facebook presence, and products and services are searched and offered via Facebook. E-mail, also in a business context, is leapfrogged through messenger apps such as Viber and Facebook Messenger.

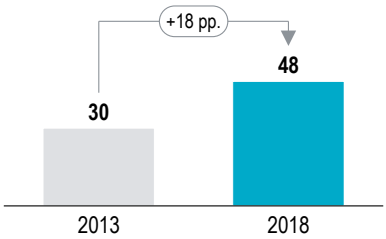
[11] Frontier Myanmar (2017): Advancing agriculture, with apps and advice.
[12] MSR (2019): Digital Myanmar 2019 Study - 73% of all survey participants in 2018. (Burmese) indicated they have no difficulties to navigate through new apps
[13] Note: The survey excluded remote rural areas and thus the national average of smartphone ownership may be lower.
[14] MSR (2019): Digital Myanmar 2019 Study.

3.2 FinTech

Cash is still king in Myanmar with over 90% of payments being made in cash and the FinTech industry has just started to slowly evolve.[15] FinTech providers in Myanmar have currently a large consumer focus and offer mobile and digital payment and remittance solutions. Applications for FinTech range from buying movie tickets, phone top-ups to online shopping and paying bills with mobile money accounts that have a daily transfer limit of MMK 500,000 (approx. 330 USD).[16] FinTech, e.g. in the form of mobile wallets growing into proper banking services over time, is particularly important to broaden access to finance, which is still very low in Myanmar with less than a third of the adult population holding a formal bank account.[17]

FinTech solutions in Myanmar started quickly to develop within the wake of telecommunication reforms. In 2013, the Central Bank of Myanmar issued a Mobile Banking Directive, and in March 2016 it published Mobile Financial Services Regulations. In autumn of the same year, Wave Money, a joint venture between Telenor and Yoma Bank, received the first mobile financial services license. At the same time, Thai TrueMoney launched a remittance service for Myanmar. Over the past 30 months, additional players also from the banking and telecommunication sector have started to offer mobile financial services, e.g. KBZpay and OK Dollar or MPT money and M-Pitesan.

Figure 4: Population share using at least one financial service [in %]



Source: DaNa Facility

Mobile money is already used by one of Myanmar's major retailers, City Mart Holding Company Ltd. (CMHL) launched their City Rewards mobile payment application which can be used at a couple of hundred outlets including City Mart, Ocean, and Seasons Bakery. With the application, users can make payments and transfer money to other users (up to 100,000 Ks, equaling 66 USD, without charges). CMHL CEO Daw Win Win Tint's vision is that the City Rewards system may eventually be also used at other retail stores and allow users to pay utility bills, phone bills and bus fares. [18] In 2019, 26% of the population made experience in transferring money via mobile platforms.[19] The largest service provider in mobile money, Wave Money, reports to cover 86% of the country with 7 million+ customers and 41,000 agents. Money transfers via the Wave Money platform reportedly account for 2 trillion MMK (or 1.3 billion USD), an equivalent of close to 2% of Myanmar's GDP.

3.3 E-commerce

Myanmar's middle class is growing, and so are its consumption demands. E-commerce has been growing country-wide over the past years. In 2019, 57% of Myanmar internet users browse through shopping websites and shops on Facebook and 16% of internet users claim to buy online – which most likely is to order from a shop page on Facebook. This trend only started to develop a few

[15] World Bank Group
[16] GIZ (2016): Myanmar's Financial Sector; exchange rate as of April 2019 (1 USD = 1,511 MMK).
[17] World Bank (2017)
[18] Kasikornbank (2018): E-commerce in Myanmar: A Rising Tide.
[19] MSR (2019): Digital Myanmar 2019 Study.

years ago and in 2017, only 2% of internet users bought items online.[20] Currently, the Myanmar e-commerce market is estimated to represent only around 0.01 percent of GDP, or about USD 6 million, but with a vast and fast-growing potential. [21]

The forms and levels of sophistication that e-commerce takes in Myanmar vary largely. As indicated above, the most informal and most common way of e-commerce in Myanmar are private sales through Facebook. Those rely still largely on bank transfers and cash payments instead of mobile payment solutions or card payments. These sales are unregulated and typically evade tax payments. Therefore, the Myanmar government is actively considering suitable legal frameworks to regulate and tax the market and adequately protect consumers and sellers. A few years ago, German Rocket Internet ventured into Myanmar with online job, car, advertisement and shopping platforms but withdrew in 2016/2017. Chinese Alibaba took over their e-commerce platform shop.com.mm.

Germany's largest investment in Myanmar to date, approximately 10 million USD (plus a 20 million USD IFC loan confirmed in early 2019), is METRO Wholesale Myanmar. In Myanmar, METRO is testing a new concept: a one-stop food distribution platform exclusively based on online orders placed through the web-shop or mobile app.[22] Payments for orders are currently structured as cash on delivery (COD) as well as card on delivery (POSM). Stocks are kept at a central warehouse in the Thilawa SEZ and distribution centers across the country, and deliveries are organized through an Enterprise Resource Planning (ERP) system. The vision for the ERP system is also for it to have integrated messaging and chat options as well as digital training modules. METRO is using Myanmar as one of the first markets globally to test its new business model, where METRO eliminates the concept of large, expensive wholesale space and only offers online order and doorstep delivery.

3.4 Smart City trends

Smart City trends are slowly moving closer to the center of attention of municipalities in Myanmar. In 2017, two leading ride-hailing apps, U.S. American Uber and Singaporean Grab, moved into Myanmar.

On the forefront of the Smart City movement in Myanmar today is Mandalay, the second largest city in Myanmar. The city recently joined the ASEAN Smart Cities Network (ASCN) initiative along with Yangon and Naypyidaw. The initiative comprises 26 pilot cities in the ASEAN region and aims to facilitate cooperation on smart city development and catalyze bankable projects with the private sector.[23] Mandalay's membership in this network emphasizes a clear mission to leverage automation and digitalization in its administration and infrastructure. One of the measures to channel the city's efforts was to nominate a Smart City Officer.[24] Current examples in Mandalay range from pilots for smart water and electricity meters to internet-connected sensors linked to CCTV cameras for remote traffic management. The city has also introduced electronic payments for toll gates and set up GPS systems in rubbish trucks to monitor their routes. Some of the municipality's ideas were inspired by a self-funded study trip on Smart Cities to Singapore.

[20] MSR (2019): Digital Myanmar 2019 Study.
[21] Kasikornbank (2018): E-commerce in Myanmar: A Rising Tide.
[22] METRO Wholesale Myanmar
[23] ASEAN Smart City Network (2018).
[24] The Irrawaddy (2018): Mandalay Chases Dream of Becoming Myanmar's First Smart City.

Internally, Mandalay's municipal government MCDC (Mandalay City Development Committee) organizes its work flow partially through messenger apps such as Viber.

Across the country, townships are already testing smart meters and mobile app solutions for tax payment collection, e.g. in cooperation with the local IT social enterprise Koe Koe Tech and the U.S.-American Asia Foundation in form of a modern assessment and effective collection of municipal taxes.[25] Near Yangon, in Dagon Seikkan, a large local construction company. Shwe Taung, also has plans to set up a new Smart City in combination with affordable housing, an investment expected to amount to USD 185 million. Smart cities can help to create an environment that fosters Industry 4.0 solutions by providing a seamless integration of data among citizens, devices, and assets (e.g., to manage traffic and transportation systems, power plants, water supply networks, etc.).

[25] The Economist (2017): Myanmar has one of the lowest tax takes in the world.

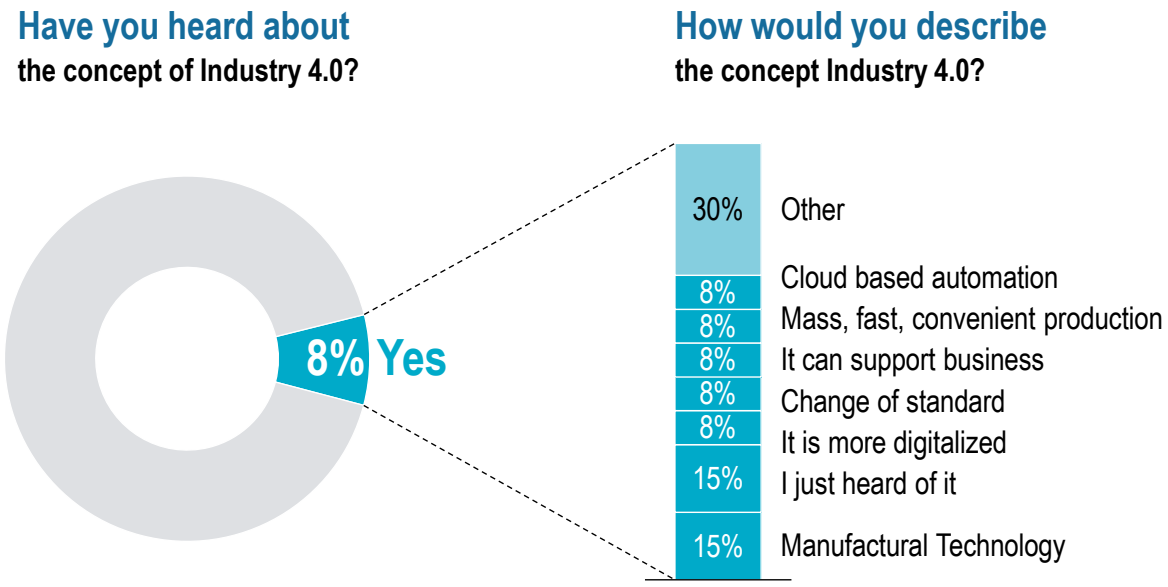
4. Opportunities of Industry 4.0 for Myanmar

As of today, various examples can be observed in Myanmar, which drive further digitization and automation in different industries. The telecommunication and financial sector have proven that leapfrogging is possible in a country like Myanmar. However, Industry 4.0 is more than digitizing single services. It entails the interconnectivity of a supply chain and even across industries by using technology and data. Industry 4.0 offers vast opportunities on a company and macro-economic level. Roland Berger estimates for a typical manufacturing company, e.g., an automotive supplier which has today on average a profitability of 6 % to increase to 13%, mainly by higher plant utilization (from 65% up to 90%.)[26] On a macroeconomic level, a positive net effect in job creation can also be expected. Although an increase in automation leads to reduction in employability of low-skilled workforce it increases the need for a medium and high skilled workforce and attracts more foreign direct investments.

4.1 Overview – Industry 4.0 in Myanmar

The full understanding of the Industry 4.0 concept has not yet reached Myanmar manufacturing businesses. Only 8% of our business survey respondents claimed to know about the term, and the understanding of the concept varied largely. 15% of the businesses perceived Industry 4.0 as a manufactural technology, whereas other answers were evenly distributed between various understanding.

Figure 5: Familiarity with the concept Industry 4.0

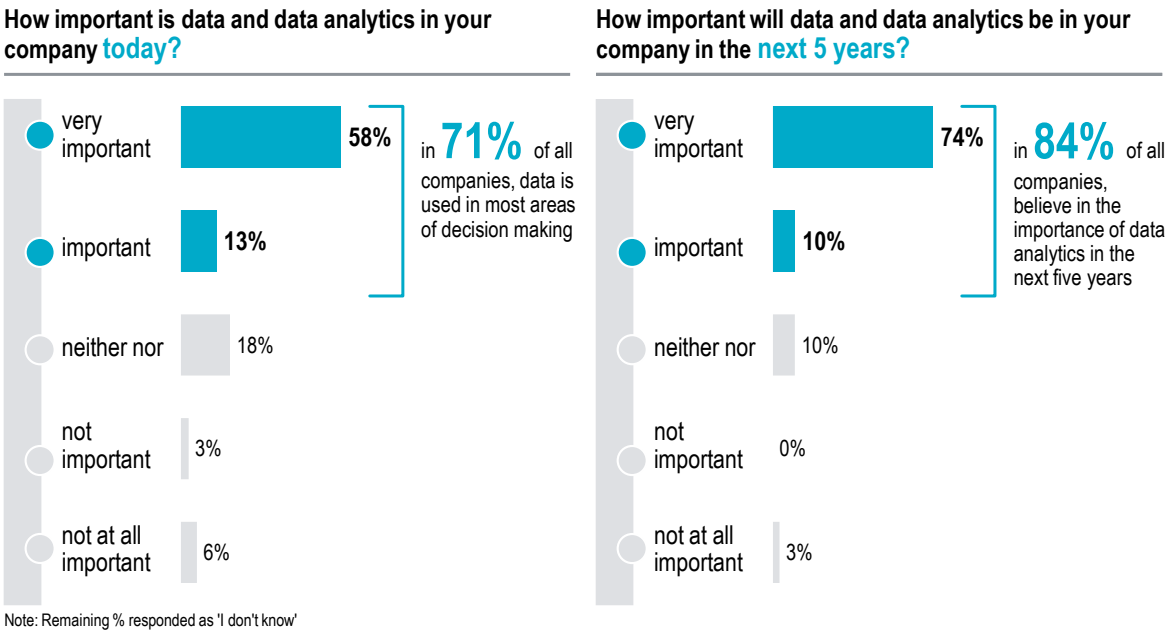


Source: MSR survey, Industry 4.0 in Myanmar – Whitepaper

[26] Roland Berger study, The Industrie 4.0 transition quantified

However, the survey reveals that companies see the importance of data and data analytics for their business since 71% stated that data and analytics are important for them. The relevance of data is expected to increase over the next five years, since 84% of surveyed companies stated that data will become more important for their company. In highly automated industries like pharma, 100% of all respondents emphasized the importance of data, whereas in more traditional industries like textile (50%) or timber (40%) the importance was perceived significantly lower.

Figure 6: Importance of data today and in the next five years



Note: Remaining % responded as 'I don't know'

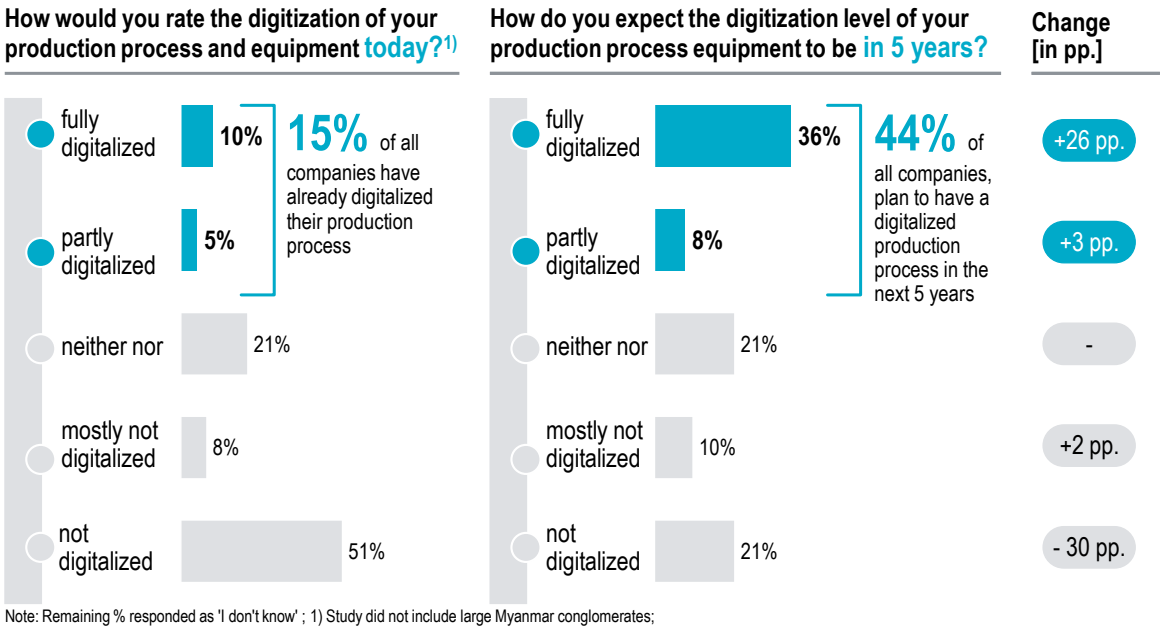
Source: MSR survey, Industry 4.0 in Myanmar – Whitepaper

Along with the importance of data, companies in Myanmar also intend to be more flexible in serving their customers, aiming for a high customizability of their products. 82% of the companies stated that in the next five years, their products should be fully customizable, and customers can ask for any configuration or any changes to their order (this compares to 75% of the companies today). However, those results might be driven by the fact that particularly small and medium-sized companies may have been more capable to adapt of their products, simply given their small size.

4.2 Manufacturing industry

Today, the manufacturing industry in Myanmar is still highly labor intensive and most of the work processes are still manual. Only 15% of the respondents of our business survey have indicated that their production process is fully digitalized. On the other hand, in the next five years, Myanmar companies intend to invest into digitizing their production processes and almost half expect that their level of production process will be digitalized in the next five years. Manufacturing companies who claim to have plans for a fully digitalized production process came from the following sectors: printing manufacturing (62%), Pharma (50%) and Chemical (50%). More traditional manufacturing industries such as metal (25%) and rubber (30%) are not planning to largely digitalize their production process.

Figure 7 Digitization of production processes in Myanmar

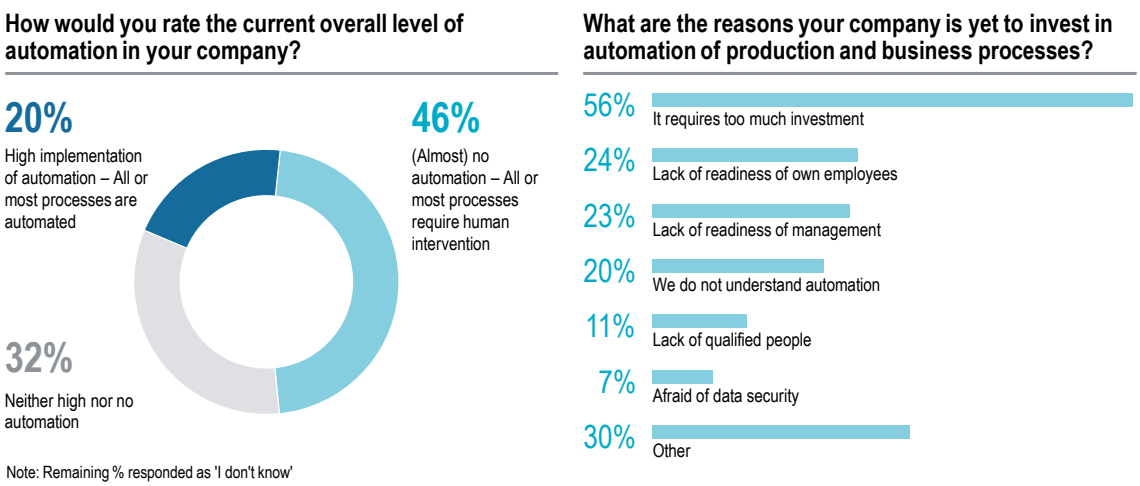


Note: Remaining % responded as 'I don't know' ; 1) Study did not include large Myanmar conglomerates;

Source: MSR survey, Industry 4.0 in Myanmar – Whitepaper

The opportunities, which arise from automating the production process are manifold for manufacturing companies. The increased usage of data and analytics would enable concepts such as predictive maintenance, which can significantly reduce the machine downtime and save related costs. Furthermore, the full automation of a manufacturing process increases the efficiency and the output of a site. Industry 4.0 also allows smaller lot sizes and hence increases flexibility in the production process. The German industrial solution provider Rieckermann for instance developed a flexible packaging solution, which allows certain manufacturers to easily change the packaging depending on their needs. Despite the benefits of automation, many manufacturing companies in Myanmar are still in an early stage of automation.

Figure 8: Automation level of Myanmar companies



Note: Remaining % responded as 'I don't know'

Source: Industry 4.0 in Myanmar – Whitepaper

46% of the companies stated that they have almost no automation in place and only 20% indicated to have a high degree of automation. Most dominant reasons for the low degree of automation were high investment costs but also the lack of readiness of employees and even of management. However, 20% of the companies claimed to already have a high degree of automation, indicating a general feasibility of automation technology for Myanmar companies.

4.3 Agriculture

Although the concept of Industry 4.0 evolved from the manufacturing industry, it is manifold and involves the entire supply chain, including non-manufacturing businesses. Agriculture for instance as one of the largest industries in Myanmar has significant potential to be further digitized. Automation technology is highly important to increase the harvest output per acre. Technology also links the sourcing industry (e.g. rice farming in agriculture) to the manufacturer and to the retailer. Smart infrastructure as further described below then ensures a seamless transportation of goods along the supply chain.

The latest trends in agriculture in Asia are artificial intelligence and self-driving vehicles. Seeds are partially already dispersed by self-driving tractors. Satellite and drone images are employed to monitor field development during different seasons. On the Chinese east coast, in Zhejiang Province, some fish farmers have started to use smart sensors to monitor the oxygen levels in their ponds and adjust supplies in real time when needed.[27] For Myanmar's growing fishery industry, +50% export growth in the past two years alone and more growth expected with the EU market now opening up for fish from Myanmar, this may also be an interesting case for Myanmar fish farms to take a look at.

In other cases, AI is employed when monitoring cows feeding behavior through facial recognition technologies, and thus identifying potential issues such as e.g. a cows' reduced appetite due to illness. AI is also used to manage the harvesting, processing or packaging steps, as e.g. illustrated by German food processing technology provider GEA.

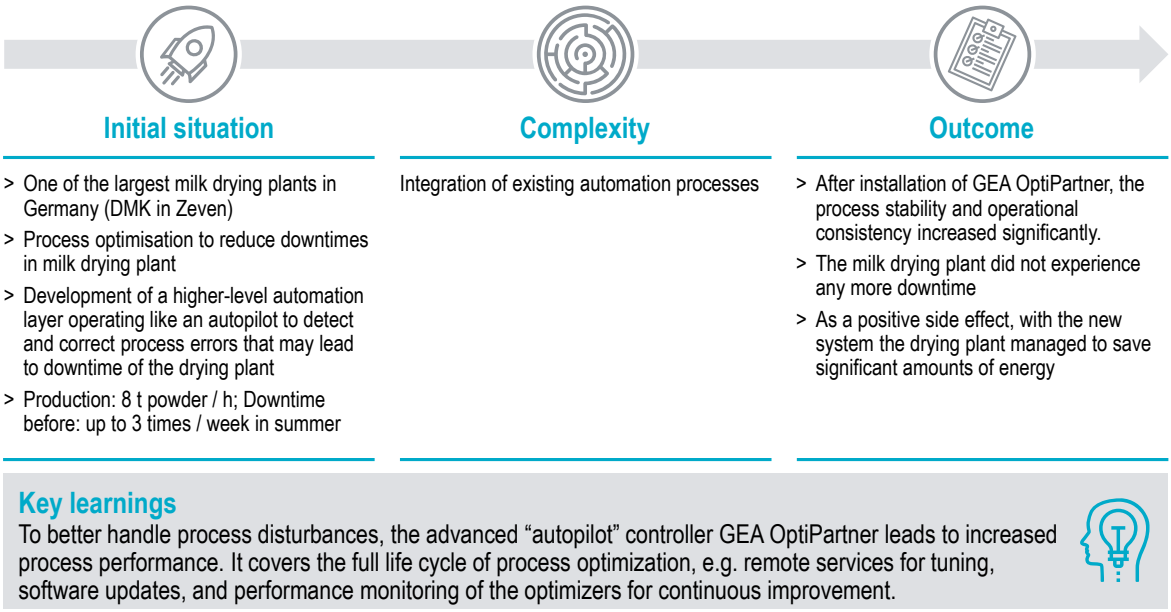
In 2017, drying repeatedly stopped at one of the largest milk dryers in Germany, the DMK plant in Zeven. Affected was the relatively new Tower 2 with an output of 8 t powder / h. During summer, up to three times per week blockages occurred in the dryer outlet / fluid bed and / or the cyclone filters, whereby the entire process had to be interrupted for several hours at a time in order to be able to manually remove powder deposits.

In response to this challenge, GEA specialists developed a higher-level automation layer that integrated all existing automation processes and can holistically take care of the entire process, from milk processing via evaporation up to the dryer. The system works in the same way as an autopilot in a vehicle and independently sets the optimum operating conditions. The system has an uptime of 98%. In the process, the flood of data generated in 300+sensors and some virtual sensors is permanently evaluated, and the control functions derived from them are carried out. The laboratory values immediately enter the system as a reference. Every 30 seconds, a wide range of process set-point update takes place. The plant operator always receives condensed information in dashboards in order to be able to assess which process trends may emerge and whether intervention is required. Since the introduction of the new system, the DMK plant did not experience any shutdown of the milk dryer. As the process is now controlled as a whole, the drying could be

[27] Nikkei Asian Review 2019

brought much closer to the optimum, which relates to residual moisture and protein content in the powder or the dry matter of the high concentrate. DMK reached considerable energy savings.

Figure 9: Case study - Milk drying process optimization



Source: Gea OptiPartner

4.4 Retail – E-commerce

Industry 4.0 would affect the entire value chain of the retail industry. Up until now Myanmar's modern retail market has primarily focused on digitizing the customer interface. The booming smartphone penetration and upgraded mobile broadband has encouraged the launch of many digital start-ups with a retail focus such as Yangon Door2Door food delivery, Shop.com.mm, OneKyat have become increasingly popular. As they are steadily scaling their operations, e-commerce platforms are relying less on Facebook as a platform. These support systems are setting the basis for an integrated workflow across the retail value chain in Myanmar instead of just focusing on the digitization of the customer interface. In this context, big data analytics could become increasingly important to better know the customer and anticipate customers' preferences and observe changing usage habits.

Only 11% of the manufacturing businesses in our survey indicated that their sales teams are closely working with digital solutions. Within the next five years, they want to expand and digitally enable more than half of their sales teams. By then, sales teams of service and trading companies could also rely on digital sales strategies on the same level as manufacturing companies (also please refer to 3.3).

Industry 4.0 is an enabler for retailers, to especially improve procurement and their logistics and distribution network practices with data analytics and improved system integration. Benefits include shorter lead times on goods movements along value chain, enhanced just-in-time delivery from the supply side, better steering of ordering, anticipation of consumer behavior, more accurate demand prediction, and better co-ordination of after sales and value-added services like delivery service. These benefits are transferred to the end customers and the public by delivering healthier and fresher products, and lead to environmentally friendly practices with less food waste and optimized

delivery routes. One application area could be the instalment of RFID chips on packaged goods to allow a detailed tracking of the logistic route, to make sure the products are freshly delivered to the customers.

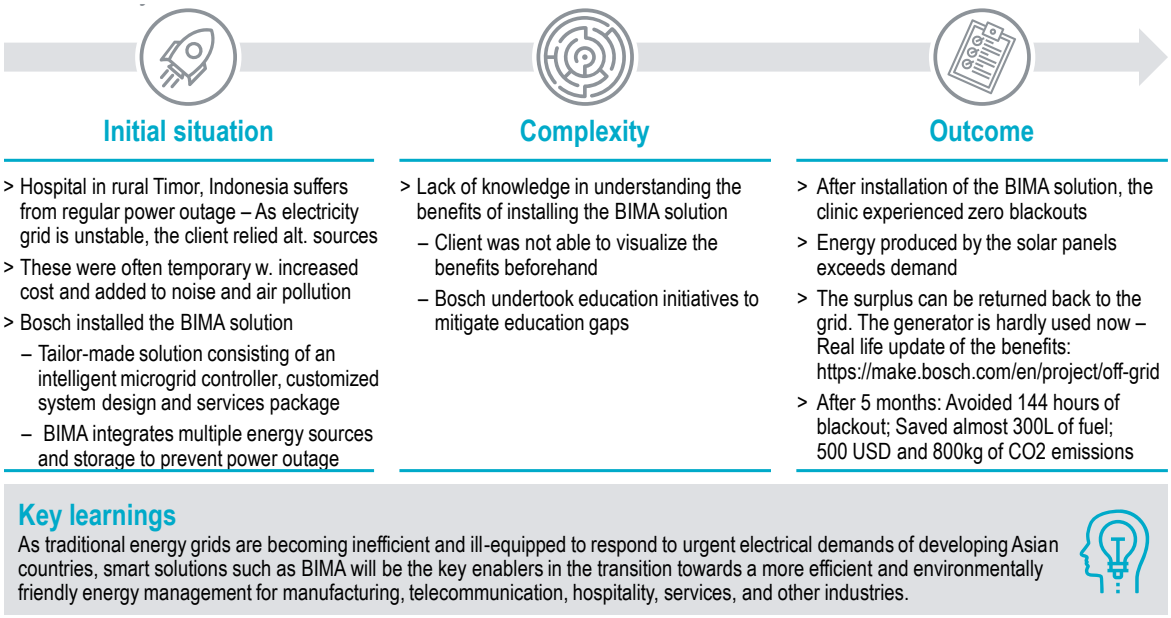
4.5 Urban development – Smart infrastructure/city

Infrastructure development is one of the areas that Myanmar is visibly lacking behind its regional peers. However, Yangon has planned many urban development projects and envisions to become the latest smart city in ASEAN. Based on the Yangon Master Plan 2040, Yangon should become a more livable place as addressed by the Yangon Region Chief Minister. The Yangon Amata Smart and Eco City Project is one of 42 prioritized urban projects, which Yangon Region Government has committed with an estimated cost of USD 2.6 bn. An example that shows, that Myanmar is gradually moving into the direction of Smart infrastructure.

In the meantime, Myanmar's second economic frontier city, Mandalay is gearing up towards smart infrastructure development – being named among top five urban areas in Southeast Asia making progress towards a smart-city status. Balancing its rich heritage and advancing towards smart city, some notable initiatives include smart traffic system and smart metering system. Mandalay City Development Committee (MCDC) has been installing over 50 traffic light sensors in Mandalay city for real-time traffic monitoring system with the objective of improving traffic control, reducing road accidents. Other ongoing smart urban development initiatives include smart waste management and smart parking system with automated payment.

By leveraging on these Industry 4.0 enablers, smart cities can effectively use real-time traffic management systems that reduce traveling and commuting time in the city, manage reduced waste-creation and pollution, higher public transport utilization, increased power stability and reliance on renewables as well as improvement in quality of life. Below case study shows an application area of Industry 4.0 in urban development in another Southeast Asian country by the German technology provider Bosch.

Figure 10: Bosch BIMA solution (Intelligent Microgrid Controller) in Indonesia



Source: Bosch

5. Barriers to overcome

This whitepaper identifies five main barriers, which Myanmar needs to overcome to further automate their manufacturing industry and facilitate a viable Industry 4.0 landscape.

1. **Lack of education** – In Myanmar, the technical skills level particularly regarding digital manufacturing (see 4.2) is still considered low, which is mostly due to the fact that the Myanmar education system and business sector were largely isolated from global ties and new R&D for decades. When considering Industry 4.0 as a concept to grow the economy, a common concern globally is the replacement of manual "people" labor by machines. Compared to industrialized countries, Myanmar is in a particularly unique situation since it has a young, "digital native" population that is eager to learn and apply new skills for the overall improvement of the country. This is the ideal ground to promote Education in the areas of Industry 4.0 and not only leapfrog factory design but also peoples' skills. Myanmar can be at the forefront of developing and educating entirely new professions e.g. robotics mechanic. German companies are already cooperating with Myanmar education institutes on this: The new School of Industrial Training and Education (SITE) in Yangon, which was masterminded by the Myanmar Ministry of Education and the local company Sea Lion, works e.g. with the German companies Festo Didactic, Siemens and Bosch to bring Industry 4.0 to the classrooms and learn future technology with the latest German machines and software solutions.

2. **Lack of financing** – A key obstacle to leverage and use Myanmar's leapfrogging potentials is the lack of funding as 56% of our survey respondents have indicated. While the NLD government has improved the share of tax collection since it took office three years ago, public funding for major investments (such as e.g. smart infrastructure) is still scarce. Most public infrastructure investments are still funded through ODA loans. For the private sector, access to finance has slowly been increasing over the past years but project finance for machinery purchases is still nascent. Banks have started to offer machine leasing/hire purchase and to accept movable collateral, but this needs to be expanded much further. To adequately support Industry 4.0 through the financial sector, more insurance products and risk-weighted loans which are more flexible in terms of pricing (interest rates), maturity and collateral, are needed.

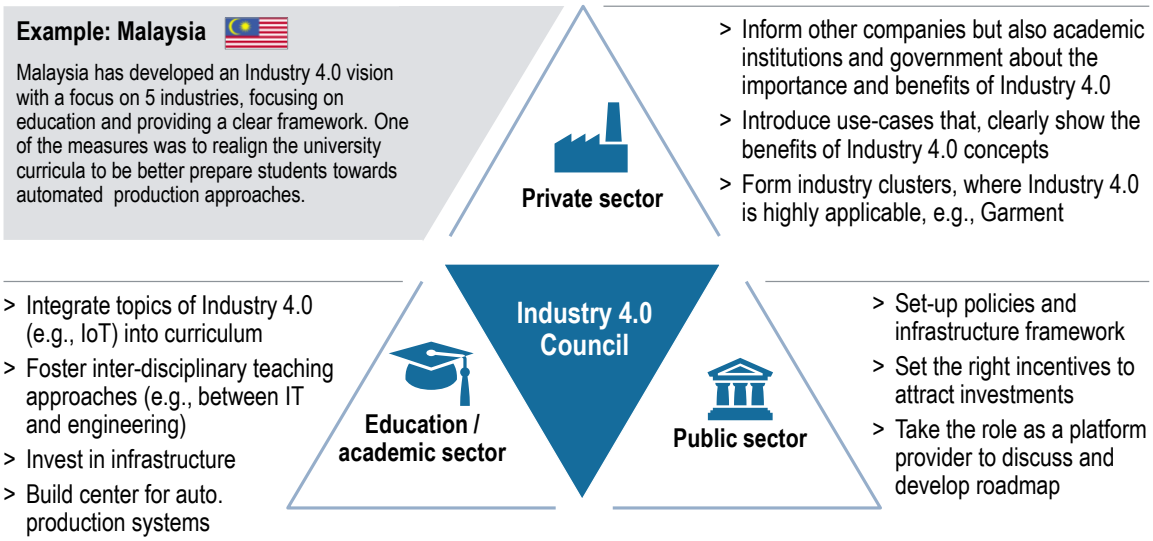
3. **Lack of infrastructure** – With an overall electrification rate of ~42% and around ~21% in rural areas[28][29], Myanmar still lacks basic infrastructure. Manufacturers still often rely on large scale generators to keep up their production during power outages. Although significant progress has been made in the infrastructure of broadband and setting up a dense network of 3G and 4G telecommunication towers, Myanmar has not yet pushed the concept of 5G as fast as neighboring countries. Whereas first trials of 5G have been rolled out in neighboring countries such as Thailand, Myanmar anticipates first 5G trials to be set up in 2-3 years. A Myanmar National Broadband White Paper 2019, which has been recently published is a first step in the right direction. Now the network should be quickly set up, e.g., in Special Economic Zones to support manufacturers in further developing their production processes. 5G is an enabler for Industry 4.0, allowing real-time data transmission without any human interaction and hence highly important to further develop the concept in Myanmar. In terms of infrastructure, the

[28] Ministry of Electricity and Energy
[29] Roland Berger analysis

country also needs to further develop their transportation infrastructure network. A comparison with the neighboring countries shows that Myanmar lacks behind infrastructure across transportation ways, although particularly apparent in road infrastructure. With 64 km paved roads / 1,000km^2 Myanmar is far behind other countries in the Southeast Asian region such as Thailand with 344km^2 / 1,000km^2.[30] A solid transportation infrastructure is not only important to ensure a seamless supply chain but according to 94% of companies in Myanmar also very important to boost overall economic growth.[31]

4. **Lack of industry standards and collaboration** – As of today, an increase in automation and approaches on how to tackle Industry 4.0 have been discussed mostly by dispersed parties. There is no common collaboration platform where the acceleration of Industry 4.0 is being discussed. To foster interconnectivity within a supply chain, and further automating manufacturing companies, the different stakeholders have to work together.

Figure 10: Stakeholder collaboration in Industry 4.0



Source: Industry 4.0 in Myanmar – Whitepaper

Public sector: The Myanmar government needs to set the right policies in order to attract companies investing in automation technology, e.g., by providing tax exemptions. Even more important is to establish national standards and ensure cyber-security. As new technologies emerge, standards across industries should be defined in collaboration with the private sector (e.g., on protocols, network and security standards). International companies can support this process with their knowledge and experience through e.g., case studies from neighboring countries, certification of trainings on standards or the development of an overall roadmap.

[30] World Bank
[31] Myanmar Business Survey #2

Private companies: To overcome the barriers of implementing Industry 4.0 in its production processes, companies in Myanmar need to adapt the concept to fit to the local market conditions. An integrated and full-scale Industry 4.0 landscape, where the company has a fully automated production with an integrated supply chain is very likely to fail. Instead companies should seek for Industry 4.0 pilots, either as a part in their production process or within an industry cluster to test and gradually develop automated production systems.

Education sector: Universities need to adapt their curricula, integrating topics surrounding Industry 4.0. Those topics can range from IoT, Big data analysis, cyber-physical systems or robotics. Since Industry 4.0 combines several disciplines, universities worldwide have been facing the challenge to bring those together. Hence, it is important that the universities foster an exchange between those disciplines, e.g., by providing teaching forums or Industry 4.0 days. Again, private companies can support universities in setting up an appropriate curriculum, using reference cases from other countries.

5. **Lack of knowledge about Industry 4.0** – The survey revealed that only few company owners and executives are familiar with the topic of Industry 4.0. Although there is a high willingness to digitize and further automate production processes, it will take time to apply Industry 4.0 in a broader context. However, an Industry 4.0 Council with representatives from government, private companies and academic institutions can help to emphasize the importance of the concept and bring it automation closer to Myanmar companies.

6. Implications for the private and public sector in Myanmar

If those barriers can be overcome, Myanmar has a unique opportunity to leapfrog across industries. However, it is important for all stakeholder to act now, act together and act selectively.

> **Act now** – Myanmar needs to act now to catch up in the race of industrial competitiveness
  - Given the relative whitespace in automation and Industry 4.0 in Myanmar, a clear roadmap can be developed, identifying focus industries and clearly setting standards to avoid a heterogenous technology landscape, which lacks in compatibility
  - Other countries in the Southeast Asian region such as Thailand, Malaysia and Indonesia have started earlier with fostering Industry 4.0 and were able to build a track record of automation technology. By not being the first, Myanmar can learn from their worst- and best practices and avoid costly failures
  - Despite some bumps in the road, recently, foreign investors still believe in Myanmar's long-term development. Pushing innovative technologies in Myanmar will support re-gaining trust and attracting foreign direct investment

> **Act together** – Myanmar needs a strong collaboration between all stakeholders
  - The public sector, the private sector and academic institutions need to collaborate and work hand in hand to introduce Industry 4.0. The topic is too big to be left alone by one of the parties.
  - An Industry 4.0 council should be founded with selected representatives from each of the groups to develop a clear roadmap on how to further develop Industry 4.0 in Myanmar
  - The government should develop and monitor manufacturing standards to ensure that a sustainable Industry 4.0 landscape develops in Myanmar

> **Act selectively** – Industry 4.0 requires a lot of resources, so it is important to use those selectively and focus on certain application areas and industries
  - The Myanmar government should consider identifying focus industries, in which an increase in automation would add most value and then selectively support these industries to not stretch public resources
  - Industry associations should add Industry 4.0 on their agenda and discuss with its members whether it is something they would like to pursue and further investigate
  - Companies in Myanmar should identify a certain area in their production process they want to automate and then work to perfectionate that instead of immediately pushing large-scale automation attempts

Other countries in Southeast Asia (e.g., Thailand or Malaysia) have shown how Industry 4.0 can increase efficiency for companies and convenience for end-customers. Malaysia for instance has used a multi-layered approach, to foster automatization and digitization in the country. By following the above guidelines and looking at successful neighboring countries, Myanmar can develop its own national Industry 4.0 strategy to further drive prosperity.

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WE WELCOME YOUR QUESTIONS, COMMENTS AND SUGGESTIONS

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Through mutual trust and sustainable value added for our clients, we have become a longstanding advisor of major international industry and service companies as well as public institutions worldwide.

Our entrepreneurial spirit has shaped our growth and fueled our outstanding achievements since the early days of the firm. In short, being a game changer is in our DNA. With nearly 50 years of continuous growth behind us and 2,400 employees working in 34 countries, we are one of the leading players in global top-management consulting. We have successful operations in all major international markets including a strong footprint in Asia. Our 50 offices are located in the key global business hubs.

Roland Berger is the leading strategy consulting firm in Myanmar, working with both local and international companies as well as the government. We have contributed strongly to Myanmar's development by supporting clients across industries on various topics, such as market entry, strategic growth, organizational development and others.

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We want to make our clients more successful by identifying relevant human insights that feed into their business and development strategies.

About Delegation of German Industry and Commerce in Myanmar (AHK Myanmar)

Since early 2014, the Delegation of German Industry and Commerce in Myanmar (AHK) and its Yangon office act as the official representation of German business, commerce and industry in Myanmar, with a mandate from the German government.

On behalf of the German government and individual clients, the Delegation of German Industry and Commerce in Myanmar conducts market research and market entry advisory services, such as distributor and business partner searches or business delegation trips to Myanmar and Germany on tailor-made topics.

The Delegation of German Industry and Commerce in Myanmar fosters Myanmar-German business relations in both directions and also provides free and in-depth support for Myanmar companies that aim at expanding into the German market.

The Delegation of German Industry and Commerce in Myanmar works in close cooperation with the German-Myanmar Business Chamber (GMBC) and sector associations as well as the German Embassy in Myanmar. It is part of the global network of German Chambers Abroad (AHKs).

Since early 2019, the Delegation of German Industry and Commerce in Myanmar within the AHKs network also has the official mandate for German business interests in the markets of Cambodia and Laos.

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