DIGITALIZATION STRATEGIES FOR THE ARAB WORLD

Framework of Action

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1. Introduction

Digitization is, of course, a global phenomenon. Nonetheless, the discussion about its effects on society and the economy initially took place primarily in the West. This is not surprising, as digitization had its starting point in technological developments in this region. Nevertheless, this transformation will have the same, if not more dramatic effects – in terms of challenges and opportunities – for the greater part of humanity in the South.[1]

DIGITIZATION AS A WESTERN NARRATIVE

The techniques and technologies used in digitization (machine learning, robotics, blockchain) will be briefly described here and new organizational units of digital capitalism will also be outlined. The effects on the South must always be considered from two points of view. On the one hand, these elements will change value creation and socio-political contexts. On the other hand, digitization in the West will also have an impact: In the course of globalization and the changes to the structure of the world economy, a division of labor has developed between these two spheres, which is now being called into question by digitization.

By analyzing these effects, rough scenarios for the individual regions and countries of the Arab region can be outlined and initial indications are shown. Two emerging strategic levels are subsequently outlined that would make sense from the perspective of the countries of the South. The first level describes necessary adjustments to digitization, while the second level of strategy proposes measures that have a "game changing" character, i.e., that go beyond adaptation and could enable countries of the Arab region to actively shape and influence digitization in line with the requirements of the countries.[2]

Based on these findings, an overview of different sectors of the Arab economy will be given and effects of the digitization and possible strategies sketched.

2. New Technologies and Organizations

The following technical components will influence the content of the digital transformation phase:

2.1 Robotics/Cyber-Physical Systems (CPS)

In the European Industry 4.0 or the US Internet of Things debates, components – or cyber-physical systems – that resemble software, robots, or sensors can be distributed all over the world and be connected via the internet. The aim is to replace physical human work: While humans consist of a fixed number of "components," such as limbs and sensory organs, partially autonomous cyber-physical systems now form a kind of "community," whose members "come and go" as they wish or as the circumstances permit. They have the capabilities of "self-design" and "self-optimization" to a degree previously unknown in technology.[3] The status of automation today allows for the very precise handling of tools by robots. Currently, these robots are being fitted with more sophisticated sensors that allow them to verify the quality of their work and even sort out deliverables that do not meet quality standards. In the next step, robots and drones will cooperate in teams – just like humans – to solve difficult und unstructured tasks and issues.[4] The potential organizational crystallization point of this development could be the "lights-out factory," where no lighting would be needed for human workers doing night shifts, because production would be fully automated and run 24/7. Although human workers are still indispensable in many production processes today, the factory of the future could be a space where robots and machines are numerically dominant and humans no longer are. A limited number of humans may be involved in these spaces, working as inspectors or maintenance workers.[5]

ROBOTS THAT LEARN AND WORK IN TEAMS

1 On the topic of digitization of the South in the shadow of the Western work 4.0 debate: Al-Ani, 2017b. A whole series of publications have recently been added. For example, for the Arab region: World Economic Forum, 2018. In general: UNCTAD, 2016. Media echo in the MENA regions has picked up as a result of these studies: Mehi-Aldin, 2019.

2 Surprisingly, the discussion in the West is still very much focused on the adaptation role of workers rather than on their political, micro- and macroeconomic role. Arlt, Kempe, & Ostenberg (2017, p. 95), for example, come to the following conclusion based on an analysis of German media reports: "In the mass media debate about the work of the future there is a design theory that does not regard technical-economic self-running as a certain variant of design and certainly not as the result of decisions that could perhaps have been taken differently". (Own translation)

3 Jeschke, 2015, p. 279ff. On the Smart Factory: Markoff, 2015. For more on the unclear role of man in the lights-out factory: Al-Ani, 2017a, p. 563ff.

4 Jeschke, ibid.

5 "Many of the new production methods in this next revolution will require fewer people to work in the factory. Thanks to smarter and more skillful robots, it is now possible to carry out some lights-out production. FANUC, a major Japanese manufacturer of industrial robots, has automated some of its production lines to such an extent that they can run unattended for several weeks. Many other factories use processes such as laser cutting and injection moulding that work without human intervention. And the machines for the production of additives can be left alone day and night." (The Economist, 2012)

2.2 Machine Learning (ML)

Machine learning, which will be increasingly used in the coming years, is a sub-form of artificial intelligence and by no means new. ML involves the translation of a decision as a target function (e.g., "find/calculate data to be inserted in this field of the contract"); the consequent algorithm accesses a set of structured data built on similar cases. By comparing present patterns with the existing data, a probability-based decision is calculated.[6] The first concepts for this technology were developed in the 1940s as part of the war efforts. Even then, key actors were aware of the serious consequences this would have for workers in particular:[7] Robots would take over the physical work of humans, while ML would replace human decisions in working processes. Learning opportunities for machines have been massively boosted in recent years, not only by faster processors, but also by the vast amount of data that the internet provides. Most organizations have been preparing – albeit unconsciously – for the coming of ML: Due to the ongoing efficiency efforts of the last decades, workload has been increasingly translated into repetitive, predefined, and regulated work steps with defined outputs (Fig. 1).[8] When data on past decisions is available, these structured tasks can be substituted or augmented by ML quite easily. For example, loans can be granted based on previous credit decisions and legal decisions can be derived based on past court rulings. Of course, ML will not be usable immediately and everywhere. In most cases, humans (with the help of machines) will first have to prepare the data structures (data enterprise architecture) and "train the machine": The chauffeur drives the car himself until sufficient driving data has been collected and the navigation systems can drive autonomously.[9]

2.3 Blockchain

Blockchain is an encryption technology using a decentralized structure (distributed ledger) that can be used to transfer value (money) as well as any other content (files, contracts, etc.) without intermediaries (e.g., banks).[10] This technology solves the problem of how to facilitate trust on the web and prevent tampering. Blockchain enables automated processes and communication between machines

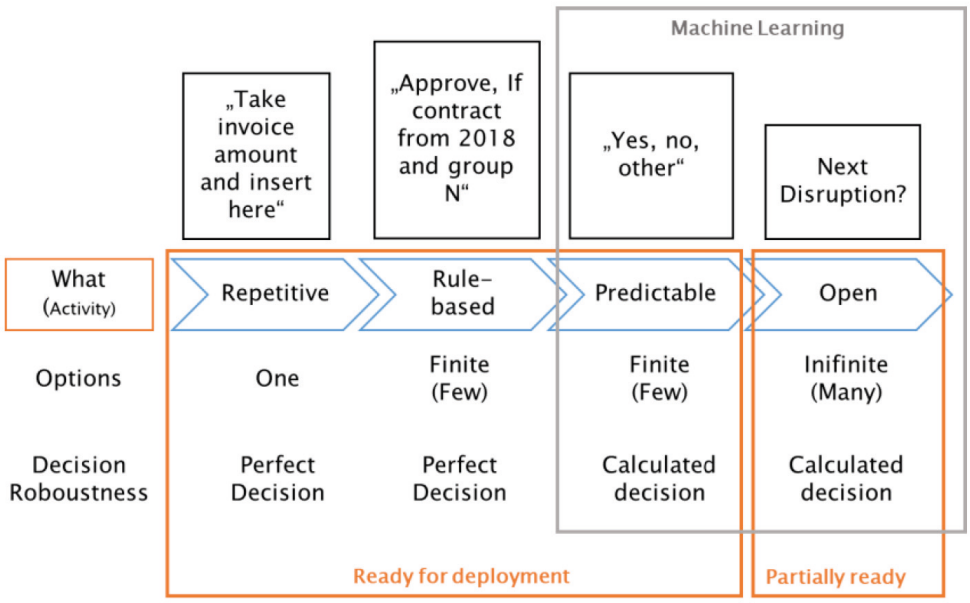

Figure 1: Work structure as a prerequisite for ML. / Source: acs-plus.

6 "A computer program is said to learn from experience 'E' with respect to some class of tasks 'T' and performance measure 'P' if its performance at tasks in 'T' as measured by 'P' improves with experience 'E'." (Mitchell, 1997, p. 2): The more experience E we have, the better we can solve the task T (measured by performance P).

7 Cf., for example, the letter from Norbert Wiener, the inventor of cybernetics, to the head of the American trade union, in which Wiener warns him of these developments and offers help in using this technology for employees (libcom.org, n.d.a.).

8 Al-Ani & Stumpp, 2018, p. 248ff.

9 This data generation strategy often uses crowdworking platforms or crowdworkers as surrogates for not yet mature algorithms: "Within professional organizations (companies, schools, hospitals) we see a trend away from tailor-made, unique solutions for every customer or patient towards standardization of service. Increasingly, doctors use checklists, lawyers rely on precedents and consultants work with methods. (...) Basically it is made available online after the systematization of expertise, often as a paid service, sometimes free and occasionally, but more and more often in the sense of the open source movement. There are already many examples of professional online service." (Susskind & Susskind, 2016)

10 Tapscott & Tapscott, 2016.

and machines as well as between machines and humans. These are based on predefined situations and are then automatically executed (smart contracts): The (autonomous) harvester orders a self-driving truck to transport the crop based on a contract and pays for it via a blockchain transaction. One can now imagine predefined workflows that run on a blockchain (smart contracts) and execute themselves in predetermined situations (date, money transfer, inventory). Where these blockchain-based workflows require decisions, ML can step in (is truck A or B nearer to the harvester?).

However, this technology is still in its infancy and has so far not been widely applied, with the exception of cryptocurrencies and some test applications. In particular, challenges with regard to scalability, governance, privacy, digital identity, and energy consumption have not yet been addressed, to name just a few. While solutions to these challenges are being worked on, it should be recognized that blockchain is a technology that requires a certain level of knowledge and skills as well as internet and energy infrastructures that could easily create or reinforce existing global inequalities.

2.4 Platforms

These are new types of organizations that mediate between customers and producers or between clients and contractors. Commercial platforms enable the exchange of goods and services, often by using ML and algorithms (finding the right contractor/customer for a company with a defined need/offering), and withhold a certain margin of the transaction for their services. Enabled by social media, there has been a rapid growth in such organizations in recent times. Not only can global platforms sell anything, anytime, anywhere, they have also given individuals, termed "crowdworkers", the opportunity to work on assignments/competitions/task packages regardless of their geographic location. One advantage of commercial platforms is that they usually do not own the means of production (these are owned by the producers: cars in the case of Uber, IT in the case of TopCoder, apartments in the case of Airbnb…) and that they can therefore respond flexibly and with variable costs to customer requirements.[11] Although a playbook of platforms has not yet been fully defined, initial "behavioral patterns" can already be identified. First, platforms strive for size: The goal is to lock in the customer/producer so that he/she has no reason to move elsewhere. Platforms also aim at building a comprehensive data pool that can be used for ML: Data on all the participants' transactions and resulting recognizable behaviors can be collected openly or covertly.[12] Once the data sovereignty of the platform has been secured, competitors – even if they have a better business idea – will find it very difficult to compete, as they have no access to crucial data on customers and markets.[13]

INTERMEDIARIES BETWEEN CUSTOMER AND PRODUCERS

Aside from this "winner takes all" challenge, the highly competitive environment platforms create for crowdworkers could lead to poor working conditions and undermine livable wages for people offering their services and labor on these platforms. The transboundary character of these platforms also poses pressing questions, for example, with regard to establishing minimum standards for working conditions, how these minimum standards could be enforced, or how a minimum wage could be defined in an international environment. Efforts have therefore been made to better understand the implications of the platform economy for crowdworkers and to develop approaches that could provide fair working conditions on platforms.[14]

2.5 Augmented Reality/Virtual Reality

Augmented reality (AR) stands at one end of the spectrum, while virtual reality (VR) stands at the other. With the power of computer vision and ML, these immersive technologies were born in the middle of the last century from computer scientists' efforts to create a version of the world that was unreal, but usefully so.

AR and VR technologies have evolved dramatically since the 1960s to reach new heights of impressiveness for the user. Overlaying digital content and computer-generated media onto a live view of a physical scene, thereby blending virtual and physical objects into one scene, makes it seem as if a new reality has been generated when viewed on camera. Generally, enhancing the reality of a physical scene by augmenting it with virtual additions is labelled augmented reality (AR). Examples of augmented reality

11 For more on the types of commercial platform that have emerged recently (e.g., industrial platforms [Siemens, GM], advertising platforms [Google], cloud platforms [Amazon Data Centers] and lean platforms [Uber]) see Srnicek, 2017, p. 36ff.

12 Srnicek, 2017, p. 97

13 The Economist, 2018.

14 Al-Ani & Stumpp, 2016

experiences include Snapchat lenses, the IKEA place app and the well-known game Pokémon Go. AR may require smart glasses or can simply run on smart devices equipped with cameras and an internet connection. AR has a great impact on many industries, such as providing rich media educational content on top of textbooks, presenting user guides and informational content over the view of a machine, displaying pieces of furniture in an empty room, and augmenting building designs in urban planning. Further, AR can help in marketing and promoting tourist sites in the MENA region, enhancing the quality of edtech platforms by attracting young users using new technologies, developing new concepts for arts and culture exhibitions, and linking online media with traditional press, among others. In contrast, virtual reality (VR) can mask a complete physical scene and replace it by a virtual environment such as the ocean or outer space, in which the person feels totally removed from their real surroundings and immersed in this new environment. This technology relies on VR devices such as HTC Vive, Oculus Rift and Google Cardboard.

3. Impacts: Robots Moving Southwards

The technologies and forms of organization outlined above are having an impact not only on Western societies and economies, but also on Arab countries. The first trends are already discernible:

THE DIMINISHING IMPORTANCE OF WAGES

- Labor costs will become less important: The lights-out-factory can be located anywhere, including in the West. This is probably even more likely in this region, because the sophisticated technical capabilities necessary for the development and maintenance of the complex machines are in place in these countries. In the textile and fashion sector, for example, this is leading to initial movements back to the West and a potentially dramatic loss of jobs in Arab countries.15 A German sports fashion manufacturer recently opened its first shoe factory in Germany, with only 15 employees;[16]

- Time-to-market will become more important: Flexibility in production and reaction times are essential, especially for production sites. New products will be designed faster with the help of platform-based crowdworkers and manufactured or printed out in the store or even at the customer's premises or in lights-out factories;[17]

- Less traditional outsourcing relationships/supplier chains: Simple activities could be carried out by ML or machines and will not have to be relocated to low-wage countries (call centers).[18] In addition, some products (cars) will contain fewer parts (dematerialization: Software becomes more important than physical components) and therefore require fewer suppliers;[19]

- Platforms from the fields of trade, mobility, industry, and education based in the West or China will enter Arab countries without incurring the usual set-up costs and will thus be able to become active relatively quickly.[20] Margins can still be earned even in low-income countries;[21]

- Access to means of production: Through improved access to knowledge (via learning plat-

15 The Economist, 2017b.

16 Busse, 2017.

17 Hofer, 2018.

18 The recent developments in India's It sector are very instructive: "Since the 1990s Indian firms have carried out back office tasks, and IT services like data entry, running call centres and testing software for foreign companies at cut-price rates by throwing cheap labour at them. But as machines become adept at this repetitive, rule-based work, the low-skill jobs – where the bulk of Indian IT workers are employed – are the most at risk." Gent, 2017.

19 The example of Volkswagen: FokusOnline, 2016.

20 For example, education (edx.com) and media platforms (Hufpo).

21 The 4–5 billion people who are hardly integrated into the economic process today are of course a worthwhile market for Western companies/platforms: Prahalad, 2014, p. 3ff. But platforms from China (Alibaba) will also spread to the South: Alibaba's target is to acquire another one billion customers outside China: Müller, 2017.

forms) and to blueprints (via industry and knowledge platforms), a certain "access democratization" can be achieved in principle.[22] Arab countries could gain better access to production plans and to the skills to "print" products on site.[23]

- At the same time, the transformation phase over the next 10–20 years may open new business opportunities for Arab countries. Crowdworkers and platforms from the region could help to set up data structures for ML. They could also take over production sites for products from the West that no longer make sense there (combustion engines) but are nevertheless exported or used in a transitional phase in the South.[24]

All in all, this is a rather mixed picture, in which concerns about the possible loss of entire production lines that dominate export industries today (e.g., the textile industry for Tunisia and Bangladesh) are beginning to grow stronger.[25]

WESTERN AND CHINESE PLATFORMS WILL ENTER THE ARAB MARKETS

4. Scenarios: the Good, the Bad, the Ugly

The effects of digitization described above may cumulatively lead to the following descriptive scenarios, which could be encountered – perhaps simultaneously – in different forms in different countries in the Arab region:

WILL ARAB NATIONS BE OWNERS OF PLATFORMS OR JUST PROVIDERS OF SERVICES?

- Complete digital transformation: Important industries are automated, the population is either redirected into other sectors or is supported by a basic income – financed by taxes from lights-out factories – and works in noncore economic areas (politics, administration, education, culture…). Active participation in the transformation and takeovers of mature/outdated traditional industries from the West for export for a limited time scope (e.g., building and exporting carbon emission cars until electric cars become a global phenomenon) make it possible to buy time and earn funds to enable the transition. Some nation states peacefully divide themselves into regions during this transformation to increase cultural and ethnic cohesion;[26]

- Partial disintegration: In this scenario, nation states in the Arab region come under pressure, as successful digitization crystallizes only in some urban centers, while other regions or even entire states are not successful. [27] This is a very likely scenario, as the break-up of individual Arab nation states has already begun (Lebanon, Sudan, Iraq, Libya, Syria, Yemen).[28] In the meantime, global platforms take over the infrastructure, provide basic services, and offer some stability;[29]

- Digitization fails: Entire nation states break up. Apocalyptic no-go areas are created, which must be isolated by robots and drones.[30]

22 Al-Ani/Jeschke, 2017, p. 121. On open source access to construction plans in the agricultural sector, for example, see: open source ecology, n.d.a.

23 On the possibility of printing electric cars: Ramirez, 2018.

24 This is probably the interpretation of the strategies of Western automobile companies in Egypt, for example: Mohammed, 2018.

25 The Economist, 2017b.

26 For more on this model, see Keynes, 1932, on the financing of companies by the lights-out factory, see Moravec, 1990, p. 133ff.

27 Al-Ani, 2015.

28 This disintegration was already foreseen by Arab economists in the 1990s: Hasseb et al. 1991, p. 281.

29 Fictional scenarios for Iraq are described in Blasim, 2016.

30 In Afghanistan an almost lab-like situation for robot warfare seems to be opening up at the moment: Sirius, 2015, p. 259. For more on the warning against ungovernable cities by the CIA, see Turse, 2017.

5. Strategies: Adaptation or Shaping?

Strategies for digitization in the individual MENA countries can roughly be divided into two categories: into measures that either gradually or rapidly adapt the existing institutions to meet the needs of digitization. However, these strategies leave the role the country will play in the digital economy unclear. In view of consolidation and monopolization by platforms and their expensive technologies, it is plausible here that countries might "only" become users of technologies and suppliers of services to these platforms but will no longer be able to design technologies and govern platforms (and thus the data).[31] In order to play a shaping role, additional measures will be necessary.

5.1 Adaptation Strategies

- Microventures/change management at organizational level: This covers the adaptation, i.e., the automation of production and service processes that each commercial, political, and public-sector organization will have to undergo. Often, new units will be founded in parallel to the traditional organization. These will offer or implement innovative products and digitized work processes and sooner or later replace the traditional organization. However, the gradual transformation will not be in vain and the traditional organization will have to finance it. This will also determine the transformation's budgetary framework and available resources, which are limited in most Arab countries. Here, it would make sense to utilize the experiences of Western companies to keep transformation costs low. In addition, Arab countries could aim to adopt leap-frogging approaches: Certain development stages could be skipped over and a higher level of (digital) organizational effectiveness targeted directly. These strategies have been demonstrated in Sub-Saharan Africa, where, for instance, payment transactions are offered by dedicated payment platforms and the development of the fragmentary banking sector has become less important.[32]

- Crowdworking and open manufacturing facilities: In principle, producers may be connected via virtual platforms to any commercial platform or open manufacturing platform.[33] Individuals may gain experience and earn money on these platforms while staying in their home locations. This could open up new sources of skilled employment and contribute to a reduction of unemployment, brain drain, and migration. What is still unclear is how crowdworkers from the Arab region can assert their interests and counteract power asymmetries on these platforms. This would probably only be possible by owning platforms, developing cooperative structures, and joining global trade unions;[34]

- Edupunks/open educational resources: As crowdworkers and citizens become producers and innovators, they will need ongoing access to knowledge and blueprints. Learning will become a lifelong process that requires individual learning paths and supports people's sometimes erratic and unpredictable biographies. The individual will become an edupunk, somebody who creates things and value with the help of free knowledge.[35] In line with this, states must open their knowledge institutions and make access free and available 24/7.[36] In addition, states would need to design social security and support systems such that they allow individuals to adapt to changing framework conditions and to maintain decent living conditions, e.g., to cope in phases without substantial income (for example for child care) or phases of education (see below).

- Digitization of public processes. Here, administration processes are digitized and thus allow for transparency and user-centric interfaces. This does not necessarily mean that these processes must become more participatory or even democratic.[37] At a minimum, open source software should be used by public administrations to enable the development of IT applications by citizens.[38]

31 These tendencies towards monopolization of new automation technologies were anticipated by Marx in his "machine fragments", which may explain the renaissance in Marxian analysis in these times of digitization: Lotz, 2014.

32 However, this also raises the question of what the employment situation will be like in an economy that skips certain phases of industrialization: Al-Ani, 2017b.

33 For more on open manufacturing: Bauwens, Mendozan, & Iacomella, 2012, p. 195.

34 Al-Ani & Stumpp, 2016. For more on platform co-ops see Scholz, 2016.

35 For more on this term see Kamenetz, 2011.

36 For more on edupunk strategies see Al-Ani, 2017c, p. 235ff.

37 The good performance of Arab administrations in digitization is remarkable, despite the authoritarian orientation of most regimes: UN Department of Economic and Social Affairs, 2016, p. 154ff

38 O'Reilly, 2009.

- Social policy: Disruptive changes in traditional industries will make it necessary to support affected groups with adequate social policies that also ensure the cohesion of society and the nation state.[39] One successful example of this in the South is the Brazilian Bolsa-Famila program under Lula, which brought financial support and healthcare to the poorest groups of society. Yet these programs could overburden poorer Arab countries and make them even more dependent on transfers from the West. Development aid money would then be redirected to these countries, and while it will not initially be value adding, it will at least increase domestic demand. The richer countries of the Gulf already have programs that are effective basic income programs and in these countries mainly foreign workers will be affected by digitization.

ENABLE OPEN LEARNING

5.2 Shaping Strategies

- Regional platforms: The challenge for Arab countries will be to establish their own platforms in areas such as mobility, health, financing, and trade.[40] Otherwise, they will become pure suppliers of such global structures, they will have little access to data from these platforms, and they will therefore find it increasingly difficult to create or market their own services and products. The unequal world order will thus be translated into platform structures. To build "Arab" platforms, the individual countries will probably also have to consider regional strategies (Northern African market ...).

- Participatory platforms: To achieve the greatest possible employment effects and to obtain positive effects on social cohesion, digital platforms that provide products and services using cooperative processes and mechanisms can be created.[41] In principle, platforms should be especially suited to establishing cooperative working methods: Self-directed producers could contribute their own resources and assets and then become co-owners of these platforms to the extent of their participation. In addition, new governance processes could then be established, making these platforms more competitive with traditional companies and also culturally compatible (i.e., because they use decision-making processes typical for rural communities etc.).[42]

- Technology hubs/communities and charter cities: If capital- and data-intensive technology leads to concentration processes, Arab countries must also establish such centers or hubs, even if it creates further imbalances in national economic structures. However, this idea could also be developed in a more progressive way: For instance, new cities or hubs could be built that could also accommodate refugees and receive relief in return.[43] The charter city concept also plays an important role in this context. The example of Hong Kong and its role as a laboratory for the transformation of the Chinese economy shows that it is important to define which multipliers should emanate from these hubs (Digital Agriculture...).[44]

39 For more on the discussion about basic incomes as a central element of digitization processes, see Brynjolfsson & McAfee, 2014, p. 286ff.

40 Currently, richer Arab countries are active as financers of global platforms like Uber and other mobility platforms. However, their involvement is limited to their role as investors. No transfer of experience or operational involvement seems to take place. For more on the role of Arab investors in mobility platforms via the Japanese tech giant SoftBank, see The Guardian, 2018.

41 Scholz, 2016.

42 For example, electing individual functionaries by drawing and appointing executive powers. For more on the problem that digital cooperatives do not have access to the capital market today, see: Wistreich, 2015.

43 This would mean founding cities/regions "(...) that are designed to accept refugees, and finance the process by having the refugees export goods and services on preferential tax rates; which would basically be a subsidy provided by the first world countries as a way of getting the refugee problem solved." (Yates, 2017)

44 For more on the charter city idea coined by Romer: Schröder, 2012.

6. Changing Labor and the Future of Work

The digital technology trends outlined in section 2 will fundamentally alter labor as we know it today, with precursors of these changes already visible today. A glance at the current literature on the future of work reveals three major areas of transformation.

TRADITIONAL JOBS ENDANGERED

6.1 Changes in Labor Markets

One of the most cited – and controversial – studies on the future of work estimates that within the next decade or two, around 47 percent of total US employment is at high risk of automation, in particular in the low-skilled and low-wage labor segment.[45] The authors conclude that tasks requiring social intelligence are rather unlikely to be substituted by computerization and that the current polarization trends[46] in the labor market will likely not persist. Other studies make similar arguments, underscoring that middle-skilled jobs involving both technical and interpersonal skills will persist and may even acquire a broader range of tasks when assisted by technology.[47] However, these analyses mainly focus on industrialized countries. For developing countries, the World Bank paints a different picture: Here, a greater polarization of the labor market due to computerization appears likely. The World Bank estimates suggest that, from a technological standpoint, two-thirds of all jobs in developing countries could be susceptible to automation.[48] On the other hand, digital technologies may lead to the creation of new employment opportunities in innovative industries and service sectors in the global South. In sum, concrete numbers of jobs that will be lost and created due to digitization remain highly speculative. However, much speaks for the assumption that the effects of digitization will challenge labor markets worldwide and that skill profiles combining technical literacy, personal and social skills, and creativity and adaptability may become more and more important.

THE EFFECTS OF DIGITIZATION ON ARAB COUNTRIES

"The technical automation potential in the six Middle East countries (Bahrain, Egypt, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates) is only slightly below the global average and benchmarks of advanced industries.

We estimate that 45 percent of the existing work activities in the labor markets of the six Middle East focus countries are automatable today based on currently demonstrated technology. This is only slightly below the estimated global average of 50 percent (...). Notably Egypt displays the highest potential share at 48 percent, whereas Saudi Arabia and Oman have a lower share of automatable current activities at 41 percent in this sample. Overall, the regional average is at similar levels as the US at 46 percent or the 'Big 5' European countries (France, Germany, Italy, Spain, and the United Kingdom)."

Source: World Government Summit/McKinsey: The Future of Jobs in the Middle East, 1/2018, p. 8f.

6.2 The Creation of New Occupations

Aside from the demand for new sets of skills, digitization will also create new occupations that require specific training. One example illustrating this trend is already visible today: LinkedIn's 2017 U.S. Emerging Jobs Report[49] found that machine learning engineers, data scientists, and big data engineers rank among the top emerging jobs – occupations hardly known ten years ago and now sought by a wide range of industries. But digital platforms and big data will not only create new occupations in the high-skilled, high-paid segment, but also in the mid-range segment. One example is the emergence of commercial content moderation as a new occupation in both industrialized and developing countries alike.[50]

New jobs that could be created in the Arab region would then also focus on the digital sector. As a prerequisite for essential machine learning, Western

45 Frey & Osborne, 2013.

46 The polarization of labor markets is generally understood as a shift towards both low-skilled, low-wage and high-skilled, high-wage employment, while the middle-segment is hollowed out.

47 Autor, 2015, pp. 3–30.

48 The World Bank, 2016a.

49 LinkedIn's 2017 U.S. Emerging Jobs Report, 2017.

50 Roberts, 2017.

companies need to create comprehensive data enterprise architectures that retrieve data from many different systems/sources and arrange them in a logical structure. This service usually requires the manual structuring and curating of data, giving companies that have a sufficiently large and cost competitive work force the upper hand, especially with respect to cost conscious Western SMEs.[51] Western companies in general will require additional resources in the areas of IT and creativity for the digital transformation ahead, creating opportunities for Arab talents who could be connected via platforms (see below).[52]

In addition, in the transition phase towards a digitized platform economy, it would also make sense to focus on traditional industries that will be migrating from the West due to technological advances and ecological regulations, but that could have a market in Asia and Africa until approximately 2030 (e.g., the automotive industry).[53]

6.3 Working with the Crowd

Another major labor trend in digital economies is the fragmentation of tasks and their completion by a crowd of networked individuals who are often located in many different places rather than by only a few individuals. Companies use crowdworking to access a wide range of skills and competencies so that tasks are done flexibly and quickly and to strengthen innovation. Crowdworking is usually organized via online platforms and can take many different forms, from low-skilled microtasks that are sometimes only worth a few cents to larger, more complex projects with higher payments.[54] This illustrates the up- and downsides of crowdworking: On the one hand, it can offer opportunities for self-organized, independent, creative, and still adequately remunerated work. On the other hand, the use of microtasks and the high competition among crowd-workers could lead to low incomes and low worker identification and satisfaction. Moreover, as crowdworkers are usually self-employed, they bear the risk of losing their incomes if they are sick, have to care for a family member, or otherwise cannot continue their work. But again, context matters:

CROWDWORKING ON PLATFORMS AS A JOB CREATOR?

Many crowd-workers do not completely rely on income from crowdworking, but rather see it as an opportunity to acquire additional earnings, to exercise entrepreneurial spirit, and to learn and apply certain skills.[55] However, when relying on crowdworking as their main source of income, crowdworkers often find it difficult to cover their expenses.[56] Crowdworking therefore entails both benefits and risks for workers, especially with regard to social security, labor rights, and work-life balance.

In summary, digitization will change the nature of work profoundly throughout the world, prompting shifts in required skills, the decline of existing occupations, and the emergence of new ones as well as new models of employment and cooperation. The challenge for policy-makers – in particular in the areas of labor, economic, education and social policy – will be to create conditions that reconcile these developments and innovative forces within the economy with social security rights and socio-economic development objectives.[57]

51 See, for example, the Smart Tunisia platform, n.d.a.

52 See the example of the Tunisian platform Think.it, n.d.a.

53 For this transition phase see: Rifkin, 2011, p. 259ff.

54 De Stefano, 2016.

55 Al-Ani & Stumpp, 2018.

56 Berg, 2016.

57 A solution could be the development of global employment platforms that are adaptable to these changes and are governed by ethical and political standards as laid out by the ILO: Shell and Graham, 2019.

7. The MENA Challenge

7.1 Agriculture

7.1.1 Size and Relevance of the Industry

The agricultural sector accounts for approximately 8.2 percent of total Arab gross domestic product (GDP) and employs one fourth of the total workforce in Arab countries.[58] However, its economic relevance varies significantly between the Arab countries. While in the countries of the Gulf Cooperation Council (GCC), the agricultural sector plays a rather minor role – both for employment and food security – it is of high importance for countries like Egypt, Jordan, Morocco, and Tunisia. In times of economic stress, the agricultural sector has often proven to be an important buffer to absorb surplus labor.[59] Yet, the scarcity of arable land and water are major limiting factors for the expansion of the agricultural sector in Arab countries.[60] Therefore, sustainable agricultural development – which means providing attractive employment opportunities, being competitive on world markets, and ecologically sound and resilient towards the adverse impacts of climate change – requires major structural and technological reforms in many Arab countries.

7.1.2 Likely Effects of Digitization

Digital technologies offer a wide range of opportunities to make optimal use of the scarce land and water resources in Arab countries. So-called precision farming has already gained wide attention in the region. The term refers to ways of farming using modern digital technologies, such as sensors, GPS, and remote sensing, so that farmers can efficiently manage water, fertilizers, and pesticides in order to obtain optimal yields. Smart irrigation systems could increase water efficiency in the agricultural sector and significantly aid adaptation to climate change impacts such as shifts in seasons and rainfall patterns as well as decreasing precipitation and soil moisture. Digital solutions can provide farmers with the latest weather forecasts, assist them in decision-making, and provide them with information and advice on plant health. All these applications could help increase productivity in the agricultural sector and improve the quality of agricultural products – and therefore strengthen rural livelihoods in the Arab region. Moreover, digitization offers farmers new ways of commercializing their products and improves the links between buyers and sellers along the agricultural production chain.[61]

SMARTER AGRICULTURE WITH LESS JOBS

7.1.3 Sector-Specific Approaches to Exploit Benefits and Minimize Risks

- Educate farmers about digital technologies that could support them in crop planning and monitoring, as well as increasing plant and animal health etc., and engage them in the development of technologies and platforms that suit their needs and contexts
- Design and implement precision farming projects and smart irrigation in combination with traditional knowledge and farming methods;
- Develop open source agriculture platforms that provide blueprints for necessary machines to be reproduced with local materials;
- Create agricultural market platforms enabling farmers to obtain market information and market/trade products

7.2 The Textile and Fashion Industry

7.2.1 Size and Shape of the Industry

For some Arab countries, this industry makes up a significant percentage of their exports (40 percent for Tunisia) and plays an important role in employment (17 percent in Egypt).[62] Moreover, the market seems to have a specific geographic orientation: MENA exports mainly go to Europe. Growth has stalled since the millennium.[63] Interestingly, there has been little branding of the Arab textile industry to date, although this is intended to change with the creation of an Arab fashion council, which aims to

58 IBRD/World Bank, 2013.
59 Santos & Ceccacci, 2015.
60 Woertz, 2017.
61 Deichmann, Goyal, & Mishra, 2016.
62 Abdallah et al., 2012, p. 13ff.
63 Someya et al., 2002.

establish an industry based on "creative knowledge" and to generate "20 Million jobs for women."[64] Notably, this initiative aims at establishing a kind of global division of labor among Arab countries, where the North Arab region supplies raw materials, the Levant becomes a manufacturing cluster, and the Gulf countries focus on retail and merchandise.[65]

7.2.2 Digitization and the Textile Industry

ENTER THE SEWBOT

Although digitization and robotics are not explicitly mentioned in this initiative, they will have a severe impact on the industry, especially on manufacturing. Currently, robots – sewbots – can produce towels, pillows, rugs, and other rectangular goods. Progress in robotics will minimize human capacities in the production process significantly, as robotic sewing machines will be able to reproduce any piece of clothing within the next 5–7 years.[66] This would mean the loss of the Arab textile and fashion industry's competitive edge, mainly low wages, while its other factor, closeness to Europe would also become less important.

Until recently, the use of robotics in the textile industry was limited as fabric still behaves unpredictably when moved around. This problem seems to have been overcome now and a massive increase in the use of machines is to be expected.[67] These machines will also enable a "mass bespokeness," in which customers will chose a style and sewbots will make them to fit individual sizes.[68]

At the next level, it now seems possible that some items will be printed in clothing shops using 3D printing devices or even at home – as is currently possible for shoes – thus disrupting the entire distribution and marketing chain.[69]

Both these developments play into the changing demand for fashion, which is more into "see now – buy now," leading into ever shorter turnover cycles.[70]

7.2.3 Sector-specific approaches to exploit the benefits of digitization and minimize risks?

- Create Arab design brands
- Develop automated production processes that print out clothes at the customer's site: design, produce, and ship any item of clothing anywhere within 48 hours
- Link textiles with other industries (chemistry and electronics) for innovation (i.e., heat reflecting or transmitting textiles)
- Develop national transition plans (taking the Turkish fashion industry as an example)

7.3 Trade and Commerce

7.3.1 Size and Relevance of the Industry

The population of the MENA region is growing rapidly: In the Middle East alone, it is expected to reach approximately 500 million by 2100. More than half of these individuals are estimated to be under the age of 24 years old. Hence, people in these countries are more likely to adopt new technologies and be more tech-savvy than the average consumer. Yet despite the rapid technology adoption in the region, the growth of online payment systems continues to be slow; this has resulted in huge untapped potential in e-commerce.[71]

The MENA region's top e-commerce spending categories include the purchase of mobile phones, payment of utility bills, and the purchase of flight tickets.[72] In the majority of the MENA region countries, excluding Qatar, cash on delivery remains the most common form of payment. Credit card penetration remains lowest in Egypt, accounting for only 16 percent of all transactions in the country. Despite lagging behind its regional neighbors with regards to both banking penetration and the use of fintech solutions, Egypt currently has the largest number of online shoppers,

64 Cuthbert, 2018.
65 AFC, 2017.
66 The Economist, 2017b.
67 Ibid.
68 Ibid.
69 See the example of Adidas reopening its first sneaker factory in Germany, which is fully automated (The Economist, 2017a) and will print out shoes in its shops (Millsaps, 2018).
70 McKinsey, 2017.
71 PWC, 2016.
72 Payfort, 2016.

which is possibly due to its population size.[73]

Between 2013 and 2016, consumers became more open to the idea of shopping online, with 23 percent claiming to make online purchases on a monthly basis in 2013 as opposed to 29 percent in 2016. Surveys by PWC have concluded that the majority of consumers who shop online do so due to the cheaper prices. Other reasons include the wider product selection. Surprisingly, increased convenience was among the least cited reasons for the use of online shopping.[74] In terms of channel preferences, desktop PCs remain the most used channel, but mobile devices are catching up and are expected to surpass desktop sales in the long run. E-commerce in the MENA region is expected to reach approximately US $20 billion by 2020, with the GCC countries (UAE, Bahrain) leading the charge. Fintech has played a rather significant role in the growth of digital payments in the region and as the services offered begin to evolve, the e-commerce space will continue to grow.[75]

INTERNATIONAL PLATFORMS ENTER THE COMMERCE AREA

Souq.com (which was acquired by the online marketplace giant Amazon) is among the e-commerce leaders in the MENA region.[76] Despite the platform's growth, the sector as a whole still remains in its early stages due to several obstacles. These include issues arising from the lack of standardization in the postal address system in the majority of MENA region countries. Concerns over security and data privacy have also hindered the growth of e-commerce here, especially in light of the countless data breaches that have taken place over the past several years. An operational obstacle is that the majority of the MENA region populations do not have credit/debit/online payment cards, leading retailers in the region to operate through cash on delivery, thus increasing retailers' risks and costs.[77]

As the e-commerce space continues to grow, consumers are expected to continue adopting the use of digital payments for an added level of convenience. In the long run, mall operators may see store rent prices fall in order to stay competitive and relevant in the commerce space in general. Luxury retailers are expected to be the least affected by the increased adoption of online payments, since consumers would much rather be able to see and touch these types of products prior to making a purchase.

7.3.2 Likely Effects of Digitization

Although the effects of e-commerce have not been fully felt in the MENA region yet, there are several factors that serve as indicators of the impact e-commerce has had on the retail space. For instance, the growth of store-based retail sales fell from approximately 12 percent in 2015 to 8.3 percent in 2016. While retail sales are expected to rise again, the rise is also expected to be marginal, reaching 9.8 percent by the end of 2019.[78] Furthermore, e-commerce may lead to a lower number of physical stores in the long run, as retailers attempt to cut costs by selling online only. This is already starting to happen on a small scale and is expected to continue as adoption of digital solutions and online payments increases. This may lead malls to begin lowering rent prices in order to retain or attract new retailers and remain competitive in that space.

For the jobs market to keep up with the growing popularity of e-commerce in the region, MENA countries will have to invest in IT education so that they have individuals with the necessary skills to further develop digital solutions without having to depend on foreign digital agencies. In 2015, the Middle East had an estimated shortage of 100,000 skilled IT networking staff, highlighting the urgent need to transform university curricula to curb this digital talent shortage.[79] E-commerce will not only benefit skilled IT professionals; it could also lead to more job opportunities for micro-entrepreneurs who can sell their goods via online platforms. This will result in more economic inclusion and allow MSMEs to become more integrated into global value chains.[80] E-commerce may also have a positive impact on female employment in the region, as it has the potential to create a greater variety of positions with more flexible working environments for those looking to work from home – for example, in startups or as customer service agents. The sector will also lead to more employment opportunities for mid-skilled staff who manage inventory at fulfillment centers and warehouses.[81] Furthermore, e-commerce will necessitate analytical and technical mindsets, as data analysts will be sought after to make sense of the large amounts of customer data that will become available to companies.

The rise of rating and review websites may also contribute to an increase in e-commerce sales due to

73 Ibid.

74 PWC, 2017.

75 Payfort, 2017.

76 Amazon recently decided to enter into the Arab market with its own brand. Kim and Levy, 2019.

77 PWC, 2016.

78 Singh, 2017.

79 Unwala, 2017.

80 The World Bank, 2016b.

81 Mandel, 2017.

the greater transparency they create. Such website features aid customers in identifying whether or not a product/service fits their needs based on the experiences of other consumers, which results in more money and time saved. The popularity of online reviews is also creating job opportunities for social media influencers, who use their large following to drive up the sales of products that they review and recommend.

Another digital trend that will impact employment in trade and commerce will be the rise of omnichannel retailing strategies in the region. Omnichannel retailing places equal emphasis on offering customers a seamless experience in both physical and digital forms. An example of this would be a mobile app created by the retailer to help shoppers find what they are looking for as they browse through the physical store in person.[82] In the UAE, certain retailers have installed a digital "Magic Mirror" in their stores. This allows customers to perform a range of activities, such as digitally "trying on" a number of clothing items without having to do so physically or getting skin care recommendations based on the mirror's facial analysis. The use of technology in brick and mortar stores will create new jobs for "customer experience leaders," who will be responsible for streamlining the customer experience across the digital and physical spheres.[83] Furthermore, technology professionals who have the ability to create the innovative apps and devices to elevate the customer experience will also be in demand, as will the workers required to operate and fix these devices.

7.3.3 Sector-Specific Approaches to Exploit Benefits and Minimize Risks

- Move more social/government services on to online platforms. This will help curb some forms of corruption (due to easier monitoring/tracking), in addition to streamlining service provision and minimizing bureaucracy. This is already being implemented in Egypt to a certain extent, with websites such as Khadamaty.com providing individuals with options such as getting a birth, marriage, or divorce certificate online or obtaining a gasoline smart card online.[84]
- Support local outlets and shops by providing local high tech platforms that offer marketing channels and supply chains and can be used to enhance digital transformation. [85]

HIGH TECH COMMERCE PLATFORMS COULD CONNECT WITH LOCAL OUTLETS

- Implement regulations that protect consumers on online platforms, in order to boost consumer confidence, and in doing so increase consumer uptake of e-platform models.

7.4 Financial Industry

7.4.1 Size and Relevance of the Industry

It is estimated that less than one in five individuals in the region currently have a bank account.[86] Accordingly, the majority of the region's population does not use any type of banking services. The number of deposits made in the MENA region remains significantly lower than the average number of deposits made in high income countries: There are fewer than 1,000 deposits per 1,000 individuals in the MENA region and approximately over 2,500 deposits per 1,000 individuals in high-income countries. Lebanon currently leads the region with regards to the total number of bank branches (30/1,000 adults) followed by Oman (24/1,000 adults), the UAE (20/1,000), and Jordan (17/1,000).[87]

Cash remains the preferred method for everyday payments in MENA countries, with physical currency accounting for approximately 80 percent of all transactions in the region.[88] The preferred method for online transactions is also cash, with 64% of MENA customers opting for cash on delivery. Qatar is also the only country in the region where payments with credit cards are higher than cash-on-delivery payments.[89] It will most likely remain that way until consumers in other countries become more acquainted with digital payments and feel that the service is sufficiently secure for them to use.

In terms of alternative financial offerings, the MENA region has historically suffered from a lack of diversification in nonbanking financial services, which has resulted in high transaction costs that deter poten-

82 AT Kearney, 2016.
83 Kaufman, n.d.
84 See Khadamaty.com for a detailed overview of the services being offered
85 See the example of the Metro Group, which offers such a platform for Indian retailers: Agrawal, 2018.
86 Payfort, 2016.
87 CGAP, n.d.
88 Euromonitor International, 2013.
89 Payfort, 2016.

tial financial/banking customers. One way to tackle this issue is through the diversification of the services offered by nonbanking financial institutions, such as leasing, factoring, and mortgaging.

Several MENA region countries have been working on implementing leasing as a financing option, but for the most part, leasing remains underdeveloped in the region relative to other parts of the world. The factors that have been hindering the growth of leasing in the region are the lack of credit information infrastructures, low enforcement of creditor rights, and an underdeveloped regulatory environment.[90]

With regards to mortgaging, Egypt is the world's fastest growing mortgaging market, a development that has been mainly driven by steadily increasing demand. There was an annual expansion of 18.9 percent in mortgaged households in 2017. The move towards better home financing in Egypt was driven by the construction of illegal housing units throughout the country due to a lack of affordable housing. In an attempt to counter that trend, the government set up a better home financing system in order to combat the rise of illegally built homes.[91]

Interest in factoring has been on the rise in the MENA region: The first regional factoring conference was held in Dubai in 2016. Banks in the region expect factoring to open new opportunities as well as to increase financial inclusion levels as a whole. That being said, factoring in the region remains in its infancy stages and it is still unclear how much it will grow over the coming few years.[92]

Over time, the rise of nonbanking financial services may also contribute to the creation of new hybrid jobs. For instance, factoring and leasing will necessitate professionals that have a mixture of both financial and legal expertise, enabling them to navigate the complicated regulatory framework.

7.4.2 Likely Effects of Digitization

Once felt, the effects of digitization will likely challenge the banking sector in the region as a whole. Banks that choose not to adopt the new technology will most likely fall behind, as consumers begin to gain a better understanding of fintechs and the services they offer, which is expected to lead to higher adoption rates among consumers in the region. The most notable trends in the region will be the rise of digital-only banks, fintech, blockchain, and cryptocurrency.

The digital-only bank is gaining traction in the Gulf, with banks such as the UAE's Mashreq offering a full range of services – such as customer onboarding, sales, transactions, and fulfillment – solely via their online platforms, thus saving time and energy for busy customers. Over time, the rise of such banks may reduce the number of jobs in the banking industry, particularly those involving the use of systemic knowledge and repetitive tasks.[93] On the other hand, the digital banking experience will also create a demand for developers, IT-security, compliance, risk-assessment, and marketing staff.[94]

While still in its infancy, blockchain is another trend that is gradually being adopted within the MENA region due to the added level of security it offers. A distributed ledger concept, conceived originally for Bitcoin but now applied beyond the cryptocurrency world, blockchain has been called "remarkable," "foundational technology," and "a key technological innovation," much "like the Internet." Blockchain applications may potentially transform many aspects of our financial architecture, including payments. In particular, it could "help to improve speed, efficiency, and transparency and thus reduce risk and transaction costs" – all immensely desirable outcomes for everyone involved. It is expected that blockchain will create a demand for data analysts who will be required to analyze and derive trends from a large chunk of information on user transactions. Growing investor interest in the field will also contribute to a rise in regional startups looking to implement blockchain in finance.

DIGITAL BANKING AS A CASE OF LEAP FROGGING?

The region is also experiencing growth in the number of fintech services being offered. By the end of 2015, the Arab world had become home to 105 fintech startups, which were equally distributed between the GCC, the Levant, and North Africa.[95] This growth can mainly be attributed to increasing mobile penetration, in addition to the high percentage of unbanked individuals within the region looking to gain access to financial services. The effects of fintech on employment remain unknown for the time being, as the sector remains relatively small, but an increase in the skilled IT staff in the region is a sub-

90 Al Qaisi, 2018.
91 Euromonitor International, 2017.
92 FCI, 2017.
93 Fletcher & Kreps, 2017.
94 McKinsey, 2016.
95 Wamda, 2017.

stantial possibility. This is a resource that remains scarce and thus could make or break the potential growth of the sector. If countries within the region do not invest in the development of fintech solutions, they may plateau due to the lack of innovation, which would mainly stem from the low number of skilled employees in the sector.[96]

In addition to the professions identified in the previous sections, the digitization of the financial sector will create new jobs for scenario planners, who will need to model the potential impact of several scenarios. Market makers are also expected to be in demand over the coming years, as they will be pivotal in identifying new opportunities for growth. Finally, social and behavioral scientists who are able to identify financial implications based on consumer trends will also be in demand.[97]

7.4.3 Sector-Specific Approaches to Exploit Benefits and Minimize Risks

- The region needs regulations that are more conducive to the growth of fintechs. The UAE is one regional example where the authorities have realized the benefit of encouraging fintech innovation through the implementation of regulatory sandboxes. Sandboxes give fintechs the ability to test their ideas without having to comply with all regulations for a specific period of time, while simultaneously allowing policy makers and financial institutions to examine the impact of such innovations on the stability of the financial system.[98]

- Use fintech to target certain underserved groups and streamline otherwise complicated processes. One example of this is the Nigerian fintech Lydia, an online platform which allows "(...) SMEs to apply for financing, get assessed and receive capital for their businesses in 1 day or less".[99]

- In order for traditional banking institutions to compete with the ever-growing number of fintech innovations in the region, the banking industry must integrate more fintech solutions or collaborate with fintechs to provide existing & new customers with a less bureaucratic, hassle-free experience. One example is the UAE's Mashreq Bank, which has opened a digital-only branch where it offers all customer services such as customer onboarding, sales, transactions, and fulfillment.

- Establish more Arab accelerators with a specific focus on producing fintech startups in order to encourage greater innovation and the development of the Arab fintech ecosystem.

- The eventual digitization of the banking industry will require developers, IT security, compliance, risk assessment, and marketing staff to successfully implement the new models. Thus, the Arab region should begin tailoring more technology-centric college curricula that can help future graduates fill these new positions.

REGULATING FINTECHS AND FOCUS ON UNDERSERVED GOUPS

96 Deloitte, 2016.

97 Accenture, 2016.

98 Wamda, 2017.

99 Accion, n.d.a.

THE MENA FINTECH MARKET

In the MENA region fintech funding has reached US $100 million in the past 10 years with a total of 105 fintech startups launched by the beginning of 2016. Egypt, Jordan, Lebanon, and UAE together host three out of four fintech startups in the region. There are four main drivers behind the growth of the fintech sector: Less than 20 percent of adults hold bank accounts which in turn means financial exclusion; SME lending accounts for 8 percent of credit lending by Arab banks across MENA, compared to 18 percent in middle income countries globally; ecommerce is set to quadruple in five years; one in three bank customers want to switch bank; 88 percent of fintech startups seek corporate partnerships.[100]

MENA FINTECH ECOSYSTEM

The rise of fintech in the region has been aided by the ecosystem. Fintech focused accelerators have been introduced. One example is the Fintech Hive in Dubai.[101] **Government regulations have a role to play as well. In an attempt to position Abu Dhabi as a fintech hub, the Abu Dhabi Global Market became the first in the region to introduce a fintech sandbox, the RegLab.**[102] **This was followed by the Innovation Testing License in Dubai and the Regulatory Sandbox in Bahrain.**[103] **A final example will be the release of new mobile payment regulations by the Central Bank of Egypt aiming to support further financial inclusion.**[104]

ISLAMIC FINTECH

Another area of opportunity for fintech in the region is Islamic-compliant fintech. With a global market for Islamic finance standing at US $2 trillion and not much invested in the fintech sector, there are high growth expectations. Late 2017, a consortium of three Bahraini banks launched ALGO Bahrain, a company dedicated to research and development in the Islamic-compliant fintech sector. ALGO Bahrain has the ambitious target of launching 15 fintech platforms by 2022.[105]

7.5 Education

7.5.1 Size and Shape of the Education Sector

Historically, the education sector, and specifically higher education, played a significant part in the Arab nation-building program. Arab universities had to provide education for the state bureaucracy and, secondarily, for the private sector.[106] In the digital age, this state-class formation role has become less viable, as the capacity of the state to influence the economy and provide jobs for university students has become less significant. On the contrary, as economic intervention to create jobs for segments of society that need to be co-opted to produce political stability is not possible, opportunity creation in the digital economy needs to be spearheaded by universities. Thus, the role of universities has changed dramatically, from mere producers of civil servants to institutions that create opportunities in global and competitive markets:

NEW LEARNING PATHS REQUIRED

"What allowed Apple, Microsoft and Google to emerge is fundamental scientific research at world-class corporate labs such as Xerox PARC or Bell Labs and universities such as Stanford and Massachusetts Institute of Technology. The US government has played a vital role in underwriting high-risk, long-term research projects through institutions such as Defense Advanced Research Projects Agency and National Science Foundation; virtually all the technology in the iPhone was funded this way. Sensible immigration policies attracted the brightest minds from India, China, Russia and Hungary to these labs. Finally, a vibrant entrepreneurial ecosystem allowed the commercialization of research."[107]

The contrast with the as-is situation in the Arab world could not be starker. There is still little understanding or discourse on these matters in the region. Policy makers, scientists, and university managers seem to be stuck in the old paradigm and universities suffer from a lack of funding that makes a change rather unlikely. Not one Arab university is ranked in the top 200 institutes list.[108] To make things worse, universities in the countries that have been affected by political and economic turmoil seem to be stalling,

100 State of FinTech, n.d.

101 FinTech Hive, n.d.: https://fintechhive.difc.ae/

102 ADGM Launches Its FinTech RegLab, n.d.

103 Wintermeyer, 2017.

104 Mounir, 2016.

105 Bizbahrain, 2017.

106 For more on the role of education for the state class formation and the example of Algeria see: Elsenhans, 1984.

107 Venkatesan, 2016.

108 State of FinTech, n.d.

whereas only the universities in Saudi Arabia and the Gulf are moving ahead.[109] Thus, for most of the Arab students, the disconnect between these educational institutions and the jobs market has become a fact of life: "In Tunisia, for example, where the enrollment rates at universities went up from 8% in 1990 to 35% in 2011, there is a lack of correspondence between higher education programs and the job market. The unemployment rate among degree-holders has registered over 30% over the past six years (...)"[110]

The digitization of economy and society is changing the role of education significantly and perhaps beyond the current setting of universities. As individuals need to embrace lifelong learning driven by the ever-increasing pace of technological development, students will develop individual learning paths that consist of traditional learning plus online learning and learning in communities.[111]

In this context, it is notable that the Arab region has already experienced the first providers of online learning, together with international brands that are moving into the region in search of a market.[112] Interestingly, but not surprisingly, these learning offerings and their platforms have developed outside the Arab universities.[113]

7.5.2 What Needs to Be Done

- Create university platforms on a national or regional basis that use resources from traditional universities and combine them with offerings from local and international massive open online course (MOOC) provider and Arab companies;
- Use universities to establish nonacademic programs for segments impacted by digitization to facilitate job changes;
- Encourage the integration of public and private employment agencies on these platforms to use their educational offerings for job training;[114]
- Encourage cooperation between the platforms and local industries and service providers to create innovation clusters on the country or regional level;

COMBINE LEARNING AND EMPLOYMENT FUNCTIONS ON PLATFORMS

- Encourage integration of learning platforms for education of teachers and scientific staff of universities;
- Provide learning path design as a service for everybody for free. This function could be set up at universities or private-public partnership companies;
- Design open educational resource (OER) strategy for every country.
- Strengthen research and development in universities, not just in technical and natural sciences, but also in social science and interdisciplinary research programs that could support states in the development of adequate strategies for digital transformation.

7.6 Administration and E-Governance

7.6.1 Size and Shape of the Public sector

The public sector was at the core of the Arab nation-building project. Following the developments of the 1960s and beyond, the state and its institutions were seen as the change agent driving the nations to the next level of development, while also maintaining political stability.[115] These state-led programs relatively soon revealed the negative effects of this strategy: unethical behavior in the public sector, limited transparency, poor accountability, and suppression of the private sector. Furthermore, the imported bureaucratic models and governance often existed side by side with other indigenous forms of institutions, leading to the problems of dual organizational structures.[116] Not surprisingly, reforms were demanded relatively early on, but they could not address the core issues: As the bureaucracy became the instrument for co-opting relevant strategic segments of the society, this was attained at the cost of efficiency. A vicious cycle was triggered: The inefficient public sector was impeding the private sector and the market; this required reforms, which in turn needed more

THE STATE AS A PARTNER AND OBSTACLE IN THE TRANSFORMATION

109 Ibid.
110 Ibid.
111 Kamenetz, 2010, p. 137; Al-Ani, 2017c.
112 For an overview of Arab Moocs: MOOC List, n.d.a.
113 Sallam, 2017, p. 536.
114 For the role of Public Employment Agencies in the Arab World and their focus on training: The World Bank, 2012, p. 6ff.
115 Huntington, 1968.
116 El Tayeb, 1987, p. 129f.

bureaucratic action.[117] Another issue was the slow democratic reform process. As citizens were not in the position to voice requests or participate in the administration processes, the drive for reforms was further weakened.[118]

7.6.2 Digitization and the Arab Spring and the Public Sector

Two aspects disrupted this development: one was of course the Arab Spring movement, which changed the political landscape and eventually put Arab citizens in principle in a stronger position in relation to the administration. Moreover, digitization promised to break the vicious cycle: it could – in principle – allow for more effective participation and sustain more efficient and effective processes. It also offered a pathway out of the financial misery afflicting most states: As citizens could now become (peer-) producers in the value creation chain of public services, this would reduce the need for public resources and thus develop a more democratic approach to administration.[119] In this scenario, the government would become a platform: a state that enables and empowers the social creation of value by its citizens. It will protect the infrastructure allowing for citizen cooperation and the creation of "commons." The state here will evolve into a manager of a "marketplace," stimulating, enabling, and organizing the country's assets – the abilities and motivations of its citizens – in an efficient manner. It will use modern devices and digital platforms to do this.[120] Peer production will change the state's strategy: Instead of providing services all by itself, a strategy that encourages and enables peer production will emerge, creating a possible "compact between government and the public" in which government puts in place mechanisms for services that are delivered not by the government, but by private citizens:

"There is a new compact on the horizon: information produced by and on behalf of citizens is the lifeblood of the economy and the nation; government has a responsibility to treat that information as a national asset. Citizens are connected like never before and have the skill sets and passion to solve problems affecting them locally as well as nationally. Government information and services can be provided to citizens where and when they need them. Citizens are empowered to spark the innovation that will result in an improved approach to governance. In this model, government is a convener and an enabler rather than the first mover of civic action."[121]

7.6.3 What Needs to Be Done

THE STATE AS PLATFORM

- Draw up Arab strategies for the creation of a "digital partner state." This state would empower citizens to be free producers of private and public services via open knowledge commons in the area of education and culture (open education resources, ponto cultural programs ...), science (open access policies, fablabs ...) industry/agriculture (maker spaces, micro factories, coworking, biodiversity and seed common, open agriculture programs, open machines ...) and civic commons (participatory legislation and budgeting, open government data, social care solidarity coops ...);[122]

- Use open source software strategies for government agencies;[123]

- Start using platforms to mobilize around issues and motivate citizens to join and participate (security, health, veterinary and agriculture);[124]

- Strengthen data protection, civil rights, and protection of the private sphere and support civil society engagement and activities in data and digital rights topics.

117 Elsenhans, 1984, p. 139ff. For more on early attempts to reform the Arab administration: Saigh, 1987.

118 The World Bank suggested quite early – without significant success – that the administration in development countries could offer more room for "Voice" and even create "Competition Surrogates" that should integrate citizens and create more pressure to behave market minded. See: Israel, 1987, p. 98ff.

119 Al-Ani, 2016.

120 O'Reilly, 2009, p. 65.

121 O'Reilly, 2010, p. 14f.

122 See here the experiments in Ecuador: Flok Society, n.d.a.

123 This would entail 10 practical steps (O'Reilly, 2010, p. 39): 1. Issue your own open government directive. 2. create "a simple, reliable and publicly accessible infrastructure that 'exposes' the underlying data" from your city, county, state, or agency. Before you can create a site like Data.gov, you must first adopt a data-driven, service-oriented architecture for all your applications. 3. "Build your own websites and applications using the same open systems for accessing the underlying data as they make available to the public at large 4. Share those open APIs with the public, using Data.gov for federal APIs and creating state and local equivalents. 5. Share your work with other cities, counties, states, or agencies. This might mean providing your work as open source software, working with other governmental bodies to standardize web services for common functions, building a common cloud computing platform, or simply sharing best practices. 6. Don't reinvent the wheel: support existing open standards and use open source software whenever possible. 7. Create a list of software applications that can be reused by your government employees without procurement. 8. Create an "app store" that features applications created by the private sector as well as those created by your own government unit. 9. Create permissive social media guidelines that allow government employees to engage the public without having to get pre-approval from superiors. 10. Sponsor meetups, code camps, and other activity sessions to actually put citizens to work on civic issues.

124 See the example of agricultural platforms, e.g. in Al-Ani, 2016, p. 231f.

7.7 Construction industry in MENA region

7.7.1 Size & Relevance of the Industry

The construction industry represents one of the biggest sectors in which MENA countries have been investing for years. Even if in recent years the construction industry was badly affected due to the decline of oil prices, mostly in GCC countries[125], the future looks somehow promising:

CONSTRUCTION SET FOR GROWTH

The presumption for MENA region shows that starting from 2018, numerous infrastructural projects mostly related to the construction sector will be established both in the long and short term.[126] The total growth expected in MENA region for 2018 will be reaching 5.8% equivalent of $ 225 bn, while in the following years it is expected to have an annual growth of 6.3%, the equivalent of $ 330 bn, thus becoming one of the fastest growing region in the world focusing on construction sector.[127]

The increasing number of construction projects in MENA is closely related to the economic growth, stability of oil price, and most important, tied to demographic growth in the region. The demographic increase in MENA region is ranked as the first region in the world with fastest growing number of inhabitants living in urban areas, therefore the need for construction is justified in order to assure all the necessities for the youth.[128]

For instance, Egypt is one of the countries whose investments in construction industry kept growing since 2016 by 10.3% and is expected to keep a positive growth of 5.3% for the next years.[129] The construction industry in Egypt is mainly oriented on investments in infrastructure, residential and energy projects in order to increase economic growth, create new jobs, reduce overpopulation and improve traffic in Cairo by building a new capital city. The strategy is designed on different stages and infrastructural changes compress residential, non-residential buildings, institutional and commercial with a budget around $ 45 bn.[130] The progress is closely tied to some reforms that Egyptian Government made by opening more to the private and foreign investment in the region.[131]

In order to be able for both country and companies to deliver the proposed projects in the established time frame, further steps should consist in using the latest technologies capable to reduce the costs and time of these projects. These steps must take into consideration the structure of the construction sector in the MENA region, which includes a few big players and up to 90% SME companies, partners of subcontractors of the big, well established and regionally and internationally active companies.

7.7.2 Likely Effects of Digitalization

Digitalization offers a wide range of opportunities to help the construction sector overcome its main challenges: reducing the cost and time. The advantages of digitalization within the construction industry are far more beneficial, being designed to respond to the market needs today, reducing both the amount of time spent on projects and costs. The presumption of a digitalized construction industry is beneficial for all the actors involved in these projects and nonetheless for economy itself.[132]

THE BUILDING AS A DIGITAL TWIN

Some of the most innovative tools used that started shaping the construction industry are 3D Building Information Modeling (BIM). BIM allows the creation of “digital twins” that allow for better and easier planning and maintenance of complex construction projects and buildings. Further, BIM is a prerequisite for the use of robots and 3D printers in the construction sector. These models will be implemented and distributed by international platforms such as Mindsphere from Siemens. BIM will gain more importance in the near future as international standards emerge, forcing construction companies worldwide to adjust and adapt to the new standards.[133]

In addition to this, machines such as 3D lasers, robots, sensors or printers (cyber-physical systems) will be integrated into platforms and will communicate and interact to survey the building land, detect water sources, sewers, phone lines, fiber optic cables

125 Deloitte, 2017.
126 Paromita Dey, 2017.
127 Ventureonsite, 2017.
128 Keulertz et al., 2016.
129 Oxford Business Group, 2018.
130 Report Buyer, 2017.
131 Ibid.
132 McKinsey & Company, 2017.
133 On the role of digital twins in construction: Intellectsoft.net, n.d.a.

and power lines.[134] In the same category, unmanned aerial vehicles and drones are used to map, monitor and scan.[135]

These tools represent only a small part of how the construction industry is going to evolve. The way contractors and the companies seize these opportunities and challenges is depending entirely on them. For instance, Dubai's construction strategy for the next period involves the introduction of new technologies in order to facilitate construction sector to a more reduced costs and time frame. The 3D Printing Strategy is one of them and it "aims to substantively reduce the cost of both construction materials and labor, in addition to reducing the amount of time taken to construct buildings."[136] The forecast shows that 25% of the buildings in Dubai will be 3D printed until 2025.[137]

Peer-to-peer technologies are another innovation on Dubai's market, focusing on "adopting Blockchain technology within its electronic real estate platform."[138]

Digitalization and innovation are transcending the industry and countries from MENA region, thus becoming more and more aware of the fact that economies relying only on traditional main sectors, like oil, gas or tourism, will no longer be the future. Given the circumstances, the process of digitalization can be seen as an opportunity to seize and develop new economies by using available technological tools and the need to create new jobs.[139]

The challenges, however, are clear: SMEs will be reluctant to adapt to the new technologies because of the investment required. Yet the big construction companies in MENA region with international projects will have a leading role in modernizing the whole sector, including the SMEs they subcontract. "To do so, it will be necessary to train young scientists with the necessary tool sets, and then retain their services in a highly competitive international competition for talent."[140] This would represent a great opportunity for MENA countries to invest in, especially because there is a high rate of youth unemployment in the region, of about 40%.[141] By innovating this sector through vocational trainings adapted to the latest technology and tools, more jobs could be created in principle.[142] In addition, the introduction of 5D building information modeling (BIM) in MENA region could have a positive impact in order to make the construction sector more competitive and transparent in terms of expenses, design and progress.[143] Previous aspect is closely related to the involvement of international actors and foreign investments in the construction industry within the region. "Preparing for these disruptions and new opportunities, while address current challenges will require broad reforms and agile, iterative public-private collaboration efforts."[144]

HOW TO ONBOARD THE SMES?

7.7.3 What Needs to Be Done

- Large construction companies in the region must create awareness among their cooperation partners and subcontractors regarding the new technologies in order to increase their competitiveness regionally and internationally by piloting theses new technologies.

- Focus on the potential of collaborative tools which would integrate stakeholders to construction projects together, such as cloud systems. The importance of this point is that it deals with a long-standing problem of fragmentation in construction projects.

- Support the collaboration among universities, research and development institutes, and the construction companies to work on and discuss applications such as 5D and robotics in construction.

134 Roland Berger, 2016.
135 McKinsey & Company, 2017.
136 Deloitte, 2018a.
137 Ibid.
138 Deloitte, 2018b.
139 World Economic Forum, 2018.
140 World Economic Forum, 2018.
141 World Economic Forum, 2017.
142 Ibid.
143 Chakravarty, 2017.
144 World Economic Forum, 2017.

7.8 Healthcare

7.8.1 Size and Shape of the Healthcare Sector

In the years following the Arab Spring, healthcare policy makers have been under pressure to figure out how to provide more accessible, affordable, and higher quality healthcare to their burgeoning populations.

DIGITAL HEALTHCARE AS WAY TO INCREASE EFFICIENCY WITH LESSER COSTS?

It is predicted that the healthcare sector in the MENA region will be worth $144 billion by 2020, which is considerably higher than the $81.1 billion it recorded in 2011. Within the coming years, approximately a third of healthcare facilities in the MENA region will be owned by the private sector. The remaining two thirds will be government owned, the majority of which will be concentrated in Egypt, Algeria, Morocco, and Saudi Arabia.[145]

The growth in market size can be attributed to a number of factors such as the region's population growth rate of 1.9% annually: well above the global average of 1.1%. Demand for healthcare is also rising due to the aging population, and the prevalence of non-communicable diseases such as diabetes, hypertension, and obesity.[146] Also, lack of access to healthcare from infancy/young ages causes high complexity of disease phenotypes. MENA will experience a shortage of 360,000 hospital beds by 2020, which is also stimulating funding in the healthcare sector.[147] However, governments and the private sector realize that higher expenditure does not always translate into better quality healthcare. Many public and private sector players are beginning to recognize that digital healthcare can cut expenditures and lead to more efficient monitoring and treatment of the Arab world's leading causes of death, non-communicable diseases.[148]

7.8.2 Digitization in the Healthcare Industry

The impact of digitization on healthcare is a very wide topic. A great positive impact can be achieved in the health sector through enhancing the hospital management systems and the classification of data. New technologies such as advanced image processing, 3D printing, next-generation sequencing, robotics and telemedicine are on the rise, yet they still need an intensive R&D in order to be implemented on a wide scale. Placing patient's medical information in the digital sphere is also beginning to gain traction. During 2017, the Dubai Health Authority transferred more than 1.4 million patient records to a unified electronic system. This has allowed vital patient information to be accessed by physicians across a wider range of facilities, enabling faster action during medical emergencies, and minimizing waiting time for patients.[149]

Bringing precision medicine to the people, even in neglected areas in the MENA Region, is essential and is only possible by a) enhancing patient care, follow-up and record systems, b) advancing disease diagnosis and treatment using state-of-the-art healthcare technologies and c) setting up reliable and accurate patient information systems on an organizational level. Knowing this, and believing in the importance of healthcare access, the Aswan Heart Centre (AHC) is a regional pioneer and a living example in region, by providing clinical services for heart disease patients in Egypt and the region and advancing personalized diagnosis and treatment for its patients using an integrated research approach. AHC is armed with state-of-the-art health technologies and research laboratories as integral components, in addition to a tailored training program for doctors, nurses, researchers and healthcare professionals.

To ensure quality, data security and efficiency, advanced Healthcare Information Technology (HIT) is being used with an Electronic Medical Records (EMR) system, a Picture Archiving and Communication System (PACS) and advanced cardiovascular IT solutions (Medstreaming, Medvisio, ...) to merge digital patient images, clinical diagnosis and lab results. This is linked to clinical databases and Research Electronic Data Capture (RedCap) and registries tailored for different patient cohorts and relevance of clinical as well as research parameters. Telemedicine was used by AHC to support diagnosis in rural areas around Aswan, by helping clinicians to share clinical images and information online and consult with AHC doctors.

DATA COLLECTION AS A KEY MEASURE

Finally, an integrated, transnational research program was established with a focus on population and disease-based studies, bringing together innovative solutions from the fields of biomedical engineering and life sciences to cover all aspects of person-

145 IMT Digital Health, 2014.

146 JLL, 2017.

147 IMT Digital Health, 2014.

148 Pupic, 2017.

149 Arabian Business, 2017.

alized patient care, such as advanced phenotyping using machine learning and artificial intelligence, 3D printing and numerical prediction modeling, genomics, transcriptomics, proteomics and bioinformatics as well as high-performance computing. Aiming to understand the landscape of health and disease in Egypt and the region and contribute to enhance early disease detection and effective treatment for all patients, scientists, engineers, physicists and physicians need to work closely to evolve clinical protocols.

The rise in the regional adoption of bioinformatics and other advanced biomedical fields such as computing, machine learning and artificial intelligence within the medical field will necessitate a slew of graduates in these disciplines in order to meet the future demand for these job roles. Digitization requires an interdisciplinary approach in the health sector with a systematic cooperation between doctors, engineers and biomedical scientists. Recognizing new paradigms on the research level through machine learning and artificial intelligence will force this collaboration on all levels in the health sector.

INTEGRATION OF ADVANCED TECHNOLOGIES IN HEALTHCARE – EXAMPLES:

3D printing technology still needs further research in order to be used on a wide scale. It could enable medical professionals to build 3D printed teeth, bones, artificial organs, and other medical devices at lower logistical and production costs. 3D printers are also being used in Jordanian refugee camps to build prosthetics.[150] Shortening the value chain in the creation of these medical tools may reduce the number of job opportunities available to low-skilled assembly labor. On the other hand, it will also create new job opportunities for CAD designers and engineers.[151]

Given this expected trend both regionally and globally within the coming years, these changes should be reflected in curricula and the creation of hybrid disciplines, in order to produce adequate graduates to fill these jobs.

Furthermore, telemedicine services such as phone calls, emails, mobile apps, and video chats will be able to provide medical access in a wider geographical scope, streamline the medical experience, and reduce costs by eliminating the need for redundant visits to the hospital. They will be particularly beneficial for rural patients with limited access to healthcare or those in war-torn countries that may need on-demand medical assistance.[152] One such startup providing these services is Shezlong, an Egyptian online psychotherapy platform serving patients all over the world.[153]

Not only will telemedicine services facilitate healthcare, but they will also enable the creation of diverse job opportunities. Biomedical engineers will be in high demand as they will be required to create the necessary communication technologies and transform inadequate rooms into operating rooms and other medical settings.[154] More complicated teleservices such as telesurgery will also require specialists who are able to handle surgery robots.[155] Additionally, teleservices will also contribute to more job opportunities for nurses on the patient's end, who may have to administer doctor's instructions or medications to remote patients.

7.8.3 What Needs to Be Done?

- Collaboration between governments, startups, universities and other important stakeholders to encourage R&D and greater innovation in the sector.
- Medical engineering is becoming of utmost importance for the health sector. Universities should create awareness about its potential and attract more young people to study it.

150 Williams, 2018.
151 Cox, 2017.
152 D'Souza, 2015a.
153 View Shezlong's website: https://shezlong.com/en/
154 Telemedicine, n.d.a.
155 Medical Futurist, 2018.

- Develop digital skills of existing labor force and incorporate more digital education in medical curriculums. Create new university departments in biomedical engineering which focus on 3D modelling, bio-informatics, and diagnostics.

- Use digital medical platforms with telemedicine services targeted at disadvantaged groups and regions to enhance and support traditional offerings in order to achieve universal health coverage.

- Countries that have adopted digital records should create laws that ensure the protection of private medical information (such as data privacy laws).

- There is a lack of regulatory and quality standards when it comes to health technology across the region, which results in a lack of trust from both the medical establishment and the patient. Thus, regulatory councils should be established to improve acceptance of digital healthcare by the medical establishment and improve uptake by patients.[156]

- Consulting the Ministries of Health, Higher Education and Research on developing an infrastructure and platforms to support Digitalization of patient data on all levels, from fundamental clinical practice to research, and review laws and restrictions to ensure secured and safe advancement in this area.

8. Implementing Digital Strategies

Digitization therefore remains a challenge, in that the necessary strategies must be developed and financed in addition to existing efforts. The nature of this challenge and the scarcity of skills, for example, in the field of ML and data science, would suggest that appropriate measures must be prioritized (e.g., based on the multiplier or linkage effects, employment effect). There is some evidence to suggest that, unlike in China but similar to the West, the administration in developing countries will not be in the sole position to devise such programs, let alone implement them.

In this context, it will be important that public administrations in developing countries also see themselves as platforms that seek relevant national and international partners from business, science, politics, and civil society for the digitization agenda items (see Fig. 2).[157] In addition to these digitization strategies, it will be important to implement "traditional" development strategies that have an expiration date but that nonetheless give these troubled economies some more time. Development programs will therefore also have to speculate more than before on "temporal" components – for example, on the effective use and effects of technologies in the future (when, where, how effective ....), as well as on possible negative and unintended effects. But this is probably the most important task that planners will have in the coming years: "Our task today, and for the next fifty years, is the task of utopists."[158]

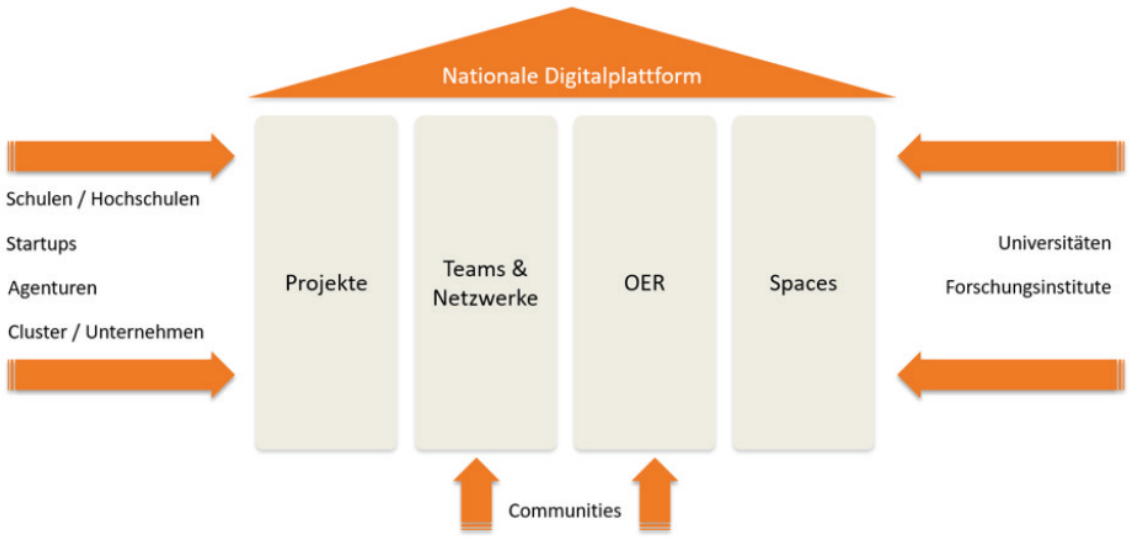

Figure 2: Strategic digitization platforms. / Source: Own research.

156 D'Souza, 2015b.

157 For more on this role of the state as a platform, see Al-Ani, 2016.

158 Wallerstein, 1995, p. 144.

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