

Impact of the 4th Industrial Revolution (4IR) on the Development in the Arab region

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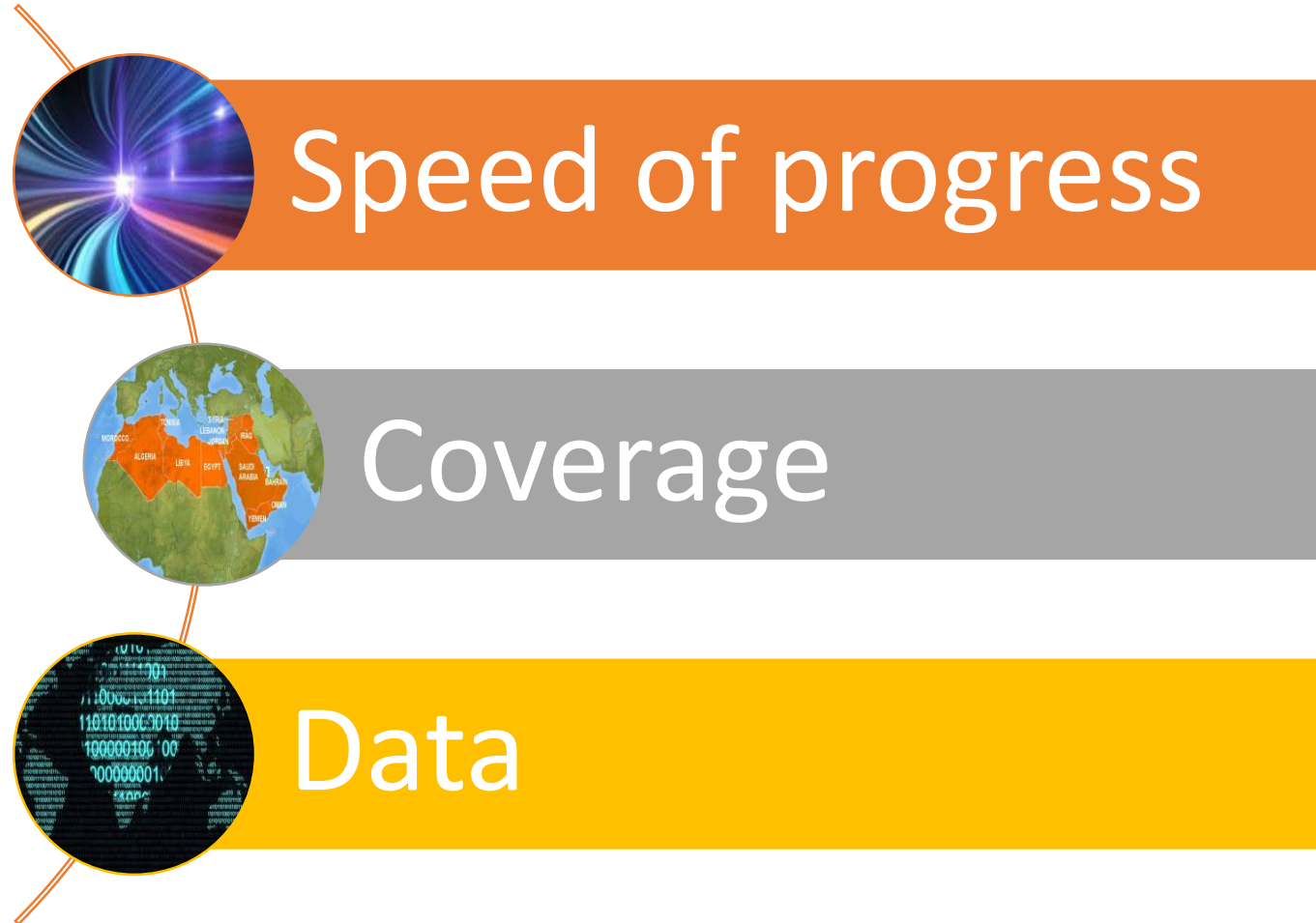
Report Scope

- Focus on 4IR technologies (beyond digital)
- Regional (Arab countries)
- Development challenges
- Mapping of impactful work
- Impact on Jobs
- Opportunities
- Threats
- Roadmap
- Key Messages

Presentation Scope

- Potential of 4IR
- Threats from 4IR
- Balanced way forward

Disclaimers



AI

AR/VR

Robotics,
Automation, and
Instrumentation

IoT

Autonomous
Vehicles

Nanotech &
Advanced
Material

Biotech

3D Printing

Blockchain

Big data and
Analytics

Level of current Activities

Ecosystem

Readiness: Policies & Capacities

Research & Development

Opportunities

- Inclusive economic growth
- Efficient recovery and reconstruction
- Empowered women
- Sustainable and responsible development

Inclusive Economic Growth

- Income inequality globally has increased since first IR
- Partly attributed to adoption of tech instead of development (deindustrialization)
- Shift from traditional manufacturing provides an opportunity to catch-up
- Examples:
 - 70% believe 3D printing will move manufacturing closer to demand
 - Once ROI on robots drops relocation of manufacturing will occur

Examples

- Adidas used 3D printing to establish “speed factories” in Germany and USA
- Philips Electronics relocated production from China to Netherlands
- Regionally: design and manufacturing of 3D printed aviation parts in the UAE for Etihad Airways

Global Manufacturing Competitiveness Index (GMCI) of
2016 only UAE in top 30

Challenges

- Scaling and growth
- Attract modern manufacturing
- Elevating barriers to investment and entry
- Attracting back expats
- Enhanced social protection

Efficient Recovery and Reconstruction

- Al-Mowasah Hospital in Amman, Jordan has been working with Doctors Without Borders to provide 3D printed prosthetics for Syrian refugees
- Nano based membranes can make safe water desalination practical and affordable
- 3D printed structures: Potential for reconstructed cities to leapfrog into the future

Challenge

- Balance between modernizing the infrastructure and preserving historical heritage
- Multi-stakeholder effort including urban planners, historians, architects, environmentalists, engineers, policy makers and local representatives

Empowerment of Women

- Some progress made during the past 50 years in closing gender gap
- ICT has helped with some of the challenges: access to info, connectivity, safety, access to education, and access to support networks.
- Still several barriers to equality in innovation and technology:
 - Limited innovations that meet the needs of women
 - Gender-blind innovation
 - Under representation of women entrepreneurs
 - Perceived high risk of investing in innovations for women

Some Estimates

- More than 1.7 billion females in low- and middle-income countries in 2015 are not mobile phone owners
- Women effective participation in the workforce can contribute \$2.7 trillion to the Middle East economy by 2025
- Women have founded or are leading one in three startups in the region (higher percentage than Silicon Valley)

Founded startups receive on average:
\$935K for women and \$2.12million for men

However, revenues on average:
\$730K for women and \$662K for men

Moving Forward

- Skills of the future; social interaction, communication, and empathy are all social skills at which women excel
- Technical skills?
 - “All Girls Code” initiative in Lebanon, providing mentorship and networking opportunities
 - Larger scale: the Women in Technology for the Middle East and North Africa
- Reduction in the demand for labor intensive jobs and assistive devices will eliminate the possible physical strength advantage of men
- Wearables to fight against gender based violence

Sustainable and Responsible Development

- Water, energy, and food
- Elderly care
- Evidence based policy making
- Response to natural Disasters
- Cultural support

Water, Energy, and Food

- Precision agriculture targeting the water, energy, food (WEF) nexus
- Biotech based fertilizers and seeds, IoT, robotics, drones, and AI
- Significant impact on optimizing food production while reducing resource consumption and the use of pesticides
- Pure Harvest (UAE): high tech greenhouses
- H2O Maghreb: AI for water management
- Nanotechnology: reducing the energy demand of desalination and water treatment, and next generation solar panels.
- Renewable energy: Morocco's third of its energy renewable and planning Africa's largest solar power plant. UAE developing concentrated solar power facility.
- Robotics: Enerwhere uses robots to clear solar panel
- Recycling: RecycloBEkia E-waste recycling and safe data destruction (Egypt)

Elderly Care

- Age in place and maintenance of mobility
- Role of IoT, assistive technologies and robotics in supporting care givers
- Provide monitoring, emergency response and caring abilities
- Life expectancy: the role of 3D printing of organs and biotechnology
- Mobility: autonomous vehicles

UAE planning for 25% of residents to use autonomous vehicles by 2030

Saudi Arabia, Qatar and Oman are also embracing the adoption of such technology

Evidence Based Policy Making

- Byproduct and enabler of 4IR: Data
- Data combined with AI can have impact on several domains: policy making and planning for health care, environment, law, education, transportation, governance, etc...
- UN women and UN Global Pulse stress the importance of data and analytics in improving the lives of women

Response to Natural Disaster

- AI and big data analytics play a key role in management and preparedness for natural disasters
- AI prediction of cyclones hitting Oman and Yemen to sand storms hitting from North Africa to the gulf
- Robotics and Drones: for rescue operation

Cultural Support

- AR to enhance educational experiences
- AR to play a role in delivery of goods where proper addressing is lacking
- AR in heritage sites and museums (Louvre in Abu Dhabi and museums in Saudi Arabia)

Threats



Arab World Online 2017 report

71% of Internet users in 22 Arab countries are concerned about AI & privacy

46% are concerned about AI and loss of jobs

Security

- Cyber and physical
- Security of biometrics:
 - Facial recognition for automated border control (Dubai's One Gate)
 - Fingerprints to unlock devices (71% of UAE mobile users)
- Security of IoT: networked cameras
- Arab countries are targeted with 6% more cyberattacks compared to the rest of the world
- Autonomous and semi-autonomous weapons (use and development)

Oman ranks fourth in the world on the Global
Cybersecurity Index (GCI) 2017

Privacy

- Beyond personal, financial and medical data privacy
- Robots, connected devices, and wearables have increased direct surveillance and access

In the region: more than 20% report that they have a TV that is Internet enabled, about 5% have smart watches, and about 4% have personal cars that are Internet connected

Ethics

- How about an AI algorithm to predict the death of a patient? How about informing the patient of the prediction? Why not inform the insurance company?
- If an autonomous car injures a pedestrian who is liable; car owner, car manufacturer, software developer, or AI algorithm designer?
- How about development of autonomous weapons? What if they are more accurate than human soldiers?

Arab countries are working on adopting a code of Ethics in Science and Technology in the Arab Region. UNESCO is championing the effort by developing a draft for the code

Roadmap



National tech strategies and policies

RDI ecosystem (Progress made but more is needed)

Socially Conscious Investments (none left behind!)

Skilling & retraining (some efforts but more is needed)

National Technology Strategies and Policies

- Most Arab countries have a strategy related to research and technology
- There is a lack of data to assess impact of these policies and strategies on the economy
- Standard data are either missing or not current for most Arabic countries in standard sources such as the World Bank and UNESCO

Government expenditure on education does not exceed 4.2% of GDP on average and expenditure on research and development does not exceed 0.5% of GDP on average, while military expenditure exceeds 5% of GDP on average

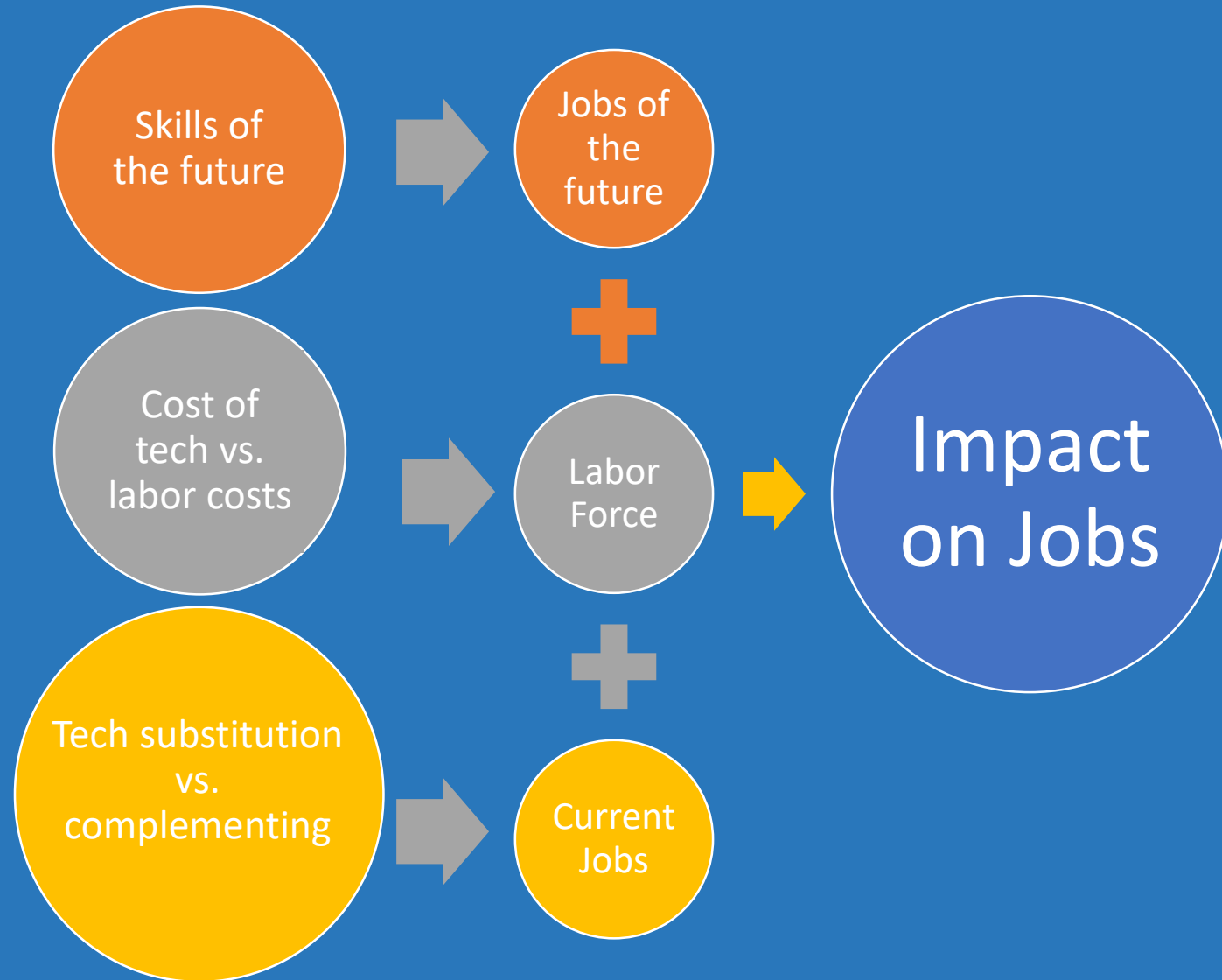
Productive Research, Development and Innovation (RDI)

- On average the citation per document for the Arab countries is 8.53 compared to Turkey which is 9.49 and Israel which is 22.54.
- The total number of publications in the Arab world between 1996 and 2017 was 736,514 compared to the total for Iran and Israel which was 794,451 for the same period
- Publications per 1000 for the Arab countries is about 2.06 while for Iran and Israel combined it is 8.83
- Patents in the USPTO database with inventors in Arab countries count 4,358 patents from 1976 to present while a country like Switzerland has 24,226 patents
- ESCWA recommendations and best practices developed to enhance tech transfer in the region

Socially Conscious Investments

- Socially focused startups not uncommon
- Blockchain:
 - Dawa: an application employing blockchain to tackle counterfeit medicine
 - Huwayeti: blockchain based application that integrates with UNHCR refugee registration system
- AI: MedLughati, allows refugees to communicate with doctors using NLP
- Robotics: used by Atlab to improve learning skills of autistic kids (UAE)
- Several competitions targeting this theme: Startups without Border, Innovate for Refugees, Madad Innovation Lab

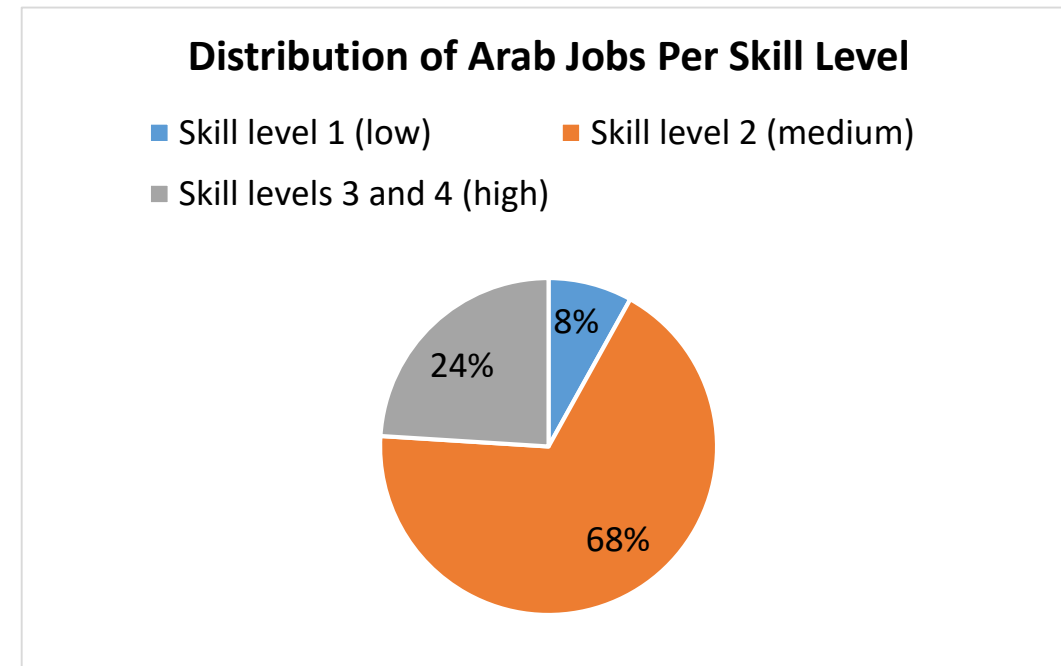
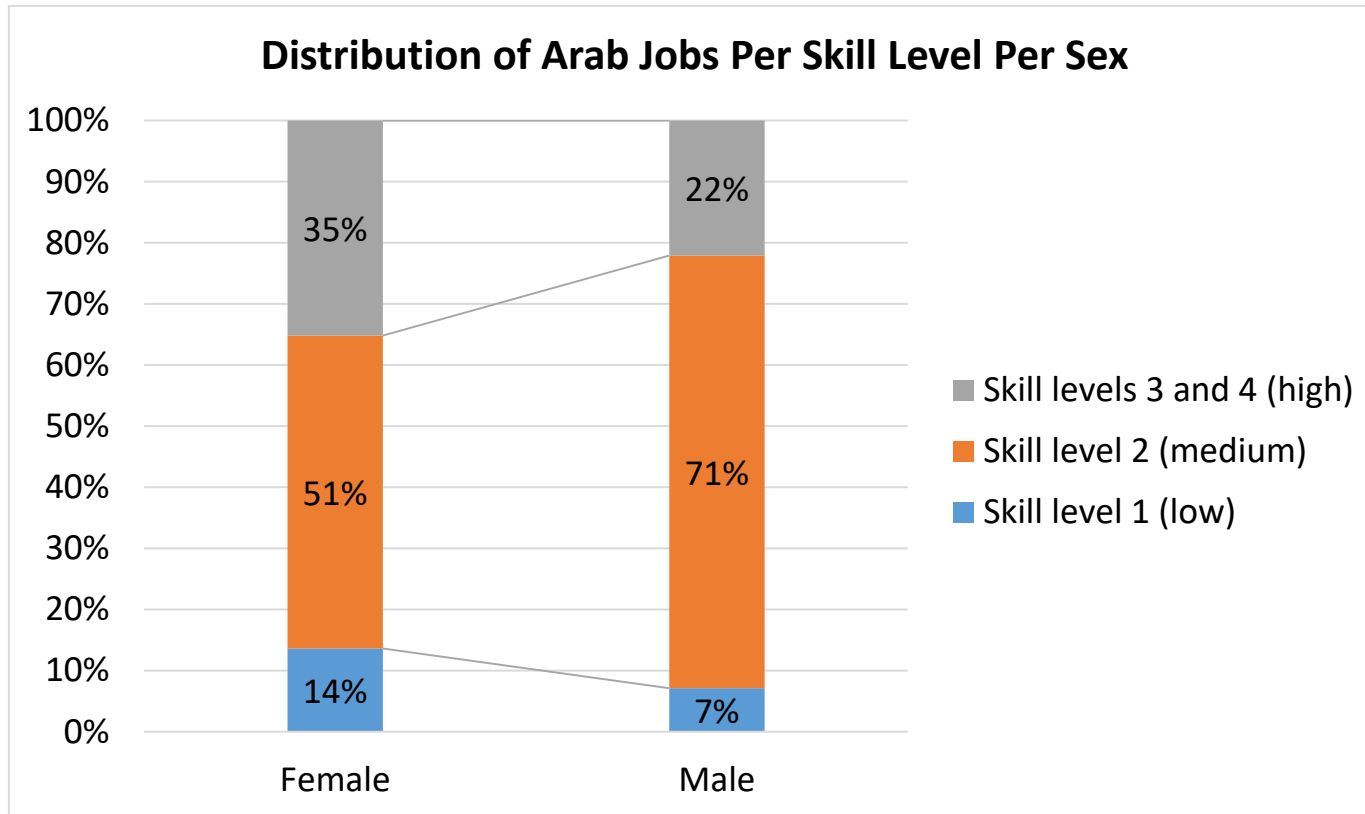
Truth About Jobs



Skills of the Future

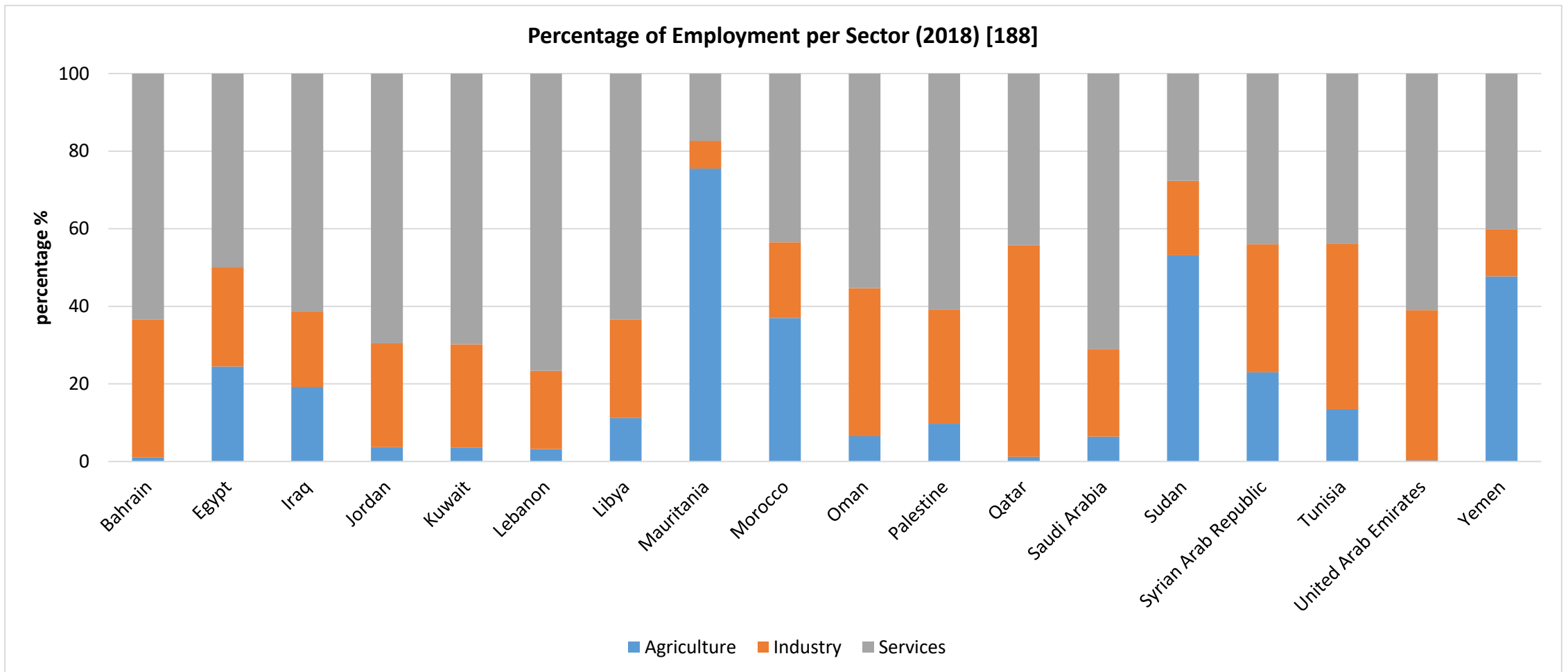
- Frey et. Al.
 - Perception and manipulation
 - Creative intelligence
 - Social Intelligence
- McKinsey Global Institute
 - Higher cognitive skills
 - Social and emotional
 - Technological
- World Bank
 - Advanced cognitive skills
 - Socio-behavioral skills
 - adaptability

Impact (Skill Based)



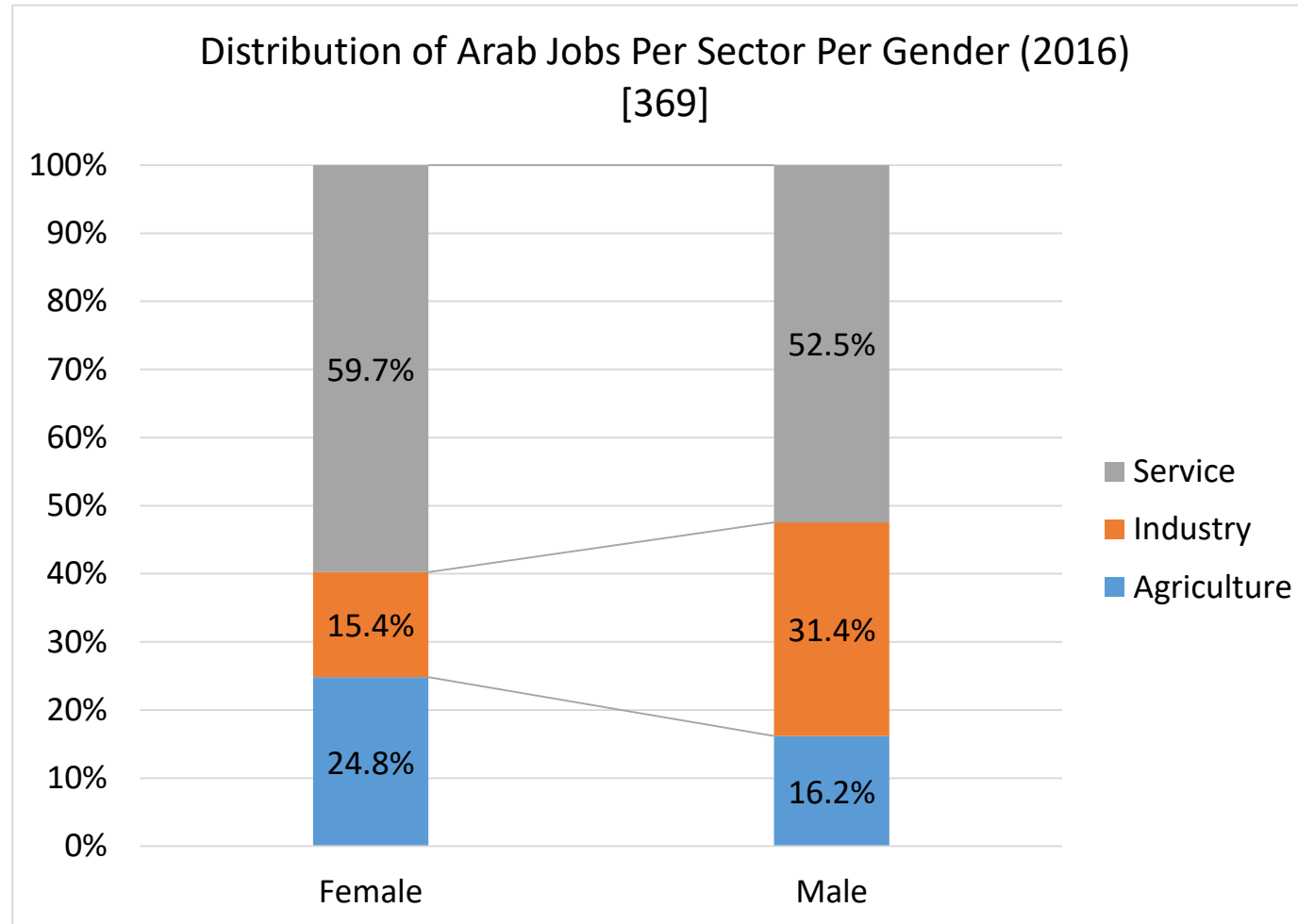
Data Source: Labour Force Surveys by ILO extracted in November 2018.

Impact (Sector Based)



Data Source: data.un.org

Impact (Sector Based)



Data Source: worldbank

Labor in manufacturing is estimated regionally at an average of 10%

Potential to leapfrog into the jobs of the future?

World Bank Human Capital Index (2019) Rankings:
Bahrain (47), UAE (49), Oman (54), Qatar (60), Saudi
Arabia (73), Kuwait (77), Jordan (79), Palestine (82),
Lebanon (86), Algeria (93), Tunisia (96), Morocco (98),
Egypt (104), Iraq (129), Sudan (139), Yemen (145), and
Mauritania (150).

Skilling and retraining: Job and labor market restructuring

- There is a shift from hiring based on credentials to hiring based on demonstrated skills
- Special attention to elderly
- Dual labor market considerations
- Noon Edu out of Saudi Arabia has shown the ability of such platforms to scale with 1.6 million registered students
- “Next tech leaders” launched in 2016 by the Egyptian Ministry of Communications and Information Technology and has already trained 5000 students in new technologies
- One Million Arab Coders Initiative: UAE government initiative
- Interesting business model is SE Factory out of Lebanon, which is focused on skilling in programming

Key Recommendations

- Governments (Funding, legislation, markets, data, decentralizations, reskilling, infrastructure, governance, political landscape)
- Private Sector (Reskilling, collaboration, investments, ecosystem)
- Civil Society (Reskilling, governance, oversight)
- Universities and schools (Curricula, gender gap, reskilling, job market, collaborations, RDI, higher education)
- ESCWA Engagement (Dialogue, inclusion, capacity building, bridging)

Thank you...