

This blueprint is an initiative to draw a roadmap that would help in leading out of the current adversity created by the pandemic situation and provides suggestions for post-COVID-19 actions in the higher education sector. Finally, I would like to acknowledge the team who worked together in fulfilling all the required tasks needed to reach this comprehensive policy framework.

Leading out of Adversity: Policies of Higher Education for Post-COVID-19 Pandemic includes action items that tackle curriculum redesign for international global courses, global education, and multi-disciplinary fields. Moreover, the policy pillars proposed in this document provide further action items related to the use of different online assessment techniques that would support remote learning. In this blueprint, the Ministry of Higher Education and Scientific Research (MoHESR) has designed an action plan to the orientation of the research process to examine the impact of COVID-19 on education, health, wellbeing and other areas of knowledge.



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LEADING OUT OF ADVERSITY POLICIES OF HIGHER EDUCATION FOR POST-COVID-19 PANDEMIC 2020



وزارة التعليم العالي والبحث العلمي

Ministry of Higher Education
& Scientific Research

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POLICIES FOR POSTCOVID-19 PANDEMIC

THE EGYPTIAN MINISTRY OF
HIGHER EDUCATION AND
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& Scientific Research

Leading out of Adversity: Policies of Higher Education for Post-COVID-19 Pandemic

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Note from the Egyptian Minister of Higher Education and Scientific Research

A Distance Education Strategy for the Coming Period

Like most other countries, Egypt was exposed to the pandemic caused by the coronavirus (COVID-19). This emerging situation took the world by surprise as it began spreading at the end of 2019 and early 2020. COVID-19 pandemic, which is considered one of the greatest declared global emergencies in recent history, forced many countries to change their plans, strategies, and executive programmes. This included significant changes in Higher Education plans, touching about three million students in Egypt. The Higher Education sector also includes about 136 thousand members comprised of academic staff, teaching assistants, and researchers in all disciplines, including scientific, educational, and technical fields, as well as hundreds of thousands of administrative and technical personnel.

One of the biggest challenges that faced the Ministry of Higher Education and Scientific Research was how to balance between saving lives and delivering expected learning outcomes, especially if the university lockdown lasts for a longer time. It has been evident to decision-makers, that the best, most appropriate, and safest mechanism to deal with this adversity, is to activate distance and online educational systems. This would ensure continuous communication and interaction between teachers and students while ensuring their safety. Hence, the precautionary actions to suspend university studies from mid of March 2020 was taken, followed by the Ministry's decision to adopt the distance education system, replacing the classical face-to-face education system conducted in lecturing halls and rooms.

The implementation of this decision has necessitated extensive and rapid communication with all affiliated bodies (the state; private and national universities and institutions; as well as research centres, institutions and organizations). This was to ensure that all stakeholders provide their visions concerning the implementation of this system, and are able to inform the ministry of the facilities they have and the equipment and devices they need. Coordination was especially important in order to support the universities that needed to upgrade their infrastructure to be able to apply to this system.

The Supreme Council of Universities has also approved an alternative method to substitute academic exams for the pre-graduation years, through which students were required to submit research papers instead of going through the traditional examination system. As for final year and post graduate students, a strict policy for regular examination had been developed to ensure that all procedures and standards of safety for students, teaching staff, and all those involved in the examination process are adhering to national and international protocols. The current academic year has also been extended until the mid of September while coordinating with all relevant authorities to ensure that students are not negatively affected by this extension.

Despite all significant success that this alternative system has achieved, it has played in continuing the academic year. Yet, it indeed faced many obstacles that the ministry would start addressing and immediately start the implementation of required reform, especially regarding the upgrading of the ICT infrastructure of some universities. These obstacles have affected the communication process between the students and their instructors, especially in areas suffering from either lack of, or problems with, the internet connectivity services. Another obstacle was concerning the establishment of a fair alternative system of examination and evaluation, that ensures students' appropriate evaluation and proper assessment of the received educational, training, and research courses required to graduate to the next academic year.

Following the implementation and the outcomes of applying the short-term distance learning system, the Ministry immediately started developing an alternative long-term educational system, to be in place in case the current situation persists throughout the next academic year. This alternative system sets up a new national strategy for university education, taking into consideration every detail concerning the following points:

- Ensuring the absolute safety of all parties of the educational process, being the most valuable

element in the system.

- Overcoming the negative aspects that had emerged when applying the system for the first time, and work on ensuring transparent and effective communication between students and teachers, as well as optimal educational and research processes in universities and institutions.
- Benefiting from all national and international expertise in the field of telecommunication and information technology, through building a national network that meets international standards in telecommunication quality and information technology access.
- Ensuring that students have access to the most significant scientific content, provided either by the networks established by universities, or by national and international information platforms like the Egyptian Knowledge Bank (EKB). These platforms attempt to fulfill the most crucial goal of the educational process, that is, providing students with the scientific content they would need throughout their study years.
- Ensuring equal opportunities for all students in all governorates, so that students living in remote or rural geographical area would receive the same scientific and training content their colleagues in main urban cities are receiving.
- Considering insights and concerns of all our students, irrespective of their gender or nationality, regarding optimizing the education system's performance at universities and institutions for the next stage.

Accordingly, a group of professors and experts has been assigned this task. Their work during the previous period has been based on two pillars: the first pillar was to conduct a comprehensive opinion survey among students, faculty, administrative staff, and top-management, through which they provided their feedback about many relevant topics. The survey ensured that all students' related information, such as: age, geographical area, and academic level, would be recorded. The survey covered more than 90 thousand male and female students, from different educational levels, and different governorates.

The second pillar was conducted following and based on the first pillar. It is concerned with developing an integrated strategy for universities and Egyptian higher education in general, for the next stage, whether the pandemic situation is over or not. It is based on a hybrid culture and blended learning methodologies where the educational process is carried out through a safe attendance alternating days system, blended with the distance online education system on the remaining days.

In completing the planning stage of this strategy, it gives me great pleasure to present it to those who belong to the Egyptian higher education and scientific research sector, and to all concerned authorities, as well as those interested in higher education in the Arab Republic of Egypt. Finally, I would also like to express my sincerest gratitude and appreciation to everyone who had a role and contributed effectively towards building this strategy. I am sure we will achieve the stipulated goals. Wishing all our stakeholders, including our academic institutions, researchers, and students, all the best wishes and success, and our dear country progress, growth, and prosperity.



Professor Dr. Khaled Abdel Ghaffar
Minister of Higher Education and Scientific Research

Note from Deputy Minister of Higher Education and Scientific Research

Steps forward for post-COVID-19 pandemic

The COVID-19 pandemic has proven to be the most significant catastrophe that the world has faced since the early 20th century. Globally, the effects of COVID-19 on higher education forced universities to act differently.

Considering the current pressing circumstances, the Ministry of Higher Education and Scientific Research is focusing on the urgent need to have adequate policies and actions to enforce online education and their certificates. The ministry already has in place initiatives related to online teaching and smart studies. However, it lacks the rules necessary to control the process.

To reach a vision for the Egyptian Higher Education sector that enables it to better adopt to the pressing challenges of distance teaching, and continue post-crisis, a team at MoHERS conducted a multilateral survey targeting investigating the university stakeholders' insight regarding the three-month teaching and delivering of the educational content online. As the Minister of Higher Education and Scientific Research has mentioned in his note, the high rate of response received for this survey, and the results obtained, provided a solid ground to build a strategy and implement suitable informed actions during and post the pandemic situation.

Based on the results of the multilateral survey, and our vision in MoHESR used to tackle the present crisis, which is recognized through seven pillars including the role of the university in serving the local society, this investigation aimed to help identify the best available policies to apply post pandemic.

Reflecting on the present pandemic, the actions in this blueprint considers easing the enrollment process of international students for existing and newly established universities. Besides, universities are requested to update their bylaws and courses specifications, to be in line with the new strategies & policies applied by MoHESR. MoHESR, along with the Supreme Council for Egyptian Universities, has indeed provided a plan to be followed when using blended and hybrid learning systems.

As for teaching, learning, and methods of assessment, MoHESR has prepared some action items that include curriculum redesign for international global courses, global education, and multi-disciplinary fields. Moreover, the policy pillars proposed in this document provide further action items related to the use of different online assessment techniques that would support remote learning. MoHESR has also designed an action plan associated with to the orientation of the research process designed to examine the impact of COVID-19 on education, health, and wellbeing.

Regarding the policy targeting the empowering process of the human capital, the action plan targets in-depth uplifting of the staff's capabilities to be to adopt to the new technologies and tools required for online teaching, research, and management. We also propose a step for developing inflow and outflow mobility models for joint education and joint research projects.

As we all know, there is a pressing need for accelerating the digital transformation to face the current virtual world. Accordingly, MoHESR has started taking several actions related to building the structure of the digital technology framework by assessing the maturity and readiness of the existing system using convenient practice frameworks.

In this blueprint, a policy for physical distancing and campus readiness was also presented. Some action items were proposed as well, such as applying a comprehensive sanitisation system. As for the newly established universities, a comprehensive plan has been implemented, applying certain standards in designing buildings, and indoor places, to ensure the applicability of physical distancing on campus.

Another policy pillar was applied to focus on developing effective communication strategies during the crisis. In this regard, this blueprint starts by presenting the gathered factual data, analysed and presented to policymakers

to support the decision-making process and examine other issues related to mass communication. As for the principal role of universities in serving local communities and industries, this blueprint provides seven supportive policies fostering the significant role of universities in serving the local communities, especially through the current pressing challenges.

In conclusion, this blueprint is an initiative to draw a roadmap that would help in leading out of the current adversity created by the pandemic situation and provides suggestions for post-COVID-19 actions in the higher education sector. Finally, I would like to acknowledge the team who worked together in fulfilling all the required tasks needed to reach this comprehensive policy framework.



Professor Dr. Ayman Ashour
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Executive Summary

The COVID-19 pandemic has proven to be the biggest global disaster faced by the modern world since the beginning of the 20th century. The pandemic started spreading from the far east at the end of the year 2019 and spread very rapidly to the rest of the world, effectively putting it on a full lockdown by the end of the first quarter of 2020. The imposed lockdown on most institutions greatly affected almost every sector in the economy, severely impacting the whole economy.

The purpose of this report is to present the role that could be played by the higher education sector in diminishing the gap between fresh graduates' skills and the job market needs. The job market has changed because of the recent events that have also led to changes in education and learning. These events have also negatively impacted the economy especially local markets, causing severe losses in jobs and businesses. This report also highlights the importance of referring to the numerous findings that have been published throughout recent researches. The dynamic changes that have been happening recently in the job markets have directed us to the urgent need to restructure our educational system to be better positioned to produce the required talents needed to lead these newly defined market sectors & its potential growth. There is also a need to work on elevating the cognitive awareness of students, so that they would be able to identify the connection between their level of the education & skills and the potential job they would be seeking as graduates.

This report consists of five main chapters: the second chapter after the introduction discusses the projects and activities that were being implemented by the Ministry of Higher Education & Scientific Research (MoHESR), prior to the COVID-19 outbreak, and the procedures implemented during the closure of the Egyptian Universities. The second chapter showcases the results of a multilateral survey that was conducted to learn about the different perspectives of the university stakeholders (students, administration, teaching staff, management, and decision makers) regarding the short distance learning experience that occurred during lockdown. Chapter four includes the different policy pillars necessary for the post-Covid-19 era, and the resumption of the academic year within universities. Finally, chapter

five presents the suggested policy recommendations for universities especially in light of their role in serving the local community and industry.

Going in depth, chapter two presents four main programmes that were being implemented prior to the pandemic and continued throughout the crisis. The period prior to the pandemic can be roughly divided into two main higher education policy phases differentiated by the main policy & business objectives of each phase, as well as the magnitude and role played by ICT to realise these objectives. The first phase (Phase I) was between 1995 and 2015, and the second phase (Phase II) started 2015 and is continuing till 2020. The focus of Phase I was to establish an extensive ICT infrastructure and improve the effectiveness and efficiency of the Higher Education system processes and functions, to support Egyptian universities using world class standards that cover equipment, programmes, related applications, internal & external communication technologies, as well as strong internet coverage. Accordingly, these projects were distributed among six major work themes as follows: Management Information Systems (MIS), E-learning, Digital libraries, Electronic portals, Training, & Networks and information centres.

These six work themes were executed through establishing permanent central units, the Electronic & Knowledge Services Center (EKSC), at the supreme university council, as well as at public universities. These units utilise Information and Communication Technology (ICT) to provide its e-services & knowledge to the academic community and decision makers.

Phase II focused on digitalising the education sector to elevate Egypt's position and transform it to a regional higher education hub through ICT. There are currently ongoing Digital Transformation Projects implemented by MoHESR such as: applying online assessment in higher education institutions, developing the needed ICT Infrastructure and Connectivity, and work on qualifying Egyptian universities to become smart universities. One of the ongoing initiatives works also on building a brand for the Egyptian universities through improved international ranking, this is done through several procedural stages in addition to endorsing the important role of scientific

research within the Egyptian universities. Another initiative works on enhancing the universities' role in servicing the local community as well as its relationship with the industrial sector.

Chapter three revealed the results of the multilateral survey questioning the distance learning experience that occurred during the pandemic induced lockdown. The analyses of the questioned stakeholders' survey resulted in several recommendations that were taken into consideration while drafting the current vision regarding universities' readiness and the handling of the Covid-19 crisis, this included:

- Online learning was reported as a beneficial experience by different stakeholders after considering some challenges faced during Spring 2020
- After universities return to normal, blended learning can be applied so that Egyptian universities would be ready to adopt in case any urgent circumstances or crisis occur.
- The importance of digital transformation and moving forward towards adapting the fourth-generation universities (4GU)
- All university stakeholders should receive life-long training to cope with the emerging changes
- The role of resilient actions taken, the flexibility, and the variety of methods of communication proved crucial in coping and leading out of any pressing adversity
- Students have a role in drawing university's policies, and their voice can be easily heard but they do need more channels, broader platforms, and channels for communication.

Chapter four focuses on Egypt's repositioning as a regional hub for higher education through utilising ICT in digitalizing the education process using Artificial Intelligence (AI). The policy included seven pillars: two of them are concerned with education and learning; the third focused on scientific research; the fourth was concerned with the human capital within universities; the fifth highlighted the importance of digitalisation in order to be able cope with the urgent requirements of distance & online learning; while the sixth & seventh pillars included strategies to apply physical distancing within campus

once lockdown is lifted, as well as strategies for effective communication during and post crisis.

The focus of chapter five was regarding the MoHESR's recommended general strategy to be implemented by the Egyptian universities. The strategy's main objective is to empower and support young talent and enhance universities' role in supporting local communities & industries.

Finally, the universities' lockdown period and the implementation of distance & online learning revealed several challenges in distance education, which were confirmed by the survey results that recommended revisiting current education policies after the end of the crisis. Through this report, MoHESR provides a multi-phase approach to deal with the crisis effectively while utilising ICT in various aspects of the teaching and learning process.

الإنترنت والتي أكدتها العديد من مؤشرات نتائج الاستبيان والتي أوصت بضرورة إعادة التفكير في سياسات التعليم لما بعد انقضاء الأزمة. من خلال هذا التقرير تقدم وزارة التعليم العالي والبحث العلمي أسلوباً تدريجياً للتعامل مع الأزمة للاستفادة من استخدام تكنولوجيا المعلومات والاتصالات في مختلف جوانب عملية التعليم والتعلم.

- يجب إتاحة فرص التدريب لجميع الأطراف المعنية في الجامعة على التقنيات الحديثة والمعاصرة للتعامل مع التغييرات الناشئة
- أشارت النتائج إلى دور السياسات المرنة وطرق الاتصال والتواصل ودورها الفعال في قيادة الظروف الطارئة والملحة.
- يمكن للطلاب إن يقوموا بدورًا هاماً في رسم سياسة الجامعة، ويمكن سماع صوتهم بسهولة ولكنهم بحاجة إلى المزيد من القنوات للوصول إلى منصات وقنوات أوسع للتواصل.

خلال الفصل الرابع كان التركيز على وضع مصر كمركز إقليمي للتعليم العالي باستخدام تكنولوجيا المعلومات والاتصالات في تحويل التعليم إلى الذكاء الاصطناعي. وشملت السياسة سبعة محاور اثنين منها خاص بالتعليم والتعلم والثالث شمل البحث العلمي والرابع اختص بالقوة البشرية داخل الجامعة وتناول الخامس ضرورة التحول الرقمي ليوكب الضرورة الملحة للتعليم عن بعد. بينما ضم السادس والسابع استراتيجيات لتحقيق التباعد الاجتماعي داخل الحرم الجامعي أثناء انتظام الدراسة واستراتيجيات التواصل خلال الأزمة وما بعد الأزمة.

مع حدوث جائحة فيروس كورونا المستجد شهدنا تسارعاً في أجندة إصلاح التعليم العالي. فإن فيروس كورونا المستجد فرصة للبلدان لتحديث خطط العمل الإصلاحية والإسراع بها. وقد أدركت وزارة التعليم العالي والبحث العلمي في مصر هذه الفرصة ووضعت استراتيجية التعليم العالي لما بعد الوباء. هذا وتتكون استراتيجية المواءمة للخروج من الأزمة من شقين: الشق الأول يركز على دمج استخدام تكنولوجيا المعلومات والاتصالات في مختلف جوانب التعليم والبحث. تماشياً مع دراسات أخرى تعتمد على استخدام تكنولوجيا المعلومات والاتصالات بشكل يكفل الكفاءة والإنتاجية والبيئة الصحية، كما تهدف السياسات إلى توفير التعليم الجيد الذي ساعد على تعزيز التصنيف العالمي للجامعات المصرية، ودعم تحقيق رؤية مصر لعام 2030.

وركز الفصل الخامس من هذا التقرير على الاستراتيجية العامة التي توصي الوزارة باتباعها بالجامعات المصرية والتي تركز على تمكين المواهب الشابة وتعزيز دور الجامعات في خدمة الصناعة والمجتمعات المحلية.

وختاماً كشفت فترة غلق الجامعات وتحول التعليم العالي في الجامعات المصرية إلى العديد من التحديات في التعليم عبر

Executive Summary in Arabic

الملخص التنفيذي

المشاريع إلى ست مسارات رئيسية: البنية التحتية لشبكات المعلومات، ونظام المعلومات الإدارية، والبوابات الإلكترونية والتعلم الإلكتروني والمكتبات الرقمية والتدريب على تكنولوجيا المعلومات والاتصالات. تم تنفيذ هذه المسارات الرئيسية الستة من خلال إنشاء وحدات مركزية دائمة في كل من المجلس الأعلى للجامعات والجامعات الحكومية. تسخر هذه الوحدات أنشطة تكنولوجيا المعلومات والاتصالات لتقديم خدماتها الإلكترونية والمعرفية للمجتمع الجامعي وملتخذي القرار.

خلال أنشطة المرحلة الثانية، كان التركيز على وضع مصر كمركز إقليمي للتعليم العالي باستخدام تكنولوجيا المعلومات والاتصالات في تحويل التعليم إلى تعليم ذكي، حيث تعمل وزارة التعليم العالي والبحث العلمي حاليًا على تنفيذ عدة مشاريع للتحويل الرقمي مثل تطبيق التقييم الإلكتروني، وتطوير البنية التحتية لتكنولوجيا المعلومات والاتصالات، وتأهيل الجامعات المصرية لتصبح جامعات ذكية.

كما تناول النشاط الثالث المبادرات الحالية لرفع ترتيب الجامعات في التصنيف الدولي من خلال مجموعة من الخطوات الإجرائية بالإضافة إلى تعزيز دور البحث العلمي بالجامعات المصرية. كما تناول النشاط الرابع المبادرات الحالية والتي تقوم بها الجامعة خلال دورها الأساسي لخدمة المجتمع المحلي ومدى بالإضافة إلى تعزيز دورها وعلاقتها بالصناعة والذي يعكس فوائده.

أما الفصل الثالث فقد اختص بعرض نتائج الاستبيان. وخلال نتائج الاستبيان لتجربة التعليم عن بعد خلال فترة غلق الجامعات فقد أشارت الأطراف المعنية المستبينة إلى العديد من التوصيات التي وضعت في الاعتبار لصياغة الرؤية الحالية لتعامل الجامعات مع أزمة كورونا المستجد والتي شملت:

- يعد التعلم عن بعد تجربة مفيدة من منظور الأطراف المعنية بالجامعة (القيادات-أعضاء هيئة التدريس والهيئة المعاونة - الجهاز الإداري - الطلاب) بعد تلافي التحديات والنقاط السلبية التي حدثت خلال ربيع 2020. وفي حالة انتظام الدراسة يمكن تطبيق التعلم المدمج لوضع الجامعات المصرية في حالة تحرك لأي ظروف عاجلة مثل ما يحدث بسبب فيروس كورونا المستجد.
- أهمية التحول الرقمي والمضي قدمًا نحو تهيئة الجامعات لتكنولوجيا الجيل الرابع.

أثبت فيروس كورونا المستجد أنه أكبر كارثة واجهها العالم منذ أوائل القرن العشرين. بدأ الوباء من الشرق الأقصى في نهاية عام 2019 وانتشر بسرعة إلى بقية العالم ووضعه في وضع الإغلاق منذ نهاية الربع الأول من عام 2020. ومع الإغلاق للعديد من المؤسسات في معظم البلدان تأثرت جميع القطاعات بشدة وبالأخص على الاقتصاد.

الغرض من التقرير هو وضع سياسات للتعليم والتعلم في ظل جائحة كورونا باستخدام تكنولوجيا المعلومات والاتصالات وتحويل التعليم إلى تعليم ذكي، وذلك من خلال دراسة الوضع الراهن لمنظومة التعليم وأراء الاطراف المعنية بالجامعة والمبادرات الحالية والخطوات الاجرائية التي تدعم التحول الرقمي وتأهيل الجامعات لتصبح جامعات ذكية هذا بالإضافة إلى التركيز على تمكين المواهب الشابة وتعزيز دور الجامعات في خدمة الصناعة والمجتمعات المحلية.

يتناول هذا التقرير أربعة فصول. يناقش الفصل الأول الأنشطة التي كانت وزارة التعليم العالي تنفذها قبل تفشي الوباء والإجراءات المستمرة خلال إغلاق الجامعات المصرية. وتناول الفصل الثاني استبيان متعدد الأطراف الذي هدف إلى استقصاء آراء الأطراف المعنية بالجامعة (الطلاب-الجهاز الإداري-أعضاء هيئة التدريس-والمسؤولين وملتخذي القرار بالجامعات المصرية). وشمل الفصل الثالث ركائز السياسة اللازمة بالجامعات المصرية بعد عودة الحياة الأكاديمية إلى طبيعتها. ويناقش الفصل الرابع السياسات المقترحة للجامعات من خلال دورها في خدمة المجتمع المحلي والصناعة.

عرض الفصل الثاني بعد المقدمة أنشطة جارية وسابقة حدثت قبل وأثناء جائحة فيروس كورونا المستجد في هذا الجزء، يمكن تقسيم حقبة التعليم العالي قبل فيروس كورونا المستجد تقريبًا إلى مرحلتين بناءً على أهداف العمل الرئيسية والدور الذي تلعبه تكنولوجيا المعلومات والاتصالات في تحقيق تلك الأهداف. كانت المرحلة الأولى خلال الفترة من عام 2005 وحتى عام 2015، وبدأت المرحلة الثانية في عام 2015 واستمرت حتى عام 2020. وخلال أنشطة المرحلة الأولى، استهدفت مشاريع تكنولوجيا المعلومات والاتصالات إلى دعم الجامعات المصرية في إنشاء بنية تحتية قوية قائمة على المعايير تشمل الأجهزة والبرمجيات والتطبيقات المرتبطة بها والاتصال داخل الجامعات وفيما بينها، فضلاً عن الاتصال العالمي عبر الإنترنت. وبذلك تم تقسيم هذا

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- McKinsey & Company, USA
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- Supreme Council of Universities (SCU), Egypt

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Abbreviations

AI	Artificial Intelligence
ASRT	Academy for Scientific Research & Technology
BMS	Building Management System
COBIT	Controlled Objectives for Business and Information Technology
DX	Digital Transformation
EGP	Egyptian Pound
EKB	Egyptian Knowledge Bank
EA	Enterprise Architecture
ERP	Enterprise Resource Planning
GCSE	General Certificate of Secondary Education
GDP	Gross Domestic Product
GiL	Government Innovation Lab
EKSC	Electronic and Knowledge Services Center
ICU	Intensive Care Unit
iiL	Industry Innovation Lab
IoT	Internet-of-Things
ISA	Income Sharing Agreement
IT	Information Technology
ITIDA	Information Technology Industry Development Agency
ITIL	Information Technology Infrastructure Library
LMS	Learning Management System
MENA	Middle East and Northern Africa
MIS	Management Information Systems
MoHESR	Ministry of Higher Education & Scientific Research
MoSS	Ministry of Social Solidarity
MoTI	Ministry of Trade & Industry
MoYS	Ministry of Youths & Sports
NiN	National Innovation Network
TOGAF	The Open Group Architecture Framework
SiL	Social Innovation Lab
SIS	Student Information System
STIFA	Science, Technology, and Innovation Funding Authority
TRL	Technology Readiness Level
UiL	University Innovation Lab
UK	United Kingdom
ULV	Ultra Low Volume
USA	United States of America



1. Introduction: A Call for Change

Coronavirus (COVID-19) pandemic has affected all aspects of our lives, and beyond the health sector, affecting other sectors, such as agriculture, manufacturing, construction, tourism, and definitely the Education sector. The pandemic has forced many sectors to rapidly adjust and adopt to the new norms of how to do business, the higher education sector has managed to showcase its flexibility and creativity in navigating through this crisis. People are actually living in unprecedented times, where many higher education institutions are being confronted by the need to make a move to online lecturing and education immediately due to the current pandemic.

Countries all over the world have taken strong measures to respond to the effects of this crisis. UNESCO has been monitoring education responses to COVID-19 globally. It has been collecting data and analysing information, facilitating policy dialogue and experience-sharing (Figure 1.1).

Online education has indeed provided an important venue for students to continue their education in this challenging time. However, the scale and speed of this mass migration, and the expected prolonged and persistent shift towards online programmes, highlights the need to ensure that online students receive an education of value

The Ministry of Higher Education and Scientific Research (MoHESR) in Egypt has taken serious actions to respond to the effects of the pandemic on the continuation of the education process despite the closure of the higher education institutions. New methods of education, lesson delivery, and assessments have been immediately put in place to respond to the crisis. The crisis has rapidly reshaped how universities operate, teach, and communicate in just a few months. This shift to online education has accelerated the application of new forms of pedagogy and gave birth to a tremendous amount of initiatives from individual academics and institutions. However, a lot of online education remain in a basic form, merely replicating the traditional forms of learning on-campus. There has been no time to rethink and develop the pedagogy, or to work with professional instructional designers on enriching teaching material for online delivery, and no time to train lecturers how to deliver online. Some institutions were already working on new approaches for online or blended delivery, but many others were caught by surprise. In 2018 the Observatory on Borderless Education reported that online education accounted for only 15% of a sample educational market share.

While the impact of the pandemic on Higher Education Institutions (HEIs) was abrupt and with barely any contingency plan other than to attempt to continue classes remotely, it is now important to put together a

The global spread of COVID-19

Epidemiological data illustrating the coronavirus pandemic's tragic effects on human health and lives.

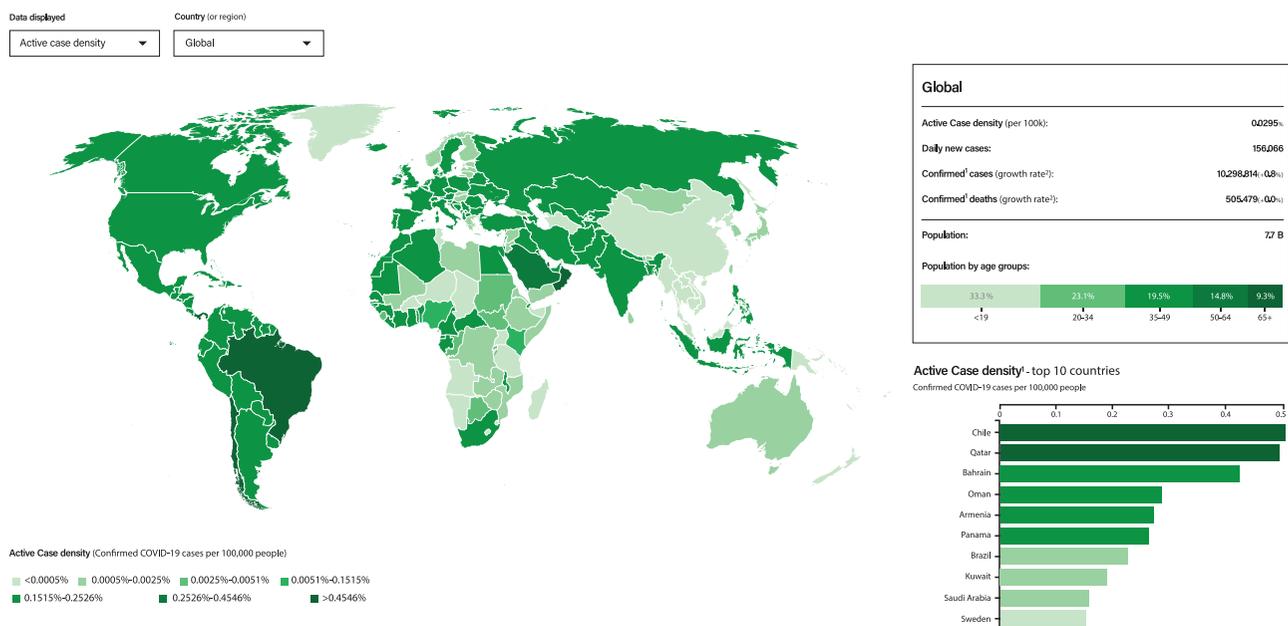


Figure 1.1. The global spread of COVID-19 (Courtesy: McKinsey)

recovery plan and a way out of this crisis. MoHESR in Egypt is dealing with this crisis as an opportunity to review and align its reform vision for the higher education sectors with the current immediate needs. The situation offers itself as an opportunity to rethink the overall purpose, role, content and delivery of education in the long term while preparing the education systems to deal with current and future crises through comprehensive and inter-sectoral approaches. With the online environment, there is a definite need to rethink both policies and legislations for undergraduate and post graduate education to facilitate globalisation and mobility.

The main questions that this blueprint attempts to answer are:

- How can MOHESR envision the future of classroom teaching and universities after the pandemic relief?
- What upskilling/ technology/ systems would be recommended to be brought in place to ensure envisioning the universities of the future?
- What are the policies needed at universities/ academic institutions to support the future where social distancing will be a norm for at least a year or two?
- How the job market will be affected, and what are the measures that should be taken to cope with new job requirements?

This blueprint provides answers for all these questions. Moreover, an action plan for post-pandemic is underlined to pave the way for the academic year when the academic life is back to normal.

The blueprint *Leading out of Adversity* is organised into four main parts (**Figure 1.2**). The first part 'Higher Education Before COVID-19 and Ongoing Actions for Pandemic' shows the situation of readiness in Egyptian Higher Education pre-COVID-19 and during the pandemic. It includes the ongoing actions that had started before the crisis and have continued during the pandemic university including, for example, the ranking and digital infrastructure that was established before COVID-19 and continue working during universities lockdown.

The second part tackles a multilateral survey for university stakeholders (top-managers, Faculty, administrative staff and students). The third part 'Policy Pillars for Higher Education and Scientific Research' explains the policies of MOHESR to lead out the adversity until the situation in the academic institutions is back to the normal. The fourth part 'Policies for Universities Serving Societal, Employability and Industry Needs' explains five policy pillars for the leading role of universities in serving the local societies.



Figure 1.2. The present blueprint structures

2. Higher Education Before COVID-19 and Ongoing Actions for Pandemic

This part focuses on three key initiatives that took place before COVID-19 and the ongoing university activities during the pandemic. Aside from several activities that MoHESR are currently doing, this part focuses on main initiatives that support the pressing current adversity. The first section in this part (Harnessing Communication Systems and Information Technology) provides a platform that enables the digital transformation in Egyptian universities to confront the pandemic.

The second section in this part, the 'Ongoing Digital Transformation Projects' showcases the success stories of ongoing projects for digital transformation. The third section here (Brand Building for the Reputation of the Egyptian Universities Ranking) reviews activities that were taking place in MoHESR before the pandemic and how it shifted its strategies after COVID-19.

2.1 Harnessing Communication Systems and Information Technology

The Higher Education sector prior to the COVID-19 pandemic can be roughly divided into two phases based on its key business objectives and the magnitude of the ICT role. The first phase (Phase I) was between 2005 and 2015, and the second phase (Phase II) started 2015 and is continuing till 2020. The focus of Phase I was on improving the effectiveness and efficiency of the Higher Education system processes and functions through utilising ICT via an automation process and business development. The six major work themes for this phase were as follows:

1. Management Information Systems (MIS): the development and localisation of automation systems for all administrative and educational staff, including: the Human Resources management, Academic and Public Cadres, Finance, Exam Control systems, Monitoring and Announcement of results, and Automation of Academic Regulations and Expenses.
2. E-learning: tackling the production and publication of e-courses to be used in the teaching process by various colleges across all universities.
3. Digital libraries: covering the electronic archiving of all the work related to the contributions of students, faculty, and the assisting staff. This

included electronic archiving of scientific theses, research papers, and technical reports.

4. Electronic portals: including the development and management of each university's electronic portal and linking it with the different MIS holders. The advantage of using the portal system is to provide administrative and educational services to all employees, faculty members and the assisting staff.
5. Training: for all administrative and technical staff to work with ICT, capacity building for all employees, faculty members and the assisting staff.
6. Networks and information centres: developing, managing, and operating the infrastructure of wired and wireless networks, servers, computers, etc.

Phase II focused on digitalising the education sector, through three major work themes:

1. Maximising the outcomes of the educational and research processes. This included enhancing the innovation, creativity and entrepreneurship capabilities of students and staff, and matching outcomes of the educational and research processes to the ever-changing economic demands and trends.
2. Enabling different learning styles: This included enhancing the distant learning model, adapting the learning process to the student's preferences and choices, and enabling learning for students with disabilities.
3. Optimizing use of university resources: This included campus and classroom resources.

To sustain the ICT projects in public universities, the Electronic and Knowledge Services Center (EKSC) had been established. It is one of the main building blocks of the Supreme Council of Egyptian Universities. EKSC includes six units, which are:

1. Egyptian Universities Network,
2. National e-Learning Center,
3. Digital Library,
4. Central Unit of Information Technology Training,
5. Management Information System, and
6. National Bank for scientific laboratories and equipment.

EKSC aims mainly to provide comprehensive, reliable, and well-developed e-services and knowledge-resources to the academic society through its subsidiary centres within the public universities. Moreover, it supports Higher Education governance and cooperates with the relevant state and international organisations. Through its units, the EKSC harnesses Information and Communication Technology (ICT) to provide its e-services to the academic community as described in the following section.

2.1.1 Providing ICT infrastructure to higher education sector

Egyptian Universities Network (EUN) is acting as the National Education Network since its establishment in 1987. In 1989, EUN connected the Egyptian academic community to the international community through the European Academic and Research Network (EARN). In 1993, EUN became the main and the first gateway to the Internet in Egypt by connecting to the Internet with bandwidth 64 Kbps to. As of today, and due to the rapid increase in the usage of the Internet, the bandwidth has been gradually increased to become more than 3 Gbps. This in addition to the connection to other international networks such as GEANT, Internet2 and GLORIAD.

The entire network serves 27 public universities and 14 research centres plus Al-Azhar University, Bibliotheca Alexandrina along with 100+ links to campuses that are outside the main university buildings. EUN contributes to some European projects, which is considered value-added services, such as EUMEDGRID-Support for a grid-computing infrastructure and connection international networks such as GEANT, Internet2 and GLORIAD.

EUN owns and operates a data centre located in SCU with prepared and redundant infrastructure that ensures the maximum reliability and availability for the provided services with 24x7 technical support. Inside this datacentre, EUN hosts and manages servers, storage, network and security appliances and software needed for the e-services provided to the universities and higher education. EUN technical team provides consultation and technical support services to the universities and the connected parties.

2.1.2 Availing digital library and scientific research recourses

As a vital EKSC unit, the Digital Library Unit (DLU) aims to enhance the utilisation of Egyptian university libraries

through the digital activities managed by the digital libraries' units in Egyptian universities. It mainly aims to achieve the two main objectives.

The first is providing reports of impact factor and plagiarism detection for the scientific committees for promoting faculty members. The unit issued 3353 anti-plagiarism reports and 11428 impact factor reports (from 2017 to 2020). The second ensures the clearance for master and doctoral proposals according to the digital repository of theses (total number is 121772 proposals) (**Figure 2.1**). The third objective attempts to handle the E-Publishing of Journals issued by Egyptian universities with a total number of 83 E-publication journals (**Figure 2.2**). Meanwhile, **Figure 2.3** indicates the story of the number of indexed articles per university.

In the same line of thinking the fourth objective aims to preserve the dissertations and thesis digitally, that is authorised by the Egyptian universities. This process comes through the digital repository of university dissertations. Figure 2.4 shows the total number of 271,070 full text of dissertation. This issue also includes providing training on using the digital resources accessed through the Egyptian Knowledge Bank.

On the same line of thinking, MOHE aims to search for the global catalogues through the digital union portal of Egyptian university libraries. **Figure 2.4** shows the indexed articles in 250 journals (total number is 59153 indexed). Furthermore, the ministry constructed, maintained, and developed the union catalogue of the Egyptian university libraries with a total number of 7,124,845 holdings (**Figure 2.5**).

2.1.2 Spreading Online Learning Culture and Developing Online Courses

National E-Learning Center (NELC) aims to spread the culture of e-learning among teaching staff members and students. It supervises 22 centres covering most Egyptian public universities. It also provides expert consultation & services to private universities and institutes and new governmental universities along with any required technical support. NELC is entrusted with setting technical and educational standards according to international standards, which is updated annually. More than 700 full e-course has been published covering 22 universities as shown in Figure 2.6 which are shared in the 27 public universities. Each course contains quizzes, assignments, scorm files, forums, chats, etc.

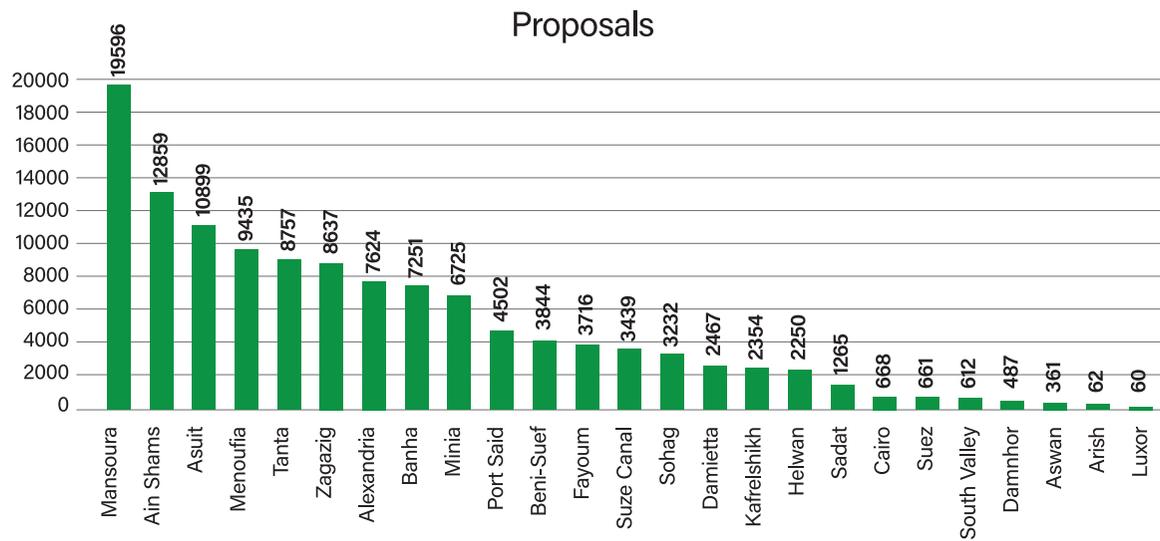


Figure 2.1. Number of proposals per university

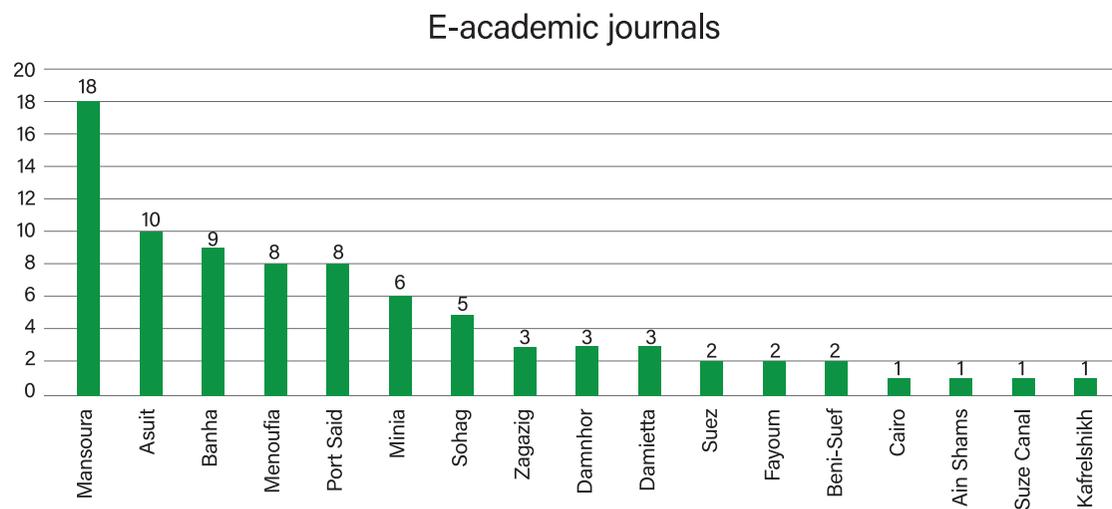


Figure 2.2. Number of E-academic journals per university

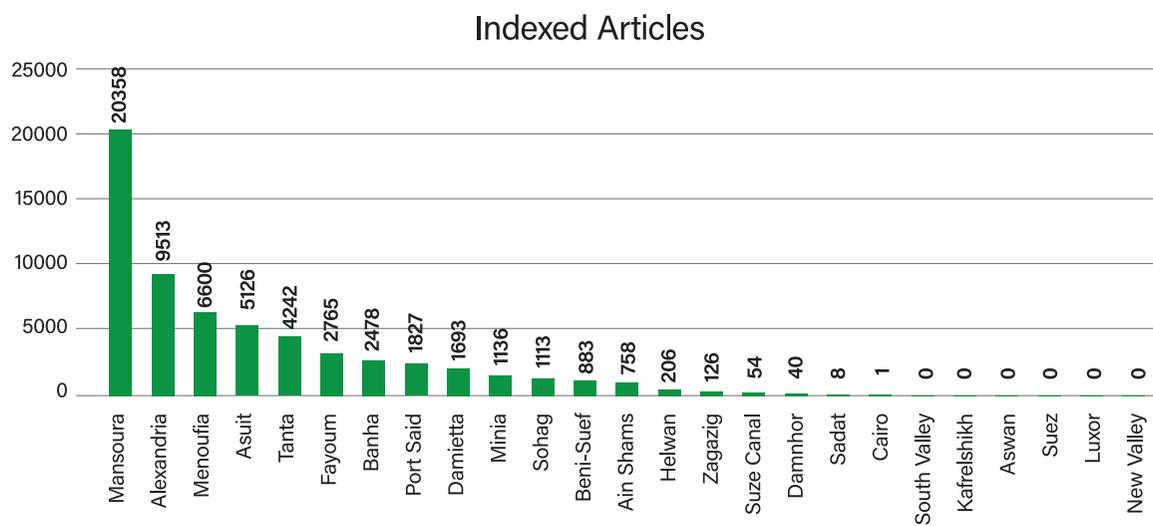


Figure 2.3. Number of indexed articles per university

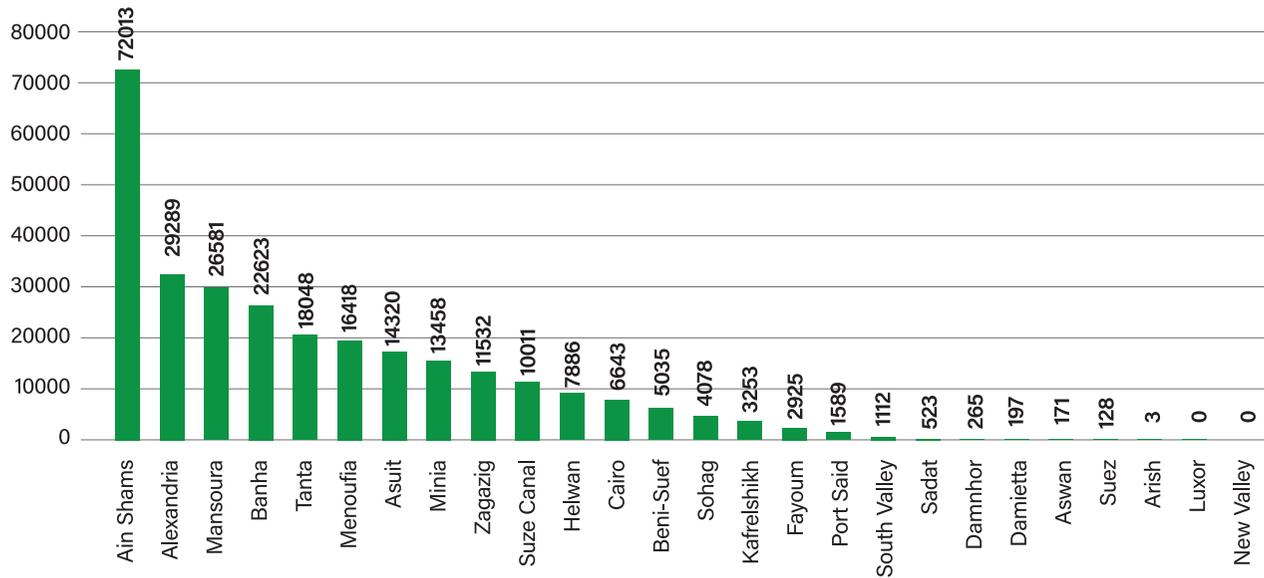


Figure 2.4. the number of full text authorised per university

EULC Holdings and bibliographic records

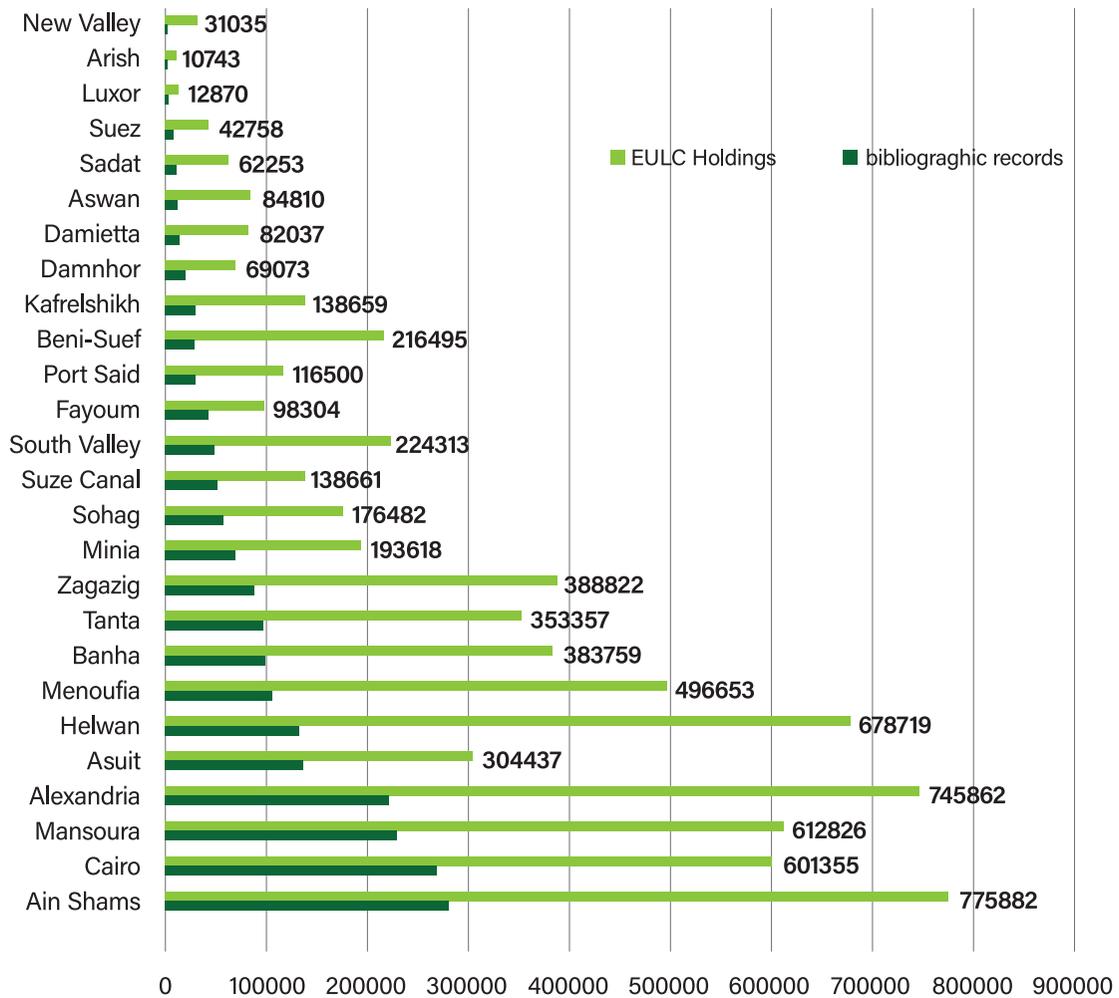


Figure 2.5. The number of holdings and bibliography records per university

The centre uses MOODLE as an open-source platform LMS. More than 2500 teacher and assistant every semester is trained on how to use LMS and activate courses. In addition, more than 500,000 students in total have used NELC courses over the past 12 years. Moreover, NELC has more than 150 technical (ID, GD, Dev) covering 22 universities.

NELC has recently launched the first educational widespread open-source platform EGYMOOCs, which currently hosts about six published courses, one of these courses is a human rights course which is a mandatory course for all students enrolled in all public universities, more than 150.000 student study this course annually.

NELC cooperates with some civil society entities such as Masr El Khair foundation, which has produced nine full e-courses for primary school's first, second, and third years. It has also cooperated with "English for Life" foundation (Efl) and produced two full e-courses. The centre is currently responsible for all blended learning centres and its courses production, standards, and ensures that services are provided in the best way. Additionally, DML portal was launched to allow teachers to share resources freely to their students (more than 5000 students) with more than 2000 learning objects with different types (scorm file, pdf, ppt, video, Sim). Moreover, NELC is responsible for providing the qualifying

test for attached public universities. In this the example is given to:

- The graduates of technical institutes to attach faculty of engineering since 2016.
- Since 2018, the example includes the graduates of the higher education to enrol schools of art (art, architecture), collage of music, collage of physical, collage of art, collage of media, schools of applied art.

2.1.3 ICT Capacity Building

The Central Unit of Information Technology Training (CUIT) is one of MoHESR initiatives that aims to enhance the IT skills of the higher education workforce through training and empowering them in an attempt to improve the educational processes and meet the challenges of the global marketplace. The central unit of IT Training was established in 2006 as an output of the ICT Project. CUIT trains staff members, teaching assistants, and university employees on four main tracks: Basic, advanced, professional, and MIS tracks. In the following figure, the number of trainees' courses is shown covering the period from 2011 to 2016. **Figure 2.7** and **Figure 2.8** shows the training percentage of the mentioned four tracks at the same time period between from 2011 till 2016.

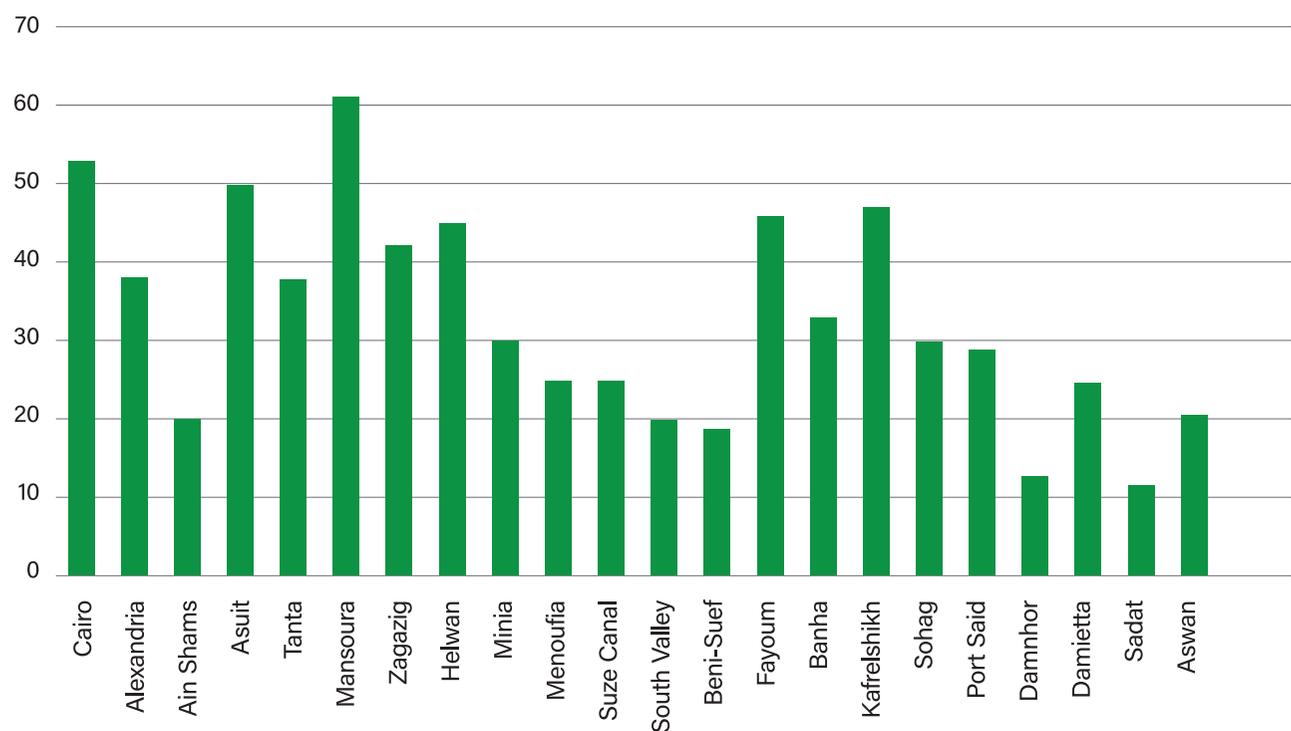


Figure 2.6. The number of available courses in Egyptian universities

2.1.4 Decision Support Systems

The Management Information Systems and Decision Support Systems (MIS&DSS) unit are responsible for developing information systems needed to automate the academic business processes at the level of SCU and MoHESR. It also applies the data science using different approaches to develop decision support systems for decision-making process at the level of SCU and MOHE. The following list is of the developed information systems by the MIS&DSS:

- Applying for membership in scientific committees and reviewers.
- Evaluating the applicants for promotion in the scientific committees.
- Evaluating Egyptian and local magazines.
- Statistical reporting system from Egyptian universities.
- Research systems equivalent to that of the private universities, institutes, and academies that are not subject to the Universities Organization Law No. 49 of 1972 and its executive regulations
- The electronic system is equivalent to that of outboard scientific degrees.

2.1.5 Providing a National Bank for Scientific Laboratories

The national bank for scientific laboratories and

equipment has been established by the decision of SCU in 2015. Accordingly, a corresponding unit in each university under the name of the scientific laboratories and equipment unit had been established. These corresponding units serve as links between the national bank and the Egyptian universities. The main aims of the national bank are threefold as follows:

- Create an up-to-date information system for the scientific laboratories and equipment in the Egyptian universities.
- Enable the researchers to inquire about the system to get the needed information about the scientific laboratories and equipment to facilitate the device usage, procurement, and maintenance operations.
- Avail and share of the scientific laboratories and equipment inside the Egyptian Universities in a large national bank to support the researchers at local and regional levels. This also encourages research teamwork.

Together, the current performance indicators of public universities were elaborated through the number of inserted devices in the national bank database of scientific laboratories and equipment (Figure 2.9).

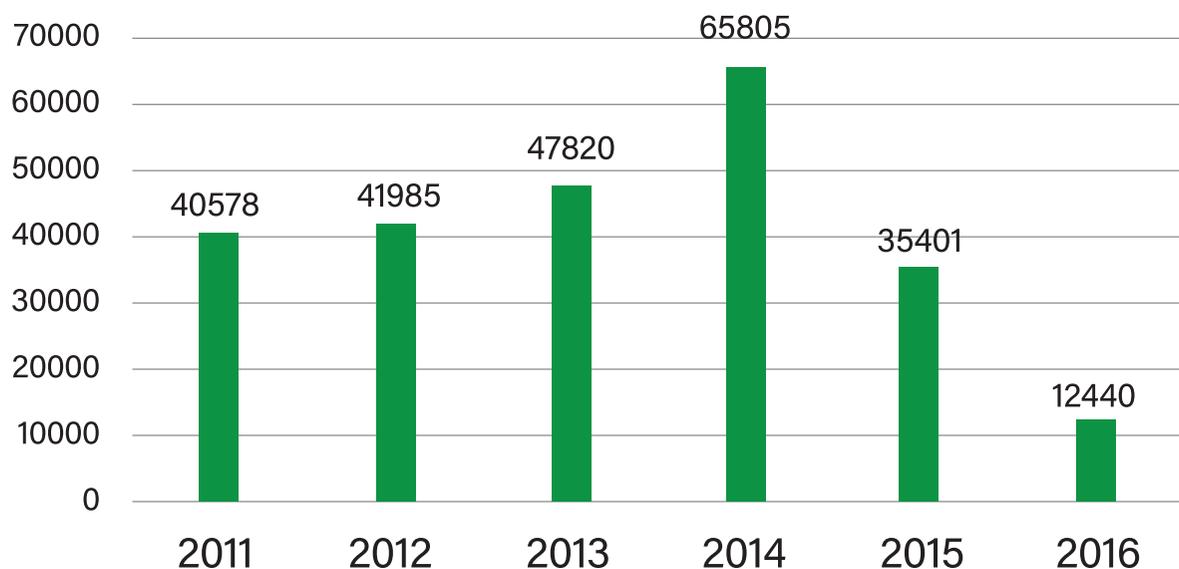


Figure 2.7. The number of trainees' courses delivered by CUIT from 2011-2016

Training ratios on different tracks

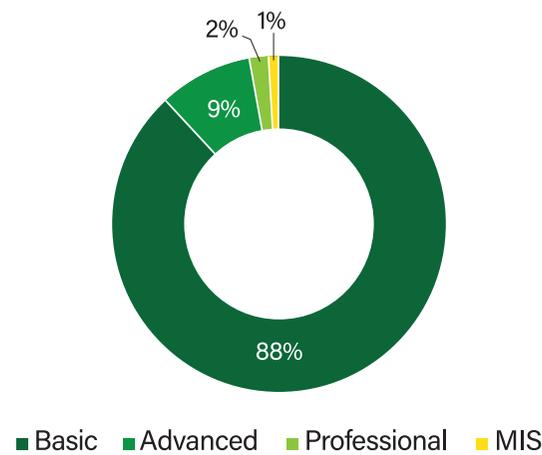


Figure 2.8. The training percentages of the four tracks aggregated for the period from 2011-2016

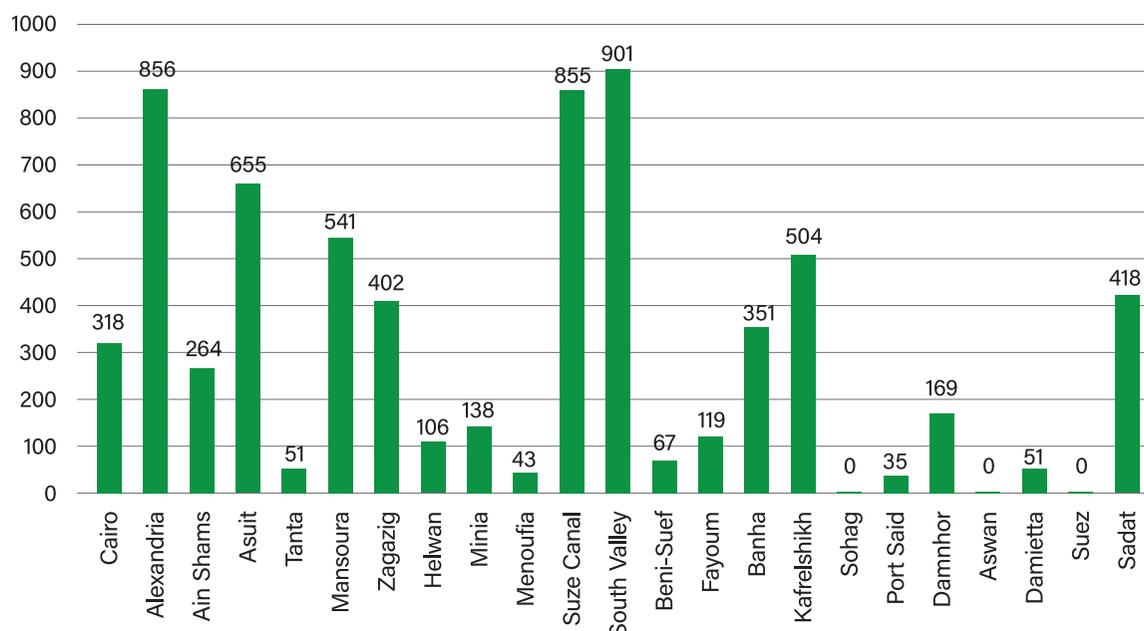


Figure 2.9. The number of inserted devices in each public university

2.2 Ongoing Digital Transformation Projects

2.2.1 Applying Online Assessment in Higher Education

According to the new vision of the MoHESR exams is to be conducted online for all university students in all disciplines. Supreme Council of Egyptian Universities

has, therefore, embarked on a new online examination system that aims to transform the academic examination system in universities from paper-based to computer-based exams, which would have significant advantages. Worth mentioning that this project serves more than two million students in 27 public universities. Meanwhile, the advantage of this project includes:

- Automated, fast and unbiased grading
- Allows modern and innovative question types like

- multi-media and simulation-based questions
- Significantly reduces the operational costs, effort and time to run periodical and final exams (printing exam papers and answer sheets, effort and time spent by instructors in marking, etc.)
- Ability to hold nation-wide exams with real-time monitoring, control, and with the ability to extract analytical reports and feedback.

2.2.2 Developing the ICT Infrastructure and Connectivity

MoHE have signed a cooperation protocol with TE Data, as a service provider, to upgrade the connectivity infrastructure of all branches and campuses of public universities (~200 sites) into fiber-optic cables and connect them to the main datacentre of each university, which is connected to the datacentre of the Egyptian Universities Network (EUN). This significant upgrade in universities' connectivity will facilitate providing several digital services, including the Wi-Fi Internet, at very high speed. Within the project, the dark fiber total bandwidth will reach around 13Gbps while the Internet bandwidth provided to universities will reach more than 10 Gbps in total. This high-speed connectivity and internet will be of great help & will facilitate the transformation of public universities to smart universities and will provide a wide spectrum of applications and smart services.

2.2.3 Qualify Egyptian Universities to Become Smart Universities

The Supreme Council of Universities (SCU) and the Information Technology Industry Development Authority (ITIDA) signed a protocol to evaluate the current maturity level of Egyptian university capabilities to transform Egyptian universities to become smart universities digitally. The aim of this protocol is threefold. The **first** is to evaluate the capabilities of all public universities to digitally transform Egyptian universities to smart universities using Smart University Reference Architecture (SURA) that was issued by the Software Engineering Competence Center (SECC) at the Information Technology Industry Development Agency (ITIDA). The **second** aim tries to analyse the gap between the current situation of public universities, and their requirements, as well as their needs, to digitally transform into smart universities. The **third** aim is to train work teams from public universities and EKSC at the SCU.

Moreover, the protocol will be activated from July to September to start training work teams from public universities and from EKSC at the SCU, in order to build qualified teams able to transform the public universities to smart universities. Accordingly, universities were asked to nominate two faculty members for training on the TOGAF fundamentals course to structure the institutional infrastructure and its business, applications, data, and technologies as well as the COBIT Essentials Course for IT Governance.

2.3 Brand Building for the Reputation of the Egyptian Universities Ranking

In June 2017, MoHESR assigned a team to work on improving universities' ranking and become recognized in the global ranking systems. The aim is to list our universities in the most prestigious ranking institutions: Quacquarelli Symonds (QS), Times Higher Education (THE), Shanghai Ranking, U.S. News, Webometrics, and Leiden Ranking. These six ranking systems were selected because they are multidisciplinary and global. This list of ranking institutions is also ranked higher education institutions, mainly universities, and they are available online and in English.

In early 2020, the team of universities ranking had put a long-term strategy, distributing the accountability of publications and funds with priority given to the immediate need and circumstances caused by the current pandemic, in line with this strategy, MoHESR avail data and supportive equipment for researchers. One of the challenging issues in achieving a convenient university ranking is marketing. A recent blog had mentioned that universities need to market themselves as never before (Neumark, 2012). These challenging issues confront the students, alumni, and faculty (Figure 2.10). As fees rise sharply and business-friendly courses boom, students, along with their families, are ever more inclined to research value for money options.

To promote the marketing aspect of universities, a focus should be on university's core values, such as its academic integrity that links teaching, research, and scholarships; business-oriented courses with an employability component; and enhanced student experience. Another issue is the target communication with parents as well as with students, involving academics as much as possible. To achieve this, several educational programmes highlight students' testimony in university marketing materials on their websites and social media. This highlights the importance of using social media tools, as well.

During a workshop, the work team put a roadmap with a plan and actions to be taken. Universities were categorised into three groups: A, B, and C (Figure 2.11 and Table 2.1). Each group will have its own action plan

to work on raising its ranking. The action plan mainly includes four pillars to raise the academic ranking: the research, the teaching strategies, employability and international reputation (Figure 2.12).

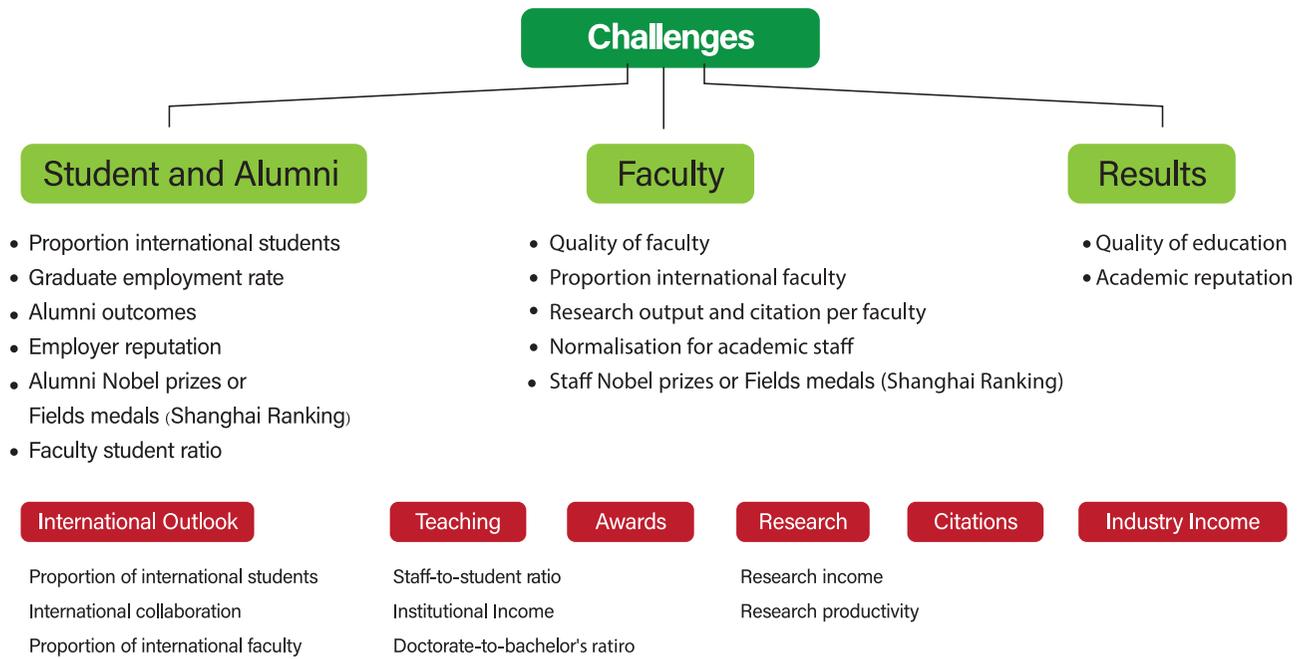


Figure 2.10. The challenge in universities ranking

Universities taxonomy based on their ranking level

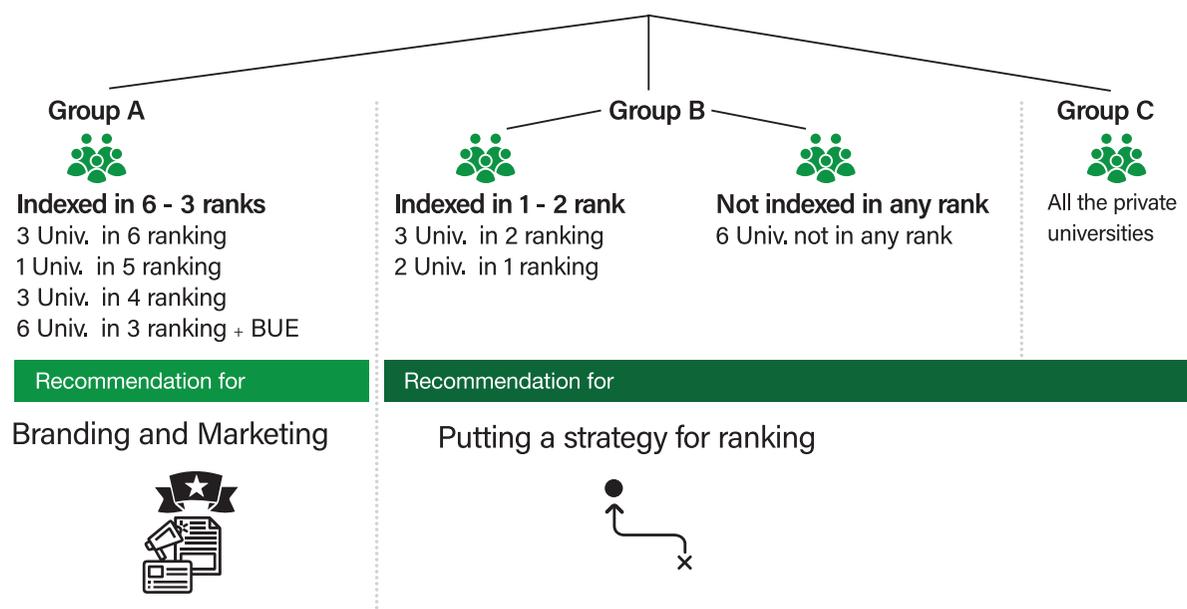


Figure 2.11. The taxonomy of classifying Egyptian universities into the three groups based on their status in university ranking

As the number of publications is one of the essential factors in university ranking, an initiative was started by the Egyptian Knowledge Bank to index the journals written in Arabic aside the other releases published in

the indexed international journals. **Table 2.2** shows the number of Arabic indexed journals in Web of Science (WOS), Clarivate.

Table 2.1. The three coaching sessions for the three groups

Coaching Sessions		
Monday 15 June 2020		
Coaching #	Cairo Time	University Name
Coaching 1	08:30 AM - 10:00 AM	Ain Shams University
Coaching 2	10:30 AM - 12:00 PM	Zagazig University
Coaching 3	12:30 PM - 02:00 PM	Mansoura University
Coaching 4	02:30 PM - 04:00 PM	Beni Suef University
Sunday 21 June 2020		
Coaching #	Cairo Time	University Name
Coaching 5	08:30 AM - 10:00 AM	Aswan University
Coaching 6	12:30 PM - 02:00 PM	Al Azhar University
Coaching 7	02:30 PM - 04:00 PM	Kafr El Sheikh
Monday 29 June 2020		
Coaching #	Cairo Time	University Name
Coaching 8	08:30 AM - 10:00 AM	Tanta
Coaching 9	10:30 AM - 12:00 PM	Suez Canal
Coaching 10	12:30 PM - 02:00 PM	Assiut
Coaching 11	02:30 PM - 04:00 PM	BUE



Figure 2.12. The four pillars that university should focus on raising its ranking

Table 2.2. The indexed universities in WOS

University	Number of indexed Journals in WOS	University	Number of indexed Journals in WOS
Assuit University	1	Fayoum University	3
Alexandria University	6	Sadat University	3
Ain Shams	20	Sohag	1
Al Azhar University	35	Suez Canal	3
Benha	4	Port Saeid	6
Cairo University	5	Tanta	1
El Wady	1	Zagazig University	3
Helwan	2		



3. A Multilateral Survey

In line with the decision of MoHESR to lockdown due to COVID-19 pandemic, a multilateral survey was conducted. The reason behind it is to stand on the situation in universities. This survey was scheduled between four central university's stakeholders: top-managers, faculty, administrative staff and students. The investigated issue was mainly the consequences of shifting education from face-to-face teaching to the distance learning process.

The purpose of this multilateral survey is to:

- Assess the severity of COVID-19 pandemic on Egyptian higher education (satisfaction, efficiency)
- Investigate how different stakeholders act and behave during the university lockdown
- Derive roadmap for post-COVID-19 based on the best practices during universities lockdown

The questions of this survey were designed and powered by SurveyMonkey and launched via various channels to reach the target stakeholders. The formula of the sample size was $SS = \frac{P(100 - P)Z^2}{E^2}$ (Bartlett, Kotrlik, & Higgins, 2001) where P is the percentage occurrence of a state or a total number of each stockholder. Z is the value and E is the percentage of maximum error required (Gill & Johnson, 2010). The study also calculated the number of sample sizes using the interface powered by SurveyMonkey (2020).

The total numbers of collected response were 1,041, 1,258, 11,100, and 93,491 received from top-managers, faculty, administrative staff and students respectively (**Figure 3.1**). The survey results were documented and analysed individually. Consistency check, reliability and validity of data have been tested.

<p>CLOSED</p> <p>Top Managers' Survey: How can universities act during and after COVID-19 pandemic?</p> <p>Created: 05/15/2020 Modified: 07/07/2020</p>	1,041 Responses	100% Completion rate	5 mins Typical time spent
<p>CLOSED</p> <p>Faculty Staff's Survey</p> <p>Created: 05/17/2020 Modified: 07/06/2020</p>	11,100 Responses	85% Completion rate	8 mins Typical time spent
<p>CLOSED</p> <p>Administrative Staff's Survey استبيان الجواز الاداري بالجامعات المصرية</p> <p>Created: 05/17/2020 Modified: 07/09/2020</p>	1,258 Responses	100% Completion rate	6 mins Typical time spent
<p>CLOSED</p> <p>Students' Survey: Assessing the severity of COVID-19 on Higher Education:</p> <p>Created: 05/15/2020 Modified: 07/07/2020</p>	89,867 Responses	57% Completion rate	5 mins Typical time spent
<p>CLOSED</p> <p>Foreign Students' Survey: Assessing the severity of COVID-19 on Higher Education:</p> <p>Created: 05/21/2020 Modified: 06/16/2020</p>	3,631 Responses	64% Completion rate	6 mins Typical time spent

Figure 3.1. Number of responses received in each survey

3.1 Top-Managers Survey

Going in-depth, the top-managers' survey was designed to tackle three main challenges (tracks) and evaluate the pros, cons and insights regarding online learning. Besides the general data about top managers includes the ongoing perceptions for handling the crisis, students' affordability for switching to the online learning and teaching provided by universities. **Table 3.1** shows the question directions.

Shading broad lights received from 1,041 responses, the general data, it focused on academic discipline and college type as well as the affordability of providing dual degree programs in his/her institution. **Figure 3.2** shows other statistics in this domain. In general information, the results figured out the significant presence in responses for 31.88% by the department heads followed by the vice-deans (20.1%) These statistics also show the weighty presence of national universities (59.59%) and private universities (36,63%). Worth mentioning, the admonitors' area of specialization came from different disciplines with participation for the life and medical sciences; and art, literature and humanities (33% and 18.9 respectively).

From the top managers' point of views, their insights on online learning (1st track) provide lines to follow. This lined include the intention to continue in blended learning. **Figure 3.3** shows how likely their institution plan to stay in giving online teaching adequately or blended after the crisis is over. On the same vein of thinking, they provide a gaze about professors' acceptance for shifting towards online learning. Another significant aspect when asking about their perspective regarding the students' attendance and participation in online teaching, the response shows a great appeal to this transformation.

The second track that tackles the affordability, the results reported that students need to have loans to buy computers for their online access (Figure 3.4 left). In the same line of thinking, they in a borderline with their thoughts about the students' affordability and their economic barriers (**Figure 3.4** on the right side).

In the third track, the survey attempted to investigate the services provided by the university. Top managers confirmed the suitability and how useful for students through using the learning management system (LMS) in their institution. The majority reported that the LMS was useful during the crisis (extremely useful 17.19% and 39.16% very useful respectively). Figure 3.5 on its left side also shows a low percentage of 7.32% and 3.81% for not being useful and not at all useful. In the same line of think, the response regarding the information technology provided by services provided by the university was also investigated. The response in this domain was somehow convenient for the services of digital services offered by the university. However, this response was exceeding the global benchmark produced by SurveyMonkey (**Figure 3.4** right).

The open-ended question to add any other comments dropped lines positively regarding online learning. One of the respondents mentioned, "Blended learning and the flipped approach should be activated as a better and more advanced method of teaching and learning."

On the same line of reporting the current status, another respondent mentioned the importance of the "online teaching [that] could be very useful and develop the teaching methods in an enormous way only if equipment and facilities were convenient and the staff were well trained." This comment comes in line with the statement

Table 3.1. The issue of investigation in top managers survey

Key issue of investigations		Sub-issues
1 st track	Insights on online learning	Intention of continue blending learning
		Professors readiness for the online environment
		Students attendance in the online system
		Dependence on online exams
2 nd track	Students' affordability for infrastructure	economic situation for students require loans for students
3 rd track	University services providing	LMS
		IT support
		Other support

said in another response: “governmental, and public universities need capacity building in its IT infrastructure to fit the intended blended learning as well as training for Staff.”

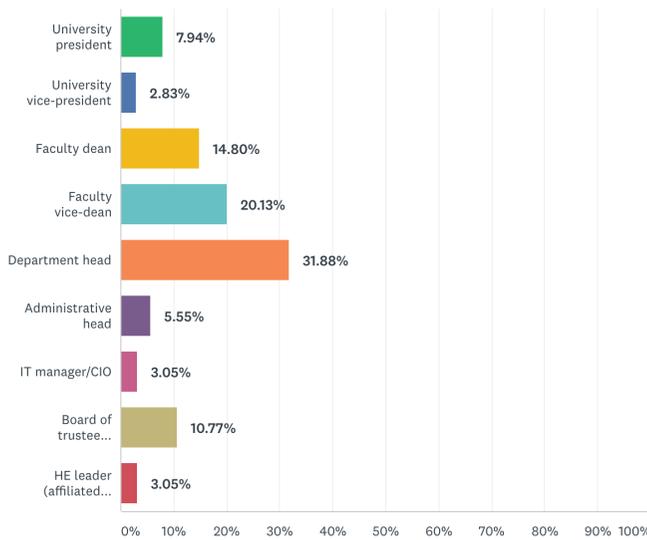
In another vein some responses mention the importance of having the equality between the public and private universities when saying that “[t]he ministry of higher education and scientific research should support all universities, whether they are governmental or private, to have a robust online education system in the near future.”

Technically, a recommendation raised here for establishing digital platform of online exams. One of a significant response in this domain confirmed the “need to develop central exams programs through the information network and mechanisms to evaluate the current experience.” This response also stated the possibility of having blended learning in the future to secure the health status and stop the spread of viruses.”

Shading light on one of a vital issue in engineering teaching, one of the respondents mentioned the

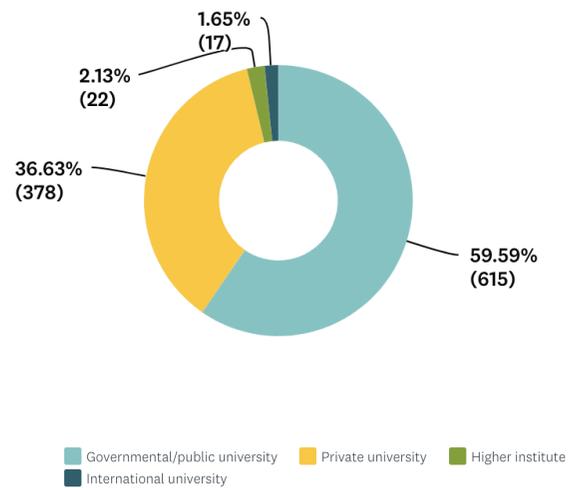
The academic position in your university

Answered: 919 Skipped: 122



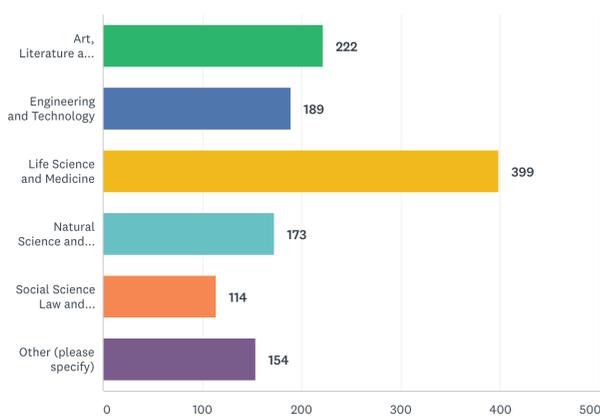
Type of your institution

Answered: 1,032 - Skipped: 9



Your area of specialization (sector)

Answered: 1,019 Skipped: 22



Offering dual degree

Answered: 1,007 Skipped: 34

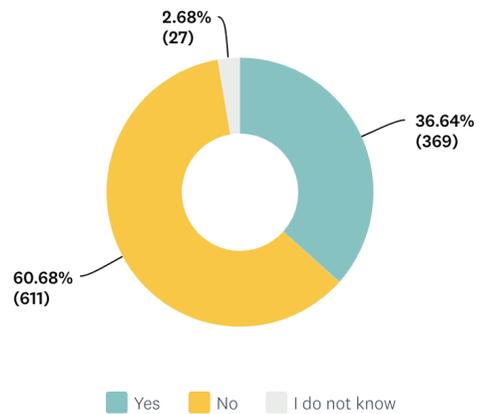


Figure 3.2. The general information about respondents

challenge that might face this area of specialization. He stated “about studying at colleges of engineering, there is a problem with online teaching, which is the study of courses that have a laboratory. He also declared the online teaching and learning need to be present in laboratories and workstations that require practical skills.” He also confirmed the difficulty in mongering online exams.

To sum up, the results of the top managers’ survey figured out information that could lead to decisions. Table 3.2 and Figure 3.6 show the aggregation of the first track; it indicated that top managers are ‘agree’ both of the first two items included in the first track. This agrees promotion represents 34.5% and 48.1%, respectively. Consequently, the weighted average of this

track indicates the same attitude with a mean of 2.73 and SD (0.919). Worth mentioning that the aggregation of all sub-tracts here that tackle top managers’ insights toward their institutions’ attitude is ‘agree’ in general for the items in track one in aggregation.

Table 3.3. and **Figure 3.7** illustrate the aggregation of the second track that tackles the response of Top managers regarding the students’ affordability of infrastructure. Their responses provide insight regarding of the economic situation and loans required. The results show that students in their institutions are “most likely affordable” representing 50% and 43.81% respectively. Hence, the weighted average of second track indicates “most likely affordable” with mean 2.05 and SD (0.4176).

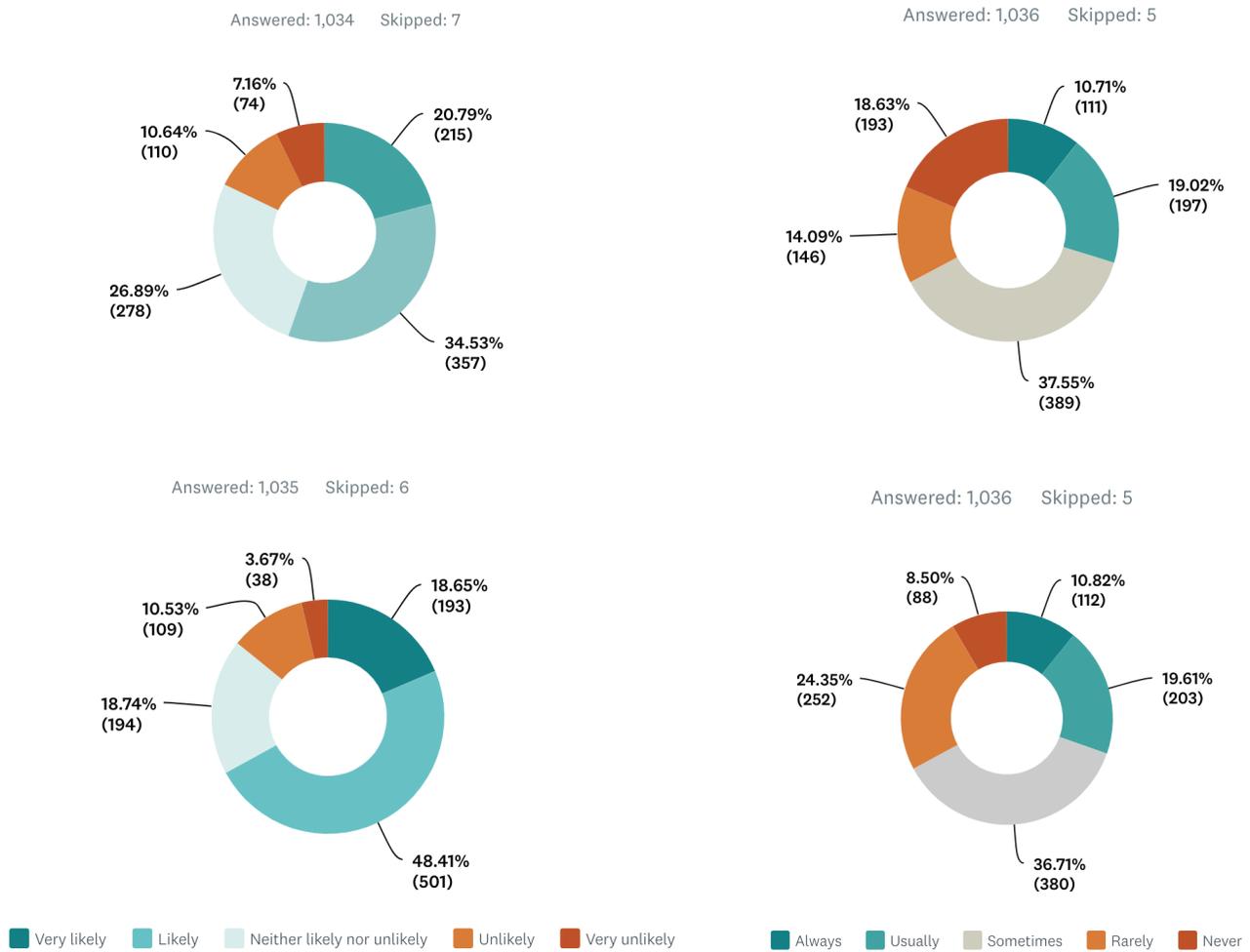


Figure 3.3. The top managers' responses to their plans for applying the hybrid learning (top-left) and the instructors' acceptance of this plan (left-down). The reaction of top managers regarding students' interaction on distance teaching (top right) and their expectation to the online exam

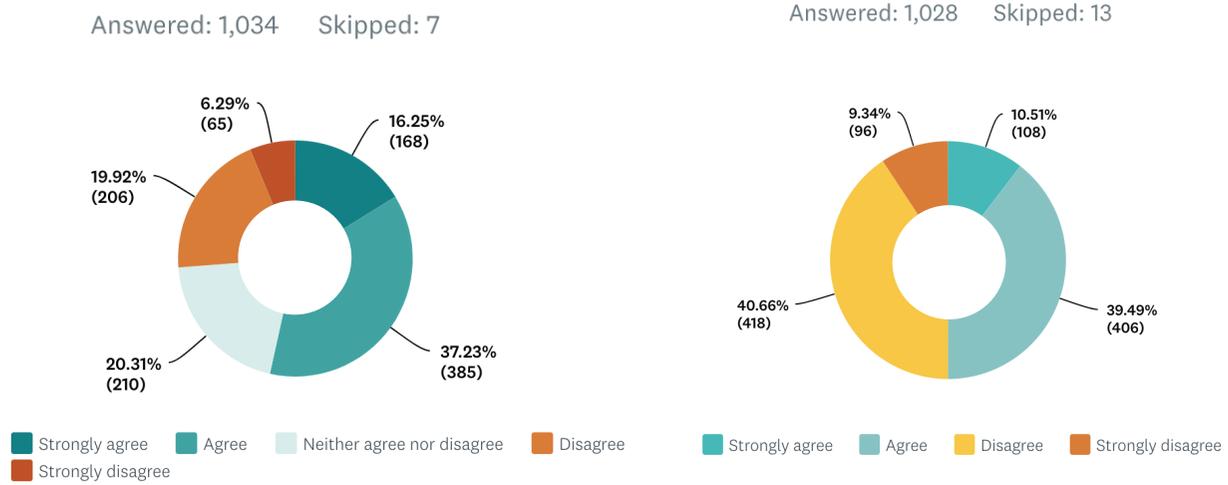


Figure 3.4. The affordability for digital transformation

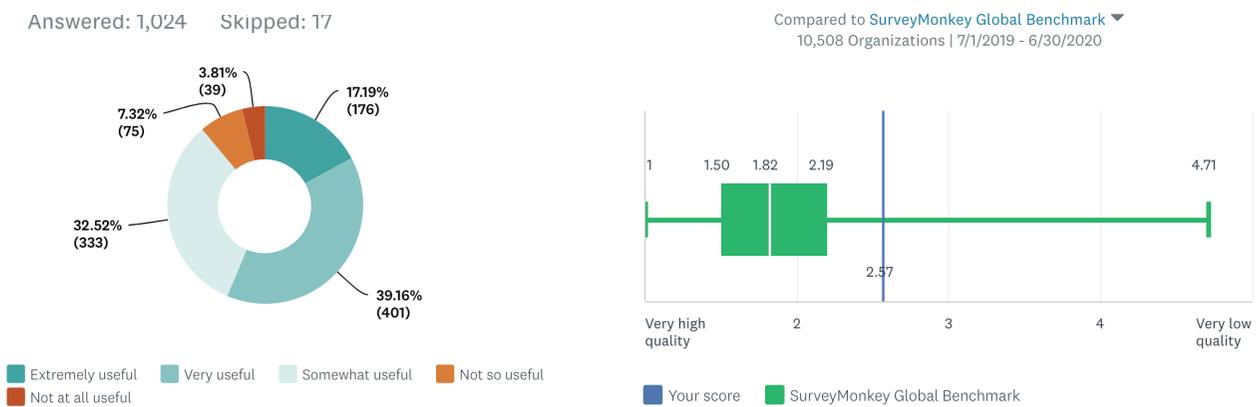


Figure 3.5. The top managers' expectations regarding the digital services provided by the university

Table 3.2. The percentage distribution of top management insights on promoting online education during and after COVID-19 pandemic

First track	Strongly agree	Agree	Neither nor	Disagree	Strongly disagree	Weighted Average	S.D	Direction
Intention of continue in blending learning	20.8	34.5	26.9	10.6	7.2	2.49	1.144	Strongly Agree
Professors readiness for the online environment	18.6	48.4	18.7	10.5	3.7	2.32	1.011	Strongly Agree
Students attendance in online system	10.7	19.0	37.4	14.0	18.5	3.11	1.222	Neither nor
The dependence on online exams	10.8	19.6	36.7	24.3	8.5	3.00	1.102	Neither nor
Aggregation on promoting online education	15.2	30.4	29.9	14.9	9.5	2.73	0.919	Agree

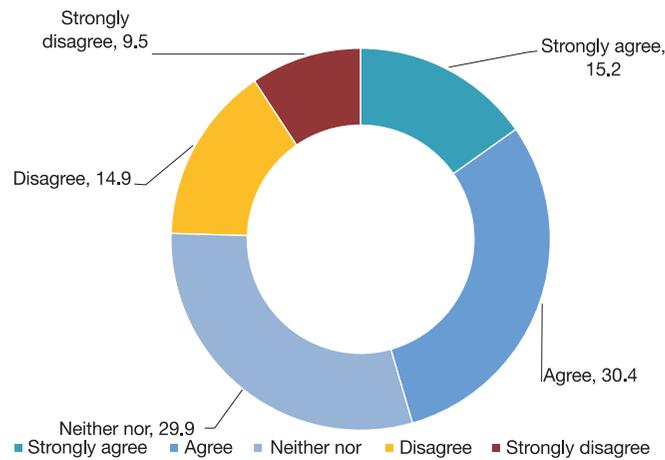


Figure 3.6. The percentage distribution of top management insights on promoting online education during and after COVID-19 pandemic

Table 3.3. The percentage distribution of affordability of infrastructure for students

Second track	Strongly affordable	Most likely affordable	Not affordable	Weighted Average	S.D	Direction
Economic situation for student	40.66	50.00	9.34	2.39	0.6704	Most likely affordable
Require Loans for students	29.98	43.81	26.21	2.27	0.8504	Most likely affordable
Aggregation of Affordability of infrastructure	35.31	46.90	17.80	2.05	0.4176	Most likely affordable

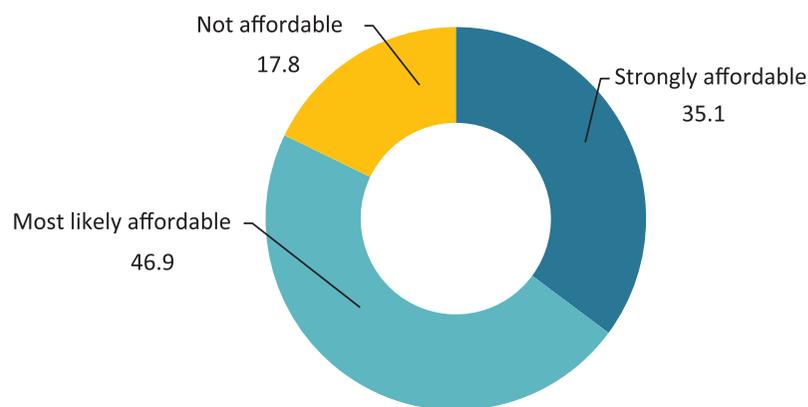


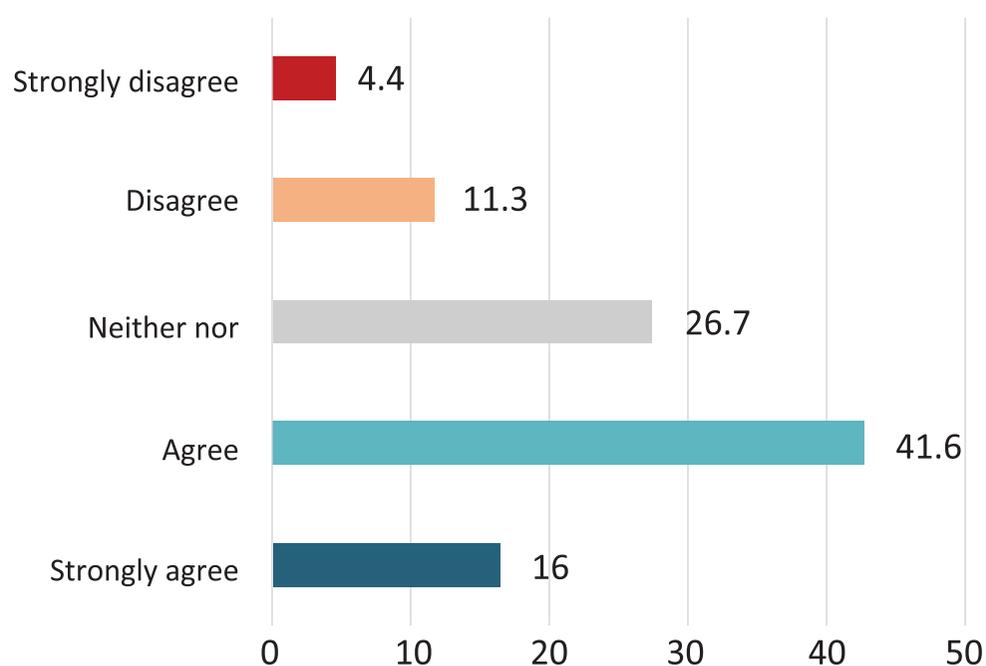
Figure 3.7. The percentage distribution of affordability of infrastructure

In the aggregation of the third track, Table 3.4 and Figure 3.8 depict that three items have scored 'Agree' for their expectation about the IT services or its' quality and the HR office support online delivery. Notably, the results score 39.2% and 38.9%, and 46.6% for agreeing

the robustness of IT support. The weighted average of indicates the same as all items 'Agree' with mean 2.47% and SD (0.890). These results mean that the managers' opinion towards IT is 'Agree.'

Table 3.4. The percentage distribution of managers' expectations about IT during and after COVID-19 pandemic

Third track	Strongly agree	Agree	Neither nor	Disagree	Strongly disagree	Weighted Average	S.D	Direction
Usefulness of the services provided by (LMS)	17.2	39.2	32.0	7.2	3.7	2.41	.981	Agree
Quality of IT service	13.5	38.9	29.1	13.8	4.7	2.57	1.037	Agree
HR office support online delivery	17.2	46.6	18.5	12.7	4.7	2.41	1.064	Agree
Aggregation of IT Expectation	16	41.6	26.7	11.3	4.4	2.47	.890	Agree

**Figure 3.8.** the percentage distribution of manager's expectations about IT during and after COVID-19 pandemic

3.2 Faculty's Survey

Faculty's survey aims to assess the severity of COVID-19 on the Egyptian Higher Education. This survey was designed tackling three principle tracks after the general information. **Table 3.5** Shows these three tracks and their sub-tracks that include:

- The insights of teaching staff and their assistants and their experience for online teaching
- Competencies for online teaching
- Staff needs for online teaching

Table 3.5. The issue of investigation in Faculty's survey

No	Track description	Sub-track description
1 st track	The insights of teaching staff and their assistants through their experience for online teaching	1. Satisfaction with the support received, workflow and the comparison between the face-to-face and online teaching (Online teaching exceeds the traditional way of delivery) 2. Students' attendance and interaction in the online lectures 3. Tools and methods used
2 nd track	Competencies for online teaching	4. The capability of preparing online content 5. Smooth utilization of online platforms 6. The sufficiency of using LMS
3 rd track	Staff's needs for online teaching	7. The validity of using online exams 8. The possibility of using virtual labs vs the face-face labs 9. The request to generate statistics on students during a lecture 10. The software required

The data entry for faculty's survey was a sum of the approximately sample size of 11,000 responses. The target population size of the teaching staff and assistants is 88958 people. Within two weeks of launching via various channels, this survey received 11,100 responses from this group of university stakeholder. In this, the present survey the confidence level was 95%, and the margin of error was 0.97%.

The general information about respondents to this survey shows their academic position and discipline of the area of specialization and their distribution among the public, private universities; higher institutions; or international universities (**Figure 3.9**).

The results of this general information of academic positions show that assistant professors score the highest, followed by teaching assistant and professors (27.6%, 26%, and 20.4% respectively). What stands out here is that the medical discipline shows up a high percentage of response to this survey in comparison to their peers (38.4%), followed by 22.5% from social science discipline.

Moving on now to the first track in this survey (The insights of teaching staff and their assistants ...), the first sub-track tackles the satisfaction regarding support received, workflow and the comparison between the face-to-face and online teaching. **Figure 3.10** shows

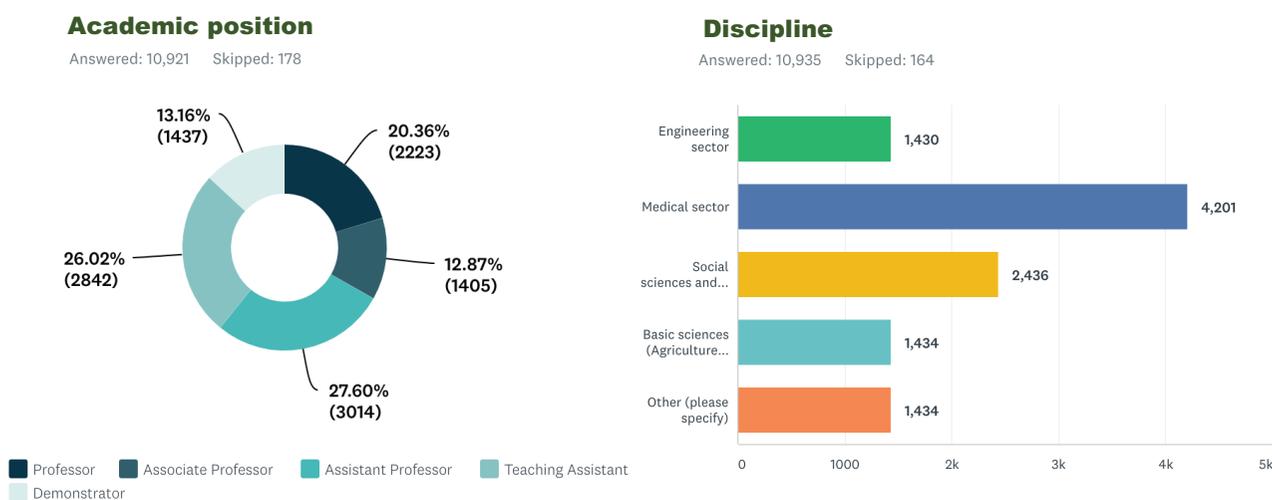


Figure 3.9. The general information about respondents for the Faculty's survey

Type of affiliated university

Answered: 7,577 Skipped: 3,522

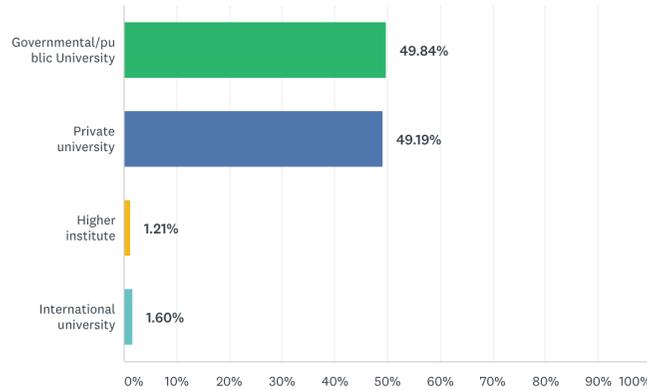
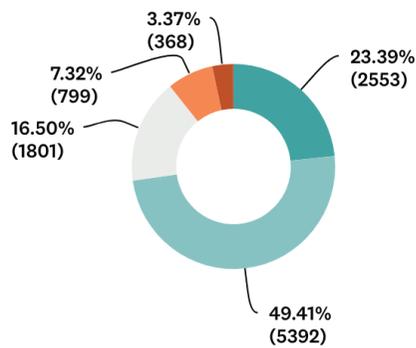


Figure 3.9. The general information about respondents for the Faculty's survey

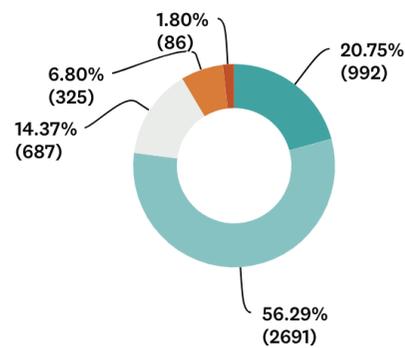
The support received from their institutions

Answered: 10,913 Skipped: 186



The workload during university lockdown

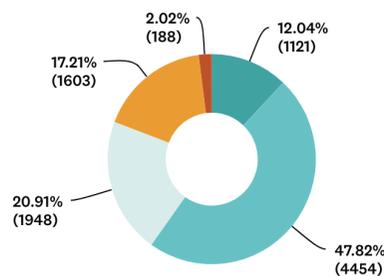
Answered: 4,781 Skipped: 6,318



Very satisfied Satisfied Neither satisfied nor dissatisfied Dissatisfied Very dissatisfied

Online teaching exceeds the traditional way of delivery

Answered: 9,314 Skipped: 1,785



Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Figure 3.10. The first track (the insights of teaching staff and their assistants through their experience for online teaching)

the results of their stratification. These results figured out the staff's satisfaction regarding the support that they are getting from their institution. These results show 49.4% of respondents are satisfied, and 23.4% are very satisfied. In the same line of results, their satisfaction with the workload to deliver online lectures by any means. However, only 20.7% in this domain are strongly agree the majority is about 56.3% who scored agree.

Closer inspection of the satisfaction, staff has mentioned their feedback in online teaching in term of exceeding the traditional way of delivery (Figure 3.10 down). Positively, the respondents reported strongly agree, and agree on the ration of 12.04% and 47.82%. Worth mentioning, a percentage of 20.91% was boarder selection between 'neither agree nor disagree.' It is apparent from this figure that the 'Disagree' and 'Strongly disagree' scored 17.21% and 2.02%.

In this domain, an open-ended question was designed to investigate actions in their institutions that they like most to

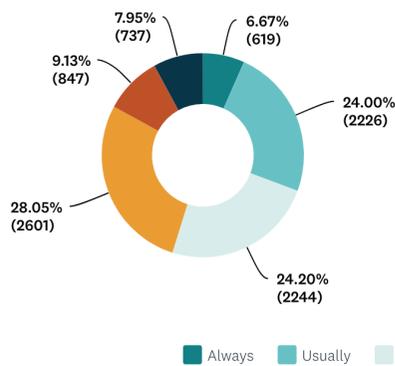
confront COVID-19 circumstances. One of the significant issue reported by the respondents who mentioned "the clear instructions and willingness to help."

Another positive response acknowledged the 'constant communication, flexibility and speed in dealing with variables.' Another respondent mentioned the most significant response is 'managing the crisis efficiently and finding various solutions and alternatives to make the educational process more accessible to all.' In the action of technical, physical infrastructure, a respondent stated that 'creating a temperature gateway for people with complete sterilization.' Besides, the most significant action was reported to the 'reduction of working days on-campus during the week, with completion of work efficiently...'

Within the first track, **the second sub-track (students' attendance and interaction in the online lectures)** shows some interesting aspects (Figure 3.11). The percentage of instructors who reported that students'

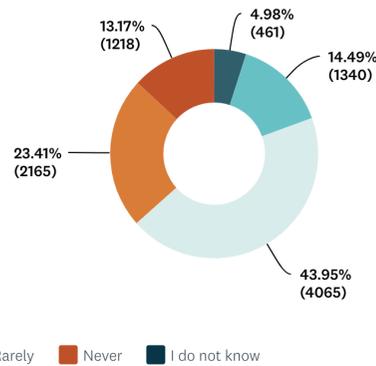
Students' attendance in the online lectures

Answered: 9,274 Skipped: 1,825



Students' interaction during the online lectures

Answered: 9,249 Skipped: 1,850



The number of students enrolled in the online classes would not affect my ability to teach.

Answered: 9,274 Skipped: 1,825

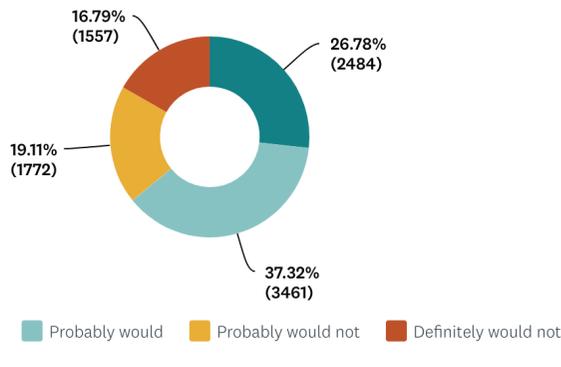


Figure 3.11. The students' attendance and interaction in the online lectures

attendance in online classes is between 6.67% and 24.00%. However, a percentage of 24.20 said as a 'sometimes' status based on the type of the course and instructors. Negatively, a high percentage (28.05%) reported that attendance on the online platforms are 'rarely' similar to the face-to-face teaching. A small percentage (7.95%) mentioned that their students never attend the online classes. Worth mentioning that some instructors reported that they do not know as they are not involved in teaching online classes and depending on providing the materials via the university LMS.

On the one side, a response regarding the students' interaction during the online lectures also provides some

insights. A low percentage of respondents conveyed the interactive learning for the online classes, 4.98% always, and 14.49% usually). Worth mentioning that this issue scored 0% of being 'I do not know' this might because they think that students interact passively to the uploaded documents on the LMS.

Moving now on the **third sub-track (tools and methods used)**, instructors reported several tools. **Figure 3.12** shows the percentage distribution of these tools, the best and worth tools/methods. The aggregation of the first track shows the positive reaction of faculty staff toward the online teaching (**Table 3.6 and Figure 3.13**).

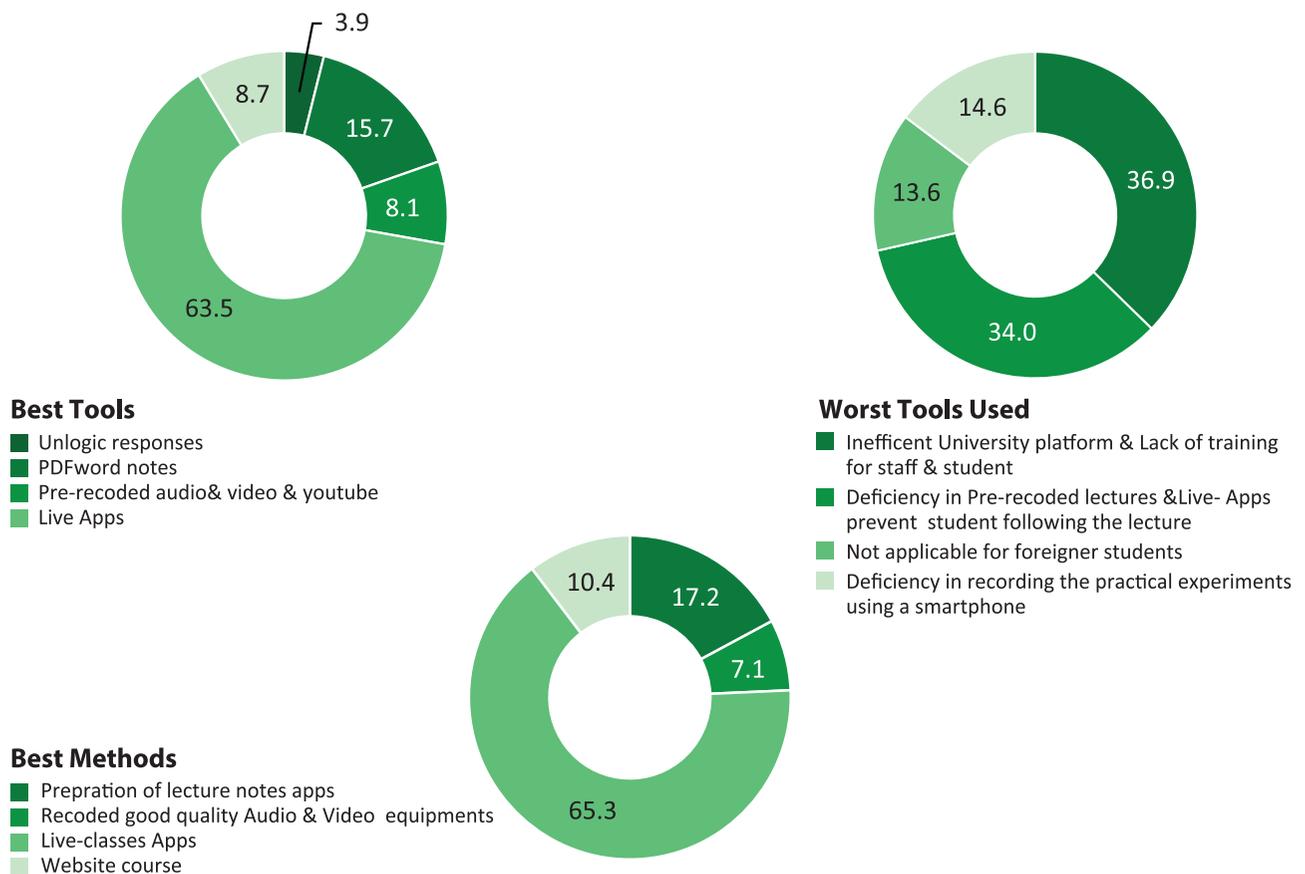
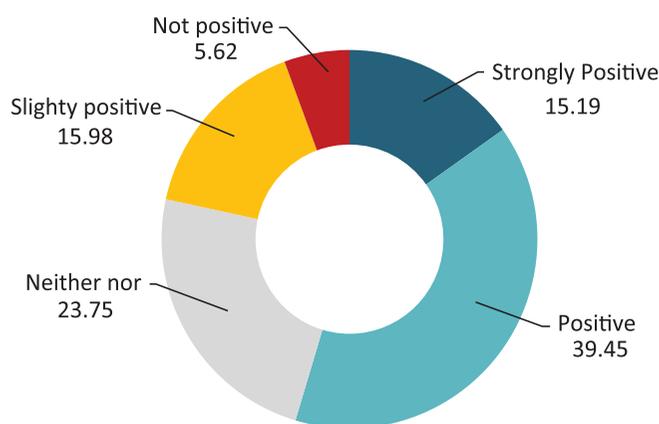


Figure 3.12. Tools and methods used

Table 3.6. The percentage distribution of Faculty's insights and experience for online learning

1 st track	Strongly positive	Positive	Neither nor	Slightly positive	Not positive	Weighted Average	SD	Direction
Satisfaction with support received	23.4	49.4	16.5	7.3	3.4	2.17	.9815	Positive
Satisfied with your workload during online teaching	20.7	56.3	14.4	6.8	1.8	2.12	.8770	Positive
Online teaching better than classical methods	12	47.8	20.9	17.2	2	2.49	.9775	Positive
Receive required support	23.3	47.8	17.5	9	2.4	2.19	.9737	Positive
More attendance of students in online lectures	6.7	24	24.2	28	9.1	3.32	1.3269	Neither nor
Students interactivity during online classes	5	14.5	44	23.4	13.2	3.25	1.0204	Neither nor
Staff Insight and Experience (aggregation)	15.19	39.45	23.75	15.98	5.62	2.60	.7479	Positive

**Figure 3.13.** The percentage distribution of faculty's expectations regarding online teaching experience with a mean of 2.60 and SD of .7479

Moving on now to the **second track (competencies for online teaching)**, two sub-tracks were included: Capability of preparing online content and smooth utilization of online platforms. Further statistical tests revealed the capability of preparing all of the online resources. Respondents in this context reported implicitly the technical tools that they might need. A small percentage of respondents reported 'unlikely and 'very unlikely' 3.50% and 0.57% (**Figure 3.14**).

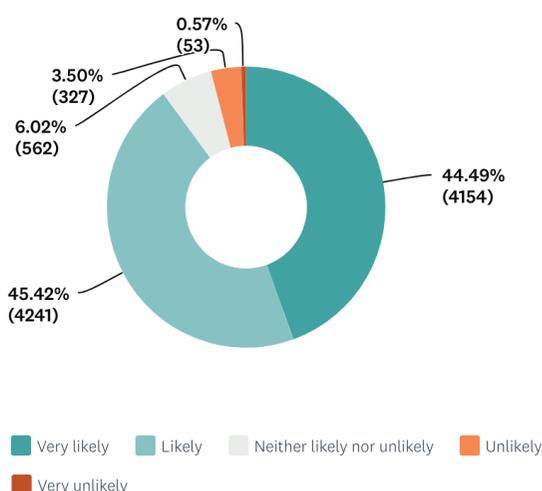
Furthermore, another significant response received regarding the experience of the online teaching, whether it moves smoothly or not. In this context, respondents reported 'a great deal' and 'a lot' scored 28.01% and

34.00%. A moderate amount (25.65%) was also reported. This survey also reported a small percentage of 9.17% and 3.17% for a 'little amount' and 'none at all' of going smoothly.

To sum up, the aggregation of the second track shows a medium direction toward their skills and ability to adapt the online teaching with a standard deviation of .7707 (**Table 3.7 and Figure 3.15**). This reflect the essential need in developing the capability of instructors to cope the online teaching. This development also requires providing a training programmes for handling the new technology.

Capability of preparing online content

Answered: 9,337 Skipped: 1,762



Smooth utilization of the online platforms

Answered: 9,306 Skipped: 1,793

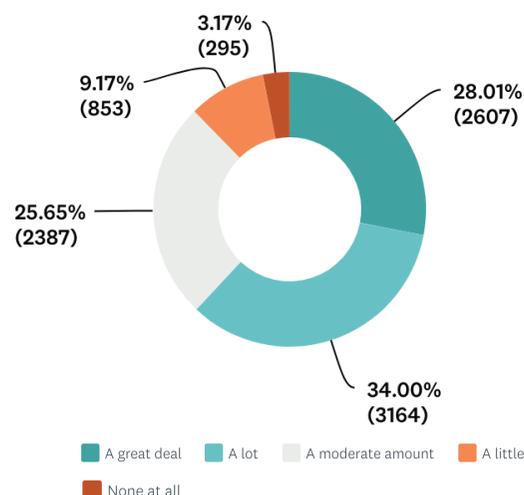


Figure 3.14. The second track 'Competencies for online teaching'

Table 3.7. The percentage distribution of staff competencies for online teaching

The second track	Strongly Competent	Medium competent	Neither nor	Weak competent	No competent	Weighted Average	S.D	Direction
Capability of preparing online content	44.5	45.4	6	3.5	0.6	1.70	.7796	Medium
Smooth utilization of online platforms	28	34	25.6	9.2	3.2	2.25	1.0601	Medium
The aggregation (Staff competent)	36.27	39.72	15.81	6.33	1.87	2.08	.7707	Medium

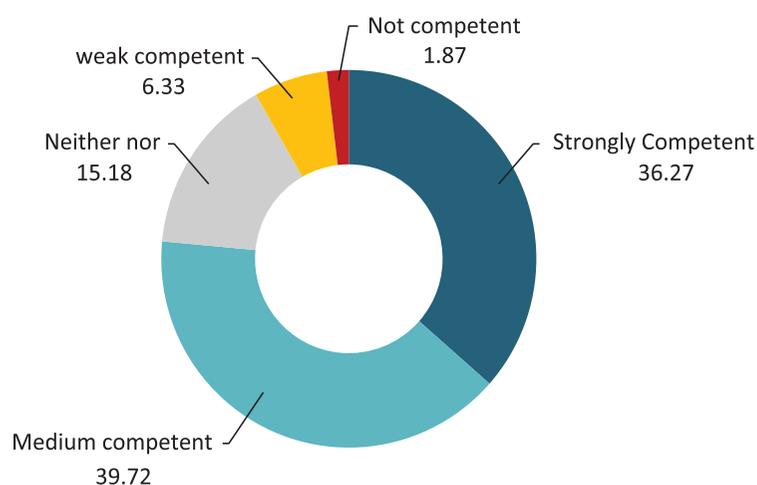


Figure 3.15. The percentage distribution of staff competencies for online teaching (second track) with Mean = 2.08 and SD = 0.7707

The **third track** in this survey (staff's needs for online teaching) holds four principle sub-tracks (refer to Table 3.2). In the first sub-track here (the sufficiency of using LMS), instructors reported sufficiency of LMS between a confirmation (23.15%) and being somehow sufficient (42.55%). **Figure 3.16** shows other statics related to this track.

The validity of using the online exam was also investigated in this survey. The results show that 11.51% and 30.16% are between strongly agree and agree for using the online exam when university back to the normal. Also, a recognized percentage of respondent neither agree nor disagreed. Comparing this with the disagree sample, a percentage of 25.49 and 10.02% for disagree and strongly disagree respectively.

In conclusion, the Faculty's survey shows that the challenge in online teaching is not with the teaching method, rather than with the culture of students who are not ready to receive knowledge remotely. The results figured out that most of the virtual applications are modern and insufficiently secure. The confidentiality of information should be secured and provide training modules for both instructors and students.

3.3 The Administrative Staff's Survey

The administrative questionnaire consists of three tracks (Table 3.8):

- Satisfaction toward the ongoing actions
- communication and instructions during the

pandemic and

- Their concerns during the university lockdown

Within **1,258 responses**, this survey aims to investigate how administrative staff can evaluate their university's acts during and after the COVID-19 pandemic. As other surveys in this blueprint, this study starts with general information about the role in the university and the type of university that they are affiliated.

The general information shows that most respondents—who interact with this survey question were part-time employees (94.15%). The statistics also show the categories of their role in the institutions' institutions they are affiliated (**Figure 3.17**).

The first track in this survey (Satisfaction toward the ongoing actions) tackles three sub-toward, in investigating the level of agreement with each of some statements about senior leadership at their institutions. **Figure 3.18** shows these statistics of this sub-track.

Moving now on the **second track** (Communication and Instructions during a pandemic). The four items related

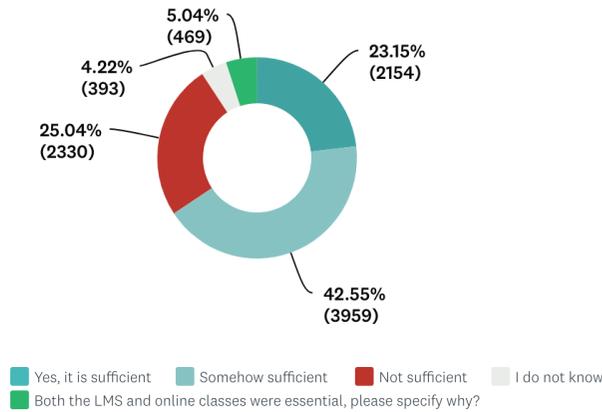
to the level of communication are focal point, time frame, clarity, and how instructions impact the work cycle (see Table 3.8). Within five levels of choices starting from very satisfied to very dissatisfied passing through neither satisfied nor dis-satisfied, these sub-tracks varied between 'very satisfied' to 'very dissatisfied' passing through 'neither satisfied nor dissatisfied' (**Figure 3.19**).

Table 3.8. The tracks of issue investigated

No	Track description	Sub-track description
1 st track	Satisfaction toward the ongoing actions	The support during a pandemic
		Helping staff to adapt changes
		Care and concern for staff
2 nd track	Communication and Instructions during the pandemic	Have a focal point to communicate with
		Time frame of communication
		Clarity of communication contents
3 rd track	Concerns during universities lockdown	Content and quality of communication
		Level of stress toward assigned duties
		The effect on employability status
		What do you worry about most during a pandemic?

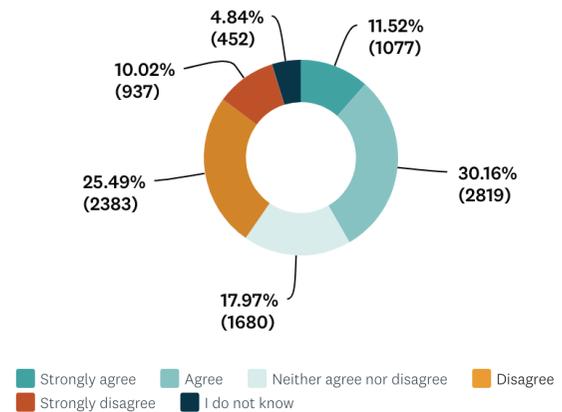
The sufficiency of using LMS

Answered: 9,305 Skipped: 1,794



Validity of using online exams

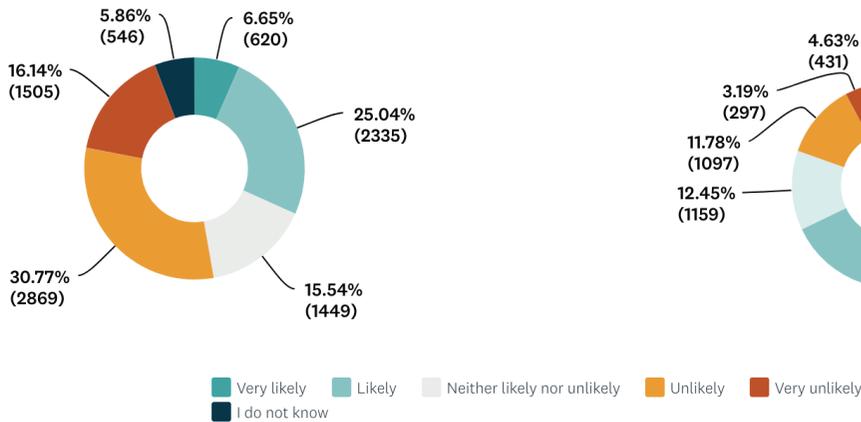
Answered: 9,348 Skipped: 1,751



Possibility of using virtual lab vs. the face-face lab

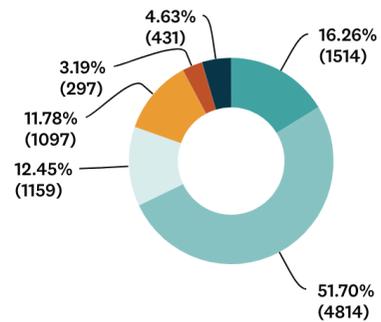
Virtual labs or online tutorials can replace real labs in both teaching and examination

Answered: 9,324 Skipped: 1,775



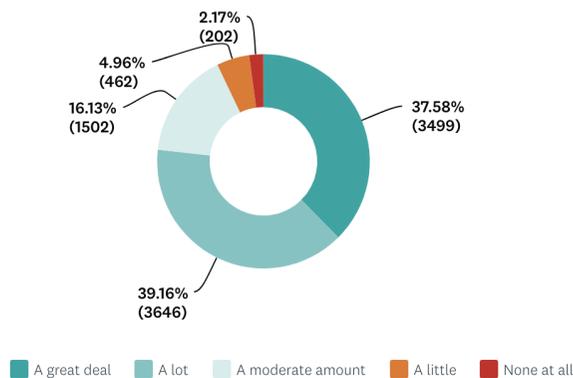
having all practical labs in a short period during the following semester

Answered: 9,312 Skipped: 1,787



The request to generate statistics on students during lecture

Answered: 9,311 Skipped: 1,788



Software tools required

Answers 9347 skipped 1753

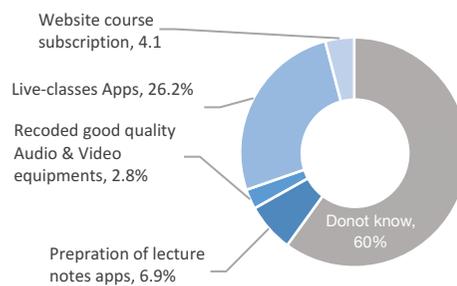


Figure 3.16. The statistics of the third track

To sum up, Table 3.9 shows the aggregation of sub-tracks. The results indicate that admirative staff shows their medium feedback regarding the support, efficiency of communication and instructions given to them during pandemic.

In the same line of thinking, the **third track** in this survey (Concerns during universities lockdown) shows some insights about the concerns of administrative staff during the pandemic. The results show that the level of stress between the administrative staff (**Figure 3.20**). Worth mentioning the response of the admirative staff toward their concerns of employability status show various and equivalent distribution between respondents. This result is in line with the response to the open-ended choice 'other' while asking them 'Given the changes caused by the spread of COVID-19, please tick on how often do

during universities lockdown.

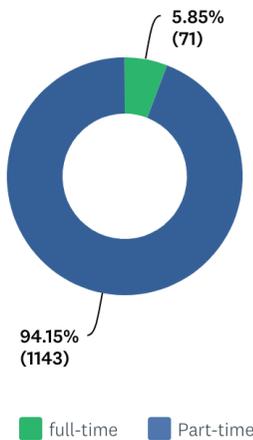
In another vein, a negative response was received as a comment to the absence of 'care at all for administrative staff besides the complete absence of sanitizations which are only available for the leaders!! Masks, gloves, soap are in their private bathrooms.'

3.4 Students' Survey

This survey consists of four tracks, that start after the general information section, with the first track assessing the institution's support and communication during lockdown. The second and third tracks investigate the instruction methods that students received through the online learning process, the infrastructure that supports

A part-time or full-time employee

Answered: 1,214 Skipped: 44



The category

Answered: 1,074 Skipped: 184

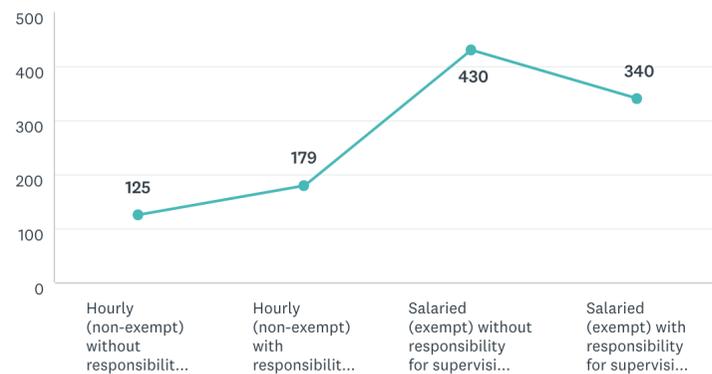


Figure 3.17. General information about survey respondents

you worry about the following.' The responses recorded their concerns and recommendation towards ensuring medical systems that provide disinfectants and masks inside the campus.

In this domain, one of the respondents reported thoughts as he/she 'believe[s] the mission through this semester went successfully from home, and it was the best solution during the spread of the COVID-19 virus.' This response also was confirmed by another employee who confirmed saying 'we can complete working from home only till this virus ends.' Furthermore, an employee stated the importance of digital communication through working from home which had helped a lot in fulfilling his/her task

online learning, as well as other emerging issues. The fourth track measures their satisfaction regarding the action that took place during the crisis. Table 3.10 shows these four tracks.

The data entry for students' survey was the sum of the population size of the target stockholder (3047916 Egyptian and international students), the confidence level (99%) and the margin of error (0.41%). For the students, the sample size should be at least 3047916 response. Here, the received response reached 93,491 students with a confidence level of 99% and the margin of error of 0.41%.

The first track (institution support and communication)

consists of five sub-tracks related to the students' evaluation of their institution's actions when dealing with the consequences of COVID-19 outbreak on universities. **Table 3.11** and **Figure 3.21** indicate fluctuation opinion between "medium support" and "weak support."

Items in sub-tracks, like the first (Communication), the

during the pandemic. However, a percentage of the respondents (38.6%) reported that they did not use any online method. Furthermore, **Figure 3.22** shows that 17.7% of the students have used audio, video, and YouTube. 11.% of the students reported using live video applications, followed by the chat applications at 8.2%. A percentage (5.6%) has used search engine, digital library,

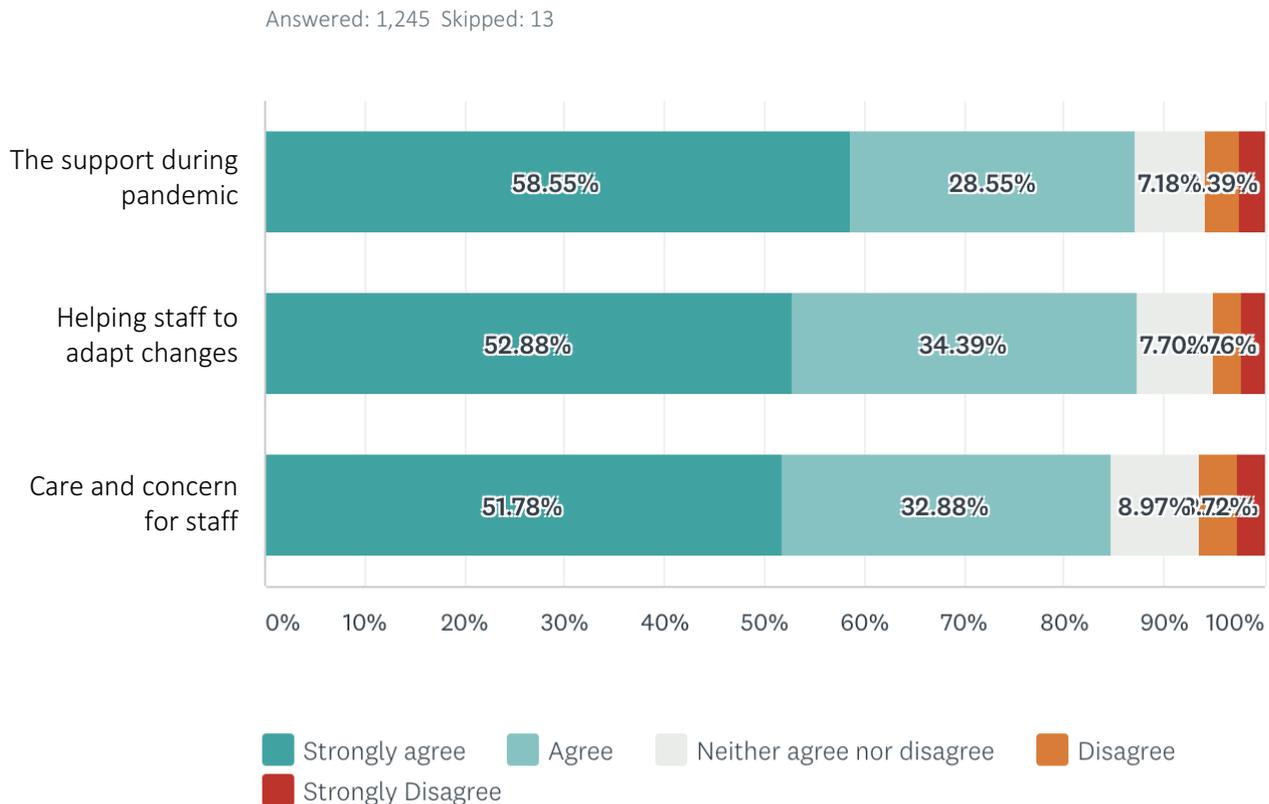


Figure 3.18. The level of agreement with supporting administrative staff during the pandemic, care and concern for staff

second (Focal point...), and the fourth (Clear instruction), have a "Medium support" with 33.9%, 27.1%, and 44.8% respectively. While the third sub-track has scored "Weak support" with a 29.4%. Based on the aggregation of these four items, the weighted average of this track gives a score of "Medium" with a mean of 2.86 and SD (0.9058).

In the first sub-track (Instructional methods used), the transformation of the educational process during COVID-19 pandemic from the face-to-face lectures on campus, to distance, online learning required the use of special instructional methods to and the ability to illustrate more information regarding how to deal with digital tools. Students reported the methods used

university platform, E-book and Egyptian Knowledge Bank (EKB), and 4.6% of the total number of students who responded to this sub-track have only used online education to submit pieces of research, assignments and quizzes.

The instructional methods used are also categorized by disciplines. **Table 3.12** and **Figure 3.23** show the results for the different instructional methods for the different disciplines. The dominant instructional method used for Medical sector is the classical method with 46.1 % followed by 24.6% in social sciences. The lowest percentage is basic science with 11.1 and followed by the engineering sector with 15.7%.

Table 3.9. The percentage distribution of communication and instructions during a pandemic

Communication & Instructions	Strong Support & Comm	Medium Support & Comm	Neither nor	Weak Support & Comm	No Support & Comm	Weighted Average	S.D	Direction
Have a focal point to communicate with	44.98	39.72	8.66	4.29	2.35	1.79	0.9364	Strong Support & Comm
Time frame of communication	41.68	40.62	10.60	4.08	3.02	1.86	0.9690	Strong Support & Comm
Level and clarity of communication	38.01	42.90	11.75	4.49	2.85	1.91	0.9628	Medium Support & Comm
Content and quality of communication	33.28	41.23	16.07	6.31	3.11	2.04	1.0123	Medium Support & Comm
Aggregation: Level of Communication & Instructions	39.48	41.11	11.77	4.79	2.83	1.90	0.9701	Medium support & comm

Communication and Instructions during Pandemic

Answered: 1,239 Skipped: 19

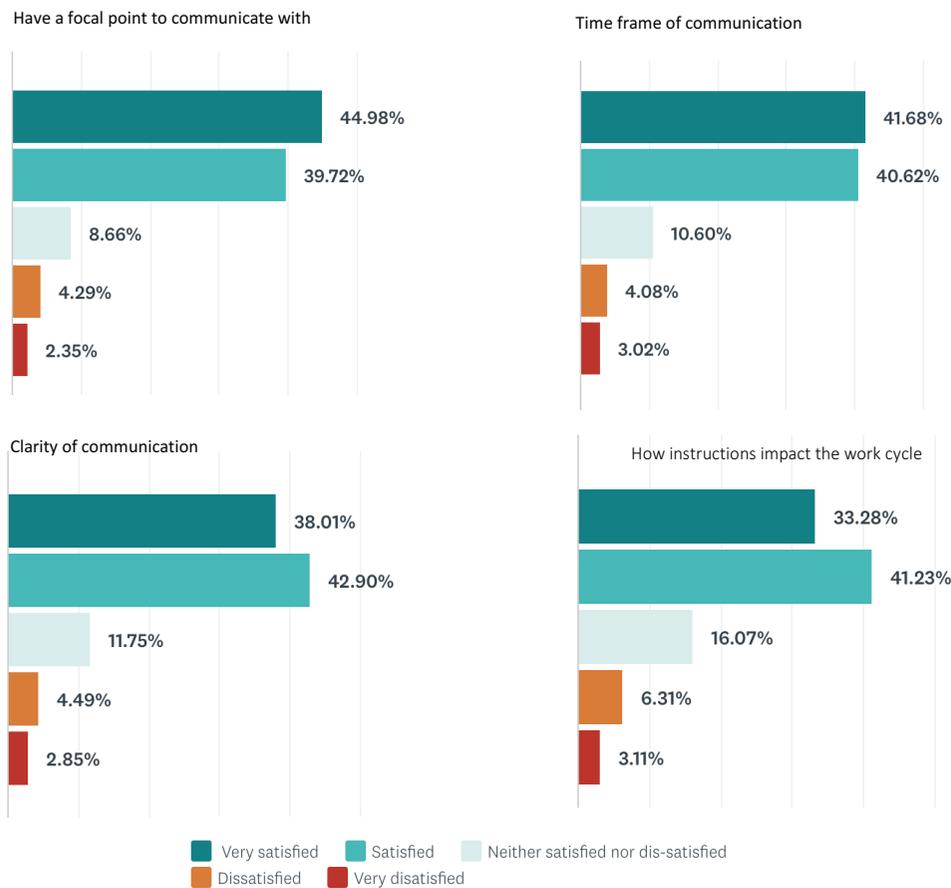
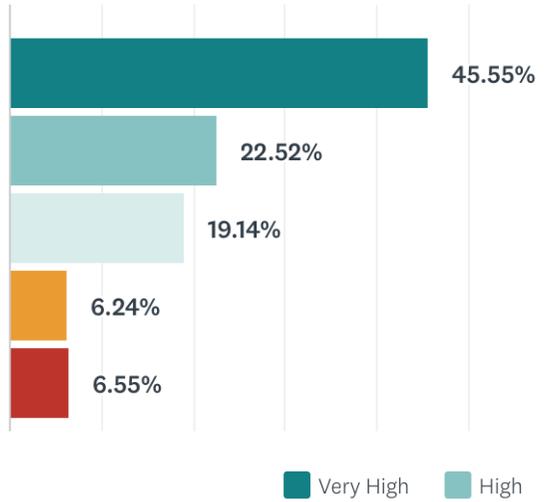


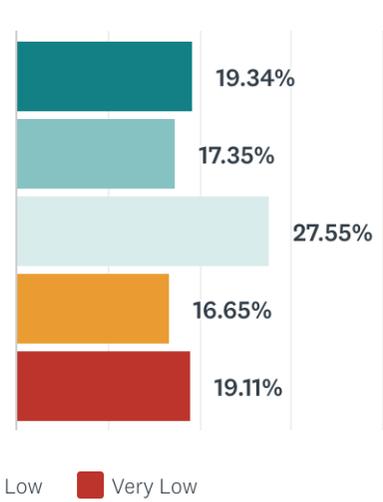
Figure 3.19. The percentage distributions of the second track

Level of stress toward assigned duties

Answered: 1,233 Skipped: 25



The effect on employability status



Very High High Medium Low Very Low

What do you worry about most during pandemic?

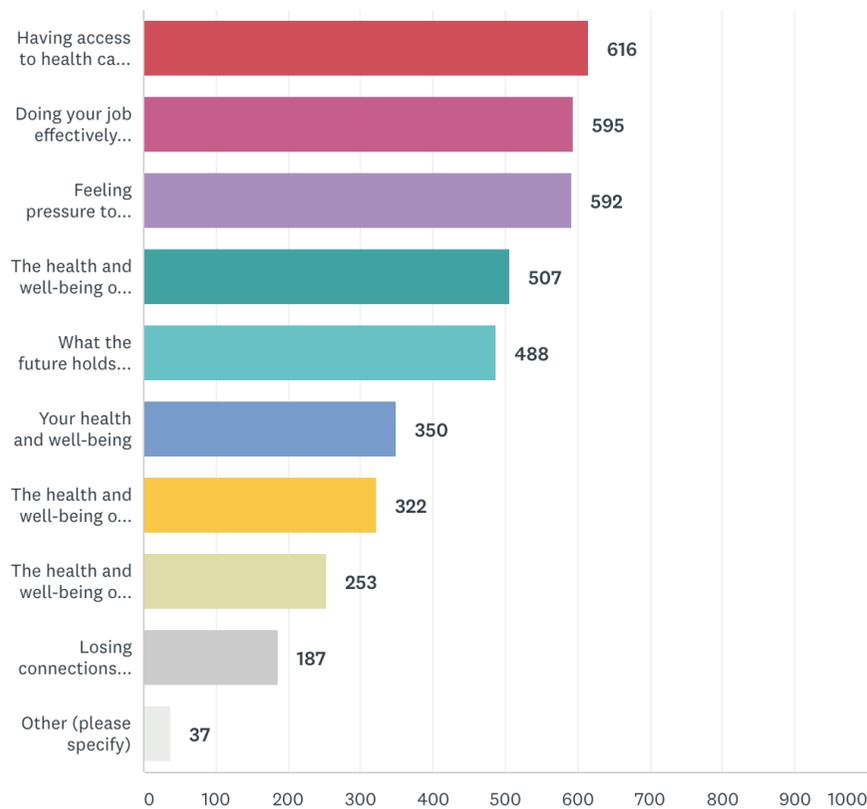


Figure 3.20. The third track (Concerns during universities lockdown)

Table 3.10. Structure of students' survey

No	Track description	Sub-track description
1 st track	Institute support and communication	Communication
		Focal point to communicate with
		Interaction with staff
		Clear instructions
2 nd track	Satisfaction for the Instructional Methods	Instructional methods used
		Access methods used
		Advantages of online learning
		Disadvantages of online learning
3 rd track	Infrastructure	PC affordability
		Internet affordability
		Type of connectivity
		University Platform
		Reliability & security of university teaching platform
		Most helpful instruction means
4 th track	Overall feedback on online education	

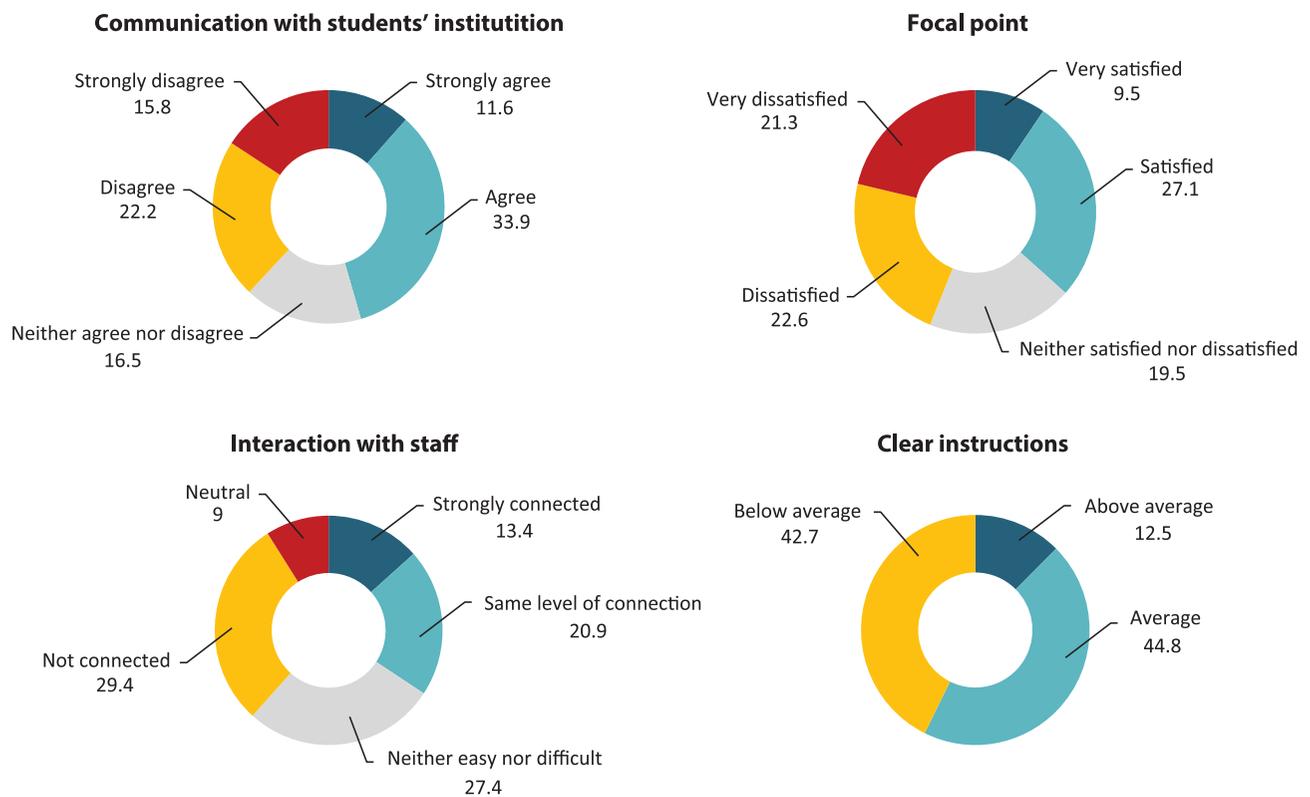
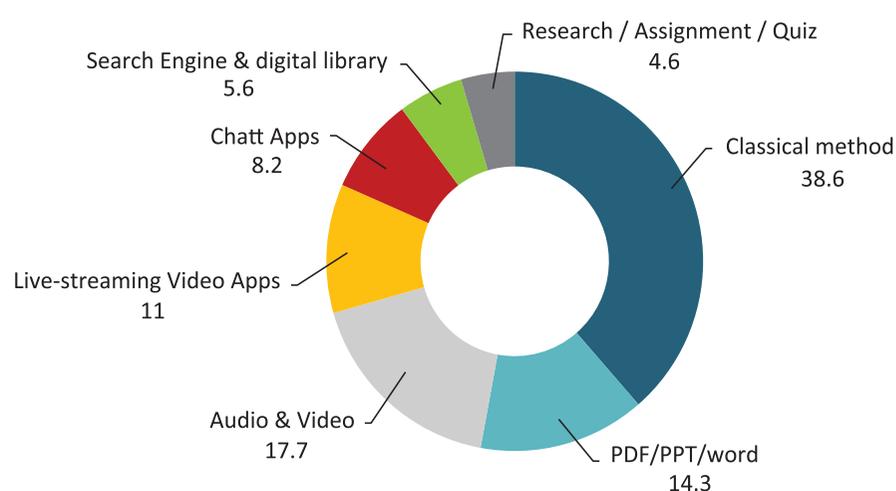


Figure 3.21. The first track (Institute Support & Communication) during COVID-19

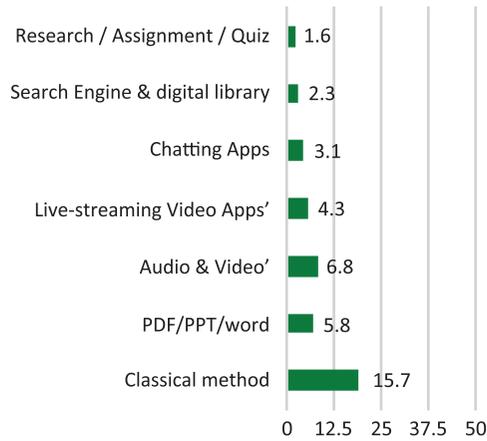
Table 3.11. The percentage distribution of institute support and communication during COVID-19 pandemic

First track	Strong	Medium	Neither- nor	Weak	Very weak or Not found	Weighted Average	SD	Direction
Communication	11.6	33.9	16.5	22.2	15.8	2.96	1.2865	Medium
Focal point	9.5	27.1	19.5	22.6	21.3	3.19	1.3006	Medium
Interaction with staff	13.4	20.9	27.4	29.4	9	2.20	0.6792	Weak
Clear instruction	12.5	44.8	42.7	0	0	2.99	1.1819	Medium
The aggregation	11.76	31.64	26.55	18.55	11.51	2.86	0.9058	Medium

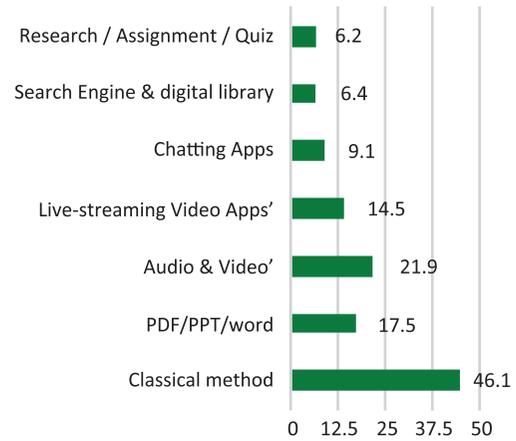
**Figure 3.22.** The percentage distribution of instructional methods used online (responses 32,112- skipped) 61,379**Table 3.12.** The percentage of instructional methods (multiple responses) by different academic discipline (answered 31-609 skipped)

		Academic Disciplines				
		Engineering	Medicine	Social science	Basic sciences	Others
Methods Used	Classical method	15.7	46.1	24.6	11.1	17.3
	PDF/PPT/word	5.8	17.5	8.7	4.2	6.5
	Audio & Video'	6.8	21.9	11.1	5.2	7.9
	Live-streaming Video Apps'	4.3	14.5	6.7	2.9	4.7
	Chatting Apps	3.1	9.1	5.3	2.8	4.2
	Search Engine & digital library	2.3	6.4	3.3	1.8	2.9
	Research/Assignments/ Quiz	1.6	6.2	9.7	1.1	2.2
	Total %	13.3	40.8	20.9	9.7	15.3
	Total Cases	12497	38442	19750	9180	14461

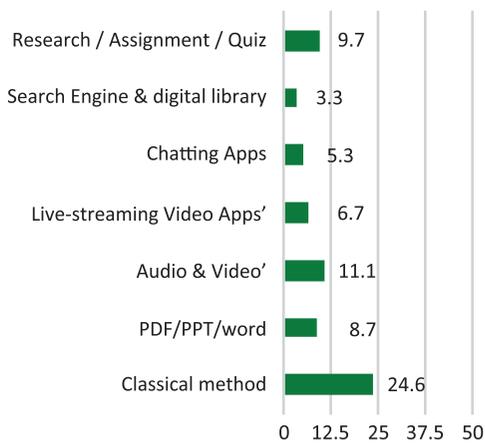
Answered 31,609 Skipped 61,902
Engineering sector



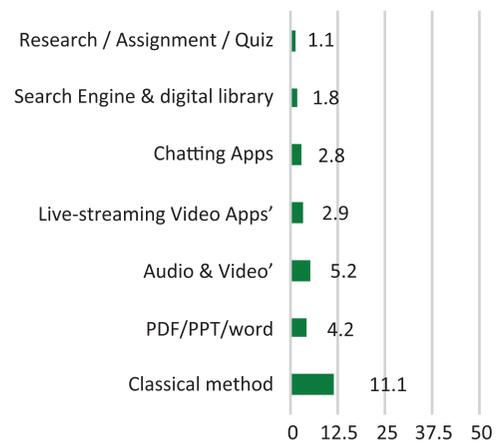
Answered 31,609 Skipped 61,902
Medical sector



Answered 31,609 Skipped 61,902
Social science



Answered 31,609 Skipped 61,902
Basic Science



Answered 31,609 Skipped 61,902

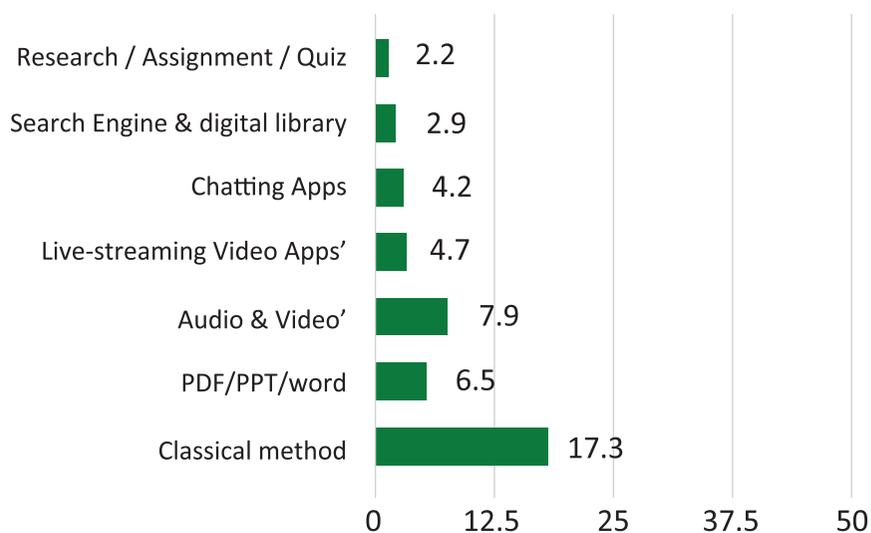


Figure 3.23. The percentage of instructional methods across various academic disciplines

In the second sub-track (access method used), Figure 3.24 shows the different methods of access used more than 70% of the students are using their mobiles, 4% are using desktop, 3% do have a laptop, while 5% do not really have access device.

The third sub-track (advantages of online learning) was figured out in Figure 3.25 that show the following:

- A percentage of students' response (13.8%) acknowledge the way of teaching. These students are satisfied with their interactive learning online.
- A percentage of the students who answered why the instructional methods and distance learning worked effectively give a reason that is because of being safe while staying at home. Additionally, students reported that online learning saves money, it also allows them to retrieve the full teaching materials at their convenience (17.9%).
- Some students preferred having pre-recorded methods and live lectures (17.3%). Besides, some students (13.8%) mentioned that it is a convenient method to transfer knowledge without any stress. Students also acknowledged the skills

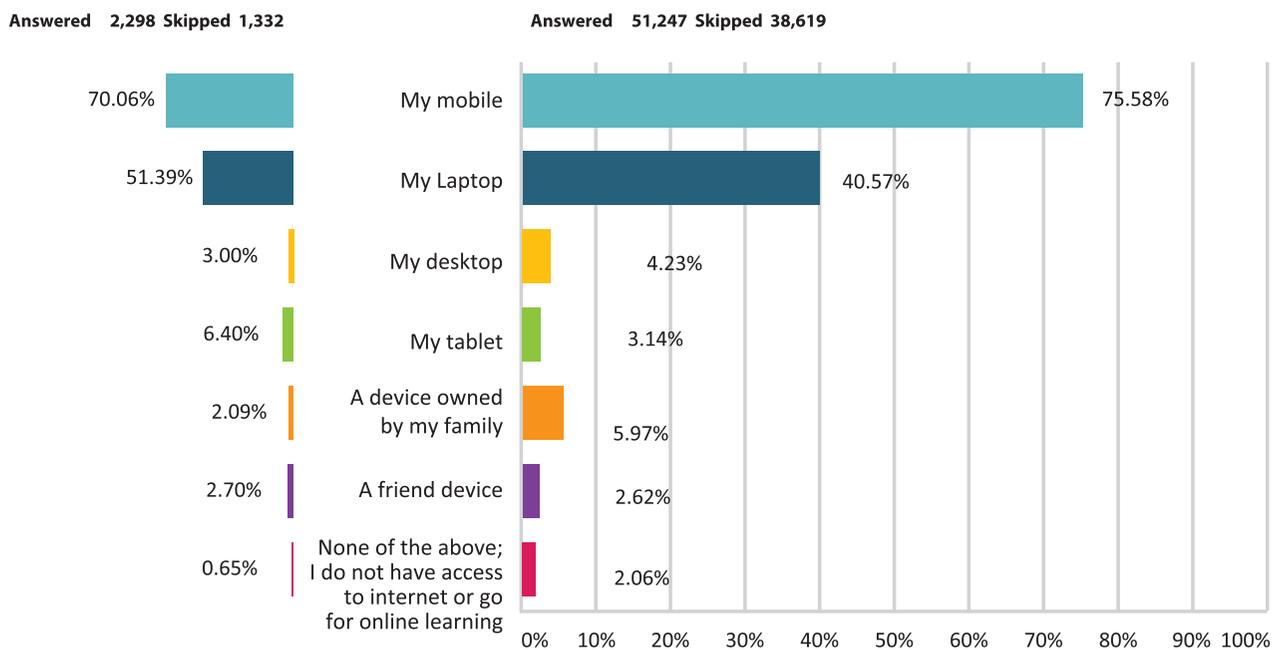
of the teaching staff in providing online education (18%).

- Meanwhile, a percentage of students (10.9%) found it a useful method to motivate students to depend on themselves, given that it is the future of education.

The fourth sub-track (Disadvantages of online learning) is presented in Figure 3.26. The results here reveal the reasons why the available instructional method did not work effectively. The analysis shows that 24.3% of the respondents mentioned that the inadequate infrastructure and the weak internet connection were the main obstacle.

Besides, 22.4% of the respondent students, mentioned that the lack of tutorials explaining how to use the instructional methods, was another problem. It appears that the distance-learning methods do not work well for practical colleges, those that require laboratory practice, on the other hand, not all subjects were included in these instructional methods, this was reported by 15.3% of the respondents. Some students (15%) reported that their university was not ready with its platform at the time of the crisis.

Satisfaction for the Instructional Methods Access methods used



International Students

Egyptian Students

Figure 3.24. The percentage distribution of why the instructional methods worked effectively

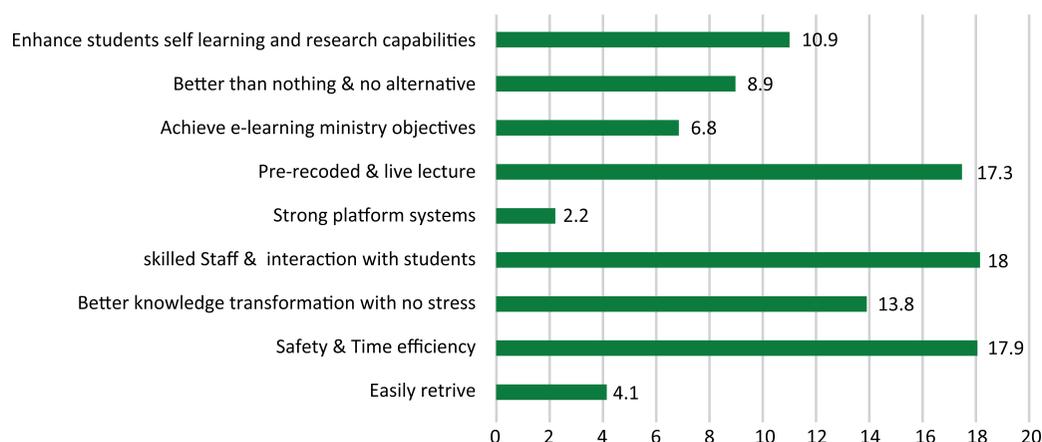


Figure 3.25. Advantages of online learning from the students' perspectives

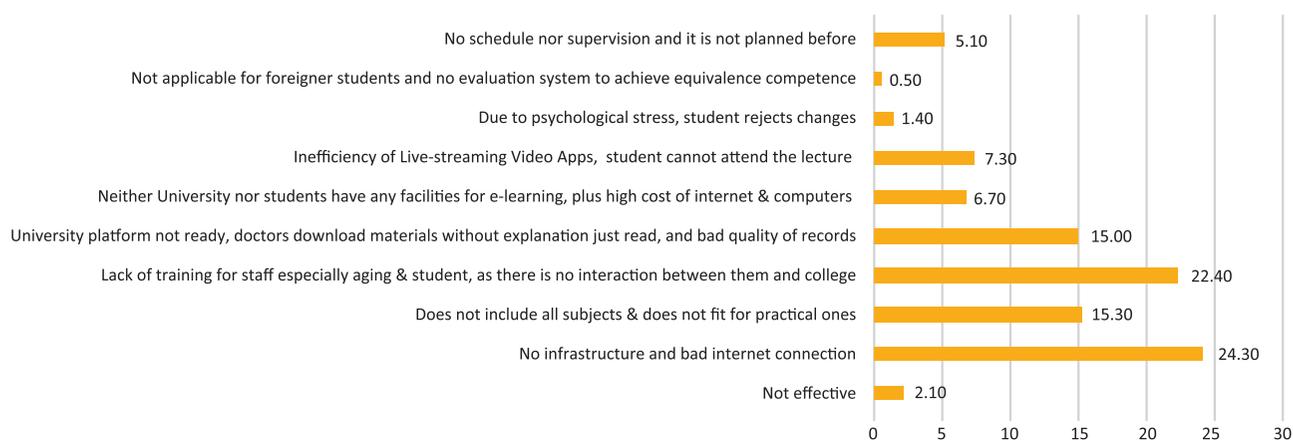


Figure 3.26. The disadvantages recognized while using online learning from students' perspectives

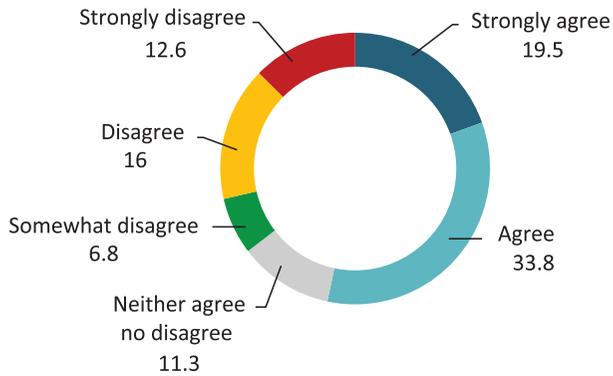
Other students have explained that in term of missing an interactive platform between students and their instructors, and the dependency on uploaded materials without any explanation or even a dialogue between them and interactors, was indeed a constraint. Other students have reported that improper sound-audio prevented them from learning effectively.

Furthermore, a small percentage of students (6.7%) mentioned that neither the university nor the students had any facilities for those who couldn't afford e-learning due to lack of internet services or tools. A small group of respondents (5.1%) believed that live lectures were not pre-scheduled nor had supervision, nor were they planned. Other obstacles were mentioned to claimed the methods used which were not applicable for international students in terms of language. Finally, a percentage of responses (1.4%) mentioned the notable issue was the

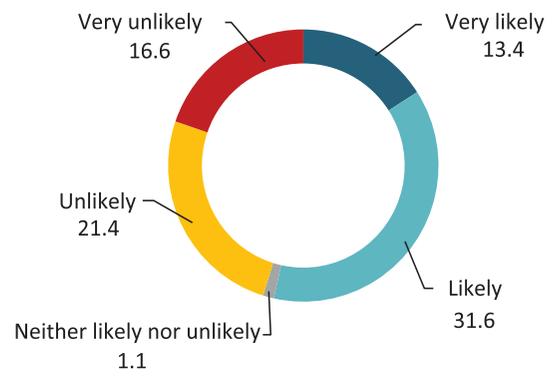
readiness of students to accept the change.

In the third track (The infrastructure), there are six sub-tracks as shown in **Figure 3.27**. Around 33.8% of the respondents agreed that they could afford a PC and 19.5% chose 'strongly agree.' Besides, 31.6% and 19.5% selected 'agree' and 'strongly agree' to the affordability of internet connection. Among the available devices, the results show that students use mobile and laptop, which came as a dominant selection for online learning (47.4%) and (36.5%) respectively. Three technological tools were provided as choices for tools used for connectivity: ADSL, free WIFI, and mobile networks. Results show that 34% agreed that their online university platform is reliable and useful. As for the means of learning, the most helpful were 'example or real life-case', and 'lecture notes', followed by synchronous live classes, and asynchronous lectures came next.

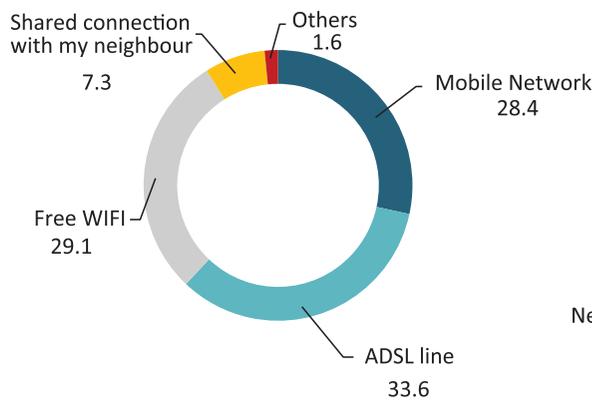
Answered 52,977 skipped 40,534
PC. Affordability



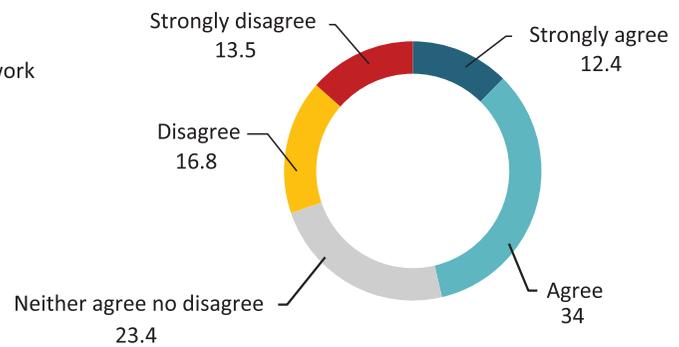
Answered 53,189 skipped 40,322
Internet affordability



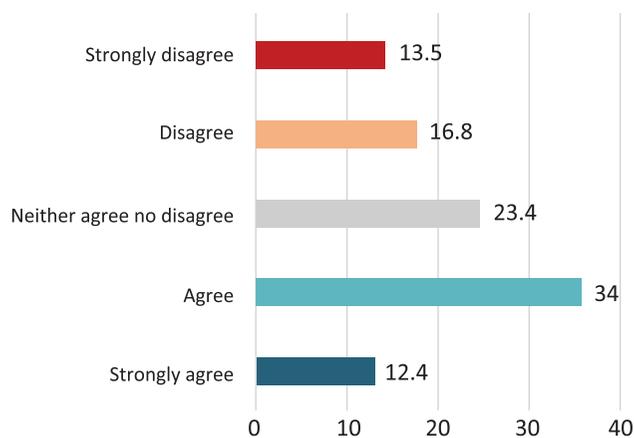
Type of connectivity



University teaching platform



My university teaching platform is reliable and useful.



Which means of learning do you consider the most helpful among the following?

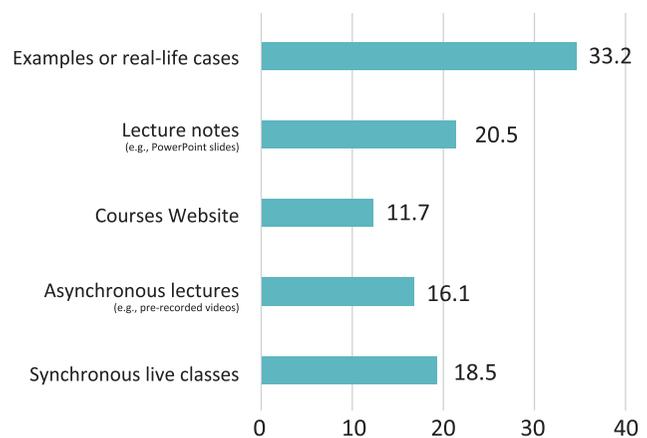


Figure 3.27. The students' responses regarding the infrastructure they received in the virtual learning

Moving on now to the final sub-track (Overall feedback on online education), the open-ended question shows some positive recommendations for better development of online teaching, and also some negative comments. One of these positive comments recommends including the possibility of retrieving the learning materials to encourage students to self-learning. **Figure 3.29** shows that 16.2% and 24.0% of the students would go for online education.

The negative feedback that this survey collected includes their dis-appealing of some audio recording materials and the dispersion between various software between

Zoom, Webex, Google Meet, Team or universities' LMS. In specific, international students face problem in communication when instructors use the Arabic language in connection.

On another vein, some students also put recommendations from their perspective to tackles the challenges they faced in the online learning experience. Their recommendations include the essential need to develop interactive learning methods when going on the remote platforms. They also recommend that their academic institutions should adjust and launch schedule for on virtual classes or tutorials.

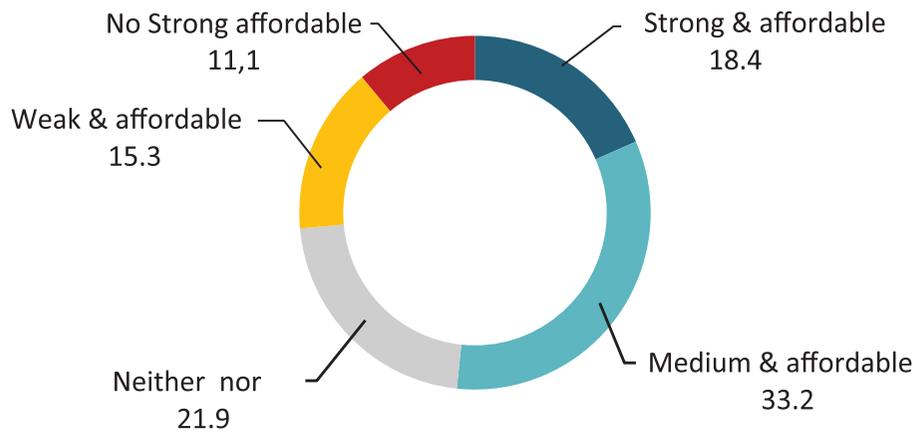


Figure 3.28. The percentage distribution of institute infrastructure during COVID-19 pandemic with mean equalled to 2.67 and SD of 0.7880

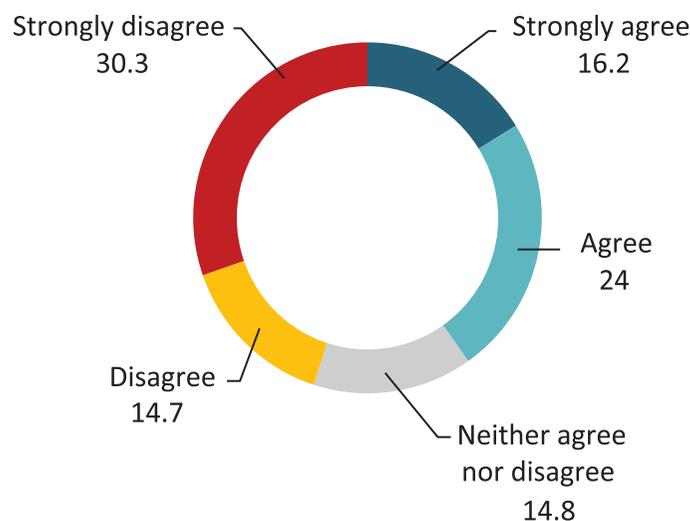


Figure 3.29. The overall results from student's feedback towards online education as a response to the questions (Overall, do you think online education is a positive experience).

3.5. Multilateral Survey Wrap-up: Challenges for Actions

The results of the current survey confirmed some challenges that need action for development and positive points for future enforcement. Going across the four stakeholders' surveys, a line of commonality between all of them. This commonality here is the level of satisfaction towards online learning and action took place during Egyptian universities lockdown. **Figure 3.30** shows the general response to distance learning and these actions.

Qualitatively, this multilateral survey holds open-ended questions that shows some insight into what university stakeholder like, dislike or recommendations for action after COVID-19. **Figure 3.31** provides directions for change and drawing policy pillars for Egyptian universities after go to the normal.

In conclusion, the lessons learned from respondents in this survey figured out the following points:

- Online learning is a beneficial experience from different stakeholders' perspective after considering some challenges and negative aspects that took place during Spring 2020 (refer to Figure 3.26).
- After universities go to the normal, blended learning can be applied to put Egyptian universities in the move for any urgent circumstances like what happens due to coronavirus.
- The importance of digital transformation and moving ahead toward adapting the fourth generation universities (4GU)
- All university stakeholders should receive life-long training to cope with the emerging changes
- The role of resilience actions taken and the variety of methods of communication proved its presence in leading out any pressing adversity
- Students have a role in drawing university's policies, and their voice can be easily heard but need more channels to reach broader platforms and channels

The overall responses to distance learning and actions/support during universities' lockdown

How likely do your institution plan to continue in providing online teaching fully or blended after the crisis is over?

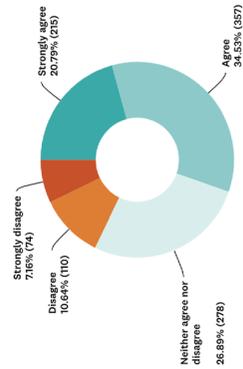
How satisfied are you with the workload to deliver online lectures by any means?

how satisfied are you with the support you are getting from your institution to help you adjust to all the changes this spring?

Do you think Online education is a positive experience overall?

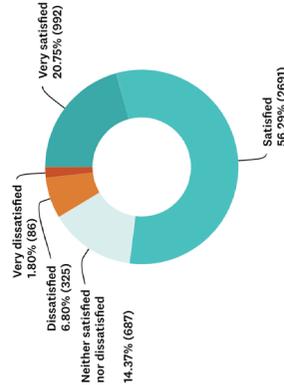
Students (Egyptians and International)

Top Managers



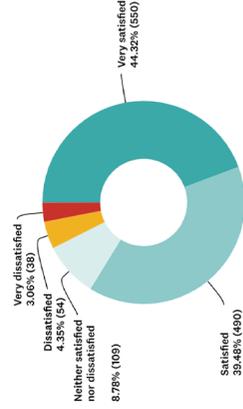
Answered: 1,034
Skipped: 7
Total 1,041

Faculty Staff



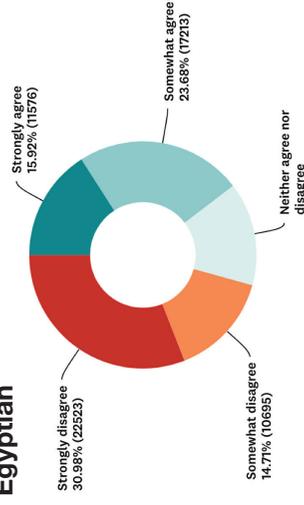
Answered: 4,781
Skipped: 6,319
Total 11,100

Administrative Staff



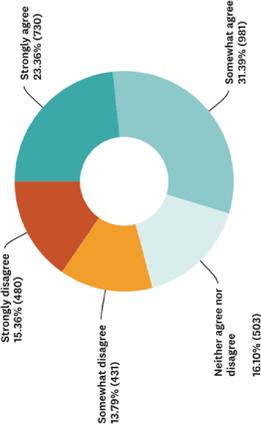
Answered: 1,241
Skipped: 17
Total 1,258

Egyptian



Answered: 72,693
Skipped: 17,174
Total 89,867

International



Answered: 3,125
Skipped: 506
Total 3,631

Figure 3.30. The collective responses of universities' stakeholders

	Top Managers	Faculty Staff	Administrative Staff	Students (Egyptians and International)
Like		<ul style="list-style-type: none"> Working from home The quick response Adapting online learning Managing the crisis 	<ul style="list-style-type: none"> Supporting human capital Sanitization for campus Working from home The quick response and transparency 	<ul style="list-style-type: none"> The uploaded materials and supportive webinars Availability of data once needed Depending on ourselves
Dislike		<ul style="list-style-type: none"> PDF alone is not sufficient Internet stability Online exam is not secured and might have no integrity The real lab can not be replaced by virtual platform Interactive via real classes is better than virtual ones 	<ul style="list-style-type: none"> Doing job effectively Pressure of time Internet stability Staying at home 	<ul style="list-style-type: none"> Dislike the recorded presentation Different software to contact the instructors (zoom, webex, team) Internet stability
Recommendations	<ul style="list-style-type: none"> Students need loan for computers Students need affordable internet packages Accelerate digital transformation Assigning IT team for managing the digital transformation in e-Learning Train the HR for distance learning/working Enroll electronic courses 	<ul style="list-style-type: none"> Securing the online exam Accelerate digital transformation Requiring a software to manage and ensure students' attendance Reduce time for face to face labs and tutorials and provide virtual labs and simulation tools 	<ul style="list-style-type: none"> Regular health check up Accelerate digital transformation Managing the time between on campus and at home work Alternatives for open air offices 	<ul style="list-style-type: none"> The need for affordable internet and loans for computers The need for interactive methods in learning Unifying the methods of interactive learning Adjust schedule for online classes Training for student and staff for the online tools Accommodate international students for language barriers

Figure 3.31. Some of key factors recommend what stockholder like, dislike or recommend in the online teaching.



4. Post-COVID-19 Policies for Higher Education and Scientific Research

In order to respond to the effects of the pandemic and to turn its possible negative effects into opportunities, the Ministry of Higher Education and Scientific Research of Egypt has identified seven pillars to sustain the transformation of the higher education sector to a more agile, online, and quality-driven system. The objective of these pillars is to ensure that the higher education sector would be able to provide quality education even during the time of crisis and pandemic. No one knows whether Fall 2020 will be an ordinary semester or not and whether business will return as usual or if we would continue with the current situation. In case the current situation indeed prevails, a more systemic and structured method would be needed to adopt with this new environment.

Furthermore, the ministry has already started seeing universities from around the world, announcing that their next fall semester will begin online. It is obvious that most higher education institutions will never go back to the classical forms of education, the change has already happened and what is needed now is to make this change part of the core structure of higher education.

Based on the best practices, experience and lessons learned during the crisis, seven pillars have been identified (Figure 4.1). These pillars constitute the roadmap for the next school year, for each pillar action items are identified with the respective priority. Short term action items should be implemented immediately, while medium-term and long-term actions would follow.

Rapid changes in science and technology require us to design our education sector to respond more quickly to changes. The system needs to be more agile to respond to quick changes in curriculum and scientific challenges. The COVID-19 pandemic has proven that institutions need to think and act differently when responding to the crisis. Ministries of Education cannot continue their journey as if nothing had happened and that we will continue work as before. In preparation to this transformation, the Ministry of Higher Education of Egypt has developed an action plan to smoothen the transformation of its education system from the classical education method to the digital online agile education method. The action plan covers all the dimensions needed for the transformation and take into consideration the effect of post COVID-19 pandemic.

Seven Policy Pillars for Post COVID-19 Pandemic

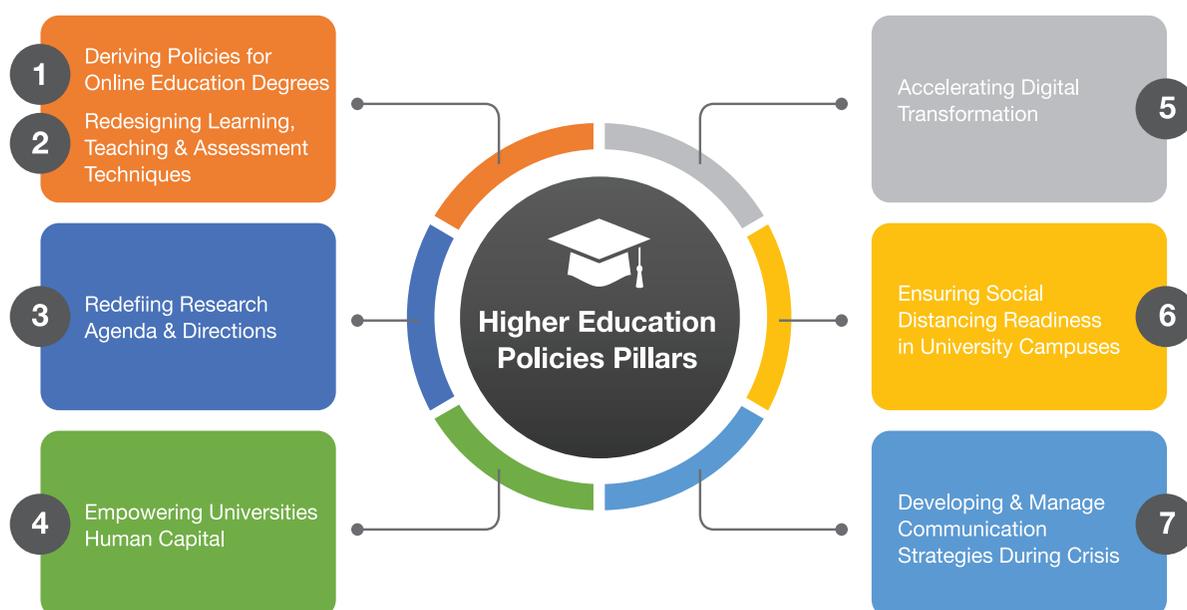


Figure 4.1. The seven policy pillars for Egyptian higher education

4.1 Deriving Policies for Online Education and 'Study in Egypt' Initiative

There is no doubt that the current policies and regulations were initially designed to support the classical delivery method of education, this applies for both undergraduate and for post graduate degrees. Face to face education has been the prominent method for delivering education; this was proven by the high rates of mobility of international students from China, India, and from other developing countries to the US, UK, Europe, and Australia. Learning necessitates that students would travel to these countries to get quality education from highly ranked universities. **Figure 4.2** illustrates the most

significant policies that need to be added, modified, or deleted to respond to the new era of online education.

On the one hand, students travel to these countries for immigration purposes, especially those who travel for their post graduate studies. On the other hand, we've seen the evolution of universities to provide online education, either through their own platforms or in collaboration with other platforms like Coursera, edeX, among others. These platforms have been successful in providing a lifelong learning education for students who are keen to excel in specific specialities.

Few universities have also provided graduates with online Certificates, Diplomas, and Master degrees. For

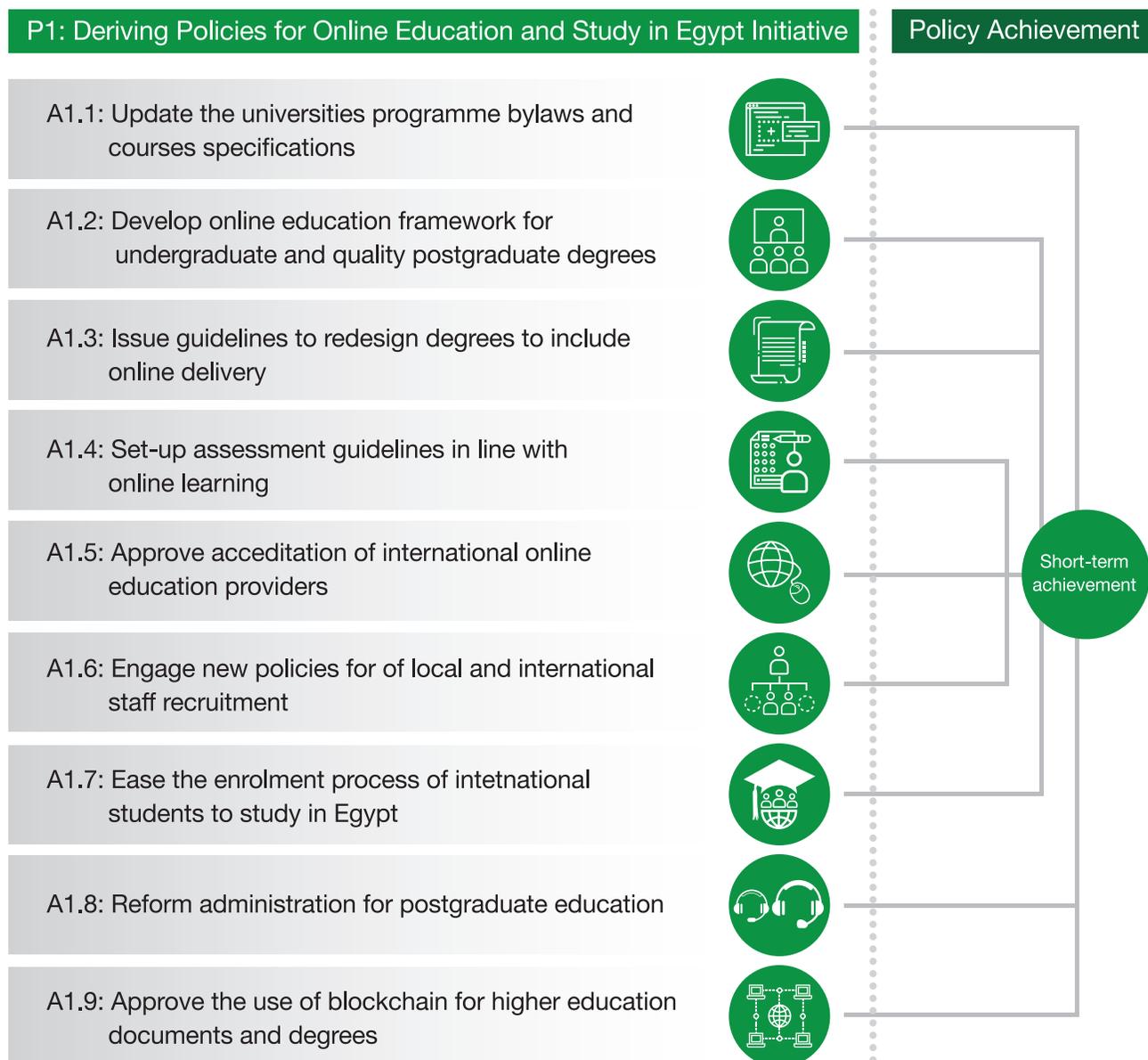


Figure 4.2. policies for online education and study in Egypt initiative

undergraduate education though, Face to Face is still the prominent method of delivery. The problem with these platforms is that they do not provide an academic degree; only certification is gained by attending the online classes and passing the online exam.

Egypt has started its transformation journey to online education in the last decade by establishing the Egyptian E-learning University. The university has faced several challenges related to policies, regulations, as well as cultural challenges. Ten years later, worth mentioning that lots of these challenges have been resolved, and with the COVID-19 pandemic situation we will definitely see a leap for universities regarding policies as well as for cultural awareness and societal education.

A1.1: Update the universities' programme bylaws and courses specifications

COVID-19 pandemic provides evidence that universities and departments need to update their bylaws to include online specifications as part of the course specifications (IESLAC, 2020). For each programme, face-to-face and online courses should be specified based on the current pressing pandemic. For online courses specifications related to a number of online contact hours versus face to face communication needs to be identified. This applies to lecture hours, labs, and sections. Following this step, the updated bylaws will be submitted for approval from sector committees. All subsequent quality documents and processes can be revised to reflect and align with the new system.

A1.2: Develop online quality education framework for undergraduate and post graduate degrees

The current quality frameworks around the world do not address the online education system or the blended system explicitly. Currently, no guidelines exist for administering mixed online bachelor's degree or post graduate degrees. It is becoming essential for the education sector to review the existing quality frameworks and reflect on the online learning system. They were examining standards and indicators in all areas of quality education to support and to guide institutions in their transformation journey. Institutions need to consider their vision, mission, and learning outcomes. A review of quality indicators measures and definitions will require a study into the effects of online education on different standards and signs. This includes students' assessment techniques, academic staff-students ratio, curriculum design and development, as well as educational resources. Programme monitoring and review need to be redefined in the new environment, in addition to leadership and governance structure, as

well as a continual improvement process (Characteristics Statement, 2020).

In this context, MoHESR has defined four steps as shown in **Figure 4.3** to revisit the content of graduate's attributes to determine the type of courses that might need face-to-face contact, distance-learning, or blended learning. The blended learning needs procedures to reach the expected outcomes. These procedures include a Learning Management System

(LMS), and appropriate digital infrastructure in universities to be able to support effective communication between instructors and students. Blended learning also requires launching specific training programmes and webinars for instructors and students to ease their interaction with the part of the course that would run virtually.

A1.3: Issue guidelines to redesign degrees to include online delivery

Current guidelines for undergraduate and post graduate degrees either follow the credit hour system or the two semesters system. Given the nature of such programmes, the planning and approval processes require consideration of a number of factors additional to those normally considered for course planning and approval.

Some standard issues require particular attention due to the nature of the delivery method. Plans for programmes delivered principally through online channels should be redesigned to account for an approval process that goes through the faculty and sector committee. This includes consideration of resources and enough time for staff members to develop teaching materials and learning activities. This issue also tackles the potentialities of external peer review for the students' products. Research on this domain has a long history in accounting for production costs of materials produced, marketing, publicity, and other running costs, including administrative fees.

A1.4: Set-up assessment guidelines in line with online learning

Programme specification requires a brief statement on course assessment strategy. MoHESR should provide guidelines for assessment techniques and methodologies aligned with the national quality framework and inclusiveness of online learning and teaching. Similar to another study for higher education, these guidelines can ensure that staff have been given due consideration to, and have clarity regarding specific issues (Hüther & Krücken, 2018). These issues include:

- Approach to formative assessment balance and scheduling of comprehensive assessments across the academic year
- Relationship of assessment to learning and teaching, as well as to course and module learning outcomes (constructive alignment)
- Range of assessment modes (tasks) and progression
- Approach to assessment and grade criteria
- Arrangements regarding providing students with feedback on assessments to ensure course team consistency.
- Arrangements to identify and deal effectively with fraud, plagiarism, and impersonation to

ensure that students' assessed work can be properly attributed to them.

A1.5: Approve accreditation of international online education providers

To take the reform process one step further, especially given the openness, ease of collaboration, and the presence of online education providers, higher education institutions should be ready to deal with calibrate courses provided from other universities or online education providers. The higher education sector needs to redefine and set regulations for online education providers' accreditation, transferrable online credit hours between

MoHESR's procedures for teaching and learning strategies after universities back to the normal

process for Hybrid Teaching & Learning

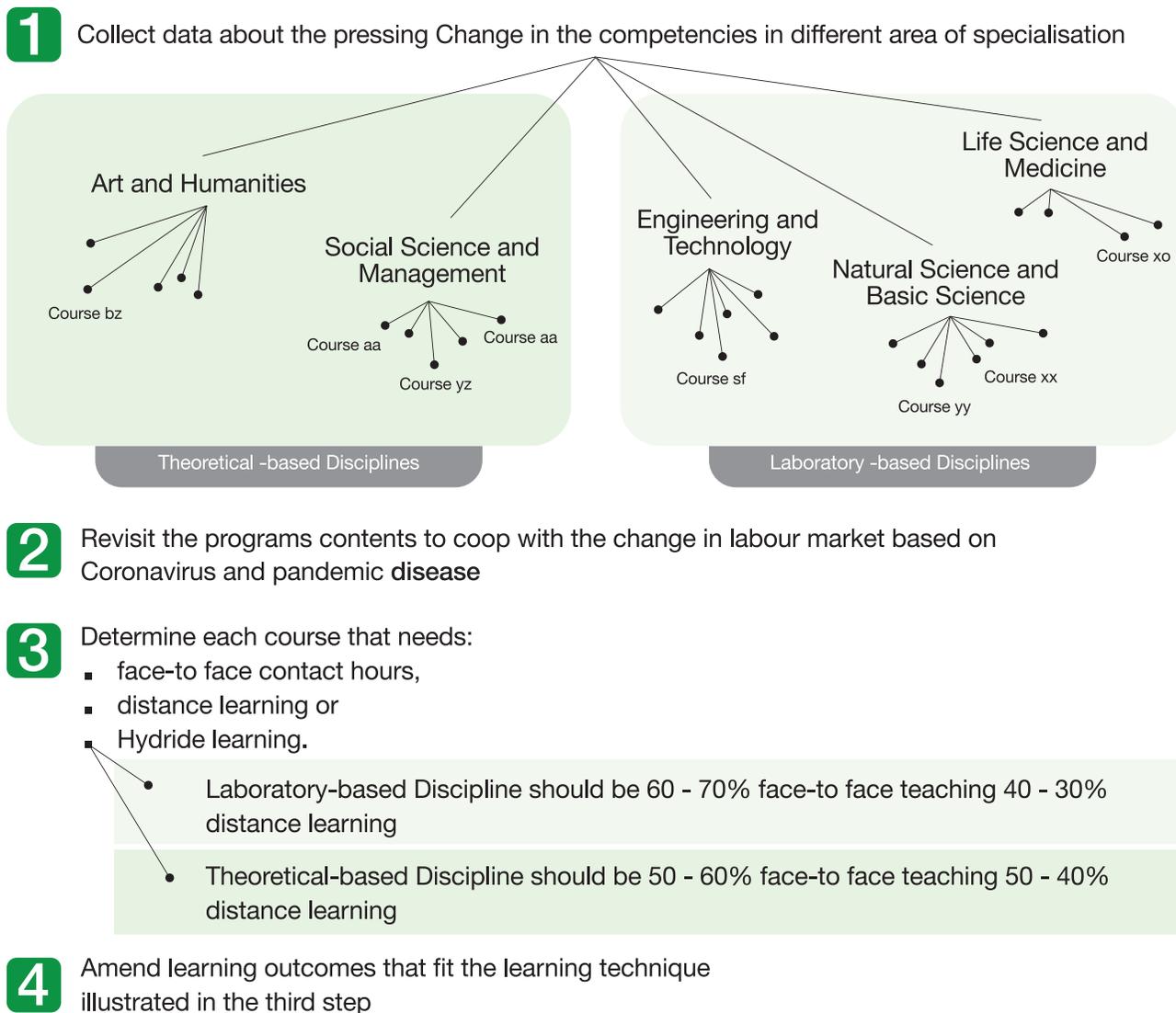


Figure 4.3. The Blended teaching and learning strategies for post-COVID-19

universities, and other issues related to the provision of online education.

A1.6: New engagement policies for local and international staff recruitment

Partnership and collaboration between universities is an important aspect in the education sector; it crosses over all borders. Online education offers an opportunity to solve challenges related to recruiting quality staff at international universities, and provides new ways of collaboration with top schools. This definitely necessitates devising new methods for staff engagement. The traditional methods of staff recruiting in the context of online education should be revised. Developing new methods and mechanisms for international staff contribution to the education process via online channels need to be encouraged, and remuneration methods should be developed especially in the context of public universities.

A1.7: Ease the enrolment of international students to study in Egypt

Many universities are currently working to improve the flexibility of their enrolment and administrative systems to avoid any potential delays in the commencement of studies. International students are valuable to supporting revenue growth for colleges and universities, and with the pandemic situation, policies to ease enrolment and exchange of students between universities and to them must be reviewed and reconsidered. Currently, the higher education, both domestically and internationally, has been disrupted—forecasts for the long-shadow implications of COVID-19 range from two-to-five-year disruption. Forecasts predict anywhere from a 15% to 25% decline in enrolment, depending on which part of the world calculations are made (Melnyk & Kontowski, 2020).

Different policies are currently being reviewed to facilitate students' recruitment, especially those concerning international students. Relaxation of initial requirements is being considered, which may include the potential lowering of language entry requirements, and delaying the submission of original certificates (Bothwell, 2020). The initiative 'Study in Egypt' puts three main factors that should be taken into account (**Figure 4.4**):

- Technology Access: Reaching to the right technology platforms to deliver education online, this includes the hardware, software, networking, infrastructure, and human resources readiness (Lecturers & Students).
- Digital Marketing Presence: Recruiting

international students will feature an intensive dependency on our digital presence to attract targeted students, highlighting capabilities and ability to follow up on students, accredited certifications, authorised testing centres globally, higher adaption to Hybrid approach.

- Financial Support: Expectation that 35% of International Students will choose online learning over traditional learning is just the start. The differentiator will not be only what we offer (curricula, but how much it cost)- an expected decent of 30% of the education fees. Instalments, paying over three to four instalments. Online payment solutions and engagement of international banks funding are among the expected changes.

Universities are also considering the possibility of allowing students to study the first years of their degrees remotely, without the need to relocate to the institution up till their final years when they will probably have to. Policies aligned with these new possibilities need to be studied and approved to be able to start the next school year smoothly.

Study in Egypt takes steps ahead of the COVID-19 strike. By the end of 2019, the Ministry of Higher Education and Scientific Research through the Central Department of International Students made a leapfrog to cope and exceed the international standards of international students' recruitment in two significant decisions of technology and marking streamlines. This issue includes:

- The development of the automated workflow system to manage the enrolment process as well as the admission automation services.
- The training the resources to adapt to the new technologies and automation standards.

Regarding the marketing, and management streamline aims to creating a new marketing approach to increase its digital presence through performed Competitive analysis that figure out the targeted audience profiles. The study also includes the creation of new SiE marketing portal and mobile application.

A1.8: Administration reform for post graduate education

The COVID-19 pandemic has uncovered some weaknesses in the administration system for post graduate studies. Digital transformation for post graduate services should be accelerated, this includes the enrolment

process, documents submission, assessment methods, and examination. Regulations should be revised to allow for online submission of documents and the acceptance of photocopies as a temporary alternative until hardcopy documents are delivered, and the blockchain platform is implemented (QS, 2020).

One of the main challenges in current legislation is the illegality of online seminars and online thesis defences. Policies should be reviewed and amended to align with the online education system requirements. With more openness and collaboration between universities, the presence of external examiners in other countries will become a common trend. Accordingly, our policies need to reflect and allow this possibility. Moreover, our policies need to be capable of allowing for better crisis management. Digital examiners' reports with an ensured mechanism for integrity should be devised. Use of digital signatures can be extended to accept reports and defence results.

A revision of assessment techniques in master degrees and diplomas should be revisited, and dependence level on the exams should be reduced. Assessments should become better geared towards project-based learning than examination assessments.

A1.9: Approve the use of blockchain for higher education documents and degrees

Building a national higher education and scientific research blockchain platform can simplify and accelerate record-keeping. It will allow verification processes between partners across the entire organisation and different Egyptian ministries' workflow, by instantly sharing data and logic on an immutable and shared network. Through an implementation process consisting of a three-step approach, the blockchain builds a consortium of networks; simplifying governance and management; and integrating blockchain solutions with systems and tools used today.

Requesting student's resume is a standard process for students transfers between universities locally and internationally. It is also a required step in all employment processes. The resume will include degrees and experiences. There are two challenges. The first is the credibility of the information included in the curriculum vitae (CV) while the second is the accreditation of complex and custom learning records.

The traditional solution for the first challenge is to establish a central authority attesting the validity of the data (Bartolomé, Torlà, Castañeda, & Adell, 2017; QS, 2020). Institutional identifiers certifying the validity of the

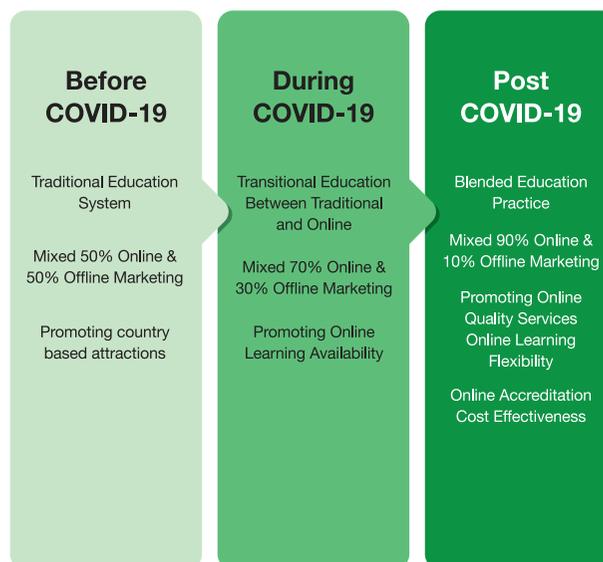


Figure 4.4. Teaching and learning strategies for COVID-19

data represent a reasonably reliable system. Alternative systems that can be used to validate scientific production can also be used. The examples include Google Scholar (GS), or the ORCID, the Researcher ID, or networks such as ResearchGate, Academia.edu, or Mendeley.

The flipped side of COVID-19 provides an excellent opportunity to accelerate the digital transformation in the higher education sector, not only at the level of learning and teaching but also at the level of administration, documentation, and governance. The use of blockchain here can ensure the reliability, security, and tamper-proof of all documents that will be stored on the distributed ledger. This technology indeed eases the use and transfer of these documents between the participants of the network and will reduce fraud and guarantee the integrity of students' degrees.

4.2 Redesigning Learning, Teaching and Assessment Techniques

Recently, students' needs for online education options are likely to grow worldwide due to the COVID-19 pandemic situation. Even before the pandemic, many universities were seeing declines in enrolment for campus-based programmes and a parallel increase in the uptake of their online courses (Legon & Garrett, 2017). With COVID-19 happening, academia community is seeing how yesterday's disruptors can become today's lifeguards. While traditional institutions thought of online education as a threat, it has now become their lifeline, offering a solution for their challenges during this crisis.

The traditional model for distance learning is where the tutor continues teaching according to schedule, regularly, broadcasting live, while the recording of the class is retrievable at any time. This method seems to be the most appreciated by students, giving them control of viewing and reviewing the content at their convenience. Initiatives that radically change operating rules and require students to leave their comfort zone without any prior training are less appreciated. Undergraduates tend to be more conservative than what might have been thought, or are less prepared to deal with change. On the same way of thinking, the behaviour of post graduate students seems to be, in this sense, more open to participatory methodologies, or those that require a greater degree of interaction with the faculty.

Generally speaking, it seems that the change in modality has not been received very positively. Part of the dissatisfaction stems from the fact that the content was not explicitly designed for an online higher education course, but rather a quick fix to make up for the absence of face-to-face classes without any special preparation. Secondly, the expectations of students are different than what they had enrolled for initially, considering all the social and experiential elements that accompany traditional, on-campus, face-to-face learning in higher education institutions. It should also be noted that distance learning requires more discipline and commitment from the student, which perhaps could explain why it is more successful among older people, that is, post graduates, compared to undergraduates.

The on-campus, face-to-face experience is particularly important for vulnerable students who have often had

fewer opportunities for interaction in areas such as that offered by a university campus. It allows them to strengthen their social skills. If the university lockdown is prolonged, universities will lag behind other students. It is difficult to foresee what impact the change in students' medium and long-term learning modality.

As a quick response to the COVID-19 pandemic situation, MoHESR has embarked on a number of initiatives to respond quickly to the pandemic and to reflect on the reform of the Higher Education system & institutions. These initiatives can be summarised in the following:

- Expanding the implementation of the electronic exams system for all branches of the health sector, including Medicine, Dentistry, Nursing, etc.
- Developing a Unified Platform for Educational content and Online access
- Innovative educational content initiative

For a more systemic approach to sustain education reform and to seize the opportunities gained from the pandemic, **Figure 4.5** illustrates the action items required to maximise the benefits of distance learning in the area of teaching methodologies and assessment techniques.

A2.1 Redesign teaching methods and courses

Several successful online teaching methodologies are used for distance learning including synchronous, asynchronous, self-directed programmes, cohort programs, flipped classes, field education, clinical placements and internships. Staff can mix these methodologies to deliver their online courses. The

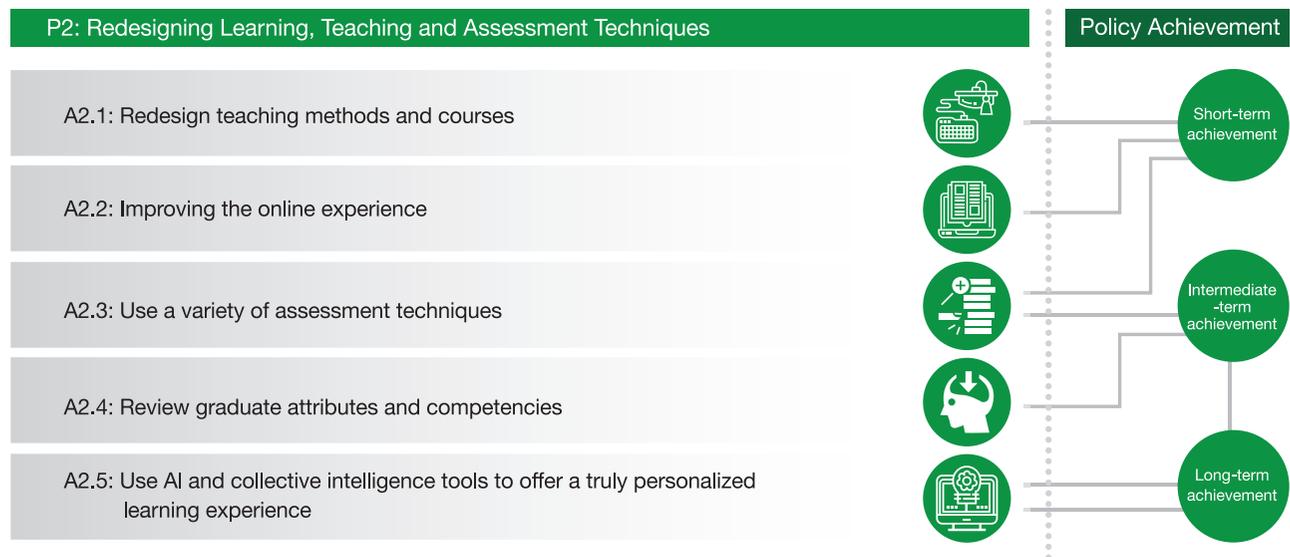


Figure 4.5. Policies and actions for teaching methodologies and assessment techniques

following is a summary of the most recognised online teaching methods which should be reflected clearly in a course design:

- **Mind Mapping:** Considered among the best online teaching techniques to implement for visual learners. The mind map is a diagram of related ideas and concepts that can be used as an aid when studying and a way of organising ideas. Thus, helping instructors in structuring classroom discussions, classifying ideas, and gradually bringing learners to the desired central idea.
- **Self-learning:** Promoting self-learning in a controlled environment is an active method to stimulate critical thinking, analytical, and research skills. This does not work in most online learning settings, where there are specific time slots in place. Instead, with self-learning, you encourage students to research certain topics and decide what areas are most important or relevant to their own interests.
- **Active Learning:** To engage students who are not in the room during a lesson. The course should be comprised of a mix of discussions; collaboration; video and audio clips; as well as hands-on exercises with text and possibly brief video lectures.
- **Adaptive Learning:** Involves utilising computers and other technologies while teaching. For some students, learning about a subject by watching a video may be most effective. Others may learn better by participating in online discussion forums. Each student can be transformed from a passive receptor of information into a willing and active participant in an online classroom. This may mean providing different mediums (video, text, visuals, etc.) for introducing each new lesson or concept.

A.2.2 Improve the online experience

Improving online experience is a shared responsibility between academic institutions, staff, and students. A plan to transform a face to face education into online, distance learning or blended learning requires the cooperation between all stakeholders to achieve a successful transformation. The following is a list of principles and actions to be adopted during this transformation journey:

- Even if HEIs already have the necessary technological and technical infrastructure to support virtual courses, they probably can't be scaled-up to the necessary current needs without the intervention of external technical

support such as video servers.

- Location & variety of on-campus facilities have traditionally been an essential factor when attracting students. This year's enrolling students will be looking for a richer online experience that goes beyond simply uploading course material online. Course facilitators should consider integrating and promoting curated tools, course templates, and real-time training to be part of their courses. Universities should empower their faculty members to support online education by focusing on engagement, compassion and flexibility (Lederman, 2020).
- Learning materials and activities, whatever the mode of communication and delivery is, (digital or physical) should be subject to quality assurance processes. All materials do not need to be available at the point of review and approval, but arrangements for ongoing quality assurance of the learning materials and activities, including provision for peer review, should be detailed and agreed as part of the approval process.
- Reconsidering education delivery modalities: for example, distance learning, both online and offline, could become part of mainstream education delivery, where the necessary infrastructure is available, as well as training on the required tools for teaching staff and students.
- Creating a mix between appropriate teaching approaches, while limiting the number of applications and platforms; and between providing tools and digital content for students, both for synchronous communication and lessons, and asynchronous learning.
- Creating and maintaining a strong presence: Instructors should engage with their students online, it's vital that virtual presence is established at the very beginning of the eLearning course. The staff needs to be engaging and supporting students right from the start and throughout the duration of the course, to be able to maintain an effective learning community.
- Set clear expectations for the course:
 - o Online learning is new to students as well. It should be made clear to students how their grades for the courses they are taking will be determined early on. (participation often makes up a much larger portion of the grade than in face to face classes).
 - o Setting expectations regarding response time is important, for example, clarifying that responding to emails will be within one business day.

- o Sharing resources with students on how to be an online learner.
- Enable peer learning. For example, create or strengthen platforms for experience sharing, national, regional and international, including communities of practice for teachers.
- Planning the schedule of distance learning courses: defining the duration of distance learning units based on students' self-regulation skills, preferably, the unit should not be more than 40 minutes; providing question and answers sessions to promote discussions; and Identifying strategies and interventions to address learning gaps, especially among vulnerable groups.
- Effective online time management: Experts have agreed that the instructor's presence is critical to student success in a virtual class, but they highlighted the importance of making sure that they are managing their time in a reasonable way, and the class does not develop into a one-on-one interaction session with students.
- Protecting data privacy and security: assessing data security when uploading data or educational resources to web spaces, as well as when sharing them with other organisations or individuals is crucial.
- Develop distance learning rules and monitor students' learning process: Use of tools to support submission of students' feedback is highly encouraged.
- Regularly check content resources, applications, links, modules, and activities. Online content can move or change, which can lead to the discontinuity between the staff and their students.
- Promote reflection, feedback, and communication with students
- Instructors are to make sure to cover all posted topics and fully discuss and promote contribution and reflection.
- Instructors should monitor participation and contact students individually if they are either not participating, or are taking over conversations and not permitting contributions from other individuals.
- Promote mobile eLearning platform: It's wise to acknowledge the importance of mobile learning, with staff, students and employees now accustomed to using their mobile devices for learning.

A2.3 Use a variety of assessment techniques

There is a variety of different assessment techniques that has been adopted worldwide to accompany the booming new online education system. A number of principles should be followed for online education to ensure quality, integrity, and transparency as follows (Bane, 2019):

- Students should have opportunities for structured and timely formative assessment, and receive constructive and timely feedback, in relation to learning outcomes and academic progress through the programme.
- Students should be provided with clear information on the arrangements for formal assessments. Such arrangements must be secure and reliable and take time into account, location of examination, supervision, security of assessments, and submission of assessments as appropriate.
- There must be robust systems in place to permit students to confirm that their assessed work has been received safely and within the deadline.
- There must be arrangements in place to identify and deal effectively with fraud, plagiarism, and impersonation in order to ensure that students' assessed work can be rightfully attributed to them.
- Design formative questions, tests, or exercises to monitor students' learning process closely

MoHESR has also started applying some of those techniques, like for example, conducting exams online. The techniques include an initiative to conduct its exams online at 151 exam centre. To ensure the success of this initiative, it will be using equipment of more than 30,000 client machines, software questions answers, question banks, among another online exam (**Figure 4.6**).

There are different methodologies and techniques used for assessment, Bloom's taxonomy, for example, is a classification of the different objectives and skills that educators set for their students (learning objectives). The six levels of the taxonomy can be used to structure the learning objectives, lessons, and assessments of courses. The online assessment methods (serves as appropriate measures of cognitive levels in Bloom's taxonomy of educational objectives, is also so shown in **Figure 4.7**.

Formative Assessment	Formative and summative Assessment	Summative Assessment
<ul style="list-style-type: none"> • Discussion (blog, board, chat, quiz) 	<ul style="list-style-type: none"> • Case study (paper) • Self assessment (simulation/animation) • Reflective Journal (Virtual Lab/Game) 	<ul style="list-style-type: none"> • Project • Portfolio • Presentation

Figure 4.6. The online assessment techniques

	Thinking . Knowledge	Skills . Doing	Attitude . Feeling
	Cognitive Domain	Competencies through doing Psychomotor Domain	Affective Domain
LOW	Remembering	Perception	Receiving
	Understanding	Set	Responding
	Applying	Guided Response	Value
	Analysis	Mechanism	Organizing and Conceptualizing
	Evaluation	Completed overt response	Internalizing
	Create	Adaptation	
		Organization	
High			
	Discipline with a specific contact and	Action	
	Learning Outcome(s)		

Figure 4.7. Bloom's taxonomy, Source: (Elshater, 2018)

Formative Assessment shown in Figure 4.6 provides instructors and students with timely and frequent feedback on the effectiveness and quality of course material and learning objectives. In essence, instructors sample students and provide feedback on their learning progress based on the results, and accordingly modify instruction methods and learning experiences. Students can also use feedback to identify and work on improving their areas of weaknesses.

Formative assessment uses several tools to achieve its desired objectives, for example discussion post (boards/blogs/chat)

- Individuals or groups can present summaries or engage in conversations on various topics to promote interaction. Instructors provide guidelines, deadlines, and discussion forum space to facilitate the activity.

- Chats can be helpful when groups or students need an avenue to ask and answer questions related to collaborative work. Instructors can also use chat as an “office hour” to interact in real-time with their students.

Quiz (short answer, multiple-choice questions, etc.)

- Short but frequent quizzes can help both the instructor and the student track their learning progress. A quiz should be 10-15 questions long to provide sufficient information for feedback.
- For multiple choice quizzes, automated grading can save instructors time and provide quick feedback for students.
- For short answer or short constructed response items, instructors may want to provide additional commentary feedback through emails or using a private communication platform in a Learning Management System (LMS).

Summative assessment is another online assessment techniques that uses results to assign student grades and make comprehensive conclusions about mastery of course learning objectives. Instructors need to be cautious of using assignments excessively, even if more assignments for assessment may be better than too few. Too many assessments, could lead students to focus on quantity rather than quality of deeper learning. For the midterm/ final exams, instructors can use mechanisms provided by Learning Management Systems (LMS) to increase academic integrity. This method might need advanced planning and reservation of computer labs in advance if human proctors are to be used.

Projects can include simulations, role-playing, case studies, problem-solving exercises, collaborative group work, and brainstorming or debates over various topics. For individual projects, participants receive peer feedback reviews. An online environment allows students or the instructor to give and receive immediate feedback. Students can choose topics with special interests or pre-determined topics by the instructor through writing for a target audience, and publish or present findings via websites/blogs/forums/discussion boards.

Projects will need instructors to provide evaluation forms for self-evaluation and peer assessment and will allow students to be creative and showcase their learning and growth through a portfolio using various tools. The example is given here to papers, digital content, and presentations. Instructors can also pre-determine what ought to be included in each portfolio.

Pieces of research on this area of specialisation recommends using rubrics to assess portfolios (Cornell College, 2020; Taylor & Devine, 1993). These portfolios should also be assessed through peer review process, that can also serve as an effective learning and assessment tool. As for presentations, instructors can design these methods using informational web pages, such as blogs, web-based student-generated quizzes, video & audio, or slideshows.

Both formative and summative assessments include case studies that can be used for individual or group assessments; teams of five to six are recommended. In these methods, asynchronous communication environment (discussion blogs instead of chat) is more appropriate for problem-based approaches because students have more time to reflect and collaborate with each other.

In conclusion, redesigning assessment techniques, and using a variety of assessment instruments will complete the puzzle for online education and will ensure the achievement of the learning outcomes.

A2.4 Review graduate attributes, competencies, and curriculum redesign

A graduate attributes approach to curriculum design focuses on the desired learning outcomes that students are expected to have achieved by the time they graduate (University of Worcester, 2020). As widely acknowledged in the literature, there is growing recognition within Higher Education Institutions (HEIs), of the need to not only identify graduate attributes the way a curriculum is supposed to develop, but also to demonstrate that these graduate attributes are actually what is demanded by the job market.

Employers look for skills and attributes related to digital competency, critical analytical thinking, multi-disciplinary knowledge, globalisation, research skills, citizenship, problem solving, collaboration, and social welfare.

Attributes need to be directly mapped to curriculum redesigning process, to reflect graduate attributes in the design of curriculum (UK Quality Code for Higher Education, 2020). With online education, designing global courses is becoming crucial to allow mobility and credit transfer between different education systems. Focusing on global issues and moving beyond the local challenges reflects global compassion between different societies and allows societies to collaborate in solving global challenges. Many challenges in the current environment requires cooperation between multi-disciplines which necessitates promoting multi-disciplinary programmes.

Finally enriching curriculums with research topics and hands-on experience will empower students and make them ready for the job market.

A2.5: Use of artificial intelligence (AI) and collective intelligence tools to offer a truly personalised learning experience

Universities can use AI to offer a truly personalised learning experience overcoming one of the biggest limitations of our current education models and assessment methodologies. It is expected that AI in U.S. Education sector will grow by 47.5% from 2017-2021, as per the US Education Sector report (Research and Markets, 2018). Even though most experts believe the critical presence of teachers is irreplaceable, there will be many changes to a teacher's job and to educational best practices.

An educator spends a tremendous amount of time grading homework and tests. AI can step in and make quick work out of these tasks while at the same time offering recommendations for how to close the gaps in learning. Although machines can already grade multiple-choice tests, they are very close to being able to assess written responses as well. As AI steps into automate admin tasks, it opens up more time for teachers to spend with each student. There is much potential for AI to create more efficient enrolment

AI has already been primarily applied to education through tools that help develop skills and testing systems. As AI educational solutions continue to mature, experts hope that AI can help fill needs' gaps in learning and teaching, and allow educational institutions and teachers to have bigger impact on students. AI can improve efficiency, personalisation, and streamline administrative tasks to allow teachers to be more time-efficient, and effective when providing understanding and adaptability, which are human attributes unmatched by AI. By leveraging on the best attributes of both; machines and teachers, the vision for AI in education is one where they work together for the best outcome for students. Since, the students of today will need to work in a future where AI is the reality, it's important that the education system exposes students to enough technology.

4.3 Redefining Research Agenda and Directions

The global awareness of the threat of a new pandemic has become widely acknowledged. Research funding-bodies around the world are now mobilising their

resources in the fight against the new coronavirus. MoHESR continuously fosters research efforts in different areas of specialisations. New grant announcements and changed terms for ongoing funding related to the coronavirus have been placed in several institutions worldwide. The focus is on research that can reduce the spread and the effects of the continuing COVID-19 pandemic, and also research aimed at preventing future pandemics. The study can be related to medical devices, treatment methods, medicines, vaccines, diagnostics, transmission, or pathogenesis for COVID-19. Other areas of which research is investigating, are the effects of the pandemic on issues like agriculture business affairs and education, which are also available by the Science, Technology, and Innovation Funding Authority (STIFA).

MoHESR has set seven actions to be taken within this policy pillar. The policy timeframe covers short-term, intermediate, and long-term achievements. **(Figure 4.8).**

A3.1: Orient scientific research to examine the impact of COVID-19 on education, health, and wellbeing

MoHESR, along with its affiliated entities like the Egyptian Academy of the Scientific Research (ASRT), have created communities of researchers to cooperate with other bodies of scientific purpose, to improve the scientific and economic status of Egypt. This practice was adopted earlier by the United States, which had created the Biomedical Advanced Research and Development Authority (BARDA) in 2006 to link different researchers across the country (Haseltine, 2020). In this context, MoHESR has recently aimed at directing the scientific research community to focus more on the impact of COVID-19 on different areas, such as education, health, and wellbeing.

Furthermore, the ministry has put a plan with the support of Clarivate office of the Middle East and Northern Africa region, to support Intellectual Property Rights (IPR) in scientific research and higher education. Intellectual Property (IP) in Education is the key to boosting the impact of applied research and its outcomes. A well-structured strategic policy with set regulations, will support researchers and institutions and help them ensure the quality of their work and guarantee its maintenance. It will also allow administrators to create economic value out of it.

Clarivate shall support all MoHESR key stakeholders on every step of the way. It will provide researchers with the vital tools and techniques needed to achieve the agreed-upon strategic aims (Clarivate, 2020). Clarivate will also work with managers, heads of departments, research groups, and researchers. The benefits lie in discovering

ways to enhance the institution’s performance at every level.

In this domain, this blueprint for scientific research during and post coronavirus pandemic focuses on four steps. It starts with setting an overview of the direction of research worldwide and how to link it with the local

challenges. The benchmarking comes in the following steps, where a comparison is drawn to assess the local status & efforts. Third step is where collaboration with international entities occur, MoHESR cooperates with SciVal, and Elsevier, which can provide a platform using supercomputing technology. Finally, the fourth step measures the trend of research directions (Figure 4.9).

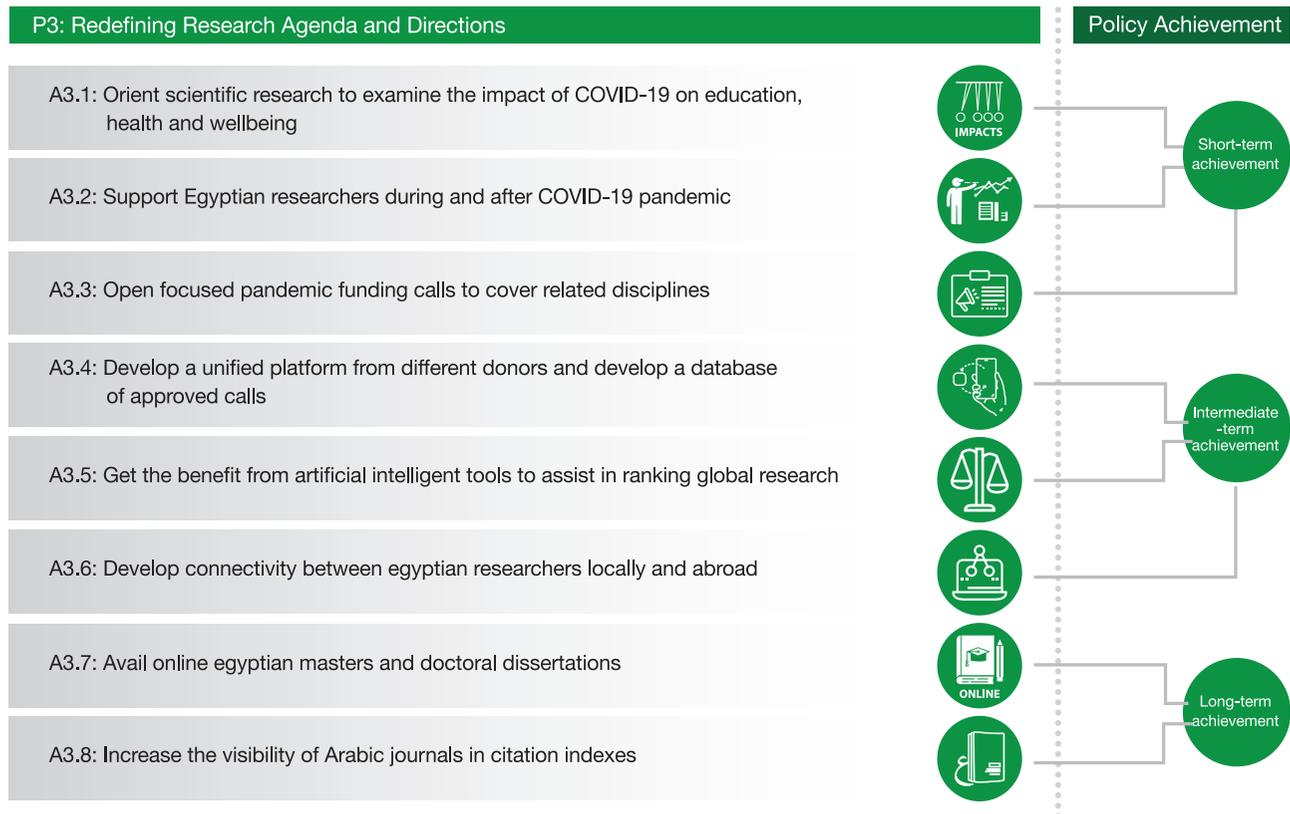


Figure 4.8. Actions of achieving the third policy pillar

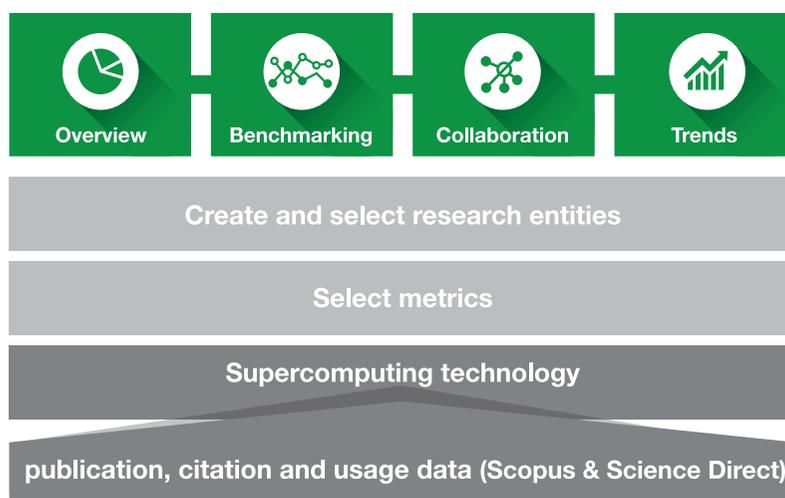


Figure 4.9. the four steps of directing the research in MoHESR

A3.2: Supporting Egyptian researchers during and after COVID-19 pandemic

Since the beginning of universities lockdown, MoHESR has been working on supporting researchers and post-graduate students with their researches. Whether their researches were related to coronavirus or any other area of specialisation. This support was provided through several webinars presented by prestigious publishers' representatives in the Middle East and Northern Africa (MENA) region. like Clarivate, Elsevier, Emerald, Sage and Wiley. Some of these webinars provide general information while other supportive specialised fields like medicine, engineering, and information technology (Figure 4.10, Figure 4.11). These webinars have started in June 2020 and are to continue sharing knowledge among early career researchers even after the pandemic.

Another challenge that occurred due to universities lockdown, was the seminars and following up on the progress of Masters and Doctoral dissertations. Overcoming this challenge might require a change in regulations of post graduate studies controlling research process. A lesson can be drawn from other worldwide universities, on how this process was done when supervisors had external examiner/s from other

universities outside the borders of the country. The possibility of having online video conferences for this process matches well with the social distancing policy applied on campus. Further benefits from this action will help in widening the number of attendees who can join virtually in a convenient time and place and record notes. Another tacit benefit from spreading this culture among Egyptian scholars, would be encouraging further cooperation with international universities via the video conference meetings.

In this context, and with the spread of virtual meetings, regulations can also control the online webinars of the dissertation findings. These regulations include the official university platform that can run the video-conference call.

A3.3: Open funding calls focusing on the pandemic and covering related disciplines

The Science, Technology, and Innovation Funding Authority (STIFA)—as a funding agency—has targeted COVID-19 through an initiative called the “Emergency Call”. This call was introduced to address national priority needs with the ultimate goal of finding efficient emerging disease management. The objectives of this call were proposed to encourage scientists to respond to societal

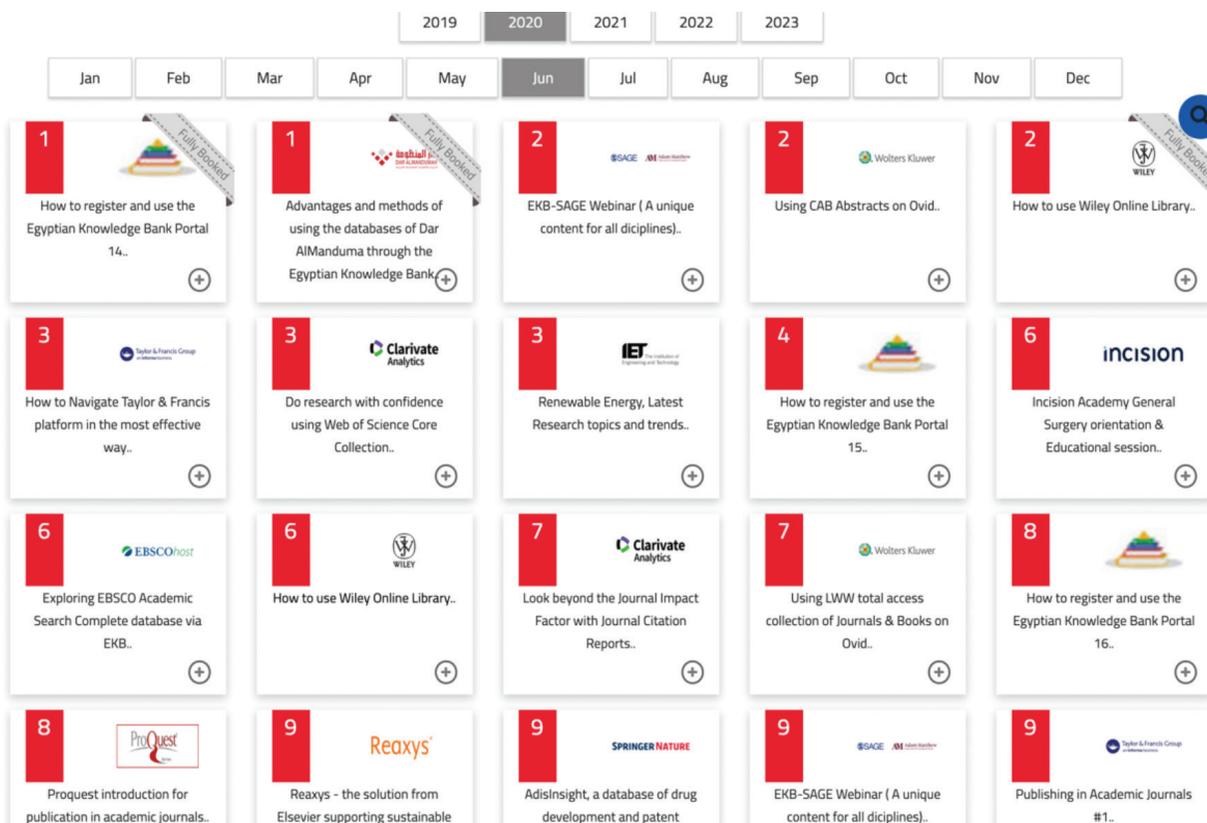


Figure 4.10. The list of Webinars presented by Egyptian Knowledge Bank

Incision Academy - Basic Surgical & Medical Skills Program 2020



Basic Surgical Skills



Basic Medical Skills

incision

Description

Passing 5 courses on the Basic Medical Skills and 5 Courses on the Basic Surgical Skills and providing instructions sheet based on each skill understanding

Instructions:

The student has to pass relevant courses fir each category and to fill the information sheet for each skill including all the instructions and the rational of each step based on his/her understanding

Deliverables:

Two files: One file per category with Cover sheet including the content and Tests Score.

Targeted groups:

Grade -1,2 & 3

Figure 4.11. The list of online courses offered by incision

and governmental needs, highlighted by Egyptian authorities, and to apply innovative and applicable solutions to the pandemic disease COVID-19 facing the society. The COVID-19 “Emergency Call” could be addressed from various research perspectives, that includes medicine and health, pharmaceutical and drug development, material, textile, engineering, biotechnology. The main objective is the development of effective, efficient, and economical products for the diagnosis, control, protection, and treatment of the viral infection and spread. The example is given to epidemiological and immunological studies, digital applications for viral tracking, and healthcare management.

COVID-19 Emergency Call also covers the industrial collaboration that would address low manufacturing costs, and shorter development cycles. Emergency Call research outcomes are expected to play an important role in the country’s control of the pandemic disease.

The main objective of the call is better management of the outbreak of the pandemic, with applicable effective economic research outcomes. The call also aims to enable the application of health development at a large scale: industrial production of sanitizers, ventilators, drugs, vaccines, and other sectors that were affected by the pandemic.

Egyptian researchers were invited to collaborate in a consortium to manage research projects addressing the outbreak of COVID -19 for better research outcomes. The participants were expected to work on enabling better local facilities, and biosafety labs needed for the work discussed at their proposals. The expected results should contribute to the controlling and solving of the pandemic challenges. The projects' outcomes should also enable Egypt, as a developing country, to utilise research outcomes for better control and manage the pandemic. This call was not limited to the government

agencies of the country but included private entities as well. STIFA encouraged proposal submissions involving multi-disciplinary teams, which will be highly supported through the evaluation process. The allocated budget by STIFA is up to 40 million EGP to cover 15-20 projects. By June 2020, ten projects had already been selected, and another ten research projects are currently under evaluation.

A3.4: Develop a unified platform from different donors and develop a database of approved calls

One of the challenging issues facing researchers, is the difficulties they might face when screening the offered calls for funded projects, and what had previously accepted. A long-term plan by MoHESR, is having a unified online platform for all calls provided by different Egyptian entities. This platform will also ensure the integrity of the submitted work, and it's the exclusivity of its submission to a specific Egyptian donor agency and not to be submitted elsewhere during the reviewing process. This action might have procedures that include:

- Unifying universities' portals to avail the connectivity between all universities staff and agencies providing funds.
- Platforms to connect professors from both universities (60), and research centres (11)
- Portal for funding agencies in Egypt to unify the

fields of projects funding and create ways of collaboration between different applied funded projects

- Fixing internet of things (IoT) platforms, to be smartly connected with all devices, such as monitors (e.g., stations, energy control, utility meters, parking, researchers' allocation)

A3.5: Get the benefit from artificial intelligence tools to assist in ranking global research

Artificial intelligence tools can provide a platform for the training and deployment of intelligent agents. Using this tool can get benefit to analyse unstructured data, to classify, organise, filter, search and explore it in ways that were not possible with a keyword search. Figure 4.12 shows the data that can be analysed by Elsevier in ranking the global research. This policy action enables the analysis of documents and text data at scale, accelerating productivity and the usage of knowledge otherwise locked in document repositories. MoHESR can use different software that can help in:

- Creating Library: Extract the text fields and documents' paragraphs
- Rank & Enrich Data: Create and train agents to score documents and data to generate analyses. Export scores via API or CSV.
- Analyse and publish: Use business Intelligence dashboard or choose to customise the analysis and publication of research results.

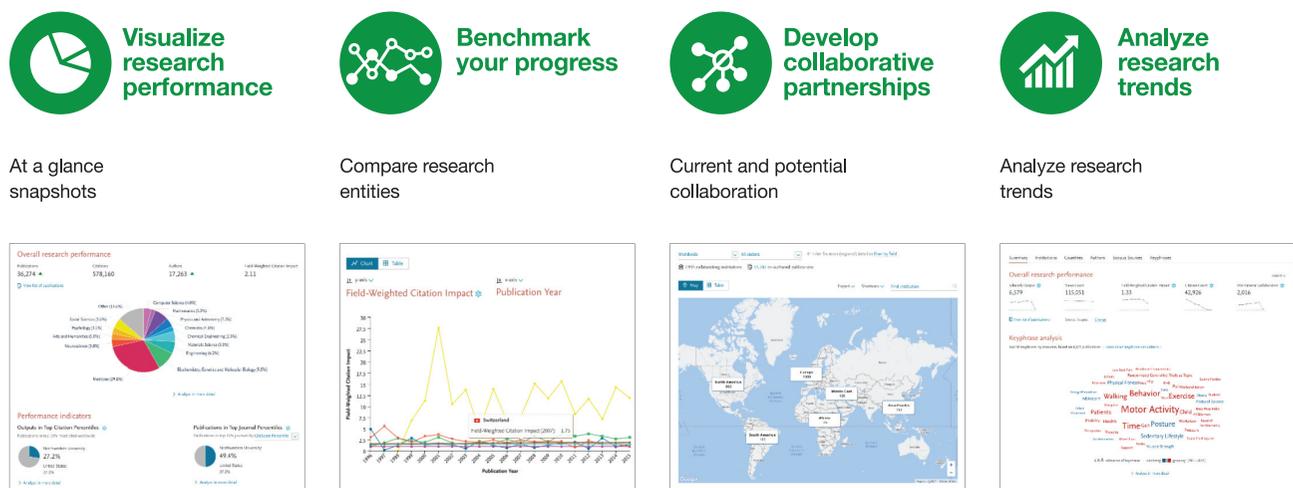


Figure 4.12. The artificial intelligence tools provided by Elsevier

A3.6: Develop connectivity between Egyptian researchers locally and abroad

MoHESR had set a plan in 2019, in cooperation with the Egyptian Knowledge Bank (EKB), Clarivate, and Elsevier through their representative office in the Middle East and Northern Africa (MENA) region, to manage the workflow of research. The main aim of this project was to manage the workflow of Egyptian analysis powered by users, and to link the researchers through a digital platform. Connection solutions between Egyptian researchers with peers around the Globe can be mannered and created by a platform like Publons, Coveris SciVal, and ORCID.

Today, with a vast amount of research set to meet coronavirus challenges in different disciplines, MoHESR aims to increase awareness concerning the use of these platforms in connecting Egyptian researchers. EKB has started an awareness initiative in April 2020, to spread the word regarding users' interfaces and tools, and how

they connect a support researchers. Examples used were Publons, ORCID and SciVal. **Figure 4.13** shows the framework that is adapted to manage the work flow between researchers as researchers and suggested solution for connectivity between them.

A solution to another challenge which is the visibility and connectivity between Egyptian researchers is having a shared storage cloud that easily stores publications and is visible by those who share the same interest. Another planned initiative is to establish cloud-based digital publishing (unit) that enables more comprehensive visibility of books (**Figure 4.14**). A roadmap can be applied through MoHESR starting with virtual studios or platforms where researchers with similar interest can contact each other. They could then have interactive cooperation to produce their research which can be stored after publication in an online cloud that would be easily accessible by readers and could be included in readers citations.

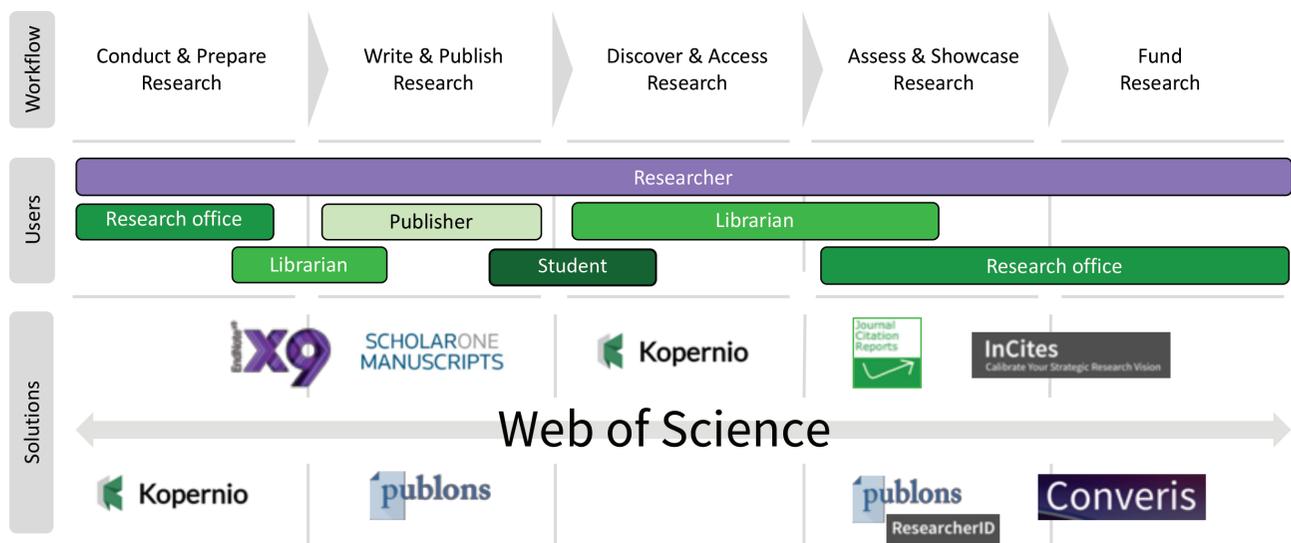


Figure 4.13. Framework powered by the Web of Science (WOS)

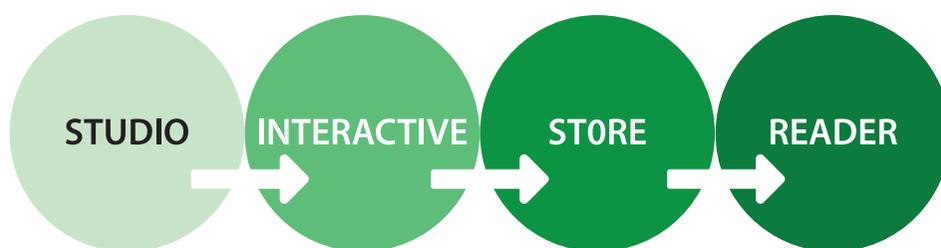


Figure 4.14. the four steps for creating connectivity between researchers for better productivity

A3.7: Avail online Egyptian masters and doctoral dissertations

Unlike highly ranked universities, MoHESR ensures the availability of a limited number of pages from accredited dissertations, and shows the results scored by the thesis. Figure 4.15 shows the Egyptian Universities Library Consortium (EULC) portal that documents front pages of all Egyptian dissertations. However, availing the entire document of any dissertation online will secure

which is not accounted and would affect the ranking of a specific university. This challenge was addressed by EKB, taking upon indexing Arabic journals powered by Egyptian entities.

Clarivate provides institutional-level bibliometric indicators through EKB. Those indicators will make Arabic journals more accessible. This level of accessibility will also give these journals with a level of visibility for the public funding process, and make them recognised

Figure 4.15. Egyptian Universities Library Consortium (EULC)

the data from being plagiarised and prevents repeating results by other researchers. In this context, MoHESR has a medium-term plan to avail the entire accredited thesis online. In order to do so, an agreement with an international agency like ProQuest, would support the availability of the thesis and will publish it online. By 2025, this plan can be applied with a different methodology, where universities would ensure the quality of published thesis online.

A3.8: Increase the visibility of Arabic journals in citation indexes

One of the challenging issues in improving the Egyptian universities' ranking is recognising Arabic publications in internal indexed journals. Over the past 10 years, Egyptian universities have emerged as the partner of choice in the fast-developing field of rankings. Meanwhile, several disciplines have a huge amount of publication in Arabic,

on the global academic map. Regarding inputting the Arabic journal on the global map, the Web of Science platform, powered by Clarivate, had provided a pathway to index Egyptian Arabic journals two years ago. This will get benefits in bridging the gap between local scientific output, and global impact, and will also connect the Arabic scholarly with more than 1.7 billion cited research references dating back to 1864 (Figure 4.16).

In doing so, the Arabic journals that aim to be selected in any indexing platform like Clarivate or Scopus will be selected by the newly established editorial board. This board will be neutral and will have representation from other Arabic League member countries. Board members will provide regional insights with subjective knowledge. The guideline principles of journal selection for Arabic citation index are based on traditional scholarly publishing standards and research norms of the region (Figure 4.17).

bridging the gap between local scientific output and global impact
the Arabic Citation Index offers many benefits:

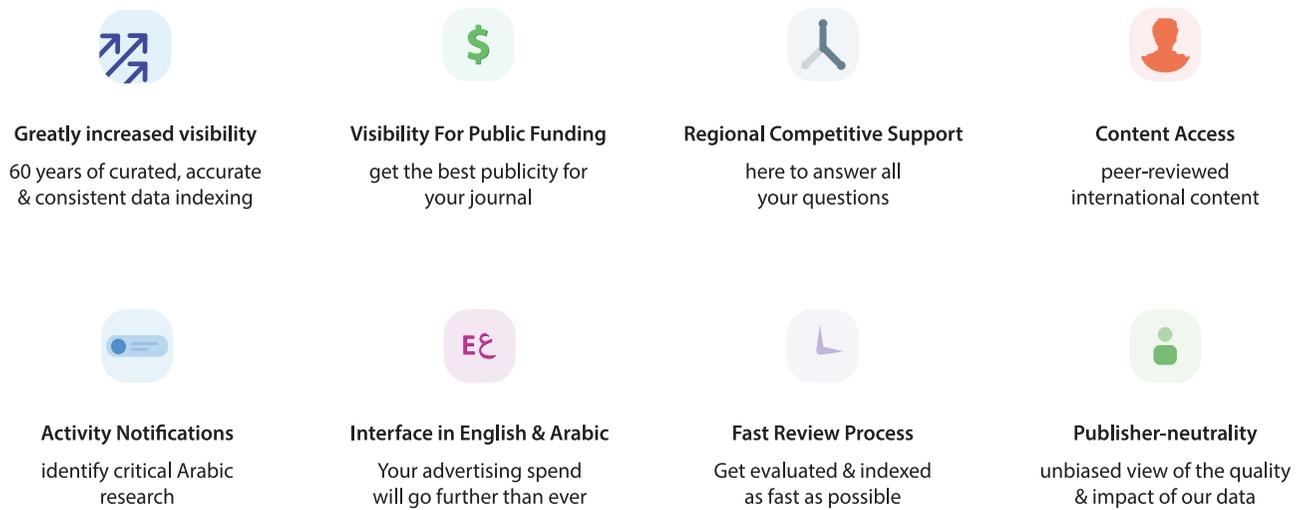


Figure 4.16. The benefit of indexing the Arabic journals powered by Egyptian entities

ARCI Triage

- ✓ Journal title
- ✓ Publisher
- ✓ ULR (online journal)
- ✓ Content access
- ✓ DOI (digital object identifier)
- ✓ Timelines/volumes

Editorial Evaluation

- ✓ Journal title
- ✓ Statement of journal scope
- ✓ Content relevance
- ✓ Language quality
- ✓ Cited references
- ✓ Editorial board structure

Figure 4.17. The list of criteria that affect the indexed Arabic publications

4.4 Empowering Universities' Human Capital

There is no doubt that human capital plays a central role in developing and implementing all types of education strategies, be it before, during, or after the pandemic. This pillar looks into the key policies and actions concerned with empowering human capital at both the academic and the professional levels. This includes the following four key objectives:

- The development of the support and IT staff capabilities needed to implement future education strategies.
- The upskilling of the academic staff to be able to adapt new IT technologies and solutions in research and teaching.
- Upgrading the academic staff's skills to able to achieve high-quality, and world-class education through providing them with well-known scientific missions for various degree and non-degree studies abroad.

- The promotion of Egypt's education capabilities and attracting international students to study in Egypt.

The main suggested policies and actions to support the above four key objectives are summarised in **Figure 4.18** and are explained in the following subsections.

What makes things even more complex, is the fact that both permanent and project contracting has been suspended for more than two years now, causing a serious issue in scaling up the IT capability of universities in a time when it is most needed. Replacements for resigned IT staff is not feasible, taxing the overall capacity and capabilities of most IT departments in those universities.



Figure 4.18. The policy Pillars for empowering the university's human capital

A4.1: Issue legislations for developing and integrating a formal IT division in universities

Information technology (IT) staff in universities are typically two types: (1) standard employees who are familiar with IT and may or may not have a formal education or training (technician), (2) contracted employee working on a specific project with a temporary contract. The latter forms the main taskforce for all central IT departments at least at the university level. Some faculties have their own IT staff that might be working under one of the above two models as well. Accordingly, the overall IT staff is not stable, specialised, and in most cases not qualified. Furthermore, most high-calibre IT staff eventually find their way to the private sector with much better salary packages and clear career paths. In fact, most, if not all, public universities have no access to formal certified cybersecurity engineers, causing a serious issue when it comes to protecting IT infrastructure, and data, which is crucial to the digital transformation project for universities. Moreover, acquiring cybersecurity engineers within the typical IT staff under any of the above contracting models is not even feasible at least from a financial perspective.

It is, therefore, essential to initiate serious efforts to drive legislations that would enable the establishment of a special IT division, with proper career paths, financial packages, & special hiring processes for IT staff. Without such legislation there is massive doubt that universities can perform the required digital transformation, effectively, and efficiently to support real transformation in education.

Another alternative for the hiring legislation discussed above is to develop an ecosystem that fosters and supports the outsourcing of most IT personal. This system would be service-oriented, delivered by a professional third-party entity, and would include the management of the infrastructure, application, and service desk/support. This, however, still requires serious efforts in order to work under the current procurement and purchase law that governs all governmental entities, including those of universities.

As for international students, and since legislations originate from the Egyptian Supreme Council of Universities, it should include a framework that

addresses the current careers requirements of the Fourth Industrial Revolution (4IR). The framework would mandate a change of the existing curricula and the related IT degrees available in the majority of the Egyptian universities and institutions. 4IR is characterised by the fusion of the digital, biological, and physical worlds, as well as the growing utilisation of new technologies, such as AI, cloud computing, robotics, 3D printing, the Internet of Things, and advanced wireless technologies. That being said, MoHESR is also working on increasing the number of laboratories to enable the practice of the new technologies that are shaping the future of IT. AI and blockchain are specifically attracting interest in Africa, as they have the potential to successfully address social and economic challenges there. There are so many other areas in which 4IR technology can be transformational.

A4.2 Build IT staff capabilities & capacities for digital transformation roadmap

Even if IT staff can be hired or made available in one way or another, it is still essential to ensure that they continually evolve to meet the ever-changing requirements & and advancements in IT. The last five years only have witnessed the introduction of several new technologies that require a whole set of new skills that are not easy to acquire without a clear human and talent management process and budgets. In most universities, minimal effort is made to upgrade and sustain the capabilities and capacities of the IT staff regarding new and emerging technologies.

Meanwhile, the processes and procedures that are applied to support the implementation and operation of these technologies, are not sufficient. A part of the shortcomings is attributed to the fact that the cost of such development plans is prohibitively high. In addition, regulations and laws may not allow for such investments regarding non-governmental employees (not on temporary contracts), which is the case of most IT staff as discussed in A4.1 above. It is therefore important to develop and support a real talent management and acquisition function in universities to ensure headhunting and sustaining of IT staff, those who are fit, and can support the DX roadmap of the university.

Best practices recommendations for the IT transformation roadmap is:

- Identify five or six capabilities, then prioritise two to three in the first year.
- Focus most capabilities and efforts on higher education business strategy, and one or two of the IT foundation building. In our case, automation of the enrolment process was prioritised.

- Develop capabilities in areas where we can truly differentiate ourselves.
- Establish alignments up and down the stack, from the business strategy, to the capability, to the project portfolio management, to the technology that brings it to life. These elements of the stack cannot be executed in isolation. So, we had integrated the Study in Egypt portal and Mobile App to the Enrolment Automation solution for better results.

It is always essential to keep in mind that capacity building is not a one-time projects, but an ongoing development. They are long-term and designed to outlive the education system, that being said, MoHESR is building five centres of excellence specialised in education automation capabilities, and customer services excellence to enhance quality of services. This is not limited only to the education process but also to the associated services, i.e. Arabic centre, transportation, health and medical insurance and online payment.

A4.3: Uplift faculty's technology capability in adopting/adapting technologies for online teaching/research/management

The decision to halt physical attendance to universities on March 15, 2020 following the outbreak of the coronavirus, has revealed the gap existing between the level of the university's staff IT skills & capabilities, and the needed IT skills for adopting digital transformation (DX) strategies in universities. The amount of digital content development and delivery needed for courses, exams, and other university businesses have been unprecedented. Even though the overall experience for faculty staff and students has exceeded expectations, especially given that the shift was sudden, indeed, it is widely acknowledged that the experience is far from ideal and does not live up to the desired objectives. Capacity building of faculty and staff requires a clear roadmap that first identifies the skills gap & actual required skills for future transformation. This process is followed by detailed steps, approach, and programmes to be applied to ensure proper capacity building, the methodology of how it would be transferred, and continuously supported and upgraded to ensure seamless integration to all staff and faculty in the DX vision.

A4.4: Develop students' technical capabilities & skills related to ethics, research, and self-learning

Students' skills, depending on their areas of specialisation, evolve during their formal education settings and curriculum development. However, they do not develop the required wider set of skills that allows

them to become “Global Citizens” equipped with all the necessary qualities needed for the current - and future world economy.

Several public universities have acknowledged the importance of the non-technical skills (life skills), and have started providing them for their students. For instance, some universities are now mandating students to attend courses tackling critical thinking and entrepreneurship before graduation. Others require students to uptake courses on design thinking and social responsibility activities before being allowed graduation. Pieces of information, free courses and paid courses are available online for students to access through the web. Yet, the most significant effect comes from role models, mentors, and career guides.

Some recommendations to elevate students’ skills include:

- Avail access to all students, local and international to the Knowledge Bank, and find an alternative to the Egyptian identity capability number requirement to use it. An alternative could be allowing the usage of passport numbers for registration.
- Provide them with mentoring programmes at their universities where students can select from nominated mentors and career consultants’ lists, to help them with advice on needed soft skills for the current job market.
- Activate MOOC (Massive Open Online Courses) in universities’ libraries

A4.5: Develop inflow and outflow mobility models for international joint programmes in teaching and research

Different programmes can be offered to enrich faculty members’ teaching and research experiences, depending on the objective. These could include: long-term exchange programmes (semester or longer), short-term exchange programmes, study tours, service learning, volunteering, internship or work placement, and post award scholarship or programme. The internationalisation of higher education has become a strategic priority for governments around the world because of its expected benefits in the economic, political, socio-cultural and academic spheres. Nevertheless, a review of the literature on internationalisation in higher education reveals that the concept of has been understood and applied in different ways (Hüther & Krücken, 2018). Considering that internationalisation is a central theme in higher education’s research and practice, this state of affair is a challenge. The offered topics for researchers and the

implementation environment play a major role in the dule programmes or joint cooperation.

A4.6: Rethink the strategic, tactical, and operational strategies and techniques for scientific missions and dispatching in higher education

The Central Department of Missions (CDM) is the entity within MoHESR that is responsible for the management and operational activities related to the dispatching of all types of scientific missions in Egypt. Currently, CDM announces one or more calls per year for all universities and research centres to apply for a variety of scientific missions such as, full Ph.D. scholarships, post-doctor missions, and joint-supervision between universities in Egypt and abroad. These missions typically cover main generic themes of science, technology, and art, and include almost all displaces.

As with most educational sectors impacted by the pandemic, scientific missions were no exception. The typical model used for announcements, dispatching, and management of scientific missions has to be restructured. In particular, scientific missions need to consider reforming in three main aspects:

- Selection of topics and scope: the impact of the pandemic on global and national economy would mandate rethinking and optimising the missions’ budget to be geared towards key pressing research challenges. These challenges obviously include medical sciences. However, research areas that can help in supporting the growth of local industries are becoming of a higher priority. Food security and related topics are becoming increasingly important and are becoming of strategic value for national security.
- Internal Dispatching System: expected limitations on mobility for the next months and perhaps years, have called for a fresh look onto the scientific mission dispatching system. Internal dispatching where students can study in high-quality world-class programmes in public universities in Egypt, is becoming an attractive option. It exploits the potential and capabilities of Egyptian universities, while reducing the challenges and risks encountered in the conventional dispatching system. Such internal mobility will not only support a wide category of researchers who prefer to study at home, but also will support the evolution and advances in our national scientific research system. Moreover, internal dispatching will foster the development and emergence of

national scientific schools, those who do have the momentum and are collectively advanced with knowledge of the state of art practices in Egypt in various strategic areas.

- Online and Blended Missions: New types of scientific missions may appear in the near future, owing to the transformation that most universities around the world is going through. Many universities, at least for the short term, will adopt e-learning approaches to support the smooth reintegration of students into the traditional on-campus system. CDM can capitalize on this opportunity to investigate blended models of dispatching that allow students to complete part of their studies online from Egypt and be dispatched to the university abroad to complete their studies and obtain the degree. This model has several obvious advantages related to cost reduction and student retention.

4.5 Accelerating Digital Transformation

This pillar focuses on the various policies and actions needed to accelerate the digital transformation (DX) strategy adoption in universities, as one way to deal with the current and post-COVID-19 situation. In particular, this pillar focuses on issues related to understanding whether our universities are ready for DX, and ways to approach the DX journey, in a systemic and standardised

way given the challenges posed by the COVID-19 pandemic. **Figure 4.19** summarises seven key policy and action items needed to realise this pillar. The following subsections explain each of these policy and action items in detail.

The demand for the almost immediate digital transformation of HEIs, not only requires the incorporation of technologies, but also requires the creation or modification of processes, and the availability of people with the appropriate capacities and skills, to develop said processes and technologies.

While several efforts are being exerted in universities and colleges to implement the required digital transformation, the current situation showed inconsistencies in the levels and pace of digital transformation processes between universities, regardless of being public or private universities.

Education Institutions digital readiness is not concretely defined, with the protocol signed between the Ministry of Higher Education and Scientific Research, and Ministry of Communication and Information Technologies, a digital transformation framework will be adopted defining all the must have capabilities in each university. This framework should be revised, approved, and adopted by universities. Each university will need to put in place an action plan to accelerate digital transformation in line with the digital transformation framework and a new service model for online education.

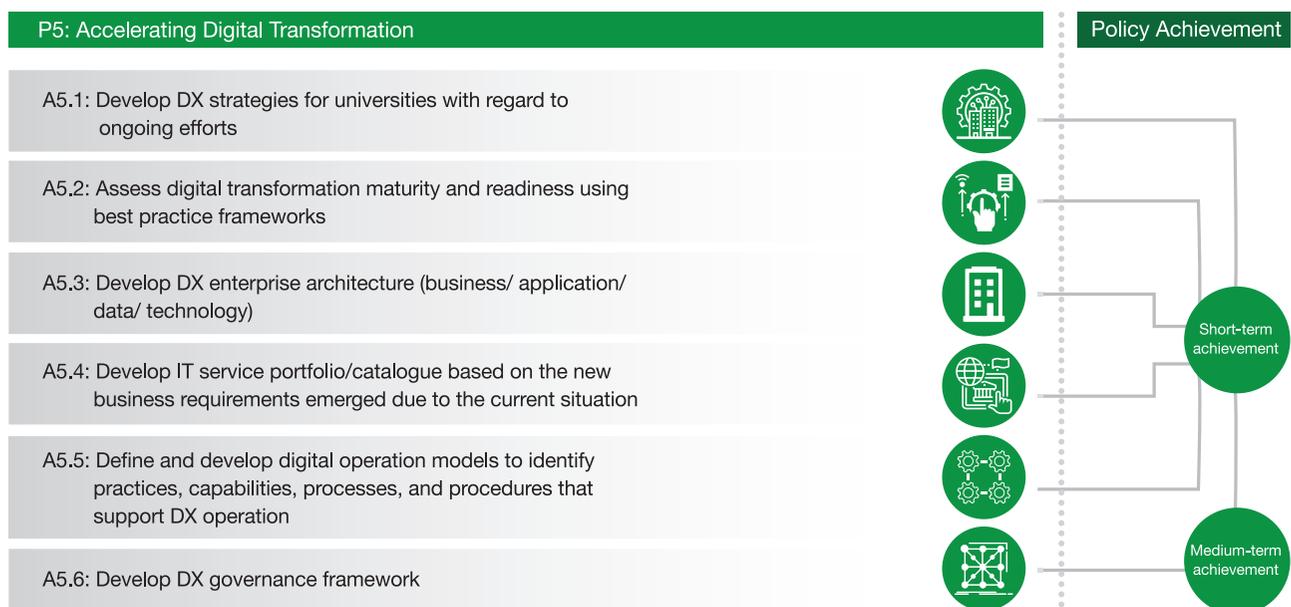


Figure 4.19. Accelerating digital transformation (DX)

A5.1: Develop DX strategies for universities and ongoing efforts

MoHESR has embarked on several strategic projects to upgrade, enhance, and transform Information Technology (IT) in all public universities a few years ago. These projects ranged from uplifting the communication infrastructure by upgrading connection speeds and deploying fiber connections in all campuses; to the piloting and rolling out of e-exams and e-learning systems. This IT transformation in the education sector used to focus mainly on upgrading the infrastructure and the applications that support aligning with different educational services. The IT transformation process mainly focused on process (re)engineering and automation of these processes to support the business of the concern. Almost all public universities in Egypt have been through some sort of IT transformation over the last 15 years.

However, COVID-19 has posed a different reality in almost all business sectors, including the education sector. In particular, the nature of the pandemic has called for a different type of transformation beyond the typical IT transformation; namely the digital transformation (DX). The main difference between IT transformation and DX, is that the former focuses on transforming IT to support the business, whereas the latter focuses on how to transform the business by adopting technology. In simple words, DX enables businesses to do things very differently or to do different things that couldn't been achieved in terms of scale and volume without the technology (Figure 4.20).

DX is not a consequence of the pandemic, but rather, a necessity that has become more pressing than ever to survive during and after the pandemic, and to cope with its consequences that have been mounting over

the past few months. Even though several universities have started their DX journey well before the breakout of the pandemic; however, time is more pressing now to accelerate the implementation and realisation of the DX in our universities.

In order for universities to accelerate their DX plans, they must first understand and be willing, both politically and technically, to transform how they implement their services. For instance, developing and delivering an e-content for a course on a website is an example of how IT can support the education service. But the model used by Coursera and Edx e-learning platforms, goes beyond the typical IT-support model and qualifies to be some sort of digital transformation, where teaching adopts high-tech capabilities in content development, payment, and data analytics among others, in order to deliver an e-learning experience with a novel business model.

Today, many universities pose a typical IT strategy with clear alignment between IT and business strategies; however, almost no university have developed a clear DX strategy that enables the transformation of business and IT together. It is, therefore, critical for universities to develop a clear DX strategy that matches their current and future needs, given the challenges posed by the COVID-19 pandemic. To develop and manage a DX strategy, universities need to:

- Specify the university's mission, vision, and objectives
- Develop policies and plans that are designed to achieve the missions and objectives.
- Define and allocate resources to implement policies and plans.

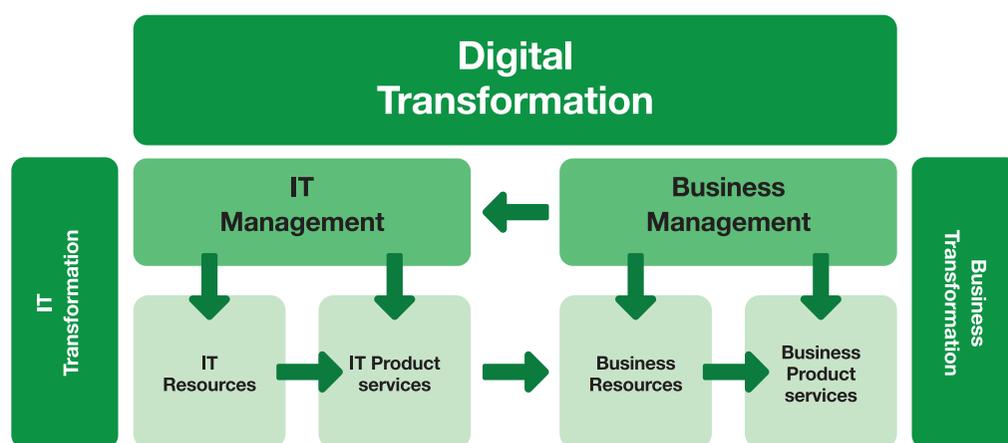


Figure 4.20. The relation between DX, business transformation, and IT transformation

The concept of cascading objectives is especially important to understand when developing the DX strategy for a university. Cascading objectives ensures that the university's strategy is translated from one level to the next. As a result, the strategy, tactics, and operations of the university will be aligned, and effective reporting can be obtained through feedback loops.

Knowledge, methods, and techniques for designing strategies are well known and established in many business domains; however, in universities, it is not uncommon to oversee important dimensions when designing IT and DX strategies. It is therefore important to stress that; a university DX strategy must cover the four main dimensions shown in **Figure 4.21**: organisation and people, partners, information and technology, and value streams and processes.

A5.2: Assess digital transformation maturity and readiness using best practice frameworks

A key step in building a DX strategy, or any strategy for that matter, is to assess the capabilities and maturity of universities regarding DX. Identifying the key gaps in

and communicating the vision, purpose, objectives, and guiding principles for an organisation.

- Planning: the focus of planning at this level is not the conventional project planning, but rather, the overall picture that can be encapsulated in an architecture. Such architecture is typically known as the Enterprise Architecture (EA). Implementation includes the overall activities related to the design and development, management, and operations of the services and products offered by the organisation. In the context of DX, services and products are typically 'digital'.

For universities to be capable of implementing its DX strategy, certain capability and maturity levels must be achieved and sustained. Capability and maturity assessments usually focus on the evaluation of the capabilities of the processes and the organisation compared with a maturity framework, model, or scale. Reference models used for assessment typically quantify maturity levels into several levels based on some specific characteristics.



Figure 4.21. The four key dimensions for DX strategy in universities

needed capabilities for DX will help define the strategy and its tactical and operational requirements.

To better understand the assessment scope needed for DX maturity and readiness, it is important to understand the main components that build up the overall DX framework for universities, which is what any organisation seeks. Figure 5.3 shows the three main types of components for DX frameworks:

- Governance: can be defined as: “the means by which an organisation is directed and controlled”. Directing scope includes setting

Figure 4.22 illustrates the capability and maturity framework span over several dimensions, including the governance, architecture, and service management, development, or operation. No single framework can be used to assess the three dimensions above together. Instead, a family of frameworks and assessment tools can be integrated and used to achieve this goal. **Figure 4.23** depicts the family of standards, best practices, frameworks, and models that, together, form the toolset for the governance, development, implementation, and operation of DX frameworks.

To this end, in 2020 MoHESR and its representative from

the Supreme Council of Universities, signed an agreement with the Ministry of Communication and Information Technology (represented by the Software Engineering Competence Centre (SECC), of the Information Industry Development Agency- ITIDA) to perform a capability and maturity assessment for the 26 public universities during Q3 and Q4 of 2020. The main objective of this agreement, is to identify the capability of a number of universities as per six key dimensions; namely, governance continual improvement, infrastructure, learning, assessment, support, and Information systems.

For each of the six dimensions, a capability assessment will be performed for the university in terms of people, technology, processes, and services. Capability analysis and scoring are then compared to those needed to achieve the strategic objectives defined by a university itself. This is especially important to be able to avoid irrelevant assessment results based on a one-size-fits-all framework, which would not be practical when assessing universities with different capability, scale, and objectives.

A5.3: Develop DX Enterprise Architecture

One of the key aspects that are missing from almost

all IT development efforts in organisations (including universities), is the development and sustainability of an Enterprise Architecture (EA). EA aims at optimising performance across an organisation, and turn what would normally be a fragmented processes and systems, into an integrated environment that is responsive to change and supportive of the delivery of the organisation's business strategy. An important aspect of EA, is the support it provides to the organisation to achieve its DX strategy. It does so by providing a strategic context for the evolution and reach of digital capability in response to the constantly changing needs of the business environment. Similarly, important, is the role of EA in achieving the balance between business transformation and continuous operational efficiency. A well-known standard for developing an EA for an organisation is the Open Group Architecture Framework (TOGAF). TOGAF is a framework for EA that addresses the business, application, information & data, as well as technology architecture (**Figure 4.24**).

TOGAF ensures the integration and alignment between the four elements, along with attempting to evolve and sustain the architecture as business emerges as shown in **Figure 4.25**. It is crucial to realise that most universities fail to address the four elements, and fail to align them

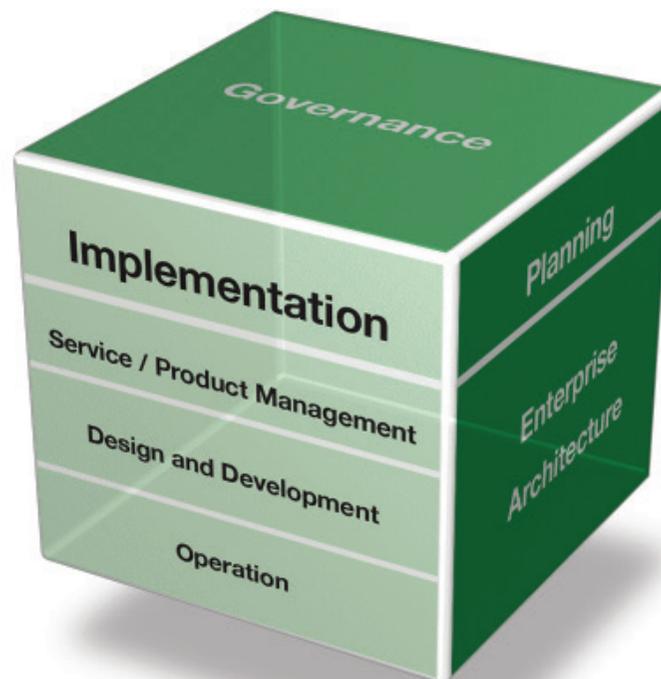


Figure 4.22. The four key dimensions for DX strategy in universities

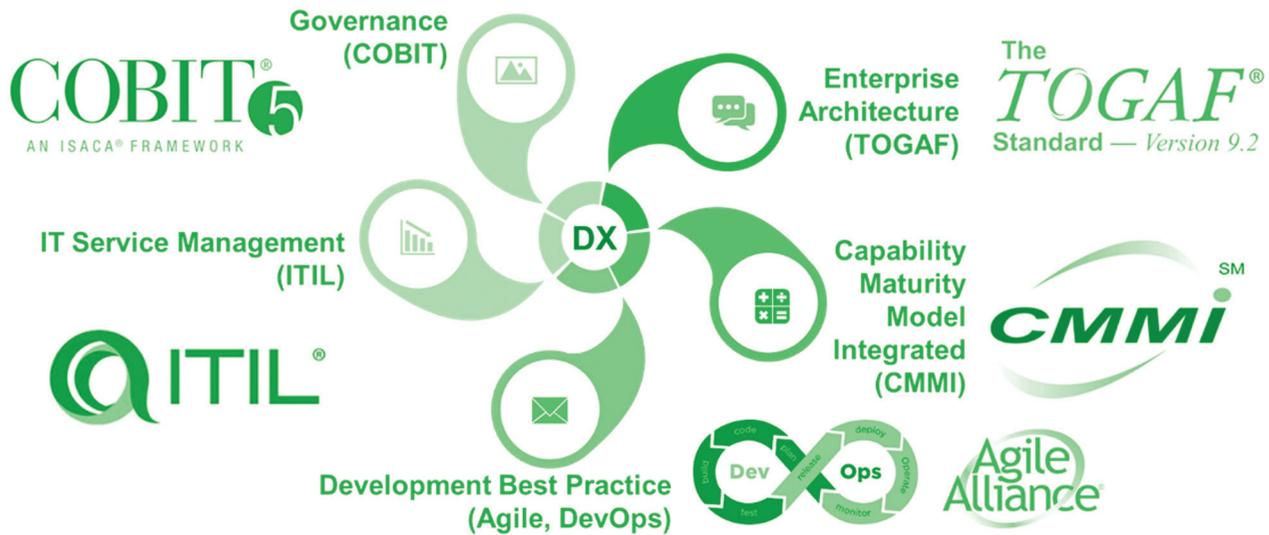


Figure 4.23. A family of standards, practices, models, and best practices for DX

properly to be able to truly support DX for business as current DX and IT efforts in most universities are fragmented with little or no architecture-oriented view in planning and/or implementation.

A5.4: Develop IT service portfolio or catalogue based on the new business requirements emerged due to the current pandemic situation

A service portfolio is one of the approaches that could support with accurate decision making, especially regarding the services that the university provides for its stakeholders (AXELOS, 2020). The portfolio’s main advantage is how it helps in the prioritisation, planning, & the efficient use of resources (human and financial) when developing the most suitable set of services that meets the organisation’s objectives (CMMI Institute, 2020). Universities need a diverse set of services to achieve DX, but they have quite limited resources, it is therefore, crucial to have the needed tools and processes to ensure the alignment of resources along with the DX objectives. Currently, universities do not have an IT service portfolio, but many alternatively do have a service catalogue.

A service catalogue, in any format, is a solution that can help the university to showcase its services to the stakeholders it serves. For instance, a student portal may have a set of services that are available for students to use or request. Services scope, limitations, level, quality, and cost (if applicable) are all provided in the service catalogue. The development of the catalogue itself may seem easy; however, maintaining the catalogue with current and accurate information

is challenging especially that it would need a clear process and trained staff. There are several techniques and tools that can be used and adapted in this regard in universities.

A5.5: Define and develop digital operation models to identify practices, capabilities, processes, and procedures that support the DX operation

EA and COBIT have set the stage for the success of any organisation they operation. However, the real success is when a value is delivered to end-users. Value realisation can be only achieved during the operation; this is where the user experiences the value of the services provided. It is important that universities define and use a clear digital operational model to support the realisation of value through delivery and support of their digital services.

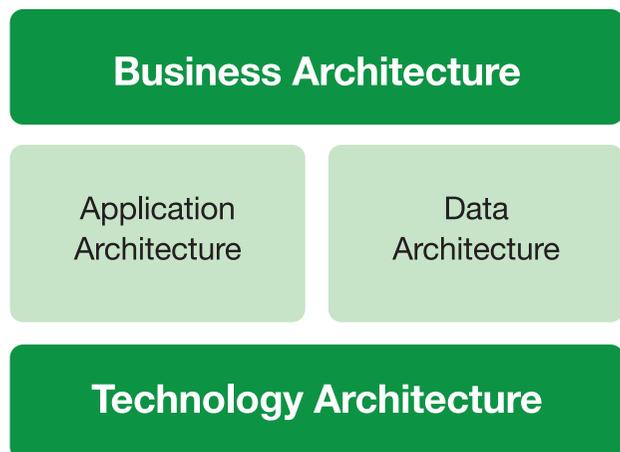


Figure 4.24. The TOGAF four architecture types

The de-facto best practice framework for IT service management (including operation), is the well-known Information Technology Infrastructure Library (ITIL) framework. ITIL has been widely adopted since 1980s, to improve and enhance IT operation and management in various organisations including universities.

A5.6: Develop DX governance framework

It is difficult to envision real DX efforts, without a clear governance component that supports this transformation. Governance supports the alignment between objectives across various levels of the organisation, and ensures that objectives are met and value is realised for all stakeholders (ISACA, 2019). Most universities in Egypt have business governance

being public universities; however, almost none has an IT governance in place. This deficiency has led to the common symptoms of misalignment of objectives, value leakages, and loose accountability in IT implementation. For DX to be effective, it is fundamental for universities to implement and manage a sound governance framework to ensure that DX strategies are continuously aligned with organisation strategic objectives with clear values. Adopting governance ensures that:

- Stakeholder needs, conditions, and options are evaluated to determine balanced, and agreed-on enterprise objectives.
- Direction is set through prioritisation and decision making.
- Performance and compliance are monitored

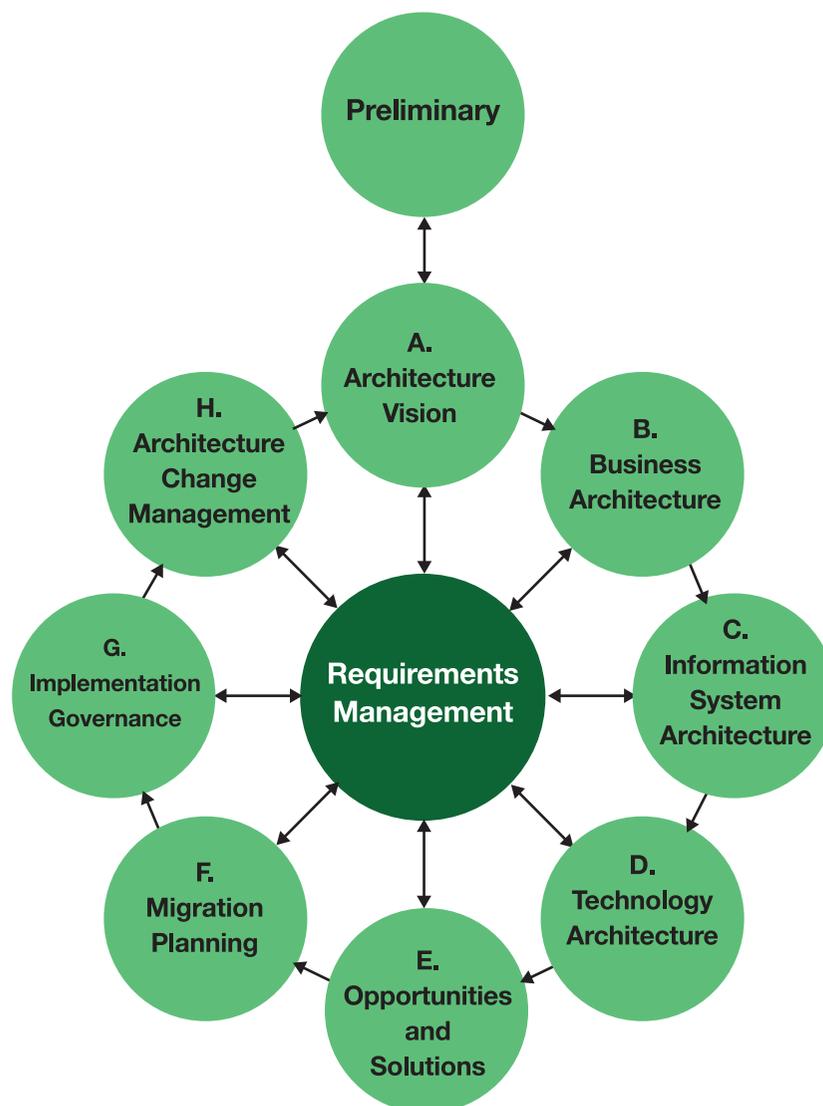


Figure 4.25. The TOGAF architecture development lifecycle.

[copyright applies to this figure from the TOGAF reference in the References section)

- against agreed-on direction and objectives.
- In most enterprises, overall governance is the responsibility of the board of directors, under the leadership of the chairperson.
 - Specific governance responsibilities may be delegated to special organisational structures at an appropriate level, particularly in larger, complex enterprises.
 - Management plans, builds, runs, and monitors activities, in alignment with the direction set by the governance body, to achieve the enterprise objectives.

The de-facto framework for enterprise governance and management of information technology is the COBIT (Controlled Objectives for Business and IT). The COBIT core model is shown in Figure 4.26. In universities, adopting and adapting COBIT can be of great value not only to govern IT and DX efforts, but also to ensure that IT supports business transformation in a tangible and measurable way. This support is fundamental to achieve benefit realisation, risk optimisation, and resource optimisation.

4.6 Ensuring Social Distancing Readiness in University Campuses

Despite all concerns regarding reopening campuses,

and life returning back to normal, MoHESR will work on ensuring the safety of all entities affiliated to Egyptian universities. In this context, the policy pillar presented in this section recommends developing a “physical distancing” plan for each course, and the implementation of a hybrid instruction mode to be applicable for each course. Ensuring social and physical distancing within universities campuses requires tackling six main items. The first three items are to be applied in the short term, while the rest are more medium & long term action items that would need more time to achieve. Figure 4.27 illustrates this set of actions.

A6.1: Allocate signs with instructions ensuring social distancing

Egyptian Universities has a plan to ensure constructing signs that provide essential information to campus users. The aim is to ensure that everyone does their part to prevent the spread of viruses through achieving social distancing. The most resilient signs are those which can be constructed and removed easily, as needed (Figure 4.28). Recent research recommends creating these signs using visual aids and post at the entrances of facilities so that users receive information immediately (Corbera, Anguelovski, Honey-Rosés, & Ruiz-Mallén, 2020). Universities can also construct physical pillars to ensure physical distancing between users at the indoor and outdoor places.

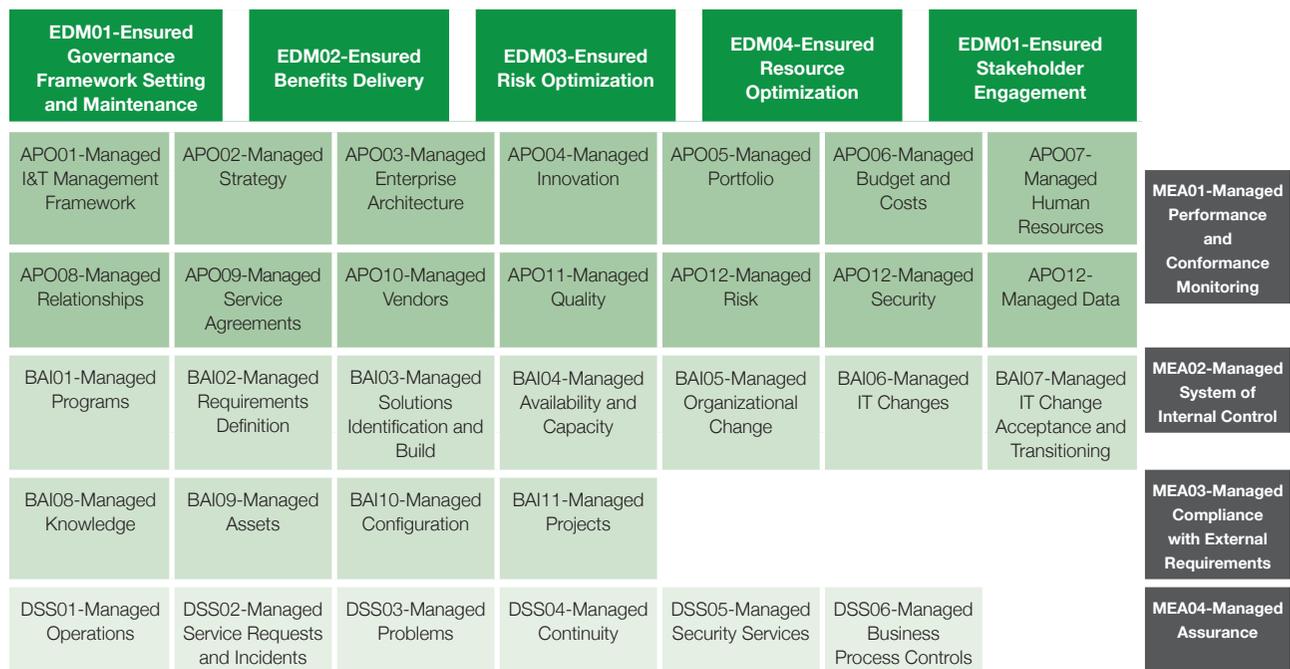


Figure 4.26. The COBIT core model

A6.2 Ensure personal protective equipment

Personal Protective Equipment (PPE), is equipment worn to decrease vulnerability to dangers that cause serious illnesses and laboratories injuries, which is usually required in places like labs and hospitals. These injuries and illnesses are usually contracted as a result of exposure to radiological, electricity, chemicals, mechanics, or other workplace hazards. During the pandemic situation, and post pandemic, when life “hopefully” returns back to normal, university campuses will ensure that all attendees would be wearing at least a face mask, and in some cases wear even a safeguard. MoHESR advises on following safety regulations & instructions in order to combat the pandemic.

Several pieces of research mentioned that PPE equipment should be carefully produced and maintained in a way that insures it is clean and reliable. It should also fit comfortably, encouraging people to use it.

A6.3: Make sure on-campus places are clean and hygienic and operate regular sanitisation

As people begin to go back to their universities and re-enter open spaces on campus, academic institutions have a commitment to keep campus clean and virus free. In addition to increasing the number of scheduled cleanings and the implementation of a new sanitisation protocol, teaching places can use temporary signage with instructions on maintaining healthy practices and promote a culture of good hygiene. Egyptian universities

have also prohibited the act of sharing electronics, desks, and workspaces.

A6.4: Ensure cross-ventilation and operate post-occupancy evaluation for central air conditioning

Ventilation is necessary for buildings to remove stale air and replace it with fresh air. Cross ventilation, and increasing air circulation in general, helps to reduce viruses spread indoors. A building may be ventilated naturally through windows, or it may have mechanical ‘forced’ ventilation. This is particularly important in large spaces that are too big to be ventilated from the perimeter windows. If the building is also next to a busy road, affecting air quality negatively, or in a noisy area where there would be sound pollution, mechanical ventilation will be necessary.

HEIs have prepared two applicable scenarios to ensure fresh air circulation in their universities’ buildings. The first scenario depends on natural fresh air circulation through windows. The second, addresses buildings with modern architectural style, with sealed windows or small windows in external façades, and therefore air circulation has to be done mechanically. In the latter scenario, institutions should ensure and maintain the pumps needed for the process of ventilation.

Below are some suggestions made by scholars regarding cross-ventilation in public buildings (Goldacre, 2020):

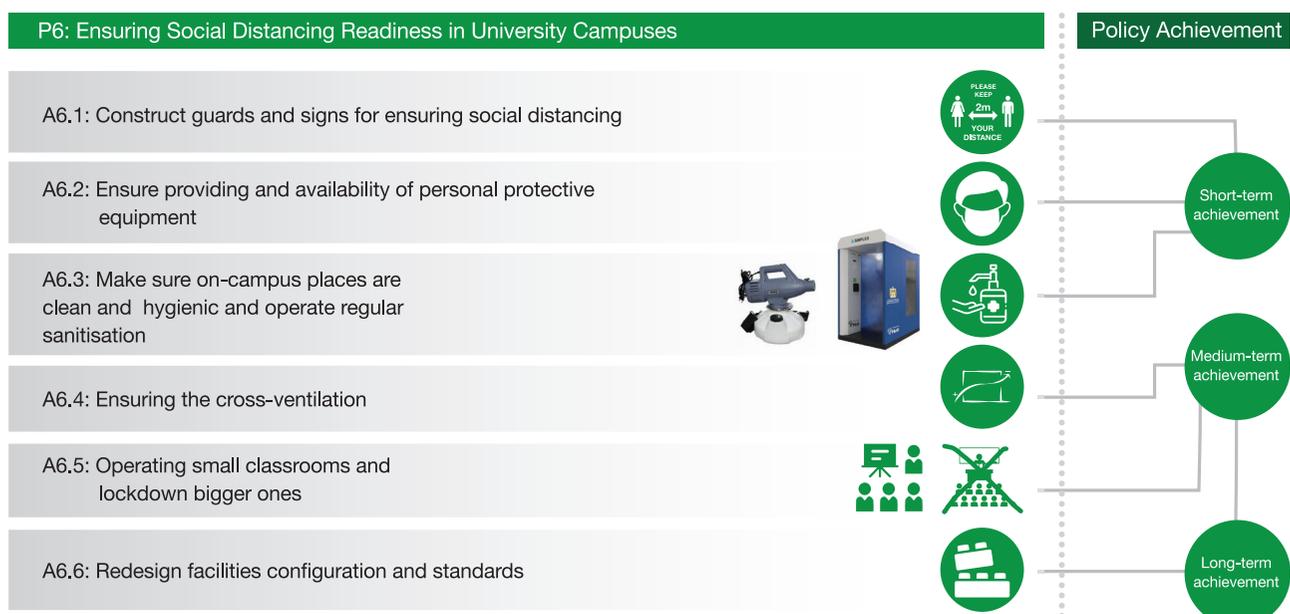


Figure 4.27. Campus Readiness for social distancing



Figure 4.28. A sample of signs to ensure distancing between users in the university campus.

Source: (Creative Safety Supply, 2020)

- If space is naturally ventilated via openable windows, then make sure the windows are always open.
- Turn on ventilation plants to operate at a nominal speed before a building usage time and switch to run to a nominal speed for 2 hours afterwards.
- Consider keeping the ventilation system running through the night and at weekends.
- Keep toilet ventilation operating 24/7.
- Switch air handling units with recirculation to 100% outdoor air.
- Periodically inspect heat recovery equipment to ensure no leakages.
- Switch fan coils off or operate so that the fans are continuously on.
- Defer any duct cleaning during this period.
- Replace central outdoor air and extract filters according to the maintenance schedules.
- Ensure operatives replacing the filters wear appropriate PPE including respiratory protection.

A6.5: Operate small classrooms and lockdown bigger ones

Egyptian universities are planning on using smaller classes rather than halls, blended with online lectures post coronavirus lockdown. Starting Fall 2020, several programmes will be running on blended systems and will be applying the social distancing taught on-campus for practical and laboratory activities and seminars.

A6.6: Redesign facilities and amenities configurations

Research on design configuration of amenities and facilities provided by the universities, has a long tradition of providing the norms and standards (Crosbie

& Callender, 1997). After COVID-19, several global calls emerged to update these norms and standards (Harrouk, 2020; Sadik-Khan, 2020). The following presents some guidance presented by the National Association of City Transportation Officials, UK, as a response to COVID-19 pandemic (Figure 4.29).

4.7 Developing and Managing Communication Tactic Strategies during Crisis

Communication is important for any institution's success, and it is especially crucial in times of adversity or crisis. (Jouany, 2020). Today, when dealing with the Coronavirus adversity, our thought process is being directed towards considering other dimensions of emotions and how to communicate effectively with the universities' Human Capital. Every organisation is vulnerable to crises, the challenge in this case, is more pressing, because it is engulfed with the fear that the virus could spread among students, faculty, and members of the entities affiliated to universities. One of the HEIs' concerns is their ability to provide a robust platform for communication between all parties involved (The World University Ranking, 2020). MoHESR has strategic tactic action plans that cover objectives related to having contingency scenarios, and being responsibly transparent.

Generally speaking, in order to disseminate and information, there are two main media platforms: social, and traditional media platforms (Zhang, Huang, Boni Su, & Zhang, 2014). Developing communication tools will be limited to short term actions (tactic policy). Within this policy pillar, it is believed that subsequent seven actions, shown in **Figure 4.30** below, might help in leading out of this adversity.

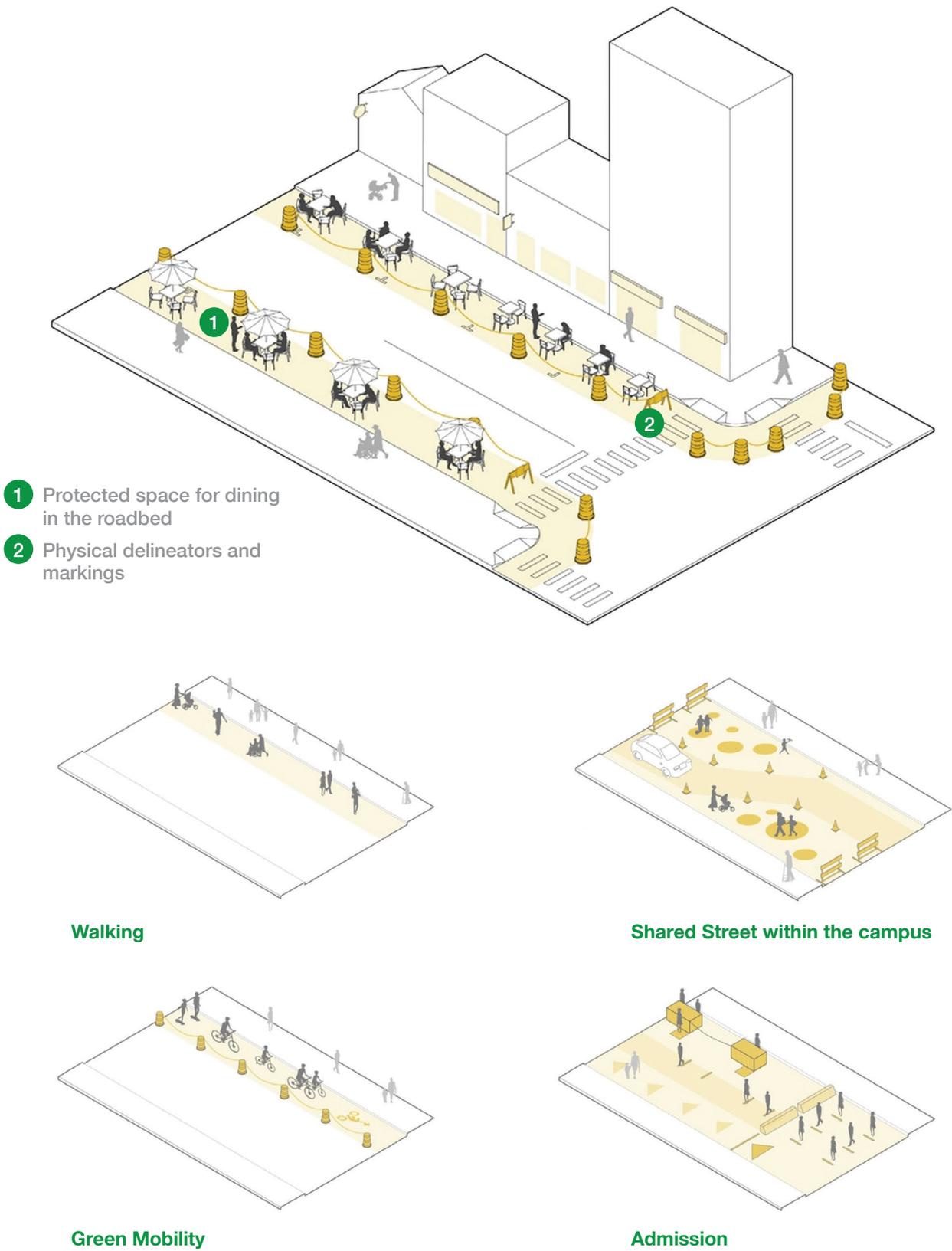


Figure 4.29. the norms for supporting the social distance



Figure 4.30. The seven actions required for effective communication management of the COVID-19 crisis

A7.1: Set a team, gather facts, and analyse data for declarations

The first action involves putting together an expert team from different departments belonging to the involved institutions. The core task of this team is to help in determining all phases of the plan, including a cycle of the phases of emergency and crisis management (BCG, 2020).

In supporting the administrators in setting up a declaration, it is essential when preparing an announcement, to collect real data about the issue. The data should be comprehensive, and covering multilateral aspects and entities. The collected raw data about the crisis should be interpreted carefully. Like risk assessment, research on priorities can be provided through a matrix which can help in identifying the likelihood of occurrence, and severity, of certain aspects, which would be much needed when delivering messages (Starbird, et al., 2015; McCallum & Santos, 1997). Administrators in universities can use the priority matrix to evaluate all the potential emergencies that academic institutions might face (Figure 4.31). It is much better to gather facts, analyse them, and create a plan, accordingly, before an emergency occurs.

A7.2: Identify stakeholders and ensure covering all entities involved

The top priority for building commitment in crisis is to

give entities involved all the information they need in a timely manner, in order to succeed in their task in leading out from adversity. Furthermore, it is essential to ensure that all entities know where to find additional resources of information. This action is concerned with correctly identifying all internal and external stakeholders, and designing special messages for each group, and perhaps even use different communication tools for each.

It is also essential to include all concerned entities when composing a message or during the announcement (Papyrus, 2020; Macias, Hilyard, & Freimuth, 2009; Sturges, 1994). It is much better to compose a message for every single group of entities that matter so that the tone of speech fits and relates better to them (Faulkner, 2020).

A7.3: Identify and train spokespeople

During the COVID-19 pandemic, it has become apparent, how important it is for universities to have the ability to respond quickly and confidently anytime a crisis emerges. Accordingly, every academic institution should select and prepare only authorised and trained spokespersons to deliver required messages to stakeholders. The literature on mass communication has highlighted how particularly crucial this is during a pandemic or crisis. Research has also provided evidence on cases from higher education ministries from global north countries, including some lessons learned regarding the communication process during crises

Accordingly, MoHESR will ensure that each crisis communication team, would include experts who have been pre-screened and trained, to be the lead or backup spokespersons for different channels of communication. The selected spokespersons should have specific skills in communication and be able to conduct speeches face-to-face or virtually to non-physical listeners via social media and other online communication tools. The decision about who specifically should speak would be made on a case by case basis. (Haddow & Haddow, 2009; Suhaimi, Marzuki, & Mustafa, 2014).

A7.4: Define communication messages, identify the frequency, media channels, and tone

Once stakeholders and spokespeople are defined, MoHESR recommends exploring the best ways to engage the entities targeted with the message and insights. The team would choose the proper channels to communicate and deploy the information. Social media is a tool that has an excellent reach for the majority of entities. Research in this domain recommends ensuring the continues feedback and quick response from all entities for inquiries received from all channels. When determining which channels work best, universities should keep in mind employees' and students time, commitment, availability, and access to technology.

It is also recommended to always start the message with a statement addressing the entities involved letting them know you are aware of the issue at hand and that you are taking the necessary steps to resolve it. Then, if you are already prepared with a plan, start communicating it to stakeholders and present the suggested solutions.

A7.5: Ensure two-way communication with all stakeholders

MoHESR would ensure holding robust, bidirectional communication dialogues between the spokespersons and all stakeholders in the educational institutions to discuss all issues and enquiries as they arise. When the two-way communication process is well planned and executed, the benefits received by organisations include heightened levels of satisfaction and increased productivity, because ambiguity about roles, responsibilities, actions is reduced. Another significant aspect of an effective two-way communication process is improved trust between leadership and employees, which builds internal brand loyalty and offers opportunities for continued growth. The institutions can provide several platforms in this domain; an example would be call centres, email address dedicated for enquires, or even frequently asked questions launched on the institution's website.

A7.6: Monitor the crisis on various channels and react accordingly in real-time

When monitoring information about an emergency, feedback received, or enquires released on multiple channels, immediate response or actions should be performed. Furthermore, when building trust with stakeholders, it is essential not to delay any responses to a problem or an issue that had emerged in this context. The assigned team should be monitoring any comments around that issue on all channels, including social media, in order to react in a timely manner. Sometimes, spokespersons and feedback collectors receive negative comments; these should be handled differently and sensitively; so as to not tarnish a university's image. A policy of monitoring responses should consider the time frame of providing answers for inquirers or concerns; one way is to categorise the inquiries and the responding answer and to prioritise.

A7.7: Ensure fast and reliable information dissemination

Literature provides a guideline for ensuring fast and reliable and digital information dissemination that tackles adversity (Abusaada & Elshater, 2020; Landfried, 1989). To ensure transparency in declarations' announcements, stakeholders should spend less effort understanding what is going on. Recently published blog recommends acting fast, suggesting immediate action using favoured communication channels during a crisis (Jouany, 2020). MoHESR attempts to ensure that universities avoid confusion and the spread of rumours during the coronavirus university outbreak. This important so that students & employees won't need to look for the information by themselves. They will receive the needed information immediately. Researchers also recommend making sure that each entity in a specific area of specialisation receives the right information (Kapur, Bezek, & Dyal, 2016).

		SEVERITY →		
		1	2	3
LIKELIHOOD ↓	1	LOW - 1 -	LOW - 2 -	MEDIUM - 3 -
	2	LOW - 2 -	MEDIUM - 4 -	HIGH - 6 -
	3	MEDIUM - 3 -	HIGH - 6 -	HIGH - 9 -

Figure 4.31. This 3x3 template provides three levels to code both the severity and likelihood of each priority: low, medium, and high (which are assigned values of one, two, and three, respectively). After determining the values for the severity and likelihood, use the grid to determine the announcement that needs to be addressed first



5. Policies for Universities Serving Societal, Employability and Industry Needs

This part is showcasing the different initiatives that MoHESR has either started implementing or even consider planning and developing. Many of the initiatives mentioned above will need collaboration with several national entities such as the Central Bank of Egypt (CBE), for example.

The first case of COVID-19 appeared in Egypt in March 2019, after which the Egyptian Government took several decisions and resolutions to combat its impact on the Egyptian public health and economy:

- 09/03/2020 (Resolution #606) Prime Minister suspended all activities that require the presence of any large gatherings of citizens
- 16/03/2020 (Resolution #718) Prime Minister halted all Air Traffic at Egyptian airports to prevent the spread of COVID-19
- 17/03/2020 Minister of Labour announces a 500 EGP subsidy for irregular workers.
- 19/03/2020 (Resolution #719) Prime Minister reduced the number of employees in the units of the state's administrative apparatus, public sector companies, and public business sector companies.
- 19/03/2020 (Resolution #724) Prime Minister suspended performances held in cinemas and theatres, until further notice.
- 22/03/2020 President El-Sisi gave many messages and issued serious decisions that represent the plan for combating dangers of COVID-19. These included allocate LE 100 billion to confront COVID-19; Reducing the price of natural gas for industry by \$ 4.5; Reducing electricity prices for industry by 10 piasters; Reducing the interest rates at the Central Bank by 3%, while providing credit limits for capital financing, and in particular the salaries of employees; Postponing the credit entitlements of small, medium and micro enterprises for a period of 6 months.
- 23/04/2020 (Resolution #852) Prime Minister orders for a partial lockdown in the country from 9 PM to 6 AM. This curfew was applied on all methods of transportation and vehicles. Only cases of emergency were permitted movement in public spaces during the curfew hours.
- 15/06/2020 (Resolution #1200) Prime Minister modifies laws governing universities to allow them to teach and deliver content electronically using remote teaching techniques.

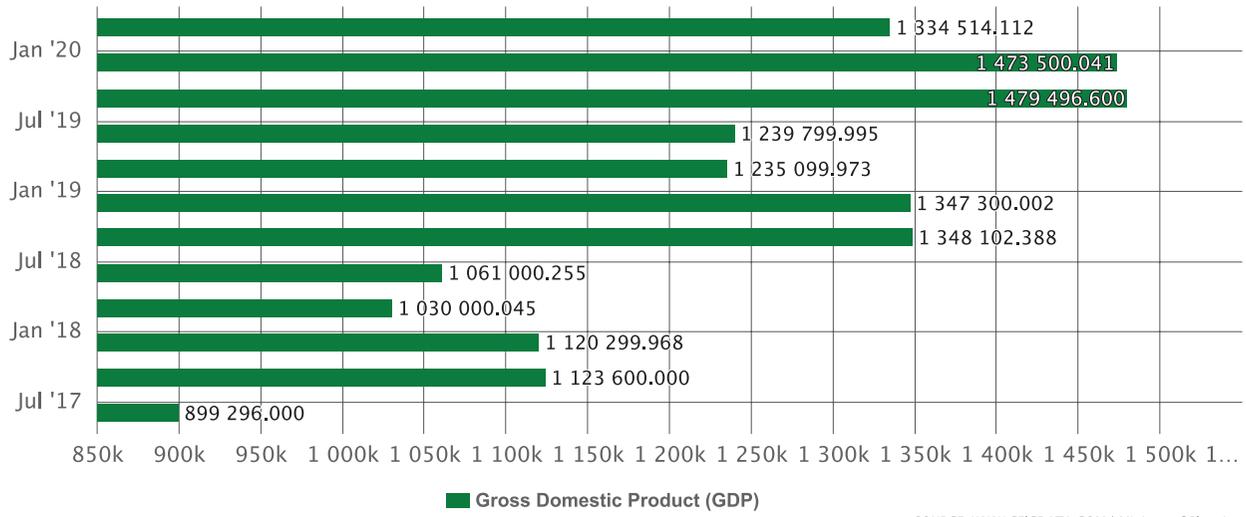
The Egyptian market sectors can be divided into the following sectors:

- Agriculture, Irrigation and Fishing
- Communications
- Construction and Building
- Electricity
- Extractions
- Finance
- General Government
- Information
- Manufacturing
- Public
- Real Estate
- Social Insurance and Insurance
- Social Services: Education
- Social Services: Health
- Suez Canal
- Tourism
- Transport and Storage
- Water, Sanitation and Recycling
- Wholesale and Retail Trade

The Egyptian Economy has seen considerable growth, as shown in **Figure 5.1** and this was attributed to growth in most market sectors during the past two years, as shown in the sectorial GDP (**Figure 5.2**).

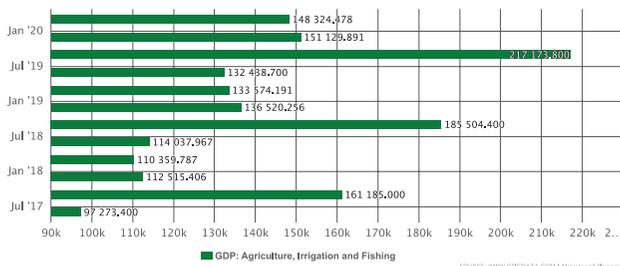
5.1 Impact of COVID-19 on Market Sectors and the Job Market

The Egyptian economy had already been suffering from unstable market performance and decline during the period shown in the figure above: just before 2018's 4th quarter, up till the pandemic outbreak. Starting July 2019, the Egyptian Government had planned several policy interventions with an ambitious plan to stimulate the industrial sector's growth, reduce imports, and hopefully increase exports (**Figure 5.3**). In response to that, the industrial production started to pick up at the 4th quarter of 2019. This industrial growth trend was halted when the world was hit by COVID'19, which created chaos in all world industries, driving the global supply chain into disarray, and bringing many local industries to a complete halt (CEIC Data, 2020)

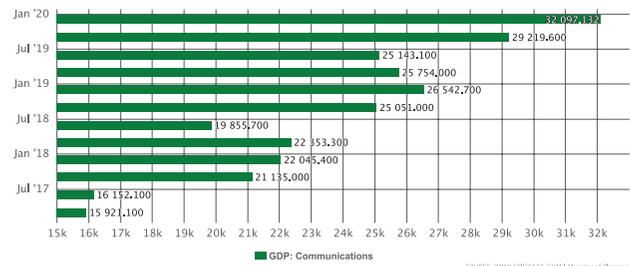


SOURCE: WWW.CEICDATA.COM | Ministry of Planning

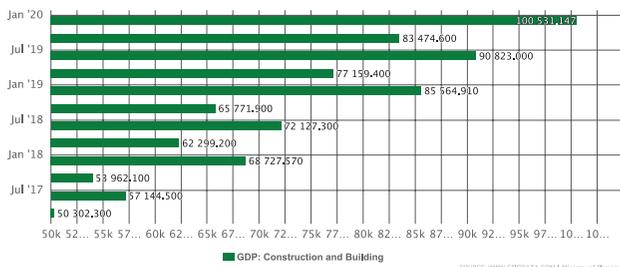
Figure 5.1. Egypt's GDP from April 17 to January 20 (Ministry of Planning, 2020)



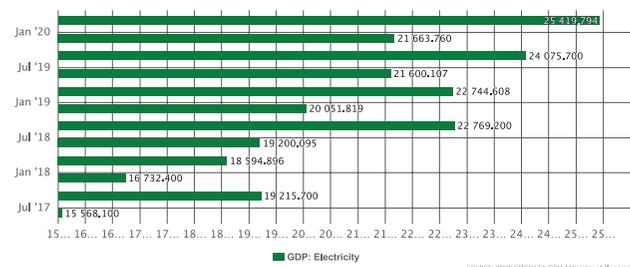
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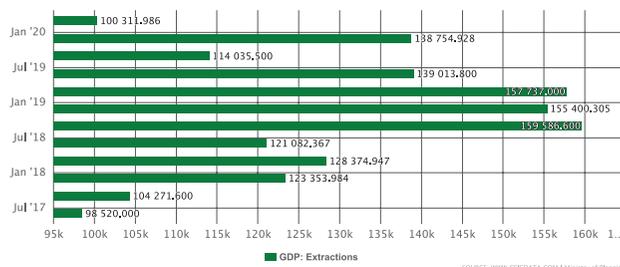
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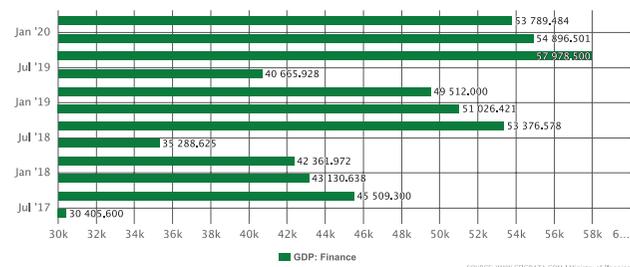
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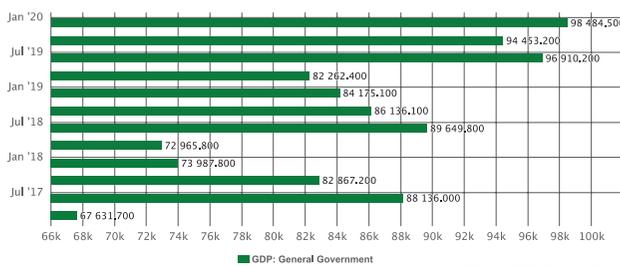
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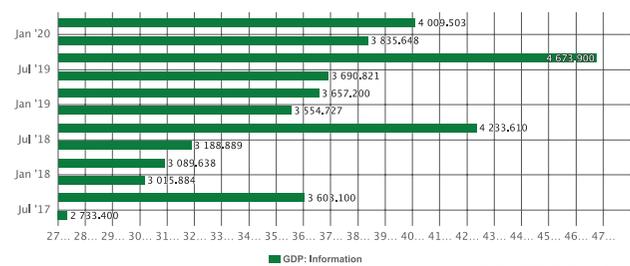
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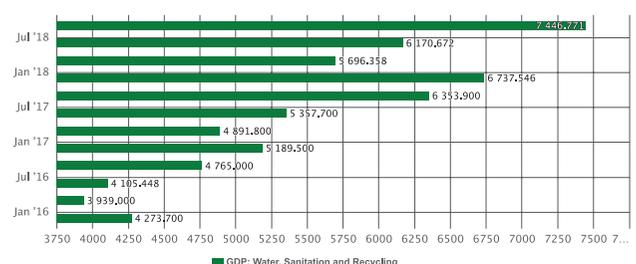
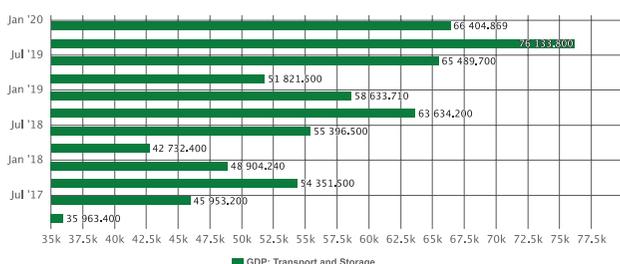
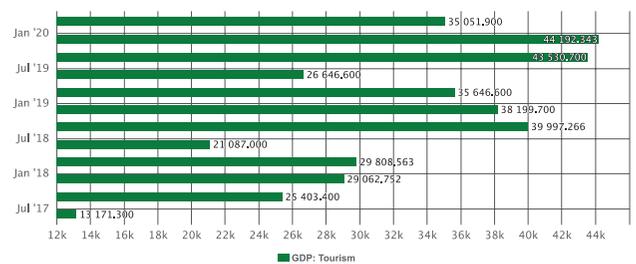
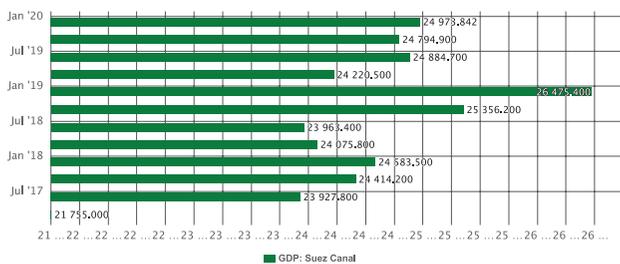
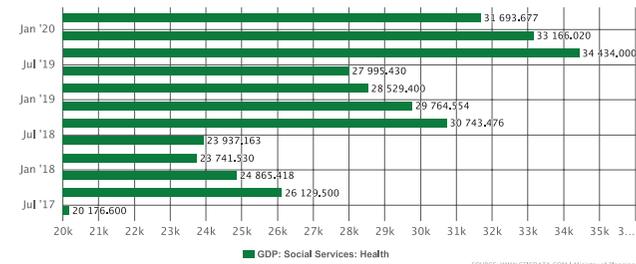
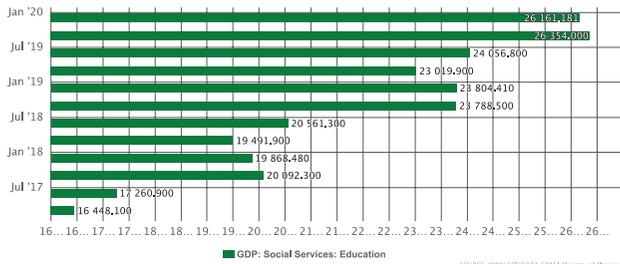
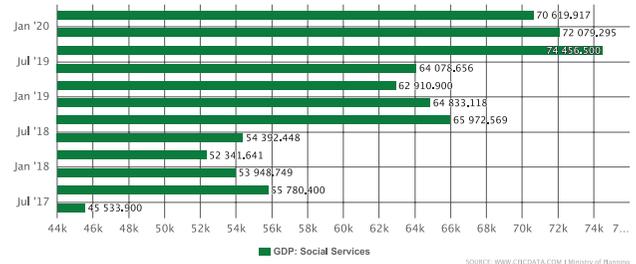
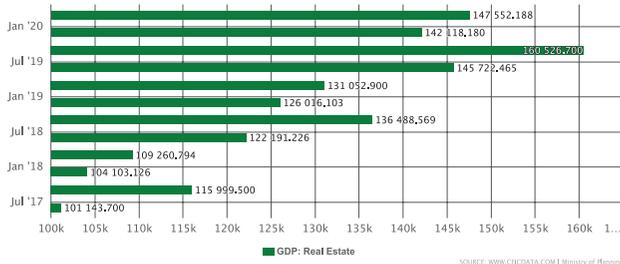
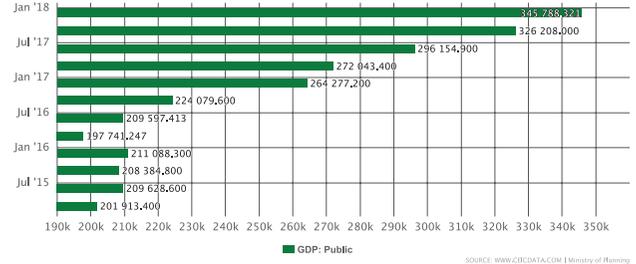
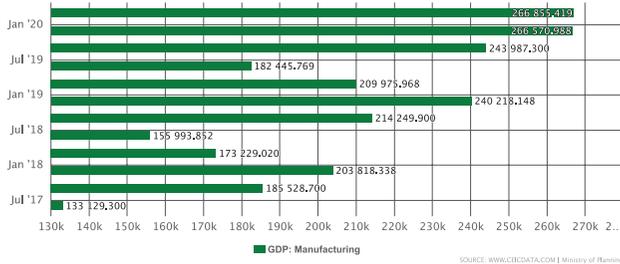
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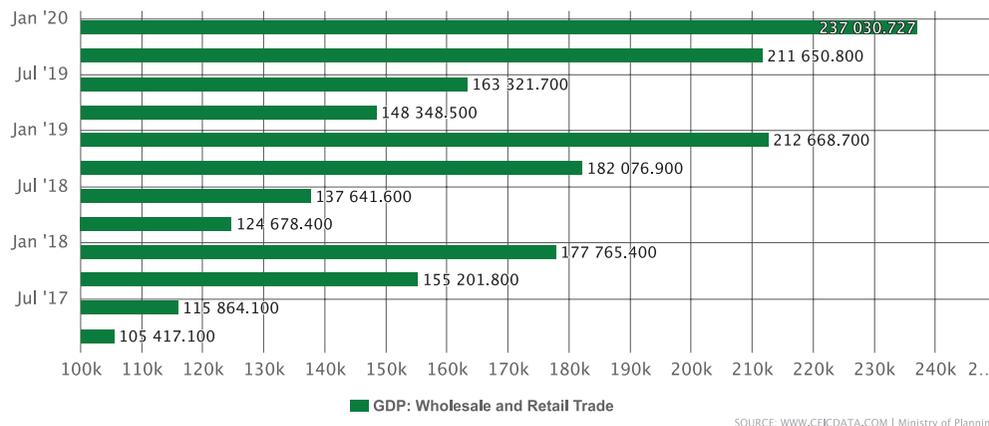


Figure 5.2. Egypt's GDP Broken Down into the Different Sectors from April 2017-January 2020 (Ministry of Planning, 2020)

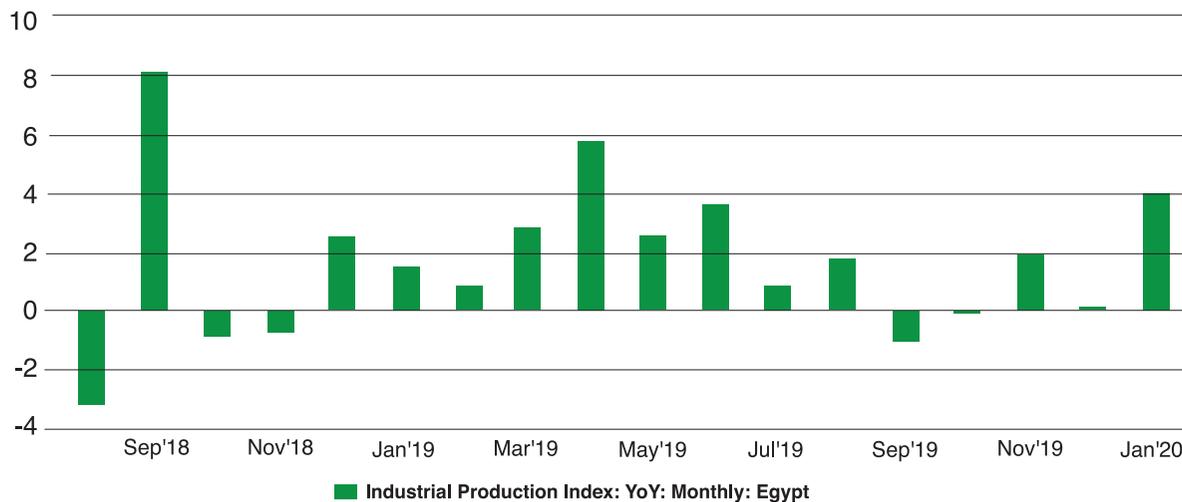


Figure 5.3. Egypt's Industrial Production Index: YoY: Monthly: Egypt's GDP August 2018-January 2020

As many people started losing their jobs in Egypt and across the world, it was important to analyse the most vulnerable jobs, the relationship of these jobs to certain age groups, gender, and education level. This analysis will then help in creating corrective recommendations for the educational sector to help reduce unemployment. Detailed market and job-related data for the pandemic period have not been released yet in Egypt, yet, on the 20th of June 2020, the Egyptian CAPMAS issued the results of a survey citing the effects COVID-19 had on Egyptian families: 62% had their employment situation had changed, 56% were working less hours or days, 26% lost their jobs, and 18% had irregular jobs. 73.5% of families surveyed had their income decreased, 50% had to borrow, 17% depended on charitable organisations, & 5.5% received the government's pandemic grant.

AS for global data analysis, McKinsey had analysed the

US market valuation across its different sectors in the period from Feb to January 2020. And as shown in the figures below, the market shares of each sector were not heavily impacted but the growth in the different sectors varied significantly. The High-Tech sector's growth increased from 6% to 21%, the Media sector increased from 2.5% to 10%, the Pharmaceuticals sector growth also increased from 0.25% to 11%, and the Healthcare supplies sector's growth went from 2.5% to 17%. On the other hand, the Air & Travel sector's decline of 6% became 27%. Banks sector's decline became worst from 6% to 23%. The insurance sector's decline went down from 2% to 19%, and the retail sector declined from 4% to 12% (McKinsey, 2020)

Figure 5.4 in his column width shows market cap at the end of 2019 by industry. Column height shows the total shareholder return of each industry during the

same timeframe. Based on the largest 5000 companies globally.

McKinsey also analysed vulnerable US jobs by using unemployment claims data that reached 6.65 million claims by March 2020 (30 times higher than the previous high in 1982 (Lund, Ellingrud, Hancock, & Manyika,

2020) as shown in **Figure 5.5** but later realised that unemployment claims offer only a partial picture of workforce dislocations resulting from COVID-19. Their analysis showed that the first phase of the battle to contain COVID-19 could leave 42 million to 54 million net jobs vulnerable to reductions in hours or pay, temporary furloughs, or permanent layoffs.

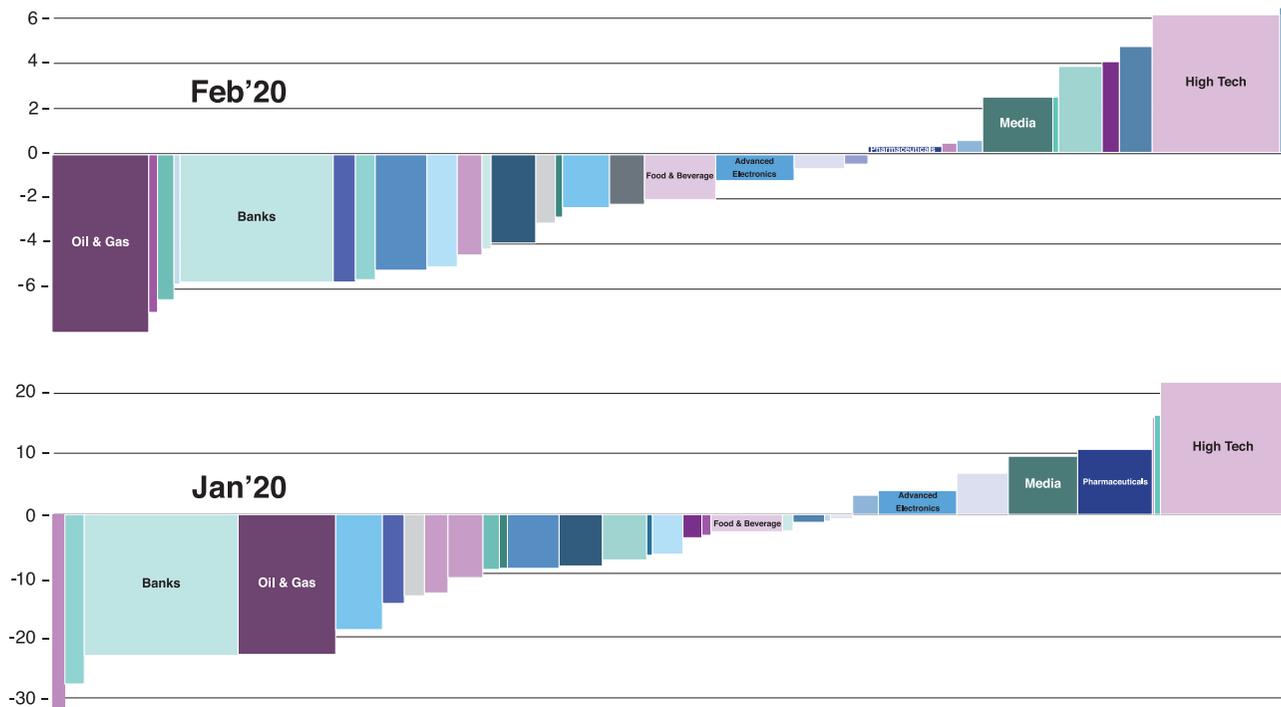


Figure 5.4. The market valuation of industries during the COVID-19 crisis in February 2020 and June 2020 (Source: (Mckinsey, 2020).

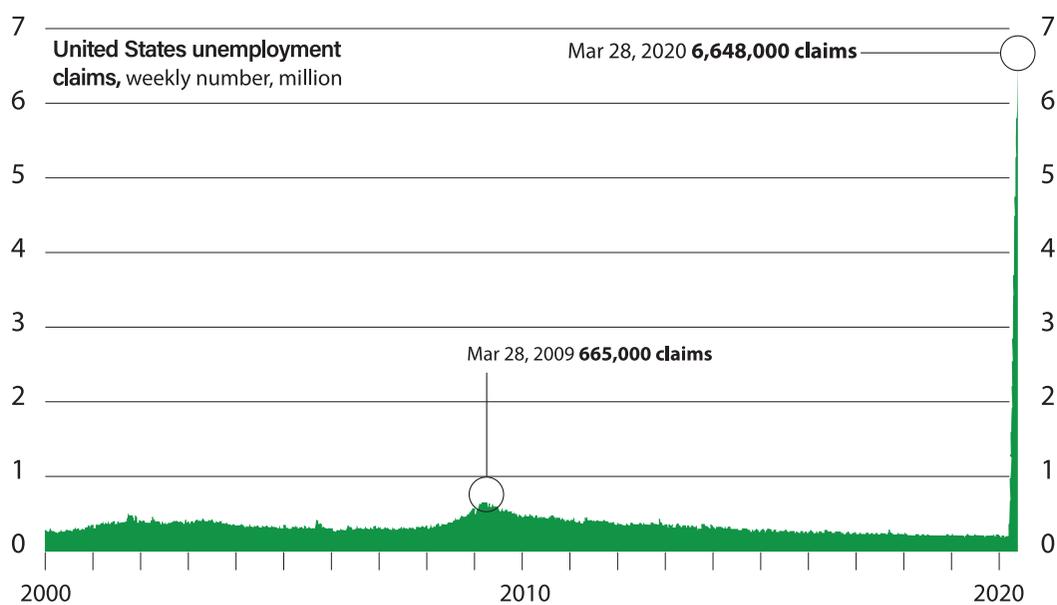


Figure 5.5. Weekly initial unemployment claims in the United States reached an all-time high of 6.6 million for the week of March 21-28, 2020 (Lund, Ellingrud, Hancock, & Manyika, 2020)

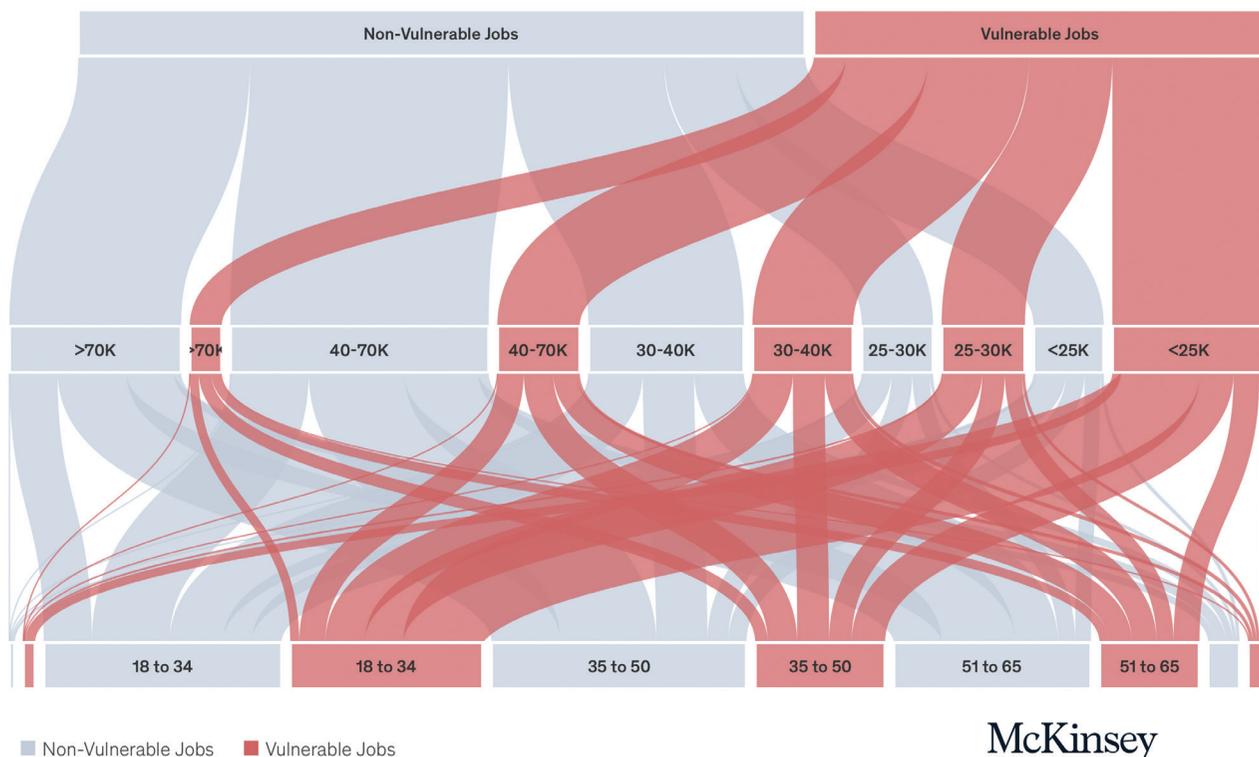
McKinsey also analysed how all vulnerable US jobs are distributed across income levels, races, age groups, education levels, and gender (Figure 5.6). Their conclusion was:

- Low-income workers are disproportionately vulnerable, but the effects are spreading to higher income brackets
- Minorities are more likely to hold vulnerable jobs, especially in large cities
- Women have sustained most of the initial job losses, but this may change going forward
- Younger workers are 35% more likely to hold a vulnerable job

Some sectors were particularly severely hit, such as the accommodation and food services sectors, and retail, which accounts for 42% of vulnerable jobs (Lund, Ellingrud, Hancock, Manyika, & Dua, 2020). Travel has been pushed to a halt, leaving planes grounded and hotel rooms empty. The analysis of the distribution of vulnerable jobs across market sectors is shown in Figure 5.7. The aftermath of the shutdown and the lost jobs effect on the economy, is expected to manifest even more later this year, as the plunge in consumption triggers its domino effect.

Digging deeper into these sectors and analysing these vulnerable jobs by occupation, certain positions seem to be hit the hardest. The analysis in shows that most impacted positions are relate to food preparation, food servers, customer service personnel, retail salespeople, and cashiers, as shown in Figure 5.8. These jobs also turned to be the ones with the lowest median salaries, and many of those occupying these positions fill it on a part-time basis. As shown in Figure 5.9 the workers bearing the burden the most of the initial shock are the very people least equipped to get through it. Up to 86 percent of the initial impact affected jobs that were paying less than \$40,000 per year.

Not only are people working in the worst-affected sectors and occupations are already earning less; if they are laid off, they are also likely to face worse employment prospects in the future, as shown in Figure 5.10. It is well known that unemployment rates are significantly higher among poorly educated people and that the number of vacancies and available job opportunities is correspondingly lower. This illustrates the value of Education in increasing the knowledge, skills, and value of employees, while reducing the vulnerability of the jobs they do.



McKinsey & Company

Figure 5.6. Distribution of vulnerable and non-vulnerable jobs across salary ranges and age groups (McKinsey and Comany, 2020)

Forty-four million to 57 million jobs are vulnerable in the short term, offset slightly by two to three million new jobs.

Vulnerable jobs, ¹ by industry, net of jobs created, millions

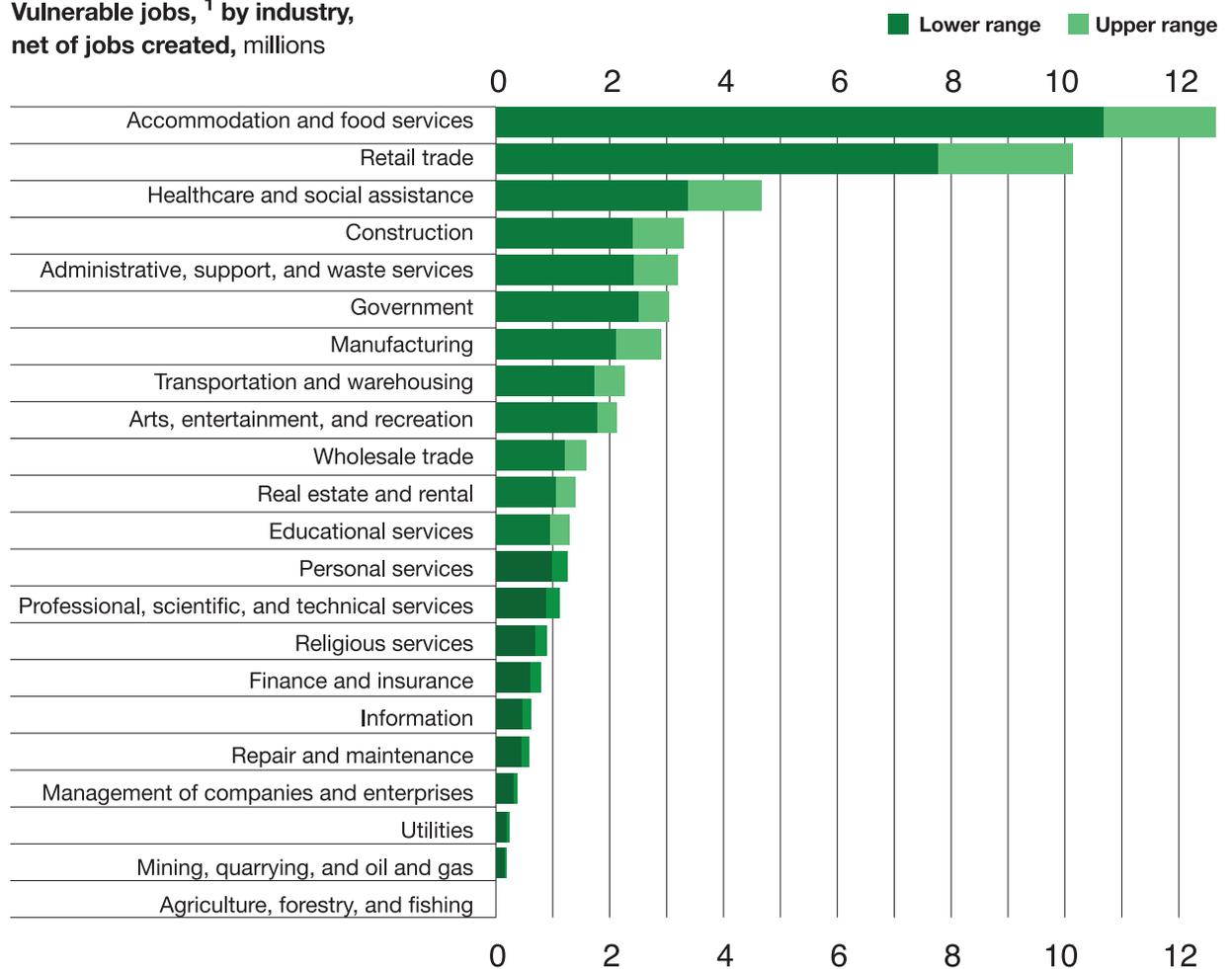


Figure 5.7. Vulnerable jobs in the United States by industry (Source: (Lund, Ellingrud, Hancock, Manyika, & Dua, *Lives and livelihoods: Assessing the near-term impact of COVID-19 on US workers*, 2020).

McKinsey also found that more than 50% of the vulnerable jobs in the private sector were in firms with fewer than 500 employees, and almost 40% from businesses with fewer than 100 people (**Figure 5.11**) These small businesses unfortunately have less of a capital margin to continue paying furloughed employees, and they may have fewer opportunities to redeploy workers to other functions within the company (Lund, Ellingrud, Hancock, Manyika, & Dua, *Lives and livelihoods: Assessing the near-term impact of COVID-19 on US workers*, 2020).

These conclusions were also reached in a similar analysis that was done on the UK's economy as shown in the figures below. The economic activity (as measured by UK GDP) was down in May 2020, roughly 30% lower than that of February 2020. Around 7.6 million jobs were

found to be at risk (McKinsey and Company, 2020). The risks are highly skewed: people and places with the lowest incomes were the most vulnerable to job loss (**Figure 5.12**). McKinsey also found that jobs at risk in the UK and pay are both correlated with levels of education. Only around 24% of employees in the hospitality, retail, and construction sectors have a higher-education qualification; more than 50% of workers in each of these sectors do not have qualifications beyond General Certificates of Secondary Education (GCSEs), as shown in **Figure 5.13**.

Europe is also not far off (Chinn, Klier, Stern, & Tesfu, 2020). The statistics may be different, but the trends and conclusions still hold (**Figure 5.14**, **Figure 5.15**, **Figure 5.16**, and **Figure 5.17**)

Forty-six percent of vulnerable jobs are in food service, customer service, and sales.

Vulnerable jobs, ¹ by occupation, millions

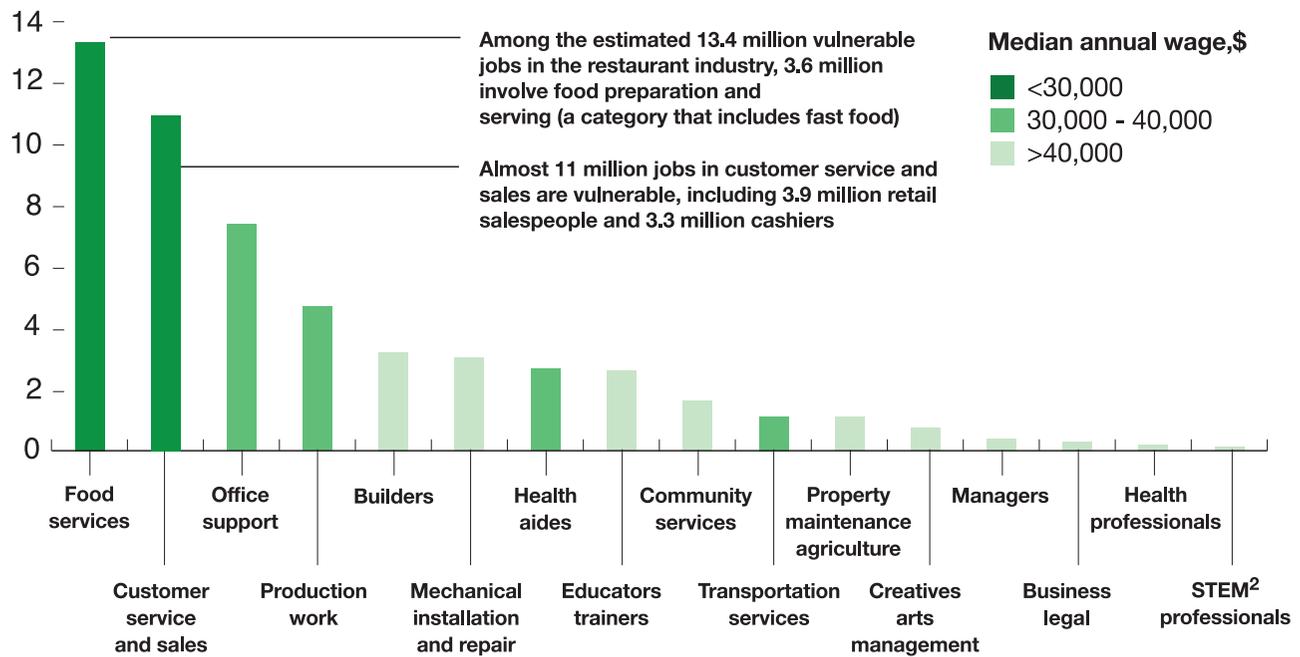
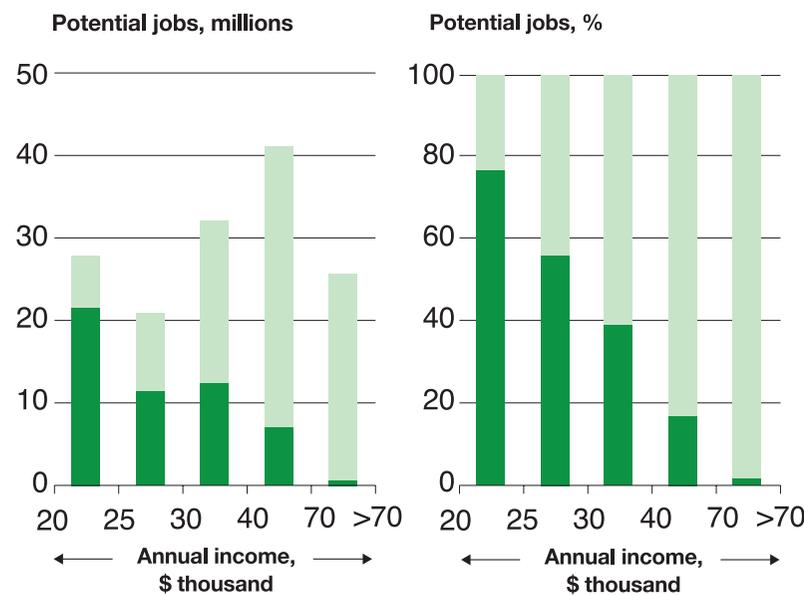


Figure 5.8. Vulnerable jobs in the United States by occupation (Source: (Lund, Ellingrud, Hancock, Manyika, & Dua, *Lives and livelihoods: Assessing the near-term impact of COVID-19 on US workers*, 2020).

Eighty-six percent of vulnerable jobs paid less than \$40,000 a year.

Level of job vulnerability, ¹ by income band

■ Vulnerable jobs ■ Stable jobs



Vulnerable jobs by annual income band^{1%}

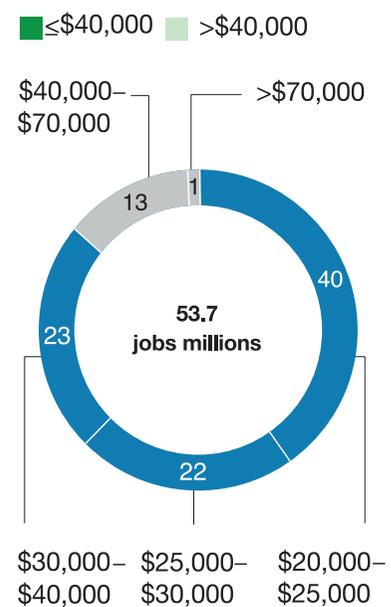


Figure 5.9. Level of job vulnerability in the United States by income band (Source: (Lund, Ellingrud, Hancock, Manyika, & Dua, *Lives and livelihoods: Assessing the near-term impact of COVID-19 on US workers*, 2020).

Industries with the lowest wages and the lowest educational attainment are being hit hardest.

Vulnerable jobs¹ by industry, earnings, and education, millions of people (circle size)

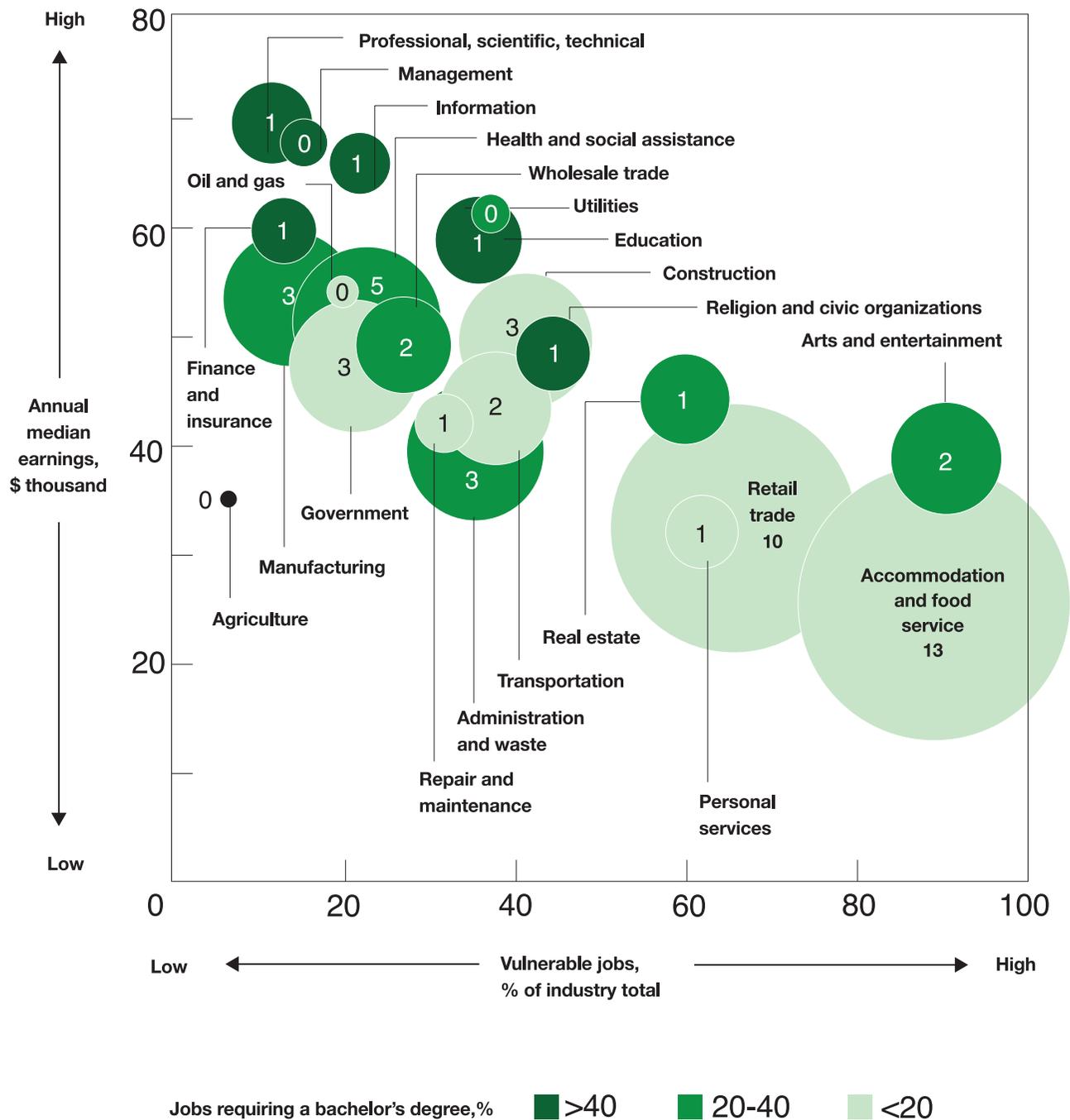


Figure 5.10. Vulnerable jobs in the United States by industry, earnings, and education (Source: McKinsey)

More than a third of vulnerable private-sector jobs are in small firms with fewer than 100 workers.

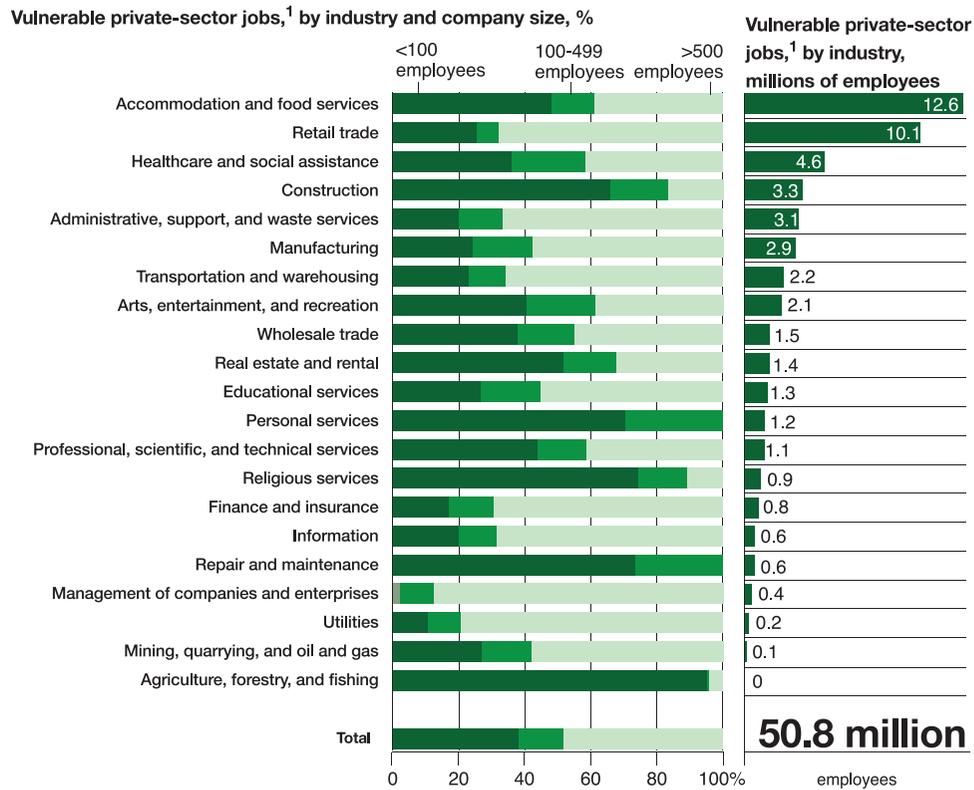
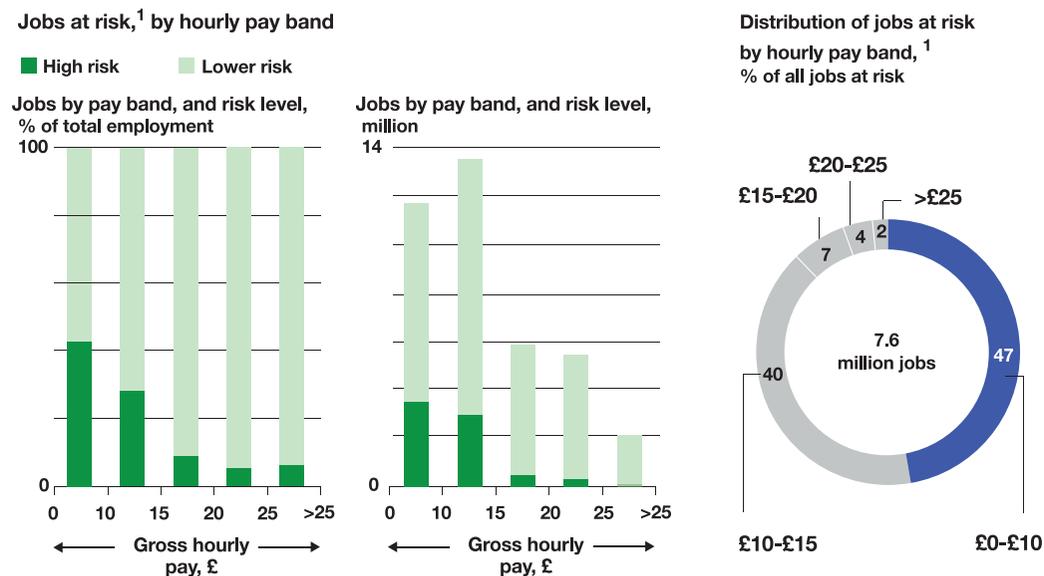


Figure 5.11. Vulnerable private-sector jobs in the US by industry and company (Source: (Lund, Ellingrud, Hancock, Manyika, & Dua, *Lives and livelihoods: Assessing the near-term impact of COVID-19 on US workers*, 2020).

Half of the jobs classified as at risk pay less than £10 per hour.

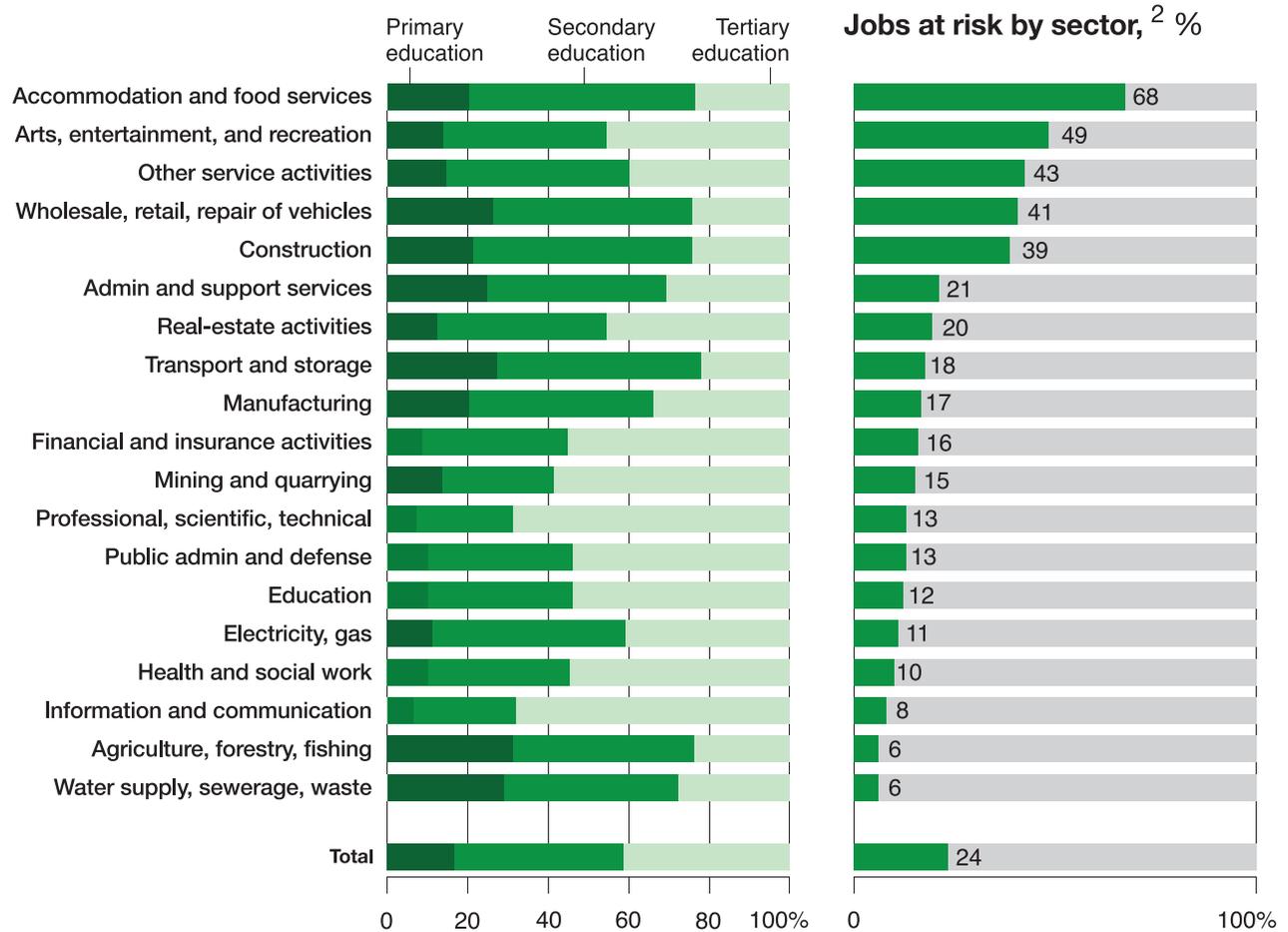


¹Jobs that are at a high risk of furloughs, layoffs, or reductions in hours or pay during periods of high physical distancing. Excludes occupations where no pay data were available. Source: Office for National Statistics; US Bureau of Labor Statistics; McKinsey Global Institute analysis; McKinsey analysis

Figure 5.12. Vulnerable jobs in the United Kingdom by pay band and risk level (Source: (McKinsey and Company, 2020).

The most affected sectors tend to have a significantly lower share of employees with tertiary education.

Education level ¹ by industry, % of total jobs in sector



¹Primary education is defined as International Standard Classification of Education (ISCED) 2011 education levels 0 through 2, which is equivalent to an educational attainment level lower than GCSEs; secondary education is defined as ISCED level 3, equivalent to the completion of GCSEs or A-Levels; and tertiary education is defined as ISCED levels 5 through 8, equivalent to the completion of qualifications above A-levels, such as an undergraduate degree.

²Jobs that are at a high risk of furloughs, layoffs, or reductions in hours or pay during periods of high physical distancing.
Source: Office for National Statistics; US Bureau of Labor Statistics; McKinsey Global Institute analysis; McKinsey analysis

Figure 5.13. Vulnerable jobs in the United Kingdom by industry and education level
(Source: (McKinsey and Company, 2020).

5.2 Impact of COVID-19 on the Global Innovation Community

As COVID-19 hit the world causing chaos and disruption, innovators inside organisations have stepped up their efforts to understand and anticipate the ecosystem's new layout after disruption. In order to better understand how organisations' innovation were shifting during the pandemic, Clarivate conducted a survey covering 247 organisations, including small enterprises, using a cross

section of industries methodology, to learn about the innovation challenges they faced during the COVID-19 crisis (Kanesarajah, 2020). The survey targeted respondents who were involved in the decision-making process, or professionals who had insight into their organisation's innovation lifecycle. Online interviews were carried out in April and May 2020.

Based on the survey, most organisations have seen a clear acceleration in digital transformation where 52%

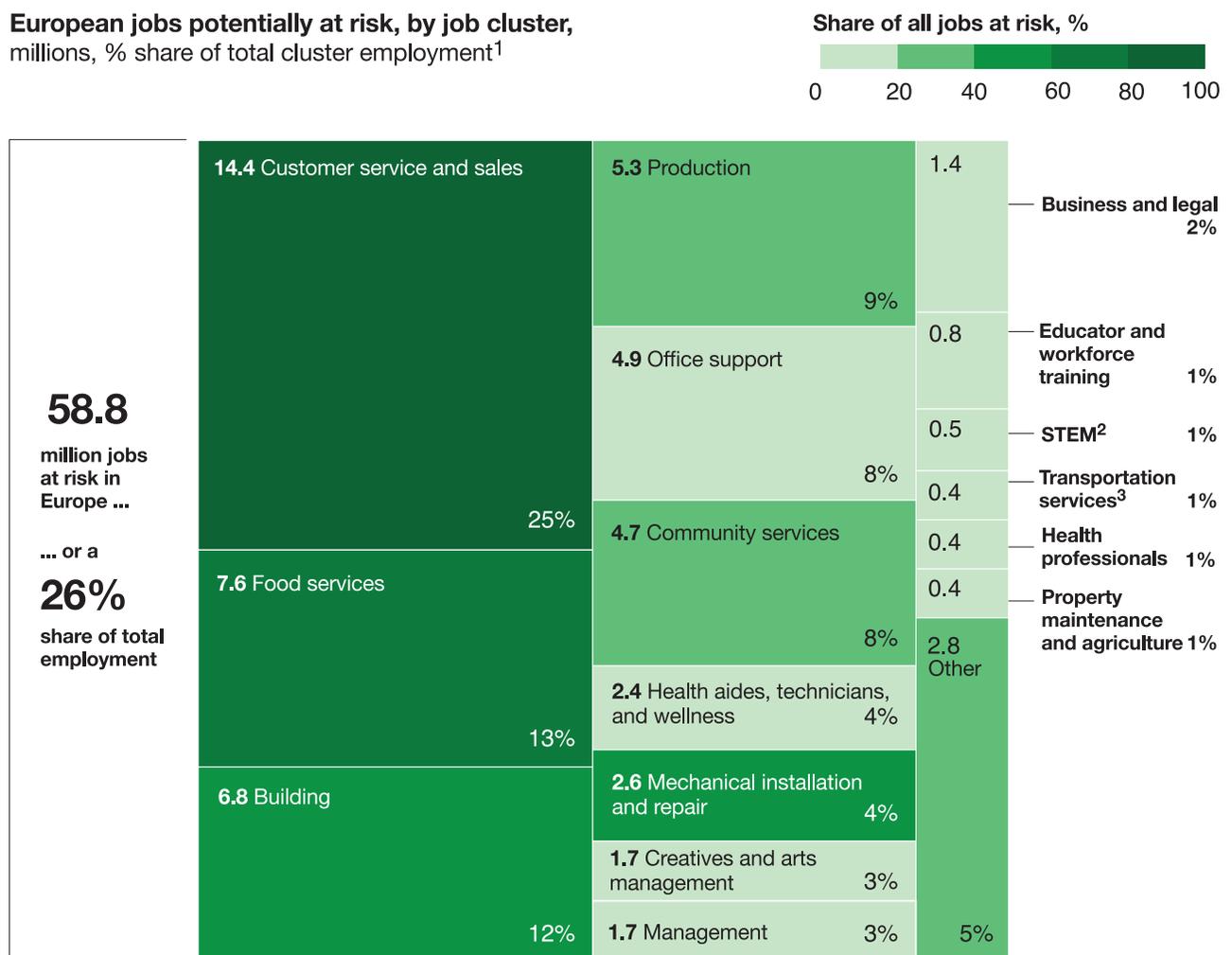
of surveyed organisations have reported significant changes to their innovation strategies (Figure 5.18). Digital transformation has allowed their organisations to change internal processes, respond to market changes, and even collaborate with local and global players effectively. Although 37% of businesses underlined the importance of keeping the company alive by directing innovation activity towards core markets, a similar percentage, 36%, embraced the opportunity to go after out-of-the-box ideas, as shown in (Figure 5.19).

The survey's results have also indicated, as shown in

Figure 5.20, that innovation is pushing companies to new market sectors. About 23% of companies surveyed noted more of their innovations being redirected towards markets beyond their primary market sector. The top newly focused market sectors are internet services; logistics; communications; disinfection & sanitation products; and healthcare & hospital services. These results reflect the skyrocketing demand for healthcare services as well as solutions that enable remote working and learning. It should also be noted that this high demand is expected to remain for quite some time, even after countries open up for more mobility.

Fifty percent of all jobs at risk in Europe fall into customer service and sales, food service, and building.

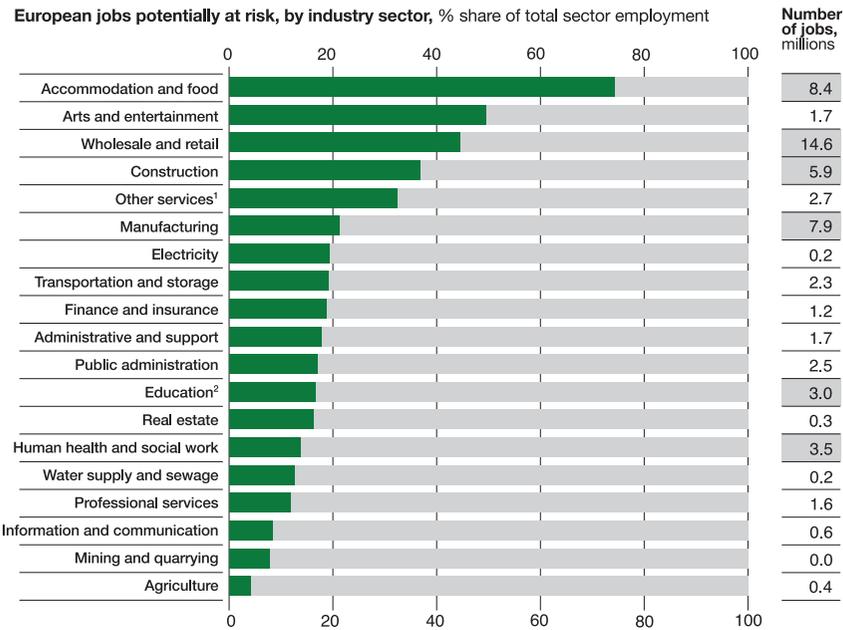
European jobs potentially at risk, by job cluster, millions, % share of total cluster employment¹



Note: Analysis determines jobs at risk based on physical-distancing policies and their immediate knock-on economic consequences; assumes level of physical distancing (defined by shelter-in-place policy) based on state policies. Figures may not sum to 100%, because of rounding.
¹Based on the job-cluster framework defined by the McKinsey Global Institute.
²Science, technology, engineering, and math.
³Does not include any form of commercial-transportation jobs, such as heavy trucking and lorry driving (which is included in the "production" job cluster).
 Source: Eurostat; LaborCube; Occupational Employment Statistics; US Bureau of Labor Statistics; McKinsey Global Institute analysis

Figure 5.14. Vulnerable jobs in Europe by job cluster (Source: (Chinn, Klier, Stern, & Tesfu, 2020))

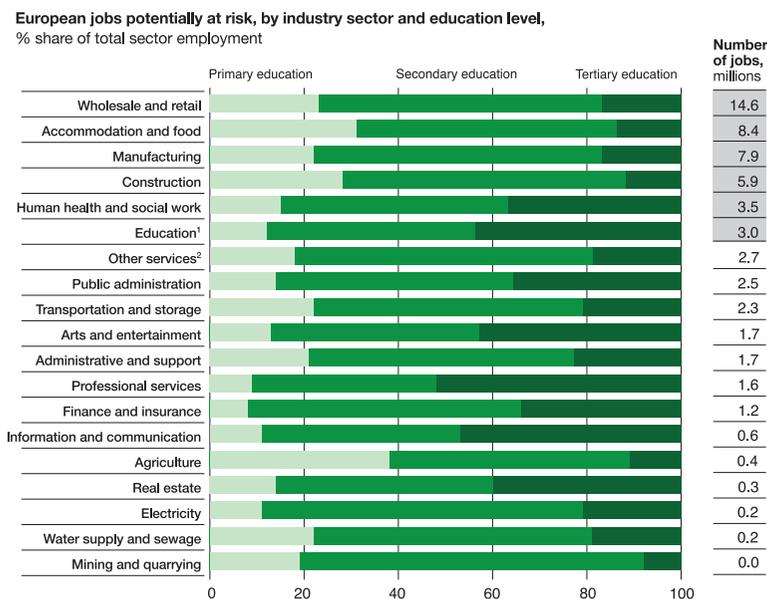
European jobs in accommodation and food, arts and entertainment, and wholesale and retail are particularly at risk.



Note: Analysis determines jobs at risk based on physical-distancing policies and their immediate knock-on economic consequences; assumes high level of physical distancing (defined by lockdown and shelter-in-place regulations by governments).
¹Includes household employment.
²Includes nonteaching employees in the education sector, such as administrators, childcare workers, and social workers; primary, secondary, and tertiary as well as vocational educators are considered essential occupations.
 Source: Eurostat; LaborCube; Moody's; Occupational Employment Statistics; US Bureau of Labor Statistics; Mckinsey Global Institute analysis

Figure 5.15. Vulnerable jobs in Europe by industry sector (Source: (Chinn, Klier, Stern, & Tesfu, 2020).

The most affected industry sectors have a significantly lower share of jobs requiring tertiary education.

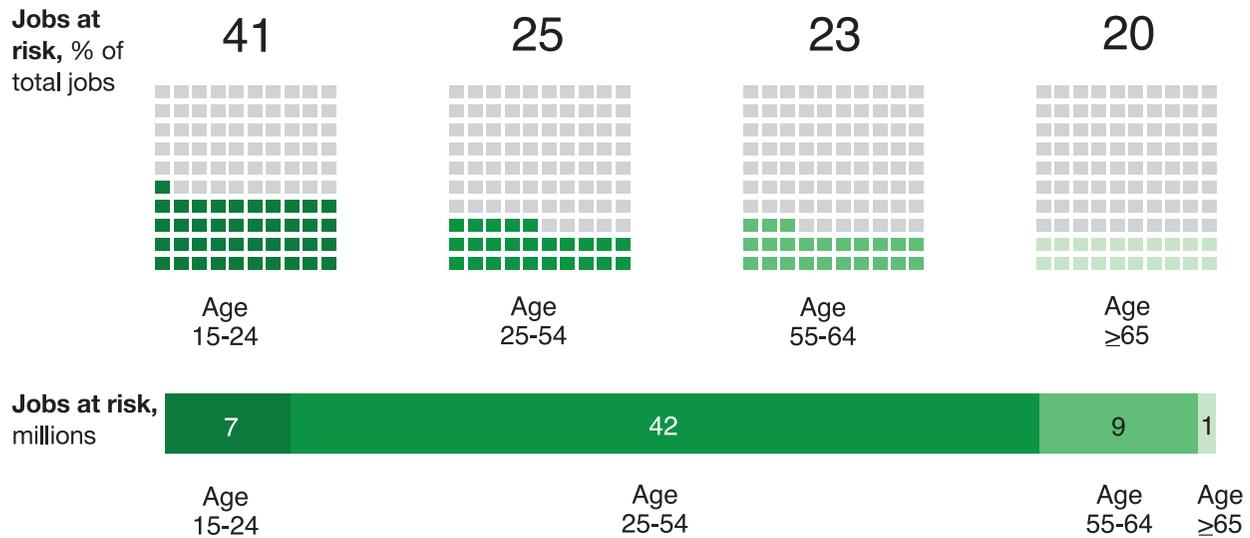


Note: Analysis determines jobs at risk based on physical-distancing policies and their immediate knock-on economic consequences; assumes high level of physical distancing (defined by lockdown and shelter-in-place regulations by governments).
¹Includes nonteaching employees in the education sector, such as administrators, childcare workers, and social workers; primary, secondary, and tertiary as well as vocational educators are considered essential occupations.
²Includes household employment.
 Source: Eurostat; LaborCube; Moody's; Occupational Employment Statistics; US Bureau of Labor Statistics; Mckinsey Global Institute analysis

Figure 5.16. Vulnerable jobs in Europe by industry sector and education level (Source: (Chinn, Klier, Stern, & Tesfu, 2020)

The short-term job risk for employees aged 15 to 24 years is higher than for those in other age groups.

European jobs potentially at risk, by age group¹



Note: Analysis determines jobs at risk based on physical-distancing policies and their immediate knock-on economic consequences; assumes level of physical distancing (defined by shelter-in-place policy) based on state policies. Figures may not sum to 100%, because of rounding.
¹Age groups as provided in employment statistics by Eurostat; further differentiation not possible, because of data limitations.
 Source: Eurostat; LaborCube; McKinsey analysis

Figure 5.17. Vulnerable jobs in Europe by age group (Source: (Chinn, Klier, Stern, & Tesfu, 2020))

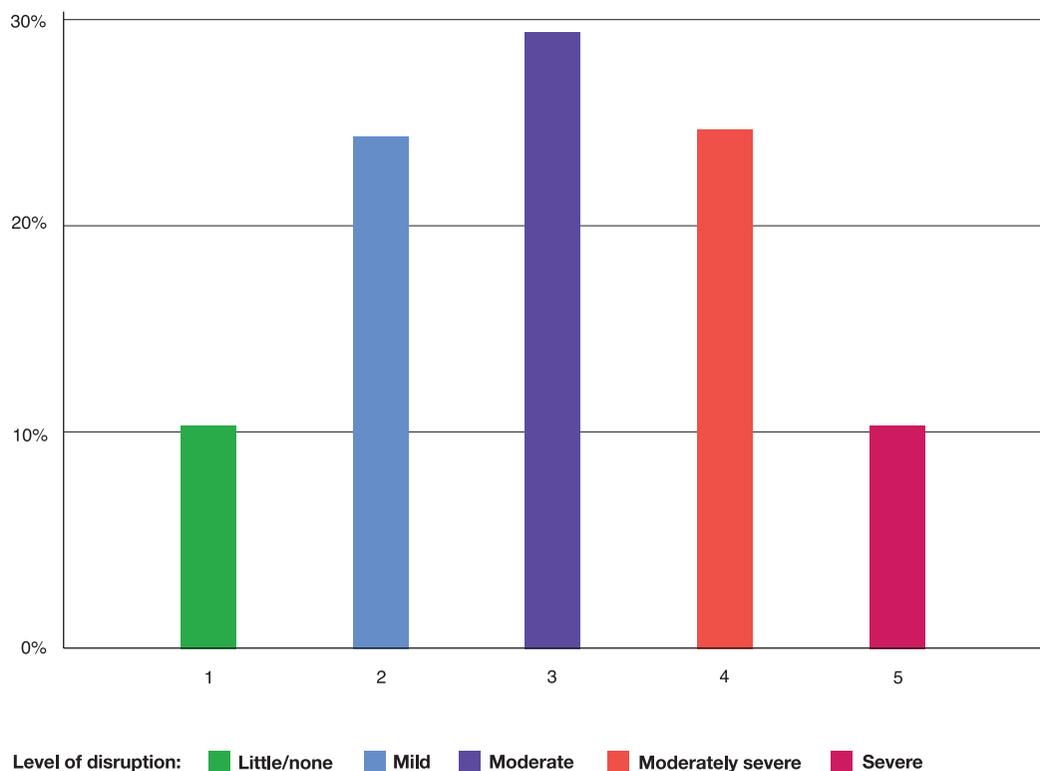


Figure 5.18. Degree of disruption to organisations' innovation strategy by the effects of COVID-19, on a scale of one (little to no disruption) to five (significant disruption) (Source: (Kanesarajah, 2020))

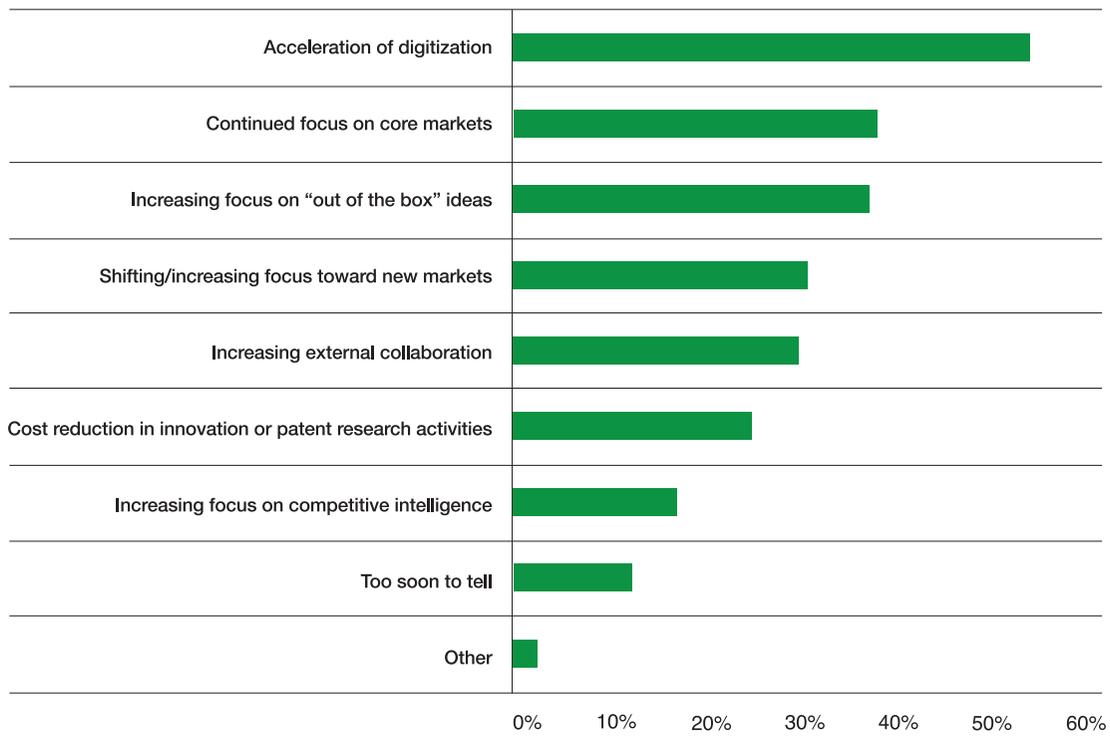


Figure 5.19. How have organisations' innovation activity change? (Source: (Kanesarajah, 2020))

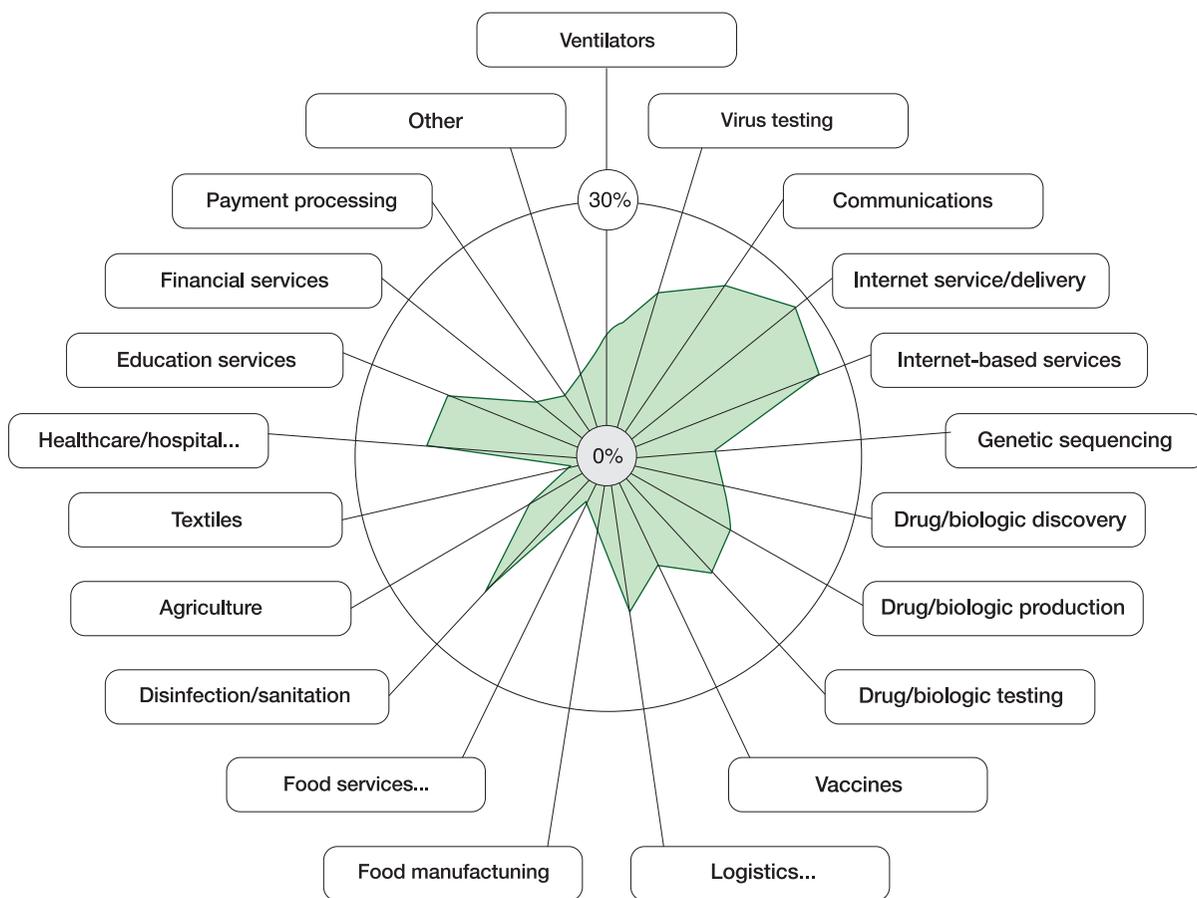


Figure 5.20. New markets that primary innovations have been redirected towards (Source: (Kanesarajah, 2020))

While most regions worldwide have reported similar levels of disruption to their innovation strategy, there is a variance between different regions in how their innovation activity has changed. 61% of Europe, Middle East & Africa (EMEA)'s organisations, have focused on unconventional and out of the box innovation, whereas organisations at countries of the Asia-Pacific (APAC), and North America (NA) regions, see digitisation as the biggest driver, as shown in Figure 5.21.

researchers decided to seize the opportunity and work on topics that can provide value, from their point of view, to the community and the industry during the pandemic. This was supported by emergency research funds and grants of almost 100 million EGP announced by Egypt's top funding agencies: Academy for Scientific Research and Technology (ASRT); Science, Technology and Innovation Funding Authority (STIFA); and the Information Technology Industry Development Agency (ITIDA).

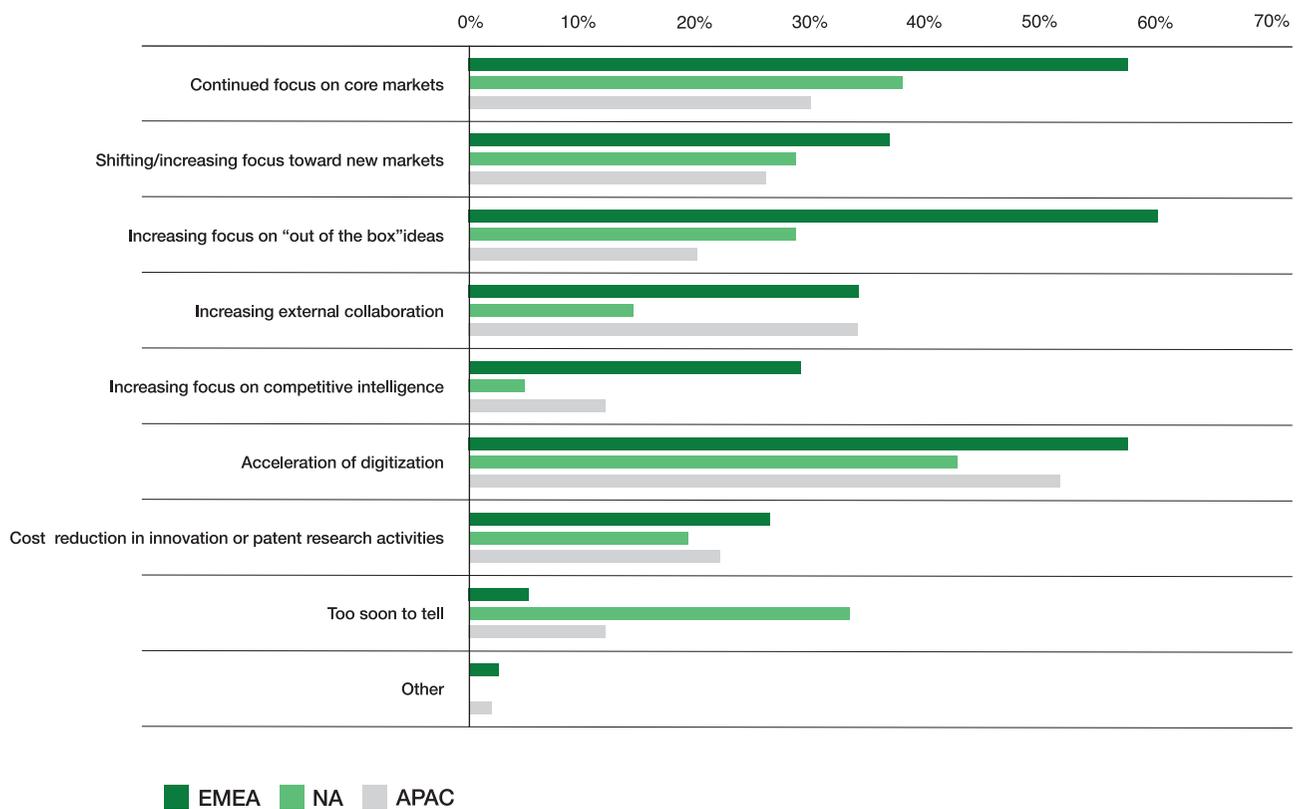


Figure 5.21. Change in organisations' innovation activity by region (Source: (Kanesarajah, 2020))

Impact of COVID-19 on Innovation in Egyptian Universities

As COVID-19 hit Egypt, companies, universities, and government were greatly alarmed. Disrupted companies started re-strategizing to remain in operation while minimising losses. Universities, likewise, focused on doing whatever is needed so that their educational services remain operational, while working on upgrading their ICT infrastructure and upskilling their human capital in university hospitals, to accommodate the surge in received patients. While the top management of most universities did not really have a specific, plan to adjust their research strategies, university innovators and

Most of the innovations that were proposed were far from what the community really needs, and from the industry's ability to adopt. This is because of the gap that currently exists between Egyptian universities and the industry. However, there was still a good number of successful proof-of-concepts that resulted from several university innovation labs that had capitalised on existing university technologies, researchers, and students. Here are a few examples of these successful projects:

- Ain Shams, Alexandria, and Mansoura University teams, had developed proof-of-concepts for ambulatory and ICU ventilators. One of those teams managed to develop into a medical equipment start-up.



- Arab Academy for Science & Technology and Mansoura University researchers, developed a proof-of-concept for medical service robots.



- Ain Shams University Innovation Hub developed a dynamic smart dashboard that displays statistics related to COVID-19 cases, and provides forecasts using Artificial Intelligence.



- Ain Shams, Mansoura, Nile, and Tanta Universities developed production lines for surgical gowns, surgical masks, and face shields.



- Ain Shams University Innovation Hub developed an ICU aerosol box, ophthalmologist shield, and dental aerosol shield funnel.



- Ain Shams, Benha, Cairo, Mansoura, and Tanta Universities developed sterilization tunnels.



- Ain Shams and Mansoura University teams performed successful clinical trials on using blood plasma for COVID-19 treatment.



- Arab Academy of Science & Technology University, Ain Shams University, and Zewail City innovation labs, developed a proof-of-concept for a COVID-19 application to help healthcare professionals automatically screen potential COVID-19 suspects using Chest X-rays.



- Ain Shams University Innovation Hub in partnership with its start-ups, developed a complete Telemedicine solution to help transform Ain Shams Hospitals digitally allowing them to remotely provide treatments to its patients across different specializations. They also developed an internal telemonitoring bot that follows up with COVID-19 self-isolated suspects and patients daily, and connects healthcare professionals when needed, and accordingly reducing the pressure on hospital infrastructure.



- Ain Shams University, British University in Egypt, Cairo University, and Helwan University innovation teams created a production line for hand sanitizers.



- Ain Shams University Design House developed an engineering prototype for a Handheld ULV Fogging Sanitizer, to be used in sanitizing hospital rooms, wards, and halls.



- Ain Shams University Innovation Hub, through one of its startups, started a virtual conference and exhibition platform to help conduct online conferences, summits, and exhibits **Figure 5.22**.

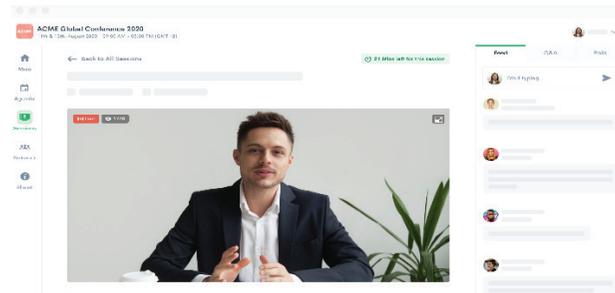


Figure 5.22. Activities based on COVID-19

Most of these innovations & solutions were developed because an industry or community need was driving innovators in university innovation labs and research centres. However, most of these solutions will remain within the walls of their campuses, as they only reached technology readiness levels of TRL3, making them not suitable for industrial partners to develop for manufacturing, that usually expect something that is at TRL7. This shows us that the ecosystem is incomplete, and for a more vivid and successful flow of innovations into the market, more elements need to be built and connected in our industrial ecosystem.

The Job Market Post COVID-19

As governments and markets start reopening after a long complete or partial lockdown, each market sector will need to assess, plan, and execute simultaneously. Each market sector was affected differently, and they will need to go through the 5 Rs: Resolve, Resilience, Return, Reimagination, and Reform. Most governments and markets are still in the first phase, and it is all about keeping the markets and spending going to avoid a longer and deeper recession (Saenz & Keeffe, 2020).

Consumers in different countries were polled to understand their sentiments during the COVID-19 pandemic. The general conclusion is that citizens from developed countries were more pessimistic than those from developing countries (Daly, 2020; McKinsey & Company, 2020), as shown in **Figure 5.23** and **Figure 5.24** (where two different polls done in two different time instances). This shows that despite the fact that many people have lost their jobs, or are at fear of losing them, they still believe that their economy will pick up soon, and accordingly, public spending will be impacted but not as much as in developed countries (Dahl, et al., 2020), as shown in **Figure 5.25** and **Figure 5.26**.

Assuming that Egypt follows the same public sentiment as China and India, both being emerging economies as is Egypt, consumers mostly do not believe that their spending patterns will change in the short term. This is a

positive sign and should be taken into consideration by every market sector. Based on how each market sector will react, they will most likely transform and either remain afloat in business, or achieve skyrocket success. In all cases, this will impact the needed talents by the market, and should affect how students select their majors & specialisations, continuously eyeing the evolving job market.

1. High Tech, Electronics, and Communications

COVID-19 has forced people to apply social distancing, it has consequentially also urged people to digitalize. This has accelerated digital transformation across all market sectors, pushing the demand for technical and communication solutions. This surge in demand is expected to persist but maybe not at the same rate. Most of the new investments will be targeting new and existing ventures in this field.

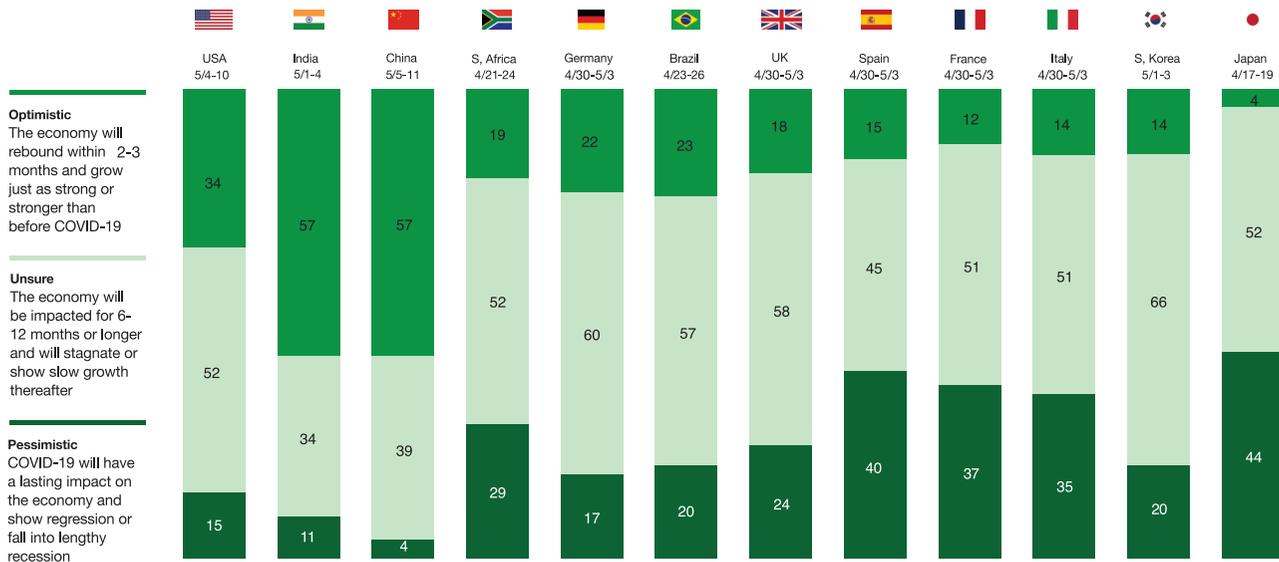
2. Construction

With uncertainty predominant in most sectors, consumers have definitely reprioritised their spending. Accordingly, this will negatively impact consumer's decision to buy real estate. Moreover, given that many companies and small businesses have adopted a hybrid or a work from home approach, many small businesses may opt out from renting an office or decide to downsize on rented space. Employees who had relocated to work at a certain company, may choose to move their accommodation to a cheaper location if they would be working remotely. Accordingly, other than public incentives, private investments are not expected to stimulate growth in this market segment at least in the near future. Architects and designers working for this sector, will be expected to start working mainly remotely, much more than the pre covid-19 era, accordingly they will be expected to have very

Consumers' economic sentiments during the coronavirus pandemic

survey data tracking consumer confidence in the economic prospects of more than 10 countries

Data as of 4/17/2020

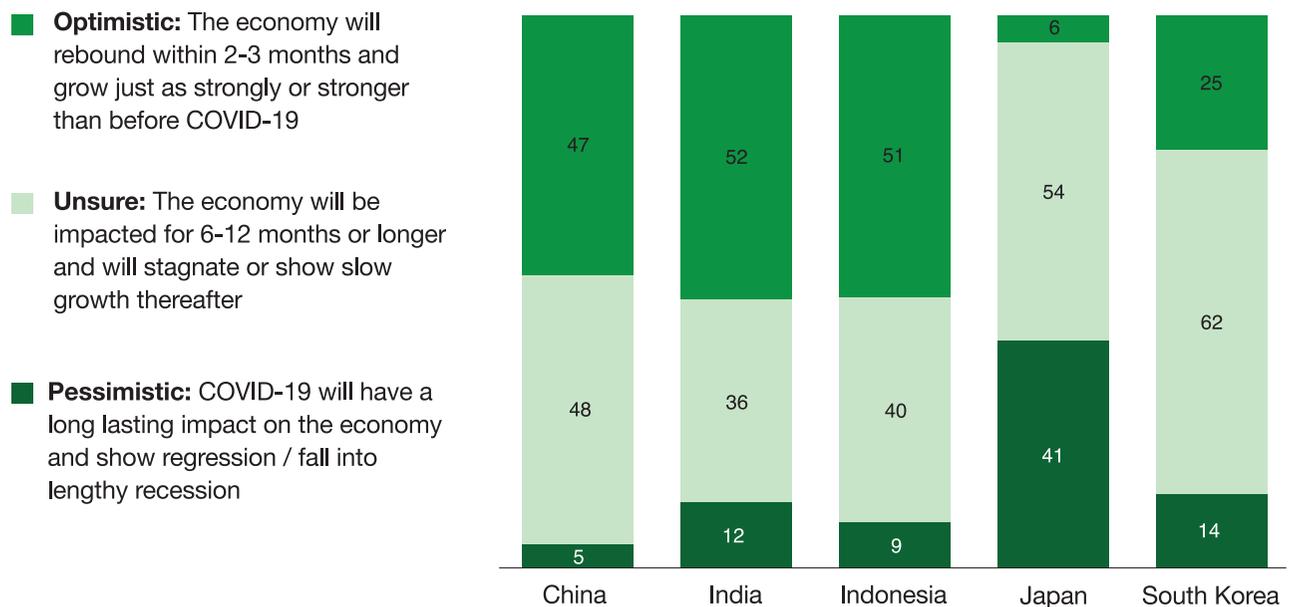


see detailed report for:

Figure 5.23. Consumers' economic sentiments during the coronavirus pandemic (Source: (Ho, Kim, & popup, 2020))

Consumer optimism likely tracks the stage of COVID progression, recently publicized government measures, and news events

Confidence in own country's economic recovery after COVID-19¹, % of respondents



¹Q: What is your overall confidence level regarding economic conditions after COVID-19 outbreak? Rated from 1 very optimistic to 6 very pessimistic
 Source: McKinsey & Company COVID-19 Consumer Pulse Surveys (China 3/23-3/30/2020 N = 1,048; South Korea 3/28-3/29/2020 N = 600;
 Japan 3/28-3/29/2020 N = 600; Indonesia 3/28-3/29/2020 N = 691; India 3/27-3/30/2020 N = 582)

Figure 5.24. Confidence in own country's recovery after COVID-19 (Source: McKinsey & Company, 2020)

good digital skills & are already mastering many of the new collaborative digital design platforms such as BIM processes and platforms.

3. Manufacturing

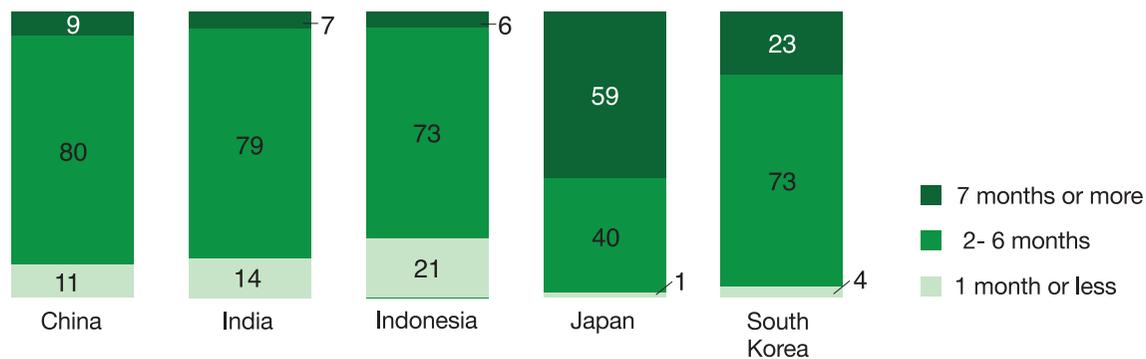
The manufacturing sector has taken a big blow during the COVID-19 era, and as countries reopen, many will be struggling to survive, regain throughput, and help support old supply chains (Dertouzos, Freund, Mischkot, Padhi, & Tschiesner, 2020; Becker, Distel, Freund, & Herring, 2020). Accordingly, countries like Egypt that had relied on importing many of its products, have a golden opportunity to seize this gap left by imported supplies, and start manufacturing alternative products. This can be achieved with the proper support from academia and

government, the correct incentives, as well as the adoption of new technologies that can help local industries improve their quality, achieve competitive pricing, and meet local demand. Also, to maintain social distancing during manufacturing, factories should start utilizing this opportunity in allocating its workforce in a more efficient way, by adopting automated manufacturing technologies of Industry 4.0, including digital designs and product lifecycle platforms. Moreover, top management, administrators, and designers that may be inclined to work remotely need to embrace and strengthen their digital skills using the proper tools for remote design collaboration, management, monitoring, etc.

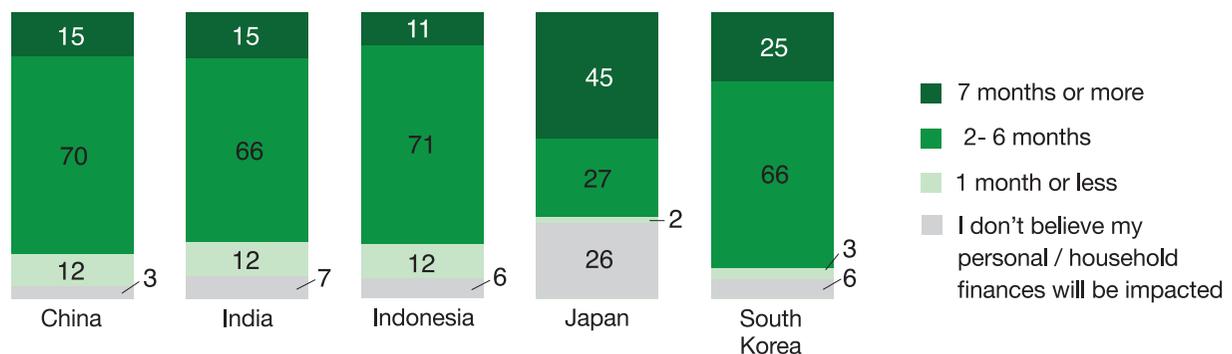
Financial impacts of COVID-19

Most countries believe COVID-19 will impact their routines and finances for 2-6 months

Adjustments to routines¹, % of respondents



Impact to personal/household finances², % of respondents



¹Q: How long do you believe you need to adjust your routines, given the current coronavirus (COVID-19) situation, before things return back to normal in your country (e.g., government lifts restrictions on events / travel)?

²Q: How long do you believe your personal / household finances will be impacted by the coronavirus (COVID-19) situation?

Source: McKinsey & Company COVID-19 Consumer Pulse Surveys (China 3/23-3/30/2020 N = 1,048; South Korea 3/28-3/29/2020 N = 600; Japan 3/28-3/29/2020 N = 600; Indonesia 3/28-3/29/2020 N = 691; India 3/27-3/30/2020 N = 582)

Figure 5.25. Financial impacts of COVID-19 (Source: (Ho, Kim, & popup, 2020))

4. Education

Schools and universities will continue, but many would have grasped the benefits of online education channels. With the proper balance of a hybrid/ blended approach, schools and universities will be able to design a more efficient education delivery system that maintain the same previous quality. This will require schools and universities to accelerate their digital transformation strategies, train their teachers and professors on embracing these new delivery techniques, re-architect campuses for more efficient use of space, and develop new business models. Public universities and schools that have their students enrolled through the conventional channels may not feel a lot of change in demand, but private ones will surely feel it. As private schools and universities start adopting digital communication and delivery tools, many

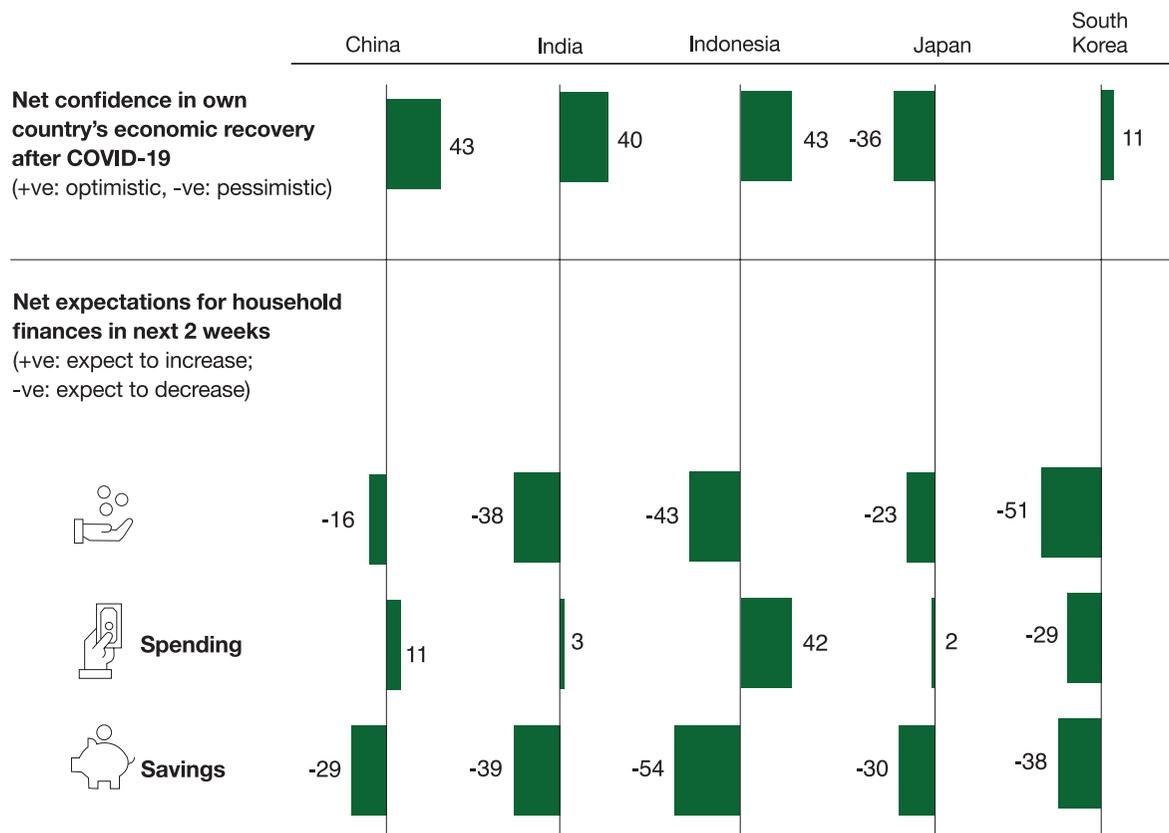
students will start reconsider which schools to join based on reputation, quality, and pricing, noting that the campus itself and location may no longer be a comparison point.

5. Health

Healthcare providers, and healthcare product manufacturers, & distributors have seen a lot of surge in demand on their services and products. This led many to exhaust their resources, such as hospitals and doctors, while responding to the sudden hike in demand. As the demand relaxes, these entities will need to re-strategize and rebuild, in order to reinforce their infrastructure and human resources. Moreover, they will also need to accelerate their digital transformation, adopt new technologies, use ecommerce solutions, as well as telemedicine platforms, in order to allow for better management and more efficient

COVID-19 impacts on household finances

In the short term, most consumers expect income and savings to decrease, regardless of their outlook on the economy



*Q: What is your overall confidence level as regards economic conditions after COVID-19 outbreak? Rated from 1 very optimistic to 6 very pessimistic; Source: McKinsey & Company COVID-19 Consumer Pulse Surveys (China 3/23-3/30/2020 N = 1,048; South Korea 3/28-3/29/2020 N = 600; Japan 3/28-3/29/2020 N = 600; Indonesia 3/28-3/29/2020 N = 691; India 3/27-3/30/2020 N = 582)

Figure 5.26. COVID-19 impact on household finances (Source: (Ho, Kim, & popup, 2020))

execution. Accordingly, existing, and new human resources will need to be trained to upgrade their digital literacy.

6. Retail

With the lockdown imposed from March till June 2020, the retail sector faced tremendous losses, leading to significant job losses as well. However, some of these shops and restaurants were able to adopt quickly and change their operational model allowing more e-commerce and home delivery, and accordingly sustaining operation with minimum losses, and some even achieved record profits. As the lockdown eases in July 2020, the retail sector will start operating again but with more operational restrictions to ensure social distancing and more hygienic measures. Retail businesses will need to seriously start utilising the virtual world and enriching their online fronts. This will allow them to access a larger pool of customers and compensate the losses they had accrued from their physical stores. In addition to adopting new technologies, they will need to upskill their workforce with digital skills.

7. Tourism

The Tourism sector was hit hard in Q1'2020.

Even though January and February had an increase of 6-10% in tourists, the air travel halt led to a 63% reduction in visiting tourists in March 2020. Similar results are expected to be announced for the months April to September, Q2 & Q3. However, local tourism is expected to slowly start picking up in July, and with the assumption that the COVID-19 would be contained by September, international tourists may start returning by Q3'2020. Those working in this sector will need to be trained on maintaining hygienic standards and using digital marketing to attract tourists that would be willing to travel given the needed precautions are applied at their targeted destination. However, many economic experts do not expect Tourism to return to the rates it had reached in Q4'2019 before Q4'2021 (Figure 5.27).

8. Transportation

Given the "Stay at Home" campaigns, and the heightened fear of going out, the within-city and intra-city transportation sector will probably keep struggling till the pandemic is over. However, companies specializing in last mile delivery of products will remain active after the huge spike in their activities during March-June'2020 period. Accordingly, transportation

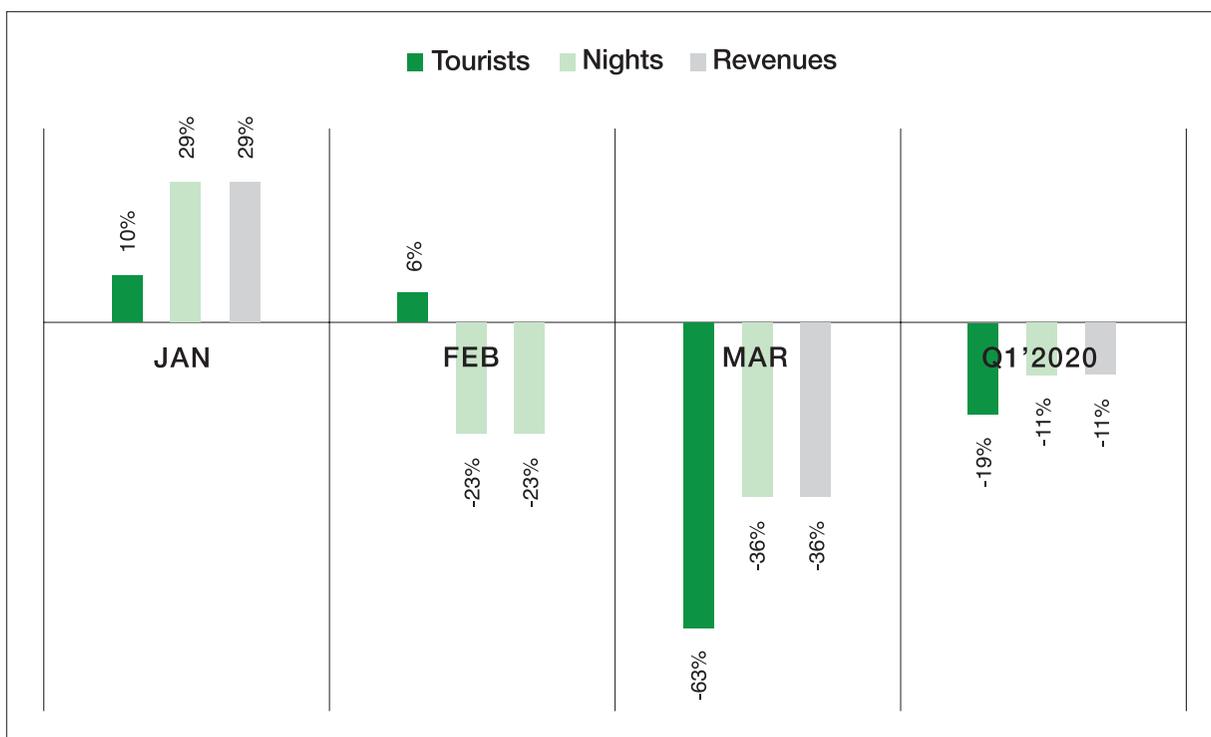


Figure 5.27. Change in the Tourism sector indicators during Q1'2020 (Source: Ministry of Tourism & Antiquities)

companies that focused on commuting passengers will need to revise their business models and perhaps start providing last mile delivery services through a B2B or a B2C model. This will need some dynamic tuning in their business modelling, as well as in their operations that might need to be hooked up to a digital platform (if they are not already) allowing them to integrate with e-commerce and m-commerce platforms as required. Such changes will require significant training and hiring to ensure a workforce with the proper digital skills to support managing the new operational mode.

9. Media & Entertainment

With more people spending longer time at home, media and entertainment companies worked on seizing this opportunity and continued providing their customers with fun, exciting content via different consumption channels used by their clients. Media & Entertainment companies need to invest more into digital channels with the availability of immediate feedback and statistics that can be used and monetised in many ways. They should also invest in Big Data Analytics and AI tools to help them predict trends and capitalise on them.

Social Impact of COVID-19

Families in Egyptian cities and governorates started suffering as their family members got hit by both: COVID-19, and reduced or eliminated income. As seen by the statistics, shown in **Figure 5.28** the governorate with the highest number of COVID-19 cases and highest density of patients was Cairo. Cairo was also the governorate with the highest number of layoffs.

The governorates with the highest density of patients after Cairo, where governorates of: Red Sea, Aswan, Luxor and South Sinai, respectively, as shown in **Figure 5.29** These governorates were double hit hard, since, it was not only that they had a lot of people falling sick, but were also going through a tough economic situation due to the Tourism coming to a complete halt, with Tourism being their main economic activity. Other industrial governorates such as Giza, Minoufiya, Qalyoubiya and Alexandria have also been double hit given the downturn in the industrial sector, as well as also having a high infection density.

With both the health and economic aspects of COVID-19 hitting Egyptian governorates, several NGOs along with

the Ministry of Social Solidarity started to investigate the arising societal problems arising in these communities. Task forces have been created and execution started from early May to support these communities using Governmental support and public charity.

5.3 Policies Serving Societal, Employability and Industry Needs,

Universities across the world have already started planning major changes in their mission, vision, objectives, strategy, structure, and plans, setting the path to transform into a Fourth Generation University. Fourth Generation Universities are universities that have innovation as the basis for all their processes and outputs, making sure that all their outputs are geared to serve the market, industry, and economy in their new form. This is achieved by redesigning university processes so that they produce: innovative graduates that add value to companies they work for; innovative technologies, products and services through their R&D labs that can be later commercialised and introduced to the market; as well as new innovative business start-ups or social ventures that would add value to the economy. Such a transformation would need significant changes in all university processes, methodologies, personnel, curricula, and infrastructure. Universities will need to boost the activities of its innovation and entrepreneurship support centres as will be described. Universities will also need to have stronger partnerships with its industry and community partners for more reciprocal benefits and for better empathy with market needs, as will be described in section Part 3.

Universities were put to a severe test due to the pandemic, and have discovered through it that they need to accelerate their Digital Transformation process. University portals and websites need to be enhanced and equipped to deliver all needed educational, administrative, and management services for its students, professors, employees, and management. All universities need to be equipped with an IT backend with an ERP, SIS, LMS, hooked up with a dynamic content library, a powerful AI & analytics engine, and connected to a smart campus infrastructure. This is to enable students to be able to virtually go through admissions, register for courses, check schedules, request administrative services, communicate with colleagues and professors, attend lectures, participate in virtual labs, take exams, and receive grades. Professors should be able to add new content, deliver lectures, tutorials, labs, conduct office hours, mentor students, create exams, and grade exams. Employees should be able to conduct most of their tasks virtually, especially those related to procurement,

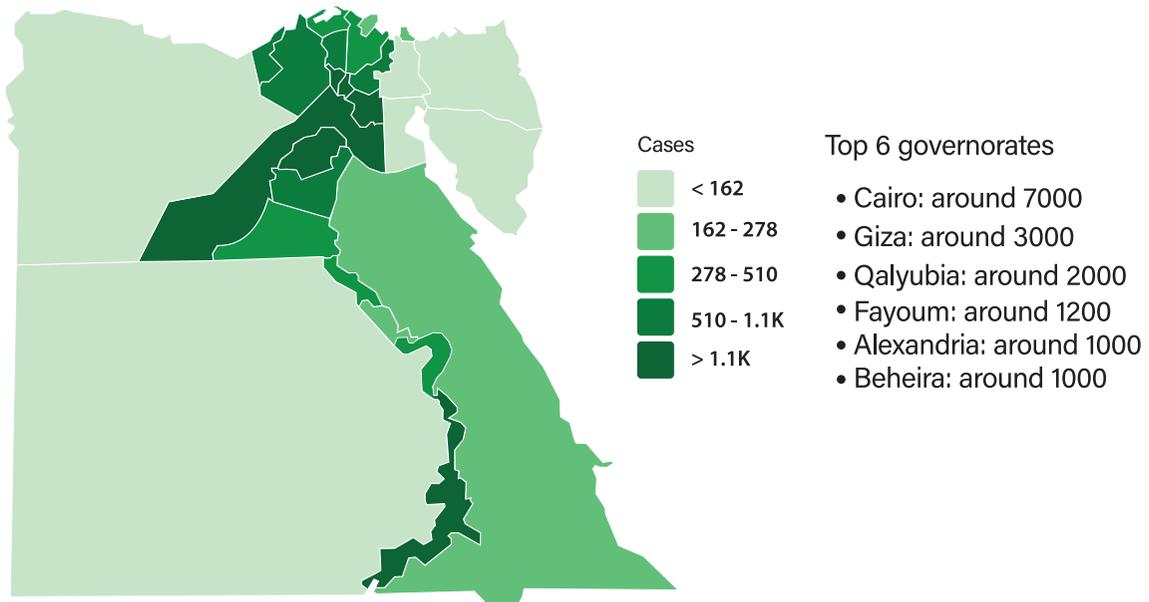


Figure 5.28. Geographic distribution of COVID-19 cases in Egypt on 31st May 2020 (Source: Daily News Egypt)

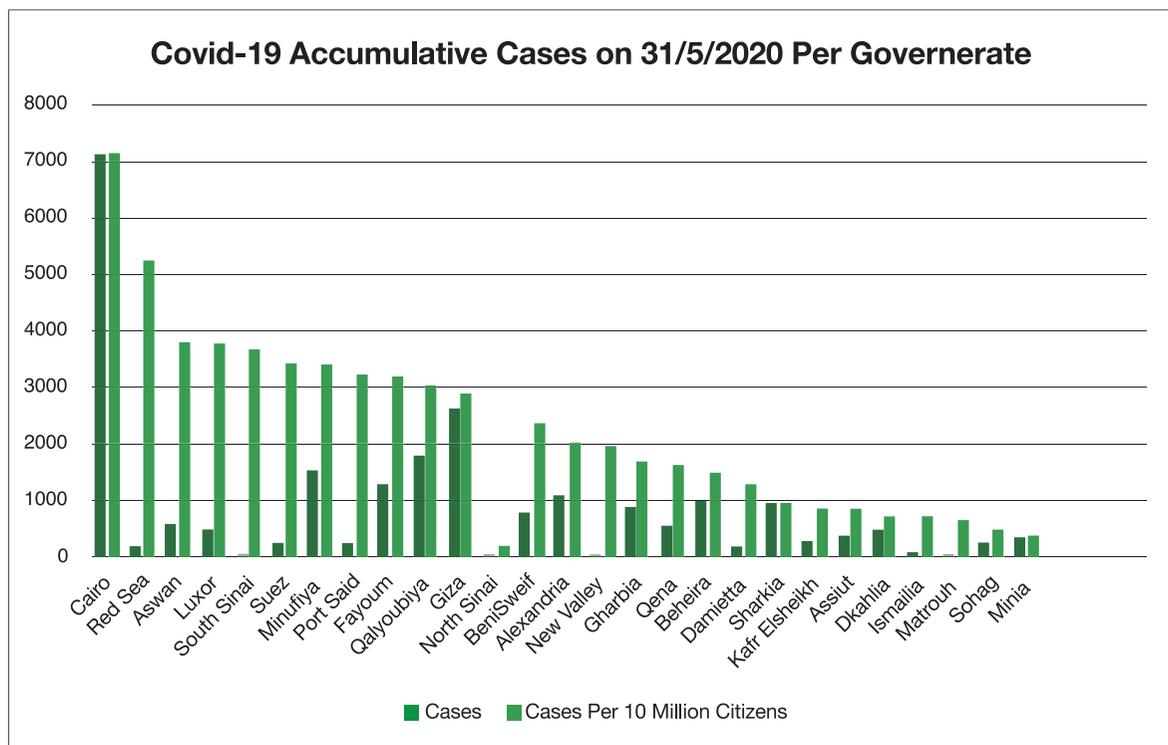


Figure 5.29. COVID-19 accumulative cases by governorate on May 31st, 2020 (Source: Ministry of Health)

accounting, warehousing, HR management, facilities management, administrative approvals, recruitment, promotions, ...etc. Top management should be able to manage all processes, evaluate performances, approve decisions, and plan interventions when needed with the help of those IT tools (Figure 5.30).

One of the biggest shortcomings facing almost all Egyptian entities is the lack of data. Most ministries, universities, companies, factories, schools, hospitals, farms, banks and others, have tons of data regarding its operation, its output, and its beneficiaries, but unfortunately, most of this data is kept in isolated silos within the entity. The

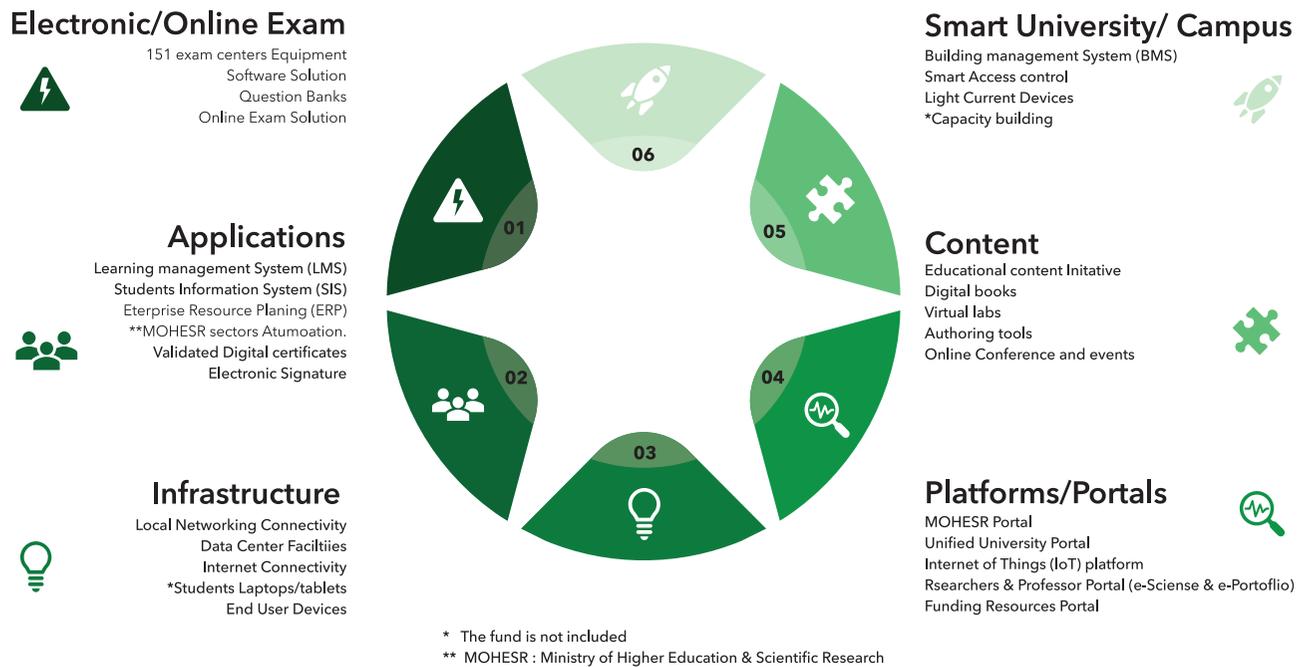


Figure 5.30. Digital transformation efforts in the Ministry of Higher Education & Scientific Research

difficulty in obtaining current and validated data makes it exceedingly difficult for policy makers, strategy makers, and planners to make properly informed decisions. Accordingly, universities need to revolutionise their data collection methodologies, how it is classified, analysed, and used in planning and decision making. They also need to create the needed alliances, as described in Part 2 and 4 to be able to share its data and acquire data from different market players, community members, and industry sectors.

transformation that will require many employees in the existing workforce to be reskilled 21st century skills that include digital skills among other set of skills, to match the new job market requirements. Universities should take this opportunity to utilise its talented workforce, its campuses, and its digital infrastructure to provide such reskilling services to the community at large. This will provide a great value to the country's existing workforce and will also generate a revenue stream that could support the universities' development and transformation efforts (Figure 5.31 and Figure 5.32).

5.3.1 Digital Literacy

As seen from the changes in the job market and the community challenges described above, it is clear that students need to be given proper capacity building training to provide them with the needed digital skills for them to be graduate and get hired in a digitally enabled ecosystem. Moreover, university employees, teaching assistants, professors, researchers, and top management need to be trained on all digital tools as universities go through their digital transformation, as described earlier.

5.3.2 Reskilling

It is inevitable that the job market will go through an acute

5.3.3 Upskilling through Lifelong Learning Programmes

Due to the fast-paced development in recent technologies such as AI, Data Analytics, Blockchain, IoT, Robotics, and Additive Manufacturing, many of the existing technology professionals will need upskilling so that they remain equipped with the latest technologies in the market. Upskilling could be applied to existing graduates, or to undergraduates through extracurricular activities, or to undergraduates wanting to enrich their knowledge & skills beyond their regular undergraduate curricula. Universities should provide lifelong learning programmes that enables continuous developments of graduates and professionals through the university itself or through its partners.



Figure 5.31. Essential digital skills for 21st century graduates (Source: ET Foundation)

RESOLVING COMPLEX PROBLEMS

The search for gradual solutions will help us to avoid errors.

ABILITY TO NEGOTIATE

Mutual respect between those involved is the best way to make an agreement possible.

CRITICAL THOUGHT

The key factors are self-discipline and a global and rational outlook.

ADAPTABILITY

You need to leave your comfort zone when faced with any kind of situation.

BE INQUISITIVE

It is essential to be inquisitive about what surrounds you and to make new discoveries.

KEEP AN OPEN MIND

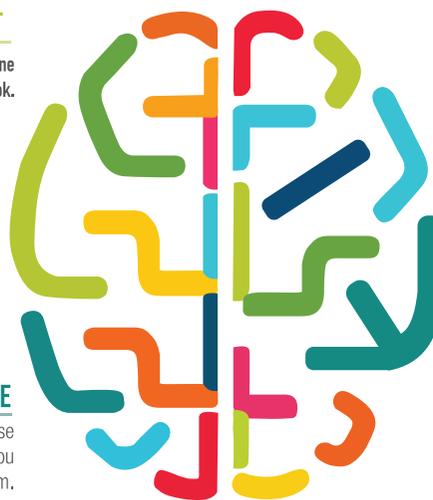
Always adapt what you know to each situation, to each moment.

INITIATIVE

Be proactive and propose new ideas before you are asked for them.

DECISION MAKING

A global analysis of any problem will always lead you to the best solution.



CREATIVITY

There is nothing better than imagination and teamwork for developing creativity.

EMOTIONAL INTELLIGENCE

Machines are not able to handle emotions in interpersonal relationships.

Figure 5.32. The most sought-after labour skills in the 21st century (Source: Iberdola)

5.3.4 Consider the Change in the Freelancing Redistribution

Graduates usually graduate to pursue a career in R&D through research and technology labs, or to find a relevant job, or begin their start-up. However, many also become professional freelancers. The currently evolving Gig economy/platform economy is encouraging freelancing more than ever. Many companies currently prefer cutting on their expenses and only hire based on the need and tasks they have and for the specific duration required. These new employment models are now more popular than ever. Freelancing gives employers the opportunity to hire more experienced professionals to do the job they need for only a limited duration until the tasks needed are completed, and with the new remote working models, they can hire the best freelancers based anywhere in the world. This opens tremendous opportunities for our graduates to freelance for companies anywhere in the world, given they are equipped with the right set of skills. Given the lower costs of living in Egypt, freelancers can offer competitive rates to attract global employers.

Universities need to prepare their graduates not only for regular full-time jobs, but also for the possibility of freelancing anywhere in the world. Freelancing may be a good option for many working professionals at least for a part of their career journey, but they need to understand the pros and cons for such working arrangement well. The benefits of freelancing include:

1. **Dynamism:** Freelancers have the flexibility to switch between companies, one project after the other, to try different market sectors, and different type of businesses with ease, flexibility, and with no strings attached
2. **Lower cost:** Freelancers just need a laptop and an internet connection with no overhead such as office space, insurance, employee benefits, making it a more lucrative option for short term business needs.
3. **Drive for Improvement:** Freelancers are always driven to do the tasks needed from them, self-learn as competition is high in the freelancing market, and work on enhancing their network. Accordingly, freelancers tend to develop themselves faster.
4. **Freedom:** Freelancers do not have long term contracts with their employers and have the freedom to terminate their relationship with their employers after their project is delivered.
5. **Working from anywhere:** Freelancers can work from home or the beach, as long as they get the job done. This gives freelancers better

chances to work while balancing between work and private life

6. **No 'Dress Code':** Freelancers have the flexibility of wearing whatever they want from wherever they want.
7. **Flexible working Hours:** Freelancers usually get contracted to get specific tasks done within a project. They have a limited number of client meetings and have the flexibility of working during any time of the day.

On the other hand, there are some disadvantages faced by freelancers, and it will be up to them to decide if freelancing is right for them:

1. Feeling isolated.
2. No paid time off and the need to hustle 24/7 for new contracts.
3. Inconsistent work and cash flow.
4. Juggling multiple clients.
5. Instead of having one boss, freelancers have several clients to answer to.
6. No company-sponsored employee benefits (medical insurance, life insurance, vacation packages, ...etc).
7. No one to back you the freelancer up in case of illness or injury.
8. Running every business aspect (sales and marketing, invoicing, signing contracts, troubleshooting technology, keeping track of tax-deductible business expenses, making estimated tax payments, etc.).
9. Feeling scattered/unfocused and lacking structure.

5.3.5 Drive more Interaction with the Market and Industry

Universities should work on collecting job market statistics and share that with their students to better inform them about the job market forecasts. This is needed to help students make better choices in the majors they choose, and the extracurricular activities they participate in so that they graduate with the skills and knowledge needed by the job market. This will allow for earlier redistribution of students among majors, reducing the gaps between academia and the job market.

Universities need to drive more dialogue and interaction with the community, market, and industry. This will allow for their staff, researchers, and students to drive their education or research to better impactful and relevant results. The university will also benefit from the received

feedback for its processes, curricula, methodologies, and infrastructure. Moreover, universities will become dynamic planning entities with more agility that can take quicker decisions regarding starting or terminating certain educational programmes, research projects, and development projects based on forecasted market and community needs. Such continuous dialogue allows for empathy & understanding of market needs and will allow for efficient operation and will generate added value for the economy.

5.3.6 Design New Business Models

Universities should develop new diversified revenue streams with innovative business models to help combat their funding uncertainty. As universities push to become fourth generation/smart universities as described earlier, their focus should be on the ROI and actual value they generate for the market. The market is very dynamic and with many uncertainties, and accordingly, universities should diversify their revenue streams to reduce risks as they operate. University planning units need to abandon conventional methods and adopt agility to have the needed dynamism to maximize ROI and be able to better respond to and absorb market shocks.

5.3.7 Derive Needed Legislature

Universities need to lobby harder with legislators to help change needed legislation for them to transform into fourth generation/smart universities. Many laws have

been initiated for this, such as legislation 23/2008 which allows universities to create incubators, companies, and tech parks, but more will be needed to allow public universities to have a leaner structure and more agile operation. Also, as universities digitally transform, and with the adoption of new technologies, universities will need new legislature to allow for digital delivery of all of their services, this includes accepting digital signatures, and more flexibility while dealing with international entities.

5.4 National Innovation Network

Egypt needs to pivot and transform into an “Innovation Nation”, also known as a “Knowledge Economy”, to be able to satisfy its needs, continue to play its regional leadership role, and have more contribution to the global economy. To do so, fictitious barriers between market sectors need to be eliminated allowing for more dialogue and collaboration. One of the key factors for entities to be more flexible, agile, and more innovative, is to have better communication and data exchange. This eventually allows service providers to have more empathy with service seekers, and accordingly be able to provide more appropriate innovative services. For this happen, each entity or group of entities need to have a focal point leading their communication and innovation system. Each of these focal points will be an innovation lab connected to others in the proposed National Innovation Network (NiN), shown in **Figure 5.33**.

MoHESR is considering establishing a National Innovation Network (NiN) that connects a different set of

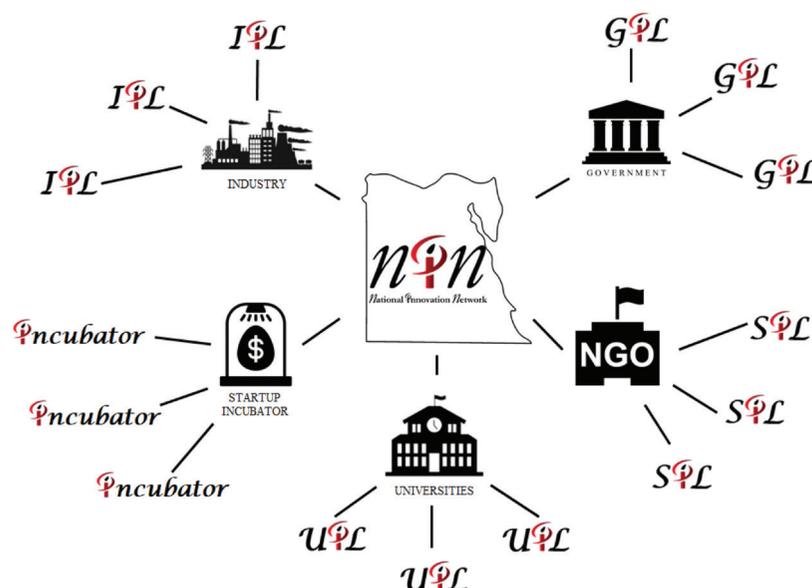


Figure 5.33. Proposed scheme for the National Innovation Network (NiN)

innovation labs and hubs across universities, community centres, society centres and industry clusters that would communicate, exchange data and services, collaborate, and share success stories. The NiN would also have an Innovation Academy embedded to provide the needed capacity building identified through the activities of the innovation labs within the network.

University Innovation Lab (UiL)

MoHESR has directed each university to create a central innovation hub connected to satellite innovation labs at their faculties. These innovation labs and hubs will:

- Initiate and conduct innovation awareness activities such as campaigns, seminars, webinars, and discussion panels shedding light on the importance of innovation, industry collaboration, market trends, and industry needs.
- Initiate collaboration between the university and the industry through dialogues, industry mentorship programmes, and technology transfer.
- Initiate R&D programmes at university research labs in alignment with & serving industry, community, and market needs.
- Provide co-working spaces, access to equipment, access to labs, and workshops to all innovators and entrepreneurs.
- Provide mentorship and consultancy services to innovators and entrepreneurs catering to all their different stages & progress.
- Connect innovators and entrepreneurs with funding agencies, angel investor groups, and venture capitalists.
- Develop and execute hands-on programmes to preincubate and incubate industry collaboration projects and start-ups.

Social Innovation Lab (SiL)

With the support of NGOs and other social support groups, the Ministry of Social Solidarity (MoSS) and the Ministry of Youth and Sports (MoYS) would start working on creating Social Innovation Labs to cater for different Egyptian communities and societies. These social innovation labs will run on a local, neighbourhood, and on an urban level, with a focus on social innovation in general, and might have a thematic focus such as environment, work, or health.

These social innovation labs will:

- Conduct periodic market research to collect and assess societal needs and challenges through their partnerships with local NGOs and MoSS.
- Provide co-working spaces to allow for community gatherings and dialogues discussing ongoing social need and ventures. Socially innovative initiatives of civil society organisations often require strong engagement of citizens.
- Provide mentorship and consultancy to social ventures tackling local social needs.
- Connect social entrepreneurs and community leaders with other innovation labs in the NiN, especially those seeking new technologies, needed solutions, and workforce.

Government Innovation Lab (GiL)

Each Egyptian ministry shall create a Government innovation Lab. These Government Labs are to be an alternative vehicle for policymaking, by turning collaborative trans-disciplinary spaces of socio-political experimentation, into a revolutionary sustainable process, that would change the way we address and understand traditional policies and decision-making processes. These labs would involve a diverse set of key stakeholders, from policymakers, and civil leaders to practitioners, academics, non-profit organisations, and social innovators, to co-design and co-participate in the design of public policies, with the purpose of improving social welfare and institutionalise a new way of doing things. These labs will:

- Scan for and identify key issues, priorities, and tasks.
- Bring together all stakeholders to discuss government challenges and find innovative solutions.
- Conduct specialised, interactive sessions, and workshops that use innovative methods and tools to inspire innovative ideas and find solutions to the challenges that face government entities.
- Test and prototype solutions.
- Create new entry points or routes to drive change in systems or have a more significant impact.

Industry Innovation Labs (IiL)

Each industrial sectorial members should work together to create an Industrial innovation Lab. These labs can be located at the sectorial chambers or industrial unions. The purpose of these IiL is to:

- Create a dialogue between relevant industries,

consumers, and technology experts.

- Scan for and identify urgent needs, issues, and tasks.
- Conduct thematic interactive workshops to inspire innovative solutions for industrial needs and new market products.
- Provide centralised infrastructure for brainstorming, testing, and prototyping.
- Pre-incubate new ideas that can later develop or form a start-up.

5.5 Wrap-up: Innovation Framework to Strengthen the Egyptian Market

The market revolves around the needs of the customer. Accordingly, a complete ecosystem is needed to identify these needs, design products to satisfy them, manufacture, then distribute them to outlets where consumer can buy them. This ecosystem, shown in Figure 5.34, can be further illustrated as following:

- A. **Trading Companies:** those who conduct continuous market research to identify potential clients, their needs, and problems. The

objectives of these companies are to find the best products that satisfy customers' needs, while making business sense to allow them to achieve appropriate profit margins. This can be done in collaboration with sectorial IIL.

- B. **Technology Innovation Labs:** those have experienced innovators, researchers, and technology creators. These innovation labs that could exist in universities (UiL), companies or industrial chambers (IiL), conduct a variety of interactive brainstorming workshops using innovation tools in the presence of both customers and technology researchers to help come up with product and service solutions that satisfy customers' needs. These ideas are usually validated by creating proof-of-concepts and testing them with a consumer focus group. Most technology innovation labs work on products from the early stages of technology readiness level TRL0 all the way to TRL3.
- C. **Design Centres:** have professionals with various design and manufacturing experience. Design centres work as an enabling agent that transforms lab-level TRL3 proof-of-concepts

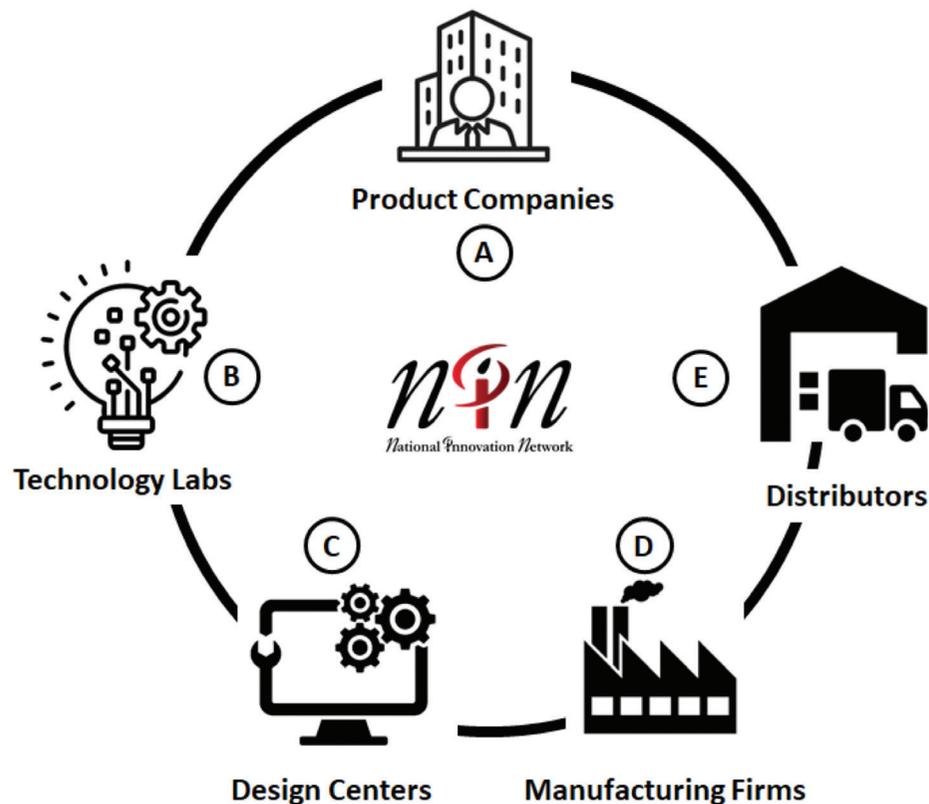


Figure 5.34. A healthy industrial ecosystem combining expertise and capabilities of both the market, academia, and industry

into TRL7 pre-fabrication prototypes that can be handed to manufacturing entities. Design centre professionals usually utilize their design skills and tools to mobilize a different design sequence, such as design-for-manufacturability (DFM), design-for-testing (DFT), design-for-cost (DFC), or design-for-variability (DFV) so that robust and cost-efficient designs are eventually attained. These designs are then prototyped and taken through a different set of lab and field testing before they finalise their TRL7 pre-production prototype and start its certification journey. These design centres exist as stand-alone private companies, or in universities, or part of product manufacturing companies.

- D. **Manufacturing Entities:** are those with the needed manufacturing equipment, technicians, and industrial & production engineers, to take in TRL7 pre-production designs and prototypes and validate them using their production lines, and optimise them for quality, reliability, cost and yield until a final winning TRL9 product can be shipped to the market. Manufacturing entities vary in size and capabilities based on the market sector they belong to, type of products they manufacture, and customer they serve.
- E. **Distributors:** are intermediary companies that distribute products from traders and manufacturers/ producers to retail businesses that sell them to end customers. Distributors usually work on building a strong relationship with retail businesses to be able to distribute the volumes they receive from manufacturers in a timely manner. Distributors also own warehouses to temporarily store products manufactured in excess to be able to absorb surges in demand. Distributors design their distribution lines, silos, and strategies to

maximizes flow of products using continuously updated data.

Upon inspecting the Egyptian market, one can easily see that the five mentioned elements of this product ecosystem do exist. However, this ecosystem is extremely fractured and segmented with many voids leading to inefficiencies. These inefficiencies, unfortunately, increases the costs of locally manufactured trading companies (A), which leads them to ignore local innovation labs, design centres, and manufacturing companies (B, C, D), and start importing the needed goods instead and then distribute them to distributors (E). This leads to a reduced demand on local design and manufacturing, reducing their cost efficiency, as well increases the volume of imports which depletes the country's foreign currency reserves, and increases our vulnerability to chaos caused by international supply chains.

Accordingly, this blueprint aims to encourage MoHESR and Ministry of Trade & Industry (MoTI), to develop a platform with the needed backend logistics, that would include all five elements mentioned of this ecosystem, to serve across all market and industrial sectors, as shown in Figure 5.35.

MoHESR will work on encouraging more output from its university innovation labs (UiL) and design centres, and better response to market needs as posted by trading companies. The output designs will then be connected to relevant and capable manufacturing entities to help continue the cycle and have high quality, cost efficient, and competitive products, introduced to the market. Such a platform, which would be connected to the National Innovation Network (NiN), will be one of the country's initiatives towards cloud manufacturing as a deeper step towards Industry 4.0.



Figure 5.35. Innovation framework to strengthen the Egyptian industry

Innovation Framework to strengthen community projects

Egypt has been going from one crisis to another for centuries, placing tremendous amounts of pressure on the people. The underserved and marginalised communities are usually the ones who suffer the most. These underserved or marginalised communities include the poor, people with disabilities, refugees, ...etc. The Egyptian Government has been exerting a lot of effort to try and reduce the effects of these crisis on these groups and on the public in general, but these efforts are not enough. This is where the community efforts & civil society steps into assist, either individually, or through coordinated efforts led by society workers or NGOs.

Every day, new societal challenges and needs appear in different communities, and voices requesting support and aid arise in response to several factors. Universities have huge numbers of students, professors, and researchers that sometimes coordinate and participate in medical, construction or relief campaigns. Yet, many of them, especially those seeking internships, research projects or community projects, complain that their abilities, knowledge, and efforts are underutilised.

To better address this societal need gap, this blueprint aims to create a unified framework to connect different Egyptian communities with the Universities to help provide ideas, solution and the needed workforce, as shown in Figure 5.36.

The Ministry of Social Solidarity (MoSS) and the Ministry of Youths & Sports (MoYS) will be onboarding Social Innovation Labs (SiL), described earlier, while the Ministry of Higher Education and Scientific Research (MoHESR) will be supporting their University Innovation Labs (UiL) to participate and design campaigns in collaboration with local NGOs. This will lead to better coordinated efforts with better specialised people with qualifications, capable to address societal needs. This will also help students to better develop their hands-on skills, as well as their soft skills, will enable researchers to participate in implementing their theories and knowledge, and will provide donors with better equipped teams to execute more efficient societal campaigns. This would be a by-product of the collaboration and integration to be provided by the National Innovation Network (NiN).

Innovation Framework to Strengthen Public Policy Making

Laws and regulations, are meant to be static, yet, they often change as society changes. To better develop these laws, regulations, and policies, efforts should be exerted in the ideation, development, and review from peers and stakeholders, is essential. This is the case all over the world and not only in Egypt. This was what led to the initiation of many Government Innovation Labs (GiL), around the world.

This proposal is to encourage each Egyptian Ministry (or group of Ministries) to create a Government innovation

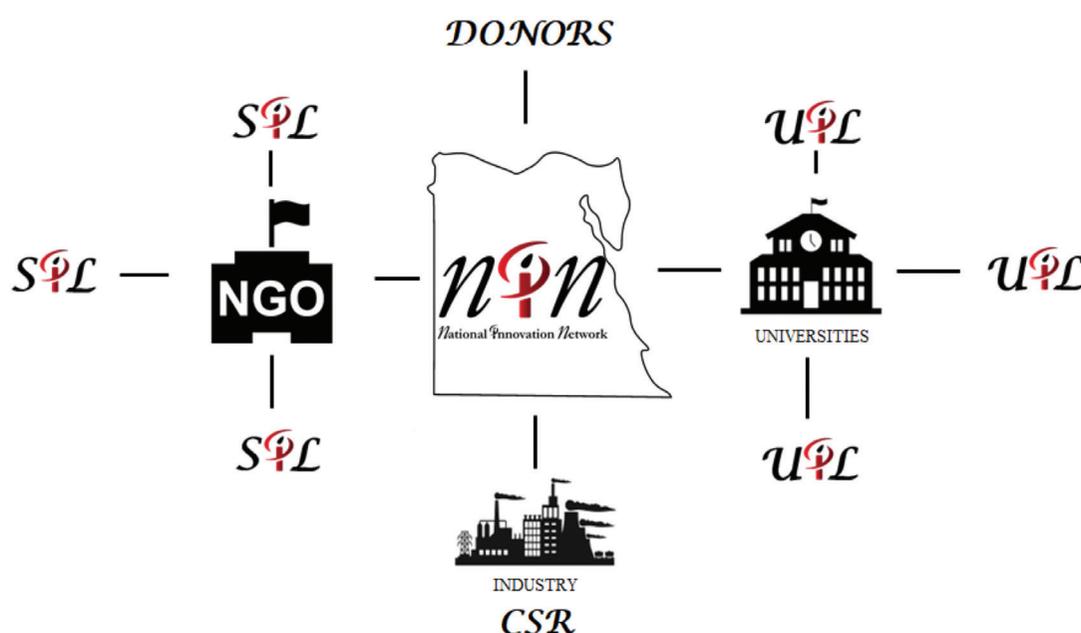


Figure 5.36. Innovation framework to strengthen community projects

Lab and connect them to the National innovation Network. Once new laws are envisioned, ideation workshops involving university innovation labs, related market & industry representatives, citizens, and political parties will be invited for several brainstorming sessions. They will also be invited to participate in early version critiques and pilot testing (Figure 5.37).

Investing in Students: Student Loans

The current higher education system enrolls a large number of students every year, offering them subsidised higher education in a variety of fields, creating a big burden on university systems and graduating a large number of graduates that either exceed or do not match the job market needs. The market has been witnessing a big shortage in highly qualified technicians and technologists that usually graduate from technical high schools and technology universities (Technical & Vocational Education & Training -TVET schools).

One of the suggested solutions to these problems, was to reduce non-technical universities' subsidies, while increasing it for technical & Technology focused Universities, encouraging more students to enrol with those universities. This will also force lower numbers of enrolment to non-technology universities, which in turn should help improve the quality of the services offered, increase revenues, and could lower the burden on state funds. The drawback would be the inability of those who wish to continue their higher education but lack the funds, of doing so. In such case, and like in many countries, a governmental student loan programme can be developed, this programme could be a solution for those with certain financial requirements.

Even though banks, do provide personal loans, and educational loans, but governmental student loans have many benefits and is adopted in many countries, such as Switzerland, USA, UK, ...etc. These benefits include:

1. Lower rates and fees
2. Students do not need a co-signer
3. More options for pausing payments
4. Less interest accrues on subsidised loans
5. Access to income-driven repayment
6. More time before student loan defaults
7. Students do not need good credit to consolidate
8. More debt forgiveness possibilities
9. Guaranteed loan cancellation if a student die.

For the **National Student Loan Programme to be developed**, MoHESR will have to coordinate with the Central Bank of Egypt (CBE), to design the exact conditions and requirements. This Student Loan Programme would

have Subsidised interest rates for students with specific financial needs, and other unsubsidised loans for the rest of the students who do not demonstrate financial needs.

Income Sharing Agreement

The financial sector is a crucial sector for investments in Egypt, like in everywhere else in the world. Investments could be directed towards real estate, a certain industry, the stock-market, or any other market sector. One of the emerging and growing investment trends in the USA and other countries, is **the Income Sharing Agreement**. An Income Sharing Agreement (ISA), is a contract agreement between a student, and an investment firm and/or their university. The student agrees to receive borrowed money from the investment firm and/or university to fund their education. In exchange, the student agrees to pay the investor a percentage of their salary after graduation, as to pay back the "loan" he/she took. Accordingly, if the student is of excellent skills and potential, is considered as an investment opportunity. The investor will provide that student with an advisor/mentor that follows up with him/her, and designs and pays for the proper learning and training path for him/her. The investor can also provide help in securing suitable internship opportunities and later, job opportunities to craft an excellent career path with a great ROI for both the student and the investor. Once the student graduates, and gets employed, the investor activates the second part of the Income Share Agreement, to receive a percentage of the graduate's salary, for a certain number of years, as per agreement. Many investors across the world have started diverting some of their investments towards ISAs, which is becoming more popular. If properly designed and planned, this can be a very lucrative direction for universities (in collaboration with investment firms) and a way to diversify their business models.

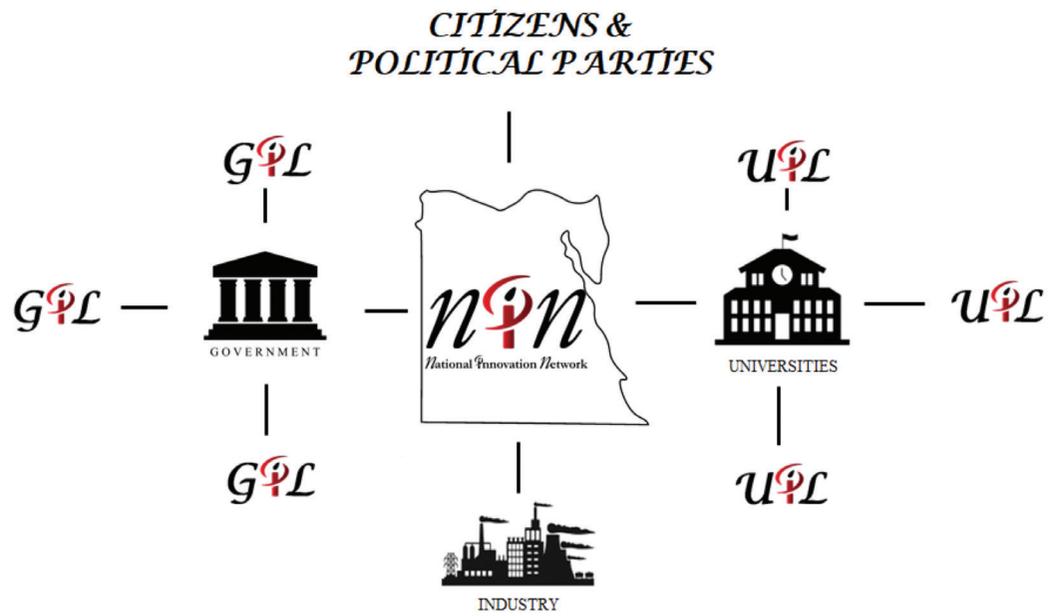


Figure 5.37. Innovation framework to strengthen public policy making



6. Conclusion

The COVID-19 pandemic has proven to be the most significant catastrophe that the world has faced since the early 20th century. The pandemic started from the far east at the end of 2019 and quickly spread to the rest of the world, putting it on lockdown mode since the end of the first quarter of 2020. With the imposed lockdown in most countries, all market sectors were profoundly affected by a negative impact on the economy in general.

The purpose of this blueprint is to showcase the role the educational sector can have in reducing the gap between graduates and the job market expectations. COVID-19 has negatively impacted the economy by hitting the market and societal communities, leading to losses in business and jobs. However, not all market sectors and not all jobs were affected uniformly. With the change in the market dynamics, signals are arising that show us that we need to adjust our educational system to help create more talents that can drive the market sectors that show potential growth. Public awareness needs to be raised so they can realise the importance and the relationship between their education level and the possible job they seek.

This blueprint tackles four parts after the introduction and ends with the present conclusion. The introduction provided an overview of the entire blueprint. The second part discusses the activities MoHESR has been implementing before the pandemic and the ongoing actions during the university lockdown. The third parts displayed the survey statistics. The fourth part addressed the policy pillars needed to assess Egyptian universities after the academic life goes back to normal. Finally, the fifth part deliberates the suggested policy for universities through its role in serving the local community and industry.

The second part displayed four ongoing and previous activities that took place before and during the COVID-19 pandemic. In this part, the higher education era before COVID-19 can be roughly divided into two phases based on its key business objectives and the role ICT partook in realising those objectives. Phase I was during the period from 2005 and up till 2015, and Phase II started in 2015 and continued till 2020. During Phase I, ICT projects aimed to support Egyptian Universities in establishing a robust, standards-based infrastructure, which included hardware, software, associated applications, and inter-university connectivity, as well as global connectivity through the Internet. In doing so, this project was divided into six main tracks: Infrastructure of

information networks, Management Information System (MIS), Electronic Portals, E-learning, Digital Libraries, and ICT training.

The implementation of those six main tracks was carried out by establishing centralised, permanent units in both the Supreme Council of Universities (SCU) and public universities. These units harness Information and Communications Technology to provide its e-services by availing digital library and Scientific Research Recourses. This unit offers ICT infrastructure to the higher education sector and spreads the online learning culture. The principal objectives of this unit include: developing online courses, enhancing ICT Capacity Building, and developing Information Systems needed to automate the educational business process. Meanwhile, this unit supports decision-making and provides a National Bank for Scientific Laboratories.

During Phase II, the focus was on positioning Egypt as a higher education regional hub utilising ICT in transforming education to being smart. To achieve Phase II objectives, the Ministry of Higher Education and Scientific Research is currently working on executing ongoing digital transformation projects. The example is given to the application of the online assessment in higher education, developing the ICT Infrastructure and Connectivity, and qualifying Egyptian Universities to become smart universities.

The second activity of the first part revealed the Egyptian higher education transformation journey to online education during the last decade. MoHESR has been moving progressively to benefit the use of ICT in different aspects of the education process. With the COVID-19 pandemic happening, we witnessed an acceleration of the education reform agenda. COVID-19 can be an opportunity for countries to upgrade and accelerate their reform action plans. MoHESR in Egypt has realised this opportunity and has developed the post-COVID-19 pandemic Higher Education and scientific research alignment strategy. The alignment strategy is composed of two folds: the first fold is focusing on integrating the use of ICT in the different aspects of education and research areas. In line with other studies, the use of ICT ensured efficiency, productivity, and a healthy environment. It also provided quality education that helped enhance the worldwide ranking of Egyptian universities. It supported achieving Egypt's vision of 2030.

Another significant activity that paved the way to achieve MoHESR's vision was the promotion of the

Egyptian universities brand, via improving its ranking. This third activity started in 2017, by establishing a team to work on improving the Egyptian universities' reputation, aiming for better global recognition. The team defined the challenges related to university ranking and its elements which consist of students, alumni, and faculty, as well as their expected outcomes of quality of education and academic reputation. During online webinars, the team constructed a policy that tackles the research, teaching, employability, and international networking.

The Third Part here discussed a multi-lateral survey was prepared to assess the ongoing teaching and learning strategies during the lockdown. This multi-lateral survey represents a combined picture to help analyse the current situation of distance learning and identify weaknesses and strengths. The survey constructs a vision for the future by identifying the best educational methods and how to deal with future crises. The purpose of this survey was to understand the status of distance learning during the pandemic. This survey helps in constructing a suitable policy to deal with the consequence of COVID-19 on education and the learning process. This survey was also prepared to evaluate the current status of distance education in Egyptian universities. It includes feedback from students, faculty members, administrators and management. This survey attempts to investigate the options available for university stakeholders: administrators, faculty, administrative staff, and students. The significant survey covered the evaluation of universities infrastructure, human resources, and institution's handling of the crisis. Following this, the listed experience gained from distance learning was also included in the final report for all stakeholder involved (students and instructors).

The Fourth Part includes seven pillars to identify the transformation of the higher education sector toward a more agile, online, and quality-driven system. **The first pillar** considers the alignment of policies and regulations to embed the use of ICT in the teaching and learning processes, as well as in the education institutions management systems. Quality teaching and learning requires a new vision for the quality framework, a new structure for the bylaws and for the assessment methods to allow the integration of online mode of delivery. Higher education institutes will require guidelines and policies that will define the new education system allowing for the proper implementation of the online education component. For effective education management systems, policies need to redesign undergraduate and post graduate processes, with the de-facto existence of ICT technologies defined. This includes the enrolment process of international students, the use of blockchain

and electronic signatures, the reform process for post graduate administration, foreign staff recruitment policies, and finally, the accreditation of global online education providers.

The second pillar focuses on redesigning the teaching, learning, and assessment techniques. This pillar defines the action plan required by universities and staff to maximise the benefits of distance learning education in the area of teaching methodologies and assessment techniques. With the digital age happening, a revision of graduate attributes and competencies is essential to ensure the skills set needed for our young generation, matched that of the current job market. Actions are also required by the staff to improve and enrich the online experience, moving from merely uploading files to a fully interactive online experience that would engage students and provide them with a similar experience to that of the face to face experience. Assessment is in the core of the education process, and with online education, a new vision of assessment techniques should be considered, tested, and verified. Supporting the staff with smart platforms and intelligent tools will pave the way to offer a truly personalised learning experience for the students.

The third pillar goes deeper, tackling how MoHESR is handling the challenges facing the research strategy due to COVID-19. MoHESR has directed scientific research to examine the impact of COVID-19 on the education, health, and wellbeing sectors. This policy pillar also discussed the initiatives that focused on pandemic funding calls covering related disciplines. This initiative also worked on having a unified platform to include different donors and develop a database for all approved calls. This latest direction comes in an effort to enhance connectivity between Egyptian researchers and their peers, locally and globally. Another implemented action aimed at raising the visibility of Arabic journals and dissertations released from Egyptian universities, to benefit in universities ranking. This policy pillar will continuously work on fostering the research direction in different areas of specialisations towards multi-disciplinary outputs.

The fourth pillar of this framework focused on Empowering Human Capital as the core asset for all other pillars. The pillar covers policies and actions needed to ensure that the human capital ecosystem is sufficient and able to develop, operate, and consume digital services required to post the COVID-19 pandemic. The pillar considers three main types of human capital: IT Staff, university faculty & staff, and students. For each type, there will be a qualification programme to enable them to perform their duties effectively and efficiently.

For IT Staff, legislations are needed to support a clear progressive career path with appropriate incentives to develop and sustain needed IT capabilities in the universities. For faculty and staff, and the upskilling programme is needed to support the integration of the team and their ability to utilise digital services and support the digital transformation of universities. Moreover, scientific missions' focus and strategies need to be revisited to cope with the realities imposed by the pandemic on all universities worldwide. Finally, students need to be integrated and supported to be prepared with all the needed soft and social skills needed for their future careers. To this end, there is a pressing need to revisit programmes and methods used at the strategic, tactical, and operational levels to support human capital development at all levels.

The fifth pillar discusses how universities have already started their digital transformation (DX) journey in the last few years. COVID-19 has urged universities to rethink their DX priorities and expedite their implementation. DX is not only a matter of improving the effectiveness and efficiency of how universities do business but a pillar for the survival of universities. The fifth of the seven-pillar framework defined in this document focuses on accelerating DX in universities and higher education at large. This pillar identified six main policies and actions to support DX realisation. The first action is to (re)define the DX strategy of universities by revisiting and setting the transformation priorities based on the current requirements posed by COVID-19. To do so, universities need to assess their DX maturity and readiness to ensure the effective and efficient realisation of their strategies. In addition, DX implementation must be realised within an Enterprise Architecture (EA) framework that structures and connects business, application, data, and technologies to support the desired outcomes. This realisation of the EA framework must be governed using best practice governance frameworks (e.g., COBIT) to ensure alignment with university business objectives. Best practice in service portfolio and catalogue should be used in order to allow for the management of investing in services and ensuring effective service delivery to stakeholders. Finally, Egyptian universities need to define an operational model to manage the delivery and support of its digital services under the promised quality of service.

Having discussed the urgent need to accelerate digital transformation in Egyptian universities, **the sixth pillar** covers universities readiness for social distancing on campus. Through six action items, this policy started by recommendations for the physical distancing plan and implementing a hybrid instruction mode. The suggested methods ranged between short term, medium-term, and

long-term actions. Some of these actions aimed to ensure safety by social distancing alongside hygienic practices, sanitisations, and cross-ventilation for the indoor places. Other items tackled redesign of the configuration facilities in universities' campus, which are also running the small classrooms.

Finally, **the seventh policy pillar** focused on strategies of communication with university stakeholders during the crisis. The pandemic has forced us to consider the emotional intelligence element while messaging human capital during the crisis. This policy pillar adapts procedure steps in delivering messages. These message communication strategies start with team selection, and the spokes-persons. Then comes the importance of data gathering and information collection about the issue at hand. Another significant issue covered by this pillar is choosing the proper methods and channels to reach a broader target audience, the timely responses, and methods of information dissemination.

Finally, **the Fifth Part** of this blueprint focused on the impact of COVID-19 on the market, industry and community. Data from the United States, United Kingdom, Asia, Middle East, and Egypt was presented. The overall impact on the economy was shown to be negative, but several market sectors have actually grown extensively, such as the healthcare sector, sanitation sector, and digital services sector. These changes were reflected in the job market, where it was clear that the vulnerability of any position was inversely proportional to the job's needed skills & educational level. Recommendations were also provided for universities to enable them to deliver, and produce qualified graduates for the post-COVID-19 era.

This part also reflected on the impact of COVID-19 on organisations' innovation activities across the world, and what specifically happened in Egypt. Based on that, four initiatives have been planned to strengthen the role of universities when serving the market, industry, community, and government. These initiatives and their frameworks all revolve around creating many innovation labs across the different elements in our ecosystem, connecting them, and integrating their efforts through the National Innovation Network (NiN).

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This blueprint is an initiative to draw a roadmap that would help in leading out of the current adversity created by the pandemic situation and provides suggestions for post-COVID-19 actions in the higher education sector. Finally, I would like to acknowledge the team who worked together in fulfilling all the required tasks needed to reach this comprehensive policy framework.

Leading out of Adversity: Policies of Higher Education for Post-COVID-19 Pandemic includes action items that tackle curriculum redesign for international global courses, global education, and multi-disciplinary fields. Moreover, the policy pillars proposed in this document provide further action items related to the use of different online assessment techniques that would support remote learning. In this blueprint, the Ministry of Higher Education and Scientific Research (MoHESR) has designed an action plan to the orientation of the research process to examine the impact of COVID-19 on education, health, wellbeing and other areas of knowledge.



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