Education 2.0

Chronicles of Technological and Cultural Change in Egypt

Edited by
Linda Herrera

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20. The Dream of Developing a Knowledge Bank for All: Interview with Majed M. Al Sadek

Linda Herrera[1]

Abstract

Majed Al Sadek, Head of the Egyptian National Scientific and Technical Information Network (ENSTINET), used to think that the idea of a knowledge bank that would be freely available to the entire country was an impossible dream. The establishment of the Egyptian Knowledge Bank (EKB) in 2016 was possible through a unique set of collaborations and commitments from different government ministries, agencies and centers, publishers, technology platforms and companies, schools, and end users. Experts working on the platform are vigilant about data security and are constantly looking for ways to redress digital inequality and financing of the project. Al Sadek asserts that the EKB has forever changed education in Egypt with far reaching implications for the region and beyond.

Keywords

copyright, digital security, distance learning, intellectual property rights, K-12 education, higher education

1 This interview took place on 15 April 2020 via Zoom. It was conducted by Linda Herrera in Arabic. Many thanks to members of the Education 2.0 Research and Documentation Project team for their contributions, in particular Nelly El Zayat for help in organizing the interview, Hany Zayed for supporting with background research and questions, and to Nairy AbdElShafy for transcribing and translating the interview.

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1. Early Stages of the Egyptian Knowledge Bank (EKB)

LH Can you introduce yourself and give some background on the Egyptian National Scientific and Technical Information Network (ENSTINET) which you head?

MS[2] I am the head of the Egyptian National Scientific and Technical Information Network (ENSTINET) which started in 1982. It is the national information network. This was a USAID project, and after five years it became self-sustaining and was adopted by the Egyptian government. It then became affiliated to the Academy of Scientific Research and Technology (ASRT) at the Ministry of Higher Education and Scientific Research (MHESR). Since then, we have been serving the community of science and technology in Egypt. We are even serving the K-12 education sector now. Currently, my role at the Egyptian Knowledge Bank (EKB) is more in IT. It's as if I am the EKB IT Manager, if we consider the EKB as its own individual entity.

LH How did you got involved with the Egyptian Knowledge Bank?

MS When the Knowledge Bank project was coming to life, I was attending a meeting at the Frankfurt Book Fair in Germany and met Dr. Tarek Shawki who was also there. He talked about his vision to reach out to a larger number of researchers, which was very promising. Before, researchers were affiliated with certain research institutes within specific universities and had access to a very small number of databases and subscriptions. It was nothing like the wide scale that exists now. To try and work on something like the EKB was a dream for us. We started to collaborate with Dr. Tarek. ENSTINET made resources available to host the EKB. We provided hardware and software, logic and search engines for user ease, and the interface. We worked with Dr. Tarek to think about how to integrate the research centers, an area where we had experience.

LH What is your main role at the EKB?

MS My role at the very beginning was to contribute to the architecture section of the portal itself, to work on how to build the portal and make

2 Majed Al Sadek is Head of the Egyptian National Scientific and Technical Information Network (ENSTINET).

it more appealing to a variety of users. We are talking about general readers, students, parents, not just scientists or academics. We designed it to be divided into four sub-portals (the Public, University Professors and Students, Students and Educators, Children Ages 6-14) (see Fig. 20.1). I might have played a role in this.

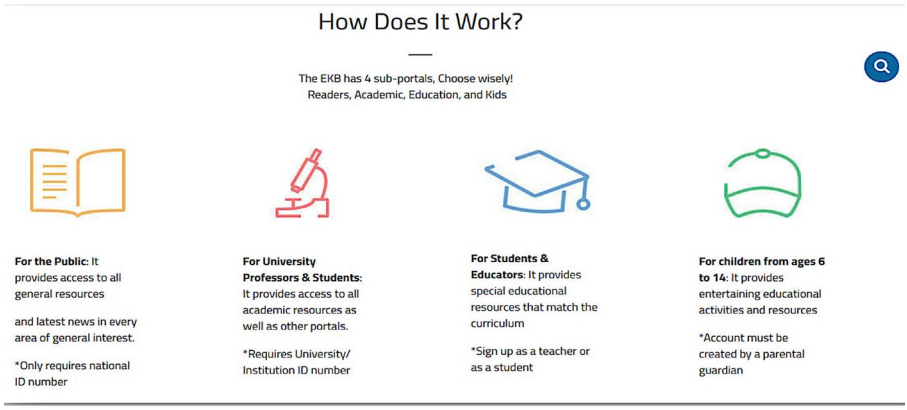

Fig. 20.1 The four portals of the Egyptian Knowledge Bank.

Afterwards, the role started evolving to be more about the technologies that would operate it. And here I mean the technologies in terms of application layers that would serve this service, and the hardware platforms that could dynamically grow and be able to address more users on demand. My role started to transform more to the project's IT part, maybe because originally my background is in IT. Now, we are working on integrating other publishers onto the platform. We help to integrate the legacy platforms that exist in the different ministries. We see how we can digitize their learning resources and help with new agreements and alignments. My role started transforming from working more in the IT side of things, to working more towards consultation. Of course, I have a large team with me.

2. Expanding the Platform to Include K-12

LH The original concept of the EKB was to serve researchers at the higher education level. Did you imagine it would grow to play a central role in supporting K-12 students? How did that develop?

MS When we began in 2016, we did not dream that we might reach where we are today. At the time, we had a very limited number of users. Our efforts were focused on the researchers. The portal had a second group of existing sub-portals, but we were timid. We discussed whether we should support general non-specialist users with a passion for the sciences among K-12 students. But we were not convinced that these students and their parents would actually access the Knowledge Bank. It was as if we were discussing something from our ivory tower, something very utopian. Every time I attended a global meeting with a national research and education network in the USA, Canada, and Europe, they talked about something called 'Children's University', where they connected several schools to national research and education networks. To us, that was a farfetched dream. We never imagined that this could happen here in Egypt.

Last year (2018/2019), after the distribution of tablets to all of Year 10 which has around 700,000 students plus their teachers, they started logging on. We had an approximate capacity of around 800,000 users at the time. We have since created upgrades and work in different ways with hybrid clouds. Thank God we have been able to serve this community as it grows. This year (2019/2020), Grade 11 joined and that doubled the numbers, meaning we added nearly 1.4 million users in two years. Keep in mind that more grades will be joining. One of our main concerns has been to protect personal data and sensitive information from being exposed to oversees corporations. This will always be a concern. We found a local solution. We started taking some resources from public clouds and ensured the data does not contain personal information. Honestly, we have been working more dynamically.

LH Did you have to make design changes to the platform as more pre-tertiary students came onto it?

MS Initially, we created a separate sub-portal for children because we did not have specific targeted content for the early years. Now, with Education 2.0., the educational curricula itself has changed and been updated with the different publishers. There is even content for K-12 students on the study platforms. Maybe they are the luckiest ones, to have this resource from when they start school. In truth, it is thanks to Dr. Tarek who within two years of him taking his position at the

Ministry, made the Egyptian Knowledge Bank play a key role in our education. Today, over 3,000 secondary schools are connected through fiber connections to the same data centers as research institutes and universities in Egypt. They all share the same resources in terms of materials from many different publishers. We could never have imagined this ecosystem existing so quickly and becoming a reality in two years. This was a faraway dream for us.

LH As a digital library, the Knowledge Bank is unique in that it is available to an entire country, not just certain organizations or institutions. How did you get the publishers to agree to participate in this project?

MS We initially faced challenges from the end users on all fronts, the teachers, parents, students, and the publishers. With some publishers we had good cooperation and understanding, with others we had resistance. Some publishers saw this is an opportunity, a good experience and said, 'Let us try it'. They could see that Egypt has the largest population in the Middle East region by far. There was the potential for them to re-sell this model and replicate it in other countries in the region. We call them the 'Golden Partners'. They were always helping us and were flexible about making a lot of English content available in the Arabic language. In fact, shortly before we started, some countries in the Gulf had an interest in this idea, so some of the English material had already been translated into Gulf classical Arabic, which is different from Egyptian colloquial and modern standard Arabic.

On the other side, some publishers showed resistance. They said, 'No, why should I make these efforts? What is the benefit to me? How much will you pay me?' Before closing any deal, the question was always about money and the cost of this material. Some saw that to make content available to all citizens, there would definitely be abuses that could not be controlled. They feared the material would not be geolocked (only accessible inside Egypt), that citizens might download the articles and sell them, that other platforms would share this content. These were the publishers' worries. But now, thank God, we have established a lot of credibility. When we ask the publisher anything now, they help us.

LH Educators concerned with access and equity worry about problems of digital inequality, or the digital divide. In your assessment, as someone with

access to statistics and trends, will this shift to online learning leave out many people in Egypt? What is your understanding of this?

MS The usage numbers are very promising. People were claiming that not everyone has Internet access at home, not everyone has tools such as a tablet or smart phone to access the system. In fact, this is a small portion of the population. Let us say that most of the Egyptian population, more than 65%, are technology natives, this is what they are born into. The day we launched 'study.ekb.eg', within the hour when Dr. Tarek made his announcement, we had eight million views on the platform.

3. Building a Learning Management System during COVID-19

LH With COVID-19 and the school closures in March (2020), how did the EKB team prepare for the sudden transition to online schooling?

MS The COVID-19 pandemic happened suddenly. Everyone started thinking that the whole world should stay at home and switch to schooling from home. We formed a task force and really worked around the clock four days. Without exaggeration, we added millions of pieces of content divided among the different grades and subjects. By the fifth day we launched the 'study.ekb.eg' platform to serve the entire population. We called it 'Study'. Around 640,000 students accessed this platform, and that is not counting Grades 10 and 11. To get there, we took content from the publishers for different grades and gave it to the Center of Curriculum and Instructional Materials Development (CCIMD). Thankfully, they stayed up nights to divide the material by grade, subjects, and lessons. We added 'tagging' and 'search' features so students could easily locate the material according to their grade and subject. The Study Guide on the dashboard provides the student daily information about what to study and the homework for the day and it provides quizzes on the lesson.

This could not have happened without the alignment of the Ministry and the publishers who were convinced by this plan. We worked for four days with very good partners. CDSM is a company that offered the solution for the Learning Management System. We also worked

with all the publishers, from the international publishers like Discovery Education, Britannica, Wolfram, and a very large number of other publishers, and national publishers like Nahdet Misr.[3] We adapted Edmodo for K-12 which provides a virtual process that is like the school.[4] Edmodo's advantage is that teachers can grab any content from the EKB and share it in their virtual classes, something that is harder to do in the physical world. This was a collaborative effort between us, the publishers, the Ministry of Education, the CCIMD, and the teachers who cared about working hard with long and late hours. This is something that makes you happy and confirms that we are no longer talking about dreams, there is a real demand for this online. Everything quickly evolved.

3 Nahdet Misr was founded in 1938 in Egypt and has been a leading provider of K-12 curricula and textbooks in Egypt and across the Arab states (see Chapter 15 and https://nahdetmisr.com/about-us/group-overview/).

4 Edmodo (established in 2008) was an educational technology platform for K-12 schools that allowed teachers to share content, distribute quizzes and assignments, and manage communication with students, colleagues, and parents. The interface was similar to Facebook. It was acquired in 2018 by the publicly traded China-based gaming company NetDragon Websoft Holdings Limited ('NetDragon' or 'the Company', Hong Kong Stock Code: 777). With the start of the pandemic and school closures worldwide, UNESCO recommended it for distance learning. The company claimed in 2019 to have more than 100 million users worldwide. Egypt accounted for a good deal of its growth. The company announced its partnership with Egypt by Tweet on 19 March 2020 stating, 'Starting today, Edmodo will be rolled out to over 22+ million students and over 1+ million teachers in the country to provide distance learning support in the period of school suspension and to enhance learning thereafter'. It referred to the 'unprecedented move by the Ministry of Education in the Arab Republic of Egypt ("MoE") to be the designated online learning platform for the K12 education system in Egypt'. On 29 March 2022, NetDragon announced, 'In Egypt, we recently signed a definitive contract to supply 94,000 Promethean interactive flat panels to K-12 schools across the country, another milestone in our long-term partnership with the Ministry of Education' (PR Newswire 2022). However, despite these plans, on 22 September 2022, Edmodo announced by Tweet that it was shutting its operations and permanently deleting all accounts. It gave assurances that personal data would not be sold to third parties, yet the US government brought a legal case against it for being in violation of the Children's Online Privacy Protection Act of 1998 (COPPA) and mishandling children's data. As reported in Gizmodo, '... students and parents often had no choice but to use it. It was also free, and... Edmodo made its money showing ads to all those little kid eyeballs, propped up by personal data including kids' names, birthdays, ages, emails, and locations, according to the FTC' (Germain 2023). The controversy and sudden closure of this company became a cautionary tale of what can happen when schools, with all its sensitive data, outsource their infrastructures to third parties (see Chapter 1 in this volume).

LH Can you explain how you at the EKB coordinated with the Center of Curriculum and Instructional Materials Development (CCIMD)?

MS To be honest, before doing this work, I did not even know this unit existed at the Ministry. Now we work directly with the CCIMD and talk with people there on a daily basis. We receive e-mails with content coming from different publishers that needs to be evaluated. The staff at CCIMD review different educational material and send their comments. We work on these comments with the publisher. Sometimes a translation is not very accurate, or not suitable to younger Egyptian Arabic speakers. We also want to make sure that we can build on content from specific lessons in the Learning Management System (LMS) by providing relevant additional resources. For example, if I have a biology class about the heart, I will find additional resources about the heart coming from Discovery, Britannica, or other publishers. The student does not need to search, these sources will be there on the screen. It is more about navigation. This system helps us to make the subscriptions with other publishers more relevant to the curricula. At the same time, the curricula become more advanced and in sync with international criteria. Perhaps there has never been a collaboration like this, directly between publishers and the Ministry's local partner.

The CCIMD has experiences now they did not have before. We can give them a large number of the publishers' incoming content on short notice, and they can help us in sorting them, giving approvals, providing comments, and dividing them among the different grades, subjects, and lessons. At the other end, the publishers themselves now know our preferences and our needs, so the content delivery is almost ready without many comments. This kind of alignment has made it much easier for us to do what we have done with the digital library and the 'study.ekb.eg' platform that supports all of K-12.

LH How was the platform able to accommodate all these new users and services?

MS Last year with Grade 10, we started to plan for the increase in users each year. We ordered hardware, licenses, and software on-demand, in whatever capacity we needed. This was a linear process, and upgrades were well planned. The situation of COVID-19 made us more experienced,

not only in terms of IT at the backend, but at the Ministry too. We can say we were technologically ready. We had to pay a lot of attention to security issues. Maybe this did not face much resistance because we established a trust relationship with the existing auditing agencies. They saw that we were really separating the personal data from the usage data to keep it well protected, so, they were helping us.

4. Securing User Information

LH Can you explain more about the security side of things and how you protect users and their data?

MS Let me say that for the state auditors, security was always a concern. We needed to not only protect users' identities, but their research interests which includes information about the specific articles and papers they access. All this can reveal national information. The auditors would sit down with us and ask, 'What are you doing? No, explain it to us more'. Security was a pressing and completely valid concern, and one of the obstacles that could have hindered us from creating a national project like this. We know in the world there are many data leaks, and these can even affect elections. It is something we know is happening, so it has been important for us to nationalize the technology.

What we have done is make all the personal user data available locally, nothing is being shared. We started using protocols, something we knew about through Internet2, one of the global research application networks. We relied on a protocol called 'ChipLET' or 'saml' which stands for Security and Searching Market Language. 'Saml' is a protocol that simply separates and makes the users accounts local in Egypt. We then produce tokens or numerical identifiers that don't change, and we exchange this information with the publishers. In the end, the user has access to publishers abroad through the Egyptian Knowledge Bank, but the publishers do not know the identity or email address of the user.

Let us take 'Elsevier' for example. The user opens 'Elsevier' with his or her unique identifier, searches the content according to a language preference, withdraws some books, and places them in the virtual bookshelf. The user can save his preferences and personalization on the publisher's native platform, but this is done anonymously because of

the token system. The publishers know this user is coming from the EKB but does not know the individual behind the request.

Even for 'search' we found searching platforms that could do two types of 'search'. We have 'discovery tools' and another called 'federated search'. Briefly, with the discovery tools we take the metadata from all the publishers and place it here locally. The metadata does not include the full text. We index it and the search takes place against the index that is stored locally in Egypt. This of course makes the search extremely fast and smooth, but it will always lag in content a bit since we have to update the mega data monthly or quarterly, and the articles produced in the interim period will not appear in the search.

The 'federated search' allows you to search multiple data sources at once, which for us means content from the different publishers. What we have done is produce something called a 'hybrid search'. This did not exist before. We are running it with a partner called Muse, one of the very well-known academic search platforms that used to be federated. We gave Muse our requirements, until we developed our own platform that is running and totally hosted here in Egypt, with all its indexes. Even the Muse platform is locally hosted. No one can know who the user is within the platform. Even the partners on the platform cannot know anything relating to personal identity.

5. Using Data Analytics in Education

LH The online schooling ecosystem is made up of different components such as the virtual classes, the Edmodo platform, and all the K-12 materials from different publishers. How do all these pieces fit together and how do you use and analyze the data coming from these different sources?

MS Even though there are different tools, the Ministry has one ecosystem to serve the students. If we must isolate our role at the Egyptian Knowledge Bank, it is more in the content. The Learning Management System is like the library inside the school. It is a kind of a home delivery system, not a traditional library. The second part is the classroom experience. The classroom, the walls, the discussions between the teacher and the students, are, we can say, replicated on the Edmodo platform. Edmodo provides a virtual process that is like the school. Edmodo's advantage is that teachers can grab any content from

the EKB and share it in their virtual classes, something that is harder to do in the physical world. Say a teacher has 120 students in the classroom, a very high density. She can deliver material virtually in an easy way. For students who are shy about raising their hand, they can now send a private message to the teacher to ask about something. The parents can watch what is happening in the classroom and motivate their children to interact on the platform. Because of the virtual classes, more resources from the Egyptian Knowledge Bank are getting used. You can also extract quizzes. This is how the different modules within the ecosystem are talking to each other and complementing each other. And maybe this digital ecosystem has made it easier for faster integration since it provides data that would not have been visible before. We could not have produced statistics from 55,000 schools in Egypt, on more than 1.7 million teachers, and around 22 million students. You need a digital environment to produce this analytics data.

LH What kinds of data analytics are you generating from the EKB, and how does this data influence or inform decisions about changes you make on the platform?

MS When someone registers to use the EKB, we ask for their national security number. Our formal agreement with the publishers is that this platform is for Egyptians, so we have the proof about who is using the platform. We have detailed information about the end users. I don't think anyone else does this. For the researchers we have their major field, minor field, and their affiliation. For K-12 students we know the name of their school, even if students from the same school write it differently. Arabic names might or might not have Hamza, and the same word could be written in different ways, with (ة) with dots or (ه) without dots, etc. We validate information about all the students with the Ministry of Education. We do content batching for student accounts and profiles to accurately build the analytics we want from their usernames and passwords. We have even worked with some entities here that are interested in producing data per governorate. This helps to know which governorate are more and less active on the EKB. We would like to know how people use the platform by categories like, for example, gender and age. We want to know which publishers are preferred by the students and the content that gets more hits. This lets us produce statistics

for publishers. We also want to know which content types are being most used, whether text or videos. All the analytics you can imagine can be extracted from the portal. We print reports for different entities internally with different parameters. Currently, we are experimenting with different business analytic tools on the Amazon cloud. We will probably adopt some of these tools and make dashboards for decision makers to see what is happening in real time.

Dr. Tarek can see the specific schools, classes, and teachers that are active. For example, we might find that biology teachers are more active on the EKB than chemistry teachers, or that Arabic teachers are not interacting with it, which means they need more training. We might see one governorate is working more than another, or that certain governorates experience delays in the network, in which case we would reach out to the Ministry of Communications to work on the infrastructure.

LH Do you know if analytics from the platform are being used to inform education policy decisions?

MS This has not been our focus so far. We are producing the analytics for outreach, to reach a larger number of students and teachers, and to increase the number of trainings and convince different entities to cooperate with the project. Our priority has been to connect to the schools.

LH How do you ensure equality of access to the EKB across governorates and locales, like rural areas or places where people do not have an Internet connection?

MS We faced the problem of some schools that do not have an Internet connection. We dig underground to extend fiber cables, prepare classrooms, and install interactive whiteboards and Wi-Fi coverage inside those schools. After we have finished this physical part to get the infrastructure in place, we can focus more on looking at these analytics for educational benefits.

LH How do you think data analytics will be applied for education reform?

MS When we are ready to start using analytics, we will likely start with the curricula. We will be able to know which components in the curricula need to be adjusted or simplified. With electronic exams, we

have the data to know which group of questions, for which learning objects, get consistently answered incorrectly. We can see which content in the EKB is not very relevant or is translated incorrectly. We can know which parts of the curriculum are outdated, unappealing, or unclear to students or teachers. This will provide us with the data to know what we need to change. With paper exams, we would not have this kind of information. The teachers correct them, and that is it. They don't analyze the questions or student data. And in Egypt we are talking about twenty-two million students in all age groups, so there is no way anyone could process all that paperwork.

Now, with so much data on the different platforms, we have a new opportunity. For instance, Pearson has developed a very reputable tool for marking and scoring exams. We can benefit from those analytics to go back and look at our content on the EKB in relation to the learning outcomes. Previously, we were measuring the student's abilities of memorization and retention. We were not measuring the student's capacity for high level thinking, critical thinking, and true understanding of learning outcomes from the different curricula.

LH How can big data be used for understanding teacher behavior?

MS With this data, we can identify how teachers are interacting on new platforms like Edmodo. There are 900,000 teachers who subscribed to Edmodo and created their own virtual classes. To be honest, this is something we never imagined. Maybe this happened after the private tutoring centers closed because of COVID-19, so teachers started to communicate through these platforms. We thought there would be a significant digital gap with teachers and they would not be able to use these platforms, but so far they proved us wrong. I expect statistics about the teachers will be a very hot topic at the Ministry, and we will be asked to produce different reports.[5] We are working proactively to create a platform for business analytics, to have dashboards that produce results

5 The EKB subscribed to a tool called Converis from the analytics firm Thomson Reuters. This is a Research Information Management (RIM) platform. Converis (Thomson Reuters) belongs to the category of Research Information Management (RIM) services. The company purports to 'manage the complete research lifecycle, from the earliest due diligence in the grant process through the final publication and application of research results….understand the full scope of your organization's contributions by building scholarly profiles based on our

so we can dive down into the data from the school to the teacher to the subject to the student. We are already exploring these tools for Grades 10 and 11. We want to see which schools and governorates are more active. Where are the top students within a school or in general? With what frequency do they access the EKB? Is it on a daily basis, a weekly basis, bi-daily? What does it look like? Maybe the Ministry still does not have a feedback loop from such information, but I trust it will be happening starting next year, inshaaAllah.

6. Supporting Higher Education

LH The EKB was initially established to support researchers in universities and research centers. Have there been changes in the research productivity and behavior? Can you attribute any progress to the EKB?

MS Before the EKB, our main role was to make knowledge available to research institutes affiliated to The Ministry of Higher Education and Scientific Research and other research institutes. We provided services that linked them to the National Research and Education Network (NREF) here in Egypt. In the past three years, our focus has been on research and education networks globally. We have connections to two international global education and research networks. The first is called, Internet2, which connects to a range of different research institutes and universities in the USA, Canada, and most of the Northern Hemisphere. The second is the GIA Network that connects us to research and higher education institutions in the European Union. Our role was limited to network and subscription services to the different databases.

We are now working actively on the researcher profiles, similar to what you find on ResearchGate or LinkedIn, but for the internal community. Individual researchers can include their international and local publications, courses they are teaching, workshops they have participated in, their travels, all this kind of information. From this data we can know, for example, if there are enough collaborations between centers, like the National Research Center in Egypt and King Abd El-Aziz University in Saudi Arabia, to warrant an official protocol between the two

publishing and citations data–then layer in your institutional data to more specifically track success within your organization' (Lorcan Dempsey 2014).

institutions. A second application is to flag promising researchers who need support with funds, approvals, and international opportunities. In this way, research funds available in Egypt will be better utilized. Third, we have many calls for research by national entities here in Egypt like The Science and Technology Development Fund (STDF) or the ASRT. Since we know researchers' search history and downloads, we can use the Research Information Management (RIM) system platform to target these calls to relevant researchers and faculties. It can also view collaborations, projects, funds accessed, and the outputs such as the number of patents or publications produced. We did not measure these outputs nationally in the past, but we can do this now.

7. Egypt's Digital Transformation of Education is Here to Stay

LH When the Education 2.0 started in 2017, there was a lot of public skepticism about the benefits of investing so much in building a national digital infrastructure. Since the pandemic, has the public perception changed?

MS Before COVID-19, maybe people did not see this as a priority. Everyone was saying that we have other priorities like health and infrastructure, like paving roads. They saw digital transformation as a luxury. But after COVID-19, the Ministry of Education was able to quickly adapt and serve students who were staying at home. Students and parents showed a high level of responsiveness on the different platforms. This showed that this vision was ahead of its time. Now, everything is moving fast with expanding this digital infrastructure. We are also extending the LMS to higher education. In the beginning, we used to be the ones running after people to interact on these platforms. Today, they are the ones running after us.

LH Do you see this digital ecosystem becoming a permanent part of the education system?

MS The EKB project started with the President's approval for four years. We have been working really well to prove our value, knowing there a possibility that after four years the priorities might change, or the people convinced by it might change, and this platform could stop.

Dr. Tarek always says that the most important thing is to move quickly, to make this platform become indispensable and a part of the daily routine of education in Egypt. People used to tell him, 'Just work on one grade at a time, take it slow'. He would reply, 'No, I want to work on the four grades together, so that even if I am replaced as Minister, my successor will not be able to stop what has been built and return to where we were before. He will have to continue it'. It has become very difficult for anyone to come and stop what we started.

But again, I think that since COVID-19 it has become clear that the money spent on this project has paid off. Schooling was able to continue without interruption, even with people staying at home. No other Ministry had this capability. The other Ministries saw the education ministry as a role model, whereas before they saw what we were doing as a luxury, not a priority. People criticized the distribution of tablets to students in Grades 10 and 11 so much, but now, they see this as something important.

Very recently, the Ministry of Health signed a protocol with the Ministry of Education to extend the LMS platform to serve the community of doctors. This is remarkable. No one would have ever imagined that the Ministry of Education would have an influence on other Ministries such as the Ministry of Health or the Ministry of Higher Education, which is also working now to adopt the same LMS. Last week the Ministry of Interior signed a protocol with Dr. Tarek to start working with them on making the LMS available to serve the Police Academy's community. We had a meeting with them three days ago, and they are very enthusiastic about this development.

We are talking now about a student who from kindergarten all the way through university, will be familiar with this online ecosystem and its platforms with the new methods of research, evaluation, and assessment. If someone goes into the workforce and becomes a doctor, for example, the continuous education and the professional certificates that will be required from him every two to three years, will be learning material from this same platform he is already used to. It really has become like a national platform that is extending to serve different purposes. What Dr. Tarek has done is very promising and farsighted. It has become indispensable which makes it difficult to imagine that all this could be destroyed one day.

LH The EKB is currently funded as a special presidential project, but this funding is not guaranteed indefinitely. How are you thinking about the EKB's future funding prospects to make it self-sustaining?

MS It requires a lot of funding, and this could be difficult for Egypt with the economic situation and all the demands on the budget. We are trying to find ways to make it self-sustaining. Dr. Tarek has an idea for something he is calling EKB Plus, something like an app store, a content store. This would make additional resources available with subscription fees, and the publishers would be involved as partners. From the point of view of the publisher, if this platform already has millions of users, a portion of them will start subscribing to it and the publishers can take a percentage, again, like an app store that takes a percentage when someone download an app. These fees will sustain the free packages of the Egyptian Knowledge Bank, so that in two or three years we will no longer need to get money from the national funds. Dr. Tarek already held extensive meetings with the publishers, one by one, face to face, for the EKB Plus idea. Everyone thought it was a great idea and they started sending proposals for subscription fees. This is a big change from when we started the EKB and many of the publishers did not have this trust that we would be able to manage this, or were concerned that Egyptians would abuse this platform. We have gained a lot of credibility from this project. Honestly, I see it as an example of the revival of Egypt's role in the region. And the publishers see this as a win-win.

LH In what ways do you see the online learning and research ecosystem as preparing Egypt's students for a changing world?

MS Dr. Tarek's vision required having faith that what is being done has a purpose and will benefit the students in the future. When they become part of the workforce, a lot of today's jobs will be extinct. With artificial intelligence (AI), automation, and all the developments that are happening, jobs are changing. This generation needs a different kind of readiness level than the previous generations to be able to push forward Egypt's economy.

LH What do you view as the greatest benefits of the EKB, whether social, scientific, or education?

MS At the very beginning when we first made the Egyptian Knowledge Bank, we saw signs of the scarcity mentality. You find a researcher sitting at one of the universities downloading full texts of many things, creating his own digital library. You would find, for example, that someone downloads 8,000 articles a day. There is no way he will read the 8,000 articles in a year, let alone a day. But people feared that this project might not continue so they tried to download all these resources they might need while they could. In all developing countries, this is something that is fully understandable. People do not understand the problem with copying an application or just photocopying a book. You would even find the professor saying, 'Go down and make a copy of this book at this library'. This is a big violation of copyrights. This is possibly why the publishers were concerned. Today, people are feeling that these resources are available, so I only login and take what I need, and when I need something else later, it will still be there. We completely secured the issue of the copyrights violations, and we improved the people's understanding of Intellectual Property Rights (IPR). All these were dreams. No one would have believed that something like this could happen.

I see the Egyptian Knowledge Bank as having real educational benefits to everyone who has participated in the project, starting from the technology partners who made the platform. The CDSM that created the Learning Management System[6] learned a lot from this exercise of building a national platform and are now in a position to do this regionally. Muse, that created the Muse federated search, used to serve only the academic community. Now, it is transforming the interface to be less complicated and more appealing to young students. They now use a Google-like interface search engine with a quick response time. All the publishers started to see this as something that could be done at the national level, rather than through individual subscriptions at high prices. Students, parents, researchers, and all end users see the great benefits. Honestly, maybe I am too enthusiastic, but I really see this as a platform that has benefitted everyone and has taken them to higher levels.

6 CDSM is a company based in Wales in the UK. According to its self-description, 'CDSM Interactive Solutions is a digital learning solutions provider, offering bespoke e-learning content and a contemporary learning platform. Founded by further education lecturers, our dedication to cutting-edge learning science and best practice allows us to deliver effective and engaging learning to our customers' https://shorturl.at/ilOR6.

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