ICT Strategies in Saudi Universities: Problems and Solutions for Effective Use

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Abstract—The integration of ICT in universities is a complex idea that requires practical interpretation for beneficial outcomes to emerge. As a developing country, Saudi Arabia faces many barriers when implementing ICT, especially in its universities. Improving the usage of ICT in Saudi Arabian universities entails integrating ICT so that all stakeholders, students, faculty members, and administrative staff can use the technology properly. This paper points out the most important problems facing Saudi Arabian universities, proposes several strategies to overcome these challenges, and reports on interviews conducted with key stakeholders in relation to the proposed strategies.

Keywords—Information and Communication Technology (ICT), strategies, Saudi Arabia, effective implementation, universities, barriers, ICT infrastructure

I. INTRODUCTION

Compared with other Gulf State universities, Saudi Arabian universities experience many problems in implementing and using Information and Communication Technology (ICT) effectively. Using surveys and interviews, we obtained data from students, faculty members, and administrative staff in 10 Saudi universities and 5 Gulf States universities. The number of participants was 142 faculty members, 121 staff/administration members, and 511 students. As reported elsewhere [1, 2], the data shows that the Gulf States universities receive considerably more benefit from ICT than the Saudi universities, despite all the countries concerned having similar budgets, sharing similar cultures, and having good infrastructure.

As a result of current problems, many Saudi universities still utilize paper-based processes that cause delays and lead to other difficulties. For example, faculty members lose much time in executing teaching duties such as marking, preparing lectures, and administrative work, and they experience communication problems as well. Moreover, students endure many problems with enrolment, contact with staff, familiarity with technology and other issues. Finally, administrative personnel lack skills to deal with technological issues, and it is evident that Saudi university staff have low or non-existent qualifications for using ICT and lack awareness of their workplace duties and obligations. Other problems emerge as a consequence of other issues in universities such as lack of ICT infrastructure, lack of training, lack of motivation, and lack of leadership.

As a consequence of the surveys' results, we prepared a report entitled "Effective Use of ICT in Saudi Universities: Problems and Solution Strategies", which we hope may help decision-makers in Saudi universities and other universities in developing countries to implement ICT effectively in their work activities. This report describes the main problems we identified, identifies the key stakeholders, and proposes potential solutions of two types: Cultural and technical. The report does not aim to cover all the problems, but to select the most significant and categorize them so that relevant solutions can be identified. The emphasis is on solutions that are practical to implement in the affected universities and that provide maximum benefit for all parties involved.

To test the validity of the report, we sought feedback from ICT professionals and experts with responsibilities for implementing ICT strategy in Saudi universities. This paper reports on the feedback received which we are now using to revise and strengthen the report.

II. LITERATURE REVIEW

Many studies have been conducted in the past decade on the use of ICT in institutions, although primarily in developed countries. In his study, Alturise [3] examined the current state of e-learning in Saudi Arabia and discussed the drivers and barriers to e-learning, the types of e-learning initiatives, and the steps being taken to overcome these challenges. Due to concerns regarding the internet, e-learning is being adopted slowly in Saudi Arabia. The advantages of implementing ICT in an organization outweigh the disadvantages [3]. Consequently, organizations need to integrate ICT into every aspect of their processing systems.

It is important to identify the barriers so that decision makers can overcome them to become successful technology implementers. ICT helps reduce costs, and many studies have identified barriers or issues that must be overcome [3]. Organizational barriers often stem from not having the right ICT infrastructure in place, e.g., good buildings, appropriate equipment, servers, networks, etc. When systems are not functioning properly, inadequate ICT infrastructure can result in important data being lost,

corrupted, infiltrated, etc. Without good technical support in their organization, resource managers and administrators cannot overcome the obstacles often associated with ICT. Effective training is one of the strongest support strategies staff can use if ICT is to be used effectively and properly [4].

Many employees lack confidence in using ICT for a variety of reasons, such as feelings of inadequacy, insecurity, and fear of failure [3]. Employee attitudes and an inherent resistance to change are also important issues that force changes in organizations' systems and use of ICT [3]. Many researchers have argued that resistance to change is an important barrier to the use of new technologies in the workplace because workers may lack the knowledge to use ICT, which affects their motivation to change [3, 4]. In addition, many ICT-related problems are the result of employees' lack of competence in integrating ICT into their tasks [5]. In developing countries such as Saudi Arabia and Syria, for example, ICT skills are a serious barrier to integrating technology into organizational systems [5]. Finally, many employees are competent in using ICT but still make little use of it because they do not have enough time to master all the technical details [3].

The last barrier occurs at the student level and overlaps with the other barriers. First, students typically do not have enough income to buy or rent the rapidly changing hardware and software technology, and therefore how much money is spent on an ICT system at the university is critical. Many students who have little technical knowledge about ICT may encounter ICT-related problems. Studies show that students in developing countries such as Africa lack integrated ICT systems, where there is a lack of support and services to facilitate learning [3, 6]. In addition, lack of access to resources, such as at home, is a complex problem that discourages students and faculty from integrating new technologies into higher education courses. Students are concerned about how difficult it is to have 24/7 access to computers or networks to complete their homework or research. International students have many difficulties with language because much of the software and applications are in English and phrased in jargon with which they may not be familiar. Many international students use ICT to complete their assignments, but they must first learn the basics of a software application language [3].

Alshehri and Drew [7] described the challenges and barriers affecting the adoption of e-government services in Saudi Arabia. They found that there are organizational, technical, social, and financial barriers. They ranked and evaluated these findings based on the results of an online survey. According to this study, technical barriers and challenges are a significant problem in integrating ICT in Saudi Arabia, and among these problems is ICT infrastructure; 62.8% of respondents said that weak infrastructure IT is considered the main problem if the old infrastructure has not been upgraded or if there is no network file server, etc. Alshehri and Drew [7] concluded that the following recommendations should lead to better implementation of e-government services in Saudi Arabia.

For example, they suggest a strong and modern ICT infrastructure in all Saudi government organizations and agencies.

In recent years, their scope has broadened in terms of the expanded role that barriers play in a particular field and especially in the higher education system. Alturise [3] examined the problems in successfully integrating ICT into learning and teaching in educational environments in Saudi Arabia. He concluded that many studies have found that teachers lack technological literacy and confidence in using computers in educational contexts. Furthermore, the lack of effective training means that there are not enough opportunities to use ICT. To make matters worse, lack of access to resources prevents teachers from integrating new technologies into their work.

Barriers at universities often result from a lack of the right IT infrastructure, such as good buildings, appropriate equipment, servers, networks, etc. When systems do not function properly, this can result in important data being lost or corrupted [3]. Students typically do not have enough income to buy or rent rapidly changing hardware and software technology, and therefore how much money is spent on a higher education system IT is critical. Studies show that students in developing countries such as in Africa do not have integrated IT systems that lack support and services to facilitate their learning [3]. In addition, lack of access to resources is a complex problem that prevents students and faculty from integrating new technologies into university courses. Students are concerned about how difficult it is to have 24/7 access to computers or networks to complete their homework or research. International students have many difficulties with language, as much of the software and applications are in English and worded in jargon with which they may not be familiar. Many international students use IT to complete their assignments, but first need to learn the basics of a software application language [3].

Alwani and Soomro [8] investigated the barriers of Information Technology (IT) in science education in Yanbu School district in Saudi Arabia through a survey. Their study revealed that some science teachers agreed on the following issues that prevented them from using IT effectively. They finally summarized all the findings into two interrelated issues – no specific budget for IT in school and lack of school funds to purchase hardware.

Alturise [3] discussed some e-learning problems in Saudi Arabia and presented some solutions to some of these problems. They point out the importance of developing IT infrastructure in the university which helps to create a safer environment where students can interact better.

Alturise and Calder [2] examined the challenges associated with the use of e-learning by faculty teaching Arabic to non-native speakers in the Kingdom of Saudi Arabia. He highlighted some challenges for the university including lack of IT resources in classes, slow network on campus, lack of motivation from the university to encourage students to use e-learning, lack of internet connection in classes, lack of training on the use of e-

learning, lack of internet resources on the university website on e-learning, lack of training for faculty to help them improve their skills on IT, and leaders who do not find it useful.

III. METHODOLOGY

According to Ref. [9], qualitative data can be obtained through interviews conducted face-to-face, by telephone or email, or in a focus group. We used semi-structured individual interviews with respondents selected based on their job responsibilities and knowledge of their organization's mission or purpose. Individual invitations were emailed to 35 professionals in Saudi universities and educational organizations; 17 replied that they would participate.

The participants included deans, directors or professionals in ICT, e-learning and distance education experts, and faculty members in computer science schools. Participants were sought from 10 out of 24 Saudi Arabian government universities that are listed on the Ministry of Education's website [10]. Most of these institutions are emerging universities that are either completely new institutions or comprise multiple campuses. Participants worked in different regions, were of both genders, and had various positions in the universities.

In seeking suitable participants, it became clear that many of the target universities, particularly those in the border areas or small cities, lack suitably qualified ICT professionals. This situation may be because most ICT qualified people work in the main cities in Saudi Arabia for lifestyle, salary, and convenience reasons. Moreover, many university websites do not include all the necessary information about a department's staff while others do not have any information at all. Finally, the title and structure of ICT and e-learning facilities vary between universities. These challenges led to the small number of participants contributing to this solutions strategies report.

Due to cultural issues, it was particularly difficult to identify appropriate women (only 3 out of 17 were female). For many institutions, there was no information about women who have or had a deanship or were employed in a department of information technology, e-learning, or distance education. Although one of the Saudi institutions is a female-only university and there is a deanship for e-learning and website, no individual information or contact details were available.

Where possible, interviews were conducted face-to-face, with the interviewer visiting the participants at their places of work. Where this was not possible because of transportation or availability limitations, Skype or telephone interviews were arranged. In each case, the interview discussed different aspects of the report and tried to link the data to their particular institution in Saudi Arabia. Following the interview, any missing information concerning certain issues was clarified by email.

The nature and extent of the feedback received from participants was different from participant to participant, partly because of their university and experience, but also because of their position. For example, feedback from participants with high level positions was generally cautious and indirect in character, whereas lower-level professionals were usually more forthcoming in their comments.

IV. PROBLEMS AND CHALLENGES

The "Effective Use of ICT in Saudi Universities: Problems and Solution Strategies" report identifies three main problem areas and associated challenges that are preventing the effective use of ICT in Saudi universities. These are outlined in more detail below, together with a summary of the feedback participants provided for each section.

Overall Feedback Summary: Most of the feedback from participants agreed that the report covers well the most important problems that Saudi Arabian universities face. New issues have emerged that add to current problems. Some experts think that these problems still happen in small universities and emerging universities but have largely been resolved in older universities. Faculty members and specialists in ICT and directors of e-services point out that not all universities in Saudi Arabia have these problems but they certainly exist in newer ones.

A. Poor Infrastructure

Many newly established universities lack necessary ICT infrastructure, which should incorporate student computer laptops, access to desktop devices and office-based Internet, Wi-Fi internet connections, smart classrooms, PCs for staff, and other software devices. Some new universities have acquired infrastructure as a consequence of merging with an existing university, but even then managing these problems is still critical, and leadership is frequently lacking in the IT department [3]. Good ICT management is especially challenging for universities with several campus sites; some universities have more than 20 campuses spread across different cities, which requires large budget outlays to keep the infrastructure functioning [11].

Feedback: According to the experts, many merging universities are suffering from infrastructure problems, especially those with several campuses that are geographically far from others, which has implications for poor distribution of budget and resources. One faculty member in an information technology school situated 400 km from the main campus of an old university said the college was underdeveloped and lacked the necessary infrastructure such as good laptops, Internet connection, and faculty staff who are experienced. Even universities with good budgets experience a problem in the distribution of money between colleges or dedicated IT sections. According to a faculty member in one computer science department that has a Deanship of Quality Assurance and Accreditation, managers responsible for the quality of university resources stated that e-learning and information technology do not exceed 20% of the attention required in this area.

Some also pointed out the problems caused by poor infrastructure in the community outside a university,

particularly in small villages or even small cities. In such situations, students do not have access to appropriate technology. According to one female faculty member in computer and information sciences: This will be a big problem because many students do not have a computer in the house and do not have an available internet connection at home. The problem is serious, especially for girls due to cultural reasons. This is one of the reasons for faculty members to avoid the use of technology especially if they do not have good infrastructure in campus.

The faculty member of an information technology school located 400 km from the main campus of an old university pointed out that the lack of Internet connection is very frustrating for students as well. This is because many students do not have the Internet at home. Internet availability is through cable and Wi-Fi is not everywhere.

In still-to-be-developed areas such as small towns and villages the Internet connection is very poor which will make it difficult to use this technology from home and in turn creates no interaction at all with the wider world. Moreover, the Internet infrastructure suffers everywhere in Saudi Arabia because there are not enough communication companies. In fact, only one company provides underground cables, a situation which creates no competition and poorer quality of services, and the big loser is the customer. Thus, communication companies should be encouraged to do business in Saudi Arabia so that competition can lead to better infrastructure.

The lack of systems or other systemic problems due to quality also reflects the reality of poor infrastructure. The director of the Systems Department in a new university said, "Failure to adopt the 'digital certification and electronic signature' for financial transactions led to a delay in transferring to electronic system for financial management". The dean of a Computer and Information Sciences College, who is also a consultant in e-learning and distance education said: I may add a barrier related to maturity of ICT in the universities specifically when talking about the integration between different systems. As it is known, universities have several information systems such as student information systems, learning management systems, and ERP, the main challenge that faces Saudi government universities is the integration between these systems.

B. Low Skills

University personnel often lack skills in utilizing ICT software and hardware, largely because of a shortage of training. Even where faculty members and other staff have good ICT skills, the poor skills of co-workers cause delays and inefficiency because the large gulf between skilled and unskilled colleagues results in duplicated work, lack of completed work, and communication difficulties. Furthermore, the lack of ICT skills in teaching staff has a 'knock on' effect for students who in turn lack skills because staff do not encourage them to use ICT in their studies or other administrative tasks [12].

Feedback: Professionals also added one very important point which is that there are not enough qualified people running the IT or e-learning department. Usually in Saudi

universities, choosing deans and directors depends on age and relationships and not qualifications, skills, and job performance. Some IT or e-learning deans or directors do not have enough of a technology background which means that communication between them and their staff and others causes problems. Even when they do have the power to change this situation, they still have the problem regarding lack of qualifications. Moreover, the number of qualified staff in IT and e-learning departments is not enough especially in emerging universities. A faculty member in one computer school said problems are not being solved due to the lack of plans and qualified people. He noted that because universities do not have specialist decision-makers, they are not willing to implement these solutions properly. It is very difficult for universities to bring in competent IT staff despite the opportunities in salary, the opportunities to develop, a suitable place to live, and other reasons. The director of a systems department in one northern university pointed out that the weakness of the salary scale makes it difficult to find suitable IT qualified staff to fill the important and sensitive positions in the university. Moreover, a director of maintenance and technical support officer in another new university pointed out how difficult it is to solve problems due to the small number of skilled employees.

University staff such as faculty members and administrative personnel also lack ICT skills. One faculty member at the School of Computer and Information Sciences in a new university in northern Saudi Arabia, commented that faculty and administrative staff have little experience with technology and this means that work is not completed in the Faculty of Humanity and Arts. The director of maintenance and technical support in another new university noted, "A large number of faculty members do not have the required skills to deal with the technology. In addition, senior administrative and faculty staff are often unfamiliar with modern technology, which weakens the technical culture among students and the importance of the use of technology in education".

C. Lack of Motivation

Many staff do not feel motivated to engage with available ICT technologies or systems. Often, faculty members and administrative staff do not use ICT in their work because they see such work as the responsibility of others, or because they see a lack of guidance from university decision-makers or policy-makers. They perceive that the workplace simply lacks the kind of support it should have, to encourage them to use new technology or update their skills. Poor motivation in employees and poor local work culture can have serious effects on improving skills and using ICT in the workplace. For example, a common problem is that faculty members with high teaching loads are not motivated to spend additional time acquiring new ICT skills, especially if they see their colleagues as having smaller teaching loads.

Feedback: According to the interviews, most universities experience a problem in motivating staff despite offering incentives in some areas. This situation

varies from school to school, department to department, and university to university because the legislation is not specific enough. This causes frustration between staff members. One faculty member and specialist in ICT and director of e-services said, "Most Saudi universities have the problem of motivation and incentives". A female faculty member in the education technology field said, "Some faculty members still do not wish to use technology due to lack of incentives". It is believed that motivation should originate at the high level decision-makers and directors in the universities and Ministry of Education, and should be supported by monitoring, infrastructure, and clear legislation and training. A faculty member in one computer science department with a Deanship of Quality Assurance and Accreditation pointed out that the university is largely interested in matters of e-learning and information technology, but quality has less importance. One faculty member at an information technology school pointed out the lack of monitoring from the Ministry of Education. Government officials may not care or there may be corruption in many universities which causes the lack of infrastructure in most universities to be endemic.

D. Other Suggested Problems by Participants

Another faculty member in a computer science department, who is also a trainer in a training center and who works in different technical positions in his university asserted, "We can also add 'technical monopoly'". He supports his suggestion that some specialists or skilled technical and communications workers do not have elite status and are not encouraged to provide leadership in their fields. Consequently, they try to avoid providing learning environments and training programs which are the proper solution. The head of one computer science department and vice-dean of e-learning in a merged university commented, "There are other problems but not primary problem such as the fear of losing the position or privileges and status after activating electronic systems or e-learning". The head of a computer science department in a new university said, "I guess the geographical nature of a university, newness (emerging universities), the unique characteristics of human factors, maturity for ICT, and lack of human resources are all crucial factors".

V. STAKEHOLDERS

Solutions to these problems must be linked to university policies and practices to be effective. The most important people who can help with these problems are university managers and directors who have the authority and responsibility for implementing ICT, technical staff and external partners who will implement and support the ICT infrastructure, and of course the teachers and administrative staff who will use ICT in their day-to-day work.

A. Decision-Makers

Decision-makers should choose a qualified and highly experienced IT team that can develop both basic and more advanced ICT solutions. The most difficult step is changing from an old system to a new one and this means implementing change at all levels in the university. IT leaders should ensure that staff are appropriately trained to deal with hardware and software issues. The decision-makers include university presidents, directors, faculty or departmental heads, deans, and senior administrative staff.

Feedback: Most of the participants agreed that decision-makers in both universities and Ministry of Education have the authority to implement these solutions. According to a faculty member in a school of computer and information sciences, and another who is on different committees in a new university (dean of e-learning), the senior levels in universities and Ministry of Education depend on having good, clear relationships to implement solutions. One faculty member in a computer science department and having Deanship of Quality Assurance and Accreditation, thinks that university decision-makers are not corrupt. They may simply lack awareness of technology or ignore its importance in the modern world. Others think that the fear of losing their position or privileges discourages decision-makers from promoting and implementing electronic systems or e-learning.

B. Technical Support

IT departments have many duties and they will have to re-plan their functions using qualified and experienced people. ICT infrastructure will have to be reconfigured so that it is used more effectively. Moreover, the Internet should be made available everywhere with the appropriate restrictions in place. Good technical support will help users use services in all campuses, schools, departments, libraries, and labs. Technical support includes IT departmental staff, IT staff in the schools, and IT staff in administrative departments.

Feedback: The dean of Computer and Information Sciences College and consultant in deanship of e-learning and distance education said the most important stakeholder is the dean of IT when solutions have to be implemented.

C. Teachers

Faculty teachers should be active by using ICT much more effectively. They must encourage students to use technology such as email for contact, access to electronic materials, submit assignments electronically, and learn about other features of the online learning management system. Teachers include full-time and part-time faculty members and training center staff.

D. Administrators

Administrative staff should understand the advantages of working electronically compared to paper-based systems. Administrators include all staff working at a university, such as full-time and part-time employees, and contract workers.

E. Other Suggested Stakeholders according to Participants

Some participants suggested other stakeholders that could be added to this list. One faculty member in a

computer science department thinks that telecommunications and ICT companies could serve as partners to support the implementation of solutions. Telecommunication companies do not provide enough services to Saudi universities and their internal and external stakeholders. There are not enough ICT companies providing services to universities. This is especially the case in small cities and villages because those environments are not conducive to doing business. Moreover, some think students are the most important stakeholders because the majority of services are directed to them and if they do not use the services, it is a pointless exercise. For this reason alone, Saudi universities have to facilitate services for students as much as possible.

VI. SOLUTION STRATEGIES

The report proposes solution strategies that can be categorized as either cultural solutions, which focus on the people involved and the way they work, or technical solutions, which apply technology to enable and support that work. Neither type of solution is sufficient without the other. Without technical support, the benefits of ICT will be non-existent. Without cultural support, the money spent on implementing ICT is likely to be wasted [6].

Feedback: According to the interviews, many professionals agree with most of the solutions and think they will be useful for many reasons. One faculty member and specialist in ICT and director of e-services said, "All solutions are logical and will help many universities but we have to start from the community and try to educate them first, and after it will be easy to implement other solutions". Some point to solutions which have begun to be implemented in their university and others have planned to implement them, which is an encouraging sign. A faculty member in a computer science department noted, "My university has the necessary resources, plans, and strategies for all information and communication technology solutions, but it needs to have parallel cultural programs which are strong and serious". On the other hand, a female faculty member in the education technology field in an old university thinks that technical solutions are effective and will change the user culture and resistance to technology.

A. Attractive Incentives (Cultural)

Universities should boost staff motivation by providing attractive incentives for improving workplace practices in the area of ICT. Universities have large government budgets and the money should be spent on training to learn incentive-related skills. This means in effect encouraging staff to improve their workplace attitudes and skills through the process of self-learning. Staff must be encouraged as much as possible to attend training courses and improve their sense of motivation and how to complete procedures, processes, and routines. that are ICT-based. Incentives will have to be evaluated by university decision-makers in terms of staff members' age, qualifications, experience and what will be required in the future [13].

Feedback: Two interviewees mentioned that there is an excellence award for distinguished users for ICT, which helps to motivate staff to use technology. Female faculty members in the education technology field in one old university point out how useful this excellence award is in motivating other staff at their university. Most of them point out that this kind of solution is already implemented in their university but there is no monitoring or control. The government gives a 25% bonus for any employees who use computers and a person's job title/position is linked to the technology being utilized. For this reason, many employees claim this incentive even if or when they do not use ICT effectively. On the other hand, some employees may use computers in their work but they do not get this bonus due to the nature of their work and duties. For example, in the past one university set several conditions to receive this bonus such as having a web page and many faculty members are paid to have a web page and send the link to the university administrative staff to obtain the bonus. Another suggestion is that universities can link yearly salary increases and performance to encourage expertise in ICT. The university has legislation and policies in place for any bonus or award with follow up and monitoring. Training is another important point for developing solutions effectively. The head of one computer science department and vice dean of e-learning in a merged university remarked, "The most important solutions from my point of view are attractive incentives with clear legislations, and equal training opportunities for all users to try to improve their skills".

Another faculty member of one computer science department noted, "There are some good technical incentives, for example, quality of systems, lack of systems' complexity, confusion and problems and having strong technical support". Moreover, the director of maintenance and technical support services in another new university remarked, "Keen users of the technology should be encouraged to use ICT everywhere. One of these effective solutions is using smart phones that take advantage of all available capabilities".

B. Up-to-Date Policies and Rules (Cultural)

Government and university decision-makers should update all universities' mission statements, policies, and rules concerning ICT and where and how it is used. Universities have to show staff these policies and rules and they should be worded in ways that give them the incentive to improve their ICT skills [14]. Penalties should be introduced if staff do not attain the bare minimum of ICT skills such as using email, organizing desktop spaces, online folders, etc. The university authorities should monitor staff usage and the specified minimum ICT services that are required in university teaching and administrative work [15]. This will be fairly easy because most staff are young and faculty members have worked or studied in overseas universities, such as in the USA, UK, and Australia where ICT usage is routine. Resistance against these policies and rules may

emerge from older staff who should be given time to adjust to the newer policies and procedures [5].

Feedback: According to the experts, many policies and rules have not been updated for many years which means that roles, accountability, and processes associated with information systems and information technologies are obsolete. For this reason, the Ministry of Education and Saudi universities have to start working together to resolve this problem. Some universities have started updating their laws and regulations but have failed to apply solutions so nothing has actually changed. The director of maintenance and technical support in one new university showed how important it is to send emails to all employees to educate and update them about the importance of information security and how to apply the concept of information security.

C. Comprehensive Usage Monitoring (Technical)

A comprehensive ICT usage monitoring system could track staff and student use of university ICT infrastructure, which would help university managers and IT leaders identify which sectors of the university are not making effective use of ICT services. Information gathered by the monitoring system can be used to support cultural solutions; for example, it could identify areas where incentives are not working well, or circumstances that cause policies to be ineffective. As an added benefit, the monitoring system can also serve to identify breaches of safety and security [16].

Feedback: Professionals have suggested this solution is very important because it is a requirement to verify other solutions, especially the application of policies and rules, and to make sure incentives go to the beneficiaries. According to one faculty member of a computer school, the university started to apply some solutions such as updating laws and regulations, but failed in the monitoring process so nothing really changed. This solution will allow staff to be more active in owning and using the technology and services. Female faculty members in the education technology field in an old university point out that comprehensive surveillance helps faculty members to compete when they know that there is a report sent to the college administration for their use. This was the first step to increase staff motivation. The dean of Computer and Information Sciences College and consultant in deanship of e-learning and distance education said, "Comprehensive usage monitoring and reporting" is a more precise name. Moreover, he is calling for the establishment of a PMO (Project Management Office) in the Ministry of Education to coordinate ICT solutions for the universities. Another faculty member in a computer science department pointed out the importance of statistical monitoring carried out by different levels of staff at the university, and the need to set standards of excellence when writing performance reports.

D. High-Quality Online Training (Technical)

Online training is an easy way to develop and update skills for staff and students. Universities should offer online training courses to suit a wide range of skill levels and needs. Staff should be required to demonstrate competence in the skills needed for their situation, with regular assessments to ensure skills are up to date and the results used to direct users to the training courses appropriate to their current skill level. To be effective, courses must be designed by specialists such as those employed or contracted by ICT companies who are familiar with university requirements [17–19].

Feedback: All professionals point out that it is very important to have training in their universities for users and stakeholders. Female faculty members in the education technology field in an old university point out that solutions will not be effective and continuous unless it is supported by training. ICT users should be encouraged to develop a minimum skill set to ensure the quality of work done using information technology. The director and dean of an e-exam department in e-learning and distance education in one of the oldest universities in Saudi Arabia pointed out how important it is to assess the results of these courses. For example, faculty members who want to use electronic or online lectures have to pass a basic distance education course on the latest modern technologies such as electronic e-exam systems or dealing with learning systems Learning Management System (LMS). Faculty members need to obtain at least 80% pass mark to get access to these online services.

One faculty member of an information technology school 400 km from the main campus of an old university said training should be for students first. If the students accepted this idea and the respondent had the all resources to go online, he would use it as well because education and teaching would become so much more efficient. Trainers can benefit from these courses because they can upgrade their positions or have their salaries increased. The director of the systems department in a new university noted that to increase the number of attendees in training courses, the university would need to officially certify all courses for these to have some benefit from the knowledge created. The director of maintenance and technical support in another new university pointed out the responsibility of educating staff through training workshops where new technology is emphasized. Moreover, a female faculty member in education technology commented on the need to "set up multiple training courses and workshops on how they can facilitate the use of technology in teaching", which would "help to increase motivation to use". She also pointed out how important it is to educate staff about every new technological development so that the necessary skills could be utilized. Finally, a faculty member and specialist in ICT and director of e-services said, "We do not need a lot of money to improve using ICT in university but we have to spend money to educate ICT users and instruct beneficiaries".

E. Universal Access to ICT Infrastructure (Technical)

Universities should make ICT resources available to all staff and students. Where possible, access should be provided to all the resources that can be found on the Internet. If such access is not possible or not desirable, for example in campuses that are far from the main

campus or that cannot afford universal access, a private staff-only Intranet should be implemented instead. Universal access to ICT infrastructure will encourage staff involvement in communication and collaboration, save time and reduce costs, provide access to business information and news, and facilitate online training and e-learning in the user's work context [20–22].

Feedback: Most interviewees agree that all universities have to provide suitable ICT infrastructure for all stakeholders and users at all campuses, colleges, schools, departments, and administrative offices. A good example was presented by the director of an e-exam department in e-learning and distance education in one of the oldest universities in Saudi Arabia. Here, 1000 tablets were offered to do e-exams and this had the support of the supervisor of the e-exam department with particular reference to solving problems occurring during the exams. A faculty member of an information technology school 400 km from the main campus of an old university said the ministerial committee should evaluate the infrastructure in all universities starting with their various branch campuses.

F. Other Suggested Solutions by Participants

The ICT director of one old university pointed out the need for technical support services to provide 24/7 phone services to solve students' and technical staff's problems. The problems are due to issues that include lack of familiarity with all the details of new technology and weak training provided to them. Most employees work on a contract basis and because they consider themselves only temporary, they see no need to participate in ICT training [23–25].

VII. CONCLUSIONS AND RECOMMENDATIONS

In response to information gathered from faculty, staff, and students in Saudi universities we prepared a report entitled "Effective Use of ICT in Saudi Universities: Problems and Solution Strategies". The report was reviewed by ICT experts drawn from a range of Saudi universities, with different roles and responsibilities, and different areas of expertise. Overall, the feedback provided by the experts confirmed the findings of the report. In addition, they suggested several additional barriers, stakeholders, and solution strategies.

We are currently revising the report in light of the feedback, with a particular focus on the cultural and technical solutions that are the key to solving problems. Although the solutions are specifically intended to improve the situation in Saudi Arabian universities, it is likely that they may also help other developing countries facing similar challenges.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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