Vision Plan for the Automation in KFUPM

Executive Summary

Final Report of the Task Group

September, 2000

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Introduction

KFUPM General supervisor has noticed that the way documents are archived is costing the university considerably in terms of space and management. He has put the issue as an agenda item before the Planning Committee. He met with the Chairman of the Information and Computer Science Department to discuss the issue. The meeting resulted in considering more aspects of document management besides just document archival. These include: document flow, advanced searching, and automatic classification. Moreover, the meeting resulted in the conclusion and the recommendation that the university vision of automation should be studied because of the great impact of automation on the effectiveness and efficiency of KFUPM processes and personnel. Automation would solve many problems that the university as a result will open the door for new advancements in several areas. The General supervisor has requested formal suggestion of the issues discussed. The suggestion was presented to the planning committee. The planning committee adopted the initiation of an automation vision plan project. Document management issues, electronic education, information visualization, effective use of communication, and evaluation of current academic and administrative applications were all suggested to be addressed in the project. The project was approved by His Excellency the Rector on May 2, 2000. A task group of ICS faculty was formed to carry out the project during Summer 2000.

Conducted Work, Studies and Employed Methodology

The task group examined all issues of automation that it was tasked to address. The philosophy that the task group adopted is that every problem our university faces might have already been faced by other comparable institutions and might have already been addressed. Therefore, instead of reinventing the wheel, we have to look around, examine, use the best practices relevant to KFUPM context and build upon them.

Work has been performed by the detailed examination of situation on two fronts. First, the external view of leaders and pioneers in respective areas and scrutinizing their practices to formulate appropriate best practices. The Internet was utilized very heavily to conduct extensive search of trends, practices, and case studies from the leaders in respective fields. The search results and the examined content was accumulated and categorized. That comprehensive collection is expected to give a head start for each of the issues considered.

The second front is one of a reflection of the prevailing internal situation within KFUPM. As much as the limited time permitted, a comprehensive examination of various organs of the university was considered for two simultaneous goals. First to understand how things work and analyze the system. Second, to view things critically, to identify limitations and bottlenecks so that they can pave the way for solutions. The task group has analyzed the findings of that study of internal organs of KFUPM and came up with appropriate recommendations. This executive summary report gives only brief highlights of the findings and recommendations.

Due to the sheer magnitude of the task at hand and the comprehensive nature of the work, the recommendations with detailed discussion have been categorized and arranged into six reports. Each of the six reports illustrates the findings and recommendations of the

task group in a specific area. In order to analyze the basis of the task group recommendations in certain area, the relevant report has to be consulted. The task group has also compiled and categorized enormous quantity of useful information such as case studies and recommended technologies in a readily usable form stored in CDs. A more up to date and evolving snapshot of the electronic version is made available as a website to provide a head start to those who may continue the work in implementing the recommendations. That web site will also maintain a categorized list of links to important organizations, consortia, leaders in respective fields, case studies, technologies, digital libraries, various products, comparative assessment of products etc.

Observations

While conducting the work, the task group has observed few trends and practices of different institutions and trends and practices within KFUPM. This section summarizes those observations. The different reports further explain those observations.

General Observations

- **Digital Divide:** Many universities and even small colleges around the world have adopted advanced automation solutions especially in electronic education. This has been a relatively new trend and is moving so swiftly, that the gap[1] between those who subscribed to automation and those who did not has been significant and is growing fast.
- **Automation Gap:** Since several of the institutions are resorting to joining consortia to share expensive development effort, it is time to seek that alternative rather quickly. However, in pursuing this option, the university may encounter a situation where cooperation with worldwide universities may not be possible if the lack of automation (the automation gap) remains as it is now in electronic education.
- **Planning Role in Achievements:** All pioneers whom the task group examined have developed information strategies, based on their business strategies, that set the goals they want to achieve and implementation steps to achieve those goals. Universities resources are then allocated to satisfy the goals and implementation steps. KFUPM lacks for such an information strategy that would help in developing technically compatible systems by providing a consistent approach to

[1] A particular kind of *digital divide*.

information technology across he university. Ad hoc development of many nice ideas cannot achieve excellence but may have scattered improvements.

- **Excessive Redundancy**: Excessive redundancy is observed in KFUPM operations. Redundancy can cause several kinds of problems, in addition to being wasteful. For instance, the same document may be filed in different departments, the same course/lesson/lecture repeated hundreds of times, the same topic might have been repeated in several courses within a program, the same information is recorded or entered more than once. All these redundancies are noticed throughout the university.
- **Lack of Scalability:** Some functions and operations of the university are very hard and expensive to scale up due to the current manual-processing setup. For instance, with the existing set up, it is extremely difficult to support, say 15000 students.
- **Automation is not cheap, but a necessity:** Adopting automation is an expensive solution. Not adopting automation is even much more expensive because the cost of running the administrative and academic functions of the university is rising tremendously to keep up with advances in technologies and coping up with the trends and practices. With the significant increase of the amount of work due to increase of size, functionality, or both and also due to the accumulation of documents and tasks, running the university in an efficient and effective manner is becoming harder and harder without automation. The cost rises would soon reach a point where it would be beyond manpower budget to keep running the university with the same quality. As a result, it is clear that the alternative to not taking up the automation – that too now – is that of decreasing quality and trailing significantly from leading universities.

Education Practices and Enhancements

- **Changing Nature of Education:** With enabling technologies based on the Web, different open standards, even nature of education is undergoing a rapid transformation. Traditional models are far from optimal in terms of the

possibilities that exist now, which were not available even five years back. For the first time, learner centric education is possible now with the technology enabled solutions providing cost effectiveness and the reduction of drudgery.

- **Participatory Experiential Learning, a key to shortened learning period:** New technologies for communication, groupware and participatory learning, and suitable supporting tools that can alter the nature of education in a drastic manner are becoming available now.
- **Diminishing Quality:** In terms of the education itself, the existing face-to-face traditional approach is falling behind leaders with its ability to 'educate' students according to its own 'lofty' goals. Diluted standards across the spectrum of colleges and programs are resulting in the loss of credibility.
- **Limited use of Tools in Education:** Poor utilization of technological tools to automate the mundane aspects of training, drilling, and testing. Likewise one can see very little use of visualization, simulation, design, and interaction tools in the various courses in different programs.
- **Rigidity of curricula and even subjects:** With the rapid changes in the technological development and increasing interactions among fields, there is this increasing need for regular updates to the courses and curricula, much more than what has been the practice.
- **Wasteful and Inadequate:** Due to the way the current sections are arranged, either it is wasteful to have such small classes for information dissemination or are too big when discussion and interaction are needed
- **Need to Upgrade Library:** KFUPM library used to be on par with the best of the libraries for a university of its size until about 1985. The contemporary situation is not as good. There are ways of significantly improving the quantity and quality of accessible materials through the gateway. Those improvements will still not be sufficient on their own, if KFUPM has to remain as a leader.

Information Role in the University Effectiveness

- **Incorporation of powerful Administrative Applications:** Many institutions developed centrally managed administrative applications to support the day-to-day operation and management of the institution. Those administrative applications not only provide virtually all-major central administrative services directly to students, faculty, and staff, but also provide University executives and managers with immediate access to accurate, timely, and appropriate decision support information. Those applications are typically integrated with one-another and have easy to use interface.
- **Development and Incorporation:** It took time to develop the above-mentioned systems. Development is usually incremental.
- **Inefficient Administrative Processes and Workflow:** Like many other universities, KFUPM has developed over the years an "impressive" cumbersome bureaucracy. Current administrative processes are inefficiently centrally controlled, highly manual, time and resources consuming, and paper intensive. Moreover, the University has evolved over time to an administrative environment of significant complexity, with myriad variations of administrative policy across the University. As in any large organization, complexity and variety add costs to administrative processes and make it difficult to implement streamlined, standardized services to faculty, students, and staff.
- **Inadequacy of Administrative Applications:** Current administrative applications of the University have grown over time in a non-integrated, component by component fashion. They have reached the end of their useful life and the University will not be able to make substantial and dramatic changes to its administrative processes without replacing the underlying technology that is at least two generations back. With the rapid advances in requirements and changing needs, the functionality of current applications is inadequate to suit the

new needs. As a result, most of the applications that were examined are not serving their purpose, requiring administrators to develop shadow information systems and to spend substantial time and effort to process routine transactions that span systems and produce summary information useful to decision makers

- **Poor Response**: Current applications, which are neither fully automated nor integrated, are causing efficiency problems to decision makers. This is evident in the poor response time to seek any meaningful information. For instance, it takes an average of 8 days for a participatory response to an upper level administrator for a routine question.
- **Expensive Endeavor:** Almost everything is very expensive at KFUPM. For instance, it costs about SR 80K to get a comprehensive report on the state of the university. KFUPM needs a minimum of SR 250K to graduate one student. These kinds of very large numbers are a symptom of lack of appropriate investment on automation earlier on which would show its results in the longer run.
- **Documents Filing System:** Current practice is one of manual filing of documents according to one's own classification system. For example, in the absence of a secretary, it might be extremely difficult to retrieve a certain document from its filing cabinets.
- **Lack of Document Content Classification:** University documents contain a huge amount of information. Because of the difficulty in accessing and managing these documents, it is very difficult to extract this valuable information, which can be easily retrieved using automatic electronic classifiers. Automatic electronic classifiers represent the state of the art technology used to classify and extract information from documents.
- **Lack of enforcement mechanisms against unauthorized operations:** Most operations occur in a healthy and trustworthy environment within the university. However, the mechanisms against an unauthorized operation are meager or non-existent.
- **Non-existent use of decision support tools, data mining:** The rationale and basis for a good amount of administrative activity is one of a direct experience and hunch. Even though several universities use extensive decision support tools

for taking sound decisions based on concrete data, none of such tools are known to be in use in KFUPM. This makes the decision making more expensive and less sound simultaneously. There is no data warehouse / data marts, or multi-dimensional models or any good information visualization tools for decision-making.

- **Over stretched faculty, staff, and students:** People from all walks of the campus, faculty, students, staff, and administrators have been stretched to their limits. A significant portion of that is quite meaningless through appropriate automation.

IT Infrastructure

- **Poor Networking and Connected-Classroom Infrastructure**: Significant progress has been made towards the campus connectivity. However, this pales in comparison either with the pace of technological development or with other leading institutions. In the entire university, hardly, a single classroom qualifies to be a modern classroom. If the metric of per person bandwidth to the Internet is considered, KFUPM cannot even match the bottom half of middle schools and high schools in USA, let alone universities of its size. Worse yet, even the available bandwidth is not utilized in an effective fashion, primarily due to the know-how and policies.
- **Limited Use of Available Communication Technologies and Tools:** Very little portion of the university community uses computer tools that can save good amount of time. For example, even though newsgroups exist, very few people either use them or participate in them. Likewise only a miniscule of population on campus use scheduling and calendaring services. This points to the need for addressing a change of culture and mindset of people.
- **Non-availability of Important Tools:** With the existing computer tools on campus, it is difficult to support several modern forms of communication patterns - for instance collaborative work and fine-grain access with traceability. Such

tools/packages need to be acquired to enable better learning experience to the students.

- **Lack of Security:** All the existing means of security are through age-old communication protocols that are easy to compromise. The mechanisms in place are weak. Even computer/network security is not up to the mark to withstand the attacks of professionals. Modern public-key encryption based security, smart cards supporting biometrics authentication, and significantly increased awareness and training to the staff are needed.

Support to Information Technology

- **Limited Scope of IT Build-up:** Decent support to PC hardware. A limited support to Network. Other important issues have negligible support if there is any.
- **Problems with the retention of qualified staff:** One of the major concerns of IT planners and directors is the issue of retaining the best talent. While there is a general concern about the issue, the leading institutions are less affected or concerned about this issue than most of the second-class institutions. There have been several techniques to mitigate with this issue. The ITC of KFUPM is facing this problem almost to the extent that there is little developmental work, since most of the effort is going into routine maintenance issues. A very serious issue is that essential IT tasks to university operations are dependent on the continuation of services of one individual. For example, university network operation is dependent on one person. KFUPM may face sever undesired consequence as a result.
- **Negligible Use of Student Talent:** One striking observation is the channeling of the student talent. Most North American universities provide an opportunity to learn by enabling students to take up part of the maintenance work and innovative projects under the supervision or guidance of full time staff. Such work would save the expensive staff time and fetch credit to the student.

Motivation for Change

Functionality of current systems no longer meets current organizational needs

1. Better education with lower long-run cost through the automation of many education activities
2. Pioneering in state of art education with the ability to cooperate with international consortia and leading institutions
3. Readiness to adapt to emerging technologies
4. Readiness to scale up the operations, if the need arises.
5. Opportunities to dramatically improve services exist.
6. Improving the reliability and the accessibility of university documents.
7. Saving the huge space occupied by university documents using imaging systems.
8. Being able to exploit statistical and managerial information from university documents.
9. Current administrative processes are inefficiently centrally controlled, highly manual, time and resources consuming, and paper intensive.
10. Underlying technology of current administrative applications is no longer supported or will not be supported in foreseeable future.
11. The cost of maintaining current systems is unreasonably high
12. Current systems will not be capable of supporting expected requirements
13. Poorly planned and executed projects virtually guarantee expensive failure.
14. Staff no longer exists to maintain the existing custom-developed system
15. An unexpected change to the financial situation (as in 1991/2)
16. Change in management (almost every new assignment brings a new vision and undoing of the previous one).

Goals

The observations, findings, and the resulting need for change call for the following goals to be pursued.

1) Excellence in Undergraduate Teaching through eEducation
    - High quality education through participatory, experiential learning; and
    - Advanced telecommunication and classroom infrastructure to support web-based education.
2) Excellence of Support and Seamless Administrative Services through Automation
    - Streamlined cost-effective administrative processes and workflow;
    - Information Technology Architecture that is flexible enough to accommodate future requirements as well as technologies;
    - Virtual provision of all major central administrative services directly to students, faculty, and staff over the Web so that these services are convenient and easy to use, and available 24 hours a day/seven days a week;
    - Empower University executives and managers with immediate access to accurate, timely, and appropriate decision support information that includes trend analysis, projections, and other services which are needed for effective management of University operations; and
    - Automatic document management.
3) Fostering Industrial and University Collaboration.
4) Excellence in Graduate Studies, Professional Education, and Research.

General Recommendations

To overcome the above shortcomings, and get ready for a fast emerging campus that renders to a good amount of automation the following general recommendations are made.

1. Even with the available facilities and infrastructure, effectiveness and efficiency can be enhanced with changes to the way different personnel put the technology to use. This requires a change to mindset, and enhanced awareness campaigns, and more important mandates from the administration on the recommended use of available information technology. These include: effective use of e-mail, news groups, WWW, scheduling & calendaring services, search engines etc.

2. The currently used manual implementation of university processes is fraught with several limitations. This situation requires attention on a priority basis so that all communication can occur through electronic media. All university services should be made available through a customizable university web site.

3. Some aspects of teaching quality can be improved with training sessions to faculty members without any substantial changes to the existing infrastructure. However, it is imperative that the necessary action is initiated to do a thorough analysis to plan and implement a fully connected, scalable, telecommunication and classroom infrastructure in line with the leaders in the field. Several leading campuses have already converted their classrooms into modern ones that fully support electronic education. The infrastructure, content acquisition &deployment or development of content will have to be developed in parallel.

4. In order to implement #1 and #2 and the infrastructure part of #3, a refocused ITC, which is capable of providing backbone IT services to other units of the University (e.g., systems development, computer operations, information center), as well as a standing IT advisory committee (ITAC) that plans, coordinates, and provides rules for Information Technology management activities throughout the University and oversees the progress and execution on the ITC side, are needed.

5. Initiation of a 24 hours x 365 days access to experts for either students or to the industry through the university website. This can be beneficial to the students initially. As the logistics are worked out and strategically recruited expert pool increases to address the specific problems with the industry, such a service can be a major income earner to the university. The scope and the kinds of topics for which continuous services are available can evolve with time and the committed resources.

Recommendations in a Logical Implementation Order

The recommendations of the previous section are expanded, rearranged to order them according to an implementable order as below. In line with the nature of this document, they are terse. Each of these recommendations is further explained and expanded with more technical details in the relevant reports.

1. Establishment of a separate standing committee 'Information Technology Advisory' (ITAC). This is in consistency with many other big universities, all around the world, where the information technology planning process is led by a separate standing committee. This committee should be charged with 1) developing a campus-wide IT master plan in line with the University strategic business plan; and 2) continuous identification, prioritization and resolution of IT issues, continuous assessment of progress, and continuous revision of obstacles within the context of the comprehensive campus-wide IT master plan. ITAC shall also observe that the following activities that affect planning are carried out: 1) convening campus-wide teams (ad hoc subcommittees and task forces) to research and define IT standards and policies; 2) publishing and promoting these standards and policies; and 3) maintain awareness of external IT standards and best practices among peer institutions and industry. This committee should represent all academic units as well as the major IT constituencies on campus to foster gathering of requirements better. It should have at least three sub-committees: 1) Infrastructure, 2) IT Utilization, and 3) Education and Training. The Education and Training sub-committee should closely coordinate and cooperation with the eEducation Board discussed in Recommendation 12. ITAC should be headed by the ITC director, and should report directly to the Rector.

   Membership: This committee can achieve its objectives with 2-3 members coming from CCSE, 2-3 members from ITC, and another 4-5 from the other

colleges and departments, and students in the University. The membership lasts for 3-years for each member. Every year, a third of the members retire and a similar number of new comers join the committee.

2. In line with the Task Group vision of making KFUPM an *e-University* and transform key relationships and services, as well as academic, outreach, and business processes through the use of Internet-age technologies and practices, it is critical that the ITC, with support form higher authorities, defines its *mission* so that it *ensures access to information and provides technological support for the advancement of the University's mission and goals by assisting student learning; facilitating effective teaching, scholarship, and service; and encouraging efficient administrative practices.*

   Accordingly, the ITC has to be empowered with adequate official authoritarian and control over the campus-wide IT-related activities. Changes in work practices and organization structures may be needed; even the overall organization of the University may be affected. For instance, for the sake of faster, unbiased IT-related decision-making, the ITC has to report directly to the chief executive officer of the University through the ITC director. This is consistent with the organizational structure of a large number of universities (with different sizes) the Task Group has investigated where it was found that there is a *Vice President position for Information Technology*.

3. **Initiation** of a massive education campaign (through project 'Creating Campus Culture to Support emerging Teaching and Learning Revolution') to significantly improve the awareness on the use and potentialities of productivity tools like e-mail, newsgroups, effective Internet search & browsing capabilities, scheduling and calendar maintenance etc. for administration, faculty, students and staff. In addition for faculty members & students exposure to presentation software, time & work management, questioning skills, XML/HTML, evaluation & assessment of learning, quiz/exam makers, and effective web searching skills need to be

addressed. The administration can support this by mandating that all communication should occur through e-mail and newsgroups and the university wide scheduling and calendaring services be used.

Duration: 1 year. **Budget:** 4 full-time equivalent persons release time

4. **Initiation** of '**Information Strategy Planning (ISP)**' project under the auspices of ITAC, with solicitation of requirements from the various colleges, departments, and administrative units. The outcome of this project is an Information Technology Architecture (ITA) for the future development of compatible integrated applications based on the university strategic business plan. The ITA includes criteria for deciding where and in what priority ITC should develop and maintain each application component, and standards for administering data, developing applications, and providing ongoing applications support. The ITA is composed of three basic (sub) architectures that are continuously maintained over the time: Information Architecture, Business Systems Architecture, and Technical Architecture.

   Duration: 1 year. **Budget:** 6 full-time equivalent persons release time

5. Establishment of a development plan of user-oriented systems to meet business information needs and priorities. Investigation of development alternatives, for examples: Re-engineering vs. Redevelopment; In-house development vs. Outsourcing; Consortiums-based development; and Hybrids. Provision of a learning opportunity to students enabling them to take up part of the maintenance work and innovative projects (as coop, senior projects, summer training, or even as course projects) under the supervision or guidance of full time staff. Such work would save the expensive staff time and fetch credit to the student. Encouragement of ITC/Departmental position sharing, summer faculty fellowships, and partnerships with selected ITC vendors.

6. Attract and Retain Skilled Technical Staff. Provide more attraction for programmers, system analysts, networking technicians, and LAN and microcomputer support personnel.

7. **Initiation** of a project for detailed investigation of the applicability of the *post-audit* mechanism in KFUPM *administrative processes* and *workflow*. The post-audit mechanism is expected to improve the current administrative processes and workflow that are characterized as being inefficiently centrally controlled, highly manual, time and resources consuming, and paper intensive.

8. **Initiation** of '**Automation and Digital Documents'** project that will develop and deploy a fully automated document filing and document-flow system with content classification. This enables filing, searching, classifying, and customizing the various kinds of documents from ones own browser.

   Duration: 2 years. **Budget:** SR 400,000. Savings from this project will be significantly more and the entire project pays off itself through its savings even within its first year of implementation. Please see the report on 'Document Management and Flow System' for further details.

9. **Initiation** of '**Smart Cards, Notebook Computers, and Connected Campus'** project that will simultaneously (in a boot-strapped fashion) (a) Increase the mandatory notebook computers (and eBooks) to KFUPM members with the ability to connect from any place on campus or from outside reaching 100% within a time-period of five years (b) Increase the percentage from zero to 100 in a period of 5 years the task of converting classrooms into modern ones with full connectivity to every student and facilities for instructors. (c) Overhaul the campus backbone as well as building (including dormitories/lines), departmental, classroom (or lab) so that many room-level networks will be wireless and the minimum building/departmental/campus-wide network bandwidth will be 1Gbps or higher. With the help of smart cards and digital signatures, it should be possible to have a single-ID and single login facility to make use of all authorized services

in a seamless fashion. (d) Promote the non-redundant development of eBook material for 50% of the basic courses by giving time off to faculty members.

Duration: 5 years. **Budget:** hard to characterize with technologies changing quickly and new products coming fast. A prudent strategy can be to divert a portion (say 25% initially but picking up to 75% by the third year onwards) of all the maintenance/lab/equipment budget of the university. No extra money is needed. The cost of Notebook computers can be recovered immediately due to the diversion of the money that would go into equipping labs and computer facilities, as they will not be needed, when every student has his own machine.

10. **Initiation** of '**University Portal'** project that will develop a single point entry for all the students, faculty, administration enabling customization. It integrates the results of document automation, academic and administrative applications, as well as the course content. Appropriate tools will be made available to each individual (students, faculty, content developers, administrators, and staff) according to the needs.

11. **Initiation** of '**Digital Virtual Library'** project that will be best of its kind in the region hosting various rare and classic documents as well as most modern digital books, reference material and journals. This can be done with collaboration with the several virtual libraries on the web.

    Duration: 2 years. **Budget:** An initial investment of SR 1,000,000 can provide the initial infrastructure and collaboration agreements. Subsequent regular overhead can be charged to courses and service users.

12. Form a separate entity[2], '**eEducation Board**' (EEB) that is responsible for the formulation of policies, quality control, content-classification and arbitration among departments, as well as testing & assessment. The eEducation Board might have some members from the ITAC, or at least it should closely cooperate and coordinate with the Education and Training sub-committee of the ITAC.

[2] This can equally be the 'Academic Excellence Center' with a new mandate.

Others members of the eEduaction Board should be from the academic departments.

Budget: a minimum of one-two experts each in policies, security, testing, assessment, software, telecommunications, and education as well as the necessary secretarial support.

13. **Initiation** of '**eEducation'** project that will develop/acquire content for various courses in a prioritized fashion, taking the currently 0% to 70% or higher in 5 years to maximize the use of electronic learning technologies to improve standards and address the issue of quality faculty shortage.

    Duration: 5 years. **Budget:** No extra money is needed; just diverting a portion of the faculty time that is currently going into several routine activities towards the development of quality content, assessment with a significant amount of automated assistance to the student to suit his level, maturity, and time.

14. **Initiation** of '**Asynchronous Counseling, Learning, and Consultancy'** (this simultaneously serves the contemporary roles of advisors, instructors conducting office hours through web, virtual help desk through the web, consultancy services to the industry by linking the problems to problem solvers through the web) project whereby services to experts will be available through the web, round the clock, 365 days a year. In a gradual fashion, within 5 years, attain the coverage of 50% or more of the courses offered by the university to have the continuous counseling.

    Duration: 5 years. **Budget:** No extra money is needed; just diverting a portion of the faculty time that is currently going into several routine activities towards the development of quality content, assessment with a significant amount of automated assistance to the student to suit his level, maturity, and time.

15. **Initiation** of '**Community Service and Mentoring'** project that will provide services to the students and industry throughout the Kingdom (or even wider if

need be) through a portal with reasonable charges to cover expenditure. This can be a byproduct of the previous project.

Duration: 2 years. **Budget:** No extra money is needed; just diverting a portion of the faculty time.

Overview of Attached Documents and Web Site

The work has grown to such a large scale that it was arranged into several logically consistent reports. In line with the modern trends, copies of these reports as well as consulted information is made available on the Web at URL: **http://automation.pc.ccse.kfupm.edu.sa/project/index.html** where the information gathered is collected, classified, arranged, and made fully using Internet browsers. The available information cover the following areas:

Set 1: Academic Applications
Set 2: Data Warehousing and Information Visualization
Set 3: Document Management
Set 4: Electronic Education
Set 5: Planning and Plans
Set 6: Technologies and Review
Set 7: Reports

The attached reports propose four different sets of projects to achieve the aforementioned recommendations: 1) Report 1 – Document Management Systems, 2) Report 2 – Electronic Education, 3) Report 3 – Computer-based Communication, and 4) Report 4 – Administrative Services. These projects cannot be useful without having the appropriate underlying infrastructure. Infrastructure-related projects are discussed in relevant reports as well as in Report 5. A softcopy of the reports is available in the accompanying CD.

Report 1: Automating Document Management Systems

This covers the issue of the problems faced with the current situation and a plan to rectify the situation through the initiation of project mentioned in Recommendation 8.

Report 2: Electronic Education

This covers the issues related to the electronic education, the problems faced with the current situation and a plan to rectify the situation through the initiation of project mentioned in Recommendations 12-15.

Report 3: Computer-based Communication & Information Sharing

This report addresses the various simple tools whose use can have a major impact on the overall effectiveness of every person, individually, and collectively. This is in line with Recommendation 3 and 10.

Report 4: Administrative Applications

The survey of existing administrative applications, their role, utilization, limitations are mentioned in this report. This is in line with Recommendations 1-2 and 4-7.

Report 5: Information Technology Infrastructure

This report discusses various approaches taken up other universities, their technological plans in upgrading their campus networking as well as a recommended plan for KFUPM. This addresses part of Recommendations 6, 9 and 11 related to IT staff, networking infrastructure and digital library.

Report 5: Planning

To steer the activities and development of the work with a clear long-term focus and reduce undirected fire-fighting effort, it is necessary to have a strategic plan that spells out a vision, goals, targets, and metrics for the assessment of fulfillment of those goals. In addition to that, annual and bi-annual operational plans taking into account the goals of

the strategic plan and budget need to be developed. This report provides guidelines for developing such by balancing realism with vision and keeping in view the financial resources. This is in line with Recommendations 1 and 4-5.