

# AALBORG UNIVERSITY



## Master Thesis

### Designing Examinations Information System Management: a comparative case study application of Soft Systems Methodology

By

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Supervisor

**Prof. Dr. Jeremy Rose**

Aalborg University – Denmark

March, 2011



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**Information Systems (IS) Unit, Department of Computer Science**

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## Abstract

Information systems development is considered socio-technical system design (Bostrom and Heinen, 1977). Technical system developments with conventional software development methodologies (lifecycle/waterfall approach, CASE tools, RAD, OOP) sometimes ignore important social and cultural factors, which may lead to failure of the information systems (Bostrom and Heinen, 1977; Bennetts et al., 2000). Soft Systems Methodology (Checkland, 1990) is identified as a potential approach for tackling such factors in messy ill-structured information system development problem situations. Many attempts have been made to integrate SSM with more conventional methodologies (Avison & Wood-Harper 1990; Savage & Mingers, 1996; Bustard et al., 2000; Lewis, 2008) and some recent developments are made by Mathiassen & Nielsen (2000) and Rose (2002). Conceptualizing work systems using SSM has been carried out in many studies (Kasimin and Yusoff, 1996; Sørensen & et al. 2010). However, almost all studies have taken a single organizations' work situation as their starting point.

This interpretive action research uses SSM to compare two work situations: the Examination Departments of Mehran University (MUET) and Aalborg University (AAU). MUET is a primarily manual system, whereas Aalborg is extensively computerized. The objective is to design an improved system for MUET. Standard SSM analysis tools are integrated with interaction and transformation models (Rose, 2002), flowchart tools (JAI, 1995), physical workspace models and user interface prototypes from contextual design (Beyer & Holtzblatt, 1998), and the process of organizational meaning model (POM) (Checkland, 1998). A systematically desirable and culturally feasible examinations information system model is proposed for MUET. Much inspiration can be taken from study of the computerized work process at Aalborg, but care must be taken to accommodate the underlying cultural differences.

## Preface

This master thesis report by **Saifullah Memon** is the conclusion of **M.S in Science and Technology Policy**. The work was carried out at the **Information Systems Unit, Department of Computer Science- Aalborg University, Denmark** from **September, 2010 to March 2011** under supervision of **Prof. Jeremy Rose**.

The project investigated through novel approach of SSM (Soft Systems Methodology) to design examinations information system for Mehran University. An extensive thorough study of examinations department of Mehran University was carried out in comparison of examinations department of Aalborg University. Finally, a systematically desirable and culturally feasible examinations information system in relation of social, cultural and political situation is proposed.

This report is structured into eight chapters. Introduction outlines the background of research topic with clear understanding of the research problem and research objectives. Second chapter describes SSM research approach, and third chapter comprehends research methodology and research philosophy. Fourth and fifth chapters give analysis of the examinations departments of both universities; and their comparative analysis is discussed in chapter six. Finally, systematically desirable and culturally feasible examinations model is given in chapter seven. Chapter eight provides research conclusion.

In the last of report, supplementary worksheets (annexure) are presented to give reader supporting information. All references used in this report have been mentioned in the end.

**Saifullah Memon**

# Acknowledgement

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First of all I would like to say thanks to my parents and family whose support, encouragement and prays were all the time together with me to help.

Then, the most important person whose contribution in assorted ways made this research deserved special mention. His able supervision, valuable advices, and guidance from the very early stage of this research as well as giving me extraordinary experiences throughout the work are worth mention. Prof. Jeremy Rose really deserves special thanks and I am grateful to him from core of my heart.

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Moreover, I can not forget help and support of Prof. Marianne Georgsen & Thomas Ryberg, Department of Communication and Psychology during my initial stay at e-Learning Lab. I am thankful to both of them.

I am grateful to my University specially Prof.Dr. A.Q.K.Rajput, Vice chancellor of MUET; Prof. Dr. M.Asam Uqaili, Pro-Vice-Chancellor of MUET, Prof. Dr. Tauha Hussain Ali, Registrar of MUET; Prof. Dr. B.S.Chowdhry, Director IICT and Prof. Dr. Roshan Shah Rashidi, Co-Director MUISTD whose help and support made me enable to carry out this work. I really appreciate their untiring and thankless efforts taken for me at each step of my life and career. I dedicate all my sincere services to them and wish bundle of prays.

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**Saifullah Memon**

# Designing Examinations Information System Management: a comparative case study application of Soft Systems Methodology

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## List of Acronyms:

S.No.	Acronym	Description
1	AAU	Aalborg University-Denmark
2	CASE	Computer-Aided Software Engineering
3	CATWOE	Customers, Actors, Transformation Process, Weltanschauung, Owners, Environmental Constraints
4	CS	Computer Systems
5	Dept.	Department
6	EL	Electrical
7	ES	Electronics
8	Govt.	Government
9	GPA	Grade Point Average
10	GUI	Graphical User Interface
11	HEC	Higher Education Commission of Pakistan
12	ICPC	Information & communication processing center
13	ICT	Information and Communication Technologies
14	ID	Identification
15	IS	Information System
16	ISD	Information System Development
17	ISO	International Standard Organization
18	IT	Information Technology
19	JAD	Joint Application Design
20	LAN	Local Area Network
21	MIS	Management Information Systems
22	MUET	Mehran University of Engineering & Technology, Jamshoro-Sindh-Pakistan
23	OCR	Optical Character Recognition
24	OMR	Optical Mark Recognition
25	OOP	Object Oriented Programming
26	PC	Personal Computer
27	POM	Process Organizational Meaning

28	QEC	Quality Enhancement Cell
29	RAD	Rapid Application Development
30	RSD	Rapid Software Delivery
31	SE	Software Engineering
32	SMS	Short Message Service
33	SOPs	Standard Operating Procedures
34	SSM	Soft Systems Methodology
35	STADS	Study Administration (student online self service system)
36	SW	Software Engineering

## Short Definitions:

<b>AAU</b>	Aalborg University-Denmark
<b>Both Models</b>	Examinations Departments of Mehran University & Aalborg University
<b>Checker</b>	Who checks and verify both results (internal/external) at Mehran University-Jamshoro
<b>Computer Cell</b>	One of the sections of examinations department of Mehran University-Jamshoro
<b>Conduct Section</b>	One of the sections of examinations department of Mehran University-Jamshoro
<b>External examiner</b>	External examiner from outside the university
<b>Internal examiner</b>	Subject teacher who has taught the course (within same university)
<b>Ledger</b>	Final tabulated results sheet of the students at Mehran University-Jamshoro
<b>Model</b>	Examinations System
<b>MUET</b>	Mehran University of Engineering & Technology, Jamshoro-Sindh-Pakistan
<b>Problematic situation of the real world</b>	Examinations Department of Mehran University
<b>Remuneration</b>	Honorarium for examinations duties to teachers and staff at Mehran University-Jamshoro.
<b>Repetitive Activities</b>	Figure: 4. 11 (The same activities are carried out separately for undergraduate, postgraduate and affiliated colleges/institutes at Mehran University- Jamshoro).
<b>Scripts</b>	Written answer copies of the students at Mehran University

<b>Secret Section</b>	One of the sections of examinations department of Mehran University-Jamshoro
<b>Sessional Marks</b>	Attendance, class tests, assignment marks during session at Mehran University-Jamshoro
<b>Stakeholders</b>	Students, Faculty, Staff, Officials & Officers, University Authority & Govt./Autonomous bodies.
<b>Tabulator</b>	Who tabulates all students' results in final result sheet

## Chapter # 1

# Introduction

### 1.1 Introduction

Developing and implementing Digital Integrated Information System refers to the interaction between people, algorithmic processes, data and technology which is not only limited to the use of ICT, but also to the way how people interact with this technology in support of their own business processes (Kroenke, D M, 2008). Information System with an easy web-based centralized user interface, can help to store, retrieve, manage, monitor and control activities and data with on demand output by use of “technology management” process. “Technology management” is a process, which refers to planning, directing, controlling and coordinating the development and implementation of the technological competences for accomplishment of the strategic and operational goals of the organization (Task Force on Management of Technology, 1987) (Shu-hsien Liao, 2005). This can accelerate routine activities and administrative processes and can also guarantee secure, reliable and cost effective information management, by ensuring the effective use of the resources of the organization. As the President of Edcom, Robert Heterich, shares that “Today you're looking at a highly personal human-mediated environment. The potential to remove the human mediation in some areas and replace it with automation-smart, computer-based, network-based systems is tremendous. It's gotta

happen" (Noble, 1997) (Grineski, 1999). For the success of any organization, quick access to the updated knowledge is key player to the "information economy". The information and communication technology infrastructure, which provides strong and open platform for data communication, information sharing and supporting organizational activities, is totally based on powerful computing and network technologies. Information computing provides powerful information processing capabilities, for which the network provides standards and connectivity for digital integration (Shu-hsien, 2005). The use of ICT and specialized information systems have become need of time, and the computer and telecommunication technologies are counted very essential for the survival of any organization. The use of personal computers and "ready-to-use softwares, have accelerated the diffusion of computer-based information systems" everywhere to support business activities (Ryker, 1995).

The specialized softwares, to meet organizational goals, are usually designed for specific needs of the business. This involves some methodological approaches to design a system. There are a number of different information systems development methodologies, such as "lifecycle/waterfall approach, CASE tools, prototype, RAD/RSD, JAD, and object-oriented methodology" (Zhou) but more or less are focused on technical approaches which ignore other important social and cultural factors as part of the development. It is argued that these "technology-centered methodologies" are not enough in real world problematic situations "especially when the relevant situation is messy and ill structured, or when political and cultural factors

are prevalent in the organization” (Zhou). Many of the information systems fail due to lack of involvement of the social, cultural and political factors as a part of development, and more focus on the technical side, which ignores the real problems of the “real world”. Such considerations were also discussed by Bostrom and Heinen (1977) who argued to focus on “Socio-Technical System design” for the information system development considering the other necessary organizational factors. The same has been discussed by Bennetts, et al. (2000) who also mentioned the major failures of the systems development. “As a reaction to these perceived inadequacies, soft system methodology (SSM) (Checkland, 1990) is identified as a valuable candidate for IS analysis methodology” (Zhou). SSM is the methodological approach, which deals with such phenomena and tackles these issues, with the intention to improve the situation in “messy” and “ill-structured problems” (refer: Chapter.2).

This approach (SSM) (refer: Chapter.2) is used here, to develop examinations information system for higher educational institutions of Sindh Pakistan. The examination is a regular common feature of every higher educational institution and is to be observed after every certain period of time in the end of a term or semester. The ratio of students in the higher education institutions is being increased day by day, for which academic record and examination information handling has become a critical issue. Manual handling of students’ huge information and managing routine administrative activities regarding conduct of the examination is time consuming, expensive and has a greater chances of errors and mistakes leading to human

frustration. Specially the large institutions offering programs in diversified fields having affiliated colleges and institutes with huge intake of students, face a greater challenge, while maintaining their students' academic record by their examinations departments. The examinations department is the most sensitive and secret section and is the backbone of the Universities in Pakistan, which has a great responsibility to conduct and manage the examinations of the University. The department is also responsible for maintaining secrecy, confidentiality, integrity with transparent examinations system and fair practices. The examinations departments of higher education institutions of Sindh are mainly driven manually and no specialized computer based information system is developed to integrate all functions of department.

Higher education (post-secondary education) refers to the undergraduate and higher level, including postgraduate diplomas, certificates, or research and development activities (HEC Ordinance, 1999). The overall higher education institutions in Pakistan are controlled by a regulatory body, which is called Higher Education Commission of Pakistan (HEC-a). There are 34 Universities in Sindh, in which 12 public and 22 are private (HEC-b). In order to streamline the smooth working and reduce the manual work in the Universities, the Higher Education Commission of Pakistan has been working on many different projects including the Campus Management System to facilitate the students and staff and has also provided a system to some of the Universities (HEC-c). Keeping in view the importance of the problem to reduce manual work, and paper based filing system, which creates errors and delays, the higher

education commission itself has taken so many steps to increase the performance and productivity of their employees by maximizing the use of ICT and automated systems, and at the same time has emphasized to the Universities to adopt it (HEC-d).

## **1.2 Research Objectives**

This study focuses on the same problematic situation (lack of organized examinations information system) of the higher education institutions of Sindh-Pakistan, and tries to solve the problem by improving the situation with an organized information system. In this regard, a detailed study will be carried out by thorough understanding of the organizational structure and working information system of the examinations department of Mehran University of Engineering and Technology, Jamshoro as a case study. This case study (MUET) will further be explored in comparison of the examinations department of the Aalborg University, Denmark to find out limitations of examination information system of MUET (refer: 6.4 ) and strengths of examination information system of AAU (refer: 6.3). The study will be focused on systematically desirable and culturally feasible changes, to be adopted by MUET examinations model in its social, cultural and political context (refer: 7.1). Finally, in comparison of both examinations models (MUET & AAU), an effective improved model of Examinations Information System for the Mehran University in its own context will be proposed. This new improved model (refer: Chapter 7) will be a secure, reliable and transparent examinations information system, capable enough

to store, retrieve, manage, monitor and control the examinations records, by ensuring the effective, error-free and prompt service to the stakeholders (Figure: 7.2) (students, faculty, staff, management, govt./autonomous bodies).

### 1.3 Research Model

Research Model

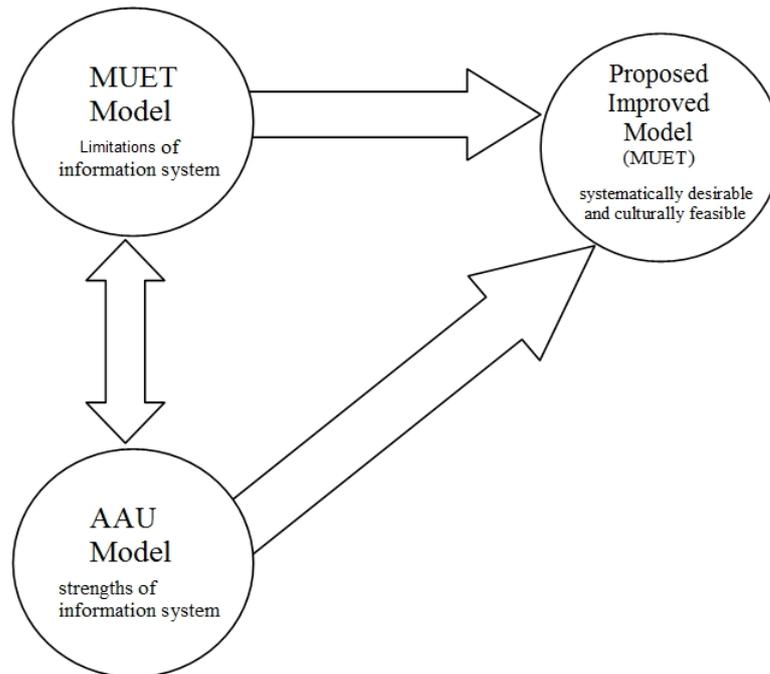
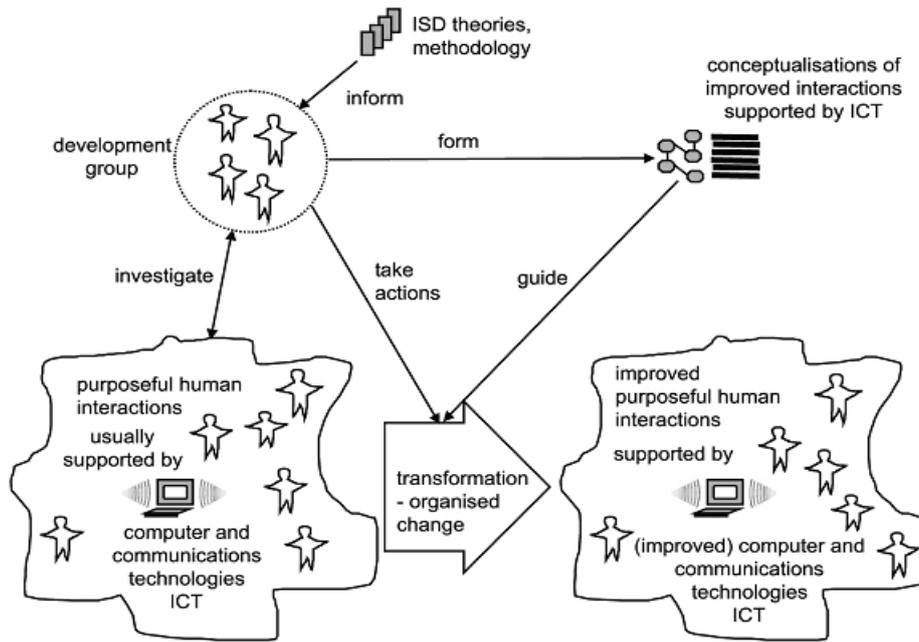


Figure: 1.1 Research model

MUET = Mehran University of Engineering and Technology, Jamshoro-Pakistan.  
 AAU = Aalborg University, Denmark.



Source: Rose (2002)

Figure: 1.2 Research model-interaction & transformation

### 1.4 Research Activity Model

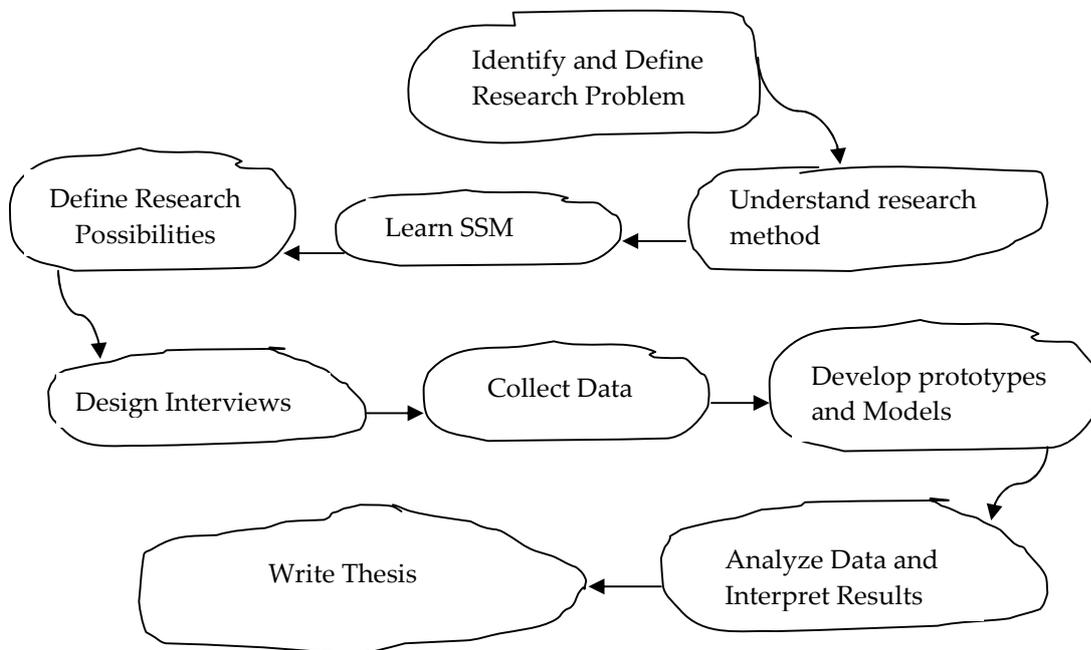


Figure: 1.3 Research activity model

## **1.5 Research Problem Definition**

The Mehran University of Engineering & Technology, Jamshoro, one of the top Engineering Universities of Sindh Pakistan, ranked as No. 1 on the HEC ranking (HEC-e) is internationally recognized as ISO certified. ISO is the International Organization for Standardization, which influences on the use of standardized practices in business processes, by maintaining the records and take corrective action for improvement of the processes (Wikipedia, 2011).

There are seventeen departments of various disciplines at MUET, where undergraduate and postgraduate studies programs are offered and the system of examinations is term system, where, almost after every six months, there is an examination (MUET). Apart from this, the University has some affiliated colleges and institutes also, where undergraduate and masters degrees programs are offered. There are two regular examinations around an academic year and two supplementary examinations. The whole University examinations are conducted and managed by an specialized separate department of the University called Examinations Department, headed by the Controller of Examinations and followed by Deputy Controller, Assistant Controller and supporting staff. There are more than forty staff members working in the different sections of the examinations department with their different job descriptions.

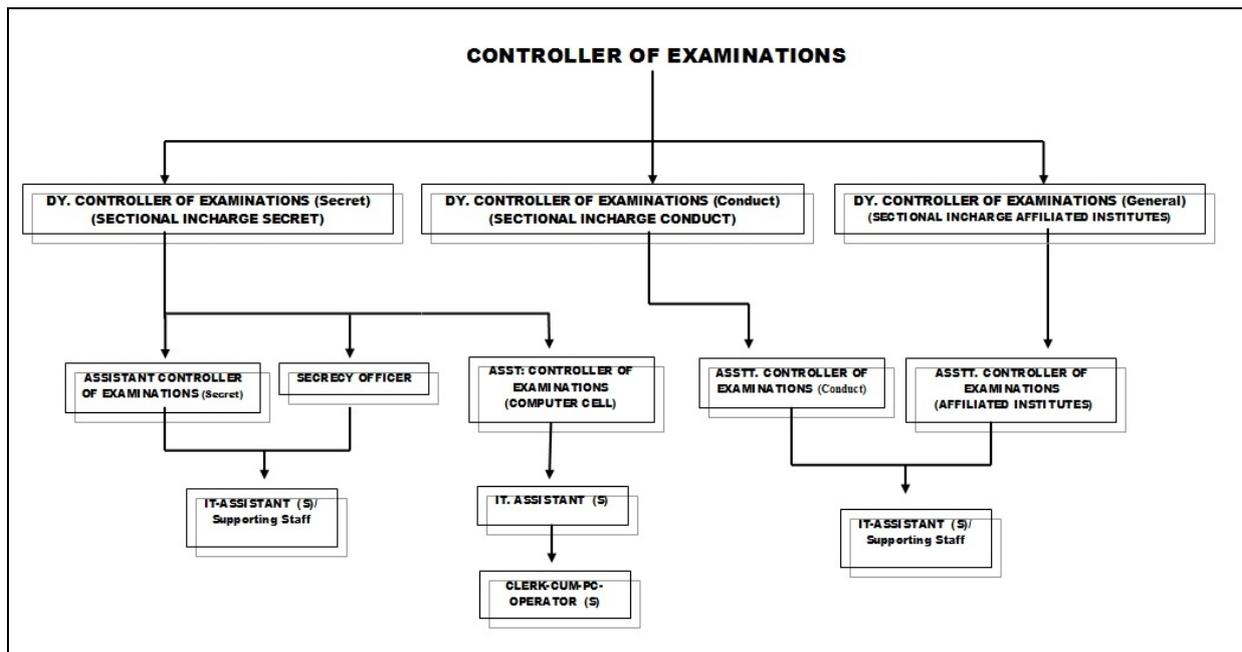


Figure: 1.4 Organizational chart of the examinations department of MUET

There are three sections in the examinations department; the Conduct Section; Secret Section, and the Computer Cell. The conduct section is responsible for activities of the conduct of examinations from scheduling timetables to hold the examinations, and keep secrecy of the question papers, while the secret section deals with post examinations activities, interact with teachers for results processing, and get developed result ledgers. The computer cell is responsible for developing and printing certificates and issues them to the students. All these activities of the sections are performed according to the SOPs (standard operating procedures) developed as per ISO standards of the university.

Due to heavy intake of students and increasing number of admissions in the University as well as in affiliated colleges, institutes and having four examinations around a year, the data of the students has become a critical issue to manage and retrieve timely. The current working information system in the examinations department of the Mehran University is not fully computerized. When the vast amount of student information and examination records are received at the end of every examination, the existing infrastructure of the examinations department face a lot of problems while processing the results. From processing of the results to developing ledgers for the results, almost all examinations activities (Figure: 4.11) are manual, paper based and repetitive, which take lot of time and labor which not only cause of human errors and delay in work, but frustration for the employees also. Moreover, the students face a lot of problems while facing delay in results, errors in certificates, delay in verification and getting a response for their queries. Sometimes, even other stakeholders such as government, autonomous bodies, higher education commission, Pakistan engineering council and other recruitment agencies can not get immediate response for their queries and data verifications for the students and graduates, which indirectly harm students or graduates' career by loss of job opportunities.

Rich Picture: A Diagrammatic Representation of the Problematic Situation.

Examinations Department- MUET

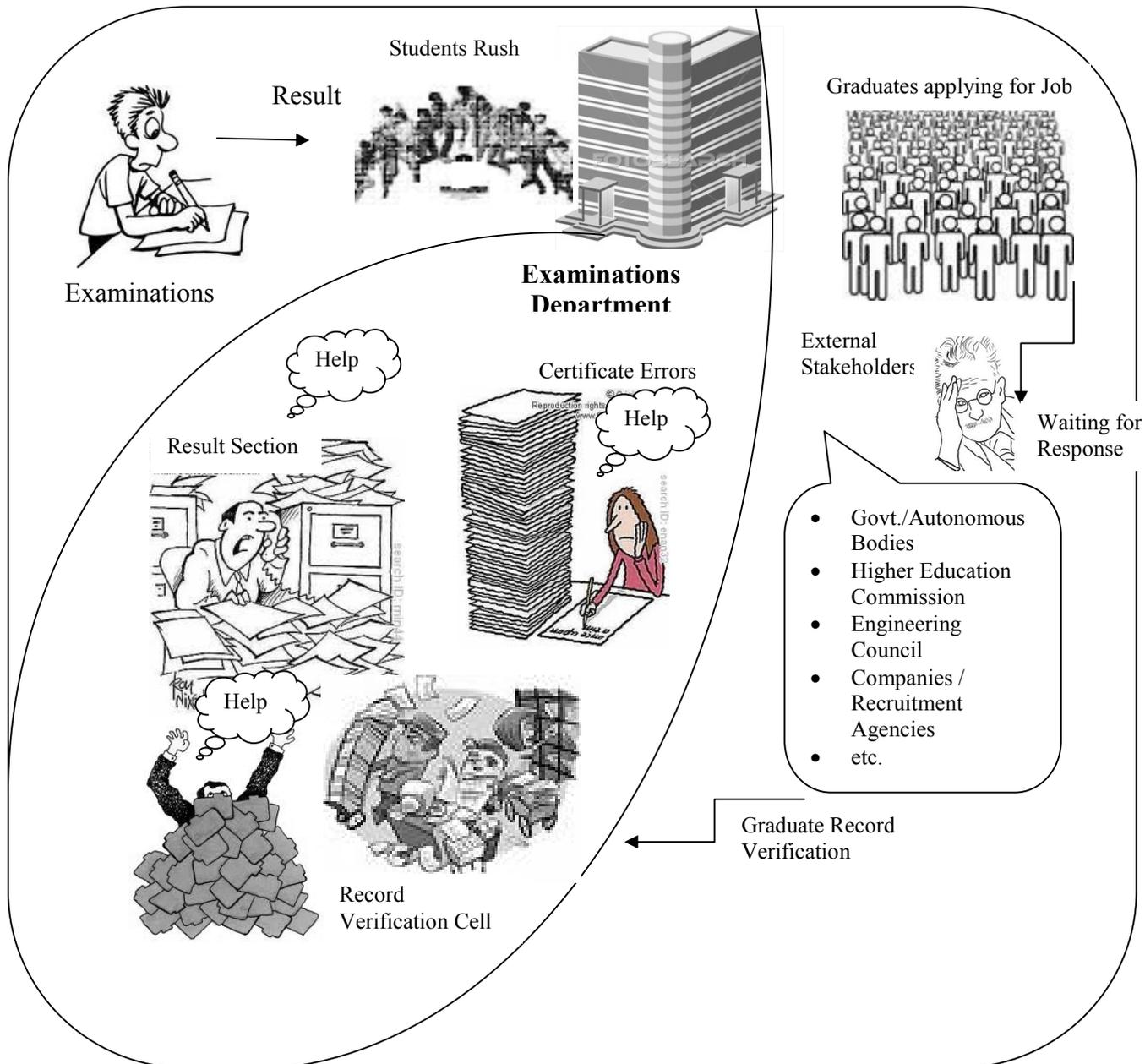


Figure: 1.5 Rich picture of problematic situation of MUET

Looking into the immediate problematic situation of the real world (MUET), and comparing it with a different contextual model of diversified culture (AAU) with focus on understanding human situations, the study will be carried out by using Soft System Methodology (SSM) (refer: Chapter. 2). Using Checkland's Seven Layered SSM (refer: 2.5), this study intends to improve the work situation of the examinations department by observing the working information system of the examinations department of Mehran University and comparing it with the examinations system of the Aalborg University Denmark, to propose new improved model. In this regard, different modeling and analysis techniques including interaction, transformation models, process organizational model, graphical user interface prototypes, and flowcharts tools will be used. The conceptual models, to express real world situation to the problem, would be developed in rich pictures and in relationship of the purposeful human activity, by formulating root definition and CATWOE analysis.

### 1.5.1 Root Definition

A root definition (refer: 2.5.3) is derived from the given formula as mentioned below which tells what the system will do and how it is to be done, by showing why it is being done.

A system to do **(X)** by mean of **(Y)** in order to **(Z)** (Checkland, 1998).

By putting our objectives of the new system in formula with relations to our problem we find:

A secure, reliable and transparent examinations system to store, retrieve, manage, monitor and control the examinations records (**X**) by means of developing and implementing integrated examinations information system (**Y**) that ensures the effective, error-free and prompt service to the stakeholders. (**Z**)

**Stakeholders:** Students, Faculty, Staff, Other Govt./Autonomous bodies

This root definition clearly indicates the main purpose of the system, which controls the examinations record through developing and implementing integrated examinations information system, which can provide an effective, error free prompt service to its stakeholders.

1.5.2 CATWOE Analysis: (refer: 2.5.4)

<b>CATWOE</b>	
<b>C= Customers</b>	Students, Faculty, Staff, Management, Govt./Autonomous bodies
<b>A= Actors</b>	University Staff
<b>T= Transformation Process</b>	Students' Examinations Record $\rightleftharpoons$ Error-free and Prompt Certificates and Reports to the End-Users
<b>W= Weltanschauung</b>	A Secure, Reliable and Transparent Digital Examination Information System ensures the effective, error-free and prompt service to the end-users.
<b>O= Owners</b>	The University Governing Body
<b>E= Environmental Constraints</b>	Higher Education and Assessment Standards

Table: 1.1 Relevant CATWOE analysis

The students are main customers of the system, who face a lot of problems while getting timely results, to know their academic status and get issue error free certificates due to unavailability of the automated integrated information system of the examinations department. Moreover, other stakeholders, such as faculty members who can send online student results and check student's academic record, or other Govt./autonomous bodies for degree verification, are also part of the system. Apart from this, the staff, who perform their labour intensive repetitive activities (Figure: 4.11) while dealing with students' record are important stakeholders

as well as actors of this system, while transforming the examinations record of the students into meaningful error free reports and certificates. A centralised integrated examinations information system (Figure: 7.5) can provide a secure, reliable and transparent management of the examinations record, with error free prompt service to the stakeholders (Figure: 7.2) rather than manual system, which always has greater chances of mistakes and errors (Figure: 4.4). This can relief to the staff members from labour intensive repetitive activities (Figure: 4.11), which are performed manually and cause human frustration also. Moreover, the University governing body has a power to execute or stop the system or make certain changes in perspective of environmental constraints led by higher education and assesment standards.

## 1.6 Research Question:

**“How do you use SSM to conceptualize a new computerized work situation by comparing the existing work situation with another (more computerized) work situation?”**

Looking into the immediate problematic situation of the real world (MUET) (Figure: 1.5), and comparing it with a different contextual model of diversified culture (AAU), this study addresses human situations with focus on social, cultural and political factors. Interacting in work situations, human take purposeful action that is worth to them and try to find accommodations to their intentions. This forms a human activity

system which needs to be understood well, while designing any information system to incorporate real needs of the users, with relevance to their social, cultural and political factors of the work situation.

Comparing two different work situations of different cultures address to the different information systems requirements with their own norms, values and human activity systems. Better understanding of these human activity systems can lead to form a well organized information system. Information system (Checkland & Holwell, 1993) is a serving system which serves purposeful human actions and provides “sound knowledge” that is not limited to the data manipulation together with people, but consists of meaningful “attribution, which is a uniquely human act” (Winter & Brown, 1995). The creation of software is recognized as a social activity (Bennetts & Wood-Harper, 2000) which incorporates the important social, political and organizational factors (Bostrom & Heinen (1977) and support human activity systems for purposeful action. There are number of information system development methodologies (Avison and Fitzgerald, 1988) which follow their technical system development life cycle (Winter & Brown, 1995) but, due to social, cultural and political considerations in a messy problematic situation, we have used soft systems methodology (SSM) (Checkland, 1981; Checkland & Scholes, 1990) (refer: Chapter. 2).

Using SSM we conceptualize the future work situation (of MUET) based on computerized information system, and attempt to study existing work situations, by comparing two models (less computerized-MUET and more computerized-AAU). We

focus on understanding human activity systems of both work situations (MUET & AAU) in relation of their own social, cultural and political parameters and try to identify strong features (systematically desirable and culturally feasible) of the computerized system.

Many attempts have been made to integrate the SSM with other conventional methodologies (Avison & Wood-Harper 1990; Savage & Mingers, 1996; Bustard et al, 2000) and some recent developments are done by Mathiassen & Nielsen (2000) and Rose (2002). Conceptualizing the work situations of the information system using SSM, has been carried out by many studies (Kasimin and Yusoff, 1996; Sørensen & etal. 2010) and a most related work is done by Rose (2002). Almost all studies have taken a single organizations' work situation as a model for change.

In this research we have used SSM in relation with two models study (MUET & AAU) with integration of other system analysis tools and techniques. Dealing with different social, cultural and political situations, with intention to improve the problematic situation, a thorough study of their work situations is carried out through observing their human activity systems. The activity model of the SSM is helpful to draw conceptual models (refer: 2.5.7) but is unable to focus on some minor, but most important activities or processes based on some decisions, which support major activities or processes (Figure: 4.11). The interaction and transformation models (Rose, 2002) also ignore such important minor supporting activities or processes which the flowchart technique (JAI, 1995) defines well. We have used the flowchart tool along

with interaction and transformation model (refer: 2.5.9) techniques to identify those human activity supporting activities or processes based on some decisions with intention to improve them. Further, identifying potential systematical and technological changes, by proposing organized information system, ultimately requires restructuring of organizational functions and physical infrastructure. This is why we have used physical workspace model and user interface prototypes of the contextual design (Beyer & Holtzblatt, 1998). Using concept of SSM in a different way, a two model study has been carried out, by comparing work situations of two organizations of different culture, and proposing an improved work situation model based on ones' strengths (more computerized) (refer: 6.3) and others' limitations (less computerized) (refer: 6.4) in its social context. To support this analysis, we have used process organizational meaning model (POM) (Checkland, 1998) (refer: 2.8). The information system models of both work situations are observed using interpretive (Klein & Myers, 1999) action research (Baskerville, 1999) approach based on unpredictable nature of immediate problematic situation, which is concerned with human situations, social phenomena, and field visits to observe behavior (Walsham, 1995). The nature of data is purely qualitative (Rowlands, 2003), which mostly deals with observations, notes, behavior and understanding real facts. Conceptualizing both work situation models by analyzing their information systems in their own context (social, cultural and political), the problem is identified, and a root definition is developed using seven stage SSM approach (refer: Chapter. 2). Comparing both work situations, future computerized information system ("systematically desirable" and "culturally feasible") model for problematic situation is proposed (refer: Chapter 7).

## 1.7 Research Methodology

In order to achieve research objectives and understanding both working models of examinations departments of Mehran University and Aalborg University, the extensive thorough study will be carried out by understanding their organizational structures and working information systems. Using Checkland's seven stage soft system methodology approach (refer Chapter: 2) both models (MUET & AAU) will be evaluated by means of certain parameters (strengths & limitations). In this regard, primary as well as secondary data will be collected using multiple data collection techniques. The work space physical model of the contextual design with prototyping (Beyer & Holtzblatt, 1998) and flowchart tool (JAI, 1995) will also be used in this research. Applying soft system approach (Checkland, 1990) along with interaction and transformation model (Mathiassen & Nielsen, 2000, Rose, 2002) techniques and using process organizational meaning (POM) model (Checkland, 1998) for comparative analysis of both models (MUET & AAU), new proposed improved model for examinations department of Mehran University will be proposed. This proposed model will ultimately provide a road map for the higher education institutions of Sindh to strengthen their examinations departments with the improved IS model to their stakeholders.

## **1.8 Research in Action**

Keeping in view the problematic situation of real world with intention to solve the immediate problem, the management of the University (MUET) took an initiative to find the best possible solution to improve the situation. This idea led to initiate action research to take immediate action and design an organized information system which can not only meet organizational information needs but should be enriched with social, cultural, political elements. It was hoped that the new system would serve human activities to meet its organizational goals and will improve the existing information system with enhanced computer based information system. It was further decided that, due to unavailability of well reputed IT-firms or their expensive systems with chances of their closure can affect after sales service, the information system can not be feasible to get it developed through outsourcing. The information system was decided to be developed through indigenous resources for which a software incubator was established in the University under the supervision of the chairman computer system engineering. The prime task of software incubator was to develop a computerized information system for the examinations department as well as for other needs of the different departments of the university. In this regard a special task force committee consisting on nine people; five people (new faculty members) as a member from faculty of computer system engineering, one member from a consultancy firm (private company) and one member from examinations department (officer) as an analyst (author) and one senior professor from the computer system engineering as a team leader, were selected where the chairman of computer

system engineering was focal person. This committee was later on reconstituted and in addition a full time professional developer was hired.

Prior to this research study, the research incubator was established and a preliminary investigation was started with number of discussions, surveys, site visits, interviews, meetings, observations and referring official reports/documents by the members of the taskforce committee at the MUET. The examinations staff was involved to provide their feedback and contribute to the development. The face to face meetings, discussions and work situations were thoroughly observed of the examinations department of MUET. Further, it was mutually agreed to develop a system with main focus on real requirements based on socio-cultural parameters and real organizational needs for which the end user was focused to be part of development. This was necessary to incorporate user requirements in the new system and make human activity systems stronger.

The system analyst from examinations department (author), with its wide professional managerial experience, was given this task to investigate for the development of systematically desirable and culturally feasible information system, which can be helpful for the professional system developer to incorporate in traditional software engineering approach. This led to the idea of choosing a methodology which is different from traditional technical software development methodologies, and has focus on social, cultural, political parameters to find

discourses, intentions and accommodations. In such a messy and unstructured problematic situation, the SSM- soft system methodology (Checkland, 1990) was chosen as the best solution to address such issues.

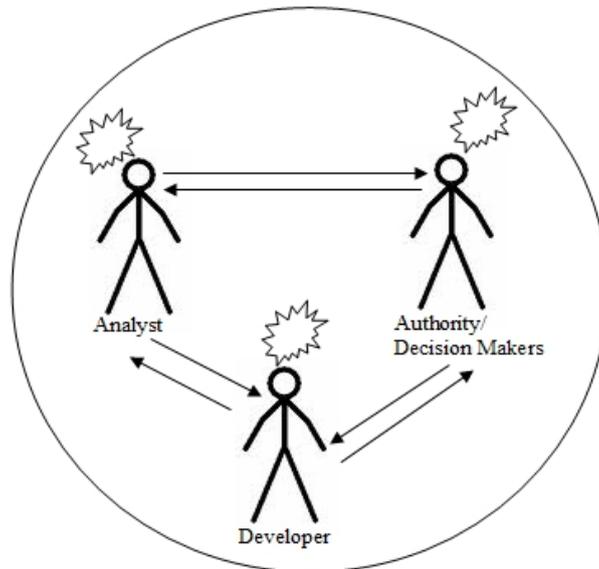


Figure: 1.6 Interaction between analyst, developer and authority/decision makers

Using, SSM approach the system analyst from examinations department (author) was able to understand well the organizational requirements of the information system along with user requirements in social, cultural and political context. He has been acting as the channel of communication between top management/ decision makers/ authority and system developers.

## **1.9 Scope and Limitations**

This area of research is very much of importance due to existence of large number of public and private sector higher education institutions in Sindh with continuously increased ratio of enrolments, where students' academic and examinations record has become a critical issue to manage. Almost all higher education institutions have same general procedures for examinations and routine tasks.

Currently, most of the higher education institutions of Sindh are facing a lot of problems due to inefficient or insufficient organized examinations information systems and all their activities are carried out manually.

This study will provide a roadmap for higher education institutions of Sindh to strengthen their examinations departments which can provide best possible customer services solution to their stakeholders. This research study will ultimately help higher education institutions of the Sindh-Pakistan in developing and implementing examinations information system and promote digital communication system in organizational culture.

Apart from this, there could be some limitations of this research study due to time constraints, which can ignore some other factors or areas of concern. The study focuses information systems development from soft corner (SSM) with social, cultural and political considerations, but may ignore some technical or practical issues. The study may not be applicable in all situations of different organizations

with different working nature but can help in improving working environment.

Moreover, the information provided here is based on facts received from both universities through different sources (primary & secondary) and may vary somewhere in case of updating sources. Some facts or areas of concern could not be focused more due to unavailability / restricted access to the confidential examinations information of both universities.

Further, the study can later be more expanded with different approaches and methodologies from different perspectives (technical, economical).

### **1.10 Structure of Thesis**

This research study report consists on eight (08) chapters. Chapter 1 gives brief introduction of the research topic, with clear understanding of the research problem and research objectives. Chapter 2 defines the research approach (soft systems methodology) which has been used as the base of this study. Chapter 3 gives basic understanding of the research methodology and research philosophy with detailed way of carrying out this work. Chapter 4 gives analysis of the examinations department of Mehran University of Engineering & Technology (MUET)-Pakistan and Chapter 5 gives analysis of the examinations system of Aalborg University-Denmark. Both university examinations models are discussed in Chapter 6 with clear

distinction and classification of their strengths and limitations. Chapter 7 proposes systematically desirable and culturally feasible changes for the examinations department of Mehran University and the last chapter 8 provides research conclusion.

References used in the report have been given in the end with annexure.

### **1.11 Research Outcome**

This action research will provide a roadmap for higher education institutions of Sindh to strengthen their examinations departments by implementing the new proposed improved model of integrated information system and provide best possible customer services solution to their stakeholders in their own context.

## Chapter # 2

# Soft Systems Methodology (SSM)

### 2.1 Soft Systems Methodology

There are number of different information systems development methodologies such as “lifecycle/waterfall approach, CASE tools, prototype, RAD/RSD, JAD, and object-oriented methodology” (Zhou) but more or less are focused on technical approaches, which ignore other important social and cultural factors as part of the development. It is argued that these “technology-centered methodologies” are not enough in “real world problem situations especially when the relevant situation is messy and ill structured or when political and cultural factors are prevalent in the organization” (Zhou). Most of the information systems fail due to lack of involvement of the social, cultural and political factors as a part of development, and more focus on the technical side, which ignore real problems of the “real world”. Such considerations were also discussed by Bostrom and Heinen (1977) & Earl and Hopwood (1980) who argued to focus on “Socio-Technical System design” for the information system development with considering the other necessary organizational factors. The same has been discussed by Bennetts et al. (2000) also mentioning in the major failures of the systems development. “As a reaction to these perceived inadequacies, soft system methodology (SSM) is identified as a valuable candidate for IS analysis

methodology” (Zhou). Soft systems methodology is the methodological approach, which deals with such phenomena, and tackles these issues with the intention to improve the situation in “messy” and “ill-structured problems”. This is “action-oriented” approach used for all messy problematic situations, where people take purposeful action, and is used in any field with maximum use in the field of information systems (Checkland & Poulter, 2006).

Soft Systems Methodology (SSM) was developed and introduced by Peter Checkland and colleagues at the University of Lancaster (Checkland, 1998), which is more focused on the human beings involvement, human situations, cultural considerations and ill-structured situational problems, and look into the system from managerial point-of-view rather than focus on the technical side (Checkland, 1998).

The SSM, which is “holistic systemic approach” was led by the failure of the “hard systems engineering (SE) approach in messy management problem situations” (Checkland, 1990), and provides “a learning methodology to support debate on desirable and feasible changes”. The distinctive feature of soft systems methodology, which counts to its strength is “its explicitly focus on problem formulation, by helping to identifying the relevant systems from the perceptions of possibly disagreeing stakeholders” (Hirschheim, 1997). Soft system methodology is not only a methodology but a “problem solving tool” based on “systems theory”, which reduces phenomena by breaking into smaller and smaller components to investigate

individually. This is has been used widely for the “information management”, “information strategy” and “business analysis”. The whole methodological approach is based on the seven layers, which can be known as the seven stages of the systematic enquiry of the soft system methodology, and are divided into two parts, the real world and the system thinking as shown below. The activities mentioned at 1, 2, 5, 6, 7 belong to “real world”, and activities mentioned at 3, 4 below the line are taken as system thinking about “real world”.

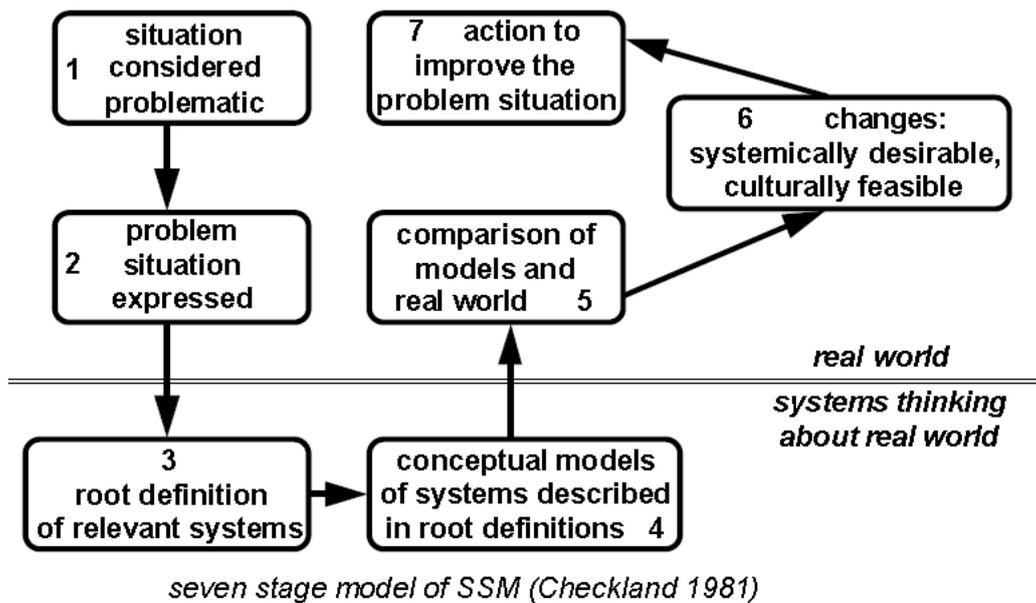
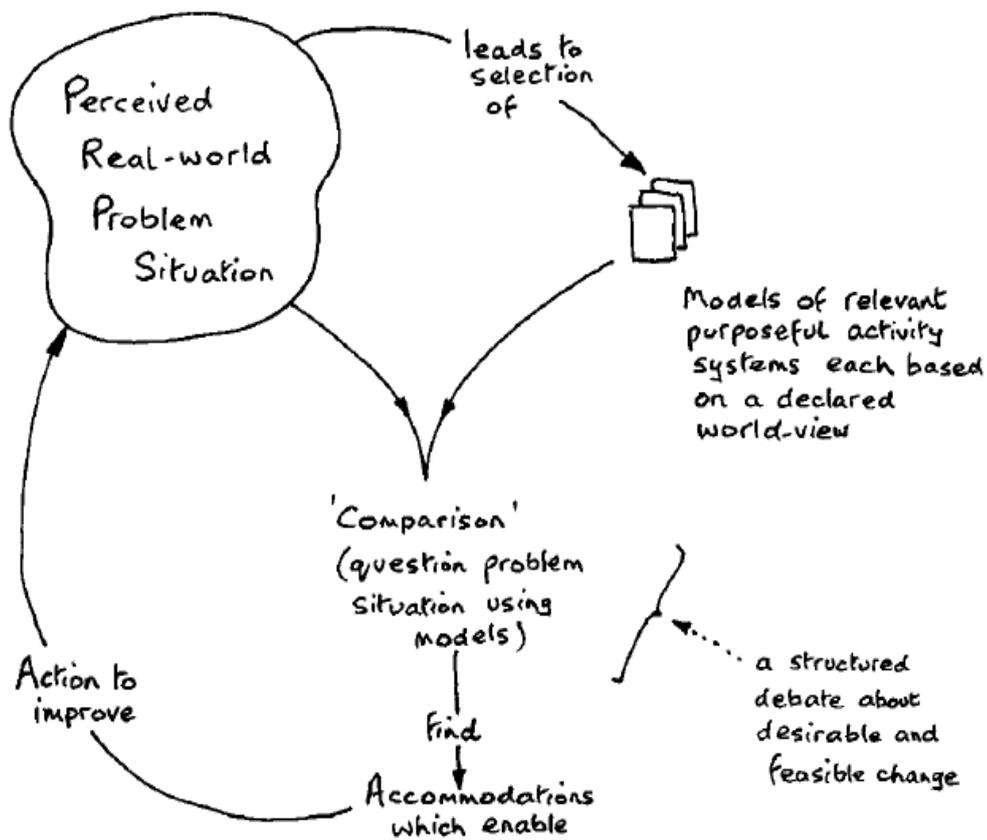


Figure: 2.1 Seven stages model of SSM

The following four “activities” clearly define the whole picture of the SSM and shape the definition.

- “1. Finding out about a problem situation, including culturally/politically;
- 2. Formulating some relevant purposeful activity models;

3. Debating the situation, using the models, seeking from that debate both (a) changes which would improve the situation, and are regarded as both desirable and (culturally) feasible, and (b) the accommodations between conflicting interests, which will enable action-to improve to be taken;
4. Taking action in the situation to bring about improvement” (Checkland, 2000)



Source: (Checkland, 2000)

Figure: 2.2 Inquiring and learning cycle of SSM

## 2.2 Real World

Opposite to theoretical or conceptual imaginary world, the real world is the factual problematic situation, where human beings take “purposeful action” in a systematic way, and observe real problems of “hard” and “soft” nature. Based on perceived view of the real world the conceptual models are developed to represent the real world and express problematic situation. The real world, which is “unfolding interacting flux of events and ideas experienced as everyday life “(Checkland, 1990), gives learning, and experience to the perceived world view observer to improve the situation. “Jenkins' idea was that the real-world experiences would enable us gradually to build up knowledge of systems of various kinds”, and that “this knowledge would support the better design and operation of such systems in real situations”. SSM was also the “result of 30 years of this kind of learning in real-world situations” (Checkland, 2000).

## 2.3 System Thinking

System thinking believes that a “complex whole can have properties, which refer to the whole and are meaningless in terms of the parts which makeup the whole”. It investigates the problem and phenomena into parts individually, which are interconnected and dependant on each other being part of the whole system as subsystems. Its core principle to have an idea of “emergent properties” to see

system as a whole has a meaning but the individual parts have no meaning (Checkland, 1990).

The system thinking is further classified into two concepts, which are “soft” and “hard” thinking.

### 2.4 Soft and Hard Thinking

The system thinking has been categorized into two “complementary traditions”, the “soft” and “hard”. Soft system thinking “creates the process of enquiry as a system”, and is considered for the “fuzzy ill-defined situations involving human beings and cultural considerations”. The world is seen as the problematic to the soft systems thinkers with the “believe that the process of inquiry into the world can be organized as a learning system” while the “hard” system thinking “takes the world to be systematic”, and is well suited for the “well-defined technical problems”.

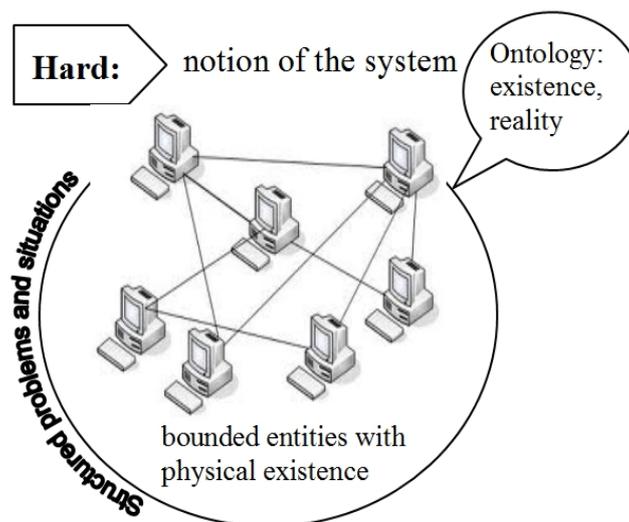


Figure: 2.3 Hard Systems thinking

For example: in organization, where man made physical system and mechanical devices are working can be easily predicted about their behavior and accuracy, which are called hard systems, but so for human activities, behavior, organizational and social problems are concerned, which are usually fuzzy, complex and ill structured are taken as soft systems (Checkland, 1990).

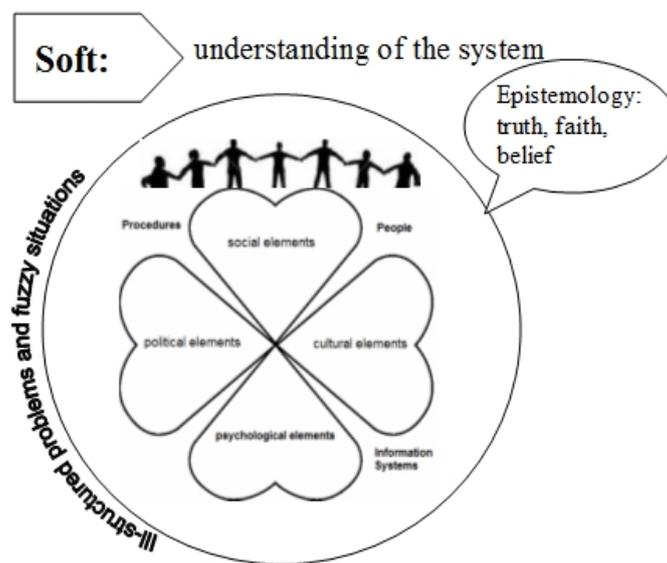
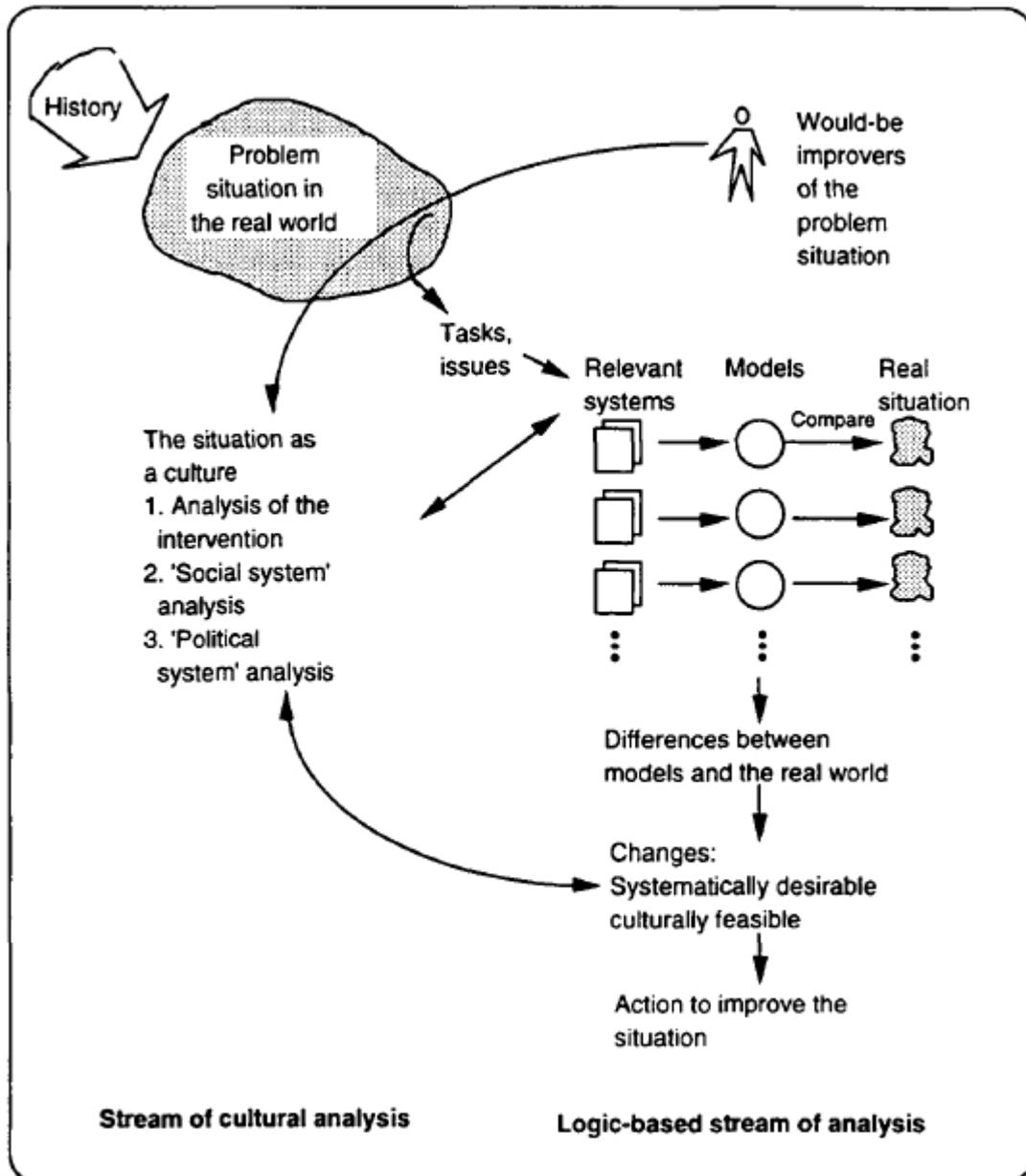


Figure: 2.4 Soft Systems thinking

## 2.5 Seven Stages of SSM

Soft systems methodology is a “well defined structure” based on seven “iterative stages” as defined in 1975 version, divided by “real-world” and “systems thinking” activities. In 1990 version, this model was replaced with a “two-stream”, “iterative process model” divided by “logic-based stream” and a “cultural analysis stream”. In

logic stream, there is a comparison between “relevant systems, models and the situation; determination of changes; and action to improve the situation”; and in cultural analysis there is “analysis of the intervention, the social system and the political system” (Baskerville, 1998).



Checkland, (1990)

Figure: 2.5 Process of SSM

Applying systems thinking approach in soft systems methodology, seven stages model of the Checkland go through complete process as per defined steps to solve the problem, by suggesting desirable changes feasible to the social, cultural and political situations. The conceptual models to express real world situation to the problem would be developed with rich pictures in relationship of the purposeful human activity, by formulating root definition and CATWOE analysis. In this regard the problem identification is the first and foremost important step on which basis the problem situation of the real world is expressed. Using “root definition” and developing “conceptual models” based on root definition can be compared to real world to propose desirable changes, which are socially, culturally, and politically feasible.

### **2.5.1 SSM-Stages-1 and 2: Preliminary Problem Identification**

In the first two initial stages of Checkland’s soft system methodology, the problem identification and express the problematic situation of the real world are the most important stages, where whole methodological approach is based to formulate the desirable solution. Rich-pictures are usually used to express the problematic situation of the real world to have a glance over the whole scenario in a nut shell that gives rich understanding to the problematic situation.

## 2.5.2 Rich Pictures

The rich picture is the artistic work of drawing pictures and diagrams showing connectivity and “relationship” between work processes, business functions, and its different elements to represent the whole scenario of the situation at a glance. This is widely used in the soft system methodology to express the problematic situations, which is much better way than the “linear prose for expressing relationship”. It requires somehow creative, and artistic approach and skills but not necessary, since its purpose is not good drawing but express the problematic situation in well. There is no particular hard and fast rule to draw pictures and sketch the situation (Checkland, 2000).

Moreover, in order to define the problem, “root-definition” is the best way to describe objective, and purpose of the proposed system (Zhou) based on the identified problematic situation.

## 2.5.3 SSM-Stage-3: Developing Root-Definition of Relevant System

### Root Definition

A root definition is the the short definiton of the main objectives of system in shape of mission statement, which tells clearly about the purpose of new system that what system will do, how it is to be done and why it is being done as per formula given

below (Checkland, 1998). A “well-articulated” root definition must consider the elements of CATWOE, which has a core objective to define purposeful transformation of the input to “new form” of output.

A system to do **X** by mean of **Y** in order to **Z**

what system will do (**X**), how it is to be done (**Y**), and why it is being done (**Z**)

#### 2.5.4 CATWOE Analysis

The CATWOE is “mnemonic”, which clearly defines the parts of the system through which the input is tranformed into meaniful output for which Weltanschauung or worldview makes it meaningful. The CATWOE is the basis for developing comprehensive root definitions, which clearly define purpose of the system. For example: main elements of system such as customers or real beneficiaries, which are directly or indirectly affected; actors, which are involved in transformational process, conversion of the input into output; world view, which justify meaningfulness of system; owners, who have power to run or stop the system with the environmental constraints, which can directly or indirectly affect system are discussed in CATWOE analysis.

<b>CATWOE</b>	
<b>C= Customers</b>	The victims or beneficiaries of transformation process
<b>A= Actors</b>	Those who would do transformation process
<b>T= Transformation Process</b>	Input $\rightleftarrows$ Output
<b>W= Weltanschauung</b>	The worldview that makes the transformation process meaningful in context
<b>O= Owners</b>	Those with the power to stop transformation process
<b>E= Environmental Constraints</b>	Elements outside the system which are taken as given.

Checkland, (1990)

Table: 2.1 CATWOE analysis

### 2.5.5 Weltanschauung: (world-view)

The “real-world”, where human beings taking “purposeful action” in a problematic situation led to the development of “human activity systems” models based on its own “weltanschauung” (Checkland, 1990). “Every model of notional purposeful whole, if it is to be coherent” is required to be developed according to its “declared world view or weltanschauung” (Stowell, 1995), because it is established fact that every observer has its own view of perceiving world. An “observer's terrorism is another's freedom fighting”; like that, “any purposeful or intentional action in real time can be perceived in many different ways” (Stowell, 1995). That’s why the models for “purposeful activity” are usually developed on basis of their own “weltanschauung” or “world-view” that makes the ‘transformation process meaningful’ (Checkland, 1990).

### 2.5.6 SSM-Stage-4: Developing Conceptual Models

This stage is very important that designs and develops the conceptual models for purposeful activity of the human situations in real world consisting on systematic activities, functions and processes, which clearly depicts the whole system by showing that “what is happening within the system” (Zhou).

### 2.5.7 Conceptual Models

Based on root definition built for the problematic situation of real world, conceptual models are developed for better understanding of the phenomena, and their interdependencies of the working relations between processes and business functions. This will lead to open discussions for feasible changes, and make comparisons between real world and conceptual models that become helpful for analysts as well as other non technical people to understand the situations easily.

Conceptual models are usually drawn with “rough bubble” drawings mentioning the activities in logical order interconnected with each other showing interdependencies with “symbol of arrows”. The activities are necessarily expressed in “verb noun phrase” (Checkland, 1990).

These models of “purposeful activity” developed with “linked activities” “carry out transformation process of CATWOE” together with other activities, which need

proper monitoring and “control action” for “operational system” to measure its performance and meaningful objectivity (Checkland, 2000).

### 2.5.8 Measures of Performance- Three E’s

This is monitoring and control mechanism to measure the performance of designed system as per defined “established” criteria and objectives mentioned in root definitions. The “notion of a transformation” can be judged easily to its successfulness or unsuccessfulness, by converting input to the output based on three parameters mentioned below (Checkland, 1990).

**E1: Efficacy** – “does the means” or system work? Or does the required transformation is achieved.

**E2: Efficiency** – to measure the efficiency of the system being worthwhile by comparing the achieved output with the required resources as input.

**E3: Effectiveness** – “does the system achieve its longer term goals?” as per defined objectives in the Z of root definition (Checkland, 1990).

### 2.5.9 Interaction and Transformation Models

Interaction and transformation are two useful forms of modeling in soft systems methodology well used by Mathiassen et al (1996, 2000) and Rose (2002). The interaction model, which “focuses on regularity” (Rose, 2001), defines “a domain and an interaction with this domain” (Mathiassen, 2000).

The interaction system is identified being “related to a domain with states, and where change of the domain is understood as transitions from one state to another”. “The human activities of the interaction system are those that are necessary to perform the interaction with the domain. The state of the domain will change but the activities maintain the structure of the domain as an invariant limitation. Each transition from one state to another is in this way governed by the structure of the domain” (Mathiassen, 2000).

The transformation model “focuses on change” and “defines a mapping between inputs and outputs with a particular focus on the overall change”. The “human activities involved in mapping some well-defined output” are identity of the transformation system. These linked activities, which are dependent on each other, are necessary for the transformation and conversion of input to the output (Mathiassen, 2000).

### 2.5.10 SSM-Stage-5: Comparison of Models (conceptual v/s real world)

In this stage, the conceptual models are compared with real world. This will lead to open discussions for “systematically desirable” and “culturally feasible” changes. Such kind of discussions take place in the real world, where usually four ways of making comparison are used, which are “informal discussion, formal questioning ; scenario writing based on operating the models; and trying to model the real world in the same structure as the conceptual models”. Among these ways, the second one which is formal questioning is widely used (Checkland, 1990).

Such discussions and debate in “real-world organization” is taken in “political arena” to pursue different “conflicting interests” and their “accommodation” (Winter et al., 1995), which are not only for improving the models but finding “accommodation between different interests in the situation”. This ultimately leads to the improvement towards “initial problem situation” (Checkland, 1990).

### 2.5.11 SSM-Stage-6: Identification of Changes (systematically desirable, culturally feasible).

Based on discussions and debates taken place in real world on the basis of conceptual models, the systematically desirable and culturally feasible proposed changes can be identified to improve the situation.

### **2.5.12 SSM-Stage-7: Action to Improvement**

This is the final stage of action taking for the implementation of identified proposed changes as conceived as a result of thorough discussions and analysis.

## **2.6 SSM and Information Systems**

SSM in the development of information systems plays an important role, and differs from other technical approaches. It has been widely used for “information management”, “information strategy” and “business analysis” due to its nature, which focuses on “social”, “cultural” and “political” factors. Since, the “information systems are part of social systems, and their use can not be specified wholly in technical terms” (Stowell, 1995). SSM is the appropriate and best fitting choice to meet such challenges and issues in real world for “messy” and “ill-structured” situations, where especially the concern is social and cultural factors. Using SSM in the development of information system, main concern is to meet real needs of the organization by generating meaningful information based on available data. The successful information systems are “created rather than simply designed” (Checkland, 1990) as per organizational real needs based on purposeful “human activity systems”, which depends on “serving system” and “served system” concepts.

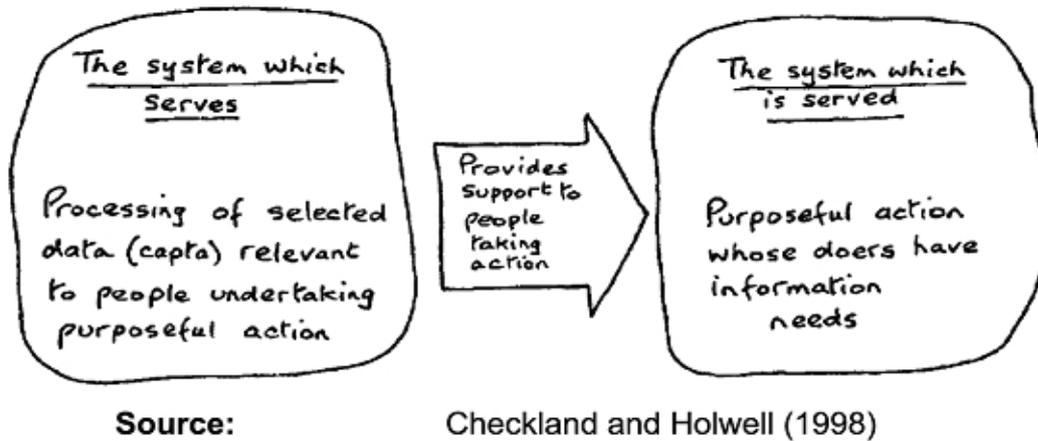
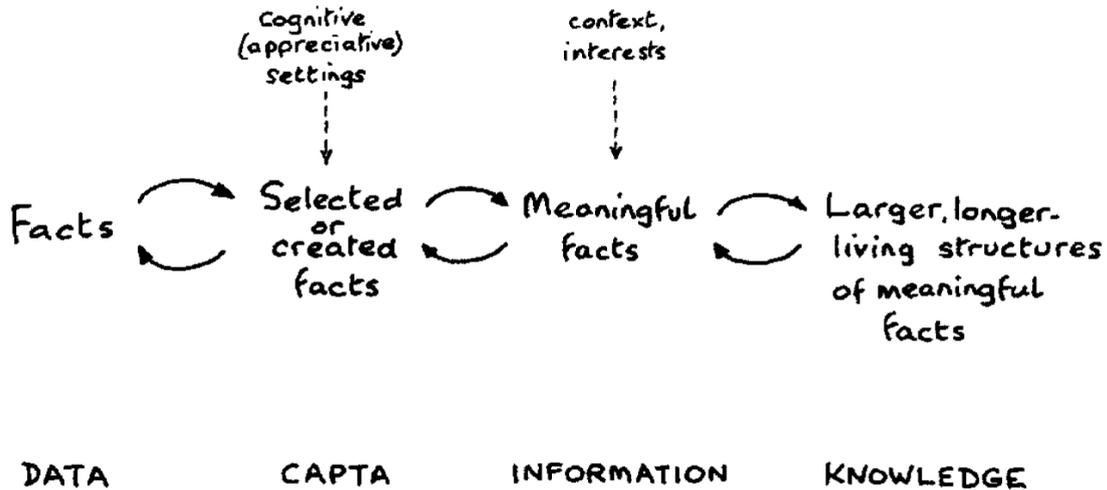


Figure: 2.6 Served and serving system concept of information system model

Usually “computer-based information systems” are considered as “serving” systems, whereas “purposeful human action” is taken as “served system”, which is being served by information system in the organization (Winter et al, 1995).

It is therefore necessary to design an information system, which satisfy the needs of organization, and fully understand the “purposeful human action” by “human activity system concept” (Winter et al, 1995). This will lead to the selection of proper data and information based on human activity systems in organization for development and creation of the relevant system.



Source: Checkland and Holwell (1998)

Figure: 2.7 Data, capta, information and knowledge model.

Checkland and Holwell (1998) declare a clear distinction between data and information, by introducing a new term “capta” for data; which choose the relevant and appropriate data based on some “criteria” to process, by converting into meaningful information (Rose, 2002). “IT-based” information systems are supposed as “capta processing systems”, “which serve people taking action” (Checkland, 1998), and SSM, which is considered for “system design” is “used in sense of human activity systems” with relevance to the “organizational development” (Baskerville, 1998).

## 2.7 Purposeful Human Activity

In “real-world” situation, people who “in the face of ambiguity, uncertainty, disagreement and conflict are trying to take purposeful action”, which is meaningful

to them for achieving their objectives in a systematic way of activities linked with each other so that “they constitute whole as a new kind of system”, which is known as “human activity systems” (Stowell, 1995). “This led to the idea of modeling purposeful human activity systems”(Checkland, 2000). The purposeful activities of organization, which are meaningful to the people, are modeled in conceptual models “with the people in the organization, by comparing them with the current action”. Such debate in “real-world organization” is taken in “political arena” to pursue different “conflicting interests” and their “accommodation”. This will lead to the development of meaningful “human activity system models” more specific to the organization (Winter et al, 1995).

## 2.8 Processes for Organizational Meaning (POM) Model

This is the overall model of “organizational meanings” of “social process”, where people take “purposeful action” in support of information systems. The information systems, which are supposed as “capta” processing systems play a vital role to meet the organizational meanings, and support people in their purposeful activity. The whole process is consisting on seven “elements’. The 1<sup>st</sup> and 2<sup>nd</sup> elements are about the people who are in groups or individual; perceive the “data-rich world” “selectively through their various taken-as-given assumptions”. And, this perception can be “exchanged, shared, challenged, argued over, in a discourse which will consist of inter-subjective” “creation of meanings”, which lead to “capta” processing and

generating information, as mentioned in elements 3<sup>rd</sup> and 4<sup>th</sup>. Element 5<sup>th</sup>, where conflicts and battles take place and are “settled” which are part of “politics”, and should be encouraged to enable “assemblies of related meanings, intentions, and accommodations between conflicting interests”. This is one of the complicated “social processes”, which ultimately leads to persuade “purposeful action” as mentioned in element 6<sup>th</sup>. The last and most important 7<sup>th</sup> “element” of this POM model is the “organized information system”, which is the basic building block to support organization and people for achieving their objectives, by supporting in human activity systems and finding accommodations. This information system developed and designed as per requirements of real world for “capta” processing is based on appropriate use of the information and communication technologies, which support the IS infrastructure with the latest trends of the computer and IT (Checkland, 1990). Because, the designed information system is a kind of “social system” with which people in organization interact to take “purposeful action”, and is not only a “piece of software” but building a “social practice” (Rose, 2002). This requires specialized professional knowledge to design, develop, maintain, control or change the system or technology.



## 2.9 Limitations of SSM

SSM is less concerned with technical issues, which are also important to develop an information system. Without analyzing and using traditional software engineering methodologies, the SSM can not alone develop an information system. SSM is concerned with analysis of information system development from social, cultural and political point-of-view, and try to solve the problematic situation with help of conceptual models, which is less concern for hard system thinkers. Perhaps, the traditional system developers who deal with technicalities can ignore important social, cultural and political elements of the information system. The SSM can be well integrated with other traditional software engineering methodologies, and SSM study can be helpful for developers to guide them for system development.

The activity models are not fully representation of real world activities, there may be number of other unseen activities, which support other processes and main activities, and SSM doesn't focus on such unseen activities.

The non-technical people in organization may not understand conceptual models fully, and critical discussion to find accommodations may not properly observe interests and conflicts between stakeholders. Politically, participants may not even express their conflicts and interests openly, which could lead to inappropriate analysis.

If one observer's terrorism is another's freedom fighting (Checkland, 1990), and no two people will see things in exactly the same way due to having different perception then development of conceptual models, making observations and concluding of discussions by the analyst may also be wrongly interpreted depending on his own efficiency and capability of understanding things.

SSM solution for information systems requires action to be taken (stage-7), which ultimately needs some resources and technical study. SSM (stage-7) emphasize to take action. It does not mention by whom this action will be taken, and how implementation or further study will be carried out. It lacks in providing proper solution with strategic planning, and does not address practical implementation of the study.

## Chapter # 3

# Research Methodology

### 3.1 Research Methodology

In order to achieve research objectives and understand both working models of examinations departments of Mehran University and Aalborg University, an extensive thorough study will be carried out by understanding their organizational structures and working information systems. Using Checkland's seven stages (refer: 2.5) soft systems methodology (SSM) approach (refer: Chapter 2), both models (MUET & AAU) will be evaluated by means of certain parameters (strengths & limitations). In this regard, primary as well as secondary data will be collected using multiple data collection techniques. Applying the soft system approach the comparative analysis of both models will be given in a shape of new proposed improved model (refer Chapter: 7) for examinations department of Mehran University. This model will also provide a road map for the higher education institutions of Sindh to strengthen their examinations departments with the improved IS model to their stakeholders.

## 3.2 Research Philosophies

Every research study is based on some “philosophical assumption” whether it is a qualitative or quantitative research. The most applicable philosophical assumptions are those, which “best fits to the underlying epistemology which guides the research” (AIS, 1997). Epistemology refers to theory of knowledge or “assumptions about knowledge and how it can be obtained” (Hirschheim, 1992). Since the nature of the study is qualitative, it is therefore necessary to know the relevant “philosophical assumptions relevant to the underlying epistemology that guide the research” (AIS, 1997). Chua (1986) has mentioned three distinct research epistemologies, which are positivist, interpretive and critical. The word qualitative is not taken as the synonym for interpretive. It depends upon the researcher’s “underlying philosophical assumptions” to have qualitative research as an interpretive, positivist or critical (AIS, 1997).

### 3.2.1 Positivist Research

Positivist studies are describes by the “inclusion of formal propositions, quantifiable measures of variables, hypothesis testing, and the drawing of inferences about a phenomenon from the sample to a stated population” (Rowlands, 2003). Positivists usually believe that “reality is objectively given and can be described by measurable properties, which are not dependant on the observer and his instruments”. Positivist

study usually attempts “to test theory, in order to increase the predictive understanding of phenomena” (AIS, 1997).

### 3.2.2 Interpretive Research

Following Klein & Myers (1999), the basic assumption for interpretive research is that; knowledge is gained by social constructions such as language, consciousness, and shared meanings (Rowlands, 2003). The interpretive study generally attempts to understand “phenomena through the meanings that people assign to them”. This study does not define dependent and independent variables prior to the study but, “focuses on the full complexity of human sense making as the situation arises” (Kaplan and Maxwell, 1994). This kind of study helps researchers to understand human thoughts and action from social and organizational perspective with the “potential to produce deep insight into information systems phenomena” (Klein, 1999). Fieldwork is the fundamental basis of any interpretive research study, which gives in-depth access to the people, issues, data and observations (Walsham, 2006). In order to access interpretations of informants the interviews are a part of most interpretive studies in the field (Walsham, 2006). In interpretive research in terms of phenomenological approach, theory is generated or induced from the data collected; therefore it is grounded in the data (Rowlands, 2003).

Interpretive research methods in information system are "aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context" (Walsham 1993)

### 3.2.3 Critical Research

The researchers of critical study believe that "social reality is historically constituted, which is produced and reproduced by people". Though people can intentionally "act to change their social and economic circumstances, critical researchers recognize that their ability to do so is constrained by various forms of social, cultural and political domination". The prime task of critical research is observed "as being one of social critique whereby the restrictive and alienating conditions of the status quo are brought to light". Critical research deals with the "oppositions, conflicts and contradictions in contemporary society" and "helps to eliminate the causes of alienation and domination" (AIS, 1997).

## 3.3 Information System Development Methodologies

There are a number of information system development methodologies, which are based on some assumptions and appropriate research approach. The "notion" of approach leads to focus on the "fundamental goals, guiding principles, concepts, and

principles for the ISD process in the customization process” (Hirschheim, 1997). Avison and Fitzgerald (1988) used the phrase "methodology jungle" for the collection of number of ISD methodologies, which more or less but are similar to each other. Bubenko (1986) and Jayaratna (1994) also have witnessed for a huge number of methodologies (Hirschheim, 1997).

There are number of approaches and methodologies, which have been widely used in the information systems development depending upon the nature and type of research, such as the Interactionist approach, Speech Act-based approach, Soft Systems Methodology, Trade Unionist approach, Professional Work Practices approach (Hirschheim and et al., 1997) and so on.

The Interactionist approach “sheds light on the social issues, which surrounds over organizational change and implementation of information systems”. The Speech Act-based approach “focuses on understanding of the rich meanings, which are exchanged in ordinary conversation” and provides a way of “modeling communicative action in organizations; especially speech acts of changes which consists of creating, maintaining, reporting, modifying and terminating organizational commitments”. The Trade Unionist approach is focusing on “political-institutional power issues”, which “develops conditions for effective worker participation to support democracy at work and quality of work”. The Professional Work practice approach “emphasis on examine the actual work practices of systems professionals

before attempting to improve them and promotes increased professionalism of Information Systems designers". A widely used soft system methodology approach in information systems development; developed by Checkland provides "a learning methodology to support debate on desirable and feasible changes". The distinctive feature of soft systems methodology which counts to its strength is "its explicitly focus on problem formulation, by helping to identifying the relevant systems from the perceptions of possibly disagreeing stakeholders" (Hirschheim and et al., 1997).

Every approach has a "different school of thought", which suits to different goals, meanings, processes and functions (Hirschheim and et al., 1997). This study is focused on the information system development which will be based on the appropriate relevant information system methodology. Hirschheim (1995) defines information systems methodology as "an organized collection of concepts, methods, beliefs, values and normative principles supported by material resources". The information system defined by Martin (1990) is "a system of data and processes that can be used to record and maintain information" (Iivari, 1996).

### **3.4 Research Method and Methodology**

All research of any nature is based on some fundamental assumptions and appropriate research methodology (AIS, 1997), which is defined as the way of "solving the research problem systematically". This involves numerous steps usually

employed by the researchers in studying the research problem besides the “logic behind it”. “The scope of research methodology is wider than that of research methods”, which deals with only methods and techniques which are used for conduct of research study to the research problem (Kothari, 2006, Avison, 1998). Cavaye (1996) defines research method as “a way to systemize observations, describing ways of collecting evidences and indicating the type of tools and techniques to be used during data collection”.

Therefore, the researcher must be known about methodology in wider sense besides to the methods and techniques to conduct the research study (Kothari, 2006). A researcher must choose an approach which is quite relevant to his field, topic and nature of study rather than focusing on likeness or dislikeness of his own or looking to “modern or fashionable theory” (Walsham, 2006).

Research methods can be classified in number of ways but the most common distinction is qualitative and quantitative research (AIS, 1997).

### **3.4.1 Qualitative Research**

The qualitative research is likely to work with text rather than numbers (Rowlands, 2003). The qualitative research deals with textual data, words or pictures rather than numbers which can consist on field notes and memos, photographs, video and audio

recordings, documents and so on. Like quantitative research “it does not reduce the pages of narration into numbers and nothing is taken for granted for a qualitative researcher”. Observing gestures, tone, behavior, response time, body language and a number of other things relevant to the study become helpful for analyzing the data. The researcher wants to know “where, when, how and under what circumstances behavior comes into being” and his “theory is grounded in the data” (Bogdan, 1992).

Depending on the “philosophical assumptions” of researcher the qualitative research study can be interpretive or positive (Cavaye, 1996) (Rowlands, 2003). In qualitative research fieldwork and in-depth interviews are important methods of data collection. In fieldwork data is gathered in a natural environment and observing natural behavior; while in in-depth interviews open ended questionnaires are used for collecting maximum information. Data in qualitative research is analyzed “inductively”, which generate theories from "bottom up" rather than "top down" where it does not set out to prove or disprove hypotheses (Bogdan, 1992).

### 3.4.2 Quantitative Research

Quantitative research is considered as the systematic investigation based on scientific methods that emphasize on quantifiable measures or “classification of variables” (Kumar, 2005). Quantitative research is concerned with numerical data analysis. “Statistics and measurement” are taken as central to the quantitative

research study as they are “connections between empirical observations and mathematical expressions of relations”. Researchers in quantitative research study try to develop and test hypothesis and generate models & theories that explain behavior (Wayne K, 2010).

### **3.5 Research Type:**

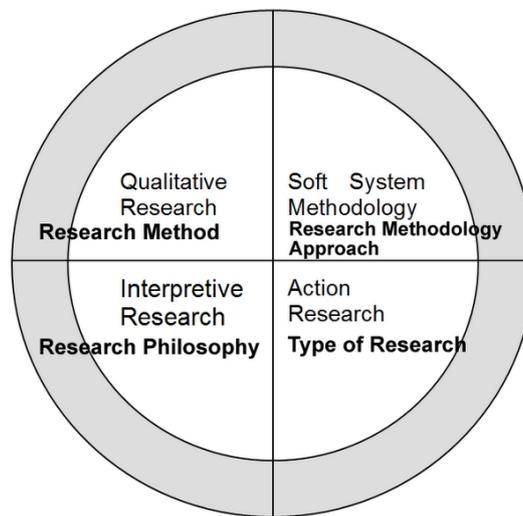
#### **3.5.1 Action Research**

Since the mid twentieth century, action research has been used in the field of social sciences and now has got significant importance in the field of information systems. This is an established research method, which generates highly relevant research results because it is grounded in practical action intended to solve immediate problems. “Its particular philosophical context is couched in strongly post-positivist assumptions such as idiographic and interpretive research ideals” (Baskerville, 1999). Wood-Harper (1985) introduced the action research to information systems community as “purely research methodology”, as it intends “to understand complex human process rather than prescribing a universal social law” (Baskerville, 1999).

Action research is a complete process in which “a problem situation is diagnosed, remedial action planned and implemented, and its effects monitored, if improvements are to get underway”. It is the “application of fact-finding to practical

problem-solving in a social situation with a view to improving the quality of action within it". The action research is intended "to improve practical judgment in concrete situations" and is focused on the particular problem in a "defined context" rather than attaining "scientific knowledge which can be generalized" (Burns, 2000 pp 443-44).

### 3.6 Research Approach



Research Model

Figure: 3.1 Research model

This action research study is focused on the information system development based on qualitative data (refer: 3.4.1) analysis, which can use appropriate interpretive research (refer: 3.2.2) philosophy. Since the qualitative nature of study has some relevant "philosophical assumptions" such as positivist, interpretive and critical (Chua, 1986) (AIS, 1997). This study uses interpretive philosophy as it gathers empirical data

from field interviews, by interacting with people to collect real facts, observations and understand the real situation (Walsham, 2006), which can lead to develop a theory based on information collected (Rowlands, 2003). Unlike positivism, this is not based on scientific observations and “objective” “truth”, which test data on predefined hypothesis or theory (Walsham, 1995), but helps in understanding “phenomena through the meanings that people assign to them” (Kaplan and Maxwell, 1994). This is the reason why we do not use positivism (refer: 3.2.1) or the critical (refer: 3.2.3) philosophy, which also deals with the “conflicts and contradictions in contemporary society” (AIS, 1997) and its solution to the problem. Both are quite irrelevant to the field of this study which is purely based on improving the situation, by solving the immediate problem with the development of the information system. The parameters, which are considered as the basic building block of this study, are social, political and cultural factors, which are of key importance while developing the successful information systems for the organizations.

There is number of information systems development methodologies but more or less are based on technical approaches. However, it is argued that these “technology-centered methodologies” are not enough in “real world problem situations especially when the relevant situation is messy and ill structured or when political and cultural factors are prevalent in the organization. As a reaction to these perceived inadequacies, soft system methodology (SSM) is identified as a valuable candidate for IS analysis methodology” (Zhou). Most of the information systems fail due to lack of involvement of the social, cultural and political factors as a part of

development and more focus on the technical side, which ignores the real problems of the “real world” . Soft system methodology (refer: Chapter 2) is the only methodological approach, which deals with such phenomena and tackles these issues with the intention to improve the situation in “messy” and “ill-structured problems”. We are also more concerned about the human beings, “human situations”, “cultural considerations” and “ill-structured” situational problems while developing the information system rather than technical side. This is the reason that, the soft system methodology and approach has been used to carry out this action research study which suits best to its nature.

This study will understand the complex problematic situations with help of action research (refer: 3.5.1), which has been used since mid twentieth century in the field of social sciences and now is widely used in the information systems development (Baskerville, 1999). Its particular focus on studying and solving “complex immediate problematic situations and social-organizational problems” (Blum, 1955) differs it from other types of research approaches and is widely used in information systems. Wood-Harper (1985) also advocates action research as a “purely research methodology in information system”. The action research, which usually takes extensive work of field studies is “context specific” used for diagnosing the specific problem with intention to improve the situation with collaborative involvement of the stakeholders (Burns, 2000). The action research was also used by Checkland to develop Soft Systems Methodology (Checkland, 1981), which has been used as research methodology as well as the research approach to carry out this study. “Soft

systems methodology and action research can both help in addressing ill-structured problems faced by managers, in collaboration with stakeholders using questioning and reflection. Both lead to an increased understanding about the problem situation” (Sankaran, 2009).

Moreover, this study will be more concerned with observing behavioral, cultural and sociological and political parameters, by collecting primary and secondary data from the different sources including personal interviews and field visits. The nature of the data is textual consisting on observations of behavior such as tone, gestures etc.; social, cultural and political phenomena (Bogdan, 1992) and other meaningful information gained through empirical studies and extensive field visits is qualitative. In this regard, qualitative data method will be used, which is more concerned with text rather than numbers (Rowlands, 2003) as in quantitative data.

### **3.7 Data Collection**

Initially, after extensive study of literature and review of relevant material based on methodological approach, the primary data collection will be started by using different techniques and tools. In this regard semi structured interviews would be main source of information. Moreover, personal interviews, face to face meetings, site visits, observations, and other traditional methods will be used to collect data relevant to the examinations department. All working staff relevant to examinations

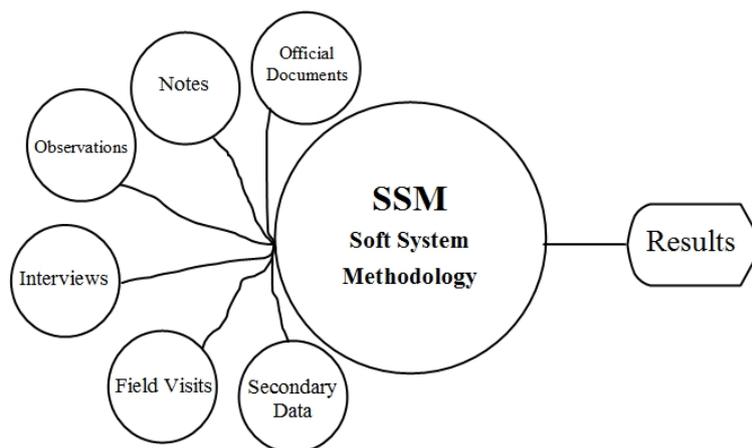
activities in all faculties/departments, technical personnel, and other examinations related officials, teachers and students will be interviewed to collect the data and develop existing examinations working models. Specially, at AAU the secretaries of the departments are playing a vital role in examinations activities from very scratch to the end, so the more focus for the information seeking would be to the Secretaries of the departments at AAU. In order to get appointments from concerned relevant people regarding face to face interviews, the list would be developed having their all information to contact (refer annexure in last). Later on, they would be contacted through email, telephone, personal contacts, and personal visits for taking appointment. A detailed thesis project information leaflet (refer annexure in last) will be developed for their information to be sent through email to concerned for getting an appointment for interviews. Keeping in view the sensitive nature of information, other voice or video recording devices can be avoided and inspite of that the diary method (conford, 2006) can also be used to record meaningful information during interviews (refer annexure in last). During interviews more focus would be on understanding work flow of the information system in the department and its link to the faculties or other stakeholders, procedure to conduct the examinations, rules and regulations, written SOPs (standard operating procedures), powers and privileges, job description and role in examination related activities, database handling and record keeping, user level access / privileges, data backup and recovery plan, result processing and announcement, issuance of the certificates, appeals and error rectification, secrecy and confidentiality parameters and observe cultural and political factors.

During interview, note taking, experiences, feedback, comments and observations also would be key role player for data collection.

Moreover, the secondary data in this regard is of great importance and will be gathered through different sources such as official publications, annual reports, articles, university websites, and official documents provided on request.

### 3.8 Data Analysis

After getting authentic and reliable information from all sources, data entry, data classification and data analysis process will be started in which statistical tools can also be used. Since, the qualitative nature of the research more focus of data analysis would be on qualitative as per soft system methodology approach (refer: Chapter 2).



Data analysis model

Figure: 3.2 Data analysis model

This would lead to develop a new proposed improved model (refer: Chapter 7) of the examinations information system for Mehran University of Engineering & Technology, Jamshro. Ultimately, this new improved model would also become a road map for other higher education institutions of Sindh Pakistan to strengthen their examinations departments.

## Chapter # 4

# MUET - Analysis

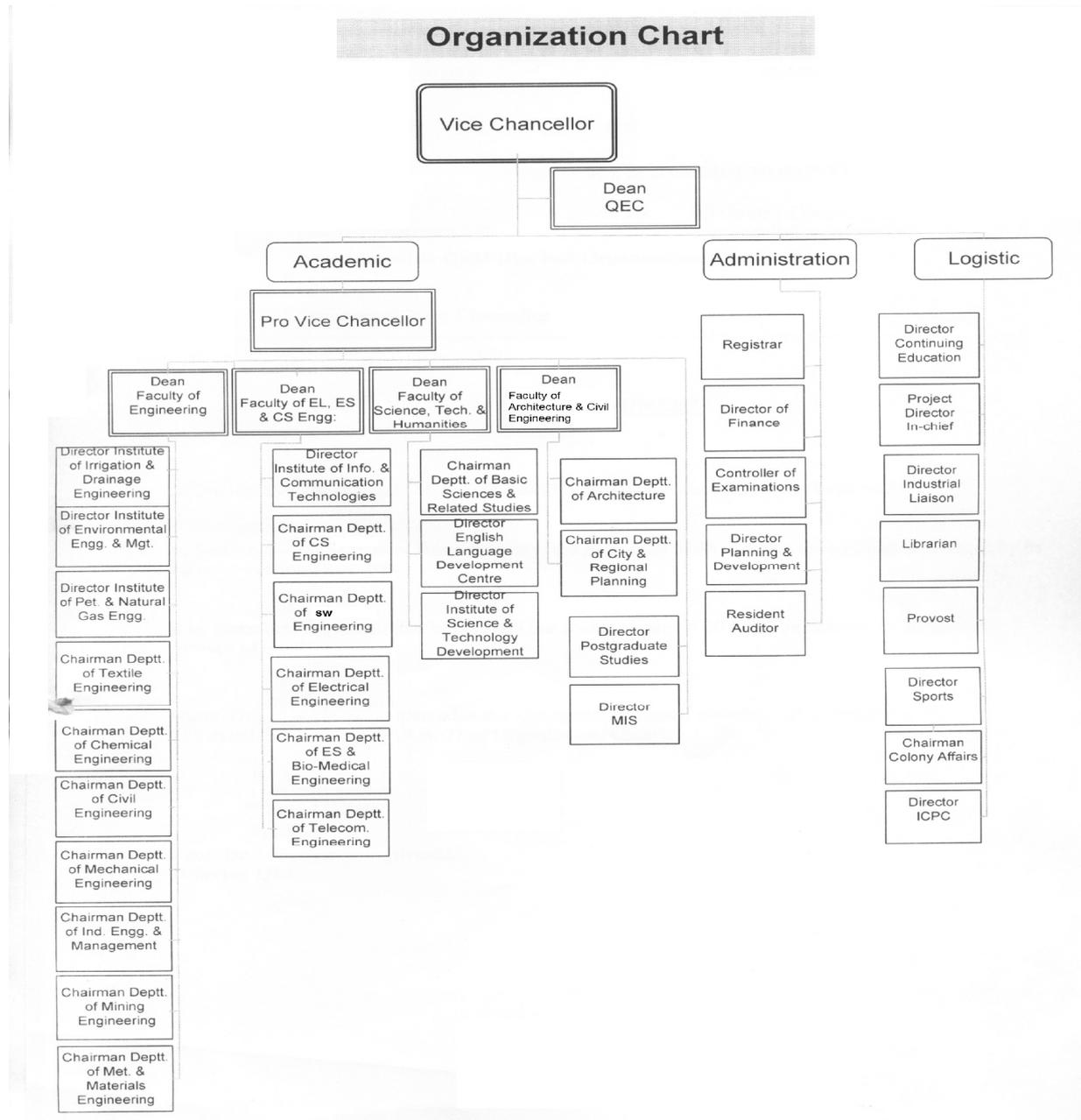
### 4.1 Introduction

The Mehran University of Engineering & Technology, one of the top Engineering public Universities of Sindh Pakistan ranked as No. 1 of the HEC ranking (HEC-e) is internationally recognized as ISO certified. The University is located at Jamshoro about 15 km. from Hyderabad on the right bank of river Indus and was established on 1st March, 1977 (MUET). The University is governed by the Higher Education Commission of Pakistan (HEC-a) and aims to promote research and development culture by providing quality education for which it has international linkages worldwide. Moreover, the University considers students as their direct customers and their sponsors, industry, government and society as their indirect customers and commits itself to satisfy their positive needs and expectations (MUET).

### 4.2 Organization

The University has four faculties, which consist on faculty of engineering, faculty of electrical, electronics and computer engineering, faculty of architecture and civil engineering and faculty of science, technology and humanities. The university is headed by the Vice-Chancellor and followed by the Pro-Vice-chancellor who look-

after the academic matters with four respective Deans of the faculties. The overall administration of the University is controlled by the Registrar.



Source: MUET

Figure: 4.1 Organizational chart of MUET (MUET)

There are seventeen departments of various disciplines under these faculties at MUET where undergraduate and postgraduate studies programs are offered and the system of examinations is term system where almost after every six months there is an examination (MUET). Apart from this, the University has some affiliated colleges and institutes also where undergraduate and masters degrees programs are offered.

### 4.3 Examinations System

Mehran University has mostly written examinations for each subject and a practical or oral viva voce for the same as a part of the subject. This usually has marking system viz. 100, 50 or 150 as per nature of the subject and criteria already defined in the syllabus or course scheme. There are two regular examinations during one academic year in undergraduate and postgraduate studies and two supplementary examinations for failure students to have a chance to reappear in the examinations.

The whole University examinations are conducted and managed by a specialized separate department of the University called Examinations Department headed by the Controller of Examinations and followed by Deputy Controller, Assistant Controller and supporting staff. There are more than forty staff members working in the different sections of the examinations department with their different job descriptions. There are three main sections in the examinations department named Conduct Section, Secret Section and Computer Cell with three major activities called

pre-examinations activities, conduct of examinations and post-examinations activities. The conduct section is responsible for pre-examination and conduct of examinations activities, which consist on correspondence with internal and externals for question papers, and scheduling of the examinations as well as printing papers. The secret section is responsible for post examinations activities, which consist on processing and announcement of results while the computer cell issues different certificates to the students. These all activities are paper based and manual.

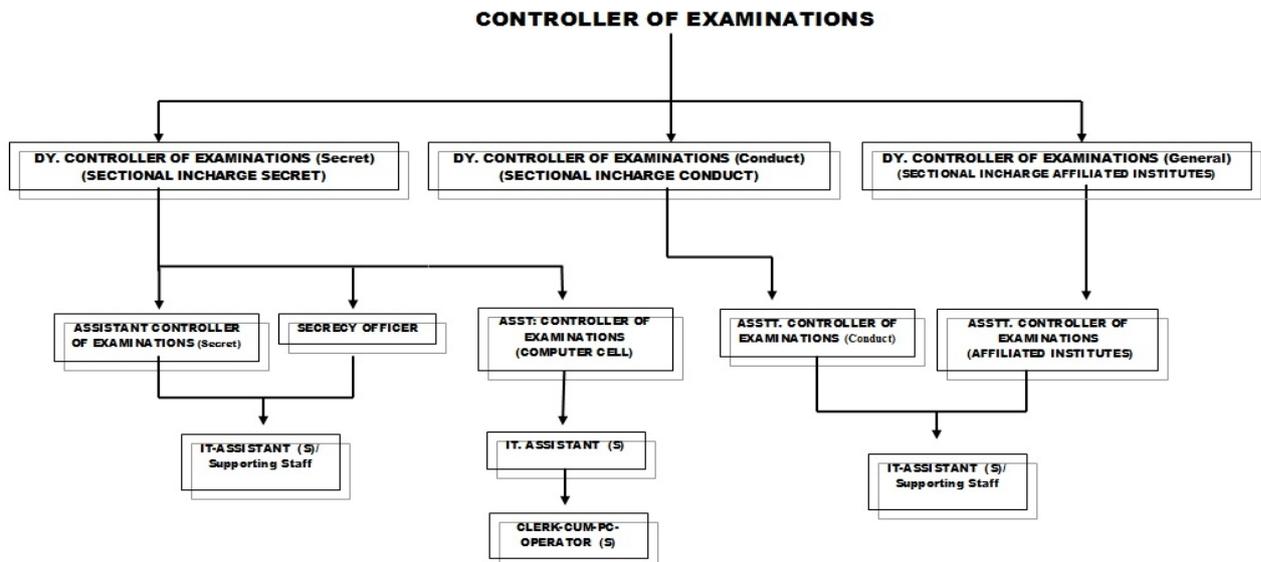


Figure: 4.2 Organizational chart of examinations department-MUET

The examinations department has lot of complex set of activities with diversified functions and procedures, which starts from conduct of examinations to the announcement of results with delivery of certificates to the students. This has been elaborated here under using activity model technique (Checkland, 1998).

### Examinations Department-MUET (Activity Model)

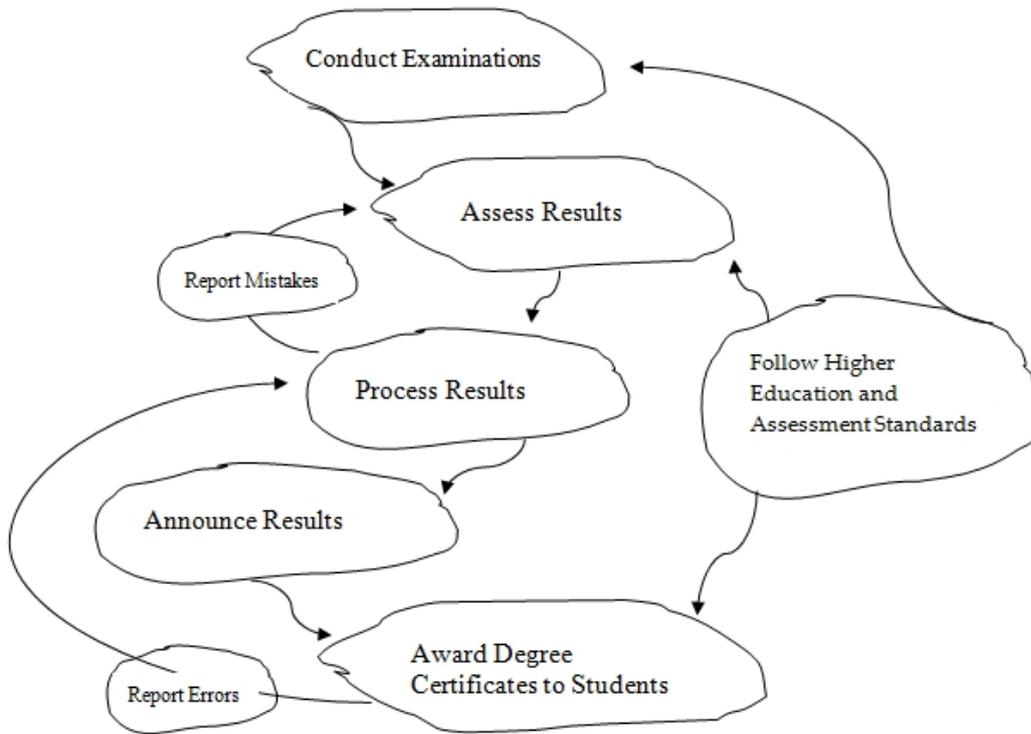


Figure: 4.3 Activity model of examinations department of MUET

The above activity model shows main activities of the examinations department starts from conduct of examinations which then leads to the assessment of answer books through a complicated result process, and finally announce the results with issuance of certificates to the students. Moreover, there is a chance of mistakes and human errors due to manual data processing of the results, which can be reprocessed if reported any error or mistake.

Using one more technique of representing the examinations activities, and understanding the role of examinations department in detail, the interaction model (Rose, 2002) has been used to mention all functions and processes clearly.

**Examinations Department- MUET (Interaction Model)**

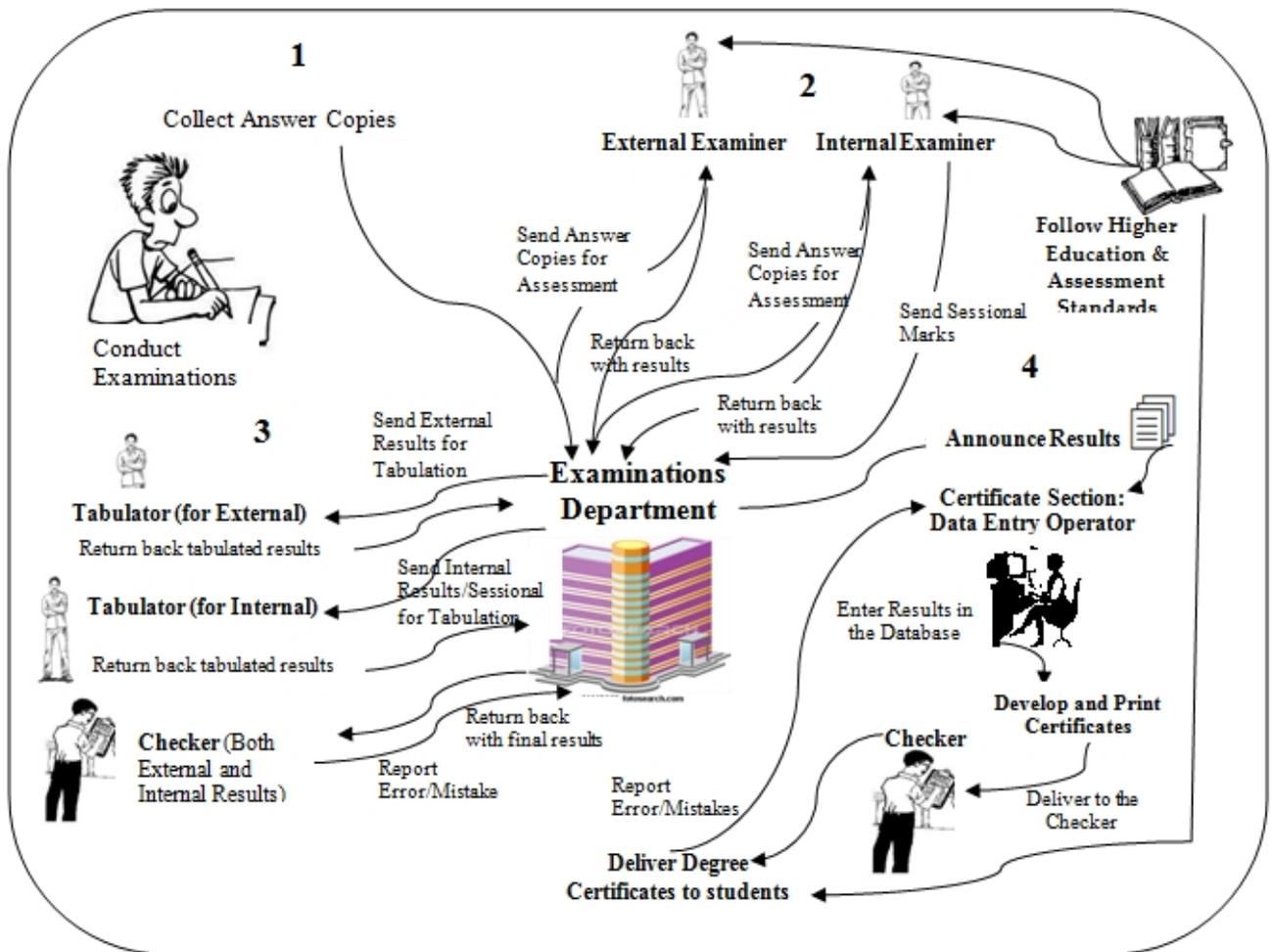


Figure: 4.4 Interaction model of examinations department of MUET.

If we observe thoroughly, the examinations activities and different processes as mentioned in interaction model, there seems to be more involvement of human and

paper based management. After completion of the every examination the answer copies are collected by the examinations department, and then are sent to the approved external examiners for assessment. The external examiner then sends back assessed answer copies to the examinations department with result sheet. The same assessed answer copies are then sent to the internal examiner for assessment. The internal also sends back assessed answer copies with his own result sheet to the examinations department. The internal examiner also sends sessional marks of the students to the examinations department. The examinations department sends both internal and external result sheets with sessional marks received from internal examiner to the two different approved tabulators for tabulation of the final results as per procedure. The both tabulators submit their final result sheets separately, which is called Ledger. The both internal and external ledgers are then sent to the checker for final checking. The checker then sends back both ledgers to the examinations department for final result announcement by indicating the errors or mistake if any. After announcement of the results the final ledger is sent to the computer section where data entry operator manually enters students' information and result records in the databases, and prepares certificates for print. After printing these certificates the same are sent to the checker for final checking, and then are delivered to the students. After all, the human error and mistake is highly expected in manual data processing, and there is always a chance of errors or mistakes in certificates, which are then reissued by verification of certain records if any error or mistake is reported.

The same has been shown in different detailed activity models and interaction models of the results assessment and result process in detail.

**Assess Results (MUET-Activity Model)**

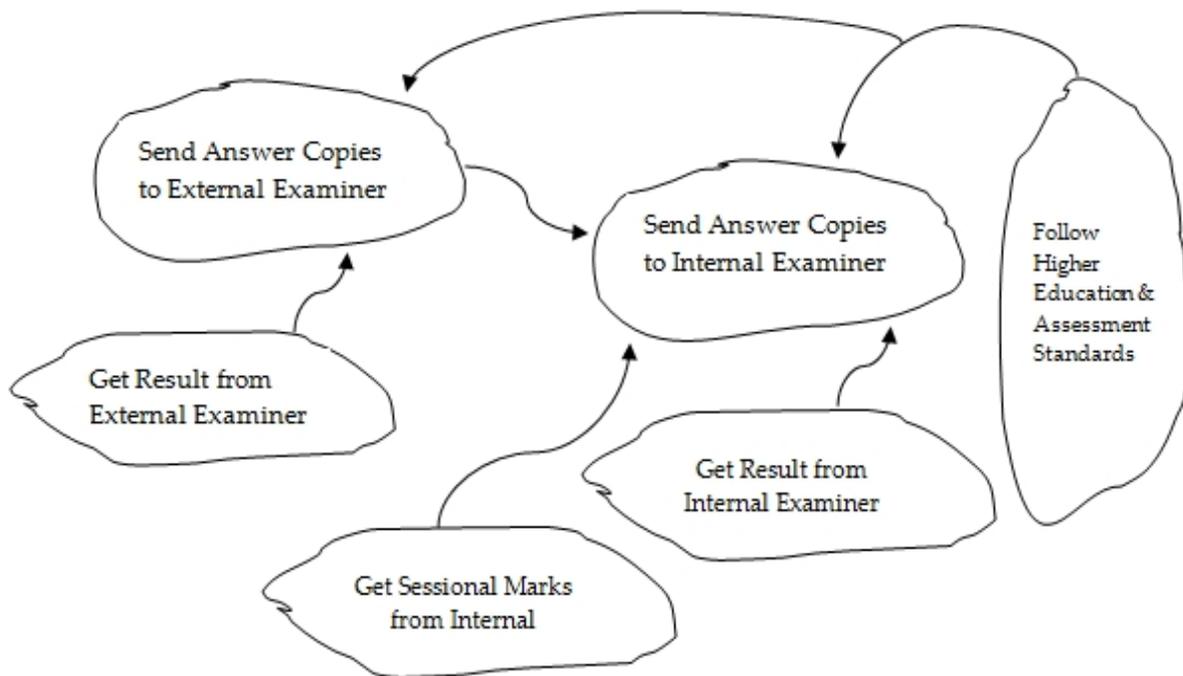


Figure: 4.5 Results assessment activity model of examinations department of MUET

### Assess Results (MUET -Interaction Model)

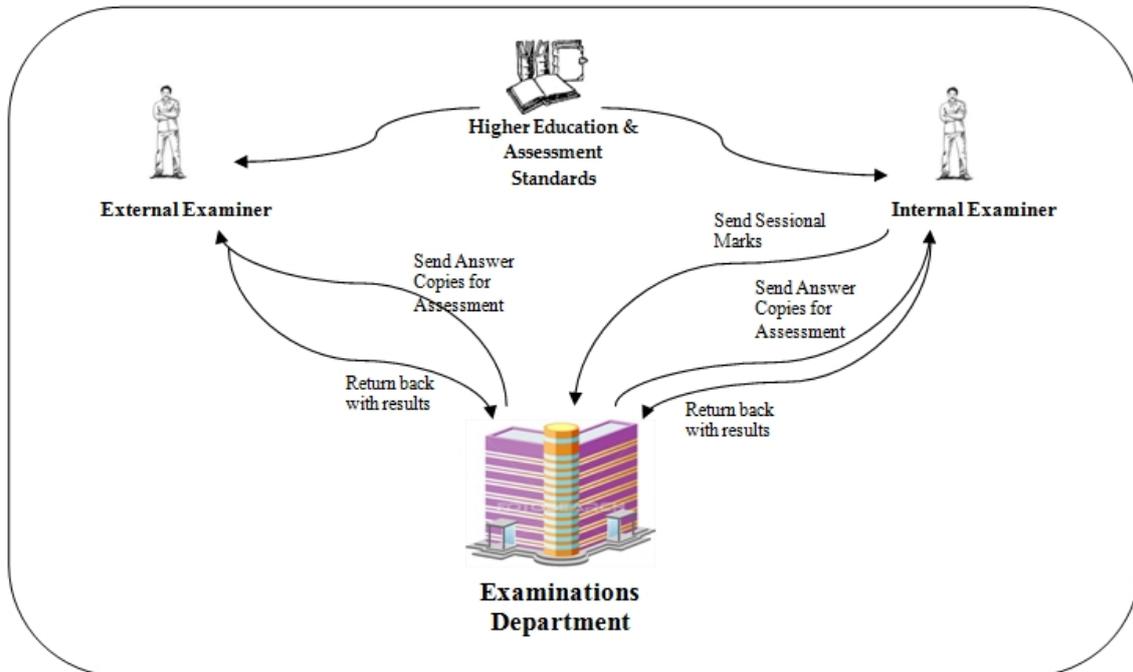


Figure: 4.6 Results assessment interaction model of examinations department of MUET

### Process Results (MUET-Activity Model)

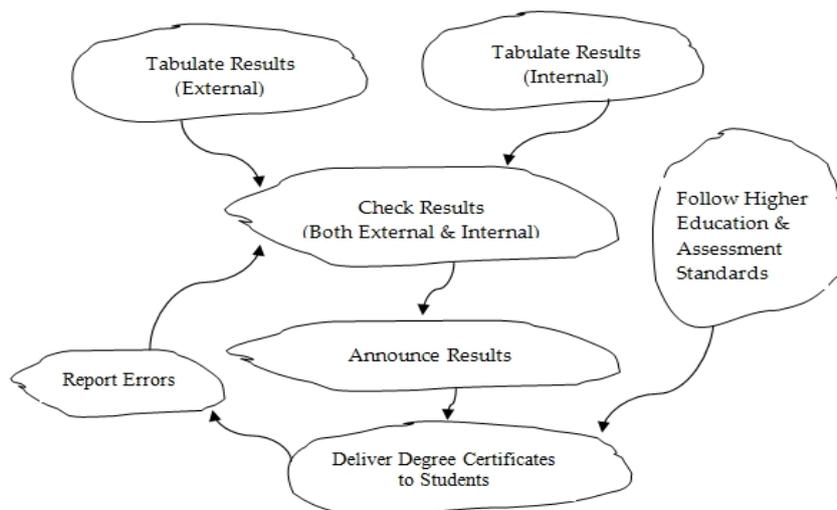


Figure: 4.7 Results processing activity model of examinations department of MUET

Process Results (MUET -Interaction Model)

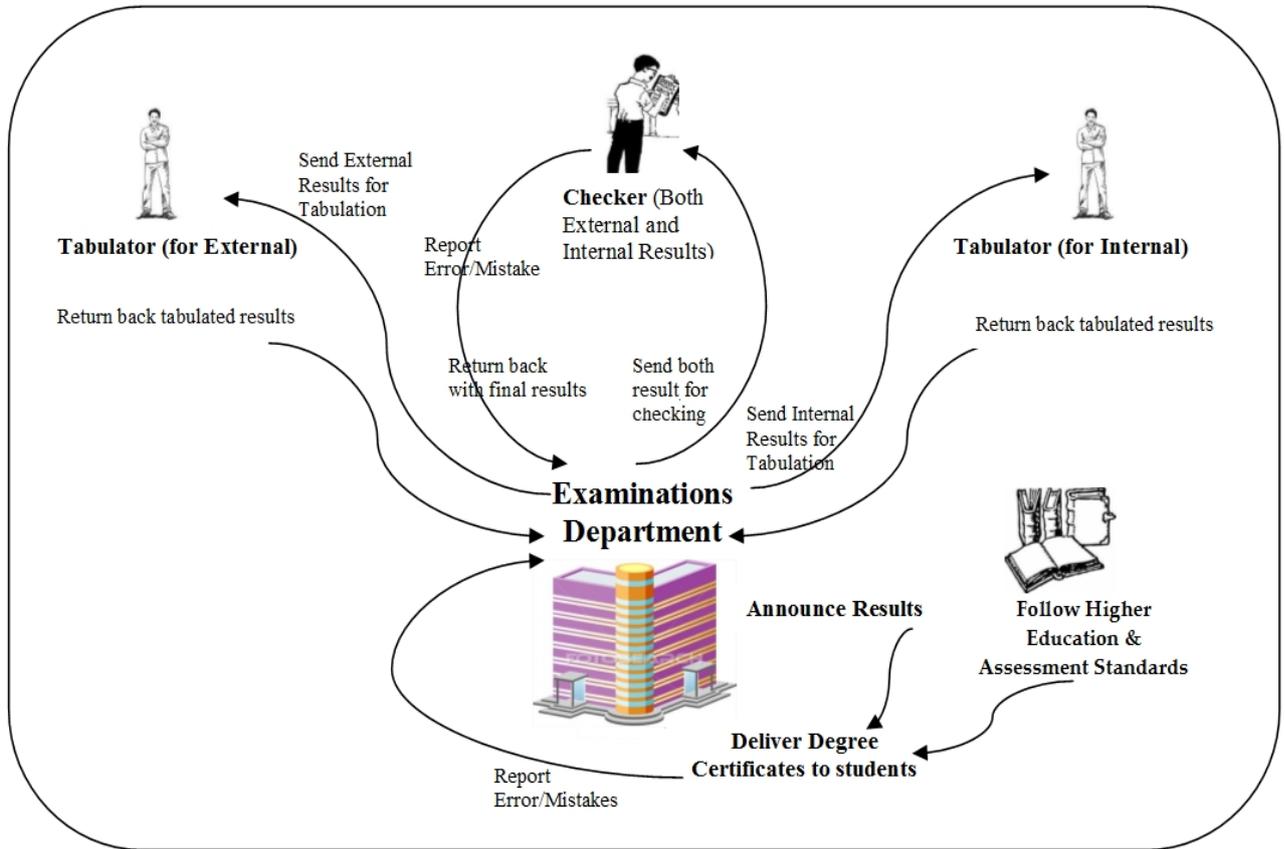


Figure: 4.8 Results processing interaction model of examinations department of MUET

**Announce Results (MUET-Activity Model)**

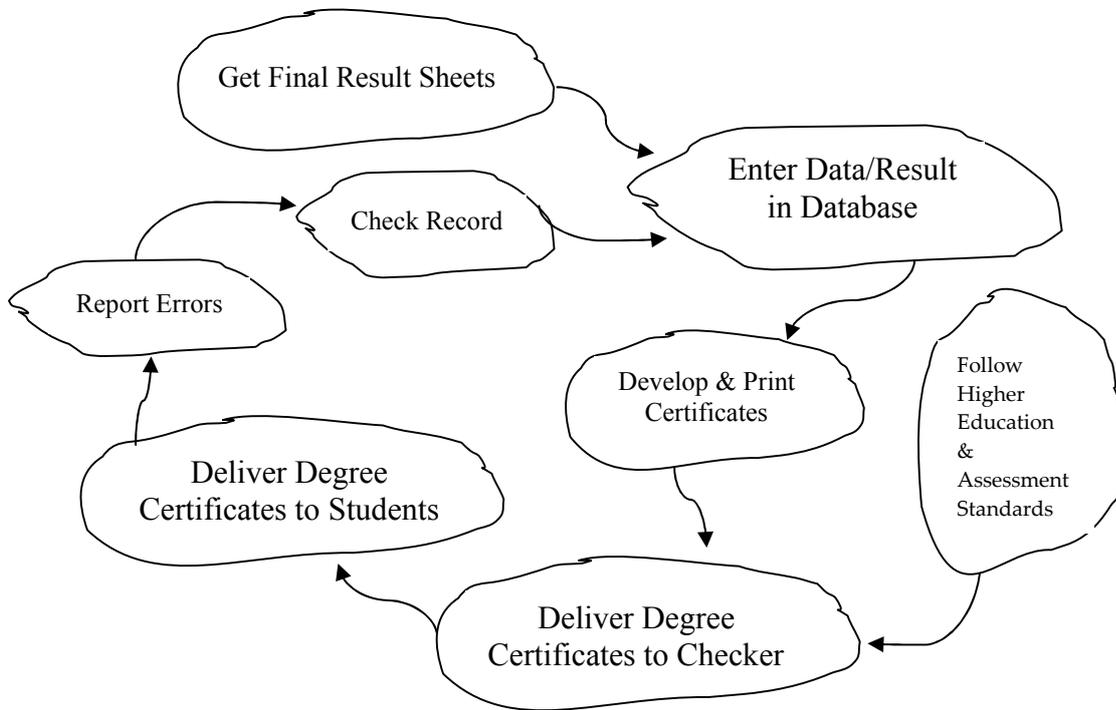


Figure: 4.9 Results announcement activity model of examinations department of MUET

**Announce Results (MUET- Interaction Model)**

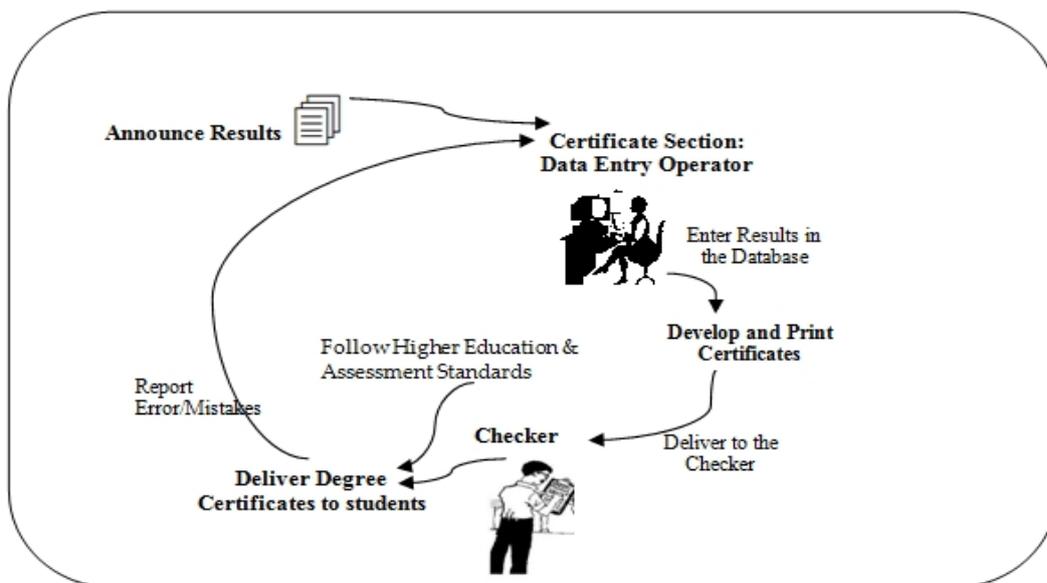


Figure: 4.10 Results announcement interaction model of examinations department of MUET

The major processes (results assessment, processing and announcing) of the examinations department can easily be explained and modeled by conceptual activity models, interaction and transformation models. But there are some important minor activities in support of major processes lying with some decisions, which are ignored by conceptual models of human activity systems. Even the interaction and transformation models do not address such minor sub activities or processes.

The examinations department of Mehran University has a lot of complex processes and activities (scripts collection & delivery, tabulation, scanning, dealing with discrepancies and variations, announcements) (Figure: 4.11), which are very important to understand while designing information system. Understanding these processes well, the supporting minor but important sub activities and sub processes (Figure: 4.11) are also necessary to identify and study, which are ignored by the interaction, transformation models also.

We have used another technique of Flowchart (JAI, 1995) that helps to understand those minor activities and processes and can easily be used to trace the area of improvement in the system.

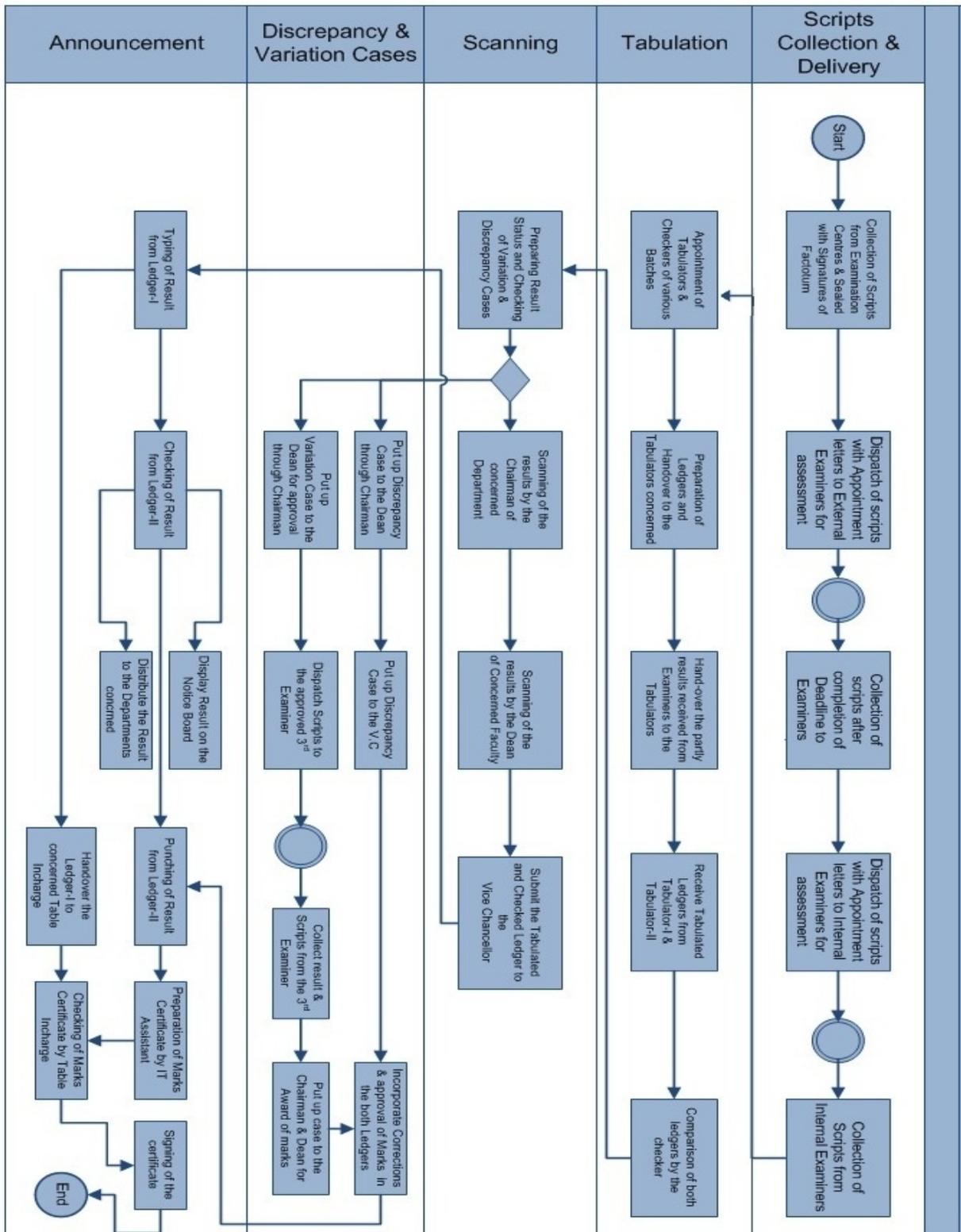


Figure: 4.11 Flowchart of detailed activities regarding processing of results at examinations department of MUET.

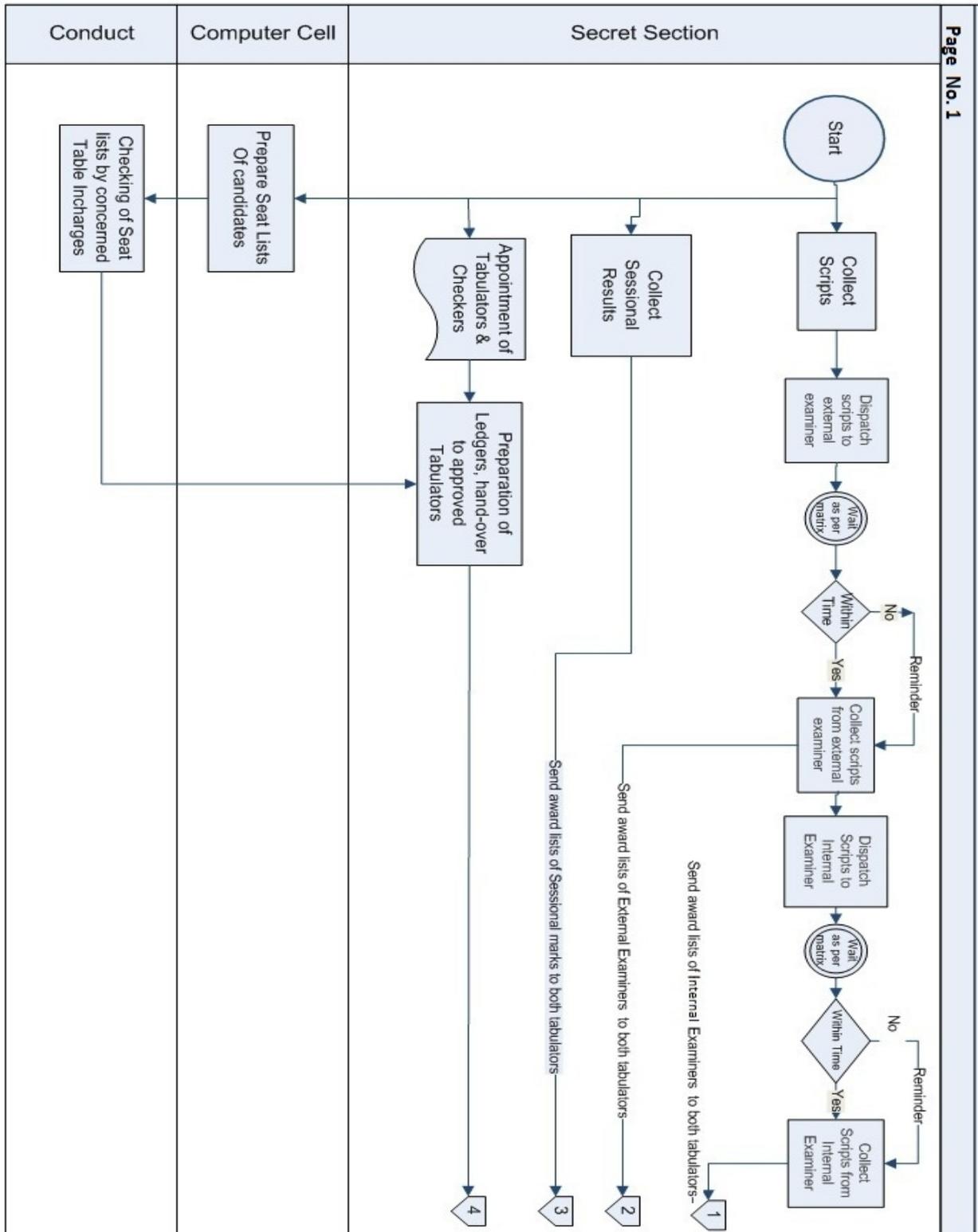


Figure: 4.12 (a) Flowchart of detailed activities (section-wise) regarding processing of results at examinations department of MUET.

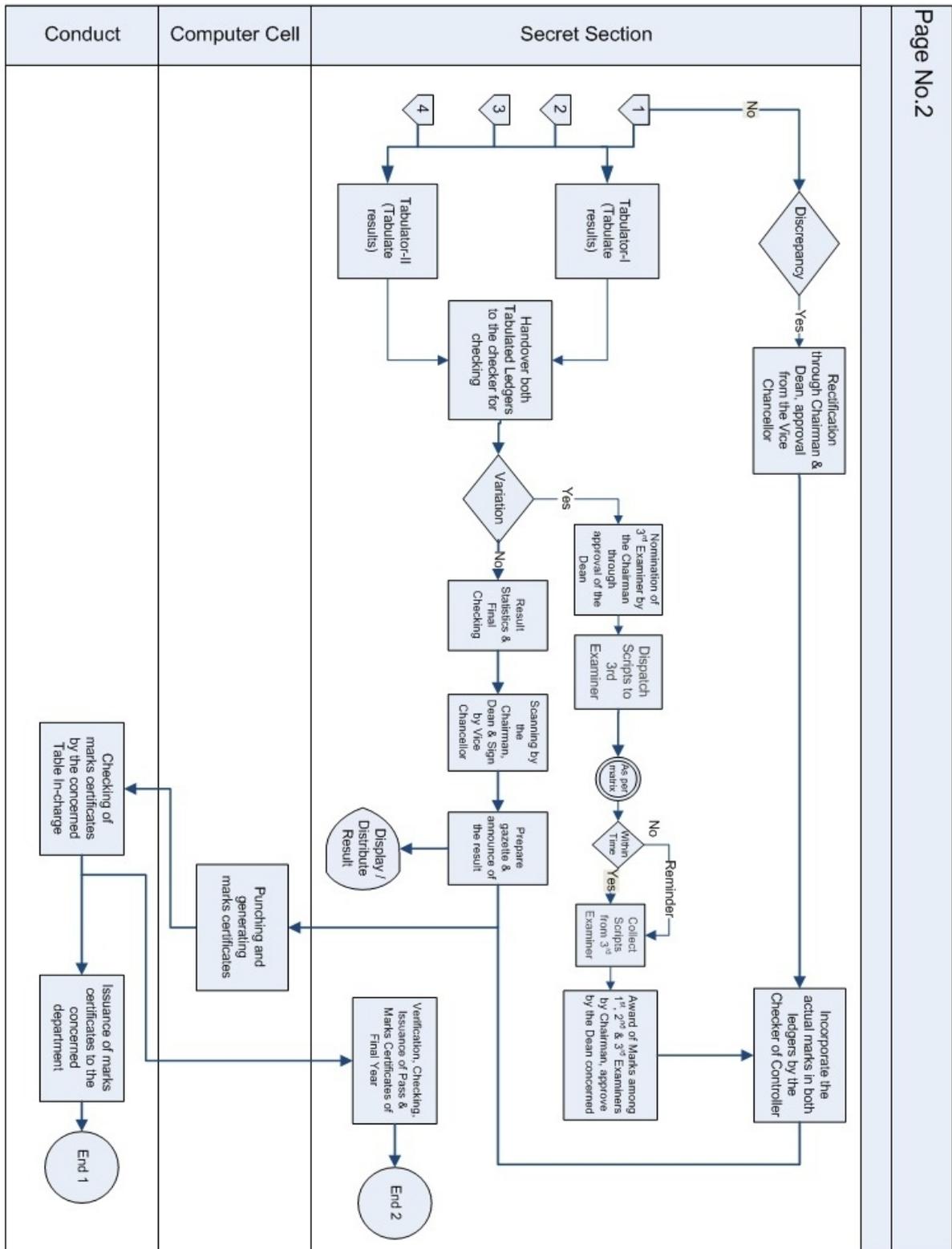


Figure: 4.12 (b) Flowchart of detailed activities (section-wise) regarding processing of results at examinations department of MUET.

After, thorough study of the working information system of the examinations department of the Mehran University, the next step would be observing the examinations information system of the Aalborg University Denmark, and then both will be evaluated by means of certain parameters.

#### **4.4 MUET-POM (process of organizational meaning) Model of Examinations**

##### **Department:**

Centrally controlled examinations activities (figure: 4.3) under one specialized department called “examinations department” (refer: chapter 4) follow hierarchical management structure (figure: 1.4). Individuals inside organization (staff, officers, controller) and outside (students, externals, govt./autonomous bodies) with interest groups of information (top management, deans, directors, admission office) are thoroughly observed for their perceived world of rich information and discourse. Individual roles, tasks, processes, procedures, organizational culture, norms, individual behavior, and political power of hierarchy are identified (element 1). Hierarchical structure of management and power of authority with chain of commands force supervisors, assistants and officers to exercise their powers. They follow standard rules for operations as per established norms and values. Every individual inside organization (staff, officer) has a well-defined role with decided actions to be performed in its own role capacity. Every individual (assistant, supervisor and officer) has a specialized separate task with respect to its specified

roles and supposed to act accordingly. Decisions are taken by middle and top management with respect to their roles, while subordinates are supposed to follow orders. Information is shared and controlled through channel of authority. While processing students' results various staff (assistants, supervisors and officers) exchange of information (results) with each other, and perceive their data rich world (element 2). Developing final exam reports in shape of marksheets, transcripts, pass and degree certificates different individuals (assistants, supervisors, and officers) are involved in processing of results, which also interact with teachers (internal/externals) for submission of results. There is a division of labor with specialized expertise. Identifying relevant data (exam record) and converting into meaningful information (certificates/reports) with relevance to its organizational culture, norms and patterns; rich perception of data is perceived. Physical record keeping (documentation) is perceived significant. However, the important stakeholders of information (students, teachers, govt. /autonomous bodies) do not have access to the examination information due to sensitivity and confidentiality issues. Result record in shape of transcript is issued to the student after announcement of results. The appreciative settings of individual and groups form rich perception of data where limited access to examinations information to only staff of the examination is observed as perceived world (element 2). This data rich perception is also affected by external forces, which are usually higher education commission and university governing body. Complex organization with complicated processes (result processing & announcement) (figure: 4.11) and procedures (paper based formalities) persuades interdependencies of operational activities (figure: 4.4).

These operational activities (conducting examinations, processing and announcing results) with mutual interaction of individuals (assistants, supervisors, officers) inside organization form discourse and created meanings for data (student exam record) and information (results) (element 3 & 4). These created meanings and discourse was found through healthy debate in real world based on human activity models. Particularly, it was observed that major issue was students', teachers', and other stakeholders' informational queries and problems, which were directly forwarded to the officers and head of department (controller). This was cause of lack of attention to the office work for officers and head of department who all the time remain busy in attending to informational queries. Such informational problems and queries belonging to service counter or supporting staff members can be resolved at lower level. The controller and officers can be free to focus on their prime duties. Assemblies of related meanings, intentions (issue error free reports and certificates with smooth working of examinations activities) and accommodations with identified interests are organized after discussing their own roles and power of authority (assistant, supervisor, or officer) (element 5). Their intentions, accommodations are well incorporated into new information system that supports their purposeful action. The organization is process-based where rules, regulations, procedures and formal authoritative decisions are important. All purposeful actions (conduct of exams, processing and announcing results) find their accommodations in rule-based system (element 6). The purposeful action of all staff (assistants, supervisors and officers) for examinations activities based on their own organizational norms and values with respect to their roles leads to form organized information system (element 7). This

organized examinations information system (element 7 a.) is formed based on appropriate IT infrastructure and relevant professional knowledge (element 7 b, c.). Created meanings and perceived data rich world for purposeful action limited to examinations staff condense wide informational needs of other stakeholders (students, teachers, management and govt./autonomous bodies). Students, teachers, management and other govt./autonomous bodies use traditional ways of communication based on correspondence and letters due to inaccessibility of examinations information online. Insufficient serving examinations information system based on limited IT resources and less computer literate workers have narrowed the scope of information system.

## Chapter # 5

# AAU- Analysis

### 5.1 Introduction

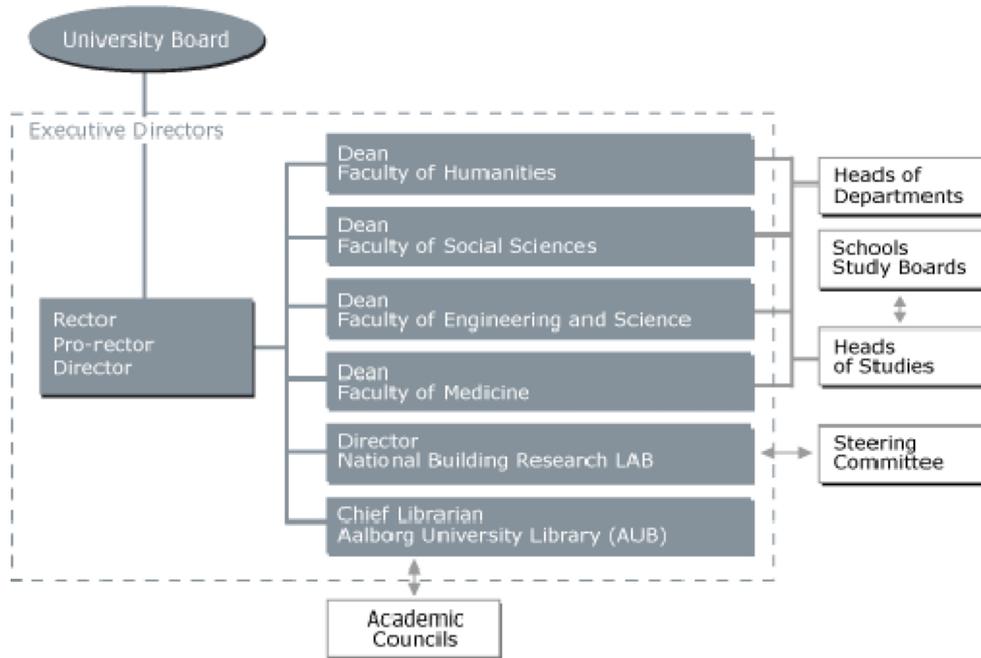
The Aalborg University with a well-established research and teaching activities is known by its different model from other traditional old universities which is based on problem based learning. This model has more focus on interdisciplinary, interfaculty studies; a pedagogical structure based on problem-centred, real-life projects of educational and research relevance - which has become known and recognized internationally as 'The Aalborg Experiment' or 'The Aalborg Model' (Facts, AAU 2009). This model enables students to learn independently and achieve knowledge and skills by solving real life problems.

The University has a great emphasis on international cooperation and collaboration with businesses and organizations with strong relations to promote research and development culture. The university research and teaching also influence on group work and collaboration. The Aalborg University was established in 1974 and is located at Aalborg in the north of the Denmark. It has other campuses in Copenhagen and Esbjerg along with several centres aboard also. There are five faculties and each faculty which is headed by the Dean is organized into a number of

departments, centres and schools. The University has more than 14000 students and offers more than 60 different study programmes under faculty of humanities, faculty of social sciences, faculty of engineering and sciences, and faculty of health sciences. The educational programmes at the Aalborg University are organized into the University's 22 different departments. Moreover, the National Building Research Institute (SBI) has also been included as a part of the Aalborg University.

## 5.2 Organization

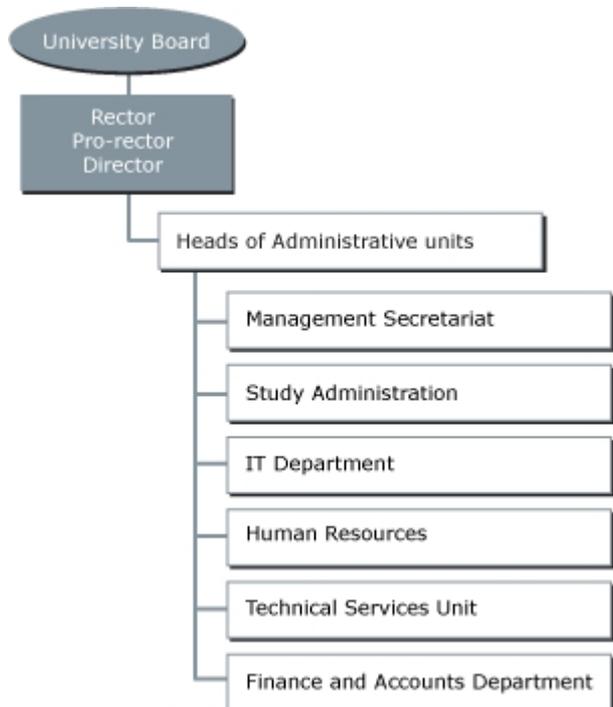
Aalborg University is a self-governing institution within public administration and under supervision of the Minister of Science, Technology and Innovation (AAU). The head of University is the Rector. A central administration of University consists on the Rector, Pro-rector, Director, University Deans, Chief Librarian and Director of National Building Research Institute and a number of Rector's Committees to support the Rector. The Pro-rector coordinates with the Rector and take-cares of his matters in his absence. The University's library service is controlled by the Chief Librarian. The faculties are headed by respective Deans. The director is overall incharge and responsible for the administration. The Board of Directors is the supreme authority of Aalborg University which works in the best interests of University and determines guidelines for its long-term business and development (AAU).



Source: www.administrationen.aau.dk

Figure: 5.1 Organizational chart of Aalborg University

### Organizational diagram for the administration



Source: www.administrationen.aau.dk

Figure: 5.2 Organizational chart of administration of Aalborg University

### 5.3 Mode of Examinations

Based on pedagogical approach of problem-based learning, the AAU has mostly oral type of examinations with some written examinations also. The mode of examinations depends upon nature of the subject and course which can consists on oral examinations or written examinations as per criteria and scheme decided earlier before start of the course. This is also communicated to the student in advance through defined scheme and program structure.

The evaluation is started during whole study of course through assignments, presentations, projects and other tasks given from time to time to the students. Each program is divided so that every term has its thematic framework for teaching and project work which consists on half of their time teaching and half on project work in groups. The course consists of a combination of lectures, presentations, class exercises, lab experiments, workshops, seminars and group work. The problem-oriented project which always has a supervisor involves students, usually in groups to formulate and analyze a theoretical or practical problem. In the last, result of the project is presented in shape of a report which can be written in cooperation with private or public organizations where studies have been carried out (AAU).

For the project report which is mostly by a group, an oral examination is organized to assess each student individually but some courses which have direct relevance to the topic of project work are evaluated through project. The University uses both

internal and external evaluations. The internal refers to the trainer examiner or the faculty member of University while the external is from outside university which can be from other university or industry of home country or any other country of the world. The written examinations in presence of the invigilators are mostly conducted by the use of PCs in the examinations hall (AAU).

There are two annual examination terms which are summer and winter. Before appearing in the examination the student is supposed to get registered for the examinations in University STADS- online self service system by having unique student ID and secure password for authentication.

#### **5.4 STADS (study administration-online self service system)**

STADS- study administration is an online self service system which is being used in University as well as is being operated in other Danish Universities. STADS is a joint cooperation in the field between different universities of Denmark which agree on a unique system development under supervision of Danish Ministry of Science, Technology and Innovation. The greater part of development is taken place at a private firm called Logica. STADS provides online student self service which let students to signup for the examinations, register or drop courses registration and examinations, view examination results and record, print transcripts and enrolment confirmation receipts, and enter personal basic information into the system.

### STADS

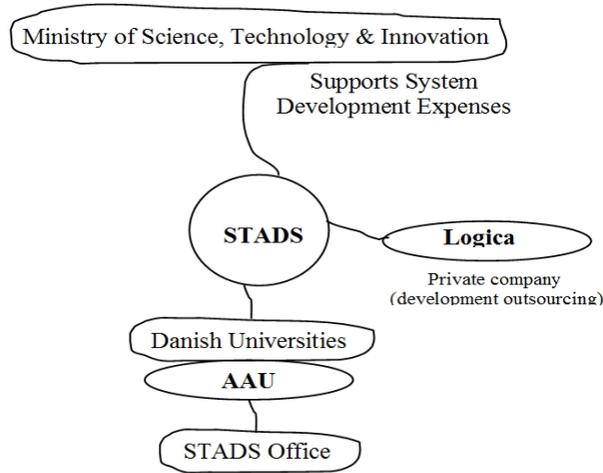


Figure: 5.2 (b) STADS- management diagram

### STADS for Examinations (AAU-Interaction Model)

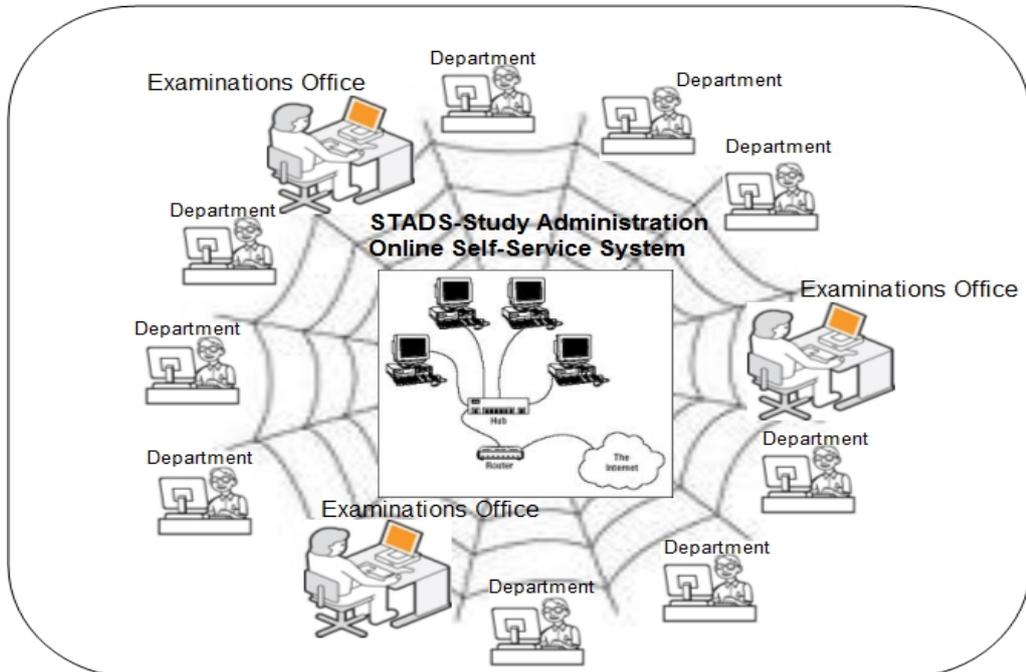
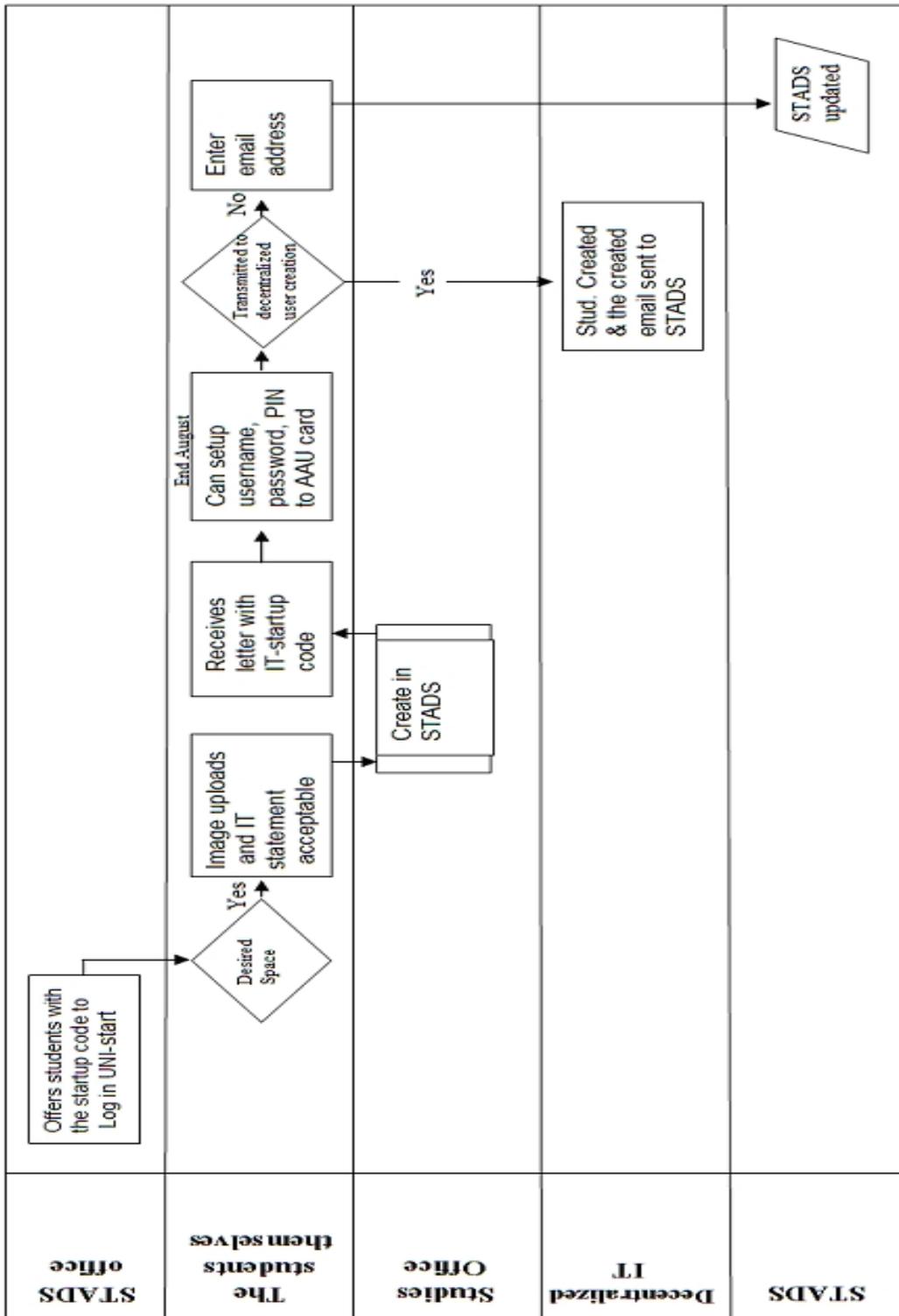


Figure: 5.3 STADS-interaction model of examinations offices at AAU

STADS-student login



Source: STADS office -Version 1.1 - 30th November 2009

Figure: 5.7 STADS-students at AAU – flowchart model

## 5.5 Examinations System

Once, the student signups for the examinations, this information goes to the secretary of the concerned department through concerned main examinations office of the faculty in shape of finalized list of students who have signed up for the examinations to verify. After confirmation, students are advised to appear in the examination by announcing exams schedule as per time table. The concerned study programme office is responsible to plan for invigilated written examinations based on registrations received, and will also circulate the examination dates with wide publicity on its local website as well as in the conference system to inform students.

The students can not appear in the examination unless they get registered themselves in the STADS self-service system within prescribed time. The students can also get print out of their examinations registration receipt from STADS- self-service and bring it to the examination for authentication.

The examinations can be of both types oral and written as per nature of subject and course decided earlier, and through certain parameters or criteria the student's individual assessment is done. An overall grade point is given on specific piece of paper as a result sheet with comments for examinations record. The university uses both internal and external evaluations. The internal examiner is always from same University and mostly the teacher who has taught the subject or course while the external is from outside the university which can be from other university or industry of home country or any other country of the world. The sensor can be constituted to

asses students individually and with mutual consensus finalize the grade points as per criteria and caliber of the students, and then put on the final result sheets with comments provided by the examinations office.

The assessment is based on grading scale which is given either 7-point scale and other pass / fail basis. (AAU) The new 7-point grading scale based on joint European transfer scale, the ECTS scale has come in force from September, 2007 by replacing old 13-point grading scale in the university. The overall assessment is accordance with stipulated objectives and assessment criteria. The 7-point grading scale consists of five pass marks 02, 4, 7, 10 and 12 and 00 or -3 are under category of failure marks (AAU).

### 7-Point Grading Scale

Mark	Designation	Description	ECTS
12	Excellent	For an excellent performance displaying a high level of command of all aspects of the relevant material, with no or only a few minor weaknesses.	A
10	Very Good	For a very good performance displaying a high level of command of most aspects of the relevant material, with only minor weaknesses.	B
7	Good	For a good performance displaying good command of the relevant material, but also some weaknesses.	C
4	Fair	For a fair performance displaying some command of the relevant material, but also some major weaknesses.	D
02	Adequate	For a performance meeting only the minimum requirements for acceptance.	E
00	Inadequate	For a performance which does not meet the minimum requirements for acceptance.	Fx
-3	Poor	For a performance which is unacceptable in all respects.	F

Source: AAU < <http://studyguide.aau.dk/programmes/gradingscales> >

Table: 3.1 7- Point grading scale

The qualified graduates, who received grades according to both 13-point and 7-point scale during their studies, can get their degrees mentioning their grades according to 13-point scale and the converted grades according to new grading system which is 7-point scale (AAU).

The final sheet of result with grade point of every student is submitted to the Secretary of the department for onward transmission to the concerned faculty examinations office. The secretary of the department then sends these results of students to the examinations office for further process. The students can be informed about their grades immediately after examinations has been finished if it is of oral type but some how later if it is of written nature.

There are main three examinations offices under faculty of humanities, faculty of social sciences and faculty of engineering & sciences which remain in touch with the secretaries of the departments regarding examinations affairs. There is strong relationship between these examinations offices and the Secretaries of the departments. Once, the final result is received by the examinations offices from different departments of university, the data entry process is started by entering grade results of every student into the databases of the examinations department which is then verified again by another person of the examinations office to avoid errors. After entering finalized results, the system is able to send auto response to all registered students by email informing about their grades and results. The students

can also login in the STADS- self service system to check their results and grades for the same.

**Examinations Process for Each Department (AAU-Activity Model)**

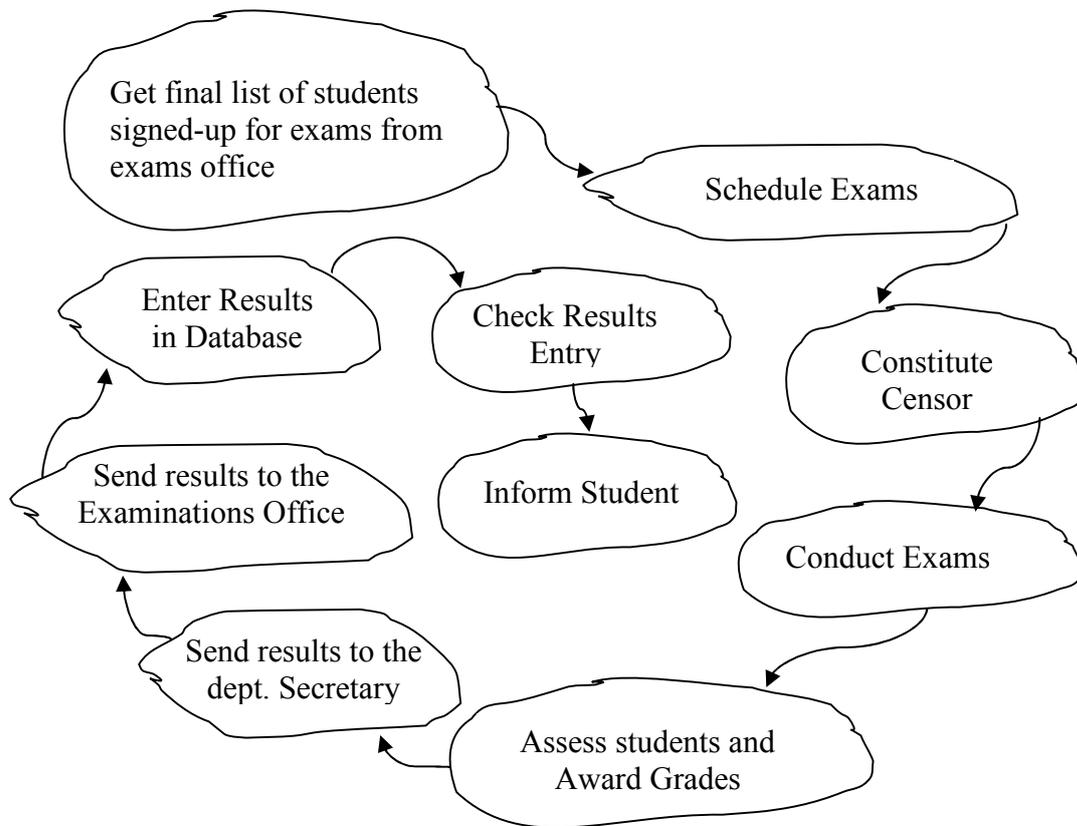


Figure: 5.4 Examinations activity model of AAU at each department

In case any student is feeling uncomfortable on grade point he has received or unsatisfied on the result then he has a right to appeal within the specific time period by giving in writing to the Secretary of the concerned department which can then be reviewed as per procedure by the committee. The student is informed later about the decision, and if any change in result observed by the committee would also be communicated to student as well as main faculty examinations office.

### Examinations Process for Each Department (AAU-Interaction Model)

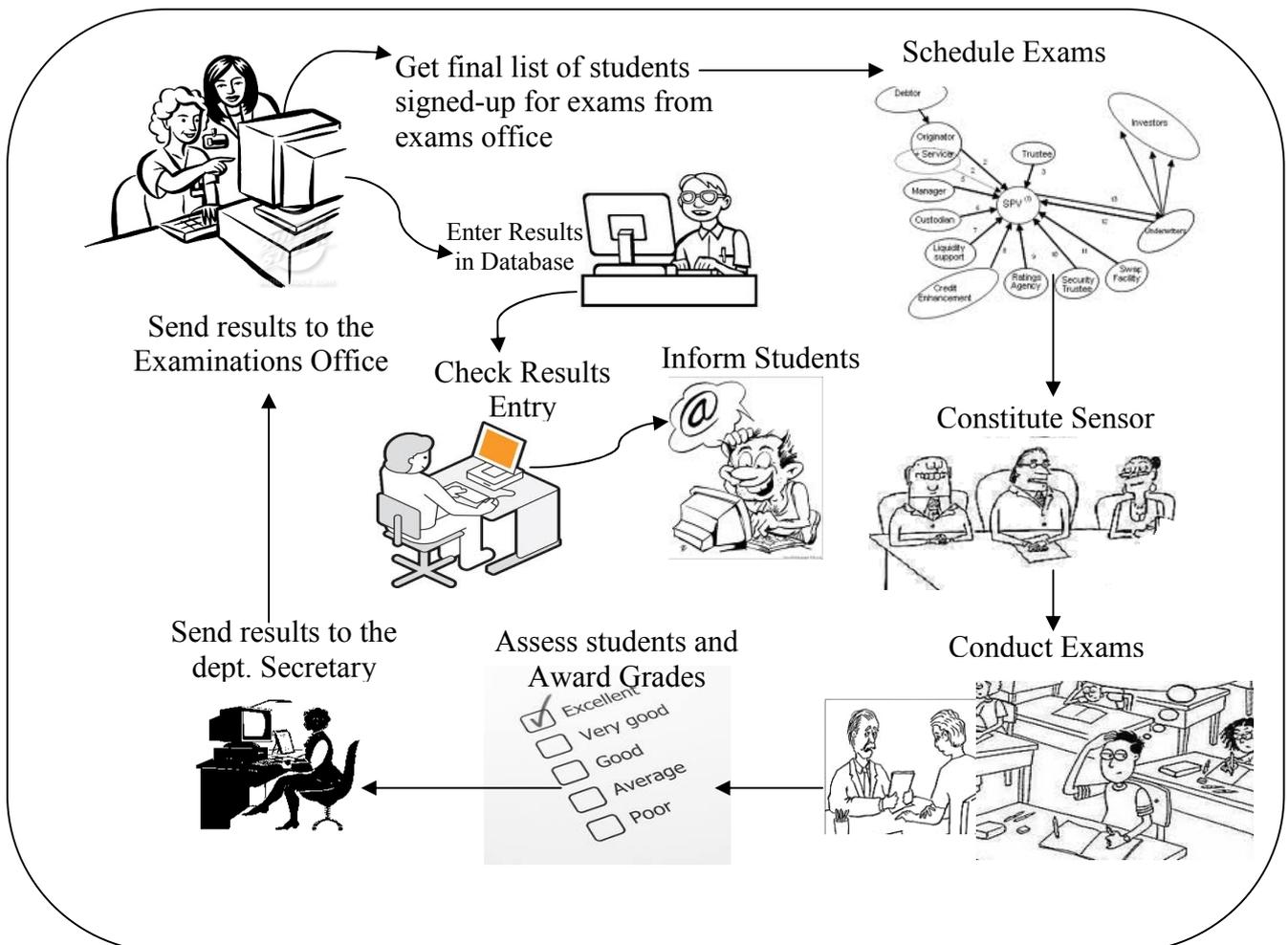


Figure: 5.5 Examinations interaction model of AAU at each department

The main faculty examinations offices which are using database software for the examinations record is based on STADS-study administration solution which is mostly developed by an IT firm Logica with some indigenous developments.

**Examinations Process at Examinations Office (AAU-Interaction Model)**

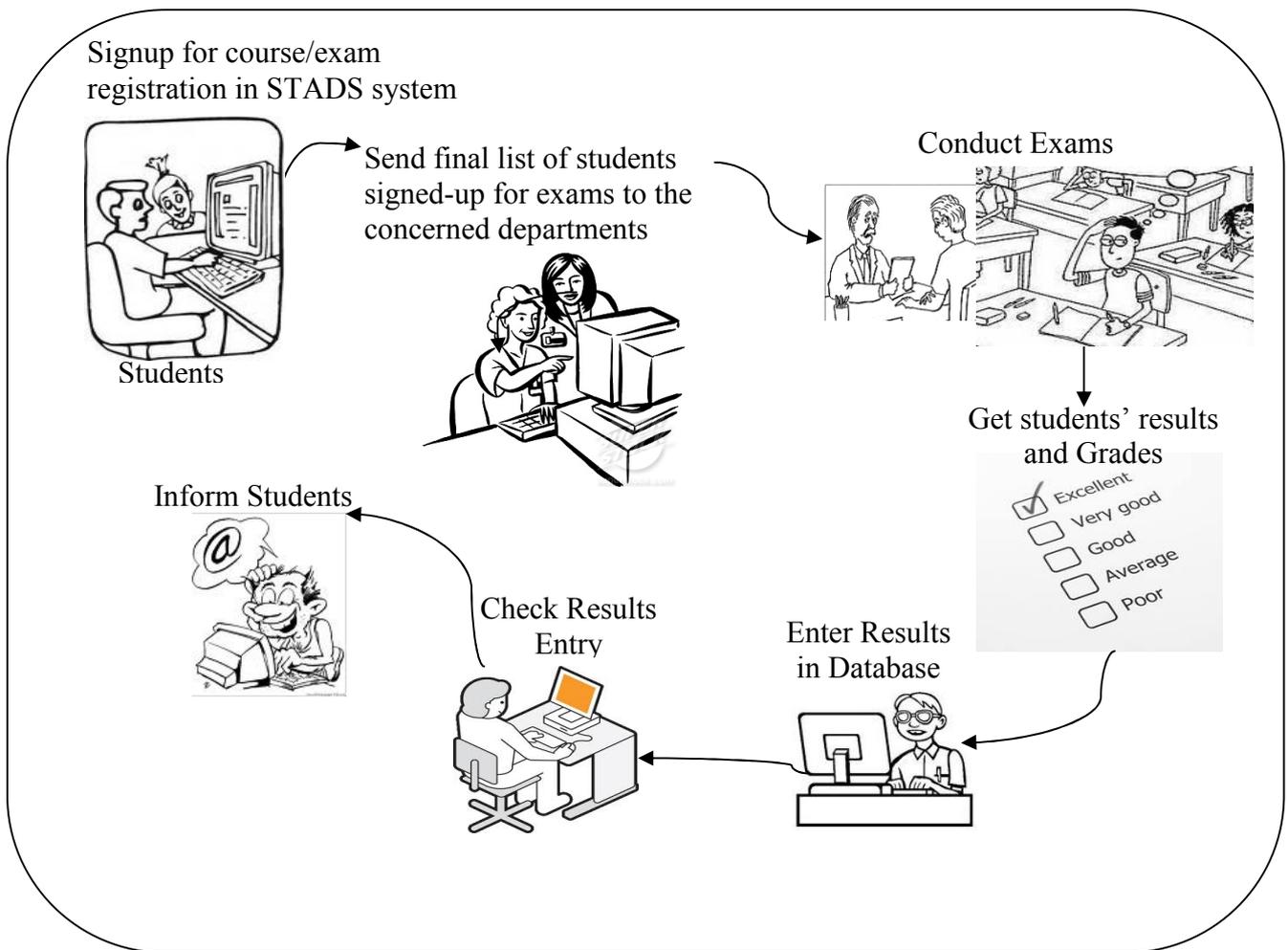


Figure: 5.6 Examinations interaction model of AAU at examinations office

## 5.6 AAU-POM (process of organizational meaning) Model of Examinations Department

The organization is based on flat management structure, and three examinations offices work in coordination with faculties, departments and institutions (figure: 5.3). Due to their uncomplicated exam data process and procedures, individuals work together in shape of team work. Departmental secretaries act as channel of communication between exam offices and departments. Very few individuals (secretaries, exam office staff) based on service oriented approach work together and exchange examinations information. Students can find their relevant examinations information (results) online and they can further interact to the examinations offices through email (element 1). Overall perception of data rich world is based on information provision and knowledge. This led them to ignore traditional procedures and paper-based formalities due to organized computer based information system. Culturally, strong ethical work-practices observe systems as trust-based with strict IT use policies which perceive data rich world to meaningful information for all (element 2). Discourse of their related meanings is well formulated into organized information system, where all official correspondence is taken through electronic mail. Mutual interaction within staff without formal procedures aims to provide service to the students. Created meanings based on information provision, develop a network of information accessible to all stakeholders (students, secretaries, international office). Well automated procedures into information system are no more required to take any kind of formal permission for decisions or accept

any pressure from competent authority. Every one (student, secretary or exams staff) can take its own decision based on accessible examinations information (result) online (element 3 & 4). Intentions to provide meaningful information (results, exam schedules, news) to students and their accommodation through well-articulated information system are assembled by strong e-communication. Cooperative working environment with mutual consensus, find solutions to unstructured situations. Access of information and interaction is PC-based automated system, where no personal intentions and human interdependency exist (element 5). Paperless communication (internal correspondence) based on strong IT infrastructure with intention to serve the information (results and exams related news) to students clearly define their purposeful action. All purposeful actions (sending and receiving exam information, mutual interaction between exams staff and secretaries) are electronic, where no formal paper documentation is maintained for record (element 6). Organized information system with well-articulated human activity systems is served as supporting tool to execute their routine office activities for information (element 7 a.). Appropriate IT infrastructure and relevant professional knowledge is strength of this system which serve purposeful action of the examinations related activities (sharing exams information /results, schedules, news). All exams staff, students, secretaries and working people are used to computer systems, and there is healthy ICT working environment (element 7 b, c.).

## Chapter # 6

# Results and Discussions

Based on overall thorough study and analysis of both models (MUET & AAU), the following main observations with key leanings are mentioned below with regards to their basic work process.

### 6.1 MUET - Analysis: (basic work process)

1. The system of examinations and hierarchical management (Figure: 4.1) structure of Mehran University is quite different from Aalborg University with respect to its own norms, values and culture. Based on contextual social, cultural and political factors the MUET adopts centralized management of the examinations with its own delegation of authority and chain of commands with specified roles.
2. This involves the Controller of Examinations (head of department) followed by Deputy Controller, Assistant Controller and supporting staff (Figure: 1.4).
3. Except these relevant people, no other individual or department has any kind of influence or access to the examinations information.
4. All examinations related decisions are made by examinations department

with approval of competent authority.

5. The examinations are conducted centrally with a specified exams timetable universal for all the departments with respective subjects and dates but within the same time period by the examination department.
6. The students are required to fill-up and submit examination form manually before appearing in the examinations.
7. Usually all examinations are written of 3-three hours duration along with practical/verbal examinations of the same subjects in most of the cases.
8. The mode of assessment of the results is assigning marks in numbers for each subject, which has a critical and complicated set of procedures and standards.
9. There is a well defined procedure of all examinations activities mentioned in the form of formal SOPs (standard operating procedures) and detail description of the roles with their responsibilities called Job Description.
10. The overall system has number of complex processes and activities (Figure: 4.11) consisting on pre-examinations activities, conduct of examinations and post-examinations activities involving numerous people diversified into three sections, secret section, conduct section and computer cell (Figure: 4.12 a, b).

## 6.2 AAU – Analysis: (basic work process)

1. AAU has a trust-based system where no formal hierarchical management exists (Figure: 5.1) for examinations and even student workers are hired to make record entry in the databases.
2. The departmental secretaries act as examinations coordinator by interacting with main examinations offices of their concerned faculty and manage their relevant departmental examinations with dealing student matters.
3. They also deal with students with regards to the examinations affairs and send grading results to the concerned faculty examinations offices provided by the faculty members.
4. The departmental secretaries and faculty and its management jointly coordinate and take decisions.
5. The examinations of all departments are conducted with different schedules as per timetable announced by the respective departments.
6. The student is supposed to be registered for examinations at STADS- self service system before appearing in the examination (Figure: 5.6).
7. Based on pedagogical approach of problem-based learning usually the examination is based on assignments, presentations, project work, group work and oral examinations. In some of cases there is also a written

examination.

8. The mode of assessment of the results is award a grading based on seven scales (Table: 3.1) and has less concern on process and procedures with minimum complexity.
9. There is no formal written procedure of examinations activities, established SOPs (standard operating procedures) or well defined job descriptions with their roles and responsibilities of the working staff.
10. The overall system has limited computer based activities without complicated procedures with the least involvement of people.

The prime objective of this study is not to discuss and compare the mode of examinations systems of both universities (AAU & MUET) in terms of rules, regulations, but the infrastructure of information processing through use of computer based information system, and measure its effectiveness towards customer service as well as easiness of working people in the organization. The whole view is led by the SSM approach (Figure: 2.1) which focuses social, cultural and political elements (Figure: 2.5) as key ingredients of this study. In view of different social, cultural and political analysis of both models the study does not allow to bring and implement complete system of AAU to MUET, but there are some strength features (mentioned here under) of the information system which can be adopted by MUET.

## 6.3 Identified Strength Features of Information System of AAU

(systematically desirable and culturally feasible).

### 6.3.1 Less Manual and More Digital System

Almost all activities (enrolment, exams registration, results, announcements) at AAU (Figure: 5.6) are based on computerized information system, and no formal manual data processing activity is carried out which has shortened the procedures, and reduced human activities with minimum number of workers in offices. The activities start from admission office (international office), where they enter student enrolment information in the system, and then get user ID for STADS which give access to exams office to enter grading results in the system. Every one (student, secretary, data entry operator, exams officer) has its own view and access to view and enter information. Everyone access same information system without manual labor work, which leads to greater accuracy and control with minimum error chances. The system is digitized with user-friendly environment and can run with limited number of people without dependency of any individual or expertise.

### 6.3.2 Strong E-Communication System & Hotline Service

The system of e-correspondence, feedback, e-communication, designed portal systems with prompt response, troubleshooting hotlines, online connectivity of AAU is strong feature of their system which is very helpful in reducing communication

gaps. Despite geographical distances between offices it seems to be coordinated and cooperative working environment. The students are informed about their examination schedules, circulars, notices, news, grading results through email, web portal (STADS), and in case of any problem the hotline is active to respond through phone call or email service.

### **6.3.3 System Integration & Coordination**

The system integration having connectivity to its subsystems (enrolments, exams, STADS, library, and administration) to the relevant sections (departments, exam offices, international office, library, accounts, and administration) with different modules (admission, exams, accounts, and library) interconnected to each other provides a sense of centralized database information system. This leads to an organized information system which serves the purpose of organization itself with benefiting the real stakeholders (students) by providing requisite information in real time. The AAU information system is centralized interconnected with respective stakeholders (international office, students, secretaries, exams offices, library and concerned officials) having user level access to view and enter information, where the same information is accessible to all sections in real time.

### **6.3.4 Paperless Management**

The computerization of information system at AAU leads to the paperless management, where all information (results, letters, news, correspondence, schedules, and files) is received or sent through e-communication. The whole correspondence between students, teachers, staff and management takes place through email with a slogan “think before print”, where no formal paper work is carried out. Even the students’ grading information and results are sent to the portal (self-service system) and no paper marksheet or certificate is provided to the students. Usually, the AAU does not have practice to issue different certificates like the examinations department of MUET issues variety of academic certificates like, marksheets, position, merit, appearance, alongwith pass, degree and transcript required by the students which incur lot of expenses and labor.

### **6.3.5 Less Formal Procedures for Students with Minimum Chances of Personal Visits**

Web based self service system and strong e-communication of AAU has minimized the necessity of personal visits to the examinations offices or departments for information. All is dealt through STADS system and e-communication, where updated academic record, grading results are available, and student is informed through email when result is announced. The student is not bothered to apply for

result sheet/marksheet or certificate facing huge formalities. All relevant information of his interest is provided him/her without personal visits.

### **6.3.6 User Login IDs and Student Self Service System**

One of the best features of the AAU model is the STADS-self-service system (refer: 5.4) which provides a web-based portal for students to access their academic information and grade results through their unique ID and password (Figure: 5.7) without making personal visits to the examination offices. They can even print their results, enrolment information, transcripts, register for examinations and courses or drop the exams. This helps management to focus on their work rather than attending queries.

### **6.3.7 User-Friendly Application & GUI (graphical user interface)**

The easiest and user-friendly graphical user interface of the application of information system has led to the staff, management to operate it without any help or problem. It does not require special computer expertise or knowledge. An ordinary user with basic understanding of computer can operate the system. The options (add, remove, update) and access has been given as per user level. The examinations offices can have more access and control over database operations but the departmental secretaries and users have limited access. The students have been given web-based interface which seems to be a web-portal login through user

ID. All students easily can access their information (basic personal information, examinations record, reports) and feel comfortable with interface.

### **6.3.8 User Logon and Activity Monitoring Record**

The most important and good feature of information system of AAU is user logon record keeping which tracks user login information and record activities (add, remove, update) carried on database. This creates a sense of security and monitoring of the examinations record for integrity.

### **6.3.9 Involvement of Stakeholders**

The students, international office, departmental secretaries, examinations offices, and relevant people have an access to the examinations information system as per their level of authority and use. These are supposed as real stakeholders of the system who have access to the system. Teacher, who is one of the important active stakeholders of the system, currently has no access to the system. The AAU is considering for launching a new improved version of STADS which let the teachers (internal/external) to put grade results in exams databases directly without getting help of their departmental secretaries who usually send results to the examinations office.

### **6.3.10 Associate Admission Office (international office) with Database**

Admission branch is the most important and crucial section, where student is registered and enrolled in the University. The admission office (international office) at AAU enrolls student, and make entry into the database with all relevant basic information of the student which serves whole the university with same information. Once data entered by the admission office and login by the students at STADS system, the same is accessible to the examinations offices also.

## **6.4 Identified Limitations of the Information System of MUET**

### **6.4.1 More Manual and Less Digital**

Almost all activities (Figure: 4.11) at MUET are manually handled while processing examinations information. This leads to greater chances of mistakes and over burden of work that cause frustration in the workers. Due to the complexity of the work process (figure: 4.11) and activities (pre-examinations, conduct of examinations and post-examinations), the manually handling of data and exam forms, maintain student information, handle exams record, compilation of records, developing result ledgers, maintain internal & external record, announcing results, circulating result sheets, issuing certificates, attending student queries, verifying examinations record, tracking old records, has increased the labor work which requires more staff to work

for late hours. This is also cause of delay in work which is lying dependent on each other's' feedback (Figure: 4.12 a, b).

#### **6.4.2 Less E-Communication**

Most of the working staff is less computer literate and the emailing system is not common. All correspondence, letters, memos, circulars, notices, schedules, timetables are issued on paper and circulated manually. The student queries are also attended manually with personal visits. Less people use emails, and no web-based examinations portal is developed for students or staff.

#### **6.4.3 No Hotline**

The MUET examinations department has no hotline service through which students can ask about their problems, queries, or can send emails. The students have to visit in person for their problems, queries, and certificates.

#### **6.4.4 Weak System Integration**

The working system of MUET model with its sub systems/sub-sections (secret, conduct, computer) (Figure: 4.12 a, b) process information separately. These sections work in isolation, and due to manual working the coordination is dependent over the response of other section. The same activities (Figure: 4.11) (developing result ledgers,

maintaining internal, external record, conducting examinations, issuing certificates) for the undergraduate, postgraduate and affiliated colleges/institutions are carried-out separately by separate people. No centralized database with different modules of particular sections (secret, conduct, and computer) is available, and each activity seems to be a whole separate isolated system rather than a part of the whole wider system. This is the reason of delay in feedback and prompt decision making.

#### **6.4.5 Paper Based Management**

The MUET model is focused on paper based working, where all activities (pre-examinations, conduct of examinations, post-examinations), processes, sections (secret, conduct, computer) (Figure: 12 a, b) are manually handled and every information (circulars, memos, letters, certificates, results, announcements, news) is carried-out through paper. Management of information is totally based on manual hard filing system, where no computerized record exists except the punched results in the databases. Every student gets issue variety of paper certificates (marksheets, position, merit, appearance, pass, degree and transcript).

#### **6.4.6 Formal Procedures for Students with Greater Chances of Personal Visits**

Due to unavailability of well-developed information system or a quick reference of information verification and authenticity, the feedback to students and other organizations is delayed. Usually students are required to produce authentic

supporting documents to get issue new certificates. Every time the student has to submit a set of documents (enrolment card, marksheets, application, ID card) separately for each document to be issued from examinations department that leads them to pass from huge formalities and personal visits.

#### **6.4.7 No Web Portal for Examinations**

The MUET model does not have a web-portal system which acts as a channel of communication between students and examinations department. There is no such relevant information available at the university website also. The student is dependent on personal visits to enquire about his problems (results, certificates, exams, schedules). Most of the time of the examinations staff is spent on attending student queries rather than to keep focus on their work.

#### **6.4.8 No Student ID Login System**

The student login system and user ID is not developed to accommodate students to access University resources (intranet, sharing, softwares, forms, files), and access examinations related information, (challans forms, proformas, and applications) available at local area network and website. All students at the moment are using other services (yahoo, hotmail) for their correspondence.

#### **6.4.9 Weaker Management of Accounts (remuneration bills)**

The system of accounts management and maintaining remuneration bills of the teachers (internal/external) is quite complex, where all bills rush to the examinations department for claiming their remuneration (for exam duties) and it takes a lot of time to get verify and calculate the exact amount for their remuneration. This sometimes, creates problems for the staff and management of examinations department to trace proper record and get overburden during examinations time. The teachers also face problems and spend their time to visit the examinations department.

#### **6.4.10 No Involvement of Stakeholders**

The teachers (internal / external), students, top management, admission branch, official, officers relevant to the examinations department, deans, directors, chairmen, and student financial aid office of MUET are separate from each other with regards to accessing examinations information. They are all interested stakeholders of the information but they don't have an access except sending formal request letter to examinations department for seeking information. The internal correspondence for seeking information within same university premises takes a lot of time and efforts which cause of delay in decision making.

#### **6.4.11 No Link of Admission Office with Exams Office**

Admission branch is the most important and crucial section, where student is registered and enrolled in the University. The admission branch at MUET maintains student information and enrolments record which is not linked to the examinations department, where again the same information (name, f.name, caste, dept. roll no.) is entered manually in the system. This sometimes creates mismatching of record (usually student name, father's name, caste) due to punching errors in issued certificates different from enrolment card issued by the admission office.

### **6.5 POM (process of organizational meaning) Model - MUET & AAU**

Organizations are successful when they meet their objectives through stable meanings and well established processes. These objectives and meanings usually are achieved through reliable, efficient and organized information system which must be enriched with social, cultural and political factors to its organizational culture. Information system is taken as serving system which serves purposeful human action. This purposeful human action forms strong human activity system that finds intentions and accommodations which can lead to the development of organized information system. This is the reason that the serving system should be capable enough to serve human activity systems, and meet organizational needs of

information. A healthy serving system is always developed by understanding human activity systems in relation of social, cultural and political factors to its organizational culture and environment. An advance study of such considerations well articulates the information system requirements which can serve best to the human actions.

We are also concerned about development of the information system in connection with the social, cultural and political factors by understanding human situations. This study examines two work situation models of the information system dissimilar to each other with respect to their social, cultural and political differences. The process organizational meaning model (Checkland, 1998) (Figure: 2.8) is used to understand and analyze the differences of both culture models of information system.

Analyzing both models with regards to social, cultural and political factors of the information system, the MET model is perceived against its limitations (refer: 6.4) and AAU model is observed for its strength features (refer: 6.3). Our purpose is to propose systematically desirable and culturally feasible information system model for MUET (refer: chapter 7) after comparing both (MUET & AAU) models.

Observing MUET-POM (refer: 4.4) & AAU-POM (refer: 5.6), analysis shows that MUET model of examinations department is more complicated than AAU based on complex activities and processes (figure: 4.11). Individuals interact with each other for data and information through power of hierarchy and their perception for information is record

keeping. There is communication gap between staff, supervisors and officers and students (element 1). Systematically, documentation and formalities are intensive. Discourse for data and information is limited to the examinations staff, but the important stakeholders (students, teachers, management, govt./autonomous bodies) are missing in information system. Purposeful action is less benefited from existing information system, and all activities are carried out manually (figure: 4.4). Information system is based on perceived world of internal working staff of the examinations department which limits the assemblies of the intentions and accommodation of their own (element 2 & 3). Information system is less enriched with intentions (error free on demand auto results generation and issuance of certificates/reports) and accommodations of real needs of the stakeholders (figure: 7.2) (element 4 & 5). Computer literacy and ICT infrastructure are two main factors that need to be addressed special attention (element 7 a, b.).

Analysis highlights important elements of change and suggests in restructuring of activities & physical workplace (refer: 7.2.1), reformulate data processing and work procedures (refer: 7.2.3), and reformulate rules with technological developments (refer: 7.2.2).

## Chapter # 7

# Proposed Model and Recommendations

### 7.1 Proposed Features of new system for MUET: (systematically desirable and culturally feasible).

Following SSM analysis with respect to social, cultural and political view (Figure: 2.5), it is assumed that systematic changes must be in context, which should be easily adoptable and applicable to the environment. Though there are many good features of the AAU examination model such as, centralized management of information system and outsourcing (logica) for STADS under support of concerned ministry (ministry of science technology and innovation), announcing results without issuing formal paper result sheets/marksheets, publishing exam schedules, timetables, and other relevant information through electronic system without circulating manually on paper but these all can not be fully applicable in MUET-exams model. The MUET has its own systematic and cultural environment, where higher education commission (HEC) governs the rules of universities, and there is no such centralized established IT infrastructure with latest technological equipment and devices to manage whole universities' information system centrally. Moreover, there is lack of well reputed IT firms with maximum possibility of disclosure or with higher

development and service expenses, which could not be met due to shortage of funds allotted to the universities. In case of implementing complete electronic system for correspondence at MUET, the important urgent information can be worthless due to inaccessibility of computers and internet to students and people at workplace who are not familiar with computers. Most of students are from remote areas, where no computer or internet facility is available to keep informing them. The students are required their results on printed official papers for their record and forward to other institutions, organizations for job, internship and financial support, where no other document is accepted country-wide.

Keeping in view the above facts in light of social, cultural and political arena, the systematic desirable changes are proposed here under for the MUET examinations information system.

### **7.1.1 Less Manual and More Digital System**

Automating all human activities from service counter, student queries, result submission, result compilation, developing ledgers, announcing results to daily examinations affairs routine management activities (record verification, result statistics, result ratios, reports and certificates) with the help of well organized information system can eliminate repetitive human actions and activities (Figure: 4.11). The digitized information (from students' basic personal information to last academic result record) accessible to all sections (secret, conduct, computer cell) for

undergraduate, postgraduate and affiliated colleges/institutions can give central command and control with least possible manual or paperwork (manual filing, writing manual reports, forwarding paper information to other sections, manual handling of students record, recording and monitoring students queries, letters, circulars, internal correspondence for information, verbal queries/conversations ). The major manual routine activities from submission of internal/external results, sessional marks, compilation of results, development of result ledgers, announcing results, issuing certificates and preparing result reports can be computerized into organized information system (Figure: 7.4) with added features (record searching, result status, student personal information) for interested stakeholders (chairmen, dean, financial aid office, admission branch, top management) (Figure: 7.6). This would reduce paperwork, which usually increases in correspondence of information seeking. With efficient use of information system, the printers are also less used which contribute to the paperless management. Publishing requisite information (results, fees, forms, proformas, applications, defining procedures for certificate issuance, circulars, notices, news) on web-portal can reduce paperwork to the great extend.

### **7.1.2 Strong E-Communication System**

The information system can be strengthening more with the development of stronger e-communication system. All information, news, correspondence, feedback, queries, information delivery, file sharing and document transferring activities can be carried out by the use of electronic system (email). The student queries, inter departmental

correspondence, internal meeting calls and daily routine tasks can be routed through electronic system so that communication can faster without paper work. This feature is very helpful in reducing communication gaps, and despite having geographical distances between people and offices provides a coordinated and cooperative working environment.

### **7.1.3 Establishment of Hotline / Helpline Cell in Examinations Department**

The hotline/helpline cell will be acting as a channel of communication between examinations department and its outside stakeholders for information (students, different government / autonomous bodies, engineering council and higher education commission). This section will provide requisite information (student results) to the interested stakeholders through accessing information system and coordinating with other sections (secret, conduct, computer cell). The students are mostly given electronic information available at web-portal or sent through email but if some queries, problems, trouble shootings are addressed to this section, it will provide prompt support.

### **7.1.4 System Integration & Coordination**

Physically centralized examinations department of MUET can be more centralized in perspective of information system development. The working system with its sub systems/sub-sections (secret, conduct, computer) and activities (Figure: 4.11) for

undergraduate, postgraduate and affiliated colleges can be formed into integrated examinations information system (Figure: 7.1), which are quite connected with each other rather than treating the sections as a separate part. The whole system can be centrally managed (Figure: 7.5) with one administrator having access to all information of all sections (secret, conduct, computer cell) and the sections can have access to relevant information of other sections.

The secret section, conduct section and computer cell (Figure: 4.12 a, b) can be same for all undergraduate, postgraduate and affiliated colleges/institutions with same functions as defined in the SOPs (standard operating procedures) but the activities (Figure: 4.11) (conducting examinations, processing results, developing result ledgers, announcing results, printing certificates ) are managed centrally.

The centralized database management system (Figure: 7.5) of the examinations department can have all requisite information of daily use (Figure: 7.1) of staff and management with relevant module (secret, conduct, computer cell) and user interface as per their level of authority and job description of the user. This concept of connectivity of all sections with one centralized information system for information seeking accommodate human activity systems and provide feedback on demand, which leads to take prompt decisions.

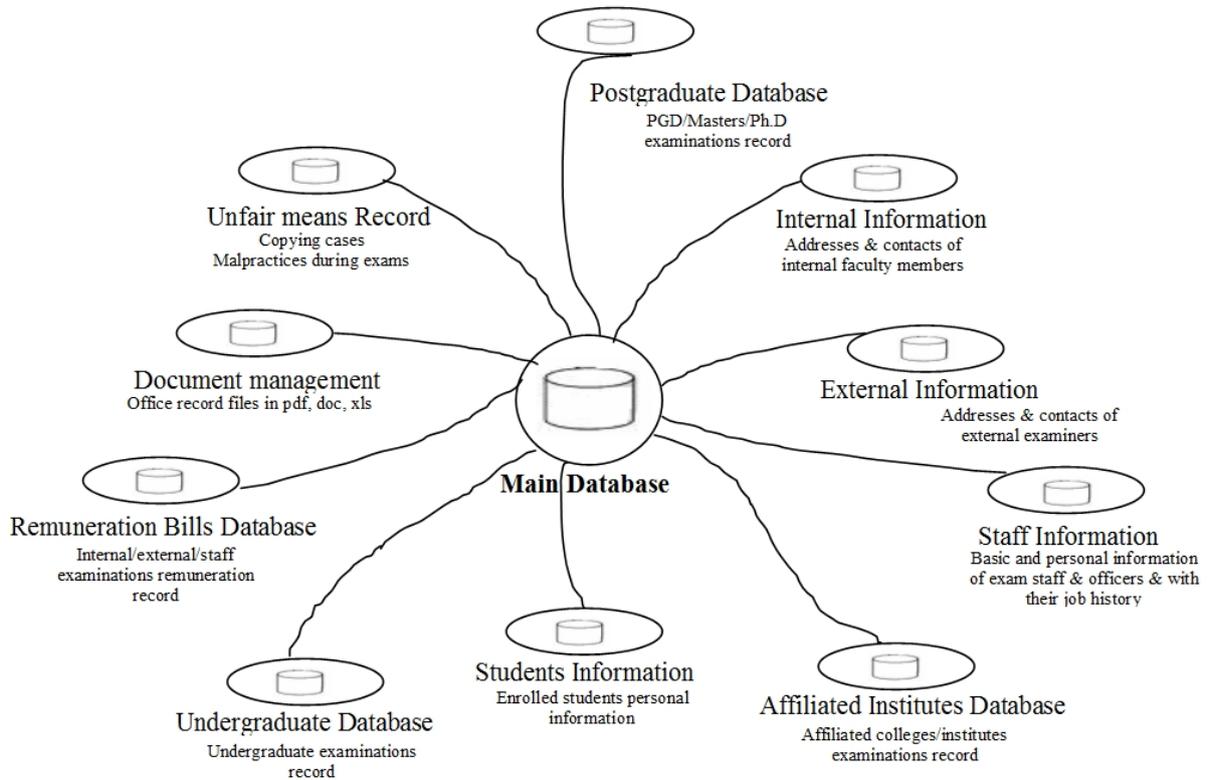


Figure: 7.1 Centralized database with all relevant modules model for MUET

### 7.1.5 Paperless Management

The overall information seeking and information delivery should be focused on electronic transformation which reduces paperwork. Information system serving the human activity systems with intention to provide meaningful requisite information to the stakeholders (Figure: 7.6) should eliminate the internal correspondence and letters to inquire about information. The traditional manual filing systems, record keeping and paper based notes, memos and circulars can be managed electronically. The activities (pre-examinations, conduct of examinations, post-examinations) and

processes of different sections (secret, conduct, and computer cell) (Figure: 4.12 a, b) are totally computerized (Figure: 7.4), where all the information is PC-based.

### **7.1.6 Less Formal Procedures for Students with Minimum Chances of Personal Visits**

The students are main active stakeholders of the information system and they need prompt and updated information. Usually, they need to know about their results, procedure and fees structure for applying their certificates (marksheets, pass, appearance, merit, transcript, and degree), exams schedule, exams form, challan form and application forms. This all information can be provided on web-portal of the examinations department, where students can view and download requisite information and forms without visiting personally to the examinations office. The results announcement can be sent them through email and the same would be available online. While getting issue students academic certificates, there should not be further formalities and requirement of documents, as the data and record is already in the system. The fees can be deposited in online bank account or through money order and the certificates can be sent to concerned department or given postal address through reliable courier service. The students are taken as customers who are given priority by providing service at their doorstep. The online information access (web-portal), email system, hotline/helpline service, and courier services can be good steps to accommodate students' interests and reduce personal visits. This

also helps examinations staff and management to focus on work rather than wasting time on attending result queries of thousands of students.

### **7.1.7 Conversion of Final Results (marks) into GPA (grade point average) System**

One of the most important elements of new system apart from traditional marks system is required to have a conversion system, from marks to GPA (grade point average) (Table: 3.1). All the universities in Sindh deals result grades in terms of marks mentioned in numbers; but, so for international standard which usually most of the universities of world follow, is GPA system (Table: 3.1). The students who usually go abroad for higher studies face a problem and take another conversion certificate from home university for their results converted from marks to GPA system.

It is better to follow international standards, and the GPA system along with individual grading of subjects with marks can be mentioned on transcript, so that both purposes should be served. The new system of MUET requires to incorporate conversion feature in the final transcript.

### **7.1.8 User Login IDs and Student Self Service System**

The students can be motivated to use computer based information system for their information needs without getting help or going in person to the examinations

department. They can be given a platform (web portal), well established network (LAN-local area network) to access examinations information (result status, personal academic record, personal information) and forms, proformas and challans which they can download and print. This all can be done through their unique ID and password provided to them during whole period in the university.

The model can be more advanced with added feature showing the status of certificate issuance applied by students, which can indicate objections in process if any. This model can greatly affect the efficiency of organization, by improving service quality and save time of attending certificate queries of thousands of students, who sometimes come in person from remote areas just to ask the status of their certificates.

### **7.1.9 Development of Web Portal for Examinations Department**

Following self-service system model of AAU, web-portal for the examinations department of MUET can be developed, which should serve not only students but the teachers, officials, staff, externals, government and autonomous bodies, higher education commission, engineering council and other recruiting agencies for the sake of meaningful information of their own interest. Students can find results, announcements, circulars, notices, exam schedules, news, application proforms, challan forms, detailed defined procedures, fees structure, instructions and rules for examinations; teachers (internal/external) can find remuneration forms, proformas,

rules; other organizations can view and verify academic record through given code printed on the certificate. The online web-portal should be updated with latest information representing the examinations department in all respects, so that viewer does not feel any question to ask from examinations office.

#### **7.1.10 Development of Web-Based Application with User-Friendly Interfaces**

The new system for MUET should be developed as a web-based application with user-friendly graphical interfaces as per their level of authority and information requirement of job description of the stakeholder (student, teacher, administrator, officer, data entry operator, controller, financial aid office, admission office and top management) (Figure: 7.6). All stakeholders (Figure: 7.2) can only have privilege to view certain information, but the teachers (internal/external) can upload or enter results record in the system with once entry restriction, which can not be changed again if saved. The admission office can enter and change personal information of student. The top management can view executive summaries, result analysis and ratios and result status while staff and officers can have limited access relevant to their sections (secret, conduct, computer cell) with privilege to enter information by concerned clerks once and then in case of changes the officer only can have this privilege to correct entry. The interfaces for information entry or delivery must be limited to the query and no extra feature access be given to irrelevant person. The controller can have access to view whole system records with all features and all sections but not to change any record. The changes in record can be possible by only one super user

who could be from officers. All is done through username and password having access to the system by all relevant people. The colors of the system should be used standard windows with animated logos and attractive guiding simple messages to every field for users so that it gives users a feel of easiness.

#### **7.1.11 User Logon and Activity Monitoring Record**

The most important feature of the system that new system of MUET should adopt is recording user logon information and monitoring its performed actions on databases. This will create a sense of security and monitoring of examinations record for integrity. The user who has privilege to enter data (data entry operators-once entry of examinations record), admission office (enter basic student information or change), designated officer for record changes (can change any record any information many times), teachers (internal/external-once entry of examinations results) can be monitored for his/her all actions performed on databases and recorded with username, date, time and change. A log file is maintained and stored after a particular time interval.

#### **7.1.12 Use of OMR (optical mark recognition) Devices and Capability of the System to Recognize**

The OMR-optical mark recognition devices can be used as a source to input data into system rather than using a traditional method of key punching, which cause of

great errors and heavy workload. The teachers who are unable to access computer and are not familiar, they can send hard copies of results, which can later be transmitted through OMR devices. A new system should be capable enough to recognize and handle data properly in this regard. For this purpose, specially designed OMR sheets can also be provided to the teachers to put results on paper, which can easily be converted into digital data.

### **7.1.13 Mobile Communication (SMS service)**

Mobile SMS communication can be used for students to keep them informed about important news (results announcements, exams schedules & dates, paper postponement) through mobile service providers. The student can subscribe on their mobile services to get messages from examinations department of the university and there can be an agreement between service providers and university authority to share news with students on nominal charges paid by the students as monthly/yearly subscription to the mobile service. In case of any updated information, news is announced by the examinations department and sent to the service providers it automatically goes to subscribed students.

#### **7.1.14 Auto-Calculator for Generating Remuneration Bills**

As a part of new information system, the auto calculator feature for remuneration of the teacher (internal/external), and examinations staff for examinations duties and assessment of results will generate auto electronic bills to be sent to the accounts branch in hard copy. This sub database will maintain whole remuneration record exam wise (regular/supplementary) and can generate consolidated reports year-wise for every person who has received remuneration.

#### **7.1.15 Involvement of Stakeholders**

The teachers (internal / external), students, top management, admission branch, official, officers relevant to the examinations department, deans, directors, chairmen, and student financial aid office of MUET can have access to the examinations information system for requisite information as per their job description and level of authority (Figure: 7.6). They should be taken as real stake holders of the information.

All stakeholders (Figure: 7.2) can only have privilege to view certain information, but the teachers (internal/external) can upload or enter results record in the system with once entry restriction, which can not be changed again if saved. The admission office can enter and change personal information of student. The top management can view executive summaries, result analysis, ratios and result status, while staff and officers can have limited access relevant to their sections (secret, conduct, computer cell) with privilege to enter information, by concerned clerks once. In case

of changes, the officer only can have this privilege to correct entry. The controller can have access to view whole system records with all features and all sections but not to change any record. The changes in record can be possible by only one super user who could be from designated officers.

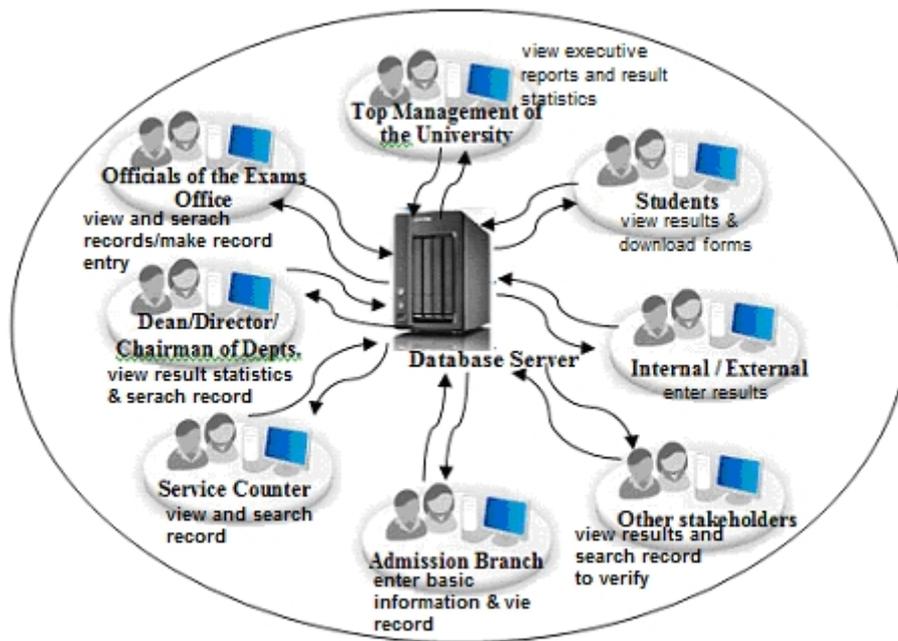


Figure: 7.2 centralized database model - access of information by stakeholder at MUET

### 7.1.16 Linking Admission Branch with Examinations Database

Admission branch is the first stage of record entry of student in the university. Once student is admitted, he is issued enrolment letter by the admission office and his record is entered in the admission branch. This record should be directly linked with examinations information system so that new student’s whole basic information can

be stored in the centralized system to generate his/her reports, certificates and marksheets with correct information (name, father's name, caste). This will prevent to get paper based hard lists from admission office and then re-enter in the system, which has greater chanced of typographic mistakes. In case student gets correction in his/ her name from admission office, the centralized connected system with admission office can automatically update record and issues corrected certificates to students.

#### **7.1.17 Linking all Universities with Centralized System under Higher Education Commission (HEC)**

The higher education commission (HEC) is the governing and regulatory body of the universities of Pakistan and has been remained active key role player in supporting universities to develop their technological infrastructure and organize their IT systems. In this regard, the HEC should take some steps to get develop and manage centralized information system for the Universities of Sindh and grant appropriate funds for development of system with maintenance budgets to the universities. There should be collaboration between universities to have a joint development consortium, where all universities can have their own systems connected to the centralized management of systems under supervision of HEC. The HEC can have access to view results status of the Universities, summarized executive reports, enrolment and passing-out student information, announced results, search student information and record, get verification of the records, degrees and certificates but do not have rights

to make changes to any record. Currently, there is a gap between higher education institutions and HEC with regards to exchange of information, which usually takes a long time in getting feedback due to overloaded work of the universities, and making traditional correspondence. This will give easy access to the information of the universities (results status of the universities, summarized executive reports, enrolment and passing-out student information, announced results, search student information and record, get verification of records, degrees and certificates) for taking decisions and allocating funds to the universities as per their performance.

## 7.2 Potential Areas of Change

Moreover, by observing AAU model and investigating MUET model, the main three points of concerns have been identified as potential change for the MUET model with respect to its social, cultural and political factors. These are:

- (i) Reallocation of resources and physical restructuring of activities and sections (secret, conduct, computer cell) to formulate strong communication,
- (ii) Technological change that can affect the activities and work practices by automating manual system and,
- (iii) Systematic change that reformulate work procedures in social and political context.

### 7.2.1. Reallocation of resources and physical restructuring of activities and Sections (secret, conduct, computer cell) to formulate strong communication

From overall analysis and depth study of the examinations department of MUET, it has been observed that there are number of repeated activities (Figure: 4.11), which are being performed separately while dealing with undergraduate, postgraduate and affiliated institutions matters. This has resulted in communication gap between people and their sections to facilitate each other for sake of information and delay in feedback. Though there are separate sections (Figure: 4.12 a, b) with specialized functions well defined by their roles such as; conduct section deals in conduct of examinations, secret sections deals with compilation of results and computer cell is associated with printing of certificates, but these sections have been limited to the undergraduate studies, while the postgraduate section and affiliated sections are allocated separately, which are performing same activities that are being performed by above three sections (Figure: 4.12 a, b). Moreover, the sections are isolated and have their own style of working. The university is ISO certified and follows international standards, which ensure the execution of universal quality policy for management of the system. This influences management for the development of a transparent centralized system by eliminating repeated actions and activities, which increase labor and cause delay in response. These activities are well defined in the flowchart diagram (Figure: 4.11), which are mostly performed manually and separate for each office dealing with undergraduate, postgraduate and affiliated colleges.

It is therefore, desired to manage the human activities with easy accessible resources required to performed their jobs conveniently to find accommodation and meet their interests. This is only possible when there is easy access to the resources and strong communication between people with integration of subsystems (undergraduate, postgraduate and affiliated colleges) or subsections (secret, conduct and computer cell) to form a proximity workplace. The POM-process organizational meaning model (Figure: 2.8) of the SSM also persuade the role of individual or groups, which are engaged in the purposeful activity having discourse to find their intentions and accommodation which will improve the situation. The isolated sections and far away resources (people, printers, machines and record), with gap of communication and interaction between people complexity of powers make purposeful activities weaker to their objectives.

In order to integrate all related human activity systems (undergraduate, postgraduate & affiliated college activities) of all sections (conduct, secret, computer cell) and find their accommodation with best intention and interests to their purposeful action, the physical workspace model of contextual design (Beyer & Holtzblatt, 1998) is used to restructure the physical workplaces, by reformulating and redesigning their activities.

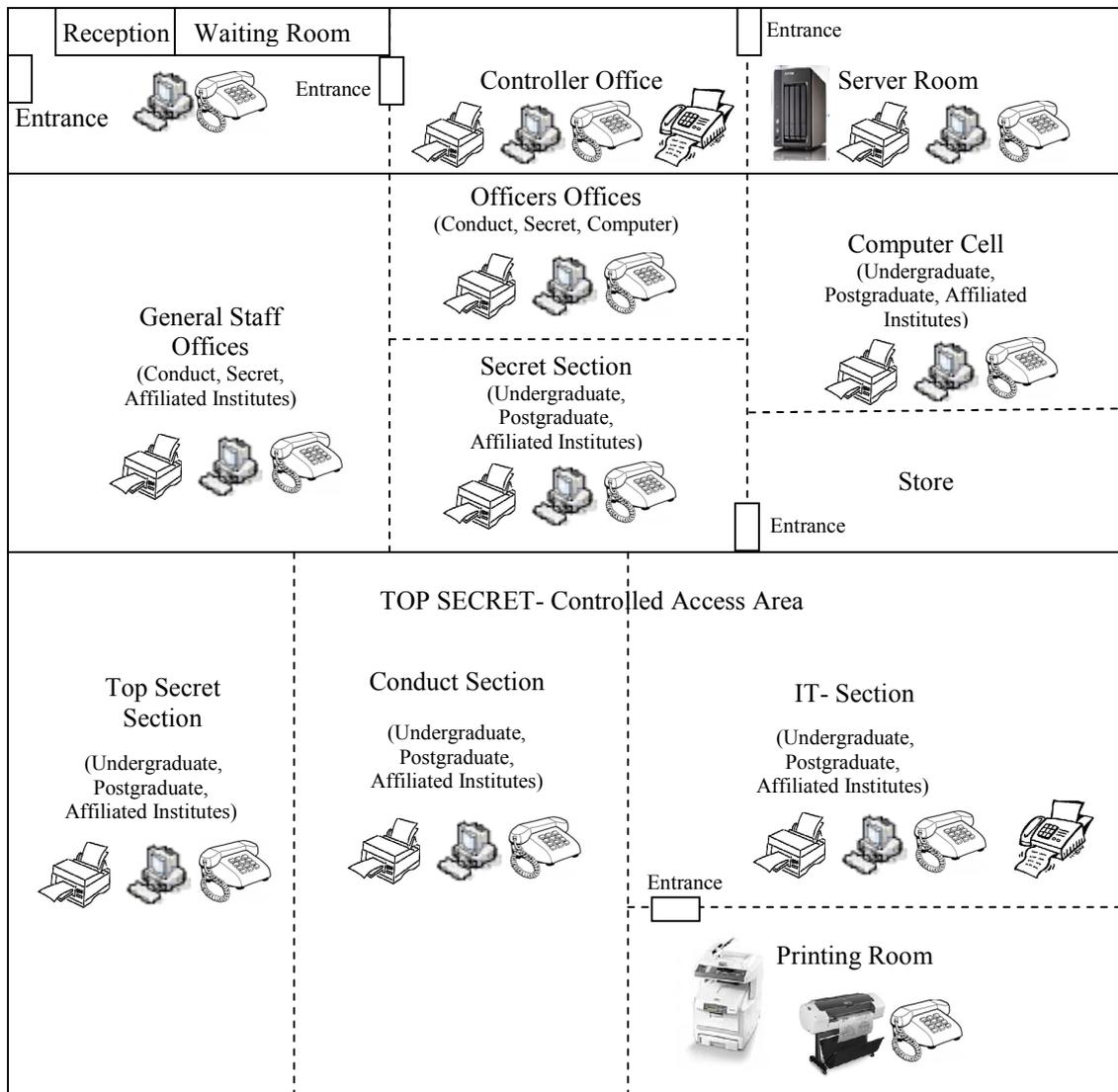


Figure: 7.3 Future physical workplace restructuring model of examinations department of MUET.

This physical workspace model proposes an strategic and organized platform for information system design and development, by restructuring the sections and their activities managed with centrally organized information system. The far away resources (people, printers, machines, record) and isolated sections (secret, conduct, and computer cell) are allocated at close proximity of their need, where the

undergraduate, postgraduate and affiliated colleges/institutions activities (Figure: 4.11) are carried-out centrally under the same sections (secret, conduct, computer cell). All the examinations (undergraduate, postgraduate and affiliated colleges/institutions) conduct activities are carried out in conduct section; secret activities of (undergraduate, postgraduate and affiliated colleges/institutions) in secret section (Figure: 4.12 a, b); and electronic processing of results, generating report and certificates (undergraduate, postgraduate and affiliated colleges/institutions) in computer cell. The overall sections are equipped with computers, printers, telephone/intercom and all activities are computer based. Using organized information system, manual activities (processing results, developing result ledgers, announcing results)( Figure: 4.11) of the secret section are computerized (Figure: 7.4) which are now carried-out by computer cell and proposed new IT-section (Figure: 7.3). IT-section will facilitate to handle and manage confidential information (internal/external results, sessional marks, development of computerized ledgers and announcing results). This section has been equipped with latest trends of technology, tools and machines (computers, internet, printers, scanners, plotters, fax, telephone/intercom, webcams, OMR/OCR devices and network devices). The computer cell will be responsible to make data entry and issue computerized certificates (marksheets, pass, position, merit, appearance, transcript, degree). The communication gap has been removed with close proximity of people and offices (Figure: 7.3), by eliminating repetitive activities (processing results, developing result ledgers and announcing results) carried-out for undergraduate, postgraduate and affiliated colleges/institutions separately (Figure: 4.11). The routine matters of the

examinations affairs and dealing with students & teachers (internal/external) are dealt by general staff and relevant officers of the sections (secret, conduct and computer) outside the Top Secret-Controlled Access Area, and no outsider is allowed in enter inside that restricted area. The students are entertained by the service counter established outside offices at main entrance of the examinations department, where a waiting room is also maintained to meet (if required) with the controller of examinations. The office of the controller of examinations is established near the main entrance gate so that visitors should not cross other secret offices (Figure: 7.3).

The overall workspace model (Figure: 7.3) will help to streamline the activities (undergraduate, postgraduate and affiliated colleges/institutes), processes (conduct of examinations, result processing, developing computerized ledgers and certificates, access and verification of academic record ) and sections (secret, conduct and computer cell) of the examinations department to form an organized information system with the help of information technology.

### **7.2.2. Technological change that can affect the activities and work practices by automating manual system**

Examination Department is a most sensitive and top secret branch, where computer based data processing with maximum use of relevant ICT technologies can help out management in their routine functions by streamlining the working of the department.

The uses of relevant and appropriate ICT technologies will strengthen the purposeful human activities to support their interests and accommodations. This leads to the development of organizational change into improved digitization and organized information system, where the heavy and bulk sensitive data is of high concern.

The examinations department of MUET deals with results processing, issuance of marksheets, transcripts, pass, position, merit, GPA, appearance and degree certificates for students of whole University. Keeping this view, data and information system is of highly concern for this department to preserve records and guarantee their authenticity, reliability, usability and integrity. It is therefore necessary to keep this data safe by ensuring easily retrieval of this information. It is also important to have a concern over up-gradation of relevant necessary hardware and software for the smooth working of operations of the department.

Looking to the complexities of examinations activities of MUET (results data collection, processing, tabulation/developing ledgers, discrepancy & variation, and announcement), mentioned in the flow diagram of flow charts (Figure: 4.11) are manual, carried out mostly at the secret section. The computer cell is only used for printing certificates of students (marksheets, pass, position, merit, appearance, degree, transcript) of undergraduate (Figure: 4.12 a, b) where the postgraduate and affiliated sections have their own staff to print certificates.

The new proposed model for examinations department strengthen the computer cell with establishment of the IT-section (Figure: 7.3) and all activities (results data collection, processing, tabulation/developing ledgers, discrepancy & variation, and announcement) (Figure: 4.11) will be handled by computerized information system with coordination of IT-section (Figure: 7.4). The model represented here is based on evaluation of overall infrastructure of the examinations department by suggesting the best possible solution for automating manual activities into computerized information system with greater concerns of soft systems methodology. Soft systems methodology is the only way of identifying social, cultural and political elements of the real world as a part of information system development and suggests a best solution to the problem.

Development of organized information system ultimately will require maximum use of latest technologies and more use of computers. All manual activities (data entry, processing results, developing paper ledgers, announcing results, maintaining record, verifying record and preparing reports) will be replaced with computer generated information with minimum use of human efforts (Figure: 7.4). All sections (secret, conduct, and computer cell) will be fully equipped with strong network based information system interconnected with each other with centralized server based management (Figure: 7.5). This technological change results in reorganizing activities, processes, and job description of working people with changing systematic procedures. This technological change will leads to the establishment of the IT-section in examinations department (Figure: 7.3), which will help to handle and

manage confidential information (internal/external results, sessional marks, development of computerized ledgers and announcing results). This section would be equipped with latest trends of technology, tools and machines (computers, internet, printers, scanners, plotters, fax, telephone/intercom, webcams, OMR/OCR devices and network devices). The computer cell will be responsible to make data entry and issue computerized certificates (marksheets, pass, position, merit, appearance, transcript, degree). The formal communication gap is removed through use of e-communication and all correspondence will take place through computer, email, telephone and intercom. All information is provided to the stakeholders (students, teachers-internal/external) (Figure: 7.2) on examinations web-portal (Figure: 7.6).

The officers and the controller of examinations are provided on demand output information interfaces on their computers (Figure: 7.6). The Controller of examinations and some designated officer can have remote access to all information and database system through web-based secure connection by login username and password. All sections (secret, conduct, and computer cell) will be interconnected with each other for undergraduate, postgraduate and affiliated colleges/institutes activities and sharing information. Strong and secure network will be established with use of WiFi technology. Mobile SMS communication can be used for students to keep them inform about important news (results announcements, exams schedules & dates, paper postponement) through mobile service providers. OMR (optical mark recognition reader) & OCR(optical character recognition) devices will replace manual

data punching, and paper based record will be replaced by digital record keeping (backup).

All correspondence with teachers (external/internal) will be carried-out electronically and paperwork will be minimized. The information system would have digital personal record of internal and external (Figure: 7.1) and can be contacted in case of emergency. The system would be capable enough to monitor deadlines and send auto reminders to the teachers (internal/external) for submission of results. The auto calculator for remuneration of the teacher (internal/external), and examinations staff for examinations duties and assessment of results will generate auto electronic bills from information system to be sent to the accounts branch in hard copy. These changes ultimately will help in streamlining the working towards uplifting the quality standards and improve the efficiency and performance of the organization by maximizing the output.



Figure: 7.3.2 GUI-graphical user interface prototype

Using Interaction and transformation models (refer: 2.5.9), new proposed models have been given below to reorganize the activities of examinations department of MUET

by using the information and communication technologies in the process of data and information.

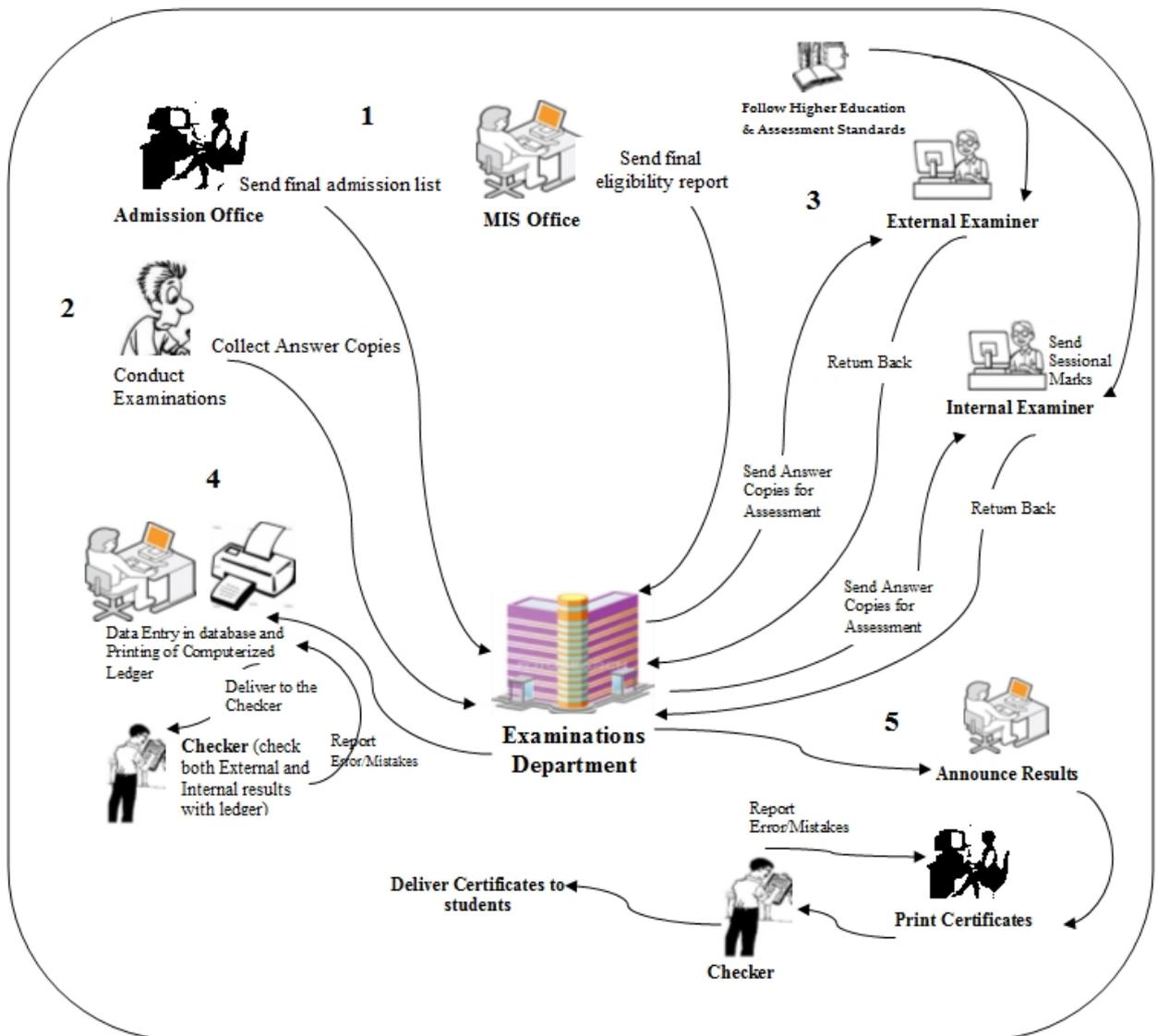


Figure: 7.4 Future examination interaction model of the examinations department of MUET

The all activities (Figure: 4.11) are supported by information and communication technologies (Figure: 7.5) and each activity is dependant on computerized information

system, where some activities (two tabulators-internal/external-for tabulating results) (Figure: 4.4) have been eliminated by improved use of computers and auto processing of results. This can also reduce workload of workers with least possible chances of mistakes, errors and late sitting which cause of frustration and poor performance.

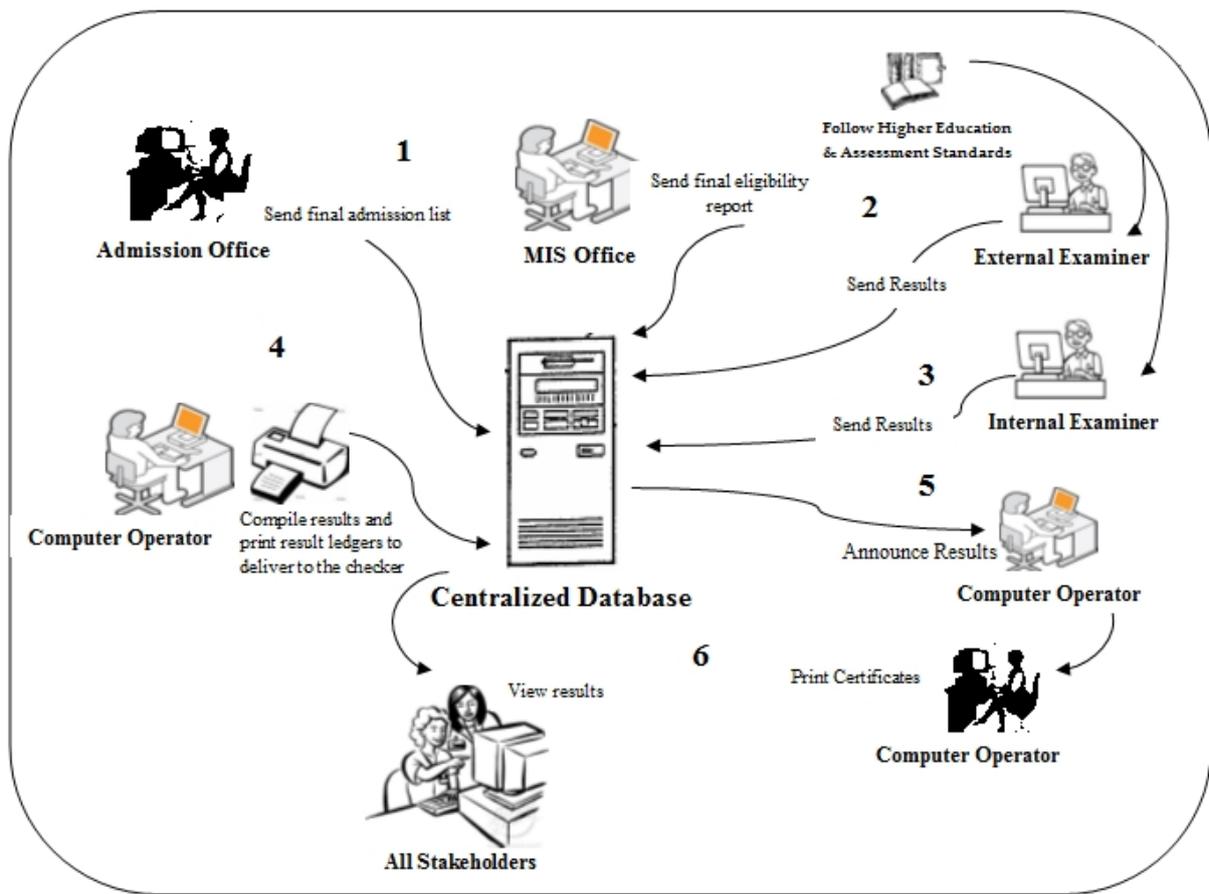


Figure: 7.5 Future computer based information system interaction model of the examinations department of MUET

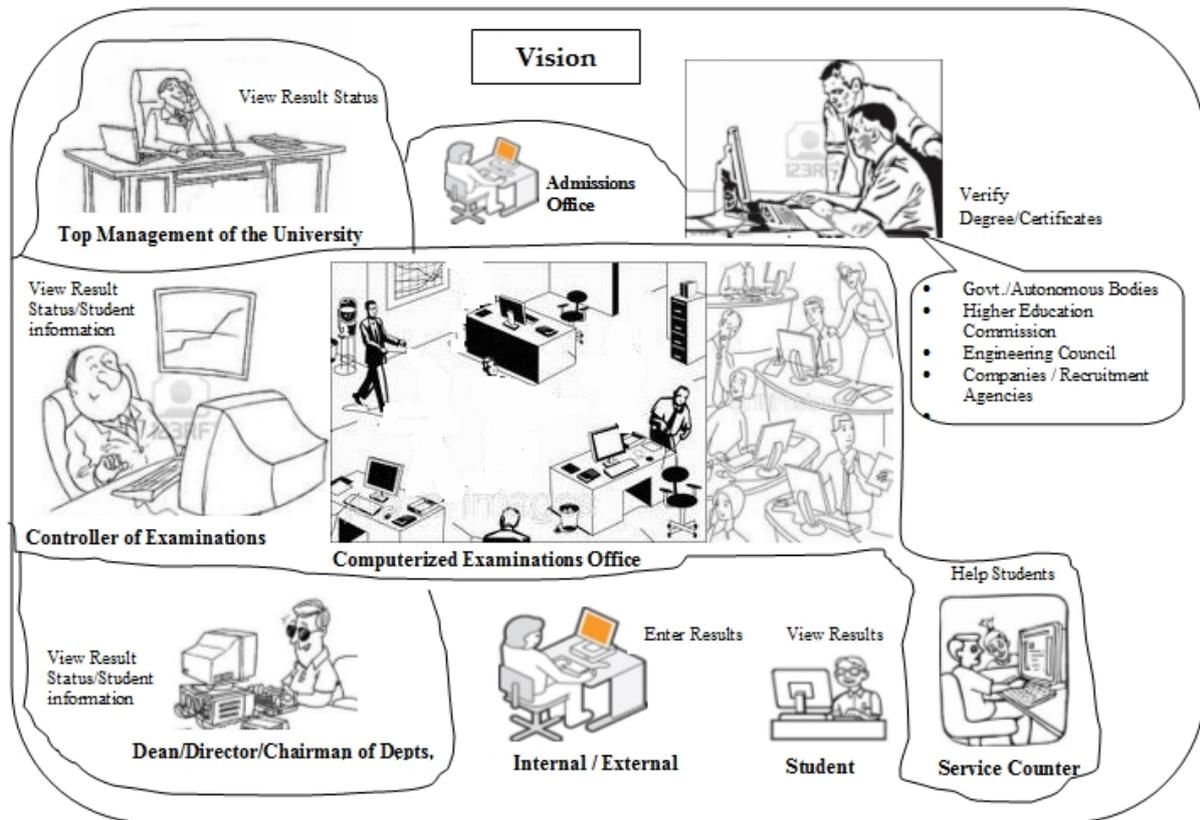
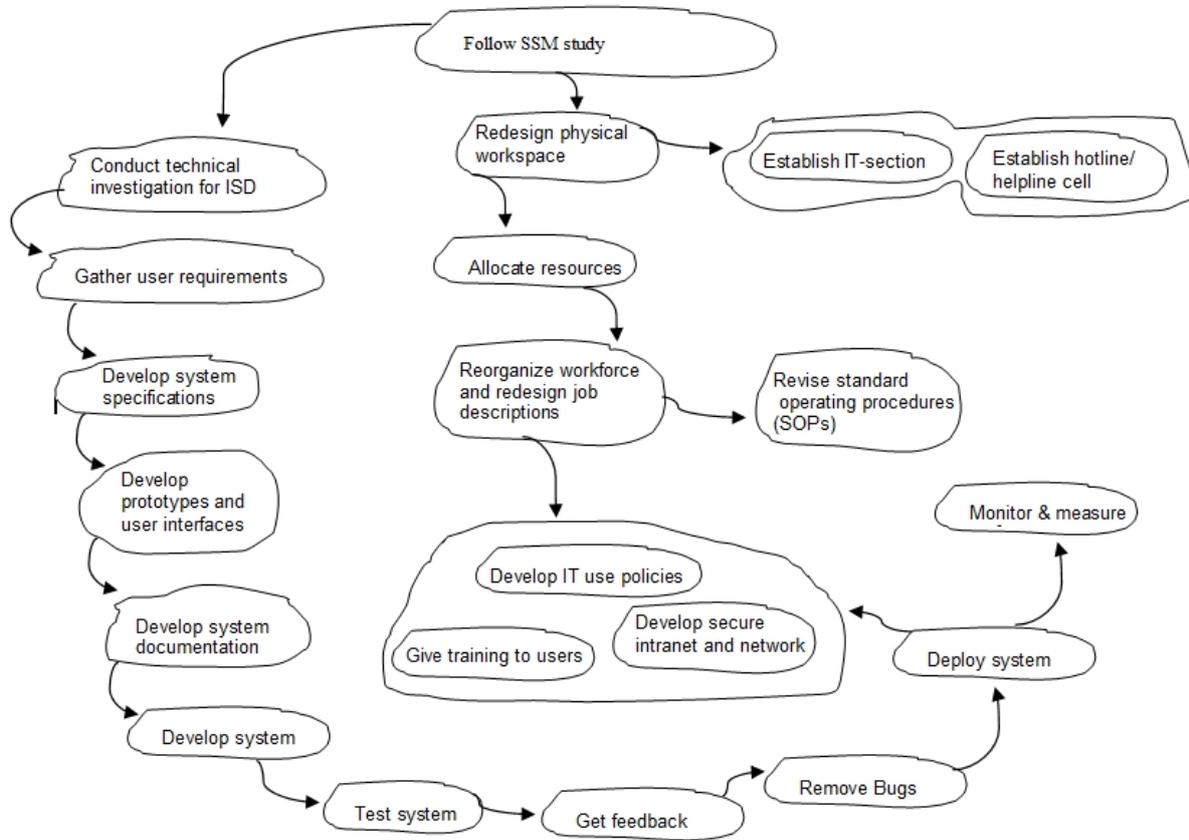


Figure: 7.6 Future vision of computer based examinations information access by stakeholders at MUET.

The real stake holders (Figure: 7.2) are benefited from new information system (Figure: 7.6) and getting updated information at their computers without making any kind of formal correspondence or disturbing someone else for sake of information. This helps in reducing workload and pressure on examinations department to provide requisite information to the teachers, students, authority and outside interested organizations for recruitment of graduates.



Transformation model relevant to achieving desired information system development

Figure: 7.7 Transformation model of achieving desired information system development at examinations department of MUET.

The overall SSM study will lead in the development and implementation phase of the organized information system and will be guided tool for traditional software engineering methodologies. Effective IT use policies and user training can also be part of implementation phase.

### **7.2.3. Systematic change that reformulate the work procedures in social and political context**

The systematic change that reformulates the procedures in social and political context is also required while developing computerized information system, where formal rules and procedure affect human activity systems, and could cause of delay in feedback, while moving through different powers of hierarchy.

The formal SOPs developed with necessary activities to be carried out for issuing academic certificates and executing the routine functions (application processing, documentation, checking, and internal/external correspondence) leads to overloaded paper work and socially trouble for students and staff to follow and maintain documentation. The staff keeps busy in sending letters to internal and externals and maintaining files, while students submit documents repeatedly for each new document issuance, by wasting their precious time and visiting in person to the examinations department. This causes a huge rush of students and overloaded paper workload on working staff, which highly affect the efficiency and performance. The computerized information system having all information about academic record of student does not require more information and proof of any certificate to be produced by student. The systematic procedures designed based on human activity systems and relying on manual data processing with paper work are required to be replaced with digital information system requirements, which does not need more formalities for students to get a certificate. The certificates (result marksheets, pass

certificate and transcript) can be issued in duplicate without complicated procedure at once if required by the student.

The assignments, duties and job description of all working staff and officers of the examinations department should be revised in pursuance with new electronic system. The teachers (internal, external), examinations staff and students should be motivated to use electronic system and avoid formal traditional methods (verbal queries, letters, direct calls, and personal visits). Despite of developed information system, some activities (such as submission of question paper in hard and soft copy in-person, sending appointment letters to the internal and externals as examiner, displaying important information on University notice boards, and announcing exam dates in newspapers) still have their paper importance and formal procedures in its social and cultural context due to sensitivity of information or unawareness of computers or unavailability of IT infrastructure in remote areas.

## Chapter # 8

# Conclusions

### 8.1 Thesis Summary

Designing and developing information system is considered “socio-technical” system design which is more than developing a “piece of software”. “Technology-centered methodologies” (lifecycle/waterfall approach, CASE tools, RAD, OOP) usually based on conventional system development lifecycle; sometimes ignore important social and cultural factors, which may lead to failure of the information systems. Designing information system with such considerations in messy ill-structured problem situations, soft systems methodology (Checkland, 1990) is identified as a potential approach.

Comparing different contextual models of diversified culture with focus on understanding human situations, this study is carried out by using Soft System Methodology (refer: Chapter 2) to address following research question:

**“How do you use SSM to conceptualize a new computerized work situation by comparing existing work situation with another (more computerized) work situation?”**

SSM has been used widely for information systems development and conceptualizing work systems (Kasimin and Yusoff, 1996; Sørensen & et al. 2010), and some developments are carried out by Mathiassen & Nielsen (2000) and Rose (2002). However, almost all studies have taken a single organizations' work situation as their starting point.

The same approach (SSM) (refer Chapter: 2) can be used in two different cultural work situations (AAU & MUET) by making comparison based on conceptualizing their existing work models. Designing integrated examinations information system for Mehran University based on model of examinations information system of Aalborg University, SSM can be used to conceptualize future computerized work situation. MUET is identified as a manual system (refer: Chapter 4), whereas AAU is extensively computerized (refer: Chapter 5). Based on strengths of AAU (refer: 6.3) and limitations of MUET (refer: 6.4) examinations, two work situations of the examinations departments are compared (refer: Chapter 6).

Carrying out study in comparison of multicultural work situation for information system development draws attention to different human activity systems (refer: 2.7). Purposeful action of these human activity systems depends upon their social, cultural and political dynamics. Such dynamics build information system requirements based on their own norms, values, working habits, work ethics and organizational culture.

Designing the objectives of new system, root definition (1.5.1) is formulated based on identified problematic situation (Figure: 1.5) of MUET and conceptual models (refer: 2.5.6) of real world (refer: 2.2) are developed to understand and debate human activity systems (refer: 2.7). Besides conventional conceptual model technique to identify human activity systems, different system analysis tools and techniques such as interaction and transformation models (refer: 2.5.9), flowchart tools (JAI, 1995) can be used. Designing a new computerized work situation can also require reorganizing work procedures and jobs, rearranging resources and redesigning workplaces, for which physical workspace model and user interface prototypes of contextual design (Beyer & Holtzblatt, 1998) are efficiently used. To better understand underlying social and cultural differences of both work situations (AAU & MUET), process of organizational meaning model (POM) (refer: 2.8) can be helpful. Conceptualizing future computerized work situation with help of interaction and transformation models (refer: 2.5.9) a systematically desirable and culturally feasible examinations information system is proposed (refer: Chapter 7). The tools and techniques (flowchart, workspace model, prototypes) used in this study can not be generalized for all studies but depends upon underlying objectives of research and requirements which may also choose other tools.

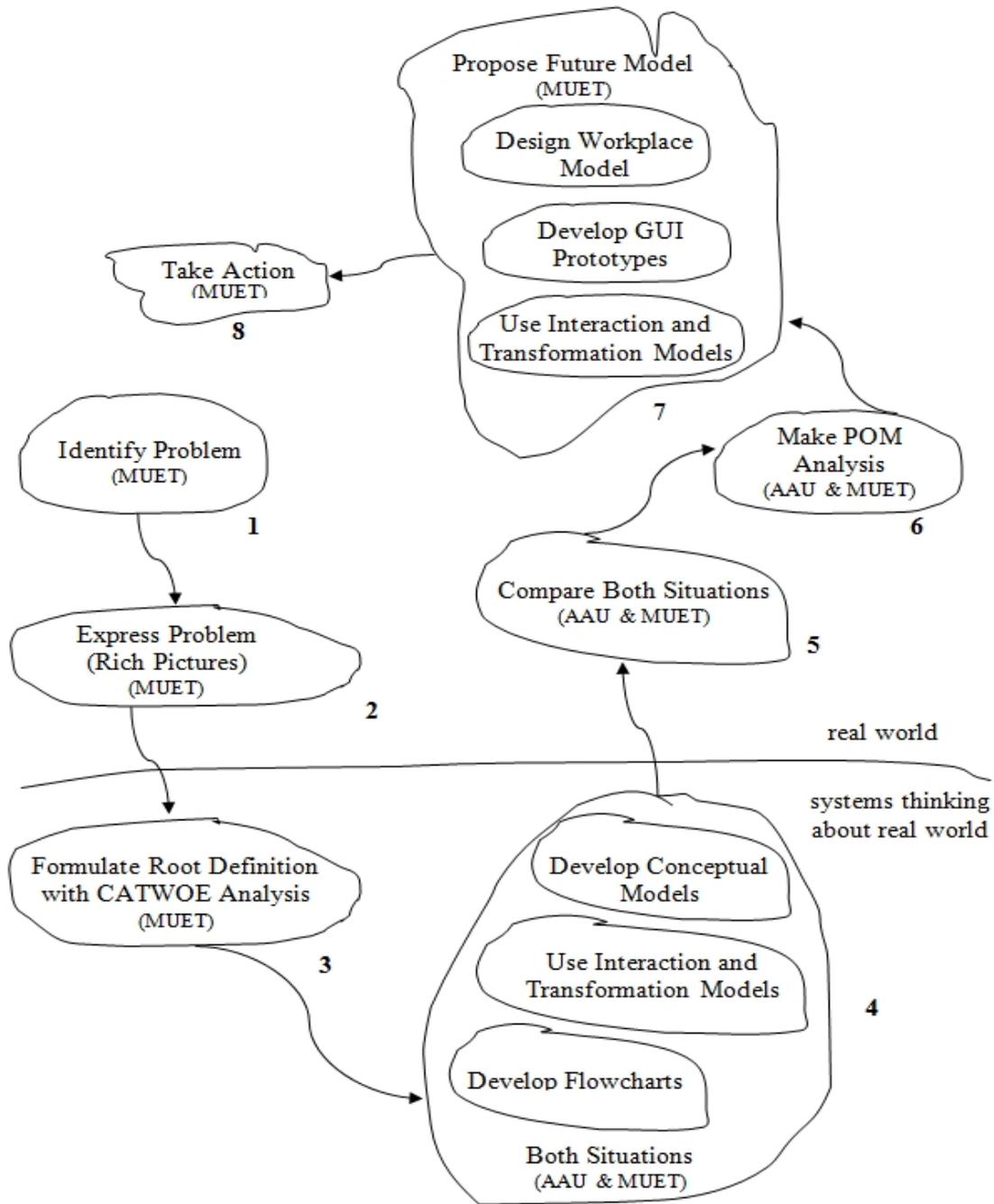


Figure: 8.1 Research process model

## 8.2 Research Learning

The use of computer based information systems have been increased with “diffusion” of computers and "ready-to-use" softwares (Ryker, 1995). Information systems are considered as “social systems” (Rose, 2002) which are not limited to data processing but “meaningful attribution” of human act (Winter & Brown,1995), and are usually created rather than designed (Checkland, 1990). Conventional "technology-centered" methodologies focus on traditional system development life cycle (Zhou) and do not address human situations dealing with social, cultural and political issues. Studying two different cultural work situations by comparing more and less improved computerized examinations information systems identify different human activity systems (refer: 2.7). Purposeful action depends upon their social, cultural and political dynamics which shape information system requirements. Conceptualizing new computerized work situation with comparison of multicultural work situations, novel approach of SSM (refer Chapter 2) provides a methodological tool to design examinations information system. SSM use in multicultural comparative studies especially with regards to under developing and developed countries helps to identify underlying social, cultural and political differences. It gives a chance to compare diversified cultural work situations, and suggest culturally sensitive & desirable changes.

Cultural and logical, two stream (figure: 2.5) analysis has been used in context of different cultural work situations which gives learning to understand social, cultural, political differences and propose systematically desirable and culturally feasible

changes. POM (process of organizational meaning) (Checkland, 1998) (refer: 2.8) model helps in multicultural study to understand such underlying cultural differences, and pinpoint social, cultural and political elements. Besides conceptual models for "identifying the relevant systems from the perceptions of possibly disagreeing stakeholders" (Hirschheim, 1997) the analysis is enriched with POM (process of organizational meaning) model (refer: 2.8). Comparing two work situations of different cultures we have used (POM) (Checkland, 1998) for analysis.

Besides use of conventional SSM tools (Rich Pictures, Root Definitions, CATWOE Analysis, Conceptual Models) (refer Chapter 2) interaction and transformation (Rose, 2002) techniques have been used to model human activity systems. But, the flowchart technique (JAI, 1995) to identify crucial areas of change can be used. SSM has been used with integration of conventional methodologies (Avison & Wood-Harper 1990; Savage & Mingers, 1996; Bustard et al, 2000) but we have used it slightly different with integration of workspace and prototype models of the contextual design (Beyer & Holtzblatt, 1998) due to reorganizing work situation and organizational culture.

An "observer's terrorism is another's freedom fighting" depicts that "any purposeful or intentional action in real time can be perceived in many different ways" (Stowell, 1995). The analyst (author) being a manager and user of system at examinations department of MUET and carrying out the role of mediator between

management, user and developers has perceived system with all angles viz. manager, user, analyst and developer (figure: 1.6).

Computer based information system can support organizational functions but same time lacks in dealing with unstructured problems. Despite many disadvantages of manual based working, it gives expertise in resolving all structured or unstructured problems based on knowledge.

### **8.3 Personal Learning**

This study is based on action research (refer: 3.5.1) which intervenes in the problematic situation, and gets personally involved in the real world (refer: 2.2) to obtain valid facts. Personal involvement gives personal learning and leads to develop theories. This research study teaches that a successful information system model of an organization can be unsuccessful for other same nature organizations having same objectives and purposes due to its social, cultural political differences. Complicated processes usually involve complicated procedures with division of labor. The radical technological change with paperless and e-communication in less developed IT-infrastructure society can be drastic. Multi-channel strategy (e-communication, paper-based, mass media) can be adopted where ever necessary. Use of computer based information system can minimize paperwork; formal procedures and its horizontal information access (without following top to bottom power hierarchy for information) reduces burden of staff and management.

Centralized management of computerized information system offers universal services to all stakeholders without any discrimination, and helps everyone to take immediate decisions at their own based on information. Information system based on solid IT-infrastructure can strengthen relations between stakeholders. Developing work ethics with proper implementation of IT use policies can shape norms and values. Lack of computer literacy and political power of information handling in organization can contribute to the resistance for information system development and implementation.

This research study provided an opportunity to understand social, cultural and political differences of two work situations of different cultures. Study helped to identify real problem of the situation, and made enable to choose appropriate information system theory in relation of the problem. In this regard, chance of studying relevant literature, different information systems theories, concepts, research methods and methodologies along with basic understanding of research process were key leanings. Data collection with interpretive (refer: 3.2.2) action research (refer: 3.5.1) approach led to intervene in the real world (refer: 2.2) situation and observe different behaviors, attitudes, habits, norms, values and morals of different people of different societies.

Direct interaction with working staff and onsite visits with personal interviews and meetings helped to develop personal communication skills. Study has given

thorough understanding of whole complicated processes of examinations activities of both universities with observing their work ethics and organizational cultures. Playing a role of mediator between software developers, users and management, learned different concerns of information system development and security from user, developer, analyst and manager point-of-view.

Information system development opened a new avenue of knowledge from socio-technical system design through soft systems methodology. This methodology (SSM) (refer: Chapter 2) has given a chance to explore system development from a social system concept, and helped to understand work-processes and human activity systems (refer: 2.7) with different tools and techniques. Such social, cultural, political and human consideration in information system development with hard and soft systems approaches (refer: 2.4) opened new ways of thinking with realization that conventional SE methodologies are not enough to develop information systems.

Moreover, it confirms that developing and implementing e-communication system does not ensure successful outcome unless proper user training, motivation and IT-use awareness is developed. Computer literacy among working staff and user training helps in successful execution of the information system. Strong political will and management support can contribute to the development and implementation of information system.

## 8.4 Implications for Practitioners

The study is a role model for all managers to develop and design information systems to their own needs of the organization. The organizations may be product, process or service oriented with limited complex business processes or diversified functions expanded world-wide. Multinational companies and organizations can effectively use underlying approach, tools and concepts to their wide multicultural business networks. Business firms can use it for benchmarking and competing in market for product and services. Different organizations can utilize it for reorganizing their roles, work situations and restructuring of organizational culture. Besides development of computerized information system, it can be effective to design organizational ICT infrastructure. Long term IS requirements and strategy can be developed to cope up fuzzy management problems.

Study is also useful for non-technical managers, supervisors and change agents to easily use for their own organizations to develop solutions. With easily understandable tools and techniques (rich pictures, conceptual models, interaction and transformation models) (refer: Chapter 2) to represent complex processes and procedures of organization can help managers and supervisors to find their initial problem. Flowchart tool (JAI, 1995) can also be used by them to give easy understanding of work-processes. Human resource managers can benefit from this study to use for their own departments to design and evaluate performance criteria and HR practices. POM (process of organizational meaning) model (figure: 2.8) can be

a good tool of analysis for all organizations for all messy situations. Small and medium size organizations can use workspace model (Beyer & Holtzblatt, 1998) to reorganize their work and restructure the organization. Specially, higher education institutions can usefully apply this study to evaluate and develop their curriculum, education, standards, teaching, performance and services. Newly established ISO-cells (International Standard Organization) in Pakistani universities for monitoring and improving performance of different sections of the respective university can use this study for their own to measure and improve quality performance.

Strategic planners and policy makers can use this model of study for developing international standard policies in all fields viz. education, health, science and technology. Moreover, industry, academia and government (triple-helix) (Etzkowitz, 2008) can jointly develop and improve mutual cooperation for research and development through this approach. Many other areas can practice this methodological approach such as: project management, business development and strategy, risk management and general problem solving (Mingers, 1992).

The whole study may not be applicable to all situations of organization, neither to all organizations. All tools and techniques used in the study may also not be appropriate to other studies. But, the practitioners can identify relevant tools and techniques appropriate to their own study and problematic situation.

## 8.5 Implications for Researchers

The study is input into design process which integrates system analysis tools to compensate for SSM weaknesses. The researcher can further explore SSM approach (refer Chapter 2) in context of two different social, cultural and political situations to develop centralized information system for organizations having world-wide expanded networks. Multinational companies and organizations can be good model of study in diversified cultures with use of POM analytical tool (figure: 2.8). Conceptual models (refer: 2.5.7) can not only be true definition of real world (refer: 2.2) activities and interaction or transformation models (refer: 2.5.9) are not sufficient enough to represent complex processes and activities. The flowchart tool (JAI, 1995) can be helpful to identify those minor key supporting activities and processes (figure: 4.12 a. & b.) to major processes and activities. Researcher can also use other models appropriate for his/her own problem and situation. Globally applicable management, quality and service standards (ISO-international standard organization) with respect to implementation in different cultures of different societies can be a good topic for researchers in relation of SSM. This study opens new avenue of research for multicultural study through SSM in comparison of under developing and developed countries, and can be explored in numerous areas such as: technology transfer, policy making, science and technology, education and development projects. Benchmarking, comparison, and multicultural work situations with more than one organization invite researchers to expand their research approach.

## **8.6 Future Research**

This research study further can be explored with Geert Hofstede Cultural Dimensions (Hofstede, 2010) of power distance index (PDI), individualism (IDV), masculinity (MAS), uncertainty avoidance index (UAI), long-term orientation (LTO) and indulgence versus restraint to understand cultural differences in international environment.



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# Annexure



## Interview List

Mehran University of Engineering & Technology, Jamshoro  
Sindh-Pakistan  
www.muet.edu.pk

S.No.	Name	Designation/Section	Phone No.	Relation to the Topic	Action / Feedback
1	Prof. Abdul Aleem K Rajput	Ex-Controller of Examinations	923003075540	Examinations Affairs	Responded
2	Ashrafuddin Shaikh	Ex-Deputy Controller of Examinations (Conduct)	922771288	Examinations Affairs	Responded
3	Abdul Khailq Surhyo	Ex-Deputy Controller of Examinations		Examinations Affairs	Responded
4	Moulabux Lighari	Deputy Controller of Examinations	923009375307	Examinations Affairs	Responded
5	Pirbux Bhalai	Assistant Controller of Examinations( Computer Cell)	9203462082553	Examinations Affairs	Responded
6	Imdad Ali Bughio	Assistant Controller Examinations (Secret)	923343619966	Examinations Affairs	Responded
7	Abu Bakar Memon Ghulam Rasool Pathan	Examination Affairs Coordinator /Secret	923013537667	Examinations Affairs	Responded
8	Ghulam Rasool Pathan	Superintendent	923003075540	Examinations Affairs	Responded
9	Syed Ghulam Ali Shah	Assistant/Inquiry Counter Examination Section	923003057924	Examinations Affairs	Responded
10	Wajid Soomro	Assistant/Secret	923453668559	Examinations Affairs	Responded
11	Yar Muhammad Soomro	Assistant/Conduct	923313595908	Examinations Affairs	Responded
12	Sharif Khaskheli	Printing Machine Operator/Conduct	923003082957	Examinations Affairs	Responded
13	Checkers	Faculty Members		Examinations Affairs	Responded
14	Tabulators	Faculty Members		Examinations Affairs	Responded
15	Faculty Members	Randomly Departments		Examinations Affairs	Responded
16	Students	Randomly Departments		Examinations Affairs	Responded
17	khurram akhund	IT Assistant	923332740791	Examinations Affairs	Responded



## Interview List

**Aalborg University-Denmark**  
**www.aau.dk**

S.No.	Name	Designation/Section	Phone No.	Email	Relation to the Topic	Action /Feedback
1	Hanne Milano	Head of Division/Exams office Humanities	99409597	hmi@adm.aau.dk	Examinations management at faculty level	Responded
2	Ulla Øland	Senior Secretary/Computer Science Dept.	99408854	ulla@cs.aau.dk	Examinations management at departmental level	Responded
3	The Admissions Office		9940 9425	studiekontor@adm.aau.dk	student admission record	
4	Heidi Sørensen	Head of Division/Engineering, Science and Medicine Faculties Office	99407256	hs@adm.aau.dk	Examinations management	
5	IT Department	IT Manager	9940 9460	hotline@adm.aau.dk	Technical Issues	
6	Karina Bräuner	IT Manager /IT Dept.	9940 9451	kb@adm.aau.dk	Technical Issues	
7	Klaus Kristian Kilt	IT Manager/IT Dept.	9940 9450	kilt@adm.aau.dk	Technical Issues	
8	Keld Toldbod	Technical Manager /Technical Management	9940 9530	kto@adm.aau.dk	Technical Issues	
9	Ms. Aase Andersen	Department Secretary/Communication & Psychology Dept.	9940 9000	aase@hum.aau.dk	Examinations management at departmental level	
10	Ms. Janne Sverd	Department Secretary/Law Dept.	9940 9873	js@law.aau.dk	Examinations management at departmental level	
11	Ms. Inger Vejrum	Department Secretary/Business Studies	9940 8220	inst-secr@business.aau.dk	Examinations management at departmental level	
12	Ms. Merete Heide	Department Secretary/Mathematical Sciences Dept.	9940 8800	merete@math.aau.dk	Examinations management at departmental level	
13	Jesper Brix Rosenkilde	IT Administrator		JBR@cs.aau.dk	Technical Issues	Responded

14	Ms. Helle Westmark	Head of Division/Computer Science Dept.	9940 8850	west@cs.aau.dk	Examinations management	
15	Bo Hvass Pedersen	Development Consultant	9940 7301	bhp@aub.aau.dk	Technical Issues	
16	Morten Nielsen	Professor /Mathematical Science Dept.	99408864	mnielsen@math.aau.dk	Examinations and Assesment	Responded
17	Jørgen Erik Lund	Senior Secretary /Study Administration	9940 9439	jel@adm.aau.dk	Technical issues and Database handling	Responded
18	Marianne Georgsen	Associate Professor/Communication and Psychology Dept.	99407284	marianne@hum.aau.dk	Examinations and Assesment	Responded
19	Jeremy Rose	Associate Professor/Computer Science Dept.	99408852	jeremy@cs.aau.dk	Examinations and Assesment	Responded
20	STADS-support	STADS/Study Administration	99409720	stadssupport@adm.aau.dk	Technical issues and Database handling	Responded
21	Portal-support	AAU Portal	99407301	support@portal.aau.dk	Technical issues and Database handling	
22	Maja Kowalska	Student Worker/Humanities Exams Office		maja.a.kowalska@gmail.com	Exams Record Entry	Responded
23	Students	(Randomly)			STADS Portal feedback	Responded
24	Pernille Refstrup	Study Administration	9940 9099	pre@adm.aau.dk	STADS Portal feedback	Responded
25	Birthe Riis Kennedy	IT Staff Member IT Department	9940 9454	brk@adm.aau.dk	Technical issues and Database handling	Responded

## Interview Design:

Target Interviewee: **Faculty Members, Departmental Secretaries, Examinations Offices Staff / Officials, Students, IT-Staff, STADS (study administration).**

Nature of Interview: **Face-to-Face**

Data Collection Method: **Notes, Observations, Official Documents and Reports, Diary Method**

Interview Type: **Semi-Structured**

Method of Appointment: **Emails, Telephone, Personal Contacts, Personal Visits**

### **Focal Points:**

- Conduct of Examinations
- Procedure and Policies
- Formal SOPs (Standard Operating Procedures)
- Powers and Privileges
- Job Description and Role in Examination related Activities
- Work Flow –Examination related Data and Information Flow
- Database Handling and Record Keeping
- User level Access / Privileges
- Data Backup and Recovery Plan
- Result Processing and Announcement
- Issuance of the Certificates
- Appeals and Error Rectification
- Secrecy and Confidentiality
- STADS Role and Architect



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Tuesday, 02 November 2010

J.no.:

Jeremy Rose  
 jeremy@cs.aau.dk

## Project Information: Examinations Information System Development

<b>Personal Data</b> 	<p><b>Name: Saifullah</b>  <b>Qualification: MBA-MIS, PGD</b>  <b>Job Experience: Assistant Controller of Examinations at Mehran University of Engineering &amp; Technology, Jamshoro (last five years)(www.muett.edu.pk)</b>  <b>Current Status: MS thesis at the Department of Computer Science, Aalborg University Denmark under Erasmus Mundus Exchange Program for Six Months.</b>  <b>Name of Supervisor: Prof. Jeremy Rose</b></p>		
<b>Project/Thesis Details:</b> 	<p><b>Title of the project/thesis: Examinations Information System Development.</b>  <b>Objectives of the study: To study the Aalborg University Examinations model and propose new improved model for Mehran University of ET, Jamshoro.</b></p>		
<b>Required Help / Expectations</b> 	<p><b>Interviewees:</b> Secretaries of the Departments/Faculty.                  Examinations Offices/Officials at Departments/Faculty.                  Faculty members                  IT staff members of Departments/Faculty.                  Central Examinations Offices/Officials.                  Central Examinations Database/IT handling offices/officials.                  University Administration office</p> <p><b>Type of Interview: Face to face meeting</b>  <b>Type of Information: General Procedures and data handling issues of the Examinations.</b>  <b>Maximum Time for interview: 1 Hr.</b></p>		
<b>Feedback / Outcome</b> 	<p><b>After thorough study of the working model of the examinations affairs by observing the work flow of the Aalborg University, the feedback in a shape of report would be submitted for the consideration of the examinations information system at Aalborg University and MUET.</b></p>		
<b>For Further Information / Details:</b> 	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p><b>Prof. Jeremy Rose</b>  <b>Focal Person/Associate Professor</b>                      Information Systems Unit                      Department of Computer Science                      Aalborg University, Denmark                      Email; Jeremy@cs.aau.dk</p> </td> <td style="width: 50%; vertical-align: top;"> <p><b>Saifullah, Memon</b>                      Erasmus Mundus –Research Scholar                      Information Systems Unit                      Department of Computer Science                      Aalborg University, Denmark                      Email: mysaiiff@hotmail.com</p> </td> </tr> </table>	<p><b>Prof. Jeremy Rose</b>  <b>Focal Person/Associate Professor</b>                      Information Systems Unit                      Department of Computer Science                      Aalborg University, Denmark                      Email; Jeremy@cs.aau.dk</p>	<p><b>Saifullah, Memon</b>                      Erasmus Mundus –Research Scholar                      Information Systems Unit                      Department of Computer Science                      Aalborg University, Denmark                      Email: mysaiiff@hotmail.com</p>
<p><b>Prof. Jeremy Rose</b>  <b>Focal Person/Associate Professor</b>                      Information Systems Unit                      Department of Computer Science                      Aalborg University, Denmark                      Email; Jeremy@cs.aau.dk</p>	<p><b>Saifullah, Memon</b>                      Erasmus Mundus –Research Scholar                      Information Systems Unit                      Department of Computer Science                      Aalborg University, Denmark                      Email: mysaiiff@hotmail.com</p>		

## Diaries (Annexure)

### Interviews from AAU

(The social, cultural and political factors were also observed during the interview but it was not possible to interpret all into text. But, the proposed recommendations (chapter 7) have been made in light of those observations).

#### 1. Marianne Georgsen

*Teaching Associate Professor*

*Department 11 - Department of Communication and Psychology*

*Kroghstræde 1*

*Room: 3004*

*DK - 9220 Aalborg Ø*

*Phone: 9940 7284*

Date: 22/09/2010

The interview from a senior faculty member in humanities faculty was conducted in her office to understand the role of a teacher in examination and processing information for the transmission to the quarter concern. She explained in detail the grading system and procedure for forwarding the information to the examinations office.

She explained by showing the grading sheet and assessment sheet given by the examinations office and she was obliged to send it back through the departmental secretary to the examinations office of their own faculty by putting individual grades on it. Every student has a separate sheet for assessment.

She also helped in getting appointment with examinations office of the humanities for further information.

The whole process was manually. Only the printed sheet was computerized with student basic information about exams.

## 2. Maja Kowalska

*Student Worker*

*Humanities Examinations Office*

*Email: maja.a.kowalska@gmail.com*

Date: 24/09/2010

The student worker Maja was working at the examinations office of the humanities faculty and she was entering the student grading into the databases from a grading assessment sheet sent by the concerned teachers to the examinations office.

She had a privilege to enter the record, view the record and delete the record as well as replace the previous record with new entry. She had a username and password with log recording feature. The entry was made by the student worker who was on working hours basis as a student job.

She did not know about technical issues and databases or further detailed information.

She explained in a very good manner. She could also entertain student queries regarding results and could forward them auto response.

## 3. Ulla Øland

*Senior Secretary*

*Department 16 - Department of Computer Science*

*Selma Lagerlöfs Vej 300*

*Room: 5-1-34*

*DK - 9220 Aalborg Ø*

*Phone: 9940 8854*

*Email: ulla@cs.aau.dk*

Date: 19/11/2010

The senior secretary Ulla was very helping in giving information and explained the whole procedure in a detail by giving exclusive time for the meeting. She was the most important team player in examination affairs. Her responsibilities were started from designing and developing the examinations timetable and sending to the teachers for consent and then get finalized. She managed the examination in the department and keep in touch with the faculty examinations office. The students can signup for the examinations online and as well as can drop out from examinations online by themselves. Some students can also report for appearing in examinations manually to her and she forwards that information to the examinations office. The updated list of signed up students for the examination is got printed having their

basic examination related information printed on it for grading. That sheet through secretary is given to the examiner for assessment. And the same final grading result with mutual consensus of internal and external is sent back to the secretary who sends back to the examinations office. This whole process is manually.

The student is informed about his-her grade on the spot if it is of oral nature, and later if that is of written nature. The secretary also can inform the students about their result. No student is allowed to contact examinations office of their faculty directly but through the secretary. There was no such written SOP for the examinations activities available to the secretary. She also kept the assignments of the students submitted to the teachers.

The students could also submit their appeal against their results which could be reviewed by the committee and informed to the student about the decision. And if there is any change in the result it could also be communicated to the faculty examinations office.

All teachers are submitting their result sheets to the secretary and the secretary sends back these sheets to the relevant examinations office. There was no particular slip for the student to appear in the examination but the student card was enough to show. The secretary can view the result status of the students also.

#### **4. Morten Nielsen**

*Professor*

*Department 17 - Department of Mathematical Sciences*

*Fredrik Bajers Vej 7*

*Building: G, Room: 1-109*

*DK - 9220 Aalborg Ø*

*Phone: 9940 8864*

*Email: mnielsen@math.aau.dk*

Date: 19/11/2010

Prof. Morten explained the procedure of students' grading and examination activities from faculty members' point of view. The professor of mathematical sciences was well aware about the security threats and disaster recovery management issues and he was conscious about record keeping and data backup. Since, he used to keep his record backup at safe place and always keep duplicate copies of their results for future reference. He was only responsible to give grading as per assessment criteria and put on the specific sheet given by the secretary of the department and same return to the secretary for onward transmission to the examinations office. He was maintaining duplicate copies of the assessment sheets as well as on soft copy on CDs for backup.

He was more comfortable in manual grade recording on paper rather than on computer. As per criteria and nature of the different subjects it depends upon whether the exam is written or oral is decided earlier and communicated to the students earlier. The externals are called from different universities and if it is PhD then can be from different countries which make neutral assessment with mutual consensus of the supervisor or internal which is then submitted the final grading to the secretary.

## 5. Students- Randomly

Date: 22/11/2010

A series of random interviews conducted from different students at AAU from user perspective of STADS system. As per discussion the students were able to register for courses and examinations as well as view or cancel for the same. They were also able to get their enrolment and examinations registration or cancellation receipts along with the transcript record available in PDF format which could be downloaded as well at their own computers. Further they could view their grade results along with signed up or drop examinations and courses. Moreover, they had no privilege to change any record except their basic personal information.

This is all was possible through a user name which is university email ID and password provided by the University.

## 6. Hanne Milano

*Head of Division*

*The Humanities Faculty Office*

*Kroghstræde 3*

*Room: 4.257*

*DK - 9220 Aalborg Ø*

*Phone: 9940 9597*

*Email: hmi@adm.aau.dk*

Date: 22/11/2010

The main examinations office of the faculty of humanities was interviewed and there were three senior level people working and looking after the different departments regarding examinations. I took time of a senior official of the examinations office, the head of division Hanne Milano who was nice to give her precious time and explained the procedure of examinations and briefly defined the way in which data and information flows from departments to their office. They were in coordination with departmental secretaries. After sign up of the students for the examinations the

complete list is sent to the secretaries automatically which is got printed at their department and then given to the concerned teachers/examiners. The same is returned back with grading points for each student and then entered in to the database system by one person which is sometimes hired as a student worker(student), and cross checked by the other one to verify authenticity. After entering the student record, the student automatically is informed about his grade by the system. The system has a feature to check students' eligibility when signing up for the examinations as per rules to have a record for number r of attempts to a particular subject examination. The head of division was satisfied from hiring the student workers for examinations section. Since, there was no such backup of data and neither there was any technical person to handle technical issues except the STADS which is handling this whole examinations database as an external outsourced organization. She informed that the STADS also provides the same services to other universities and educational institutions also. She preferred to contact with STADS office for further technical information.

## **7. Jørgen Erik Lund**

*Senior Secretary*

*Study Administration*

*Fredrik Bajers Vej 5*

*Room: 130*

*DK - 9220 Aalborg Ø*

*Phone: 9940 9439*

*Email: jel@adm.aau.dk*

Date: 08/12/2010

Jørgen was leading at the study administration office (STADS) and he was a nice person with positive attitude. He told that he is full time there to handle STADS issues and remain in touch with technical people at IT department and Logica if any problem arises. They personally do not go and see problem but observing nature of the problem they move to the concerned and they do not find any problem almost. The new employees or the users of the system were given trainings at their faculty offices if required and they had no such data backup responsibility. They could see the database and records of the students entered by the examinations offices and they both Jørgen and Pernille had control of looking into the system more advance. They were in touch with software developer Birthe at IT department if there is any change required.

## 8. Pernille Refstrup

*Head of Section*

*Study Administration*

*Fredrik Bajers Vej 5*

*Room: 136*

*DK - 9220 Aalborg Ø*

*Phone: 9940 9099*

*Email:pre@adm.aau.dk*

Date: 08/12/2010

Pernille was very nice and cooperative, she was very much friendly and given complete scenario of their system. She told that this is a joint venture between Danish Universities for which government supports 50% of total development expenses and rest of the expenses are born by University if there is new change. After every specific period of time there is tender for hiring the services from well reputed IT firms to manage this system but its continuously to the Logica. She said that, the government monitors the students' ratio, enrolment and results also for granting funds and release scholarship amount and that's why they can also check reports. She agreed to have shortage of English written literature about their work and job description, system and STADS but can be developed in future.

In the office there was only one part time person and a full time colleague Jørgen with Pernille. There was no IT support technician, or some other technical person. She informed that in case of any problem it is observed about the nature of the problem, if problem persist all where in other universities also then it belongs to the logica and then they will handle. But, if the problem is in our University and system then it is forwarded to the quarter concerned within University.

## 9. Birthe Riis Kennedy

*IT Staff Member*

*IT Department*

*Selma Lagerlöfs Vej 300*

*Room: 4-1-36*

*DK - 9220 Aalborg Ø*

*Phone: 9940 9454*

*Email: brk@adm.aau.dk*

Date: 20/12/2010

A senior IT-Staff member and software developer at IT Department, Birthe was interviewed in order to know about the STADS system and its technicalities. She informed that their department handles IT related issues of the STADS and other sub systems of the University which are computerized, like system for their management administration. They handle trouble shooting and they have hot lines to receive and

respond or forward query to the quarter concerned. The system has number of servers and multiple applications running on them. They also develop some of their own applications as per requirement and integrate with the system after testing. She had a team of different people with different functions related to the development and management of technical issues. They were expecting to improve their system with some changes in future which are under process regarding examinations result entry directly by the teacher/external rather than through secretary. She told that STADS is joint cooperation of the Danish Universities supported by the government through its main STADS office. The decisions for improvement in the system are taken by the Universities as per requirement through consultation with technical teams and Logica company. Then these are approved by the ministry concerned through their advisory committee but the requirement has more weightage to get approved. The University also pay for this development and change but the government also supports for the funds and expenses.

In response of one question she said logica is the only who takes this tender and no one other is competing, but if someone if gets this tender and new company take this challenge then even it would not be a problem for our university to deal with and manage database as we are also part of the development and some applications are our own. The detailed description of the system and technical reports were not developed in the English to get more understanding of the system but some stuff was available in Danish which could not serve the purpose of queries during interview.

She was very cooperative and helping, and assured that she will have weekly meetings in which we all together will think about giving you more information in English and meanwhile a detailed list of requisite information given to their office to furnish the information.

## Interviews from MUET

(The social, cultural and political factors were also observed during the interview but it was not possible to interpret all into text. But, the proposed recommendations (chapter 7) have been made in light of those observations).

### 1. Prof. Abdul Aleem K Rajput

*Ex-Controller of Examinations*

Cell: 923003075540

The ex-controller of examinations who has been remained the head of the examinations department was interviewed. Since, the overall system of the examinations is manual so he emphasized to make it computerized through automation. He informed that the system is transparent and involved so many people to check and verify to keep transparency but it takes time and can also have chances of mistakes. People spare more time and more labor with a lot of service cost. He was looking a centralized system with updated information ready to print for controller and executives with more control and transparency. He told that there is a complete procedure of all activities pertaining to the different sections of the examinations department which is fully documented called SOP (standard operating procedure).

### 2. Ashrafuddin Shaikh

*Ex-Deputy Controller of Examinations (Conduct)*

Ph: 922771288

He was observing problems while managing information and manually handling correspondence of his section with teachers, internals, externals and examination record. He was required some information from other sections of the examinations department but was dependant on their feedback which was late, but if he had a system that could immediately watch to the students record and take decision. He had to give reply to his superiors within minutes or hours but the information took time due to manual or dependant feedback nature. He had only two working staff of computer assistants. Their function was to conduct examinations and make correspondence with teachers and print question papers which were all based on manual work which took them in tension and overloaded all the time.

### **3. Abdul Khailq Surhyo**

*Ex-Deputy Controller of Examinations*

He was looking after secret section and other secrecy matters of the examinations department which all were dependant on manual filing systems. This could make him extra laborious work and overtime services that were giving him depression and overloaded pending assignments. He was very conscious about his work as his work was too sensitive and had no chance of mistakes. He was also dealing with affiliated colleges and issuance of degrees as well. He was getting students' degrees write-up by a calligrapher. He was working all the time till late evening. He was under pressure during convocation to issue degrees of students and show their status to the top management and furnish reports for meetings.

### **4. Moulabux Lighari**

*Deputy Controller of Examinations*

*Cell: 923009375307*

He was incharge of some affiliated colleges and dealing with their exams and results. He had a one assistant but the overall exams record was manually entered in the computer and the each student had a separate record file which was easy for him but not good from systematic point of view. As his all work was manual and he wanted to get it computerized. The activities were in isolation form other sections which were also doing the same activities with repeated laborious work.

### **5. Abu Bakar Memon**

*Examination Affairs Coordinator /Secret*

*Cell: 923013537667*

He was mostly dealing with the student queries, regarding results recounting, withheld, announcement, variation, discrepancies and so on in secret section. He had no assistant but pressure of students to give feedback soon. His work was too laborious and referring heavy weighted ledger records which was too difficult for him. He was using calculator all the time for each student to make calculation of results through formulas but he was also overburden.

## 6. Syed Ghulam Ali Shah

*Assistant/Inquiry Counter Examination Section*

*Cell: 923003057924*

He was working at the customer service counter dealing with the queries of the students. He informed that most of the students come for correction to their certificates and results which are not as per their original results or with mistakes in name, father's name, or percentage. There remain all the time a heavy rush of the students to ask for the forms, fees challans and mostly students rush for their marksheets when the result is announced. And it becomes terrible situation to face the huge crowd of the students even more people are deputed with me but we can't face the students when they cry.

## 7. Khurram Akhund

*IT Assistant*

*Cell: 923332740791*

He was dealing with the punching of the results in the database and issue marksheets of the students. There were many other guys with the same assignment entering manually the results from a record sheet called ledger and printing from a printer attached to every system. He can made mistakes in punching also and sometimes even when heavy rush of results announcement take place , then they have pressure to immediately issue the marksheets of the students which also contribute to the chances of more errors. He along with other fellows sit for a late evening to punch the records and print the certificates. Sometimes meanwhile he is asked to provide other information to the other section or top management which he has to give within no time while sustaining the pressure of students also.

## 8. Checkers

*Faculty Members-MUET*

The checkers who are mostly from faculty (teachers) were randomly interviewed and they were quite satisfy for this practice of checking through manual system as they were calling it the real transparency to be observed by other independent who is not the part of examinations department. This took a lot of service charges paid by the examinations department. The examinations department was sometimes dependant to get checked results back for the announcement and always face a burden of processing service bills for that which was also overburden of work on department.

## 9. Tabulators

### Faculty Members- MUET

The tabulators who are mostly from faculty (teachers) were randomly interviewed and they were also quite satisfy for this practice of tabulation of results by collecting all separate results of the students of every subject and compiling it into the shape of a single record sheet called Ledger. They believed that tabulation from an independent person that is not from examinations department is a good transparency system. This took a lot of service charges paid by the examinations department by per student rate. The examinations department was mostly dependant to get tabulated results back from teachers for checking and announcement which delayed the announcement and cry of the students.

## 10. Students

### *Randomly Departments*

In random students' interview conducted from different departments the University, the students were not more satisfied from the feedback of exams department and sometimes they had to wait for a longer time to get results, certificates, verification and correction. They were unable to see their results online and most of the time they had to visit exams department personally where already a heavy rush was there. And people there could respond to one at a time and in manual system they can take more time for each student and rest of them can not get response. Due to classes it sometimes becomes difficult for the students to come personally to the exams dept. for their important matter. The teacher has no access to the system for accessing result and the student has to fulfill the formalities for each query by submitting documentation. This is the terrible for students as well as for department to handle heavy paperwork.





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