CHAPTER 7

CONCLUSIONS AND SCOPE FOR FUTURE WORK

7.1 INTRODUCTION

This chapter is divided into seven sections. The next section 7.2 presents the major conclusions and findings drawn from the overall research work described in this thesis. Section 7.3 provides the findings and conclusions drawn from the component analysis performed on the selected e-contents of ‘Operating Systems (OS)’ of NPTEL. Section 7.4 presents the inferences derived from the social survey conducted on e-learners on strategic components for the purpose of designing object oriented approach for e-content development of OS. Section 7.5 narrates the conclusions drawn from the proposed instructional model. Section 7.6 presents the findings from economical analysis akin to technical feasibility study on the proposed model. Various recommendations resulting from this research work and suggestions for future research work are presented in Section 7.7.

7.2 MAJOR CONCLUSIONS

7.2.1 On component analysis

The component analytical study performed on existing media/material of ‘Operating System (OS)’ of NPTEL shows lack of picturesque / diagrammatic components in its slide presentations, although the dealing of actual subject content may be adequate and acceptable. It is concluded that when the maximum presence of cognitive structure is ‘Demonstration’, this portrayal could easily be represented with diagrams and/or pictures for better retention on the part of learners.
7.2.2 Strategic components for e-learning

It is found from social study that the maximum desirable time duration for one e-learning episode at one stretch is 15 minutes. This shows e-learners want each episode to be of small time duration.

E-learners want only a minimal presence of video, graphical animation and numerical example components in instructional episodes.

E-learners want one specific subject concept to be represented in each episode.

7.2.3 Proposed SCO black-box model

The fundamental design principle of the model is to split instructions into small, independent and reusable modules, called ‘objects’. This instructional strategy adapted in these objects follows a proven problem centric model called Merrill’s ‘First Principles of Instruction’. The advantage of this model is that it provides quantifiable cognitive structures that form the constructs for these episodes.

It is concluded that this model has been put into operation, tested, experimented and validated.

7.2.4 Economical and technical analysis of the model

It has already been established that instructional episodes in e-mode need to be structured so as to deliver effective instructions, and Merrill’s cognitive structures are proven to aid in designing efficient structured instructions. The distribution of cognitive structures found in existing NPTEL instructions are haphazardly arranged as evidenced by the content studied, analyzed and reported in this thesis. Hence, it is concluded that although the subject contents of OS of NPTEL are strong in their presence, the instructional approaches are not acceptable, because of the lack of structural approach followed by NPTEL. As NPTEL follows uni-directional instructional approach (ie. all the unit contents in one stretch, one
after another) it is undoubtedly un-economical as the whole needs to be retained in e-mode all the time.

The model proposed in this thesis presents distribution of cognitive structures in a well organized manner in each individual object. Social studies conducted on these experimental episodes have proved that these instructions are very effective. Even though NPTEL episodes are technically feasible, this researcher’s episodes are technically more feasible, as it contains smaller episodes that contain independent materials that infuse scientifically designed cognitive structures. This researcher’s model is highly economical, as it uses reusable instructional objects, thus reducing developmental costs. Besides, these objects do not follow uni-directional instructional approach, but cyclic instructional approach, and hence all objects need not be retained in e-mode form all the time. Hence, the proposed strategy is economical.

7.2.5 CPU, elapsed and retention times of instructional episodes

It is experimentally proved that there is no significant difference between pure textual and pure graphical contents of e-contents as far as CPU, elapsed times are concerned when related with retention time.

It is concluded that the object retention time of this researcher’s approach is less than NPTEL’s retention time of total OS contents. Besides, this researcher’s model uses more graphical contents for better comprehension of concepts.

It is thus inferred that this researcher’s model is technically feasible that is akin to economy.

7.3 CONCLUSIONS ON COMPONENT ANALYSIS

7.3.1 Modules of NPTEL’s OS

No real world task that is related to topics of ‘OS’ is found to be present in NPTEL’s e-contents.
The maximum present cognitive structure in almost all 20 modules of NPTEL’s OS is ‘Demonstration’ that is followed by ‘Application’, while the other two portrayals namely ‘Activation’ and ‘Integration’ are found to be minimal.

The entire subject content of OS of NPTEL is uni-directional. This shows that the entire subject content needs to be put in e-form all the time.

It is concluded that the instructional approach followed by NPTEL’s OS is not problem centric, while the subject contents are present in adequate measure.

7.4 CONCLUSIONS ON STRATEGIC COMPONENTS FOR REUSABLE MODEL

7.4.1 Representation of episodes

A maximum number of respondents opt for independently represented e-episodes in small contents, independent modules (objects). The time duration need to be not more than 15 minutes each.

Maximum number of respondents prefer for logical sequencing of segments within instructional objects.

7.4.2 Media components in episodes

Most of the respondents do not prefer for large quantities of videos and graphical animations in instructional episodes. They also do not seem to be impressed with large number of numerical problems. Most of the respondents do not want large figures with dimensions and elaborate user friendly navigation icons/menus in instructional episodes.

7.4.3 Instructional approaches

Maximum respondents demand for clarity in instructing basic concepts. Maximum respondents have expressed no opinion on mental retention time.
are also not interested in testing analytical and critical thinking abilities to be included in large quantities in the instructional episodes.

Most of them want introduction or hinting on pre-requisite topics for important topics.

Almost all these strategic components have been considered for the design of instructional model.

7.5 CONCLUSIONS ON PROPOSED REUSABLE OBJECT ORIENTED MODEL

7.5.1 Sharable content reusable objects

The model uses sections layers, module layers and objects layers. All objects are reusable and most of the modules are also reusable, thus making the model economical.

The object consists of both ‘SCO White Box’ and ‘SCO Black Box’. The black box follows Merrill’s ‘First Principles of Instruction’, while the white box specifies instructions specific to particular object or module.

The episodes demonstrated by this researcher use maximum graphical media and has taken conceptual instructions on OS.

7.5.2 Validation of the model

Respondents have inferred the following: The proposed approach represents ‘Real World Situation’; has kept the learners alert; it seems to be a valuable instructional approach; it is an appropriate self instructional material.

Thus, the model has validated its approach.
7.6 CONCLUSIONS ON ECONOMICAL VIABILITY AKIN TO TECHNICAL FEASIBILITY

7.6.1 Existing NPTEL

Most of the contents are purely textual. No significant difference between CPU time and elapsed time seen compared with retention time.

7.6.2 Proposed model

Graphical media are mostly used for instructions. While no significant difference seen between total elapsed time between textual and graphical media, when compared with retention time, retention is enhanced by graphical instructions. Besides, the model applies reusable objects.

7.7 RECOMMENDATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

7.7.1 Recommendations

1. E-content development should use reusable and independent objects that may be infused in reusable modules for economical viable proposals akin to technical feasibility.

2. Use of cognitive structures while designing instructional episodes will improve efficiency.

3. Real world problems should be used in cyclic instructional episodes.
7.7.2 Suggestions for future research

1. This work has limited its scope only to concept based subject content of COMPUTER SCIENCE, like OS. This research could be extended its scope to programming subjects like C++ or Java.

2. Research on the impact of this instructional model on other technical components like online learner evaluation, security etc., can be taken up.