CHAPTER 3

RESEARCH APPROACH ON E-LEARNING PROJECTS

3.1 INTRODUCTION

Estimation of the problem size is an important aspect of estimating effort, cost and duration of projects. The program size indicates that the amount of time and effort required for completing the project successfully and measuring the development complexity of the project.

A reliable estimate of e-learning project size is an important element in the calculation of estimated project schedules and cost. Generally, the initial size estimation depends on the known system requirements. Hence, it is essential that sizing should be done as accurately and consistently as possible, specifying the uncertainties intrinsic in estimation. Sizing is complex for different reasons.

1. It is achieved in diversity of different circumstances, some with a mass of information about the system and some with almost no information at all.

2. There are numerous choices for the structure and language used to explore the requirements and design.

3. Generally, e-learning projects are the integration of fresh, reused and customized components.

A sizing approach should be capable of incorporating all the three modes even when the reuse and customization occur in the design and
requirements rather the codes. There are various approaches are used in the literature, for overcoming the complexity involved in software size estimation.

- **Source Line Of Code (SLOC)** – It calculates the total number of LOC in the completed software project.

- **Application Points** – It formulates the object points and appends rating scales for productivity of the project.

- **Feature and Function Points** – It estimates the degree of functionality by computing and weighting the queries, inputs, outputs, interface and logical files.

- **Predictive Object Points** – It formulates the object points and appends the information on how the objects are clustered into classes.

- **Object Points** – It computes the software size by high effort points such as client data tables, screens, server data tables and reports recycle from the previous projects.

- **Unified Modeling Language (UML) assembles** – A comparatively new approach based on the use case, an approach for defining how a user interrelates with the system to execute functions.

- **Analogies** – An entire project uses identical characteristics to the designed project to suggest the software size.

The proposed effort estimation is based on the Function Points Analysis (FPA) and the efforts are estimated with the help of classification of e-learning projects.
3.2 NEED OF FUNCTION POINT ANALYSIS

Function point analysis is used to provide a consistent measure for the system size, its feature are explained as under:

- It is easy and simple to apply.
- It is applied in the early stage of the software development life cycle.
- Sizing can be done in the early stage of requirement and design phase.
- It is significant to the end user.
- It is independent of the necessity for development technology.
- It is predictable from the requirement specification.

The size of the software product or the development process can be estimated as the product of the following three measures:

1. Information processing size: It is historically measured in LOC.

2. Environmental measures: It includes staff motivation, experience and skills, the utilization of the programming language and tools used.

3. Technical complexity measures: It considers the size of the diverse technical issues and other problems involved in attaining the requirements for the proposed project.

FPA aims to estimate the size of the business software project based on the first and the third measures. Currently, there are many
controversies over the inclusion of technical complexity measure. It refers to the task complexity and not means the overcoming of the software size.

3.3 FEATURES REQUIRED FOR E-LEARNING SYSTEM ESTIMATION WITH FPA

E-learning projects are comprises with a large number of text and image based contents, animations, videos, and audio with interactive (chat, e-mail, forum) and non-interactive (ppt, .pdf) e-learning projects are deployed in the web based system. For calculating the effort estimation for the e-learning projects is more crucial, first need to calculate the size of the e-learning projects. For calculating the size of e-learning project, the function point analysis is more suitable and reliable component because it involves more number of components compare with high level language like c and C++.

E-learning is basically the network (Client server environment) and computer enabled transformation of knowledge and skills to the e-learners. It is also referred as computer based learning, web based learning, digital collaboration and virtual class rooms. E-learning content is distributed through the intranet/extranet, internet, satellite TV, CD-ROM and audio/video. It contains media in the form of text, simulation, streaming audio, video and animation. Table 3.1 represents the features required for e-learning system estimation with FPA (Angel, et al. 2013).
Table 3.1 Features required for e-learning system estimation with FPA

<table>
<thead>
<tr>
<th>Sno</th>
<th>Features</th>
<th>FPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Past project experience</td>
<td>Essential for producing efficient parameters for estimation</td>
</tr>
<tr>
<td>2.</td>
<td>Technology</td>
<td>Algorithmic / Parametric / Proxy based method</td>
</tr>
<tr>
<td>3.</td>
<td>Accuracy</td>
<td>It is accurate based on the specifications of FPA. However, GUI/Web based applications are not good</td>
</tr>
<tr>
<td>4.</td>
<td>Time</td>
<td>Minimized time</td>
</tr>
<tr>
<td>5.</td>
<td>Quality</td>
<td>Good for procedure oriented programming</td>
</tr>
<tr>
<td>6.</td>
<td>Dependency</td>
<td>Language dependent</td>
</tr>
<tr>
<td>7.</td>
<td>GUI support</td>
<td>Little bit supported</td>
</tr>
<tr>
<td>8.</td>
<td>Cost</td>
<td>Minimized cost for estimation</td>
</tr>
<tr>
<td>9.</td>
<td>Reusability</td>
<td>Little bit considered</td>
</tr>
<tr>
<td>10.</td>
<td>Storage</td>
<td>Little bit considered</td>
</tr>
<tr>
<td>11.</td>
<td>Distribution</td>
<td>Little bit considered</td>
</tr>
<tr>
<td>12.</td>
<td>Networking</td>
<td>Little bit considered</td>
</tr>
<tr>
<td>13.</td>
<td>Database</td>
<td>Little bit considered</td>
</tr>
</tbody>
</table>

For developing the application software using any high level languages the various staff members are involved in different phases (analysis, design, coding, testing and implementation). Like our software development, the different kinds of staffs are involved in e-learning development with different kinds of phases. Generally for software development the analyst, senior/junior programmers, team leader, project managers and delivery managers are involved to implement the application software. In e-learning project development the following staffs are involved to develop the projects: Project manager, Subject Matter Expert (SMEs), Instructional Designers (IDs), Web developers/Multimedia developers and Technical support members.
Generally the Subject matter experts SMEs are used to transform the knowledge to the learners and expertise in the field of particular course. SMEs can write the content of the particular courses and producing the text for e-learning lesson using ppt, pdf and any other format like word. If it is an online class room then the SMEs are act as instructors. The specific roles for the SMEs are preparing the e-content, assignment and give the answer to the question.

The instructional designers IDs are collaborate with project manager and SMEs to convert the e-learning course material to appropriate instructional strategies. IDs are also responsible for developing the storyboard for the e-learning activity for the specific course.

Web developers and Multimedia developers are responsible for developing a web based server side coding and action scripts for interactive components like animation in the web based environment. After creating the courseware and animation and deployed in the web server. Technical support members are involved in the all the stages of e-learning development. They are responsible for implementing the e-leaning projects and require assisting to the users and developers.

3.4 SCOPE OF EFFORT ESTIMATION

Effort estimation in e-learning development is important as it provides the basis for calculating the necessary values of e-learning projects like total time and cost requisite to produce the e-learning software product. Some of the reasons for effort estimation are:

- Project Approval: There should be a decision on e-learning product launching on the part of an organization, prefaced by effort estimation necessary for successful project completion.
• Project Management: Project managers are answerable for managing and planning the project. Both the events require effort estimation based on the corresponding staged in order to complete the e-learning project.

• Understanding by the Development Team Members: The development team should perform efficiently individually and also as a team. The team members should understand their individual roles and also their overall activities of the entire team.

• Explaining Project Task: Task knowledge can be used for this development purpose and it is done based on the effort estimation.

• Accuracy of Effort Estimation: It is the current issue for the researchers in this domain. Currently, these estimations are majorly unreliable, there is no such proof of significant progress that has been obtained in their improvements.

3.5 E-LEARNING COMPONENTS

Web Based Training is known as the instruction deployed in the web server using internet or intranet and anywhere any time access to the course ware through the web browser. The web based instructions are classified into two types. 1. Synchronous (instructor-led – facilitated) 2. Asynchronous (Self-directed, self-paced).

Tutors and instructors provide support and collaboration at different levels to facilitate the instructor-led. Whereas for the self-paced learner, there is no need for the instructors as they are completely independent.

E-learning approaches can have various types of e-learning components (Buzzetto-More and Koohang 2009). They are:
- **E-learning content** – It contains simple learning resources, electronic simulations, interactive e-lessons and job aids. Simple learning resources are called as non-interactive resources like documents, PPTs, audio or video files. These files are called as non-interactive infers that e-learners can only read and watch the content without implementing any action. Simulations are very interactive forms of e-learning. The work “simulation” generally refers creating a learning background which “simulates” the real world, permitting the e-learner to learn. The general approach for self-paced e-learning is web based training, which comprises of a set of interactive lessons. It is a linear order of screens that contains text, audio, video, graphics, animations and interactive questions and feedbacks (Downes 2005).

- **E-coaching, E-tutoring** – It infers the services that can offer social dimensions to support e-learners through the learning experience. E-coaching offers individual support and feedback with the help of online tools and techniques (Georgouli et al. 2008).

- **Collaborative learning** – Collaborative activities varies from discussions and knowledge sharing to function on a common project. Social software is used for online collaboration among e-learners. Some of the social software is chats, blogs and discussion forums. Collaborative activities can include scenario based assignments and project works (Dillenbourg 1999).

- **Virtual classroom** – It is almost similar to traditional classroom training, since it is completely led by an instructor. Virtual classroom is an e-learning event, here an instructor remotely with the help of material such as PPT slides, audio and video files. It requires least effort to convert materials (Zhang et al. 2004).
3.6 STAGES OF E-LEARNING DEVELOPMENT

The e-learning project development consists of many activities with multiple phases like software development. The e-learning projects are divided into different phases; it will help to manage the complexity and uncertainties involved in the e-learning project development. A typical e-learning project includes the following phases (Clark & Mayer 2011).

- Analysis
- Design
- Development
- Implementation
- Evaluation

The development of e-learning includes five major stages. They are analysis, design, development, implementation and evaluation.

**Analysis**

Analysis phase would be established at the start of any development to estimate whether the training is essential to fill a gap in professional skills and knowledge. E-learning is the ideal solution to provide the training. This phase helps to allow the identification of high level course objectives.
**Design**

The design phase comprises the following activities. The activities are learning objectives, sequencing, instructional and delivery strategies. In this stage, creating the learning objectives which are necessarily to be obtained at the high level of the course explains the order in which the goal should be attained. It chooses the media, evaluation, instructional and delivery strategies.

The result of this stage is the blueprint that will be utilized as a reference to design the course. It explains the syllabus covered for each unit and the delivery formats and methods included on each unit.

**Development**

The e-learning content is actually developed in this stage. The e-content can changed considerably based on the available resources. For instance, it may include some simpler materials (little or no multimedia or interactivity such as PDF files) that can be consolidated with other materials such as audio or video files. Here, storyboard, media development and electronic correlations are not conducted.

Multimedia interactive content includes three major steps:

1. **Content development** – writing or gathering all the essential information and knowledge.

2. **Storyboard development** – combining instructional approaches and media components. It is obtained by developing the document which holds all the components of
the final interactive products such as text, images, assessment tests and interactions.

3. Courseware development – It implements media and interactive elements, which offers the different course formats.

**Implementation**

In this stage, the course content is delivered. It is installed on server and made available for learners. This phase also comprises facilitating and managing learner’s activities.

**Evaluation**

An e-learning project can be estimated for particular evaluation purposes. The learner’s reactions are evaluated at this stage, the achievement of learning goals, and impact of the project and the transfer of job related skills.

**3.7 CLASSIFICATION OF E-LEARNING PROJECTS**

Based on the assumption, the e-learning projects are classified into three different categories based on their content. They are:

a) Simple

b) Medium

c) Complex

The e-learning project is simple, when if it deals only with text based content, images and presentations. Generally in the simple e-learning
projects the non interactive course wares are used to deploy in the web server. The simple projects neither have neither any animation nor any complex action scripts. If the project has both text and animation and has a smaller number of action scripts, then the e-learning project is treated as a medium. If there are lots of animation, audio, video, and action scripts, then the e-learning project is called complex.

3.7.1 Simple E-Learning Projects

The e-learning projects created based on the text based content are classified as simple e-learning projects. It may also contain images with text based descriptions of non interactive e-learning content housed on web based interface. For instance, a mathematical e-learning project includes text with some representation of images. It is considered as simple e-learning project in our perspective. Text based e-learning is a scheme designed to assist the learners to gain knowledge and access to any university of their preference. It can comprise;

- An enhanced face-to-face teaching (on campus, internet with computer usage)
- An enhanced distance education (on or off campus either individual or collaborative learning methods)
- An instruction entirely online (group and individual learning).

Due to the above mentioned factors, text based e-learning knowledge and virtual classroom are moving towards every e-learner as a part of his study.
Online learning defines learning and other supportive materials that are accessible through a computer. It contains computer-based instruction, web-based training, computer-based training and technology-based instruction. It definitely delivers a diversity of approaches to old habits of sharing knowledge: traditional method, education, and training at class rooms; help to carry workers execute their jobs; and resources that contribute to organizational experience and information. The text based e-learning uses the text content to deliver data and information. E-learners or will be in their computer getting lectures as if they are located in the classrooms. The simple e-learning projects are concerned with text base e-learning and not visual e-learning. Moreover, files that are transferable within the web should be in form of,

- Text file format (*.txt),
- Rich text files format (*.rtf) or
- Hypertext markup language files format (*.htm).

3.7.2 Medium E-Learning Projects

The medium sized e-learning project includes text, more number of images with less complexity animations. Most of the organizations and institutes still use the traditional techniques to educate their learners/students. The whiteboard animation is the perception of training the learners digitally while maintaining meeting. This method can be changed with some voice-overs and interactivities. Whiteboard animations can take play a vital role in e-learning business with the use of appropriate delivery techniques. With a useful script and storyboarding, it can also be utilized to formulate a better meeting for e-learning.
Whiteboard Animation

Whiteboard animation is defined as the process where a storyboard and a creative story with illustrations are drawn on a whiteboard by lecturers who record themselves during the process of their teaching. It can also be used in customer awareness, sales and marketing, product awareness, fun stories, sales and marketing, etc.

Whiteboard animation may appear as a time-consuming process, as it is necessary to draw everything in a single line or a word. The techniques involved are simpler to generate than normal e-learning mode of media like WBT, CBT and SCORMs.

3.7.3 Complex E-Learning Projects

E-learning project containing wide range of complex animation and scripts is called a complex e-learning project with an interactive e-content is deployed in the web server. Video based courses and the combination of text, audio and video based courses are categorized as complex projects. Usually, the contents are full motion video clippings of a lecture or a dramatized sequence. The video based online course contains the text, audio and video contents for e-learners. Numerous software programs are available for easy formulation of the complex e-learning projects. Here, some of the software programs are discussed as follows:

Go Animate

This software permits creation of captive professional whiteboard animation- video using your favourite internet browser and mouse.

Video Scribe
This software authorizes the user to make captive whiteboard-style animated videos without any technical know-how or any design.

**PowToon**

It is one huger web tool that helps creation of powerful video presentations and animations.

**Whiteboard animation with authoring tools**

This is a kind of animation where the e-learner can see and hear the information. It can be made interactive through use of the authoring tools where the e-learners can act together with the animation and execute actions based on adult learning philosophy. Top e-learning tools have the characteristic of effort with videos and combine those videos with the e-learning course materials. Whiteboard animation software facilitates video output files. It can also be applied for reconstruction with authoring tools with appropriate animations and interactivity.

Tools such as Articulate Storyline and Adobe Captivate have the characteristic of capacity to introduce video into the e-learning classes, where the whiteboard animation can be effortlessly merged with e-learning classes.

**Voice-overs**

Voice-over is a useful medium for most of the whiteboard animations to embed with animations to formulate effective learning resources.

**3.8 SUMMARY**

This chapter provides the need for the proposed research methodology. In the proposed method, FPA and effort estimation are the key concepts and they are explained and justified with their remarking points.
This chapter explains the e-learning components and the stages of e-learning development. Moreover, this chapter provides the brief explanation of the classification of e-learning projects.