

# Maturity Level Definitions for the Evaluative Framework to Measure the Maturity of Skill Based Training Program with Multimedia Support in an E-Learning Environment [SBTP-MSeLE]: A Learners Perspective

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**Abstract** - Success of e-learning is depend on effective delivery, course contents, nature of the courses and training via electronic media including the Internet, intranets, and extranets. Short of funds and absence of suitable infrastructure, facilities are considered to be the main obstacles to effective e-learning practices. Creating an e-learning environment with proper curriculum, interaction with students, assessment techniques, active feedback system would play an important and significant role in building and structuring the e-learning environment. In this paper the authors describes the process measurements of evaluative framework to Measure the Maturity of Skill Based Training Program with Multimedia Support in an e-learning Environment [SBTP-MSeLE] model and define the maturity of indicators in four levels. The key variables used in the SBTP-MSeLE maturity model were found during the pilot study of SBTP-MSeLE. This study was conducted with 317 students who are doing the skill based training programs such as CISCO Academy courses, CIW, and ICDL in various universities in UAE. These maturity level definitions could be used to evaluate the maturity of Skill Based Training Program with Multimedia Support in an E-Learning Environment

**Keywords:** Maturity Framework, Skill based Learning, e-Learning - Evaluative Framework, Multimedia based Learning, SBTP-MSeLE.

## I. INTRODUCTION

The education sector is no more bounded by one geographical place. The learners are always looking for opportunities to study from a well-known institution. These Institutions are, sometimes, not within the reach of learners due to some financial, geographical and personal reasons. At the same time, the universities also want to see their education growing globally and not restricted to one region. This is the main motivation towards bringing the concept of

distance learning and the e-learning solutions. Universities and their stakeholders are investing largely towards such learning system, which could stream line, their education process and expand the education globally. Many Institutions are trying to bring a good organizational culture so that the better learning environment could be created, and institutions needs to have a system that could reduce the teaching time. Adequate training and support, planned activities, teaching with methods, teaching with technology could help in improving the learning experience. Learning system could be helpful in bringing a good managerial and a standard delivery mechanism to the education/ learning environment [1].

## II. THEORETICAL FRAMEWORK

Skill based training programs are designed to educate learners to become expert and more focused to acquire verified of skill at the end of the training program. In the computer field, an expertise related to particular tool equipment could be part of the curriculum and delivered with a hands-on approach. With the use of internet technologies, Institutions have enormous opportunities to deliver education and training programs. Internet technologies with suitable learning strategies assists to provide an open, flexible and dynamic learning environment [2]. This innovative approach of delivering information and education is known as E-learning.

Kaufmann conducted a research with 431 people, and found the motivational factors towards learning. Kaufmann and his team discovered that large number of people could look for the following motivational factors while doing the training program [3]:

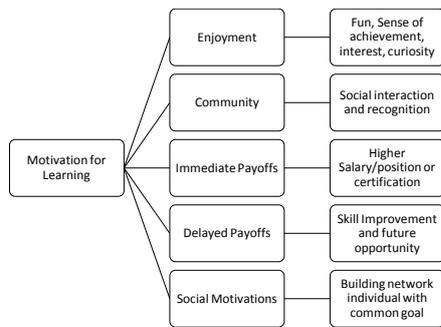


Figure 1: Motivation Factors for Learning [3]

- **Enjoyment:** Learning environment with interactive element includes quizzes, activities and games as a part of the course can add the fun element scenario based. Case based courses can also be used to the training program to discuss the real situations analysis. A degree of freedom given to learners in course navigation instead of forcing them to view all the pages also contributes to more number of learners taking the courses.
- **Community:** Learning environment caters the need for social interaction and collaboration. The training program could provide a collaborative learning environment where learners can interact with others in the organization who may be located in different geographical regions. Opportunities of remote mentorship and guidance, and peer interaction could prove to be good motivational factors.
- **Immediate Payoffs :** Provide quantifiable incentives in the form of higher salaries, position and certification to employees who complete the courses. This can be very motivating and employees are more likely to complete the courses assigned to them.
- **Delayed Payoffs :** This is to satisfy the long term needs and make sure that the knowledge acquired is beneficial to employees in the long run particularly in their career growth. It also helps in Signaling’ which refers to using actions as strategic signals to the surroundings. A learner uses the learning environment by actively participating in the discussions and knowledge forums, which could be noticed by senior managers who may otherwise not have direct interaction with the learner. It provides a forum to be noticed and seen which by itself is a good motivating factor.
- **Social Motivation:** Satisfy social needs establish a Learning Management System (LMS) that becomes a hub of activities, where there is constant interaction and learning

among employees across the organization, irrespective of their geographical locations. Blogs, Wikis, and discussion forums could be a part of this dynamic network of individuals with common goals. Employees could also interact with their colleagues who have completed the courses to check out how the courses can be beneficial to them.

With the data collected from 173 students, Chen found that, when e-learning technologies are provided appropriately as per the students expectations, could result in successful adoption of e-learning [4]. According to Chen, the learners are looking for the following facilities in the learning environment.

- Better and faster access to information for their learning [5]
- Learn information from multiple perspectives [6]
- Controlled learning environment and process [7]
- More customized learning instruction[8].
- Support their pace and style [9]

#### A. Evolution of e-Learning standards

It is universally accepted that e Learning is the best vehicle for supplementing the knowledge beyond the classroom, certainly there are many issues which need to be addressed to create in an e-learning environment.

- **Scalability** Techniques which could encompass large numbers of learners [10][11]
- **Interactivity** Techniques to gain more insight into the Knowledgebase interactively [12][13]
- **Inter-operability** Techniques to support to how easily one can offer the same course on different platforms [14][15][16]
- **Security** Techniques adapted in the system to provide the secure learning experience[17][18][19][10].
- **Interchangeability** Techniques to support how easily learning content move between the tools.
- **Supplementary** The tools and techniques that could help to learn beyond the classrooms [20][21].
- **Comprehensive** Techniques that could provide a complete learning

environment with all features just like a class room and beyond[22][2].

E-Learning environment with all these features requires expertise to develop, manage and maintain. But with this learning environment faculty and student could result in effective and active learning[23].

*B. Need for evaluating maturity of skill based training in a e-learning environment*

A Maturity Model is a stage approach to improve the process over a considerable period of time [24]. Information technology revolution creates extensive changes in the learning methods. Integrating IT applications to educational courses is one of the most important results of this revolution. ICT and computer based education is becoming common these days[25]. These technology trends capable of providing in-person and remote learning approach. Exponential growth of eLearning in the recent age has witnessed high rate of success in e learning market. Many learning environments are developed and delivered from the instructors point of view [26]. If the learning environment is designed and developed more from the learner’s perspective, it could result in higher level of learning and better skill development [27]. Better results are produced by a system when it follows a matured process in its operations. Maturity is important in a e-learning program environment because immature system will not have a critical mass of support, consulting, training, vendors and users [28]

III. PROBLEM STATEMENT

The purpose of this paper is to describe the process measurements of evaluative framework to Measure the Maturity of Skill Based Training Program with Multimedia Support in an e-learning Environment [SBTP-MSeLE] model and define the maturity of indicators in four levels.

IV. RESEARCH METHODOLOGY

During this study, a thorough literature review was conducted methodically and analyzed to identify thirty three variables to construct the research framework [27]. Many researchers have developed maturity-based framework to evaluate the maturity of e-learning environment. Some of such maturity models are five-levels : E-Learning Maturity Model [29] , five-levels : Online Teaching Staff Maturity Model (OTMM) [30], five-levels: CMM approach for (Business process maturity model [31], CMM derived E-Learning Capability Model (ECM2). Six level model for enterprise e-learning improvement (Harris 2004). five-levels: online course design maturity model ( OCDMM) ( Neuhauser, 2004). five-levels: THINQ Learning Management Maturity Model. However, rather than creating similar maturity model or reproducing existing maturity model on e learning, this research paper aims to add into the

body of knowledge by providing a maturity based multimedia supported e-learning environment evaluation model. The maturity model developed in this research is a four stage maturity based on thirty three indicators relating to computer based/e learning environment acceptance.

V. MATURITY LEVEL AND ITS PROCESS

**SBTP-MSeLE** : A maturity based evaluative framework is to measure the maturity of the learning environment from a learners’ perspective. This maturity based evaluative framework is a strategic model, which could help to evaluate the maturity of the learning environment. Maturity models are involving process and high performance delivery to allow individuals and organizations to self-assess the maturity of various aspects of their processes against benchmarks [32]. Set of procedures that can make any organization’s processes or outcome a standard, and that could be repeated and improved systematically. The e-learning Maturity Model provides a set of processes, that define a key aspect of the overall ability of institutions to perform well in the delivery of e-learning. It is a quality improvement framework based on the ideas Software Process Improvement and Capability determination (SPICE) methodologies [33]. The fundamental idea that guides the development of the e learning Maturity Model (eMM )is that the ability of an institution to be effective in any particular area of work is dependent on their capability to engage in high quality processes that are reproducible and able to extend and sustained as demand grows. Following such framework in an educational institutions and academy could leads to a great learning environment and leads to outcome based learning. The maturity model developed by this research consist of four stages Process Measurement as shown in figure 2 and the maturity based on 33 indicators relating to computer based/e learning environment acceptance.

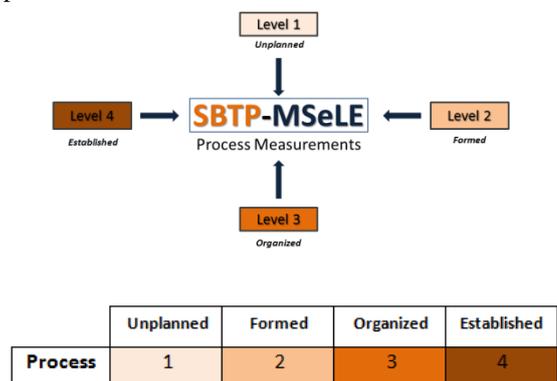


Fig 2: Process Measurement

## VI. PROCESS VARIABLE DEFINITIONS

TABLE 1 : PROCESS STAGES AND VARIABLE DESCRIPTIONS

Stages	Description
<b>Level 1: Unplanned</b>	Training Program conducted in an unstructured way
<b>Level 2: Formed</b>	Training Program conducted with predefined objectives and goals. Not evaluated systematically
<b>Level 3 : Organized</b>	Training Program conducted in a structured way, and quality is controlled
<b>Level 4 : Established</b>	Training Program and its processes such as delivery, communication and quality control are all set and it is repeatable for diverse learners. Competency level of a learner is measurable in multiple ways.

Ind.	Factors/Variables	Maturity Level - 1	Maturity Level - 2	Maturity Level - 3	Maturity Level - 4
		<i>Unplanned</i>	<i>Formed</i>	<i>Organized</i>	<i>Established</i>
11	<b>Study Material Availability</b>	Available during the class	Material is available online	Material available online and there is a facility to download.	Material available in the form of a book with proper publishing standards.
12	<b>Study Material in Multiple Format</b>	Material in single format	Material is available in one format but not standardized.	Course material available in multiple formats to support different learning style such as audio, video, and animation	Course material is available in all formats with multiple language support. It is customized as per learners style
13	<b>Repeatable Instruction Delivery</b>	Learner must take notes so that they can study and revise. Xerox copy of self-prepared material circulated by Instructor for reading purpose	Material available online, it can be seen by learners at any time	Unlimited access of instructions in the form of recorded audio, video and presentation.	Full course material is distributed in all formats on the first day of the course.
14	<b>Compatibility of platforms</b>	Material is available only on paper.	Online material platform oriented.	Online material works in all platforms.	Material periodically updated. Intimation of new formats and supporting devices available on site
15	<b>Multimedia based learning</b>	Material circulated is not adequate	Material circulated has few multimedia components	Material designed with different components such as animation, diagram audio, video to make the learner understand better.	Material is available in multimedia components and in multiple language to support and better understanding of subject
16	<b>Structured learning content</b>	Course Material does not have objectives, and defined outcome of each topics	Material is provided with clear objectives and learning's outcome.	Material is provided with objective and target to check the outcome.	Material is updated regularly to support the industry requirement and outcome based.
17	<b>Skill supportive material</b>	No manuals/ instructions for conducting hands-on Instructors presence is required all the time.	List of experiments and task descriptions – worksheets are available. Learners can print and use during the hands-on	A proper lab manuals with all experiments, task description, with the systematic procedures and the outputs expected is given.	Experiments are up-to-date to industry standards. Updated periodically and Archives of the old experiment list are also provided for additional learning.
18	<b>Reference material</b>	Students are asked to refer material on their own, no lists provided.	Students are given with reference site list with the name of references	Students are given links to refer the material on their interest and it is provided on the site.	Students are provided with the reference links and the subscription to refer and read from it.
19	<b>Face-to-face course delivery</b>	No predefined lecture Sessions, Students are not aware what is going to be in today's class.	Lecture Sessions are Predefined and time bounded. Conducted as per the schedule and material.	Time bound, topic covered with specific outcome and students are very clear about next stage.	Topics covered as per the curriculum and leads always with the intension of goal and achievement, Students are taught with higher excellence.
110	<b>Simulation based learning</b>	No such tools used in the learning process	Simulation tools are used to conduct experiments	Separate set of experiments are given to apply in the simulation environment other than real environment.	Simulation is integrated to learning on web site. It is capable of recording students activity and able to give the scores immediately.
111	<b>Demonstration based learning</b>	Theory classes based, lectures, not much focused on demonstrations.	Instructors demonstrate the tools supported for that course for better understanding of course.	Demonstrations are available on the site, students can learn from the demo videos independently	Tools used for learning purpose are all recorded and they are made available on learning site or in the material pack given on the first day of course. Students can learn independently by demonstration and try by themselves at their own pace. Skill demonstration could be available as a mandatory component on the learning pedagogy and it is graded.
112	<b>Problem solving</b>	Simple problems based on	Case studies are discussed in	Students are given case studies	Students are given new

		theory are solved during the class	the class to gain the application of the skills in the particular area.	and asked to study the case and present the solutions submit	problems and case studies on their learning site, solving such problems and presentations are included as a mandatory component in the curriculum
I13	<b>Non-interactive remote class</b>	No facilities for such interface	Recorded classes available as a video on the learning site.	Online streaming facility is available in the learning site for any special lectures or additional lectures.	Learning site has full-fledged streaming provision, they are broadcasted to support remote learners.
I14	<b>Collaborative Learning</b>	Individual assignments/ task are given to solve in the class or lab	Students are formed in a group to solve the problem in the class	Student group will work remotely or in the class and solve the issues and present them during the class or submit.	Facility to assign a time bound collaborative work in the class and students will be able to submit their work during the class or submit online and it is evaluated immediately or offline.
I15	<b>Customizing Learning Environment</b>	No such option in the learning environment.	Common learning and access environment to all students.	Students are given individual user account and password. They can set the learning environment according to their wish and according to regular usage components.	Students environment has provision to set their interest and it automatically learn the students interest arrange itself, capable of setting learning environment according to their way of learning such as audio, video, collaborative, organize the environment.
I16	<b>Learning through Conferencing</b>	No sophisticated technology used.	Third party tool for such communication.	Facility for instructor to conduct audio, video chat with student when there is a doubt on a particular task.	Own facilities to conduct such sessions. Used when students are on fieldwork, projects, team projects.
I17	<b>Peer Interactivity</b>	Peer Interaction is done during the regular classes. Students use their own communication, chat tools to communicate	Students and faculty use personal official mail id to communicate.	Learning site has a provision to post students queries, and other students can answer the issue and clear technical doubts.	Learning site has facility for post questions and they can track and clear doubts with their friends and others online.
I18	<b>Expert Counseling</b>	Expert visit is arranged during the class hours and students interact.	Facility to send queries to expert through form or mail and it will be answers by expert	A group of experts assigned and they will be online on chat or mail ( synchronous or asynchronous)	Expert / Alumni community provision is in the learning web site support students to get their queries, doubt solved immediately.
I19	<b>Student-faculty communication</b>	Happens only during the contact hours in class room	Student faculty will interact with the common interaction board available online.	Faculty will be able to answer individually and commonly for a particular problem	Provision for personalized query and maintenance of log of all communication for creating a knowledge base.
I20	<b>Online submissions</b>	Submission only in hardcopies	Faculty receives student's submission in his email account.	Course web site has provision to submit online on the site and faculty will be able to view them with his account.	Students will be able to see their status of submission and provision for checking the plagiarism level of their work with the tools supported by the online submission tools.
I21	<b>Practice Assessments</b>	Offline exam conducted and evaluated manually.	Sample quiz/ practice test available on learning website or given material.	Students can give practice test available on the learning website. On scoring low marks, they can repeat as many numbers of times. Instructor can set these features.	Students give practice exam online or from the material distributed; these mile stones could be included in the grade book to complete the final exam. Mandatory items must be completed before appearing for final exam.
I22	<b>Skill based Assessments</b>	Students visit the lab/ class to their skill exam	Students use the simulator real equipment environment to do the skill based assessment. Marks are properly recorded and manually entered.	Online skill test facility through integrated simulator tool. Evaluation is done automatically with the tools and results announced immediately.	Online challenges are evaluated immediately on completion and scores added to grade book. Real equipment skills or monitored and entered by the faculty.
I23	<b>Descriptive/Objective type assessments</b>	Students have no online exam facility. They give exam only in class room.	Exams stored on local server or third party software in the premises for conducting exams/assessment.	Learning website has provision for enabling online exam. They give practice exam before they take final exams. Marks are entered manually to their grade book progress book.	Learning website has provision for enabling exam for individual student according to their availability. A good collection of assessment question pool is available. Exam could be organized remotely or in classroom in a monitored environment. On completion, marks are automatically added to their grade book or progress report.
I24	<b>On Field Assignment</b>	No fieldwork, or assignment is given to solve and submit.	On completion of recommended skills, students	Field work is mandatory to complete the course the	Fieldwork is allotted as a part of the course and it is

			are given fieldwork to gain more experience. Assessment score given personally by instructor.	number of credit hours outside the class room.	assessed. Project is mandatory to complete the course.
I25	<b>Intimation about the exams</b>	Informed in the class, students convey to others	Informed in advance on a common platform.	Informed well in advance individually and it appears on students personalized dashboard.	Students are informed about all activities prior to course start and they are followed
I26	<b>Results with description</b>	Assessment results manually calculated and displayed	Manually calculated Results declared on a common platform such as learning website.	Results are generated automatically after completion of exam on web interface.	Results are shown to student immediately after assessment. Personal feedback about the assessment score and the knowledge area is generated for student to improve score and performance.
I27	<b>Course Progress Status</b>	No such information	Module completion and assessment completion report compiled by faculty and given to student on a predefined duration.	Students are shown completion of the module information and next levels on their dashboards.	Students will see their progress on every module and time allotment and completion deadline on their dashboard. Very much useful for the student to know the progress and the deadlines.
I28	<b>Performance Report/ Grade Book</b>	Progress report is given at the end of the course.	Progress report is given to student the periodically.	Personal Progress report / grade book is available on the student account and they can access any time.	Student personal progress report is available on website. Faculty comments are included based on the performance.
I29	<b>Course Feed back</b>	Students are asked an oral feedback during the course of study	Students are asked to give a formal feedback at the end of the course	Students are asked to give the feedback after completing every mille stone in the course about the Couse, and delivery	Feedbacks are well taken and they reflect in the environment. Students are able to feel the changes.
I30	<b>Award/Appreciation on completion</b>	Marks are allotted/ grade sheet is given at the end of the course.	Certificate and proficiency certificates manually prepared as per the score and given to students.	Students certificates, proficiency certificates, and achievements points are automatically generated on completion of all assessments.	Awards and certificates are generated immediately after assessment. They will be awarded to students on a common platform. Achievements are available on learning site to motivate other learners.
I31	<b>Intimation about Opportunities</b>	Announced in the class or during meeting	Information sent on a common mail ID	Individually on their mail or it appears on learning site	According to the selection, subscription opportunities are show on the students dashboard and sent to individual mail id immediately when information is uploaded by the institution.
I32	<b>Provision of Internship</b>	No Internship facility	On completion of recommended skills, students are allowed to do optional internship	Internship allotment depends on the assessment scores	Internship is mandatory and it has to done for specific hours for completion of the course.
I33	<b>Intimation of Course updates</b>	Announced in the class or during meeting	Information sent on a common mail ID	Individually on their mail or it appears on learning site	Subscribed users will get update as per their subscription. New versions details are available on dashboard. User gets update when new versions launched.

## VII. DISCUSSION

This maturity model framework of this research work has taken the inspiration from the processes, measuring techniques and methodology of CMM -developed by Software Engineering Institute., SPICE developed by International Organization for Standardization [22] and eMM by the University of Manchester [29]. A questionnaire for the pilot study has been constructed with the variables and circulated to 200 students. These students belong to computer science, media and communication, information technology and interior design programs. All the students had the experience of completing the training program with support of an e-learning facility.

This study has been conducted with two universities in Dubai, UAE. The training programs were conducted by CISCO Networking Academy, ICDL Testing and Training Center and CIW Training and Testing Center. As a result of this process, indicators were finalized and they will be used in developing the maturity framework. Maturity is defined as the state or the quality of being fully-grown or developed. Maturity model will help the process of high performance delivery and allow individuals and organizations to self-assess the maturity of their process against benchmark [24].

## VIII. CONCLUSION

This paper highlights the indicators and their maturity level descriptions. The next stage of this research will take the

authors to construct the final user acceptance indicators for the SBTP-MSeLE environment.

#### IX. FUTURE WORK

The data collected from the pilot study will be used to examine how these SBTP-MSeLE environment indicators influences and forming a process. This process will be measured for maturity designed for four levels and described in the Table 1

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