An Assessment Framework for Leveling Digital Readiness

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This thesis Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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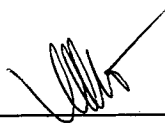
DAFFODIL INTERNATIONAL UNIVERSITY

DHAKA, BANGLADESH

APRIL, 2018

APPROVAL

This Project/internship titled **"An Assessment Framework for Leveling Digital Readiness"**, submitted by Bhaskar Sarkar, ID No: 142-15-3698 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 4 May 2019.

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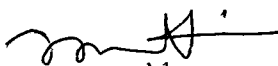Daffodil International University

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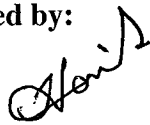Daffodil International University

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DECLARATION

We hereby declare that, this project has been done by me under the supervision of **Dr. Sheak Rashed Haider Noori , Associate Professor, Department of CSE,** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ACKNOWLEDGEMENT

First I express my heartiest thanks and gratefulness to almighty God for His divine blessing makes it possible to complete this work successfully.

I am grateful to **Dr. Sheak Rashed Haider Noori , Associate Professor**, Department of CSE, Daffodil International University, Dhaka. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, and valuable advice have made it possible to complete this work.

I would like to express my heartiest gratitude to everyone who has helped in different aspects of the work and Professor **Dr. Syed Akhter Hossain, Head, Department of CSE**.

Finally, we must acknowledge with due respect the constant support and patients of my parents.

ABSTRUCT

In our fast paced world, we can avail anything living in the digital environment that surrounds us everywhere and in every aspects of life. But the truth is, it is not easy for everyone to cope with the new ways of technology and perform at their best in a digital environment. This thesis proposes the Learning Readiness Assessment Framework (LRAF) for measuring readiness for succeeding in a digital learning environment. The LRAF scores each student for different parameters and provides a detailed report on the readiness level for different aspects which can provide an understanding on the possibility of success by the student in a digital learning environment. Moreover, the system also suggests a possible CGPA range for the student depending on the learning readiness assessment score. However, one of the critical study done in this thesis is the relation of digital readiness level and performance in a digital learning environment. This solution not only opens a new door for understanding the influence of digital readiness on a different scale but also enables an institution and its teachers and people who are concerned with student welfare to keep a track on the performance of their students according to their potential.

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INTRODUCTION

1.1 Introduction

Technological innovation and quick incorporation for better life often leads to problem because it is not necessary that everyone has the same capacity to cope with it. Problems can occur when improper planning cannot perceive whether there is acceptance of new digital influence by various if not all parts of an ecosystem i.e. an institutions, education system, governments, flow of information among the mass etc. This situation underscore two points about how new technology works its way through society. "First, different people and institutions have varying levels of preparedness for using next-generation technologies. Second, this reality can result in varying levels of usage of new technologies as they diffuse in society. These differences can, in turn, ultimately raise the possibility that uneven adoption and use of technology could have negative consequences for those who are not facile and comfortable technology users" [1] and affect the overall efficiency of a digital system. Therefore, in order to develop a successful and efficient digital system or environment, a scale (Digital Readiness Level) to determine the level of readiness of the end user or the digital system or environment itself is mandatory.

Moreover, it takes a lot of money to transform towards digital. But it is not necessary that all the funding is unlocking the best transformational benefits that digital can drive. It is a very simple fact that jumping to simple tactical digital initiatives are not enough to unlock the true value that digital can provide. The Digital Bangladesh movement is a great promise for us which is vital as we are developing rapidly. But it is very critical that we plan our development towards digital according to the Digital Readiness (DR) at organizational and personal level. However, unfortunately there is still no such tool to understand and measure the level of DR at organizational and personal level that is aligned to the socio-economic infrastructure of Bangladesh which will surely hinder the proper planning and investment towards digital transformation of our country.

The Learning Readiness Assessment Framework (LRAF) is a unique approach towards leveling digital readiness while measuring the capacity of a student to succeed in a digital learning environment. By scoring five major parameters that are Life Factors, Personal Attributes, Technical Competency, Technical Knowledge, and Reading Recall, this framework scores a student and provides a detailed report that gives meaningful insights on the prospect of a student in a digital learning environment. Which in turn provides a possible range of CGPA for the student based on the scoring. And using the scores, a digital readiness level of a student is also determined thus a unique way of determining digital readiness level is approached and a relation between digital readiness level and performance of a student in a digital environment is determined.

1.2 Rationale of the study

Educational institutions in Bangladesh are rapidly incorporating digital ways of teaching and training as part of the digital revolution that is happening in our country. However, it is important to make sure that the development of the digital learning environment is done keeping the readiness level of the students. Because, despite the rapid growth of information technology in our country, the reality is, many of our students still do not have effective digital knowledge and competency to utilize necessary technologies and systems which can be detrimental towards performance in a digital learning environment. This thesis approaches to provide an assessment of the readiness of students to perform well in a digital learning environment and takes parameters such as life factors and individual attributes into account which increases the accuracy of the output as those parameters indirectly affects the readiness level of a person. It is important for an educational institution to know about its students' learning readiness situation along with their digital readiness level so that they can structure their learning method that is most effective for the students. Moreover, this framework also provides and estimated CGPA range for students based on their scores which is vital because due to the huge number of students, it is quite impossible for teachers to always know which students need more support and since this framework can notify an institution or a teacher when a student is not performing

up to his/her potential it would be easier to provide necessary support. Last but not the least, this thesis work will enable an institution to know the status of its students in terms of digital readiness thus they will be able to take necessary steps to improve the situation and/or incorporate more or less technologies into their learning system.

1.3 Research Questions

The followings are the research questions that this thesis work provokes −

I. What are the important parameters that influences the learning readiness curve of a student and how do they impact to digital readiness level?

II. How does Digital Readiness Level affect the ability of a student to perform in a digital learning environment?

III. How can the Learning Readiness Assessment Framework (LRAF) help an academic institution in designing its digital learning environment and monitoring overall student performance?

IV. Why is it important to study LRAF and Digital Readiness Level in relation to each other and how does it improve the assessment?

1.4 Expected Outcome

I. An effective learning readiness assessment framework through the identification of influential parameters on learning readiness and digital readiness.

II. A unique approach toward evaluating digital readiness level that includes practical parameters that influence human's coping capacity besides measuring technology related parameters.

III. An automated system that uses sophisticated scoring mechanism for LRAF and digital readiness leveling.

IV.   A helpful system that will help an institution understand the learning readiness of its students along with digital readiness level to better design the digital learning environment.

V.   Personalized insights to students that will help them understand their competencies, capacities, and learning styles.

VI.   Guidelines for improvement in learning readiness

VII.   A tracking mechanism for institutions to ensure steady performance of students

1.5 Report Layout

In chapter one, Introduction part describes the brief Introduction, Importance, Impact, Research questions and Expected output to the Research work.

In chapter two, the Background Study consists of background of factors that influences learning and digital readiness in students, related works, Research summary, Scope of the problem, and Challenges

The third chapter, consist of Research Subject and Instrumentation, Scoring mechanisms for the LRAF and Digital Readiness Level, Data Collection Procedure, Statistical Analysis, and Implementation Requirements.

The fourth chapter, clearly discuss the detail functionalities of LRAF and relation to Digital Readiness Leveling on the basis of survey questions and scoring mechanisms in Experimental Results and Descriptive analysis, and Summary.

The Fifth chapter, Propose a Solution and for the research issue for betterment.

The final chapter, focused the summary of the study, conclusions, Recommendations, Implication for Further Study

CHAPTER 2

BACKGROUND

2.1 Introduction

Digital Readiness can be explained as the preparedness of people to adopt technology using digital tools, trusting the digital environment, and effectively using the digital resources to carry out necessary tasks. [1]

Figure 2.1.1: Pillars of digital transformation [2]

Now, there have been various approaches to determine the level of digital readiness that a person or an organization possesses. There have been approaches where the levels have been spread into five dimensions [3] and in some approaches a staggering nine levels [4]. Approaches to identify the digital readiness level in different aspects of an organization has been done by many along with approaches to determine digital readiness of an individual. However, various studies have also worked on the impact of digital readiness

in effective use of technology in a learning environment. This is my scope of interest. The LRAF provides an elaborate picture of the readiness level of a student and then connects with digital readiness level while predicting a range of academic performance for a student.

2.2 Related Work

The 2014 paper by John B. Horrigan on the meaning of digital readiness [1], he proposed operational definition of digital readiness includes several things and mainly digital skills, trust, and use. And while working to measure digital readiness he focused on specific educational resources that are common core standards, distance learning, the khan academy, Massive Open Online Courses (MOOCs), and digital badges. The surveys showed that 54% people with regular interactions with technology were very confident although 57% in common core standards and 80% in MOOCs had little or no idea.

In another paper of John from 2014 on spectrum of digital readiness for e-learning [3], he used cluster analysis that brought out five distinct groups. These are digitally ready-confident in online skills (one in six adults- 17%), cautious clickers- different from the because they are not used to engage in personal learning (31%), the reluctant- not worried but also not fully confident (33%), traditional learners- active learners but not interested in technology (5%), and the unprepared- not so much interested in learning new things in general (14%).

The research team composed of five researchers on greater digital readiness translates to higher level of use of technology in learning [5], compared measures of digital readiness to the frequency people prefer digital tools for learning purpose. Indicators of higher digital readiness included those who are familiar with "ed tech" terms and who are confident with computers and internet. Indicators of lower digital readiness included confusion in trusting

online information and those who would need help with digital or in other words electronic devices.

The Gulf Medical Journal paper done by three doctor on 2014 on The Relationship Between Background Education, Socio Demographic And Lifestyle Factors And Academic Performance [6], assessed the association between the socio-demographic factors, parental support, lifestyle, time management and academic history with academic performance of health science students. With 277 participants aged 18-32, the research showed that better academic performance can be dependent on time management, sleep quality, gender, and paternal support. However, socioeconomic status did not relate to academic excellence much.

The report on ICT in education in Asia on 2014 by Peter Wallet, was an elaborate comparative analysis of ICT integration and e-readiness in schools across Asia. The study was published on the UNESCO Institute for Statistics. This report is a brief and tactical study on E-readiness as a framework for quantifying ICT in education. It discusses teaching and learning and ICT in education. The study also puts guideline on infrastructure development for proper implementation of ICT in education and the effect of e-readiness.

A significant work done in Bangladesh related to the interest of this thesis was published on 2016 in the Online Journal of New Horizons in Education, that focused on readiness and challenges of using ICT in higher education of Bangladesh. It to explore the use of ICT in Higher Education of Bangladesh and mentioned that as a country we are trying to include technology as much as possible in learning. The data revealed infrastructural lacking, lack of manpower and training. It also found that students are more eager than the teachers. Furthermore, the research suggested that teachers play a crucial role in improving the quality of education using while putting emphasis on digital tools and environment [11].

Given such importance, the study then focused on ICT training for the teachers and stuffs mainly focusing on multimedia classroom management and professional development.

2.3 Research Summary

The through research of multiple relevant national and international research papers, reports, and journals indicates the importance of digital readiness alongside a readiness assessment system of students tailored for Bangladeshi students. Moreover, the studies also shows the connection between life factors and personal attributes with academic performance. Hence, the proposed approach of LRAF is very relevant considering the current circumstances in digital learning environment in our country. This thesis is an approach to develop a learning assessment system that focuses on key parameters including life factors, personal attributes, and technological aspects such as technological competency and knowledge along with reading rate. This assessment system will give both the student and the educational institution a clear understanding of the capacity of each student and predict a relevant range of CGPA for each student depending on the score. And the digital readiness level derived from the scoring will also suggest the relation between digital readiness and the effect of it for a student's ability to perform in a digital learning environment.

2.4 Scope of the Problem

This thesis and the resulting framework and leveling system for digital readiness opens the door for following scopes-

I. First ever learning readiness assessment framework tailored for Bangladeshi students and educational institutions

II. A way to understand how life factors and personal attributes affects the performance of a student in a digital learning environment besides technical knowledge

III.   A framework that also gives an idea about the learning styles of students so that educational institutions can better tailor their curriculum

IV.   A unique way to calculate digital readiness level than may be more accurate in comparison to the various approaches taken before

V.   First ever approach for educational institutions for a way to understand the capacity of their students and have a monitoring system so that necessary steps can be taken for each students facing difficulties in a more effective way despite the incredible number of student enrollment in each semester

2.5 Challenges

Despite having various upsides of including digital environment in education system, there lies various challenges in incorporating them.
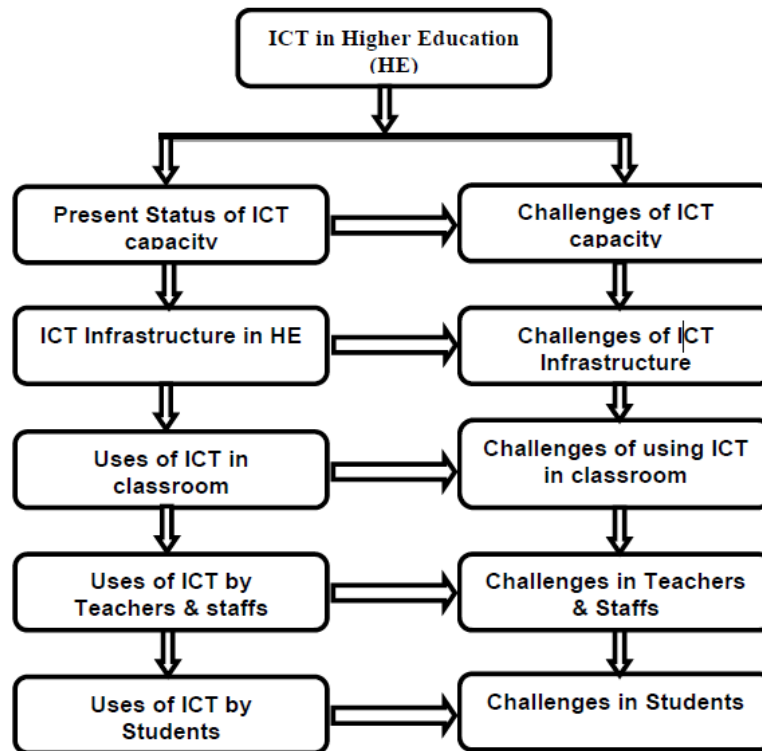
Figure 2.5.1: ICT in higher education and related challenges

The above figure from the research work done in Bangladesh [7], shows the challenges that can grow at each step of including digital. Which portraits the image of how difficult it can get to have an effective digital learning environment without proper digital level or having proper ideas about learning readiness status of students. The main challenge while developing the LRAF was to find the right questions to ask and the right simulated tasks to give for finding the status in different parameters. More importantly, choosing what parameters to work on to get proper ideas about the learning readiness which also resembles digital readiness was not easy and getting to the current efficient scoring mechanism was a tedious work. However, a greater challenge lies ahead to keep the framework relevant with the incredible pace at which technology is growing. Another major challenge that has been faced is that sometimes students seems to lose focus at the last 2 section, more on the last section. Which sometimes can result in imperfect scoring and outcome.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The proposed way for the logical foundation of the learning readiness assessment framework, its elements, and relation to digital readiness had to undergo a severe amount of in depth research regarding life factors that are most strong in influencing learning curve, individual attributes that has impacts on learning, and more importantly how they effectively impact in a digital learning environment, the right questions and tasks to ask in technical knowledge and competency section and including reading recall section while not having typing speed and accuracy despite being a regular practice in measuring digital readiness in advance countries. With trial and error and reoccurring surveys, the framework kept improving.

3.2 Research Subject

The focus of this thesis is to find out aspects of life factors and personal attributes that influences learning curve, aspects of technical competency and technical knowledge that can relate to digital readiness, and score reading rate and recall. And use a sophisticated scoring mechanism on survey questions and tasks in order to develop a framework that can assess the learning readiness of a student and generate an elaborate report. While doing all these, the LRAF also defines the digital readiness level and predicts a score range in CGPA for each student and informs the educational institution or the teacher if a student is not performing up to his/her potential.

3.3 Data Collection Procedure

Fundamentally, in order to work on the thesis and develop the learning readiness framework and relate it to digital readiness, a thorough research on previous works done on digital readiness, different aspects that influence learning capacity, and technological aspects that relates to learning capacity and readiness level had to be done. Based on literature review, I identified possible new approaches and worked on this thesis. The questions and tasks used in the LRAF are also derived from a large array of previous works and implications along with suitable additions for our country's perspective. For trial and error, the framework and scoring system was used by a controlled group of 20 for multiple times to increase efficiency.

3.4 Statistical Analysis

The thesis's outcome, the LRAF, has multiple sub-parameters within the major five parameters. The following shows the percentage of sub-parameters in the different sections-

Table 3.4.1: Percentage of sub parameters in major sections

Main parameter	Sub Parameter	Percentage	Overall influence on score
Life Factors	Time	20	20%
	Place	20	
	Reason	20	
	Resource	25	
	Skills	15	
Individual Attributes	Academic attribute	25.8	20%
	Help seeking	8.6	
	Persistence	12.9	
	Procrastination	8.6	
	Time management	12.9	
	Locus of control	30.1	
Performance in digital	Technical competency	33.3	60%
	Technical knowledge	33.3	
	Reading rate and recall	33.3	

The gender based demographic of the sample is as follows-
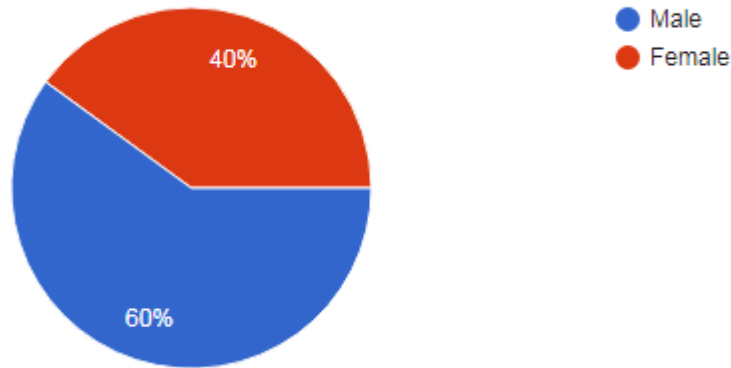
Figure 3.4.1: Gender based demographic

3.5 Implementation Requirements

The thesis involves the following requirements for proper implementations.

I.   Survey: The survey method was used as a means to collect data on the digital literacy of students and other aspects for scoring. A survey is a organized procedure to gather information from a small size (sample) of entities for constructing quantitative indicator of the attributes from the greater counts of which the entities are members. The word systematic or organized is purposeful and meaningfully separates surveys from other tools for getting data and information. The indicator "a sample of" appears while defining as sometimes surveys measure the whole group in a population and sometimes just a small portion or sample.

II.   Questionnaire: A predefined series of questions used to collect information from individuals. The questionnaire used in the LRAF has been chosen with considerable research and trial and errors to increase efficiency. The 3 types of scoring mechanisms have been used. One is where each option contains different points, one where only one option contains points, and one where before getting a point the student has to do a specific task to identify the correct answer. The questionnaire design workflow can be expressed like below-
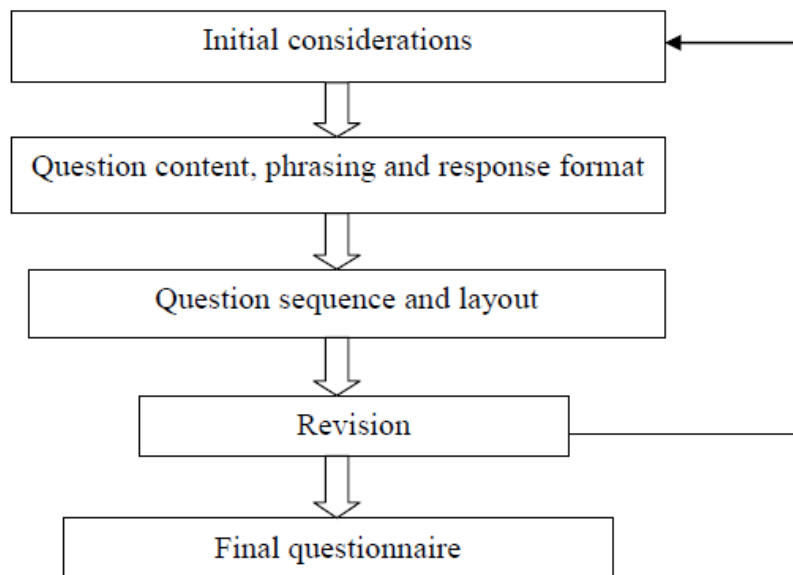
Figure 3.5.1: Questionnaire design process [8]

The questionnaires for scoring different sections have been developed through very extensive researches (over 30 sources) regarding the various parameters which also included some Bangladeshi research works.

III.   Sampling: The current sample size is 20 which consists of students from different departments. This can be considered as a standard sample size. Moreover, the effectiveness of the sample group for proving the efficiency of the framework is

more effective because of using students from different educational and personal background and academic and career interest.

IV.   Analysis: Analysis of received data is vital because that defines the accuracy of the outcome. Every aspects of collected data have been analyzed statistically and represented through statistical presentation, percentages, graphs, tables and charts.

V.   An automated web application: The web application is used to actually run the Learning Readiness Assessment Framework that has been developed through this thesis. A student can take an assessment and view the generated assessment, digital readiness leveling, and projected CGPA here. On the other hand, the application provides the data to teachers and also generates performance warning to teachers if the acquired CGPA of a student is lower than the estimated CGPA.

CHAPTER 4

EXPERIMENTAL RESULTS AND DISCUSSION

4.1 Introduction

The efficiency and accuracy of the LRAF for assessing the situation of different key factors used for scoring for each student plays significant role for it real life implications. And the results, comparisons, and statistics perused from the tests taken by 20 students of different department shows that the prediction of CGPA for each student is very accurate and the different identifications for each parameters and sub parameters were also commented as very accurate by the test takers. The digital readiness leveling also works fine in relation to the learning readiness assessment. The findings and analysis of different outputs are discussed in brief.

4.2 Experimental results and descriptive analysis

The scoring mechanism for digital readiness level identification in relation to overall score in Learning Readiness Assessment (LRA) and the related suggestive CGPA is shown in the following table.

Table 4.2.1: Relating overall LRA score, digital readiness level and suggested CGPA

Overall LRA score	Digital Readiness Level	Suggested CGPA
80% and above	Digital Readiness level 5	3.7 and above
75%-79%	Digital Readiness level 4	3.5 to 3.69
70%-74%	Digital Readiness level 3	3.25 to 3.49
65%-69%	Digital Readiness level 2	3.0 to 3.24
Below 65%	Digital Readiness level 1	Below 3

The definitions of each digital readiness level is as follows-

I. Level 1: Almost no idea and experience about digital learning environment and using technology to get information or getting tasks done. Highly doubtful about online security and interest in using technology is low.

II. Level 2: Somewhat accustomed to digital environment. Faces trouble in various task completion in online environment and little or no idea about security, software, or troubleshooting.

III. Level 3: Moderate level of digital readiness. Has been definitely exposed to digital environment. With proper enthusiasm and guidelines, can turn into higher digital readiness level.

IV. Level4: Ability to perform in a digital learning environment is almost close to Level 5. Only difference is that in this level, deep level troubleshooting and higher efficiency software using is not available at a reliable continuity.

V. Level 5: Digitally ready. Has been involve in digital learning environment for long time and accustomed to digital tools and not afraid to learn and troubleshoot. Early adapters of new technologies. And can be used as trainers for others.

The following shows the likelihood of digital readiness in terms of the subject of study in the university level.

Table 4.2.2: Sample size and digital readiness score depending on major

Major	Digital Readiness	Sample size
CSE	Scores higher for digital readiness and LRA. However, some newly admitted students tends to score average to below average.	50%

BBA	Scores average in most cases with very few exceptional high level.	25%
Textile	Scores average in most cases with a few low level.	15%
English	Scores below average to average.	10%

Among the questions that one has to ask in the LRAF the percentage of question types are as follows. Here, ranged questions have multiple scores for each question ranging from 1-4, 1-5, or 0-3. Statics have only one right answer and for task based questions, the student needs to complete a task for understanding a given work or scenario to choose the right answer.

Table 4.2.3: Types of questions and targeted parameter

Type	Percentage in LRAF	Used in
Ranged	65%	Life factor, individual attributes
Static	22.5%	Technological knowledge
Task based	12.5%	Technological competency

The followings are an auto generated LRA in the LRAF for a student scoring above 80% and having a Digital Readiness Level of 5. The following figures will help to understand the workings of the LRAF and the Digital Readiness Leveling. The color coding of red, yellow, green, and blue indicates very low, low to average, good, and excellent score accordingly.
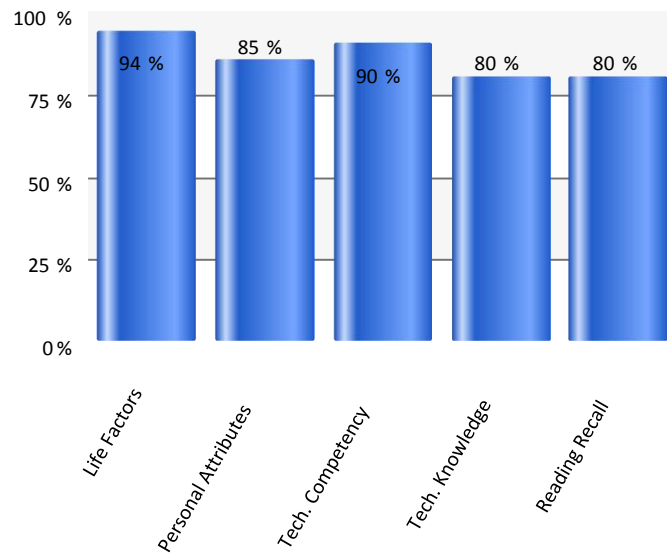
Figure 4.2.1: General summary

The above representation shows that each sections plays a vital role in the scoring mechanism and a correlation among all sections is clearly visible as no sharp drop or rise is noticeable.
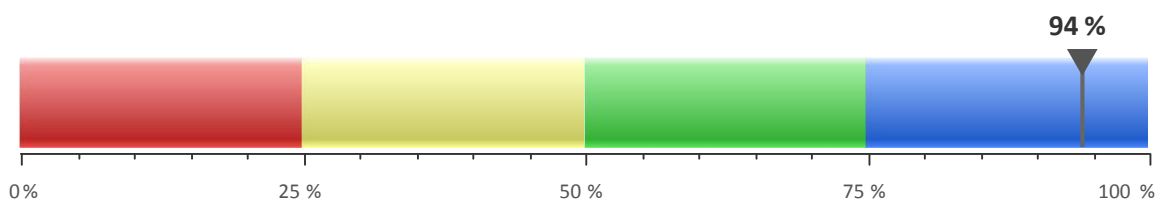
Figure 4.2.2: Life factor overall score
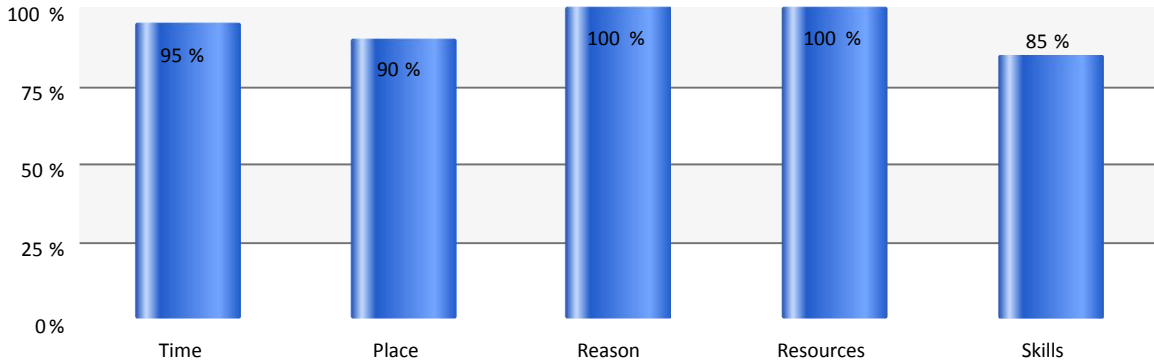
Figure 4.2.3: Detailed item result in life factor

The life factor section consists of the above 5 sub parameters. Scores in all the sub parameters also indicates no sharp rise or fall which again provides reasoning for the proper correlation between the sub parameters and the total score of the parameter.
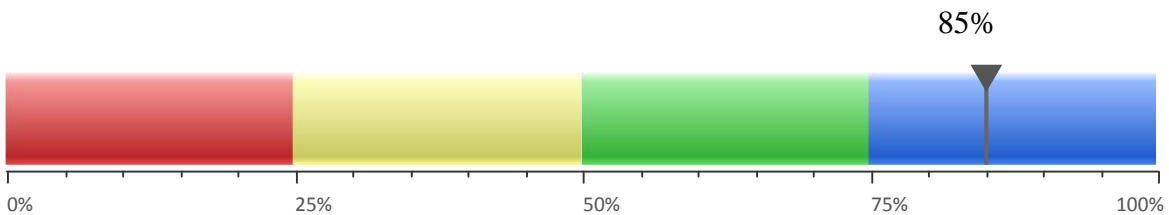
Figure 4.2.4: Individual attribute overall score
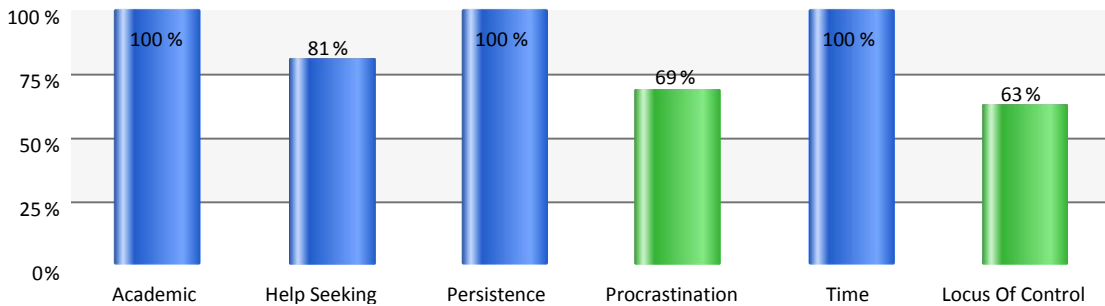
Figure 4.2.5: Detailed item result in individual attribute

As we can see, in this parameter of individual attributes, fluctuations can happen among sub parameters. This means that a student's various personal attributes may not be completely correlated and a student may succeed in academics and digital readiness even while having average scores in some sub parameters. However, a correlation among the sub parameters academic, help seeking, persistence, and time is perceived while procrastination and locus of control seems to have correlation. Overall, it can be concluded that, although there are mixed correlations among the sub parameters, the score for the total parameter still gives the right assessment which is vital for the LRAF and Digital Readiness scoring accuracy.
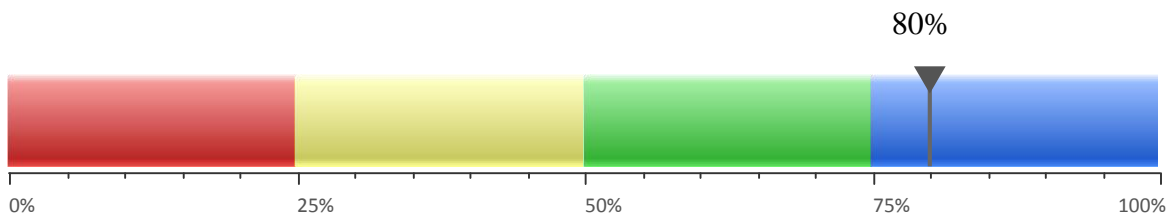
Figure 4.2.6: Reading recall score
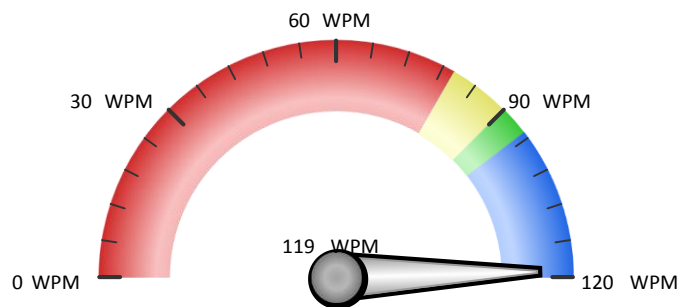
Figure 4.2.7: Reading rate (119 word per minute)

Screen reading is a vital skill for learning performance in a digital environment as well as digital readiness level. Here, we can see a high score for reading recall and also reading rate which establishes a correlation for this case study of a student. However, in other student results in this section showed that even with high reading rate, many failed to score

high in reading recall and with slower reading rate many still failed to score high in recalling. This actually happened for many cases due to the lack of concentration in this section and failure to follow instructions and details. Students with lower score in this section also had average to below average scores in Life factors and Individual attributes section which indicates those two section plays a major role in seceding in this parameter of learning curve and digital readiness.

90 %

0 %   25 %   50 %   75 %   100 %
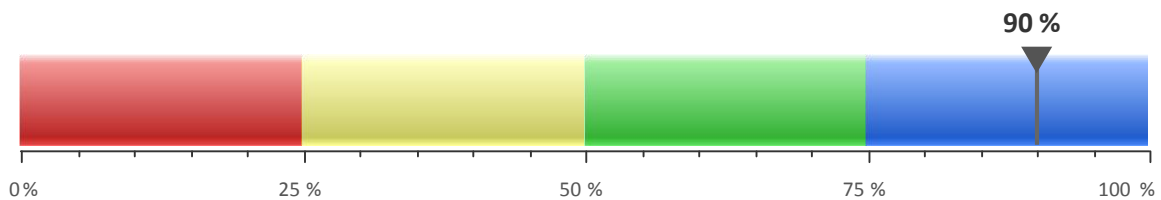
Figure 4.2.8: Technical competency

This section comprises of tasks based questions where a student needs to follow the instruction and identify information from visual tasks to find the right answers. The questions and tasks in this sections are chosen to measure the capacity of a student to use various digital tools which are absolute necessities to perform in a digital learning environment now. This section is highly focused to measure the digital readiness capacity of a student which also in turn affects the learning curve.

80%
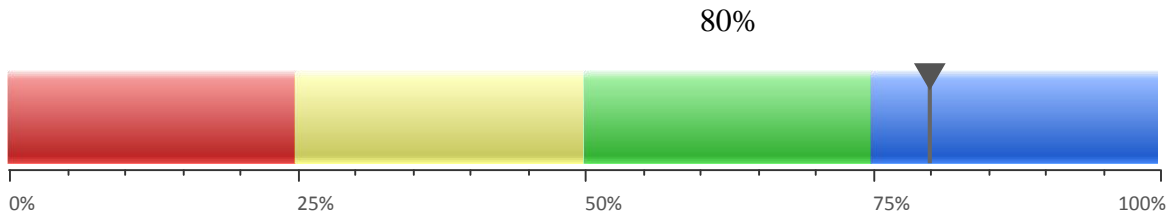
Figure 4.2.9: Technical knowledge
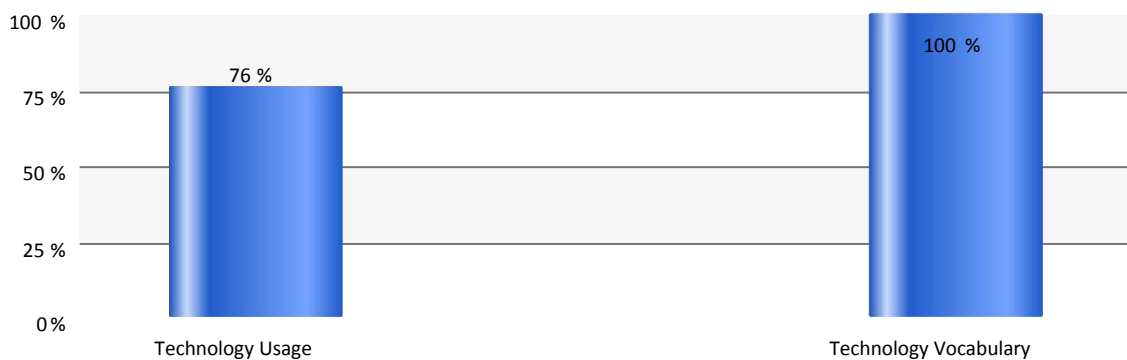
Figure 4.2.10: Detailed item result for technical knowledge

The technical knowledge section measures the knowledge base of a student which identifies the level at which a student is accustomed with various utilities, terms, efficient and proper uses, security, and understanding of regular digital jargons. The sub parameter scores indicated that higher usage of technological tools and environment leads to higher holds on technology vocabulary. Score in this section also identifies the digital readiness level of a user and relates it to learning capacity in a digital environment.

The figures above is a straight forward approach to understand how the scoring mechanisms work and how the parameters and sub parameters influences the overall score. Moreover, the above data representations shows how accurate the framework is in

assessing different variable and generating a proper prediction. As the average score is higher than 80%, the predicted CGPA range was 3.7 and above and it was found true.

One of the major outcome of the LRAF and the Digital Readiness Level is that when the projected score in the assessment does not relate with the acquired academic performance of a student in terms of CGPA, this means that the student is in some kind of difficulties because of which he is not performing according to expectation. And this approach has been proven by identification of 2 students among the 20 students who were assessed. Both of them had Level 5 score but their CGPA was lower than projection. And after contacting with the two students, I was informed that one of them had A+ in both HSC and SSC but his scores in university started falling from 3rd semester due to family issues, personal issues, and extreme case of depression. I provided him with some advices and met with him personally multiple time to help and as his high score in LRAF suggests that he has higher competency, he was motivated to pursue his academics properly again. On the other hand, another student also had fall in CGPA in 2nd year due to her poor health condition and lack of knowledge on how to utilize various supports from the university. I consulted her too and she is working with department to gain some additional support so that she can uplift her CGPA.

The successful identification of such cases based on the missing correlation between the assessment and actual performance is a huge success for this thesis.

4.3 Design specifications

Front end design

Framework: Bootstrap, this makes the website responsive which means it will adapt to PC or mobile view.

Language: HTML, CSS, Javascript

Back end design

Framework: ASP.NET

Architecture- MVC

Language- C#

Database- Microsoft SQL Server

Use case diagram
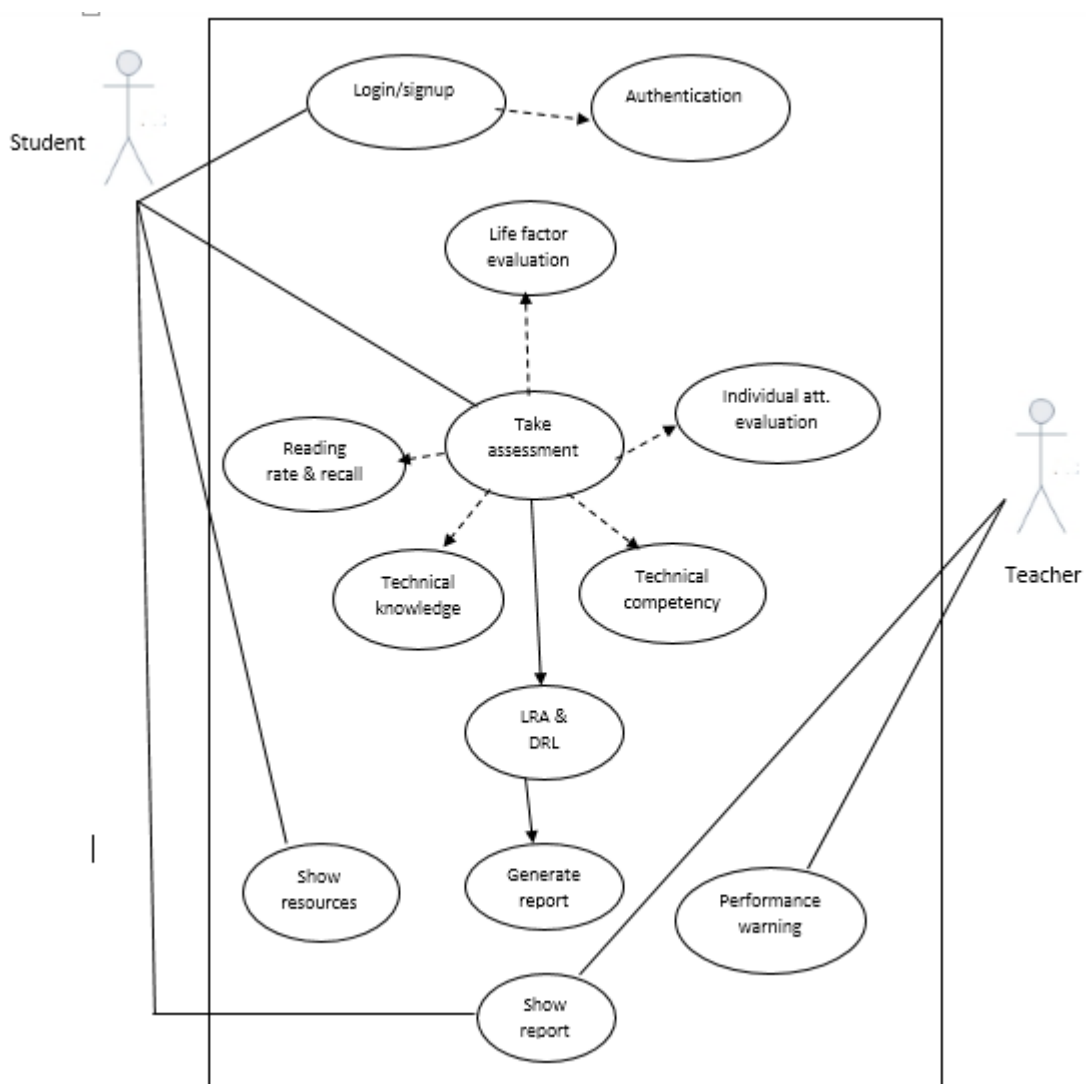
Figure 4.3.1: Use case diagram
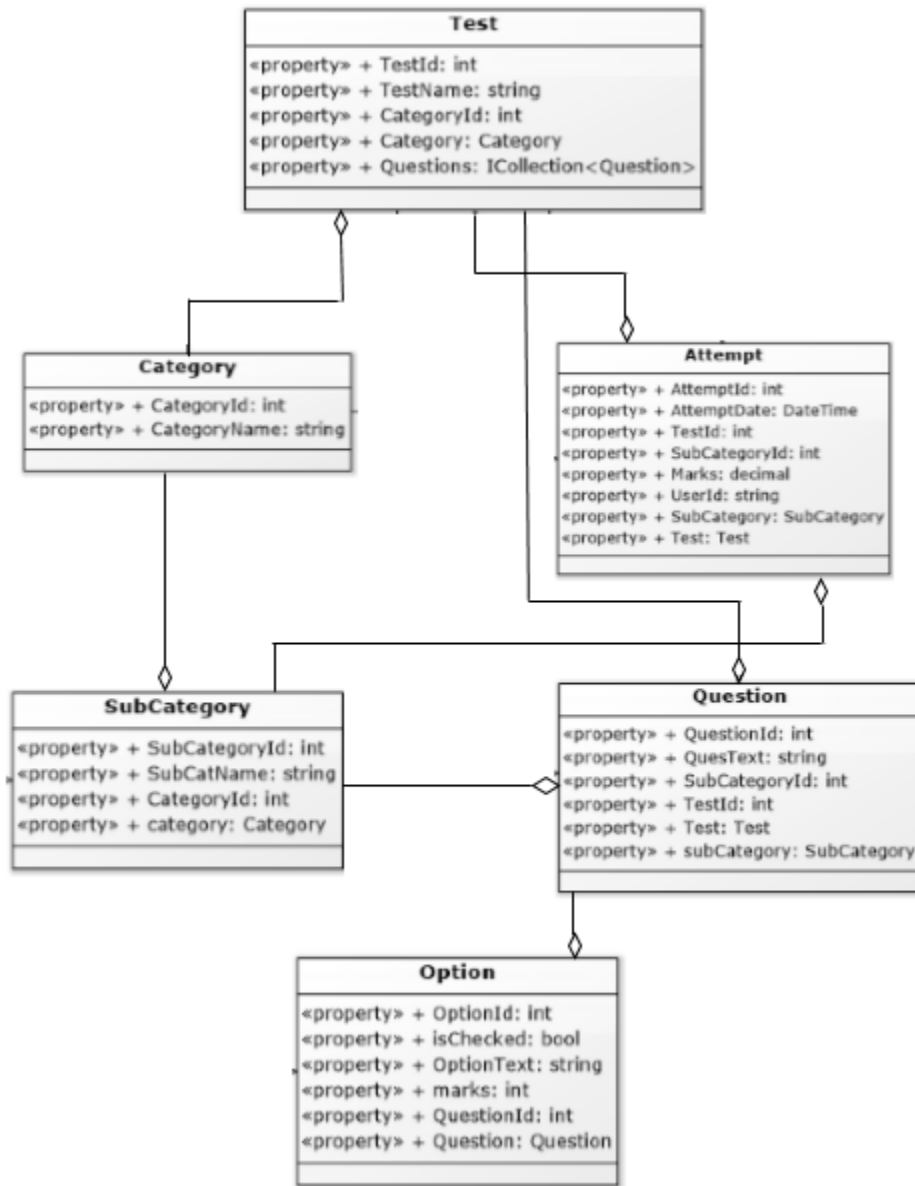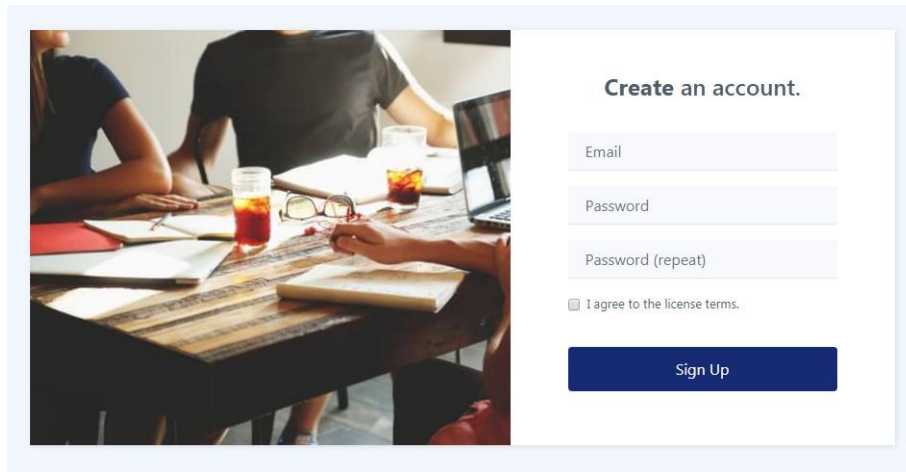
Figure 4.3.2: Logical data model

Web view

Figure 4.3.3: Login page

Figure 4.3.4: Home page

Figure 4.3.5: Life factor evaluation

Figure 4.3.6: Individual attributes evaluation

Figure 4.3.7: Technical knowledge evaluation

Figure 4.3.8: Technical competency evaluation through tasks

Figure 4.3.9: Reading rate and recall evaluation

Figure 4.3.10: Result window

Resources For Support

Life Factors What It Takes To Be A Successful Student
Stress Management
Finding time to study – Tips from other student moms.
Finding a place to study
The Study Spot: Creating a Place to Get Your Work Done.
The value of a college degree
Study finds link between Facebook usage and low grades in college
Budgeting time for studying.
Effective study skills

Individual Attributes
Goal Setting
Motivation
Motivation
10 Tips to Beat Procrastination
Maximizing Your College Experience
Study Tips & Note-Taking Strategies
Test Anxiety - Strategies To Help You Succeed
Time Management
Understanding & Conquering Procrastination
How to Study
Study Skills Help Information

Learning Styles
Advice on Bringing Your Learning Styles Into Balance
Discover Your Learning Style

Successful Learning: Cycle through Learning Styles

Reading Rate & Recall Speed Reading Test Online
Reading Rate Test & Improvement Techniques
Reading Comprehension Lessons

Figure 4.3.11: Resources for support section

4.4 Summary

The Learning Readiness Assessment Framework for leveling digital readiness and academic performance is currently performing is a great fashion. In order to avoid monotony and possible biased answers, the questions that resemble to different sub parameters under each major parameter have been shuffled besides using different types of questions. The framework has also successfully detected an anomaly where a student who had a very high overall score and level 5 digital readiness did not perform according to the suggested CGPA range. And after reaching out to him, I came to know that he was suffering from depressions and family issues which has led to his poor academic performance. After talking with me and taking necessary suggestions he became motivated and promised that he will try his best to get on track. This scenario proves the vital implication of the LRAF. The brief and visually represented report can also be easily understandable which makes it perfect to use for students with any digital readiness level and understand and utilize its outcome.

CHAPTER 5

UNDERSTANDING THE PARAMETERS AND THEIR IMPLICATIONS

5.1 Life factors

Numerous understudies firmly want to proceed with their training. Be that as it may, regularly different circumstances in life keep them from having the capacity to do as such. The Life Factors area of this evaluation makes inquiries about different components throughout your life that may affect your capacity to proceed with your instruction. The section measures five items: Time, Place, Reason, Resources, and Skills. This is also an important parameter that can indicate the capacity of a person to cope with new technology based on life circumstances thus making it an important parameter for acquiring digital readiness level.

You might most likely adjust conditions which sway a portion of these fundamental abilities. Assuming this is the case, you are urged to make suitable move to enable yourself to succeed. Be that as it may, a portion of the conditions in life might be outside your ability to control. If so, monitoring these substances and arranging as needs be might be helpful for you.

Time

The measure of time you have accessible to take an interest in exercises identified with your school work is a fundamental parameter for performance. Students with abundant time to give to class work should be considered lucky because that is not the case for many students due to jobs and other responsibilities. Nonetheless, you may need to get ready for and spending your time with a plan so you are giving due perseverance to class work. Maintain a strategic distance from exercises like person to person communication which examine has demonstrated can undoubtedly devour a lot of time and divert you from contemplating.

A for the most part acknowledged principle guideline for time went through with school classes is that you ought to hope to learn around 2 to 3 hours out of each week for every unit of credit in a run of the mill multi week class. In view of this standard guideline, an understudy assuming 15 acknowledgment hours ought to hope to go through 30 to 45 hours every week with school work [14]. Understand this is like the time expected of an ordinary occupation. Proceeding with your training requires a generous speculation of time. Obviously, on the off chance that you are working while you go to class, you should spending plan your time cautiously. As a rough guideline, your studying time might be divided as follows.

Table 5.1.1: Time division for studying

If your course is	time for reading the assigned text (per week)	time for homework assignments (per week)	time for review and test preparation (avg. per week)	total study time (per week)
3 credits	1 to 2 hours	3 to 5 hours	2 hours	6 to 9 hours
4 credits	2 to 3 hours	3 to 6 hours	3 hours	8 to 12 hours
5 5 credits	2 to 4 hours	4 to 7 hours	4 hours	10 to 15 hours

Place

Having a distinguished, fitting spot to consider for study is a major concern. Survey the assets beneath for supportive clues about how you can make your places of concentrate most helpful for learning.

Here are some useful clues about making a fitting spot to ponder. (1) Find a situation that suits you. A few people favor quiet and some incline toward foundation commotion. (2) Select an agreeable spot, however not all that agreeable that you will nod off. (2) Claim the space as yours. Educate others the space is your examination zone and they are not to bother things or you while in the space. (4) Avoid normal territories, for example, kitchen tables or sanctum lounge chairs. (5) Avoid performing various tasks. While you are concentrating

close your email and don't partake in long range informal communication. (6) Feed your stomach then your brain. In the event that you are eager you will most likely be unable to center and might be enticed to take visit breaks to nibble. (7) Be provided. Keep the majority of the provisions, for example, pens, paper and highlighters at your examination space. (8) Have a brilliant thought. Ensure that your examination space has fitting lighting.

Reason

All around characterized, solid explanations behind going to class or learning something new is vital. Remembering yourself inspired with the objective is critical as you take your courses. You are urged to record the manners in which that going to class will profit you. Sporadically audit this rundown to remain roused.

A few research considers have demonstrated that the more instruction an individual has, the more yearly salary they create and the better their personal satisfaction. Today, an advanced education is a fundamental fixing. Bosses habitually use degrees as an approach to screen candidates. At that point even after you land the position your compensation might be intelligent of your instructive qualifications. By and large, an individual with a Master's qualification acquires $31,900 more every year than a secondary school graduate—a distinction of as much as 105%! So keep yourself propelled and your focus on the awesome end goal.

Resource

Resources such as support from family, friends and your employer are a concern for putting proper effort. Review the resources below for more helpful ideas on finding support for going to school.

To be successful, you really need the support of others and the appropriate resources. To make sure that you have access to the financial resources to continue your education, talk

to the financial aid office at your school. If you are concerned about having the physical stamina, consider getting a physical exam from your doctor. If you have family or friends who can support you in ways such as childcare, have a discussion with them about your plans for going to school and express how you would appreciate their support. If appropriate, have a discussion with your employer. Ask if the company has an educational reimbursement plan and any policies regarding studying while on the job or during breaks.

Skills

Positive concern about your scholastic capacities is a major learning curve influencer. Numerous schools give sorted out friend mentoring administrations. You are urged to consider volunteering in a program like this to help different understudies. You may likewise need to survey the assets beneath for more data on being scholastically fruitful.

School is the place you turned out to be increasingly canny. You are not expected to be a virtuoso to get in, sufficiently arranged to realize how to function and willing to make the vital penances of your time and vitality. Do you realize how to think about? Would you be able to stay with an undertaking until it is done? Being fruitful in school is regularly as much disposition as bent.

5.2 Individual attributes

This section measures six items: time management, procrastination, persistence, academic attributes, locus of control, and willingness to ask for help. These attributes can be enhanced or improved through academic interventions. Ask your faculty member or academic advisor about the resources for remediation and/or support which your school may provide.

Academic attributes

Scholastic properties mirror your history of accomplishment with scholarly interests just as your apparent capacity to perform well scholastically.

Help seeking

The Help Seeking classification mirrors your readiness to request help when you experience an issue. It is imperative that you look for assistance from the employee or other fitting individual when you are befuddled about the course content. Your score shows that you are happy with looking for help when required. When you experience issues in your courses don't sit around idly, however look for help soon.

Persistence

Persistence is a measure of your likelihood to finish what you started. Higher score indicates a high rate of persistence based on your prior experience.

Procrastination

It is postponing until tomorrow what should be possible today. It is anything but difficult to postpone beginning work on assignments. Your score demonstrates that you are to some degree liable to stall. You are urged to begin promptly on course assignments. Envision how great it would feel to finish a task early.

Time management

Courses have contrasting assumptions about participation as well as cooperation. Be that as it may, a lot of time is still required every week for perusing course materials. Your score shows that time the executives isn't an issue for you. In any case, it is prescribed that you plan for a particular number of hours every week to take a shot at course assignments. Courses have contrasting assumptions about participation as well as interest. Be that as it may, a lot of time is still required every week for perusing course materials. Your score demonstrates that time the board isn't an issue for you. In any case, it is

suggested that you plan for a particular number of hours every week to take a shot at course assignments.

Locus of control

Locus of Control is a proportion of how much you feel that you are responsible for the end result for you. An individual with high (inward) locus of control trusts that their encounters are constrained by their very own expertise or endeavors. Your score demonstrates a moderate level of locus of control. This may abandon you having emotions that paying little heed to your endeavors, your evaluation will for the most part be dictated by how much the educator likes you or simply destiny. You are urged to intermittently examine your execution in the course with your employee.

Learning styles

Individuals adapt in an unexpected way. A few people are truly open to perusing a lot of content. Others are progressively happy with tuning in to somebody talk or recording things for themselves. An individual's favored "learning style" is the way to deal with discovering that feels most normal to them. It depends on a mix of their encounters, qualities, shortcomings, and inclinations. Everybody has a blend of learning styles, and a few people have solid, prevailing learning styles. There are no "right" or "wrong" learning styles. A great many people will in general adjust their learning style to the setting of learning. With training an individual can fortify themselves in the learning styles that are least agreeable for them. At the point when an individual perceives the learning styles that work best for them, they would then be able to settle on a superior educated choice about the manners in which that they approach adapting new things.

5.3 Reading rate and recall

The normal grown-up perusing rate for English exposition message in the United States is around 250 to 300 words for each moment. Research demonstrates that perusing is around 25% slower from a PC screen than from paper [15]. Subsequently you may somewhat

expand your outcomes to discover your speed when perusing from paper. This is an essential parameter for advanced availability in light of the fact that with time, the need of printed books or any data is diminishing quickly.

5.4 Technical competency

So as to take an interest in class, an understudy must have some approach to get to the study hall. An understudy in a conventional class may drive a vehicle on an interstate to go to class, yet an understudy in an online course "drives" a PC on the Internet (the Information Highway) to "visit" class. It is imperative to have Computer Competency which demonstrates the quickness in working a PC to complete things. Since one may think that its hard to finish assignments in your courses on the off chance that you have to invest energy figuring out how to utilize the PC. (Suppose you needed to drive a vehicle to a class, and you began figuring out how to drive on the primary day of class!). Learn more at http://www.trainingbetter.com/computer.htm http://tutorials.beginners.co.uk/

A critical piece of specialized competency is Internet Competency which shows the quickness in using the web to discover fundamental data to put into important use. This is an imperative parameter for advanced status that assumes essential job prevailing in a computerized learning condition. Learn more at http://www.internettutorials.net/

5.5 Technical knowledge

Technical usage

Your high state of fitness and trust in utilizing innovation will be a benefit as you take your courses. You may even wind up giving accommodating counsel to different understudies about utilizing innovation. You are at a reasonably abnormal state of innovation use on this scale. People who routinely utilize a few things of innovation and who consistently total errands online will have the experience should have been agreeable and certain taking

courses. With this dimension of utilization of innovation in your normal routine you should be happy with learning by utilizing innovation. In any case, endeavor to remain educated about rising advances and figure out how to utilize them to your advantage.

Technology vocabulary

In courses a portion of the terms utilized on this appraisal might be normally utilized. You will be relied upon to recognize what the terms mean and how their significance impacts your capacity to learn. With your dimension of learning of innovation data you ought to have the capacity to exceed expectations in on the web or innovation rich courses.

CHAPTER 6

CONCLUSION

6.1 Summary

The Learning Readiness Assessment Framework (LRAF) and its ability to briefly and with visual techniques to represent different aspect of learning curves in a digital learning environment and using a sophisticated scoring mechanism to determine an overall Learning Readiness Assessment (LRA) score and leading to Digital Readiness Level (DRL) which can predict the performance capacity of a student is a research that was due for many days for the circumstances of our country as it is rapidly looking forward to digitize every aspects of the nation. The different types of questions and tasks and their organization has increased the effectiveness of the LRAF and its ability to determine DRL. Not only students, but also an institution can benefit greatly from it and use it to plan digitization accordingly and also provide guidance to students when they need it most.

6.2 Conclusion

Bangladesh is considered the emerging Asian tiger. And the vision 2021 of our nation signifies the importance of digital environment on every aspects of our life. Specially, education system and infrastructure definitely needs a reform. But more importantly, it needs to happen keeping the learning readiness and digital readiness of the students so that no student gets left behind. The LRAF is a system that can be adopted by educational institutions to make sure inclusive innovation happens while digitizing in order to ensure a digital learning environment that is ready for everyone and gives the chance to everyone to cope with and avail the boon of digital.

6.3 Recommendation

The following recommendations can be made to make the outcome of this thesis work to its best-

I.   Incorporate LRAF in universities so that universities can know about their students' learning readiness and digital readiness.

II.   Keep continuous track of the inputs by students over a specific time period such as each early. This will help the institutions to know whether their students are improving with time or not.

III. Continuous analyzing of data pattern needs to be done so that new knowledge can be discovered.

IV.   Teachers should regularly check the online platform to know whether any of their students are performing inferiorly so that they can reach out to them to provide support.

V.   Decision making panels of educational institutions should use the data by LRAF so that they can measure how effective their new endeavors are for the students' improvement.

VI.   Students should be guided to go through the LRAF with complete honesty so that the results are most effective.

VII. The online system needs to be spread through the country in many educational institutions so that we can have national average data on various parameters and sub parameters. This will help in further improving the system and also give students an idea on how well they are doing in national standard.

6.4 Implications for future research

This is the first attempt towards bringing a more practical approach is assessing learning readiness and relating with digital readiness and tailor it for the condition of our country. Future possibility of extension on this work would be use the analytics by gathering student

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submission after 6 months and 1 year and use the data insights to further improve the mechanisms. The speed of technological innovation is rapid. As a result, the system needs to be updated which means the question and tasks, their types, and scoring mechanism may need to change with regular interval to keep this relevant. A unique approach for future implication would be to extend the framework for organization employees and mass people to understand how it affects organizational performance. Moreover, various derivative works can be achieved from the input characteristics for different questionnaires.

REFERENCES

[1] B. HORRIGAN, J. (2016). The meaning of digital readiness. [online] Pew Research Center: Internet, Science & Tech. Available at: https://www.pewinternet.org/2016/09/20/the-meaning-of-digital-readiness/ [Accessed 31 Mar. 2019].

[2] Evans, N. (2017). *Assessing your organization's digital transformation maturity*. [online] CIO. Available at: https://www.cio.com/article/3213194/assessing-your-organization-s-digital-transformation-maturity.html [Accessed 1 Apr. 2019].

[3] B. HORRIGAN, J. (2016). The spectrum of digital readiness for online learning. [online] Pew Research Center: Internet, Science & Tech. Available at: https://www.pewinternet.org/2016/09/20/the-spectrum-of-digital-readiness-for-e-learning/ [Accessed 31 Mar. 2019].

[4] Tool Co, D. (2019). *9 levels of digital*. [online] Digital Readiness Level. Available at: https://drl-tool.org/ [Accessed 1 Apr. 2019].

[5] Greenwood, S. (2016). Greater digital readiness translates to higher level of use of technology in learning. [online] Pew Research Center: Internet, Science & Tech. Available at: https://www.pewinternet.org/2016/09/20/greater-digital-readiness-translates-to-higher-level-of-use-of-technology-in-learning/ [Accessed 31 Mar. 2019].

[6] Mohamed, M., Wagner, D. and Wada, A. (2014). The Relationship Between Background Education, SocioDemographic And Lifestyle Factors And Academic Performance. GULF MEDICAL JOURNAL. [online] Available at: https://www.gulfmedicaljournal.com/download/supplement1_14/sup1-14%20(18).pdf [Accessed 31 Mar. 2019].

[7] Wallet, P. (2014). INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN EDUCATION IN ASIA. INFORMATION PAPER NO. 22. Montreal, Canada: UNESCO Institute for Statistics.

[8] Hossain, T. (2014). Digital Literacy Skills of University Students of Bangladesh: A Comparative Study between a Public and a Private University. *University of Dhaka*, p.73.

[9] Sieberhagen, A., & Cloete, L. (2012). The Evaluation of a Digital Information Literacy Program. South African Journal of Libraries and Information Science, 80(2).

[10] Martin, A., & Grudziecki, J. (2006). DigEuLit: concepts and tools for digital literacy development. Innovation in Teaching and Learning in Information and Computer Sciences, 5(4)

[11] Eyal, L. (2012). Digital Assessment Literacy—the Core Role of the Teacher in a Digital Environment. Educational Technology & Society, 15 (2), 37–49.

[12] Hargittai, E. (2005). Survey measures of web-oriented digital literacy. Social Science

Computer Review, 23(3), 371-379.

[13] Karnad, A. (2013). Embedding digital and information literacy into undergraduate teaching.

[14] University, S. (n.d.). *What is a Unit? | Stanford Undergrad*. [online] Undergrad.stanford.edu. Available at: https://undergrad.stanford.edu/advising/student-guides/what-unit [Accessed 17 Apr. 2019].

[15] Kurniawan, S. and Zaphiris, P. (n.d.). *Reading Online or on Paper: Which is Faster?*. [ebook] Detroit: Wayne State University, p.1. Available at: https://www.paperbecause.com/PIOP/files/f7/f7bb6bc5-2c4a-466f-9ae7-b483a2c0dca4.pdf [Accessed 17 Apr. 2019].

Appendix

Individual attributes questions

1. I usually get things done without having to be directed by others.
2. Considering my personal and professional schedule, I can commit at least 7-10 hours per week to study, Note: The amount of expected study time per course may vary significantly depending on the school and the specific course.
3. When I have an assignment or chore I don't like, I typically start working on that task and keep at it until it's done.
4. I think that some people are naturally more intelligent than others.
5. I usually finish things I start.
6. Other than work-related activities, I can plan what I do and when I do it.
7. I have never dropped out of an academic program (high school or college).
8. I have already thought about how I will need to change my schedule to fit this semester.
9. I am comfortable reading for more than 30 minutes at a time-
10. I am interested in higher studies to earn a specific degree.
11. I am willing to spend significant time and energy to participate in my course.
12. I need to have someone set deadlines for me to get things done.
13. I feel that chance has a lot to do with being successful
14. I like to figure things out on my own.
15. I often have trouble getting things done on time-
16. I agree that school success is mostly a result of one's socio-economic background.
17. I am concerned about being successful in this program-
18. If faced with a problem I couldn't solve, I would ask the instructor for help.
19. I am able to express myself well in writing-
20. I usually get things done ahead of time.
21. When I don't understand something, I am hesitant to ask the instructor for help
22. I have always completed the courses that I started.

23. I feel that if I set realistic goals, I can succeed no matter what-

Life factors questions

1. People continue their education for many reasons such as getting a raise at work, keeping their current job, getting a better job, personal satisfaction, and/or they were told to go to school by someone like a parent or supervisor. To what degree do you feel like you have a strong reason for enrolling in school?
2. Do you have a dedicated place with a computer and Internet access at which you can work on school activities?
3. To what degree are you anxious about your personal health impacting your ability to go to school?
4. How many times have you ever had to drop a college course for any reason?
5. To what degree are you anxious about being able to learn in a distance education course environment (for example a fully online or a partially online course)?
6. To what degree are you anxious about the level of support that you will receive from your employer for you to go to school?
7. How many hours per week are you involved in required, non-work responsibilities? Examples include responsibilities such as caring for a sick parent or coaching a child's team or volunteering
8. To what degree are you concerned that you will make a strong personal investment (such as investing your time, money and other resources) on going to school and yet it will not benefit you very much when you graduate?
9. To what degree are you anxious about your financial ability to go to school?
10. How many hours per week do you work a part-time or full-time job?
11. To what degree are you anxious about the level of support (for example from family and friends) that you will receive while going to school?
12. To what degree are you concerned about not having enough time for school?

13. In relation to the general population of our society, I consider my academic ability to be

14. Typically what grades have you made on prior school work?

15. Which terms below best describe how many distractions (examples: children, loud noises, conversations) there are where you will primarily be working on your school work?

16. Which place is most similar to where you will primarily be working on school activities?

17. To what degree are you concerned about having a specific place to work on your course work?

18. To what degree does this statement apply to you? "I am committed to my educational goals, and I'm fully prepared to do what it takes (for example, putting forth effort and making sacrifices) to attain my educational goals"

19. How many hours per week can you commit to school work?

20. How much do you agree with this statement? "Of all of the things that I could be doing in this phase of my life, going to college is one of the top priorities."

Technical competency questions

1. Identify which of the following is a correctly formatted email address

2. Communication in your courses may often occur through an online discussion board. The image below is of an online discussion board. If you wanted to post your comments in response to these comments posted by John, where would you click?
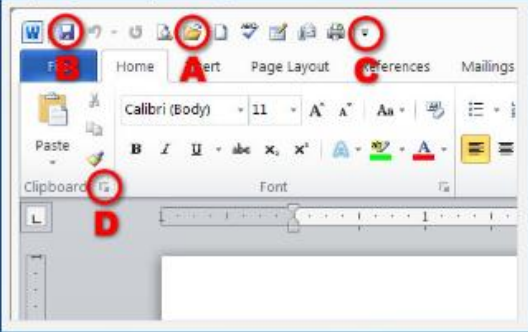
3. In your course you are instructed to open a word processing file. Which area of the picture below should you click on to start the process of opening the word processing file?

4. In your course you are instructed to design a fundraiser for a local school. As part of the assignment, you are to (1) write a letter about the fund raiser, (2) create a budget to track the income and expenses, and (3) track names and addresses of potential donors.

Choose the answer that matches the software application and task.

5. Often in courses you will obtain information from audio or video files. Also for many cases, you will have to deal with compressed (zipped) folder may contain a multiple folders together. Demonstrate your ability to download, unzip, and play an audio file by clicking on the link below. In the audio file you will be given a secret word. Alter listening to the file choose the secret word from the options below.

Link:https://drive.google.com/file/d/1X7TnEVXM534IyxdyVvzfQ0eHqiaefAa/view?usp=sharing

6. Often in courses you will need to store and retrieve files within folders. What is the name of the FOLDER in which the file named "script" is contained?

7. In a college course an instructor may send you a document as an attachment. The image below is taken from an email client. Which area would you click to start the attachment process?

8. In a course you are instructed to save a word processing file. Which area of the picture below should you click on to start the process of saving the word processing file?

9. While continuing your education you will often need to print a file. Which area of the picture below should you click on to start the process of printing this document?

10. To find resources on the Internet for your courses, you may need to use a search engine. Suppose that you are collecting information about the city of Columbus, Wisconsin. Which of the following searches would result in the most appropriate results?

Technical knowledge questions

1. PDF Files

2. Electronic Mail (Mail)

3. Word Processing

4. File Management

5. Hardware/Troubleshooting

6. Software Usage

7. Internet

8. Estimate how many years old the computer is which you will use to participate in your courses.

9. What operating system do you have?

10. Which one best describes your situation?

11. Blog

12. Browser

13. Computer Virus

14. ISP

16. Login

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