



<b>Qualification details</b>			
<b>Training Package Code and Title</b>	ICT - Information and Communications Technology (Release 7.2)		
<b>Qualification National Code and Title</b>	ICT40120 Certificate IV in Information Technology (Release 3)	<b>State code</b>	BFF9
<b>Qualification National Code and Title</b>	ICT50220 Diploma of information Technology (Release 1)	<b>State code</b>	BGJ4
<b>Assessment Title</b> <i>(as per DAP)</i>	Assessment Task One (Individual Project)		
<b>Unit National Code &amp; Title</b>	ICTPRG443 Apply intermediate programming skills in different languages		
	ICTICT430 Apply software development methodologies		
	ICTICT449 Use version control systems in development environments		
<b>Date Due</b>	Week Ten	<b>Date Received</b>	16/03/2022
<b>Student Name</b>	Atit Singh		
<b>Student Declaration</b>	I declare that the evidence submitted is my own work:		
<b>Assessor Name</b>			
<b>Assessment Decision</b>	<input type="checkbox"/> Satisfactory		<input type="checkbox"/> Not Yet Satisfactory
<b>Assessor Signature</b>		<b>Date</b>	
<b>Is student eligible for reassessment (Re-sit)?</b>	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<b>Re-assessment Date:</b> Week Twenty
<b>Feedback to student</b>			
Via Blackboard (LMS) – Please check [Grade] section.			
<b>Feedback from student</b>			
Via Blackboard (LMS) – Please use [Comment] section during submission.			
<b>Student signature</b>	Atit Singh	<b>Date</b>	16/03/2022



## Assessment Instructions

### TO THE ASSESSOR

Type of Assessment	Individual Portfolio
Duration of the assessment	8 class sessions (Weeks 2-10)
Location of assessment	Classroom
Conditions	<p>Assessor to ensure that the noise levels, natural interactions and time variances are maintained as it would be in the Software Development industry.</p> <p>Learners are required to complete the required tasks in class and submit the required documentation electronically via Blackboard</p>
Elements and Criteria	<p>As detailed in the assessment plan</p> <p>You are required to make sure that all students meet the elements, performance criteria and oral communication items as outlined in the provided solution</p>

### TO THE STUDENT

Purpose of Assessment	<p>You are required to show you can:</p> <p>ICTPRG443 Apply intermediate programming skills in different languages</p> <ul style="list-style-type: none"><li>• Demonstrate your skills and knowledge by creating, coding, debugging and testing code</li><li>• Establish user requirements and then research and collect information about data structures to provide suitable solutions.</li><li>• Manage time and tasks to complete a series of coding and documentations problems</li></ul> <p>ICTICT430 Apply software development methodologies</p> <ul style="list-style-type: none"><li>• Select traditional and non-traditional systems development methodologies</li><li>• Apply selected software methodology to project plan which identifies resources and control structures</li><li>• Document analysis for approval to external stakeholders.</li></ul> <p>ICTICT449 Use version control systems in development environments</p> <ul style="list-style-type: none"><li>• Prepare and evaluate version control systems</li><li>• Install and configure a version control system</li><li>• Create and upload code to version control system</li><li>• Test and review logs on version control system</li></ul> <p>The student must demonstrate the ability to complete the tasks outlined in this assessment and is expected to use systematic analytical processes and effect time management to meet the goals/deadlines outlined in the DAP.</p>
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Allowable Materials	Blackboard Topic One: SDLC, Weekly readings (PDF), Example programs and Independent Outside of Class Activities
Required Resources	<p>Web links and example code can be downloaded from the Blackboard portal.</p> <p>PC with MS Visual Studio, MSOffice.</p> <p>Internet Access to MSDN, GitHub and <a href="http://www.citem.com.au/">www.citem.com.au/</a></p>
Reasonable Adjustment	<p>In some circumstances, adjustments to assessments may be made for you. If you require support for literacy and numeracy issues; support for hearing, sight or mobility issues; change to assessment times/venues; use of special or adaptive technology; considerations relating to age, gender and cultural beliefs; format of assessment materials; or presence of a scribe you need to inform your lecturer.</p>
Assessment Submission	<p>All questions and programming activities must be attempted. All written answers must be submitted in this assessment document in the appropriate space.</p> <p>Use of research tools and peers in formulating answers are acceptable – but work submitted must be your own work.</p> <p>Final project documentation is to be uploaded to the appropriate area in the Blackboard course created for this unit.</p> <p>If you are marked as NYS (Not Yet Satisfactory) on your first attempt, you will be provided with another opportunity to re-attempt the assessment.</p>
Portfolio Description	<p>A project of programming tasks and written questions which should be completed in class and finished in the students' own time on a weekly basis as per the Delivery and Assessment schedule.</p> <ul style="list-style-type: none"><li>Question 1 – Project Specifications</li><li>Question 2 – Version Control Specifications</li><li>Question 3 – UML Diagram</li><li>Question 4 – Development Methodologies</li><li>Question 5 – Methodology Analysis and Selection</li><li>Question 6 – Project Plan</li><li>Question 7 – Manage Version Control System</li><li>Question 8 – Prototype Development</li><li>Question 9 – Version Control Update</li><li>Question 10 – Data Structure Matrix</li><li>Question 11 – UML Activity Diagram</li><li>Question 12 – Debug Test Report</li><li>Question 13 – Post Development Analysis</li><li>Question 14 – Demonstration and Submission</li></ul>

## Scenario

You have accepted the role of a Senior Programmer for CITE Managed Services, your task is to develop a fully functional wiki application for the junior programmers. In Computer Science there are many different categories and definitions for Data Structures, most of these terms are used in the CITE software development department, however, CITE management would like to see a uniform definition and cataloguing of this information. They have supplied some basic details but would like you to complete a feasibility study and create a working prototype application. A rudimentary interface design has been provided along with a list of proposed program criteria which the prototype application must include.

Before the project can move to the next stage CITE management would like a report on the full development process and related documentation. Review the proposed program criteria and answer the associated questions. Use the supplied template forms to present your answers. Finally develop a working prototype using Microsoft Visual Studio C# and GitHub version control. The purpose of the assessment is to demonstrate to CITE management how this project can be achieved. If you do not have a GitHub account you should sign up for the free version, this will be used again in other courses (<https://github.com>).

You should consult with the CITE representative (Your Lecturer) if you are unsure about any of the problems or questions. Your primary research should focus on the resources on the Blackboard and CITEMS website, additional information can be collected from the Internet, ensure all sources are referenced at the end of your submission. You must write your answers in the standard templates provided in this assessment task document.

## Proposed Program Criteria

<ul style="list-style-type: none"> <li>The user can select an item from the list box and the corresponding information will be displayed in the four text boxes (on the Left),</li> <li>The user can search for an item which will be displayed in the four text boxes,</li> <li>Search input box must clear if search unsuccessful,</li> <li>The user can add a new item,</li> <li>All user interactions must have full error trapping and feedback messaging,</li> <li>The wiki prototype will load and save data when the buttons are clicked,</li> </ul>	<ul style="list-style-type: none"> <li>All wiki data is stored/retrieved using a binary file format,</li> <li>A double mouse click in the search text box will clear the search input box,</li> <li>The prototype must use a two-dimensional array of type string,</li> <li>The Data Structure information must be defined using the following attributes: Data Structure Name, Category, Structure and Definition, (refer Data Structure Matrix in Question 10).</li> </ul>
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## Proposed Interface Design





## Question 1

You are required to create a list of all the User Requirements for the wiki prototype application. Then list all the User Interactions and Specifications of the wiki application. Fill in the relevant sections of the following Project Specifications template to answer question one.

Project Specifications			
Project Name	IntraWiki		
Date	02/02/2022		
Developer Name	Atit Singh		
User Requirements			
Req. #	Description	Importance	Notes
1	The item must be displayed on the list box and when the user selects the item, it should display the corresponding information in the four-text box.	1	
2	The user should be able to search an item which is displayed in the four text boxes.	1	
3	Search input is meant to clear if the search criteria is unsuccessful	2	
4	The user can be able to add a new item and relevant information.	1	
5	The user must be provided the relevant error trapping and feedback messages.	2	
6	The application should load and save data when the buttons are clicked.	1	
7	Only binary file format should be used to store and retrieved data.	2	
8	A double mouse click in the search text box will clear the search input box.	3	
9	Only two-dimensional array is used to declaring string for the application.	2	
10	The Data Structure information must be defined using the following attributes: Data Structure Name, Category, Structure and Definition.	1	
User Interaction and Specifications			
1.	The item must be displayed on the list box and when the user selects the item, it should display the corresponding information in the four-text box.		
2.	The user should be able to search an item which is displayed in the four text boxes.		
3.	Search input is meant to clear if the search criteria is unsuccessful		
4.	The user can be able to add a new item and relevant information.		



5.	The user must be provided the relevant error trapping and feedback messages.
6.	The application should load and save data when the buttons are clicked.
7.	A double mouse click in the search text box will clear the search input box.

## Question 2

CITE currently use GitHub as their primary source control; however, they would like you to investigate/research an alternative to GitHub. The purpose is to ensure CITE have chosen the best version control system for software development. Fill in the relevant sections of the following Version Control Specifications template to answer question two.

Version Control Specifications			
GitHub VCS		Alternative VCS	
VCS Name:	GitHub	VCS Name:	CVS
URL:	http://github.com	URL:	https://savannah.nongnu.org/projects/cvs
Major Features			
1.	Provides strong support for non-linear development.	Client-server repository model.	
2.	Distributed repository model.	CVS client will keep the working copy of the file up-to-date and requires manual intervention only when an edit conflict occurs	
3.	Compatible with existing systems and protocols like HTTP, FTP, SSH.	Keeps a historical snapshot of the project.	
4.	Capable of efficiently handling small to large sized projects.	'Update' command to keep local copies up to date.	
5.	Cryptographic authentication of history.	Uses delta compression technique for efficient storage.	
6.	Garbage accumulates until collected.	Excludes symbolic links to avoid a security risk.	
Recommendation: Which VCS would you choose and why?			
<p>For the project I would recommend using GitHub as a version control as setting up the repository in Git is very easy by using "git init &amp;&amp; git add. &amp;&amp; git commit". Secondly, in Git all operations are atomic: either they succeed as whole, or they fail without any changes, however in CVS if an operation on the repository is interrupted in the middle, the repository can be left in an inconsistent state. Because Git is a distributed system in addition to connecting to a central repository developers can connect to another developer's repository. This allows teams to share code without affecting the central repository.</p>			



## Question 3

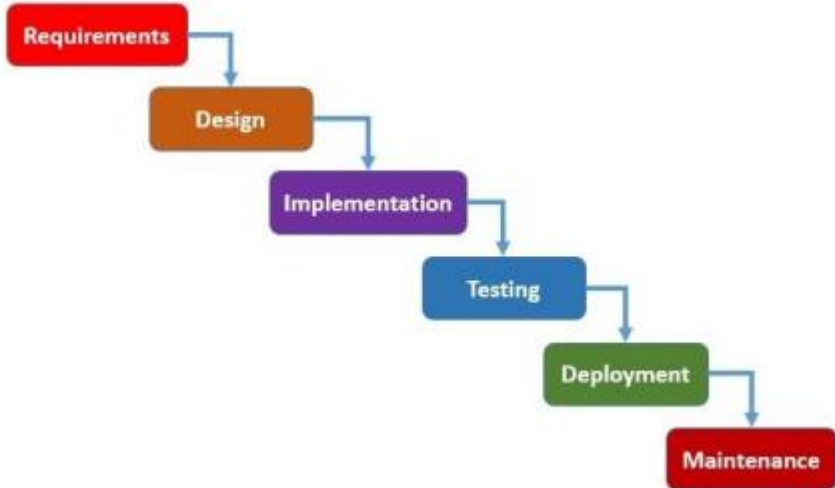
Create a UML Diagram for the 2D wiki data structure information. Ensure you have added the data structure and attributes. Fill in the relevant sections of the following UML Diagram template to answer question three.

UML Diagram	
Attributes	
1	Name
2	Category
3	Data structure
4	Definition
Data Structure	
2-Dimensional Array String is used for the application.	
Diagram	
<div><div>IntraWiki</div><div><div>-Name: String -Category: String -Structure: String -Definition: String</div><div>-Add(): String -Edit(): String -Delete():void -Search():void -Sort(): void -Open():void -Save(): void</div></div></div>	



## Question 4

You are required to create a comparison of four (4) software development methodologies that would be suitable to create the wiki prototype application. Your comparisons must include both traditional and non-traditional system development methodologies. Complete the following Development Methodologies template to answer question four.

Development Methodologies	
1 <sup>st</sup> Methodology Name: Waterfall	
Description: The Waterfall model is widely considered the oldest of the structured SDLC methodologies. It's also a very straightforward approach: finish one phase, then move on to the next. No going back. Each stage relies on information from the previous stage and has its own project plan.	
Diagram:  <pre> graph TD     A[Requirements] --&gt; B[Design]     B --&gt; C[Implementation]     C --&gt; D[Testing]     D --&gt; E[Deployment]     E --&gt; F[Maintenance]           </pre>	
Advantages: <ul style="list-style-type: none"> <li>• Simple and easy to understand and use.</li> <li>• Easy to manage due to the rigidity of the model – each phase has specific deliverables and a review process.</li> <li>• Phases are processed and completed one at a time.</li> <li>• Works well for smaller projects where requirements are very well understood.</li> <li>• Clearly defined stages.</li> <li>• Well understood milestones.</li> <li>• Easy to arrange tasks.</li> <li>• Process and results are well documented.</li> </ul>	
Disadvantages: <ul style="list-style-type: none"> <li>• No working software is produced until late during the life cycle.</li> <li>• High amounts of risk and uncertainty.</li> <li>• Not a good model for complex and object-oriented projects.</li> <li>• Poor model for long and ongoing projects.</li> <li>• Not suitable for the projects where requirements are at a moderate to high risk of changing. So risk and uncertainty is high with this process model.</li> </ul>	

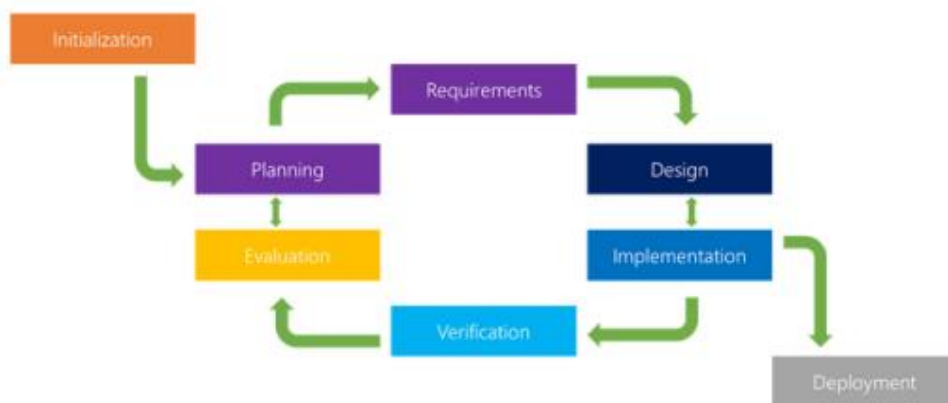


- It is difficult to measure progress within stages.
- Cannot accommodate changing requirements.
- No working software is produced until late in the life cycle.
- Adjusting scope during the life cycle can end a project
- Integration is done as a "big-bang" at the very end, which doesn't allow identifying any technological or business bottleneck or challenges early

## 2<sup>nd</sup> Methodology Name Iterative

Description: The Iterative model is repetition oriented. Instead of starting with fully known requirements, project teams implement a set of software requirements, then test, evaluate and pinpoint further requirements. A new version of the software is produced with each phase, or iteration. Rinse and repeat until the complete system are ready.

Diagram:



Advantages:

- Some working functionality can be developed quickly and early in the life cycle.
- Results are obtained early and periodically.
- Parallel development can be planned.
- Progress can be measured.
- Less costly to change the scope/requirements.
- Testing and debugging during smaller iteration is easy.
- Risks are identified and resolved during iteration; and each iteration is an easily managed milestone.
- Easier to manage risk - High risk part is done first.
- With every increment operational product is delivered.
- Issues, challenges & risks identified from each increment can be utilized/applied to the next increment.
- Risk analysis is better.
- It supports changing requirements.
- Initial Operating time is less.
- Better suited for large and mission critical projects.

- During life cycle software is produced early which facilitates customer evaluation and feedback.

## Disadvantages:

- More resources may be required.
- Although cost of change is lesser but it is not very suitable for changing requirements.
- More management attention is required.
- System architecture or design issues may arise because not all requirements are gathered in the beginning of the entire life cycle.
- Defining increments may require definition of the complete system.
- Not suitable for smaller projects.
- Management complexity is more.
- End of project may not be known which is a risk.
- Highly skilled resources are required for risk analysis.
- Project's progress is highly dependent upon the risk analysis phase.

## 3<sup>rd</sup> Methodology Name: spiral

Description: One of the most flexible SDLC methodologies, the Spiral model takes a cue from the Iterative model and its repetition; the project passes through four phases (planning, risk analysis, engineering and evaluation) over and over in a "spiral" until completed, allowing for multiple rounds of refinement.

## Diagram:



## Advantages:

- Changing requirements can be accommodated.
- Allows for extensive use of prototypes
- Requirements can be captured more accurately.
- Users see the system early.

- Development can be divided into smaller parts and more risky parts can be developed earlier which helps better risk management.

## Disadvantages:

- Management is more complex.
- End of project may not be known early.
- Not suitable for small or low risk projects and could be expensive for small projects.
- Process is complex
- Spiral may go indefinitely.
- Large number of intermediate stages requires excessive documentation.

## 4<sup>th</sup> Methodology Name: Agile

Description: In the Agile model, “fast failure” is a good thing. The approach produces ongoing release cycles, each featuring small, incremental changes from the previous release. At each iteration, the product is tested. The Agile model helps teams identify and address small issues on projects before they evolve into more significant problems, and engage business stakeholders and get their feedback throughout the development process.

## Diagram:



## Advantages:

- Is a very realistic approach to software development
- Promotes teamwork and cross training.
- Functionality can be developed rapidly and demonstrated.
- Resource requirements are minimum.
- Suitable for fixed or changing requirements
- Delivers early partial working solutions.
- Good model for environments that change steadily.
- Minimal rules, documentation easily employed.
- Enables concurrent development and delivery within an overall planned context.
- Little or no planning required
- Easy to manage
- Gives flexibility to developers

## Disadvantages:

- Not suitable for handling complex dependencies.
- More risk of sustainability, maintainability and extensibility.
- An overall plan, an agile leader and agile PM practice is a must without which it will not work.
- Strict delivery management dictates the scope, functionality to be delivered, and adjustments to meet the deadlines.



- Depends heavily on customer interaction, so if customer is not clear, team can be driven in the wrong direction.
- There is very high individual dependency, since there is minimum documentation generated.
- Transfer of technology to new team members may be quite challenging due to lack of documentation.

## References

Blackboard > Cluster -C Sharp Two > Topic Six - Software Development Life Cycle > Software Development Life Cycle (PDF)

Blackboard > Cluster -C Sharp Two > Topic Six - Software Development Life Cycle > Summary of Software Development Life Cycle (PDF)

## Question 5

Refer back to question four and answer these two questions:

- What selection criteria determined your choice of the four development methodologies? Create a list of your selection criteria.
- What methodology from question four would you recommend for this project? List your reasons why this is your preferred option.

Complete the following Methodology Analysis and Selection template to answer this question.

Methodology Analysis	
Selection Criteria	
The project needs a continuous improvement and changing	
High product owner involvement.	
The project needs to be delivered in short, flexible timeline	
Reduced risk	
Methodology Selection	
Methodology Name	<u>Agile</u>
Justification (reasons for selection)	
Working on self-reflection and striving for continuous improvement is one of the 12 core principles of the Agile manifesto. The methodology works in iterations which means that each sprint will be better than the last one and previous mistakes will not be repeated. Agile methodologies foster an open culture of idea exchange and collaboration which allows team members to learn from shared experiences and improve together.	
If the product owner wants to be more hands-on, an Agile development methodology allows for the product owner to be deeply involved. The product owner is a member of the team and is the owner of the product requirements. The product owner ultimately makes all decisions on the scope and the functionality of the product.	
If you need to get the project delivered in a short amount of time, Agile is the appropriate choice here where action and getting things built is more important than documentation and process.	
Developers regularly assess progress during sprints, meaning they have better visibility into the project and can spot potential obstacles quickly. These minor issues can be tackled before they escalate, creating an effective risk mitigation process and giving the project a greater chance of success.	



## Question 6

Using your recommended methodology from question five, create an initial project plan. List and describe all the tasks required to complete the development of the wiki application. Use the following Project Plan template to answer this question.

Project Plan			
Project Name	IntraWiki		
Date	09/02/2022		
Developer Name	Atit Singh		
Development Tasks			
Task Name	Task Type	Task Description	Input/Output Parameters
Form	coding	Creating the form for the project	
List Box	coding	Creating the list box to view and list the data.	Output: data
Add button	coding	Button to add the data to the application.	Input: Click button
Text box	coding	Creating text box so that user can type the data for search, edit or delete.	Input: Input data
Static variables	Coding	Variable used for the project	Input/output: data
2D Array	coding	2D array to hold the input of the data as row and column	Input: data
Display method	Coding	Displaying the data from the array to the List box	Output: Displaying data
Sort method	coding	For the sorting of the array data so that it can be helpful for the search method	Output: Sort data
Search method	coding	Function to search the data and return values.	Input/Output: data/Boolean
Open button	Coding	Button to open the file	Input: Click
Save button	coding	Button to save the data into the file.	Input: Click
Error trapping	coding	Error trapping to view the errors	Output: error
Feedback messaging	coding	Informing the user about the error.	Output: information
Testing and debugging	Testing	Testing of the application all the function and code.	Output: Testing Report



## Question 7

CITE has authorised the usage of GitHub as the recommended Version Control System (VCS) because it is fully integrated into Visual Studio, create your own GitHub account (you can use your existing account) then download and install the desktop interface onto your local PC. Create a suitable folder structure for both the local and cloud systems to accommodate the development of the wiki prototype application. Complete the following Manage Version Control System template to answer this question.

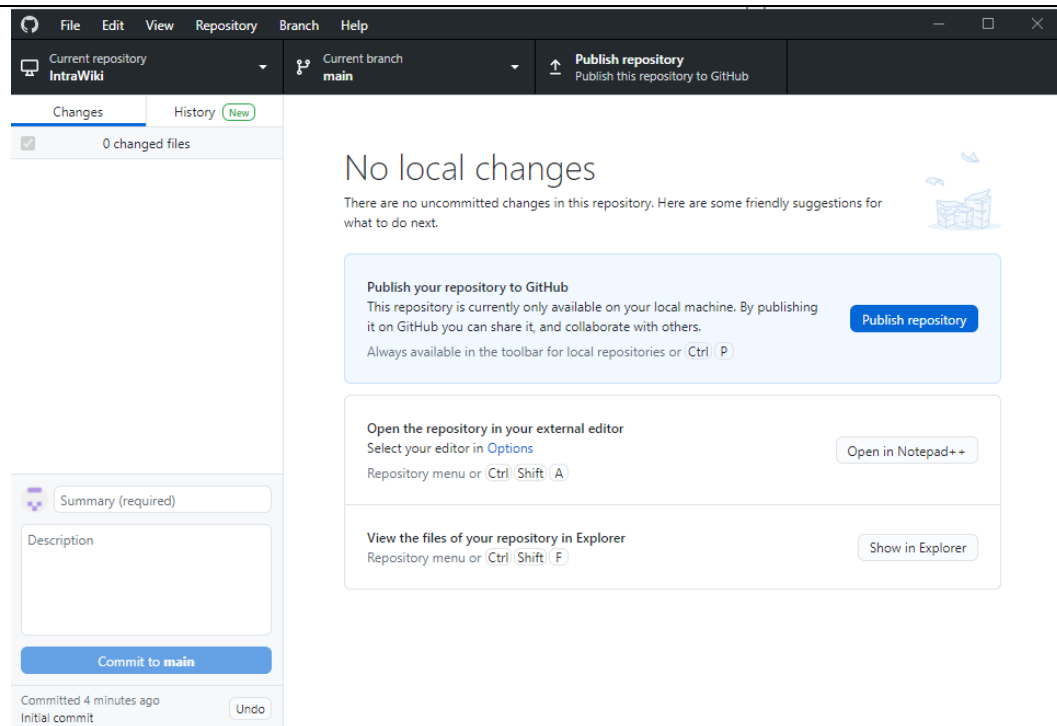
Consult with your lecturer if you wish to use an alternative source control service. Any alternative source control must support a local desktop installation.

Manage Version Control System			
VCS Name	GitHub		
Version Number	Version 2.9.6	Date	09/02/2022
Supported Platforms	Visual studio		
Installation Information		Yes	No
Has the cloud VCS account been created and named correctly?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Has the cloud VCS folder structure been created?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Has the desktop VCS software installed correctly?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Has the desktop VCS folder structure been created?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are the two VCS resources linked?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comments/Issues/Problems			
Account Details Checklist			
Repository Name:	IntraWiki		
URL	<a href="https://github.com/ateet143/IntraWiki.git">https://github.com/ateet143/IntraWiki.git</a>		

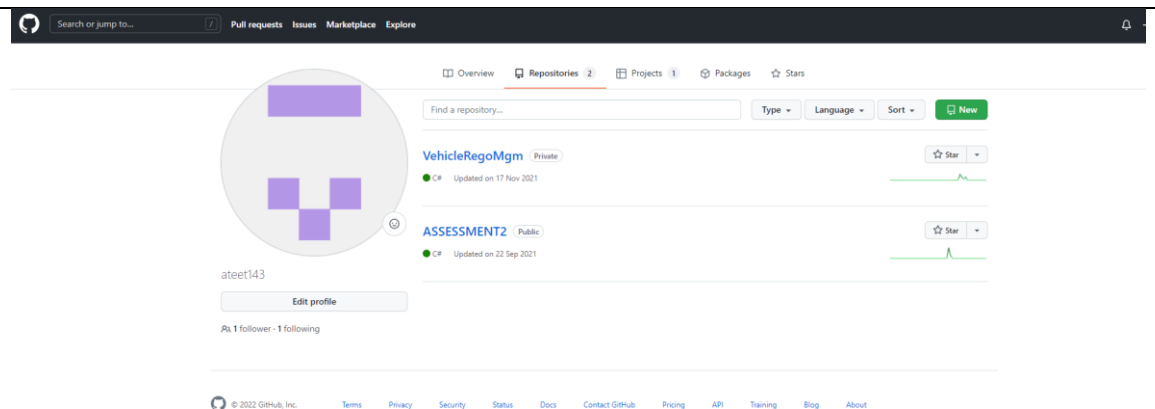




## Desktop Screen Shot

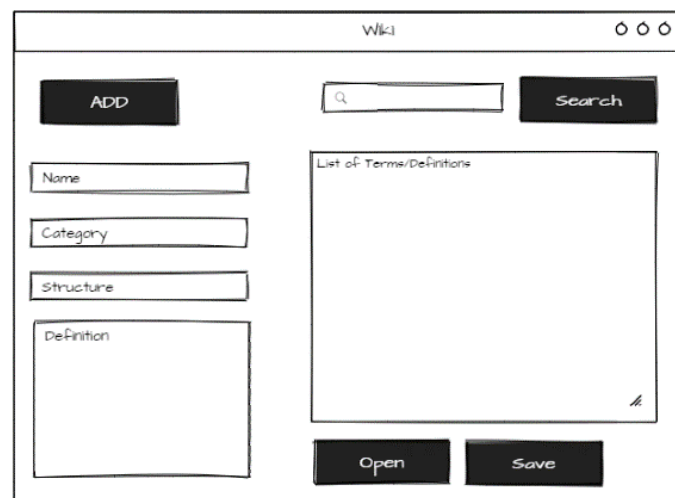


## Cloud Screen Shot



## Question 8

Create the wiki prototype to demonstrate how a collection of information can be stored using a Windows Forms Application. This prototype application will utilise a two-dimensional array with 12 rows and 4 columns (**use a simple 2D string array – not collections**). Use the hardware and software supplied in the classroom to accomplish the development, debugging and internal documentation of the prototype. Use the Version Control System from Question 7 to manage your code during the development; ensure you record these commits as a series of screen shots to be included in Question 9 (ie start, working, final). Your code must adhere to the CITEMS software development standards. (refer <http://www.citems.com.au/>) The following user interface is provided as a starting point for your prototype development.



**Note:** You are not permitted to use a class structure; this assessment is a demonstration of a 2D string array.

The following programming criteria and features are required;

### Programming Criteria

- 8.1 Create a global 2D string array, use static variables for the dimensions (row, column),
- 8.2 Create an ADD button that will store the information from the 4 text boxes into the 2D array,
- 8.3 Create a CLEAR method to clear the four text boxes so a new definition can be added,
- 8.4 Write the code for a Bubble Sort method to sort the 2D array by **Name** ascending, ensure you use a separate **swap** method that passes (by reference) the array element to be swapped (do not use any built-in array methods),
- 8.5 Write the code for a Binary Search for the **Name** in the 2D array and display the information in the other textboxes when found, add suitable feedback if the search is not successful and clear the search textbox (do not use any built-in array methods),
- 8.6 Create a display method that will show the following information in a List box: Name and Category,
- 8.7 Create a method so the user can select a definition (Name) from the Listbox and all the information is displayed in the appropriate Textboxes,
- 8.8 Create a SAVE button so the information from the 2D array can be written into a **binary file** called **definitions.dat** which is sorted by **Name**,
- 8.9 Create a LOAD button that will read the information from a binary file called **definitions.dat** into the 2D array,



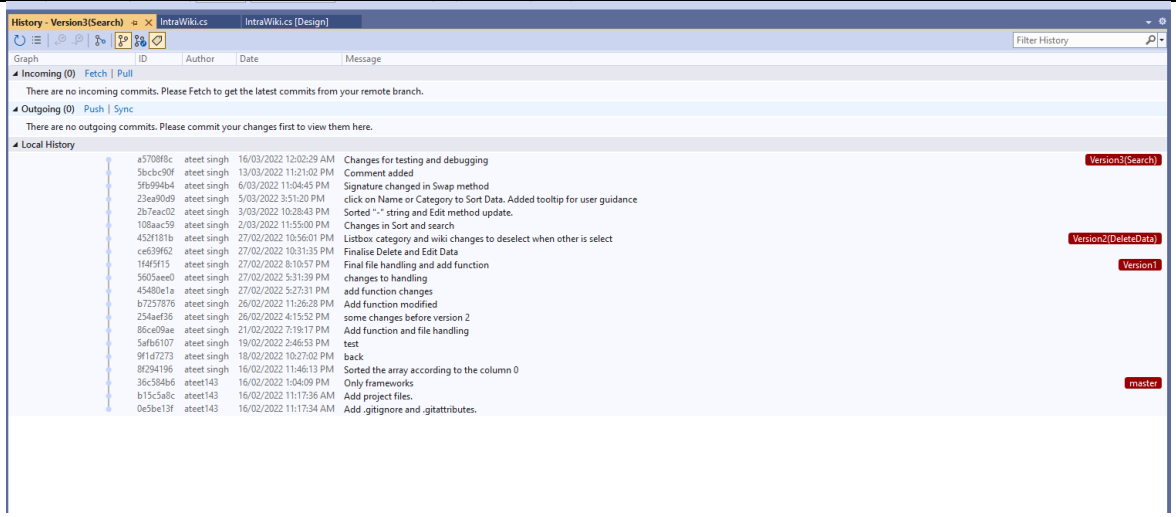
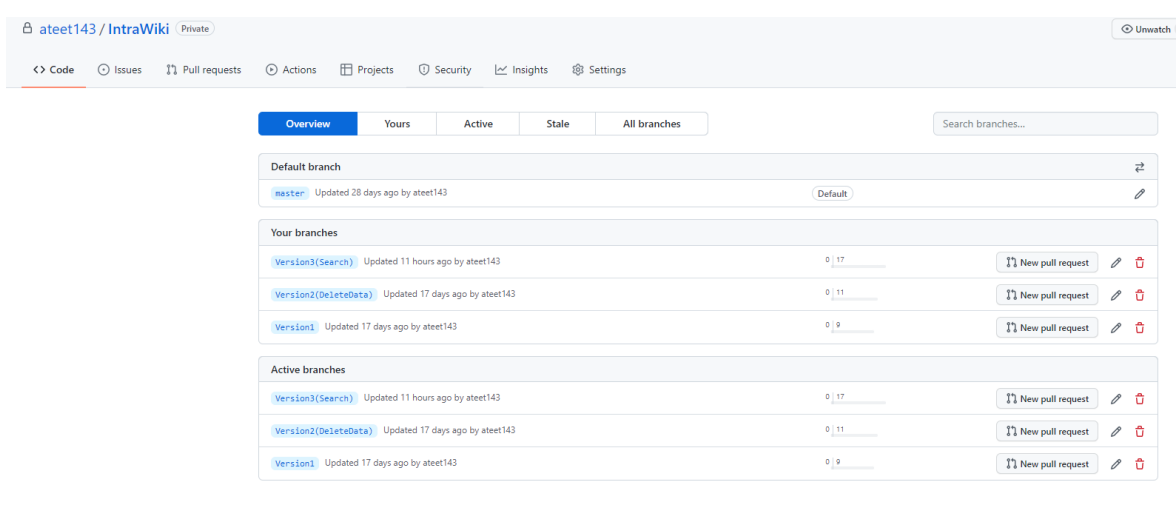
8.10 All code is required to be adequately commented. Map the programming criteria and features to your code/methods by adding comments above the method signatures. Ensure your code is compliant with the CITEMS coding standards (refer <http://www.citem.com.au/>).

**Note:** The exact requirements of the Programming Criteria are essential. Any variation from them will need to be corrected in order to achieve a satisfactory performance.



## Question 9

At the conclusion of the code development record the Version Control changes, commits and pull requests with a series of suitable screen shots. Complete the following Version Control Update template to answer this question. A minimum of three screen captures is required (ie start, working, final)

Version Control Update	
Repository Name:	IntraWiki
URL	<a href="https://github.com/ateet143/IntraWiki.git">https://github.com/ateet143/IntraWiki.git</a>
Desktop Screen Shots	
Cloud Screen Shots	

## Question 10

Create test input data by researching and providing a definition for the 12 data structures listed in the Data Structure Matrix template below. The definitions must be between 20-40 words and contain real information which will be entered and saved by the wiki prototype. Add your definitions to the following Data Structure Matrix template to answer this question.

Data Structure Matrix			
NAME	CATEGORY	STRUCTURE	DEFINITION
Array	Array	Linear	An array is a collection of elements of the same type placed in contiguous memory locations that can be individually referenced by using an index to a unique identifier.
Two Dimension Array		Linear	Arrays can have more than one dimension. The multidimensional array can be declared by adding commas in the square brackets. For example, [,] declares two-dimensional array
List	List	Linear	The List<T> is a collection of strongly typed objects that can be accessed by index and having methods for sorting, searching, and modifying list. It is the generic version of the ArrayList that comes under System.Collection.Generic namespace.";
Linked list		Linear	A LinkedList is a linear data structure which stores element in the non-contiguous location. The elements in a linked list are linked with each other using pointers. Or in other words, LinkedList consists of nodes where each node contains a data field and a reference(link) to the next node in the list.
Self-Balance Tree	Tree	Non-Linear	A self-balancing binary search tree (BST) is any node-based binary search tree that automatically keeps its height (maximal number of levels below the root) small in the face of arbitrary item insertions and deletions.
Heap		Non-Linear	A Heap is a special Tree-based data structure in which the tree is a complete binary tree. Generally, Heaps can be of two types: Max-Heap: In a Max-Heap the key present at the root node must be greatest among the keys present at all its children.
Binary Search Tree		Non-Linear	A binary search tree (BST) is a binary tree where each node has a Comparable key (and an associated value) and satisfies the restriction that the key in any node is larger than the keys in all nodes in that node's left subtree and smaller than the keys in all nodes in that node's right subtree.
Graph	Graphs	Non-Linear	A Graph is a non-linear data structure consisting of nodes and edges. The nodes are sometimes also



			referred to as vertices and the edges are lines or arcs that connect any two nodes in the graph
Set	Abstract	Non-Linear	Sets are an abstract data type that can store a list of non-repeated elements. Their name comes from the concept of finite sets in mathematics. Sets, unlike arrays, are unsorted and unindexed. A set has two properties: the data is not duplicated, and it is not ordered.
Queue		Linear	Queue is a special type of collection that stores the elements in FIFO style (First in First Out), exactly opposite of the Stack<T> collection. It contains the elements in the order they were added. C# includes generic Queue<T> and non-generic Queue collection. It is recommended to use the generic Queue<T> collection.";
Stack		Linear	Stack is a special type of collection that stores elements in LIFO style (Last in First Out). C# includes the generic Stack<T> and non-generic Stack collection classes. It is recommended to use the generic Stack<T> collection.
Hash Table	Hash	Non-Linear	A hash table is a data structure that stores data in a way that is associative. Data is kept in an array format in a hash table, with each data value having its own unique index value. If we know the index of the needed data, data access becomes very quick. As a result, it becomes a data structure in which insertion and search operations are extremely quick, regardless of data size.

## References

<https://www.geeksforgeeks.org/introduction-to-arrays/>  
<https://www.tutorialsteacher.com/csharp/csharp-multi-dimensional-array>  
[https://en.wikipedia.org/wiki/List\\_\(abstract\\_data\\_type\)](https://en.wikipedia.org/wiki/List_(abstract_data_type))  
[https://www.tutorialspoint.com/data\\_structures\\_algorithms/linked\\_list\\_algorithms.htm](https://www.tutorialspoint.com/data_structures_algorithms/linked_list_algorithms.htm)  
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<https://brilliant.org/wiki/sets-adt/>  
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[https://www.tutorialspoint.com/data\\_structures\\_algorithms/stack\\_algorithm.htm](https://www.tutorialspoint.com/data_structures_algorithms/stack_algorithm.htm)  
<https://www.hackerearth.com/practice/data-structures/hash-tables/basics-of-hash-tables/tutorial/>  
[https://www.tutorialspoint.com/data\\_structures\\_algorithms/hash\\_data\\_structure.htm](https://www.tutorialspoint.com/data_structures_algorithms/hash_data_structure.htm)



### Question 11

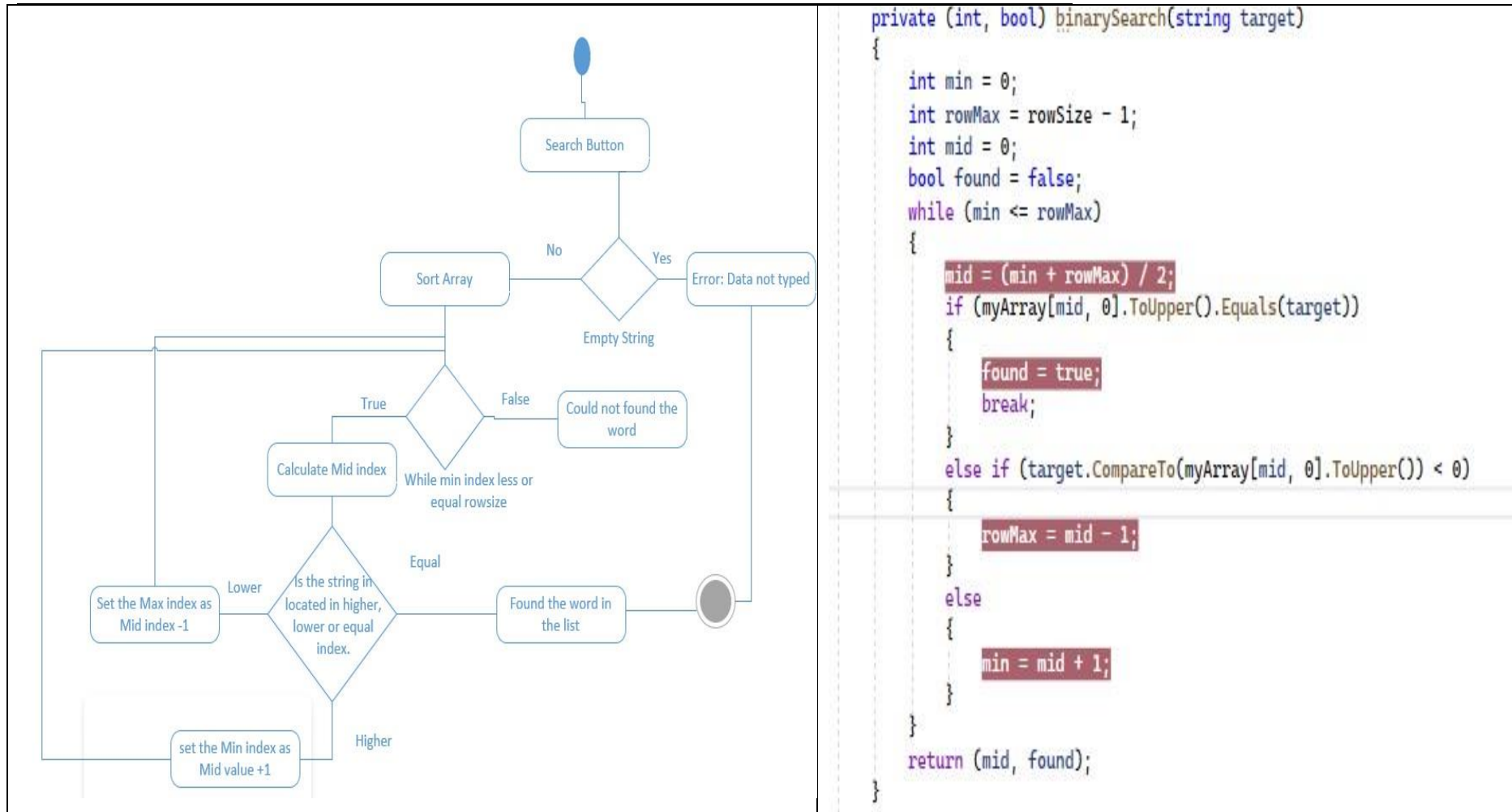
Create a detailed UML Activity Diagram for the Binary Search method. Start by copying your C# code into the right side of the UML Activity Diagram section, then add your UML Activity Diagram in the left side. Now, using the code and the UML diagram identify breakpoints so all major pathways are tested.

Update the C# Code on the right section to identify the breakpoints. The example is provided for clarification. Complete the following UML Activity Diagram template below.

UML Activity Diagram	
Diagram	C# Code



# Assessment Task One







## Question 12

Using the breakpoints shown in the previous question as a starting point, utilise the debug features to debug, trace and test your Binary Search code. Ensure your code is error free and functions correctly (refer Programming Criteria Question 8.5) record and correct any errors. Your Debug Test Report must include appropriate evidence that your code functions as expected (references to screen captures). Complete the following Debug Test Report template below.

- Ensure you have entered 12 records from Question 10 before you begin testing,
- Place a break point at each Decision and Loop construct and record the data as it changes,
- Use a test data item that will be found (ie Stack),
- Use a test data item that will not be found (ie ArrayList).

Debug Test Report					
Project Name		IntraWiki			
Method		Functional Testing of the Binary Search Method.			
Description		Testing , debug and trace the output of the variable in Binary Search code.			
Level of Testing		Unit test			
Developer		Atit Singh	Tester	Atit Singh	Date 15/03/2022
Test Case No	Test Case Name	Test steps	Test Data	Expected result	Pass / Fail
1	Value in 1 <sup>st</sup> Row	Load the file in the array, Sort the data and enter the data in the textbox and click search button	"Array"	Select the value from the list box and display the success message.	Pass
2	Value in 12 <sup>th</sup> Row	Load the file in the array, Sort the data and enter the data in the textbox and click search button	"Two Dimension Array"	Select the value from the list box and display the success message.	Pass
3	Value in 6 <sup>th</sup> row	Load the file in the array, Sort the data and enter the data in the textbox and click search button	"Linked list"	Select the value from the list box and display the success message.	Pass
4	Value in 7 <sup>th</sup> row	Load the file in the array, Sort the data and enter the data in the textbox and click search button	"list"	Select the value from the list box and display the success message.	Pass



5	Value not in Data	Load the file in the array, Sort the data and enter the data in the textbox and click search button	"abcd"	Select the value from the list box and display the not found message.	Pass
6	Value not in Data	Load the file in the array, Sort the data and enter the data in the textbox and click search button	"CSharp"	Select the value from the list box and display the not found message.	Pass
7	Search button click without user input	Load the file in the array, Sort the data and click search button.		Select the value from the list box and display the user feedback message.	Pass

## Test case no 1

```
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\WINDOWS\Microsoft.Net\as
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\WINDOWS\Microsoft.Net\as
User Entered:ARRAY
Minimum index 0
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\Program Files\Microsoft
New Mid VALUE 5
myArray[5,0]=Linked list is higher than ARRAY
New rowMax:4
Minimum index 0
New Mid VALUE 2
myArray[2,0]=Graph is higher than ARRAY
New rowMax:1
Minimum index 0
New Mid VALUE 0
myArray[0,0]==ARRAY
ARRAY Found
```

## Test Case no. 2



```
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\WINDOWS\Microsoft.Net\assemb
User Entered:TWO DIMENSION ARRAY
Minimum index 0
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\Program Files\Microsoft Visu
New Mid VALUE 5
myArray[5,0]=Linked list is lower than TWO DIMENSION ARRAY
New min value: 6
Minimum index 6
New Mid VALUE 8
myArray[8,0]=Self - Balance Tree is lower than TWO DIMENSION ARRAY
New min value: 9
Minimum index 9
New Mid VALUE 10
myArray[10,0]=Stack is lower than TWO DIMENSION ARRAY
New min value: 11
Minimum index 11
New Mid VALUE 11
myArray[11,0]==TWO DIMENSION ARRAY
TWO DIMENSION ARRAY Found
Return Value mid:11,Found:True
```

## Test Case no 3

```
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\WINDOWS\Micros
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\WINDOWS\Micros
User Entered:LINKED LIST
Minimum index 0
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\Program Files\
New Mid VALUE 5
myArray[5,0]==LINKED LIST
LINKED LIST Found
Return Value mid:5,Found:True
```

## Test Case no 4



```
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\WINDOWS\Microsoft
User Entered:LIST
Minimum index 0
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\Program Files\Mi
New Mid VAlue 5
myArray[5,0]=Linked list is lower than LIST
New min value: 6
Minimum index 6
New Mid VAlue 8
myArray[8,0]=Self - Balance Tree is higher than LIST
New rowMax:7
Minimum index 6
New Mid VAlue 6
myArray[6,0]==LIST
LIST Found
Return Value mid:6,Found:True
```

Test case no 5

```
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\WINDOWS\Microsoft.Net\assembly\GAC
User Entered:ABCD
Minimum index 0
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\Program Files\Microsoft Visual Stu
New Mid VAlue 5
myArray[5,0]=Linked list is higher than ABCD
New rowMax:4
Minimum index 0
New Mid VAlue 2
myArray[2,0]=Graph is higher than ABCD
New rowMax:1
Minimum index 0
New Mid VAlue 0
myArray[0,0]=Array is higher than ABCD
New rowMax:-1
Return Value mid:0,Found:False
Display Message in toolStrip:!Could not found the typed word...
```

Test Case no 6



```
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\WINDOWS\Microsoft.Net\ass
User Entered:CSHARP
Minimum index 0
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\Program Files\Microsoft \
New Mid VALUE 5
myArray[5,0]=Linked list is higher  than CSHARP
New rowMax:4
Minimum index 0
New Mid VALUE 2
myArray[2,0]=Graph is higher  than CSHARP
New rowMax:1
Minimum index 0
New Mid VALUE 0
myArray[0,0]=Array is lower  than CSHARP
New min value: 1
Minimum index 1
New Mid VALUE 1
myArray[1,0]=Binary Search Tree is lower  than CSHARP
New min value: 2
Return Value mid:1,Found:False
Display Message in toolStrip:!Could not found the typed word...
```

## Test Case no 7

```
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\WINDOWS\Microsoft.N
'IntraWiki.exe' (CLR v4.0.30319: IntraWiki.exe): Loaded 'C:\WINDOWS\Microsoft.N
Display Message in toolStrip:User has not typed any word...
```



## Question 13

Once you have completed coding and testing of this prototype application you can answer the following questions and complete the Post Development Analysis section in the template below.

- What SDLC did you use during the development of the Prototype Application?
- How effective was your project plan in developing the final prototype?
- What alternative data structures could be used?
- What constructive advice could you provide for the development of a similar project?

Post Development Analysis
Questions
What SDLC did you use during the development of the Prototype Application? Agile SDLC was used for the development of the Prototype Application. The project was meant to be completed within 8-10 weeks and continuous involvement of the client approval, improvement and additional features were added during the lifetime of the project development.
How effective was your project plan in developing the final prototype? The planning for the project development was very effective from starting to the end. As the client direct involvement in the requirement helps the project to go in the correct path. As dividing the project in smaller unit and testing was affecting for getting the final product.
What alternative data structures could be used? For the project we could have used List as a data structure.
What constructive advice could you provide for the development of a similar project? For the development of the similar project, I would recommend implementing the List as a data structure. We had faced many difficulties in managing the null data in 2-dimensional array and had to fill up the array element with empty string. If we had used list as data structure than we could have save more time and less code. Another benefit of List is that it is better for frequent insertion and deletion which was one of the requirements in this project.



## Question 14

### Demonstration and Submission

Demonstrate your working program to your lecturer using the realistic data from Question 10. Ensure your code is fully commented with your Name, ID, Date, Assessment Task placed above the workspace header. Ensure all the documentation has been completed and is ready for inspection, use the following Assessor Marking Guide to ensure all code and documentation is compliant.

### Assessor Marking Guide

Assessor Marking Guide		Satisfactory		Comment
Questions		YES	NO	
Q1	Project Specifications: All proposed program criteria is listed within the User Requirements and User Interaction Specifications.	<input type="checkbox"/>	<input type="checkbox"/>	
Q2	UML Class Diagram: List four attributes and a simple UML class diagram showing Array	<input type="checkbox"/>	<input type="checkbox"/>	
Q3	Development Methodologies: List four different SDLC methodologies, No variations of a single methodology.	<input type="checkbox"/>	<input type="checkbox"/>	
Q4	Methodology Analysis: List several (three or more) selection criteria, Lists several (three or more) recommendations for SDLC	<input type="checkbox"/>	<input type="checkbox"/>	
Q5	Project Plan: Reflect selection from Question 4 and has all the SDLC tasks outlined	<input type="checkbox"/>	<input type="checkbox"/>	
Q6	Manage Version Control System: All fields are completed and there are screen shots of GitHub desktop and cloud	<input type="checkbox"/>	<input type="checkbox"/>	
Q7	Prototype Development: all program criteria and feature have been coded, software standard have been implemented in layout and comments	<input type="checkbox"/>	<input type="checkbox"/>	
Q8	Data Structure Matrix: All 12 data structure have a suitable definition.	<input type="checkbox"/>	<input type="checkbox"/>	
Q9	UML Activity Diagram: The code has breakpoints in the Decision and Iterative constructs, the activity diagram reflects the C# code.	<input type="checkbox"/>	<input type="checkbox"/>	
Q10	Testing and Debugging: All four bullet points have been tested and the results recorded.	<input type="checkbox"/>	<input type="checkbox"/>	
Q11	Post Development Analysis: All four questions have been answered.	<input type="checkbox"/>	<input type="checkbox"/>	
<b>Assessment Decision</b>		Satisfactory <input type="checkbox"/> Not Yet Satisfactory <input type="checkbox"/>		

**Note:** All documentation must use the supplied templates/forms.

**Submit the zipped solution folder with relevant documents to Blackboard**

End of Assessment Task One