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Novice Programmers developing Small Web Applications: NetBeans or Visual Studio

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Abstract

As the demand for Web applications to be created increases, so does the demand for IDEs and most importantly developers who have the best possible skills and resources available to develop these Web applications. This report also aims to find that IDE. Using the Evidence Based Software Engineering (EBSE) Methodology and applying the DESMET assessment, this report systematically and scientifically evaluates two well-known IDEs used for Application development. Once the investigation is completed a recommendation will be made based on which program is ideal for Novice Programmers.

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1. Introduction

1.1 What is it that I am doing for my Project

In this project I am conducting an Empirical Evaluation exercise to find out a suitable Integrated Development Environment (IDE) for Novice programmers to develop small Web Applications. I will be conducting an Evidence Based Software Engineering (EBSE) exercise in order to find a solution to this problem I have.

As part of the EBSE exercise that I will be conducting, I will also be using elements of the DESMET Methodology which is a method of evaluating software engineering methods and tools. This will play a big part in my personal and practical experience with these IDEs. This will later be discussed in this project.

1.2 Why am I doing this Project

IDEs is a place for a programmer to; investigate and edit the source code of an application, it is also a compiler and interpreter, and it is used to build automation tools and is also a debugger amongst the various other benefits of IDEs.

During my industrial placement I was presented with a list of IDES. My task was to move an operation critical web application from a standalone PC to another location of my decision. This triggered a question in my mind upon my return to my final year of study.

I decided to use NetBeans as it was recommended by a senior colleague. I therefore used this Tool so that I could uncover the source code for that application. The main reason why I chose this was because I was advised and not because I saw the benefits in this particular tool.

As a final year project I have decided to conduct an extensive Empirical Evaluation, so that I can find out for myself which environment is best suited for a programmer who does not have much experience, but may still have either a gift or desire for programming small Web Applications using IDEs.

1.3 How am I going to do this Project

I will conduct an extensive EBSE exercise which is a method of determining what works, when and where, in terms of software engineering practice, tools and standards. In order to provide a solution to the problem I have, I will also be using a few DESMET Methodologies such as; Surveys, Feature Analysis and Experiments to aid me in producing some practical evidence of the practical experience of not only those around me but also professionals in this software development field that will be able to bring years of experience to my findings.

EBSE Step One: **Define an answerable question using the issue that is being mitigated.** This will involve cultivating an official EBSE question that will address the problem I have and produce an official question for my problem that will give me a route to find a solution. This question will be formed in a constructed way as we have been taught to do so in the 1st semester of our final year studies.

EBSE Step Two: **Perform a rigorous search through the literature to find evidence that answers the question best.**
This is where I will cultivate search terms based around the question that I have created in the 1st EBSE step. This research will grant me passage to find various articles and journals of both professionals and alike in the Applications Development field.

I will be using various different reliable search engines that will be able to provide me with reliable journals and articles that I could use for my project and for finding solutions for my problem. These search engines will be; **IEEE Scholar, Google Scholar, ACM Digital** etc. This will include most of the material I will need for my project.

Once I have a steady amount of reliable journals, articles and blogs (range between 20-50) based on answering my EBSE Question, then I will set out a list of selection and rejection criterions that will help me have a group of resources that is directly related with answering the set problem.

EBSE Step Three: **Appraise the evidence collected critically for its validity and how well it can be applied to answering the question.**
At this stage I will have selected reliable literature that I could then appraise. This would include a description of how the literature has matched up with the criteria. I will need to critically analyse every resource to bring out the key points for and against both technologies.

I will need to appraise the literature against the criteria that I have set out, which I will use to help me evaluate each finding in a way that I will be able to assess how effective the literature is.

EBSE Step Four: **Combine personal experience to the appraisals executed in the previous step along with customer's values.**
At this stage most of my research should have been completed and I will be ready to start my own personal findings.

Here I will conduct a few DESMET methodologies, which will allow me to extend the research I have done through journals and articles and also have another vehicle of research that I could use.

This would include conducting Surveys that would help to gain an estimated 30 personal opinions that could be added to my project. These findings will be used to develop a greater scope of opinions from professionals, Novice programmers, everyday users and also IT Students. I will also be conducting experiments that will enable me to find open source pieces of web applications I could open in both IDE's and compare different functionalities based on the findings I have found from my Systematic Literature Reviews and also my surveys.

Once completed; I will integrate my personal practical findings with the surveys and literature collected. Once this has been successfully completed then I would have enough evidence and relevant experience to make a precise recommendation on what elements of both IDEs compete with each other and which is more suitable in an overall context.

EBSE Step Five: **Evaluation the way in which steps 1-4 were executed and seek out ways to improve them.**
This is the stage where I will evaluate my Evidence Based Software Engineering exercise and look at the various ways it can be improved. I will look at the different aspects and come to a final conclusion for areas of improvement for future purposes.

1.4 Following chapters

In the next chapter (chapter Two), I will demonstrate how I constructed my EBSE question. I will also identify all of the key parameters of the question. It is always useful to display how a question is constructed as it gives deeper depth into the problem at hand and how this problem will be converted into a scientific question.

In chapter Three the EBSE question constructed will be used to set out the search criteria for the Systematic Literature Review (SLR). Through a thoroughly documented SLR it will enable me to have a deeper understanding and core knowledge of both the technologies being compared against various criterions.

From chapter Three I will have enough understanding to conduct a Feature Analysis in chapter four for the two technologies. There will be an in depth explanation of the Feature analysis at the beginning of chapter Four.

An experiment will be conducted in chapter Five. This will consist of a survey of practitioners and users of either one or both technologies that is being compared.

Chapter six will convey documentation of my practical experience with both technologies. It is at this point where I will assume the role of a novice programmer and develop a group of open-source applications in both environments (IDEs).

Chapter seven is where the SLR, personal experience and practical experience will be integrated together in order to come to a conclusion and form a recommendation based on my findings, personal experience and practical experience. The three experiments from chapters Four, Five and Six will be a personal and practical display from me and also the practitioners involved in my research.

Chapter eight is the final chapter where an analysis is made of the Systematic Literature Review conducted and also statements of points of improvement for the EBSE exercise. I will explain how the work carried out will contribute towards good practice in both industry and academia.

2. Background

In this chapter I will demonstrate how I constructed my EBSE question and also most importantly what each component of my EBSE question actually means. I plan to explain the concept of an EBSE question and also I will show how each component plays a significant role to having a complete EBSE Question.

2.1 Evidence Based Software Engineering Question One Concept

The Evidence Based Software Engineering Question One is aimed to "convert a practical problem into a question that is specific enough to be answered but not too specific that you don't get any answers." (Dr Rainer. A (2011), "EBSE Walkthrough Lecture", University of Hertfordshire).

This definition here attempts to take a practical problem and re-frame it into a software engineering question. Following this I will then create a question that will aid me in finding reliable literature. This will then give me the answers that I require for an expected requirement of answers.

Even though I may have one main question that requires an answer, I will also have sub questions that will be able to find me components of the answer I am looking for. The concept of an EBSE Question is to ensure that the question is of relevance to the problem being addressed, the question is important in relation to the problem and also whether or not the questions being asked are feasible enough to answer the question in the available time.

There are components to an EBSE Question that works together to create the framework. One component is Intervention which is the declaration of the tool that is being investigated. Another component is Baseline which is the other tool that is being compared with the main tool. The Outcome component is where the centre of the problem that needs an answer is stated. The User component is where the declaration is made for who the question is focused at. Lastly the Situation component is the part of the question where the activity is described very briefly to give readers the understanding of how the Intervention, Baseline and Outcome relate to one another.

2.2 Components of the EBSE Question

Intervention

From research previously conducted I have found that NetBeans seems to be one of the most powerful and productive IDEs on the market for providing advanced support for web applications.
The NetBeans IDE eases all aspects of web application development, incorporating a wide range of powerful features into one well-designed package. It is for these reasons that I have chosen to use this IDE as one of my technologies for my EBSE exercise.

Baseline

The Visual Studio IDE will be the technology I will be comparing with the NetBeans IDE. This is a strong tool that has always stood as a market leader and is recognized amongst Developers.

Users

I decided to focus on Novice Programmers. The reason I came to this decision is because I felt that as a final year student who has only done programming for various individual modules, I am confident that I can relate with Novice Programmers. So therefore when I am doing my searches for relevant literature and developing open source applications, I will be able to think in the same concept as my targeted users.

Situation

In this day and age that we are in, web applications seem to become more popular, more and more people are cultivating an interest in learning how to develop these applications. For example when I looked at Apple's IOS I noticed there has been a significant increase in developers and this also applies to web applications.

Outcome

I plan to compare different aspects of both IDE's and in hope come to a conclusion on which elements are more suitable for Novice programmers in what situations and in which examples.

2.3 EBSE Question

Is the NetBeans Integrated Development Environment (IDE) [Intervention] **more suited** [outcome] **to develop small web Applications** [situation] **when used by Novice programmers** [users] **rather than the Visual Studio IDE** [baseline]**?**

3. Systematic Literature Review

The search will begin with a Systematic Literature Review (SLR) that will perform a rigorous review of grey and academic literature to find appropriate articles from previously conducted evaluations of either or both NetBeans and Visual Studio. The SLR will also appraise the articles and evaluate their quality. When the SLR is completed, the findings from the SLR will then be used to create a Survey study and Feature Analysis. The survey study and Feature Analysis will provide the view via real people's experiences and opinions as mentioned in chapter 1.

3.1 Search Procedure

All searches will be executed using Google Scholar, IEEE Xplore and ACM Digital Library. Whilst performing the searches in (Table 1), articles will be retained and discarded according to the criteria below. If an article satisfies at least one criterion**,** it will be retained**.**

The search strings will be executed at the search sources mentioned above. When selecting the articles initially, the abstract of articles will be reviewed and evaluated according to the inclusion and exclusion search criteria below. For further evaluation of the articles and to refine the list of initially selected articles, their full text will be read.

Initially when I ran the searches; I was faced with much more resources than that which was relevant. Table 1 displays the number of results I found for each of the search terms when I put them through various search engines and digital libraries in order to gain a wide breadth of findings.

Once there was adequate literature found, I then needed to narrow down my search terms in order to have resources that related directly with that which I was looking for. In (Table 2) it will display the modifiers applied and how the amount of literature found was reduced in number.

From (Table 2) my biggest findings was the fact that I could enter the same search terms into IEEE Xplore instead of IEEE Scholar (which is its sister site) and even Google and this will only return articles, journals or conference notes and will most importantly ensure that it is either relevant to my search terms without duplications.

Therefore from modifying my search terms I was able to have a wider scope of literature that was more specific to the question that is being asked. I was then faced with the issue of fishing through all of the literatures to find direct answers that do not just mention these IDEs; but also mention strengths, weaknesses or most importantly direct comparisons between the two environments.

Table 1. Search Strings used for systematic literature review

Search Strings	Search Method	Date and Time	No of Results
Advantages of Microsoft Visual Studio IDE	IEEE Scholar	19/02/1213:31	8,080,000
Advantages of NetBeans	IEEE Scholar	19/02/1213:32	2,960
NetBeans vs. Visual Studio	Google	23/02/1214:32	2,870,000
Environments with best functionality for Web Application Development	IEEE Scholar	24/02/12 09:32	16,600,000
Integrated Development Environments for Web Application Development	IEEE Xplore	24/02/12 09:35	208
Best suited environment for Novice Programmers	IEEE Scholar	16/02/12 17:04	138,000,000
Microsoft Visual Studio IDE	IEEE Scholar	23/02/12 15:02	33,200
NetBeans IDE	IEEE Scholar	23/02/12 15:03	9,980
Best IDE	IEEE Scholar	23/02/1215:04	24,400,000
NetBeans or Visual Studio which one is better	Google	16/02/12 17:08	4,090,000

Table 2. Search Strings with modifiers used for systematic literature review

Search Strings	Search Method	Modifiers	Date and Time	No of Results
Advantages of Visual Studio	IEEE Xplore	Quotation marks around **Visual Studio**	29/02/12 13:31	8
NetBeans vs. Visual Studio	IEEE Xplore	Change of search engine	24/02/12 14:32	562
Environments with best functionality for Web Application Development	IEEE Scholar	"**Web Application Development**", "**Environments"**	27/02/12 09:32	28,300
Best suited environment for Novice Programmers	IEEE Xplore	Change of search engine	27/02/12 17:04	328
Best IDE	IEEE Xplore	Change of search engine	27/02/12 15:04	20
NetBeans or Visual Studio which one is better	Google	"**NetBeans IDE**", "**Visual Studio IDE**"	27/02/12 17:08	14,500

3.2 Selection/Rejection Criteria

- The article provides advantages and disadvantages of NetBeans
- The article compares NetBeans to Visual Studio directly

Articles that fit this criterion will be most valuable as they will provide direct comparisons between the two programmes in the same areas. The comparisons can be compared to the requirements extracted from articles that satisfy the fifth criterion.

- The article provides advantages and disadvantages of Visual Studio
- The article gives a justified recommendation of the most suitable IDE for the development of small Web Applications

An article that satisfies the criterion above is most likely to provide the reasons why the recommendation was made; the baseline of the recommendation. If it does not provide any reasons the article is unreliable. Again, the reasons provided can be compared to the requirements obtained from articles that satisfy the criterion below.

- The article talks about the issues of Novice Programmers developing small web applications.

An article that satisfies the criterion above will provide a basis on what the advantages of either program should correspond with. It could also highlight factors that may be seen as an advantage of one of the programs when used by experienced developers but has a counter effect on Novice Programmers.

Applying my Selection/Rejection criteria enabled me to sift through all the literature that was collected via my search terms. The 1st hurdle was to have a look at the abstract of most of the articles that I found relevant in order to have a brief idea of whether or not the article/journal/blog satisfied at least one of the criterion.

The next hurdle was to investigate whether or not the literature mentioned any of the strengths/weaknesses of either or both environments. With this particular criterion it helped me to discover that most IDEs in this current time are being compared with IBM's Eclipse, which seems to be the most popular IDE on the scene at the moment. Therefore because of this it has enabled the SLR to allow a few more results which could benefit the Evidence Based Software Engineering exercise.

Because Eclipse seems to be the biggest competitor when compared with Visual Studio and NetBeans it makes more sense to include this environment into the comparison. The reason for this is because most developers would recommend Eclipse.

From the Systematic Literature Review, twenty two articles were found that covered the following topics:

- The strengths and/or weaknesses of NetBeans
- The strengths and/or weaknesses of Visual Studio
- The issues concerning Novice Programmers developing Web Applications
- A direct comparison of NetBeans to Visual Studio
- Why either NetBeans or Visual Studio is the preferred choice for Novice programmers to develop Web Applications.

3.3 Appraisal of Articles from Systematic Literature Review

Criteria to appraise each article:

- Does the article tackle the issue of Novice Programmers
- Is the article attempting to encourage more users of a particular program to benefit the author
- Is the article based on experience or facts
- Does the article give a strength or weakness of at least one of the two environments
- What does the article imply about NetBeans, Visual Studio or both environments

1. **(Vaughn-Nichols, 2003)**
   - This article concentrates on a direct comparison of IBM Eclipse and Sun NetBeans (at the time of this comparison) whilst mentioning Microsoft's Visual Studio as the environment for "***developers who are not hard-core programmers but instead are mainstream business application developers***".
   - This article tackles the issue of developers having to use various application development environments on one project in order to get it completed. In one way this article does speak on issues concerning novice programmers. As novice programmers, people do not really want to be learning a lot of different languages and developing skills in various environments just for the sake of completing one project.
   - The purpose of this article is to;
     - States benefits of NetBeans which will be further reviewed in the Feature Analysis.
     - Attempts to encourage merged universal IDEs. This could possibly solve issues developers have with using various IDEs for different tasks.
     - Suggests that NetBeans is a sun specific IDE which would support Java developers in particular.

2. **(Nourie, 2005)**
   - This tutorial concentrates on how NetBeans was written in the Java programming language. But yet from my findings I have come to the realisation that there are "*add-ons*" that could be implemented in order to develop in other languages [1].
   - The tutorial does not consider any drawbacks of NetBeans which portrays the tutorial as one sided.
   - The tutorial is aimed at novice programmers that may be new to using IDEs and fairly new to developing applications on a Java platform.
   - The tutorial is based on experience from using the NetBeans environment.

3. **(Abramson, 2009)**
   - The article concentrates on a direct comparison of Eclipse, NetBeans and Visual Studio as popular IDEs.
   - The article is very useful as it illustrates how IDEs work alongside other applications in order to develop web applications.

- It is not mentioned, but the authors seem to be experienced practitioners and have based the following article on their personal experiences with using these environments.
- This article is useful because it highlights a key issue novice programmers would encounter, which is debugging. This is a crucial area especially for users without prior experience of developing applications through various programming languages.
- Visual Studio is built for the Windows platform and supports C programming amongst others such as C++, C#, J#, ASP. NET etc.
- The NetBeans IDE is built upon the NetBeans platform which supports Java programming.
- Strength of NetBeans over Visual Studio in this statement would be the fact that there are various extended packs available that enables NetBeans to support and develop C/C++ applications.
- The article suggests that Eclipse as a tool that ought to be used by most users/developers for developing applications.

4. **(Mckinney, 2003)**
   - This article refers to SoftWIRE, which is a graphical programming integration environment for Visual Studio.
   - The article suggests that SoftWIRE provides a better way to teach introductory programming.
   - This article tackles the issue of which IDE is suitable for novice programmers.

5. **(Evjen, 2003)**
   - This article concentrates on how Visual Studio was created for using .NET and hardly touches the NetBeans environment, but the detailed discussion about Visual Studio is significant.
   - The article does not consider any drawbacks of Visual Studio which portrays the article as one sided.
   - The article does not specify whether or not the Visual Studio IDE is best suited for Novice Programmers but it does however state benefits of Visual Studio that seem to be factors that would aid Novice Programmers especially; so it can be argued that the article is addressing new developers.
   - The article discusses an element of Visual Studio called Visual J#. Visual J# is an imitation of Java but on a more basic level for beginners. This is ideal for Novice Programmers as it is an easy form of Java, novice programmers can use this when needed instead of having to learn Java.
   - This article is based on facts, which means it is a reliable source.

6. (**Xinlei, 2011**)
    - This article is a direct comparison of NetBeans and Eclipse based on bug data.
    - The article is based on discovering which of these two IDEs is better compatible with different operating systems.
    - A limitation of NetBeans is the possible number of bugs that could be in the IDEs database.
    - The article tackles the issue for novice programmers as in if the IDE has high levels of bugs then the user will need to have a deep knowledge of bug/error handling.
    - Eclipse is preferred to NetBeans in terms of stability which does play as a key limitation and disadvantage for novice programmers.
    - The article is implying that if programmers are using Mac then they must go with Eclipse whilst with Windows it is more likely NetBeans.

7. (**Boekhoudt, 2003**)
    - This article provides an argument against IDEs and is supportive of primitive programs (e.g. Notepad). It provides feeble advantages about Visual studio but does not provide anything specific about NetBeans.
    - The article seems relatively biased, not to NetBeans or Visual Studio however but are against them and other IDEs. However the content is relative.
    - The article draws attention to a person the added stress and extra languages and programs needed to do anything in an IDE. When creating Web applications with IDEs, a user usually ends up having many applications running in order to complete development.

8. (**Dillon, 2009**)
    - This article is based on comparing IDEs to Command Line/ Console Environments
    - The article was based on performing interviews on undergraduate students. This article relates to addressing the issue of which environment is more suitable for development by novice programmers.
    - The article suggested that through findings it was discovered that students favoured the Visual Studio IDE compared to a Command Line Environment.
    - Article contains a brief comparison of Eclipse to Visual Studio in relation to a Command Line Environment [p41].
    - Article states that Visual Studio has a powerful debugging tool.
    - Article states how long it took student to get "*comfortable*" [p46]. This is beneficial to the exercise because it provides foundation to the length of time taken for a novice programmer to learn how to develop in Visual Studio.
    - Visual Studio has abilities to automatically format and align code along with being able to compile and execute a program with "just a click" of a button. Other strengths of Visual Studio were Syntax Highlighting and managing projects.

9. **(Bragdon, 2010)**
    - This article is based on suggesting a prototype IDE user interface for Java based on working sets.
    - This article does not mention any strengths or weaknesses of either Visual Studio or NetBeans.
    - The article compared the code bubble IDE with Eclipse.

10. **(Votis, 2009)**
    - The article is based on presenting an advanced accessibility simulation using the NetBeans IDE.
    - The article investigates NetBeans as a tool that is available as widely as possible and can be manipulated easily by experienced or inexperienced users. This implies that the authors are looking at a tool that can be used by novice users also as well as professionals.
    - Article contains advantages of the NetBeans' plugin such as 'preview design', which enables developers to preview the form layout.
    - Article states strength of NetBeans being the 'Run Main' functionality (User Interaction) which gives the developer the ability to explore, run and test their implementations whilst the application is running.
    - The article addresses the issue of Novice programmers' ability to understand what it is that they are coding. The user can view their changes live, which limits the errors that can occur.

11. **(Markelov, 2011)**
    - The article presents an approach to implementing data repository of user interface components as a module for the Graphical User Interface (GUI).
    - The article contains a direct comparison of NetBeans and Visual Studio in terms of programming languages supported and the Number of User Interface controls in the GUI builder packages.
    - The article does not address the issue of Novice Programmers.
    - The article does not suggest which environment is more suited for web application development.
    - The article is based on facts and research collected, therefore this article is reliable in terms of a User Interface comparison.

12. **(Satav, 2011)**
    - The paper is based on a comparison of various IDEs including Visual Studio and NetBeans.
    - The paper states that both NetBeans and Visual Studio are IDEs used for developing application in the C/ C++ programming language, also mentioned in article [3].
    - There is no proper description of the strengths/weaknesses of Visual Studio.
    - The paper mentions strengths of NetBeans such as the GUI design, JavaScript editor features comprising of syntax highlighting refactoring etc.
    - The paper implies that the NetBeans Java IDE is used on various operating systems as mentioned in article [6].

- The paper implies that NetBeans contains a Profiler which is used to analyse which section of the program should be optimised in order to increase its overall speed. This addresses the issues of Novice Programmers this shows that there is assistance available to ensure that coding is conducted in an effective way.
- The paper states that a debugger is a crucial element to any IDE and NetBeans has this element which definitely supports a Novice Programmer in terms of writing error free code.
- A strength that the paper highlights is the fact that NetBeans contains a GUI Builder which is not common to all IDEs at this stage.
- GUI building assists programmers in terms of the ability of automatic code generation and conversion in order to match the code written by the programmer.
- The paper is based on both experiences and also facts and figures so data is reliable.

13. (Zadgaonkar, 2006)

- The article is based on a direct comparison of NetBeans and Visual Studio.
- The article mentions features of Visual Studio such as Parallel Programming, Democratizing application lifestyle management, web development, database management.
- The article mentions features of NetBeans such as Multi-language editor for Java and dynamic languages, Live Parsing, Refactoring, Smart Code Completion, "Go to File, Go to Type, Go to symbol", Insert Code, File history etc.
- The article encourages developers to use NetBeans for building Java and open source application.
- The article encourages developers to use Visual Studio for developing in .NET
- The article addresses the issue of Novice Programmers because it gives a distinct breakdown of both IDEs.
- The article is based on personal experience.

14. (Furmankiewic, 2010)

- The article is based on a comparison of NetBeans, Eclipse and IntelliJ.
- The article suggests developers should use Eclipse.
- Ever since NetBeans 5.5 the IDE has provided a "top-notch" user experience.
- The article implies that the menu layout is very logical and easy to use.
- The NetBeans' Code completion is slower than other IDEs.
- This article addresses the issue of Novice Programmers being able to use the NetBeans IDE to develop applications.
- The article is based on personal experience.
- The NetBeans Visual Webpack which is an add-on of NetBeans has a few drawbacks such as lack of support for page templates, lack of support for deploying applications to servers that use certain web based environment.
- The article states that NetBeans does not have the same size community as Eclipse. NetBeans needs more resources behind it in order to become number one in the Java IDE space.

15. (Jacobs, 2010)

- The article is based on a direct comparison of the advantages/disadvantages of NetBeans and Visual Studio.
- The article states strengths of Visual Studio such as; Intellisense, Automatic code formatting, Extensibility and compiles code.
- The article states limitations of Visual Studio such as; "CPU Hog", Overwhelming GUI and Cost.
- The article states strengths of NetBeans such as; Extensibility, Compiles code and most importantly it is free.
- The article states the disadvantage of NetBeans being that it is "Bloated"
- The article is based on facts and experience.
- The article addresses the issue of which IDE is most suited for Novice Programmers.
- The article does not suggest which environment is best.

16. (Wu, 2009)

- The article is based on investigating the security checks in Visual Studio.
- According to the article Visual Studio has embedded into its system security checks where it generates out a 32-bit word into the stack in order to mask the data and this word is used to identify the data in the stack.
- The article does not address any issues concerning Novice Programmers.
- According to this article when security checks are embedded into the Visual Studio compiler, it degrades the performance. So this could be classed as a limitation if the user desires to protect the code of the application they are developing. Such a task would imply that this cannot be done be a novice user as it would mean having prior knowledge of processing security checks in their coding.
- The article suggests that the code generated in Visual Studio should be integrated with other protection technologies, which would be separate from the actual IDE.
- The information found in this article is not useful as it does not contain any resource that supports the EBSE Question.

17. (Gregersen, 2008)

- The article is based on applying a novel dynamic update approach to NetBeans' reload feature.
- The article states that NetBeans has multiple dependency problems. If a change is made in one module that has dependants then when that module is reloaded then it may not reload in the other modules which could then lead to inconsistencies in the program.
- The article implies NetBeans takes a logical step to overcome these issues. The article says that NetBeans unloads the initiating module and all its dependants in one operation, thereby ensuring that shared types are always compatible. This is good to some extent but this will not help a novice programmer if he/she has to go through some complex algorithms in order to complete a task in just one module.
- As mentioned the developer would need to change every instance in all of the modules in the application being developed in the NetBeans IDE every time a change is made that directly relates to other modules.

- The article makes a statement that the NetBeans module system prohibits circular module dependency, so therefore modules in this IDE would not be able to depend on one another in order to function properly.
- The article suggests that In-Place Proxification techniques and correct handling of correspondence mapping lets modules interact naturally regardless of the number of dynamic updates that have been applied. This could then make this a benefit of NetBeans if applied correctly.

18. (Unanimous, 2007)

- The article is based on a direct comparison of NetBeans and Visual Studio
- The article supports the issues of Novice Programmers in a way where it gives the user an opportunity to look at different features of either IDE in comparison to his/her strengths and weaknesses
- Again supported OS/Platforms would be an issue if the user was developing applications in any other system besides windows. Because Windows is a product of Microsoft, Microsoft mostly favour their own brands so therefore this would be a limitation towards the Visual Studio IDE
- NetBeans covers more programming languages so therefore in terms of the suite of plug-ins available to NetBeans, This IDE would be classed as a better IDE according to this article
- According to this article both NetBeans and Visual Studio have an advantage of Code Completion which is crucial to any and every developer. But in this comparison it is simply a case of speed vs. data available. If users are willing to wait slightly longer in order to view all methods and variables available then NetBeans would win in this light. But on the other hand if users are limited on time and wouldn't mind viewing one method or variable at a time then the speed of Visual Studio would win this comparison. The question here in this article is whether or not what is available for Code Completion is relevant to that particular developer
- According to this article NetBeans is the best out-of-the-box IDE option due to its RAD
- The article confirms claims that have been found from what other articles found about the great quality of the GUI Builder over other IDEs
- The article is based on personal experience and facts which makes it reliable
- The article seems to lean more towards Eclipse as a preferred IDE overall

19. **(Unanimous, 2011)**

- The article is based on a comparison of NetBeans and Eclipse
- The article is based on personal experience
- The article states that NetBeans provides built-in support for most of its features. This would address Novice Programmers' issues with initially learning how to use a specific IDE
- NetBeans comes with sample applications that a Novice Programmer for say could use to learn how to do basic Java programming before commencing on development a live web application

- The article suggests that developers that are using Java to develop applications for the first time should use NetBeans

20. **(Jackson, 2012)**
    - The article is based on an analysis of NetBeans 7.1 which was released early this year
    - The article states that NetBeans uses the latest version of Java Swing GUI. This could seem to be quite a good thing, but because it is fairly new it is very hard to say what bugs could possibly be in this newly released version of the NetBeans IDE
    - NetBeans 7.1 contains a visual debugger that can be used to pinpoint problems in the code. This would assist a Novice programmer because once he/she has seen what an error looks like at least a few times then it makes error handling a lot easier once the developer has been adjusted to such an IDE
    - This article is just based on facts that may have been released by Oracle who has owned NetBeans since 2010, so the data is not very reliable
    - One advantage highlighted by this article was the fact that NetBeans has been integrated with an open source environment whereby multiple programmers can work on a single program together. Therefore this expands a user's experience in comparison with well-established developers who can lend a "helping hand" to Novice Programmers

21. (**Steffen, 2007**)
    - This article is based on an analysis of NetBeans in terms of IT development and deployment
    - This article confirms many claims that have been made in other articles concerning NetBeans supporting multiple languages
    - This article states a few of the features of NetBeans that can be classed as strengths such as; supporting the entire application development life cycle. This is also an advantage for Novice Programmers that may find it hard to trace at what stage of the cycle they are currently in
    - This article attempts to expand on ways of bridging the gap between IT and the Business. Most web applications are created in order to fulfil the requirements of a business in order to satisfy a need for a tool to either share opinions, data or to add functionality to an organization
    - This article is based on facts
    - The article implies that the extension packs available for NetBeans enable developers to master heterogeneous projects. This grants an advantage for developers who want to learn a new language without having to change functionality and menu selection etc.
    - Because this article is based on NetBeans it suggests users to use NetBeans for the development of Business IT applications.

22. (**Prajapati, 2009**)
    - The article is comprised of a comparison of NetBeans and Eclipse.
    - The article helps us to understand that NetBeans provides Support in Coding, Support in Testing, Support in Integration and Deployment and Support in Maintenance. Because NetBeans provides all means of support for developers. This could mean that a Novice Programmer would be comfortable with developing small Web Applications in this IDE due to the amount of support available from the tool.
    - The article is based on experience and also facts which would make the data reliable.
    - The article does not produce any recommendations for the preferred IDE.

Table 3. Literature Appraisal Results

Article no. (refer to list of appraisals)	Retained or Rejected	Explanation
1	Retained	This article was retained because this can be used as reference in my Questionnaire explanation as it gives a comparison of the mentioned environments
2	Retained	This article has been retained as it gives personal experience of NetBeans in terms of developing Java web applications
3	Retained	As mentioned in the appraisal for this article, it includes direct comparisons of both environments
4	Retained	This article has been retained because it cover an additional tool that can be added on to Visual Studio in order to enable the teaching of this IDE
5	Retained	This article can be used as reference due to it being based on facts about Visual Studio and .Net/J#
6	Retained	This article will be retained for use in the Feature Analysis exercise where there will be a comparison of both IDEs features
7	Retained	This article will provide questions to how suitable IDEs are for novice programmers and also how beneficial Visual Studio is
8	Retained	This article will provide questions for the Questionnaire as it is based on interviewing students who have used Visual Studio
9	Rejected	Insufficient amount of evidence. This does not provide enough evidence to support my research

10	Retained	This article will provide questions that could be asked during the practical experiment phase where open source application will be tested in both environments
11	Retained	This article brings will support the exercises to come in the following chapters concerning the languages supported by both environments
12	Retained	This article will be used to form questions for the Questionnaire and suggests features for comparison also
13	Retained	The article provides questions and answers for the Questionnaire, Feature Analysis and also the recommendation
14	Retained	The article brings up questions that will be addressed in the following chapters to come concerning features of NetBeans
15	Retained	This article achieves most of the appraisal criteria except suggesting which environment is more suited which will provide a backbone for the recommendation
16	Rejected	Not relevant enough for Systematic Literature Review
17	Retained	This article will supports facts and opinion about NetBeans for the recommendation
18	Retained	This article will be used to provide features for the Feature Analysis and also questions for the Questionnaire
19	Retained	This article will be used for the Experiment where open source applications will be developed
20	Rejected	NetBeans 7.1 is just over 2 months old and a proper evaluation has not yet been conducted
21	Retained	This article will provide evidence for the analysis of NetBeans in terms of features that are essential for novice programmers
22	Retained	The article will be used as reference for the recommendation based on facts and opinions provided by the author

4. Feature Analysis Exercise

This chapter is based on conducting a Feature Analysis based evaluation. In this chapter an attempt will be made in comparing the feature of two technologies. The comparison should support features that will grant Novice Programmers with the right necessities in order to develop small web applications.

As time and resources are quite limited, it will be ideal to conduct a Feature Analysis-screening mode. This feature analysis is a method of comparing both NetBeans and Visual Studio directly according to the features they both consist of. The results of the feature analysis should paint a clear picture on where both environments stand for each feature; which environment is stronger and which environment is weaker.

The components of the Feature Analysis have been derived from the articles alongside personal observations of both tools. The Feature analysis will follow the guidelines proposed by Kitchenham [23]. The scoring scheme for the feature analysis will be a rating from 1 to 5 based on level of support and the judgement scale can be found in (Table 5). The restriction of rating the features from 1 to 5 only is discouraged; however it will be used for simplicity. Also participants will be asked to rank every feature in terms of relevance from 1 to 21.(Table 4) contains a shortened list of the features to be analysed along with their importance to this reports evaluation. In (Table 4) a two value conformance scale will be used in order to assess whether a given feature is supported by the tool or not.

Table 4. Feature Analysis Table

Feature	NetBeans IDE	Visual Studio IDE
GUI Builder	Yes	Yes
Compiler	Yes	Yes
Debugger	Yes	Yes
Code Completion	Yes	Yes
Supported Languages	Java, C/C++, Ruby, PHP, JavaScript, HTML/CSS, JSP, JavaFX, XSL, UML	C/C++, C#, ASP.net, HTML/CSS, LINQ
Supported OS/Platforms	Windows, Mac, Linux, Solaris	Windows
Source Code Editor	Yes	Yes
GUI & RAD Tools	Yes	Yes
Profiler	Yes	Yes
Testing / Maintenance	Partial	Yes
User Interaction	Yes	Yes
Integrated Tool chain	Yes	Yes
Code Coverage	Yes	Yes
Static Code Analysis	Yes	Yes

Designing/ UML	Partial	Yes
Extensibility	Yes	Yes
Parallel Programming	Yes	Yes
Usability	Yes	Yes
Reliability	Yes	Yes
Robustness	Yes	Yes
Live Preview	No	Yes
Size Requirements	Pentium III 700MHz, 384MB RAM, 125 MB Disk Space	Pentium III 600MHz, 160MB RAM, 4.1GB Disk Space

Table 5. Feature Analysis Table with scoring

Feature		**NetBeans IDE**	**Visual Studio IDE**
	Ranking	Level of Support	
GUI Builder	12	12	10
Compiler	3	12	12
Debugger	7	12	12
Code Completion	32	10	11
Supported Languages	51	14	9
Supported OS/Platforms	51	12	9
Source Code Editor	30	11	12
GUI & RAD Tools	55	11	13
Profiler	27	12	12
Testing / Maintenance	42	11	12
User Interaction	48	11	13
Integrated Tool chain	54	9	11
Code Coverage	33	10	13
Static Code Analysis	27	11	13
Designing/ UML	53	8	13
Extensibility	46	9	12
Parallel	44	6	13

Programming			
Usability	34	12	14
Reliability	17	12	13
Robustness	21	11	12
Live Preview	50	3	14
Total		**219**	**253**

Table 5a. Judgement Scale

Scale Point	Score
1. Little/no Support	1
2. Some Support	2
3. Strong Support	3
4. Very Strong Support	4
5. Full Support	5

Below are further explanations of the features listed in (Table 4) and above is the table used for the Judgement Scale used for the exercise. The Feature Analysis exercise given to 3 participants can be found in Appendix 1.

- **Non-functional features:**

1. The usability in terms of navigation of the environment is expected to be of a high standard. As the users are most probably new to the aspect of Web Application development, they will need an environment which makes developing as simple as possible. This also applies to the Graphic User Interface (GUI) of the program. An environment with poor usability will contribute to difficulties the Novice Programmer may already have with Web Application development.
2. Reliability of the program is also a contribution to the EBSE Question. An environment that is less prone to attacks is more reliable and therefore Novice Programmers will not have to worry about losing recent updates to the application. It is a frustrating and aggravating problem to lose work and having to start again.
3. Reliability and robustness go hand in hand as the program should be able to recover efficiently if an error does occur.

- **Functional features:**

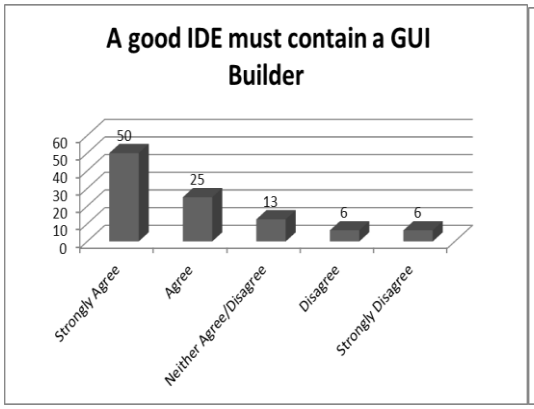
1. User Interaction and Code Completion are mandatory features of an IDE. The Novice Programmers will benefit greatly from the assistance provided from them. These features are the differences between an IDE required for any developer and an IDE required for a Novice Programmer as a new developer will need assistance but an experienced one is not likely to rely too heavily on these features.
2. An IDE that adopts Static Code Analysis is appealing for a Novice Programmer as it will allow the developer to view any possible defects that could arise in the web application that they are developing.
3. Using an IDE that is compatible with more than one operating system is another contribution to the EBSE Question as it will increase the availability of the IDE and decrease the chances of Novice Programmers struggling to find ways of using the IDE.
4. Debugging is also compulsory as it is what will identify problems with code and let the user know where the problem is. It is most likely that a user will write incorrect code when learning, so if the debugger is not present in the environment or is weak the user will struggle to find out where the errors are located and may not learn how to correct them.
5. Live preview is a feature of Visual Studio that allows the user to load the application in a browser and will update every time the application is updated. It is a useful feature that is convenient and nice to have but not exactly mandatory.

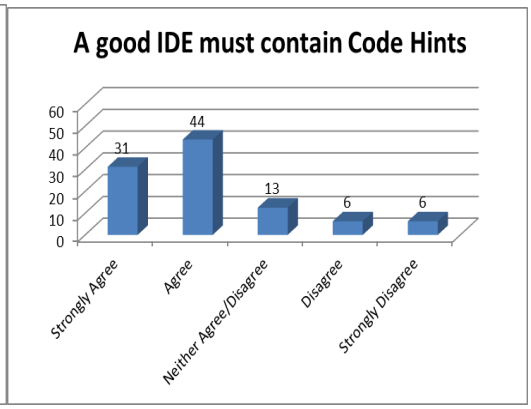
5. Survey Study

A questionnaire was created in order to find out the opinions of inexperienced developers on their preferences of the features of an IDE. The target for participants was students who were currently studying Web development. The survey did not include individuals who previously studied Web development because there would be no way of distinguishing between the inexperienced and experienced developers' results and the aim of the survey is to identify the preferences and difficulties of the inexperienced developers. 30 responses were received and the result tables are placed next to each other for the simple case of saving space. The survey consists of statements which the individual can agree or disagree with on a scale of 1 – 5 with:

- 5 meaning Strongly Agree,
- 4 meaning Agree,
- 3 meaning Neither Agree or Disagree,
- 2 meaning Disagree
- 1 meaning Strongly Disagree.

The questionnaire is found in Appendix 2.



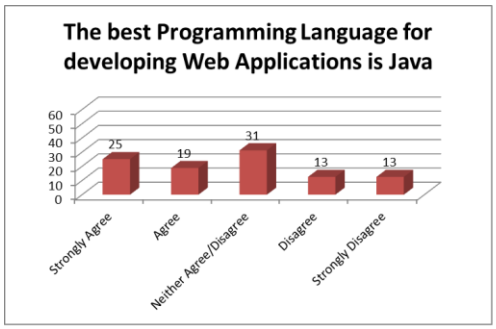


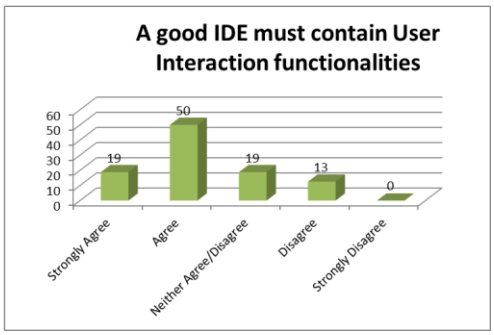
1) A good IDE must contain a GUI Builder

As both environments have this feature, this question determines the dependency of novice programmers on this feature. Article [12] and [17] points out that NetBeans has the appealing feature called a GUI builder which assists the programmer is automatic code generation that matches what the user is coding. 50% of the participants Strongly Agreed that this feature was necessary as it has evidence of supporting Novice Programmers with creating successful Web Applications. In my Action Research I will be investigating how the use of a GUI Builder is in both environments.

2) A good IDE must contain Code Hints

The aim of this question was to find out the level of dependency Novice Programmers seem to have on help features and assistance. The majority (75%) of the participants agreed that they rely on code hints, this makes this feature essential and must provide the help that is suggested because since most participants stated it was a requirement.



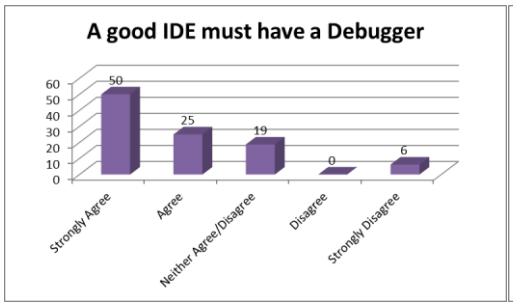


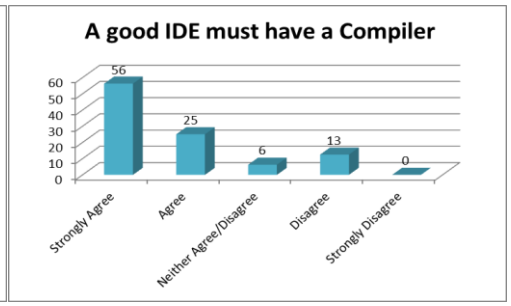
3) The best Programming Language for developing Web Applications is Java

The aim of this question was to find out which Language was favoured by users and also in order to see which IDEs were available for that language. 44% of the participants said they thought that Java was the best language and 31% didn't agree nor disagree, so this meant that people either didn't mind which language they used or it didn't make a difference to their tasks. The NetBeans IDE would be the obvious choice for that 25% that strongly agreed to Java being the best Programming Language. In the case of this question it rules out Visual Studio as an option for Novice Programmers especially if they require using different languages.

4) A good IDE must contain User Interaction functionalities

Article [10] states that NetBeans contains a feature which enables the user to interact with the system which gives the developer the ability explore and test their implementations whilst the application is running. Visual Studio requires an add-in in order to have the same level of interaction as NetBeans. 69% of the participants agreed that having User Interaction functionalities would be good as it would make conducting tasks a lot easier. In the practical experiment I will be investigating how effective the User Interaction is in both environments.



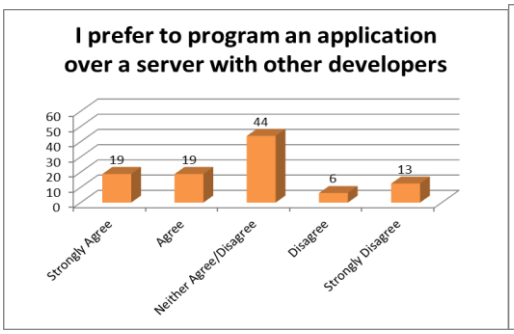


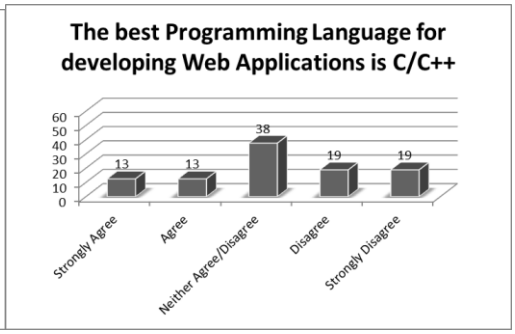
5) A good IDE must have a Debugger

It is compulsory that every IDE has a Debugger. This is also of great benefit when it is an effective Debugger. 50% of the participants strongly agreed with this statement. According to a NetBeans forum [24] where the author was listing the advantages and disadvantages of NetBeans against Visual Studio the author stated that Visual Studio's Debugger was easier to use as compared with NetBeans. So this statement and the results I have found will play a key part in the definition of the **most suited Integrated Development Environment for developing Web Applications**.

6) A good IDE must have a Compiler

Just like Question 5 the Compiler is a compulsory feature of every IDE. 81% of the participants stated that the Compiler was a necessity of a good IDE. This question is important because it gets the participants and also any user to think how good a compiler must be in order to fulfil its role. If I refer back to the NetBeans Forum [24] the author states that NetBeans compiles whilst the user is still typing, this gives the user an edge because then they wouldn't have to remember to continuously compile to ensure the code is correct but then it varies on how long it takes each IDE to compile which will be investigated in the practical experiment.



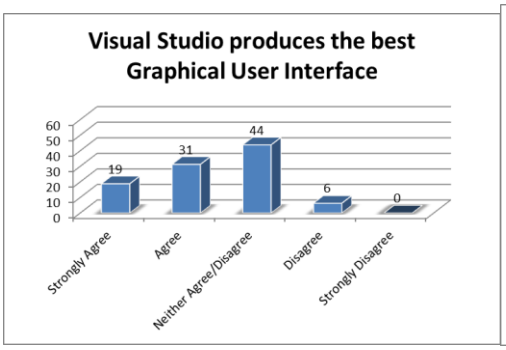


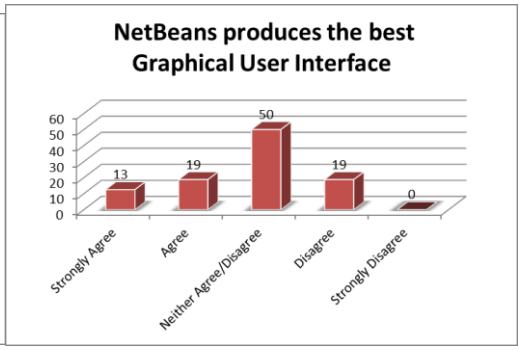
7) I prefer to program an application over a server with other developers

This question is more applicable to users who either require Parallel Programming or would like to share an application with other developers or friends over a server where they can view each other's updates to the application. As seen by the results 44% of participants stated they did not mind this ability being included in an IDE. But yet there were a few (38%) that made it known that they did require this function as it could appear to be very helpful to those who need it.

8) The best Programming Language for developing Web Applications is C/C++

This question was given in order to gain the opinion of C++/C developers who desire to remain faithful to their programming language. 26% of the participants stated that C/C++ was their favourite Language for developing Web Applications. Both NetBeans and Visual Studio have the capabilities to be used with this language. Visual Studio uses this Language by default whilst if NetBeans users wanted to program in C they would need to use an add-on. This question will be referenced in the recommendation.





9) Visual Studio produces the best Graphical User Interface

This question was put in place to see what users thought about the Graphical User Interface of both Environments. Article [15] stated a limitation of Visual Studio, which was that the author felt that Visual Studio had an overwhelming GUI. Looking at the results from this question it appears that 50% of participants would disagree with the statement made by Jacobs [15]. The majority of programmers felt that Visual Studio produces the best GUI and from market research Visual Studio has been the most popular IDE on the market before being compared to Eclipse.

10) NetBeans produces the best Graphical User Interface

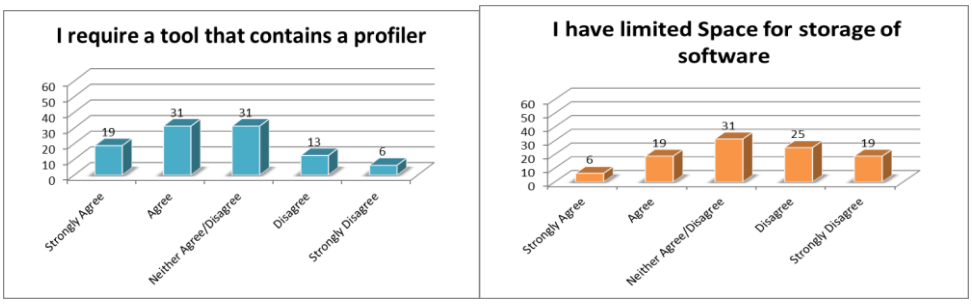
This question is in direct comparison of Question 9. This question was supposed to be a mirror reflection of question 9 because if most participants felt one IDE contained the best GUI then by theory the other IDE would not be considered as having the best IDE. 50% of the participants did not agree nor disagree with NetBeans producing the best GUI which would mean that they were looking at this element of the environment. Whilst on the other hand 32% of participants agreed that NetBeans did produce the best IDE. So therefore it would be classed down to user preference.

11) I prefer an environment that contains testing abilities

This question was formed from a query made through the Feature Analysis. A tool that contains testing ability is a compulsory necessity as it would enable a Novice Programmer to do more tasks when developing a web application. 82% of the participants agreed that they preferred an IDE that contained testing ability. Article [22] stated that NetBeans contained testing support which means that NetBeans has the ability to support users when coding. In the Action Research exercise I will be investigating this feature further.

12) I am willing to pay for an IDE in order to develop small Web Applications

This question was used because it addresses the fact users would need to pay that in order for users to fully enjoy Visual Studio at its full capacity. 38% agreed that they would not mind paying for an IDE which means that both IDEs would be a choice in these people's eyes. Whilst on the other hand 38% of the participants stated they would not pay for an IDE, so then this would leave these people either with the express version of Visual Studio or NetBeans that is completely free and open sourced.

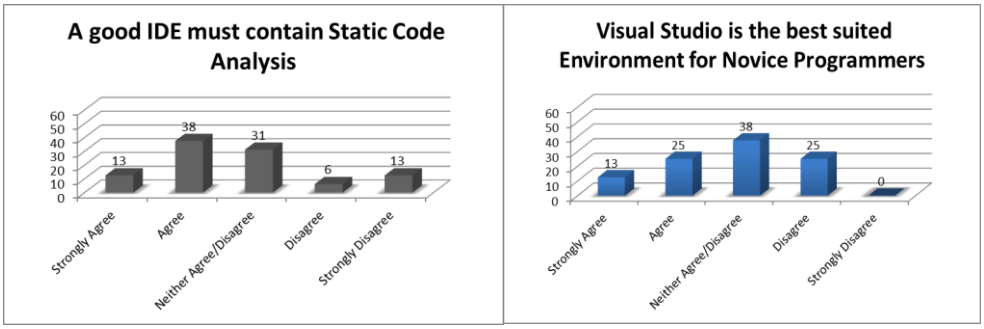


13) I require a tool that contains a profiler

Article [12] mentions NetBeans containing this feature. The majority of the participants either wanted this feature or didn't really mind if it was there or not. So this shows that a Profiler would be a crucial tool Novice Programmers as it would ensure that the applications that are being developed are created to full ability in terms of efficiency.

14) I have limited Space for storage of software

Only 25% of the participants stated that they had limited space for software, so if they had to install either IDE on to their machines then it would either need to run from and to an external hard drive or not run at all. So according to the results found this is not an issue that Novice Programmers would face as they would bear in mind that not only is a lot of space needed in order to develop web applications but also there would need to be necessary space for the store of the actual IDE.

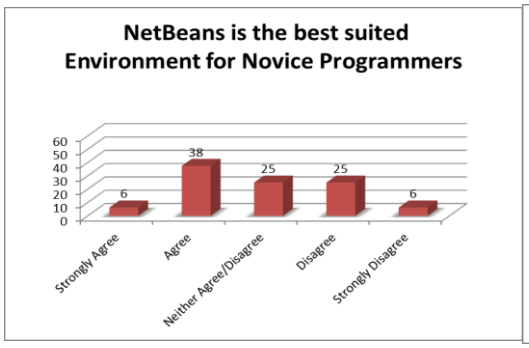


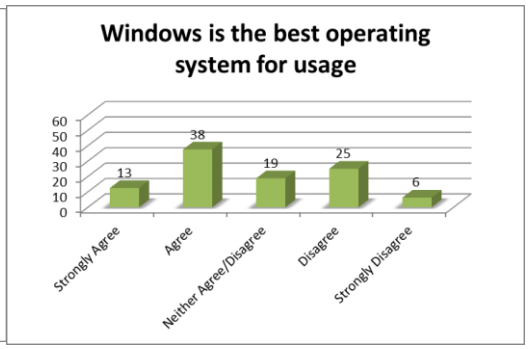
15) A good IDE must contain Static Code Analysis

From the results found for this question it is very evident that this feature is compulsory (51% of participants stated they needed this feature) as it enables the user to discover defects whilst still in the coding phase which would save a lot of time, especially in the testing phase. This is beneficial to know especially on behalf of Novice Programmers that may not have the acquired skills needed in order to effectively test a web application before launch.

16) Visual Studio is the best suited Environment for Novice Programmers

This question was used because it not only brings diversity but also gives the participants a chance to state which IDE they feel is most suited for Novice Programmers in an overall sense. Article [15] contains a recommendation by the author into which IDE is most suited for Novice Programmers and so this question was formed from this recommendation. 38% of the participants said that they felt Visual Studio was the best Environment. Evjen [5] touched on the fact that Visual Studio is best for .NET, so therefore the question goes back to which programming language will the programmers be using as well as which environment.



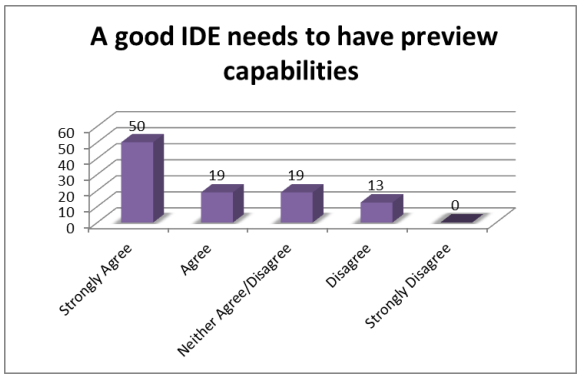


17) NetBeans is the best suited Environment for Novice Programmers

This question is just like question 16 in terms that it is asking the same question but rather about NetBeans instead of Visual Studio. 44% of the participants said that they felt NetBeans is the best suited Environment, which means that they either have experience with this IDE or have heard reviews of it. Evjen [5] recommended NetBeans in terms of Java programming as to Visual studio, which would then give the assumption that some of these participants are Java programmers (especially if they choose Java as the best programming language).

18) Windows is the best operating system for usage

Microsoft programs work best when they are used together. As Visual Studio is a Microsoft product, if Novice Programmers mainly use back end Microsoft applications, it can be assumed that Visual Studio would be the best option. The majority of the participants, 40%, said they agreed to use Microsoft applications with a very small minority, 13%, strongly disagreeing. The reason for this is most probably due to the use of Microsoft Access as a database for the Web applications. NetBeans is also flexible in terms of operating systems (as shown in the Feature Analysis in (Table 3)).



19) A good IDE needs to have preview capabilities

According to Article [10], Visual Studio contains this features which means that the user will be able to make live changes to a Web Applications which would be classed as a huge bonus to any IDE. NetBeans has a similar feature which would require a click of a button in order to give a preview of the form layout. 47% of the participants agreed that an IDE needed to have this feature. So therefore this shows that the feature would be required by a Novice Programmer.

Appraisal of Feature Analysis and Questionnaire

From the results of the Questionnaire, it is clear that the participants preferred an Environment that provided the most support possible. This supports my research in terms of the most suitable tool to aid Novice Programmers in developing a Small Web Application. If the decision was based on the Questionnaire, it would be NetBeans based on the additionally help given by the IDE, which was also the same finding I got from my SLR where most developers were in favour of NetBeans due to not only the features but also the diversity of Languages available. But then on the other hand if the decision was based on the Feature Analysis then it would be Visual Studio as the professionals who graded the features felt that Visual Studio provided more support for developing Web Applications. So from the findings here it seems that the opinions of Developers, Industry Experts, IT Professionals and students are diverse in terms of the **most suited Integrated Development Environment for developing Small Web Applications when used by Novice Programmers**.

(Table 5) shows the results and scoring sheet for the Feature Analysis Exercise. The results do not reflect the findings I received from the SLR exercise. According to the articles found most users favoured NetBeans. But here the participants have made a fair decision based on their previous experience with both tools or in assumption with specialising in one tool which could then lead to favouritism of one tool over another. This can be the case at times, especially in programming where a developer will naturally prefer their favourite IDE over others but of course I did not ask the participants which tool that favoured as it was confidential.

The findings here have displayed the fact that NetBeans does not contain Live Preview, but does contain a similar feature where the user can preview the HTML page but of course it would not be a live version of the application. So therefore with bearing that fact in mind it would be clear why NetBeans scored 2 for that particular feature as it shows little/no support for such a helpful feature for Novice Programmers.

Article [13] mentions a feature of Visual Studio called **Parallel Programming**, which is another feature that is crucial to Novice Programmers that does not seems to be supported a lot by the NetBeans IDE. Up to this year it would be clear that Visual Studio would win by a land slide in terms of that feature but according to article [20] in the latest version of NetBeans 7.1, NetBeans has integrated with an open source environment where developers can work on the same application together. This would not be included in this comparison as the tool is fairly new (under 3 months old) and based on the results I received from my Feature Analysis I doubt these professionals have used this tool yet. This appraisal will be used to support my Recommendation

6. Action Research

In order to validate or disprove points and evidence that has been gathered using the Systematic Literature Review, Feature Analysis Exercise and the Questionnaire, Action Research will be carried out and the results will be included in the report. A number of tasks will be executed on both NetBeans and Visual Studio to see how each program deals with the tasks.

The tasks will be derived from the Feature Analysis. The aim will be to compare the results and highlight which are better in each environment. The tasks are listed below and the screenshots of some tasks can be found in Appendix 3.

1. Generate code with a few deliberate errors to see how efficient the debugger is:
    - NB: Contains the **Debug** option on the main toolbar so it makes it easily accessible for users to locate this error and use it effectively. Also possible to create unit tests that tests the Debugger further
    - VS: Identified that there were errors and stated what line the errors could be found on in order of their lines. Also contains the **Debug** feature on the toolbar that needs easy access to the feature.
2. Attempt to create tests to analyse testing Abilities:
    - NB: Provides a few types of test but not as extensive as Visual Studio. Methods for testing are much more complex and does not provide a wizard option to support with creating of test files
    - VS: Provides a vast number of testing methods that enables the code developed in Visual Studio to be tested extensively. Provides a wizard to assist with testing
3. Use the IDE on Windows, MAC and Linux
    - NB: Works across Linux, Windows and Mac Operating System
    - VS: Only able to work on the Windows operating System
4. Evaluate both Environments in order to investigate the Parallel Programming abilities:
    - NB: This feature is not included in NetBeans but on the other hand in version 7.1 there is adjustments being made [20] where multiple Programmers that develop an application. Over time there will be more reviews on how successful this feature will become
    - VS: This feature is listed under the **Debug** tab which would enable users to work alongside one another in order to complete a task or develop a web application
5. Investigate the GUI Builder in both IDEs:
    - NB: Very similar to Visual Studio's GUI Builder capabilities but also includes additional add-ons such as automatic correct spacing and alignment. NetBeans contains a help bar that displays context-sensitive hints about what can be done with the selected component and suggests shortcuts that can speed up a user's work in the future
    - VS: Users are able to "drag and drop" elements straight on the canvas (if they have selected the **Web Development** option), which makes creating a graphical interface much more easier and realistic as then the user gets a first-hand view of what it will look like almost instantly

6. Investigate the Static Code Analysis Feature in both IDEs:
   - NB: I did not find this feature in NetBeans. So there is an assumption a deeper test may need to be undertaken in the future in order to test this feature.
   - VS: Allows the user to choose from sets of rules rather than picking and choosing from one flat list of rules.

7. Investigate the Code Coverage feature in both IDEs:
   - NB: This is a plug-in that must be activated in NetBeans.
   - VS: This is a feature that also needs to be activated in Visual Studio which may take some time but once it is activated then it becomes a very useful tool as shown in the appendix.

8. Evaluate both IDEs for their Source Code Editor:
   - NB: When Source is opened in NetBeans it immediately marks errors and highlights occurrences, which is a feature called **Live Parsing**. Another great benefit noticed was when an identifier has been renamed or a class is moved, then it automatically updates all occurrences. This supports the user in terms of **Searching & Replacing** code. This is an advantage for Novice Programmers.
   - VS: There are several ways to view the source code of an application. I.e. via the **Solution Explorer**, from within the **Form** or through the **File Menu**. The Source code can be edited through the HTML Designer, CSS Editor, and XML Editor Features of this IDE. So therefore Visual Studio gives the user choices in terms of not only confidence of which feature to use to amend the source code but also depending on what parts of the code is made available.

9. Investigate the profiling ability of both IDEs:
   - NB: Contains several methods of Profiling where the user is able to view the overall performance of the application/program that is being developed.
   - VS: Analyses the performance data collected during the performance run and will use pre-defined rules to recommend a few areas for further investigation.

10. Evaluate the User Interface (UI) of both IDEs:
    - NB: Clearly structured, Toolbar is straightforward and for easy for a user to follow. Has clear option below the toolbar for opening/ creating a project or opening /creating a file.
    - VS: Start page contains links to different templates that provides help with common issues that users have currently experienced and also displays recent projects that have been worked on in the environment.

11. Evaluate the Smart Code Completion feature in both IDEs:
    - NB: Provides support for the user especially if the user is unsure as to what code to enter into the program in the context of the particular application. This confirmed every assumption I had about NetBeans providing all code available in one call.
    - VS: Confirmation that one method or code suggestion is listed at a time.

7 Recommendation

This is the chapter where I will make a recommendation based on the Systematic Literature Review in relation to the Questionnaire (Survey Study), Feature Analysis exercise and the Action Research conducted from Chapters 4 to 6. In this chapter I will list the Advantages and Disadvantages of both NetBeans and Visual Studio. Here I will list all the interesting factors I have discovered throughout my Empirical study.

Within each of the articles selected there were several opinions portrayed where some authors stated Eclipse as the most suitable tool, which is outside of my comparison but also very crucial to the study because it opened up my research further and also gave a deeper comparison. NetBeans is noted as a market leading IDE. It is mentioned in some of the articles found – [13], [18], [19] & [21] that it is the most suited IDE and widely used tool amongst programmers within the IT industry. IT professionals who have good experiences of NetBeans have brand loyalty towards NetBeans due to its extensive functionality and the wide range of useful features it provides. As mentioned in the Feature Analysis exercise NetBeans Is adaptable to various operating systems and many programming languages as opposed to Visual Studio which seems to work best with .NET and the Windows platform.

In Visual Studio's defence, the simplicity of this IDE would make it a more suited environment for Novice Programmers. It provides a simpler form of creating applications that requires minimal programming skills regardless of programming language and has features to assist Novice users such as Smart Code Completion. Article [8] refers to Visual Studio as a preferred tool for students which can be related to Novice Programmers since both groups are classed as students learning a tool. In addition, Visual Studio includes easier and simpler version of the Java language **Visual j#**, which is a great starting point for Novice Programmers.

In terms of the Feature Analysis Conducted in chapter Four Visual Studio seemed to contain more solid evidence of the Features and strengths/weaknesses mentioned in the SLR and Questionnaire. This is reflected from what both of the IDEs scored. Professionals suggested through their grading that Visual Studio provided more support to them regardless of the level of expertise. If I put the directed audience to one side for a moment I can look at the scores and see 2 sides of the final grading. This is either the professionals have always had a good experience of Visual Studio and may be loyal supporters of Microsoft and all its services.

Visual Studio has been on the market far longer than NetBeans which would mean that "new entrants" don't always come out on top when compared to established tools such as Visual Studio. The Questionnaire reflects a broad overview of what Users thought concerning several features of either or both IDEs. One main observation made from the SLR was that developers felt NetBeans had the best GUI Builder. On the other hand Visual Studio had a better GUI Interface according to the Survey study. Also, according to Article [15] Visual Studio contained an 'Overwhelming GUI'. This shows that what inexperienced users and established developers think and feel can be totally different, even when favouritism is not applied.

A breakdown of the strengths and Weaknesses of both IDEs based on a summary of the SLR, Feature Analysis, Survey study (Questionnaire) and Action Research is found on the next page.

Visual Studio Strengths

- Provides Visual J#
- Great .NET support
- Makes aspects simpler for developers
- Great for Novice Programmers
- Stronger Debugger
- Best for web development
- Has several examples and help sections
- Strong Graphical User Interface
- Automatic code formatting and alignment

Visual Studio Weaknesses

- Relies Heavily on .Net
- Ease of use makes Novice users think tasks are trivial
- Works best with other Microsoft applications
- Microsoft has been found to be bug prone
- Overwhelming GUI

NetBeans Strengths

- Strong Compiler
- Stronger Smart Code Completion method
- Supports more programming languages
- Strong Profiler
- "Preview Design" (active plug-in enabling user to view preview of application)

NetBeans Weaknesses

- Built mainly for developing Java applications
- Preferred as an IDE for "Experienced developers"
- Complex methods in place to amend code instances in every class

The recommendation is leaning towards Visual Studio but the question is, to what extent? It is not the tool that makes the developer but the skills that are learnt and adopted. In my opinion it is better using a simple IDE like Visual Studio rather than an advanced IDE such as NetBeans. It was mentioned that it is better to understand fundamentals and underlying code thoroughly and that "learning one software package is always an extremely risky idea as tools and technologies change fast, even over three years" (A, Stanton, personal communication, April 6, 2011). Applying these opinions to the EBSE question, it is clear that the best tool for developing small Web Application is a tool that is simpler in order to allow Novice Programmers to learn the underlying code. In this case, that program is Visual Studio. As functional, popular and dynamic NetBeans is, from this report it is clear that it is not more suited for Novice programmers learning Web Application development, but rather those who are experienced and are hard core developers [1]. The Feature Analysis exercise also favoured Visual Studio as the IDE that provided a higher level of support for the provided features. Figure 1 illustrates this discussion in an argument form.

Figure 1

R: Reason

C: Conclusion

Because,

R → Visual Studio is a program that makes things simple

And because

R → NetBeans is very functional and best suited to experienced developers

And because

R → Inexperienced developers need to use a simple program to develop better coding Skills

Therefore

C → Inexperienced developers develop better coding skills in Visual Studio

Because

R → Inexperienced developers develop better coding skills in Visual Studio

And because

R → NetBeans is the best out the box IDE

And because

R → Visual Studio is best for Students

Therefore

C → The best program for Web Application development for inexperienced developers is Visual Studio because they can develop better coding skills

Therefore the recommended Environment to use to develop small Web Applications is Visual Studio.

This decision is based strictly on scientific evidence and not my very own personal opinion. Before this study started, the preferred tool was NetBeans. The reason NetBeans was preferred was due to its variance of programming languages supported as well as the community that favoured this IDE. All indicators from a 1st point view directed at this rising IDE.

Once this investigation had begun it was clear that personal opinions would not justify a good enough reason for a whole industry of developers to use one tool over the other. This scientific study provided not only a scientific question but importantly provided scientific solutions and answers that could effectively support any final recommendation. Therefore this is the main reason to my recommendation of Visual Studio IDE as the **most suited tool to develop small web Applications when used by Novice programmers.**

8 Conclusion

The report made use of the EBSE Methodology and the DESMET Methodology. The Guidelines provided by Rainer & Beecham [25] gave clear concise guidelines and instructions on how to complete each step. For future evaluations for tools/methods, EBSE is most likely to be adopted again. For a thorough review of the evaluation, a PMA (Post-Mortem Analysis) will be completed for each EBSE step. A PMA consists of the following questions:

- What went so well that I would want to repeat it?
- What was useful but could have gone better?
- What were the mistakes that I want to avoid for the future?
- What were the reasons for the successes or mistakes, and what can be done about them?

8.1 PMA of EBSE Steps

8.1.1 Define an answerable Question using the issue that is being mitigated

What went so well that I would want to repeat it?

It was initially planned to only compare NetBeans to Visual Studio for a specific purpose. After reviewing the initial EBSE that was created, it was decided that the topic was too specific and needed to broaden in order to grasp a deeper understanding of the two environments would be used for.

What was useful but could have gone better?

The search for a list of programs to select the comparable programs was valuable in terms of finding out the different programs that were available and what operating systems they were compatible with. However, it would have been more useful if the search had included personal opinions on each program and the programs had been rated in terms of purposes as opposed to being rated by how popular they are.

What were the mistakes that I want to avoid for the future?

It would be a better idea to create a general question and systematically narrow it down as much as possible in order to create a specific problem to address from the beginning and not having to revisit and correct previous steps.

What were the reasons for the successes or mistakes, and what can be done about them?

The mistake of initially choosing a problem that was too specific which was most likely due to the eagerness to begin the evaluation. In order to avoid this problem in the future, it would be best if more time is spent on this step and more background information is acquired.

The success of creating a suitable question was due to going back to review the step even though it had been completed.

8.1.2 Perform a rigorous search through the literature to find evidence that answers the question best

What went so well that I would want to repeat it?

The variety of article types that were collected, the articles included: journals, books, videos, online discussions, blogs and websites.

What was useful but could have gone better?

The articles collected were of a satisfactory amount. However, having more articles may have increased the information learnt and used and also may have validated more claims from each article.

What were the mistakes that I want to avoid for the future?

Assuming there are enough articles collected. By not thinking this way, it would lead to an exhaustive search.

What were the reasons for the successes or mistakes, and what can be done about them?

The mistake of only collecting a few articles can be avoided by allowing more time for the searches to be completed.

The success of the variety of articles was due to the personal interest in the two programs.

8.1.3 Appraise the evidence collected critically for its validity and how well it can be applied to answering the question

What went so well that I would want to repeat it?

The breadth of understanding I was able to gain about both environments which would make me a specialist in terms of the features and opinions of both environments.

What was useful but could have gone better?

The breakdown of the articles was informative but it seemed as if not enough information had been extracted.

What were the mistakes that I want to avoid for the future?

Not extensively extracting the information from the articles.

What were the reasons for the successes or mistakes, and what can be done about them?

The mistake of extracting minimal information was due to the topics of the articles. If there had been more articles specific to developing small Web applications using the two environments, there would have been more appropriate information.

8.1.4 Combine personal experience to the appraisals executed in the previous step along with customer's values

What went so well that I would want to repeat it?

The structure of the Feature Analysis exercise

What was useful but could have gone better?

The Questionnaire and Action Research were completed as planned but there had not been enough time allocated by the ethics committee to collect many more questionnaires and insufficient skill in order to conduct a thorough Action Research.

What were the mistakes that I want to avoid for the future?

Assuming the Action Research, Questionnaires and Feature Analysis exercise would be relatively simple.

What were the reasons for the successes or mistakes, and what can be done about them?

The mistake of not allocating enough time to the collection of responses from the questionnaires was due to spending too much time on the formats and designs.

This report has conducted a systematic evaluation on the ideal environment to develop small Web Applications using the EBSE methodology, which included an SLR, as well as the application of DESMET. The methods used throughout this report provided scientific and verifiable results that can be disproved or challenged. This report conducted a search to find the two programs that would be compared and evaluated. NetBeans and Visual Studio were the programs that were systematically selected. The findings from this report aims to assist anyone looking to Web Application development to select an appropriate program that is most likely to develop better technical skills. The recommended IDE was Visual Studio.

Reference List and Bibliography

1. Vaughan-Nichols, Steven .J., 2003, The Battle over the Universal Java IDE http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=1193223 Accessed 24/02/2012

2. Nourie, Dana, 2005, Getting Started With the NetBeans IDE Tutorial http://tonysnguyen.com/Documents/NetBeansIDETutorial.pdf Accessed 24/02/2012

3. Abramson, D, Chu, C, Kurniawan, D, Searle, A, 2009, Relative debugging in an integrated development environment http://onlinelibrary.wiley.com/doi/10.1002/spe.932/pdf Accessed 24/02/2012

4. McKinney, A L, 2003, A recent radical graphical approach to programming http://delivery.acm.org/10.1145/780000/770826/p28-mckinney.pdf?ip=147.197.175.118&acc=PUBLIC&CFID=69450202&CFTOKEN=56717374&__acm__=1331134365_7dd17c9aeeb77104e0071d505d928ec1 Accessed 24/02/2012

5. Evjen, B. 2003. Introducing .NET and ASP.NET. In: Wiley, John & Sons, Incorporated ASP.NET Professional Secrets. Canada: Wiley, John & Sons, Incorporated. 3-16.

6. Xinlei, W, 2011, Operating system compatibility analysis of Eclipse and NetBeans based on bug data http://delivery.acm.org/10.1145/1990000/1985479/p230-wang.pdf?ip=147.197.239.103&acc=ACTIVE%20SERVICE&CFID=86418767&CFTOKEN=35274766&__acm__=1329993859_b4d032f4a29c386c7fdaf9f46d832a84 Accessed 27/02/2012

7. Boekhoudt, C, 2003, The Big Bang Theory of IDEs http://delivery.acm.org/10.1145/960000/957775/boekhoudt.pdf?ip=147.197.239.103&acc=OPEN&CFID=86418767&CFTOKEN=35274766&__acm__=1329994480_89e8d2ec29c89845b59afe9ab1c073bd Accessed 24/02/2012

8. Dillon, E C, 2009, which environment is more suitable for novice programmers: Editor/Command Line/Console Environment vs. Integrated Development Environment? http://acumen.lib.ua.edu/content/u0015/0000001/0000103/u0015_0000001_0000103.pdf accessed 27/02/2012

9. Bragdon, A, 2010, Code bubbles: rethinking the user interface paradigm of integrated development environments http://delivery.acm.org/10.1145/1810000/1806866/p455-bragdon.pdf?ip=147.197.175.154&acc=ACTIVE%20SERVICE&CFID=86984570&CFTOKEN=13717980&__acm__=1330283160_4868f83b005638eb5696fa75e8eb47bb Accessed 27/02/2012

10. Votis, K, Oikonomou, T, Korn, P, 2009, A Visual Impaired Simulator to achieve Embedded Accessibility Designs http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=05358165 Accessed 27/02/2012

11. Markelov, O, Lobur, M, 2011, Repository of User Interface Controls in an area of Electronic Design Automation Software for Usability Improvement http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5744479 Accessed 27/02/2012

12. Sampada, S, Satpathy, S, Satav, K, 2011, A Comparative Study and Critical Analysis of Various Integrated Development Environments of C, C++, and Java Languages for Optimum Development, Sampada K Satav et al UNLASCIT, Vol 1 (1), 2011, 09-15 http://uniascit.in/files/documents/2011_03.pdf Accessed 27/02/2012

13. Zadgaonkar, H, 2006, NetBeans IDE vs Visual Studio http://hrushikeshzadgaonkar.wordpress.com/2010/10/06/netbeans-ide-vs-visual-studio/ Accessed 28/02/2012

14. Furmankiewicz, J, 2010, Eclipse, NetBeans, and IntelliJ: Assessing the Survivors of the Java IDE Wars http://www.devx.com/Java/Article/34009/1954 Accessed 28/02/2012

15. Jacobs, G, 2010, Top 5 Integrated Development Environments http://hackaday.com/2010/08/24/top-5-integrated-development-environments/ Accessed 28/02/2012

16. Wu, Y, 2009, Enhancing Security Check in Visual Studio C/C++ Compiler http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5319513 Accessed 28/02/2012

17. Gregersen, A, 2008, Module Reload through Dynamic Update – The Case of NetBeans http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4493297 Accessed 28/02/2012

18. Unanimous, 2007, Visual Studio 2008 Vs NetBeans 6.0 http://sunnytalkstech.blogspot.com/2007/09/visual-studio-2008-vs-netbeans-60.html Accessed 28/02/2012

19. Unanimous, 2011, NetBeans vs Eclipse vs JDeveloper http://www.indicthreads.com/1513/java-ides-netbeans-vs-eclipse-vs-jdeveloper/ Accessed 28/02/2012

20. Jackson, J, 2012, Oracle Gears NetBeans for Building Better User Interfaces http://www.cio.com/article/697392/Oracle_Gears_Netbeans_for_Building_Better_User_Interfaces Accessed 29/02/2012

21. Steffen, B, Narayan, P, 2007, Full Life-Cycle Support for End-to-End Processes http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=04385259 Accessed 28/02/2012

22. Prajapati, H B, Dabhi, V K, 2009, High Quality Web-Application Development on Java EE Platform http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4809267 Accessed 28/02/2012

23. Kitchenham, B.A. (1997). Evaluating software engineering methods and tools, part 7: planning feature analysis evaluation. ACM SIGSOFT Software Engineering Notes, 22(4), 21-24

24. Unanimous, 2009, NetBeans 6.5 vs. Visual Studio 2008 http://forums.netbeans.org/topic7487.html Accessed 21/03/2012

25. Rainer, A. & S. Beecham. (2009). Supplementary Guidelines, Assessment Scheme and evidence-based evaluations of the use of Evidence Based Software Engineering (Draft V2.0). Technical report, University of Hertfordshire, Hatfield, U.K.

Bibliography

1. Kitchenham, B., Linkman, S. & Law, D. (1997). DESMET: a methodology for evaluating software engineering methods and tools. Computing & Control Engineering Journal, 8 (3), 1-49.

Appendix 1 – Feature Analysis Exercise

On a scale of 1 to 23, rank each of the features below in order depending on level of relevance to IDEs:
1 = Most Relevant, 23 = Least Relevant
On a scale of 1 to 5, rank each of the features below depending on level of Support for IDE's:
1 = Little Support, 2 = Some Support, 3 = Strong Support, 4 = Very Strong Support, 5 = Full Support

Feature Analysis Table with scoring

Feature		NetBeans IDE	Visual Studio IDE
	Ranking	Level of Support	
GUI Builder		1—2—3—4—5	1—2—3—4—5
Compiler		1—2—3—4—5	1—2—3—4—5
Debugger		1—2—3—4—5	1—2—3—4—5
Code Completion		1—2—3—4—5	1—2—3—4—5
Supported Languages		1—2—3—4—5	1—2—3—4—5
Supported OS/Platforms		1—2—3—4—5	1—2—3—4—5
Source Code Editor		1—2—3—4—5	1—2—3—4—5
GUI & RAD Tools		1—2—3—4—5	1—2—3—4—5
Profiler		1—2—3—4—5	1—2—3—4—5
Testing / Maintenance		1—2—3—4—5	1—2—3—4—5
User Interaction		1—2—3—4—5	1—2—3—4—5
Integrated Tool chain		1—2—3—4—5	1—2—3—4—5
Code Coverage		1—2—3—4—5	1—2—3—4—5
Static Code Analysis		1—2—3—4—5	1—2—3—4—5
Designing/ UML		1—2—3—4—5	1—2—3—4—5
Extensibility		1—2—3—4—5	1—2—3—4—5
Parallel Programming		1—2—3—4—5	1—2—3—4—5
Usability		1—2—3—4—5	1—2—3—4—5
Reliability		1—2—3—4—5	1—2—3—4—5
Robustness		1—2—3—4—5	1—2—3—4—5
Live Preview		1—2—3—4—5	1—2—3—4—5

Participant 1

Feature Analysis Table with scoring

Feature		NetBeans IDE	Visual Studio IDE
	Ranking	Level of Support	
GUI Builder	4	1—2—3—4—5	1—2—3—4—5
Compiler	1	1—2—3—4—5	1—2—3—4—5
Debugger	2	1—2—3—4—5	1—2—3—4—5
Code Completion	12	1—2—3—4—5	1—2—3—4—5
Supported Languages	14	1—2—3—4—5	1—2—3—4—5
Supported OS/Platforms	15	1—2—3—4—5	1—2—3—4—5
Source Code Editor	11	1—2—3—4—5	1—2—3—4—5
GUI & RAD Tools	21	1—2—3—4—5	1—2—3—4—5
Profiler	3	1—2—3—4—5	1—2—3—4—5
Testing / Maintenance	10	1—2—3—4—5	1—2—3—4—5
User Interaction	13	1—2—3—4—5	1—2—3—4—5
Integrated Tool chain	20	1—2—3—4—5	1—2—3—4—5
Code Coverage	5	1—2—3—4—5	1—2—3—4—5
Static Code Analysis	6	1—2—3—4—5	1—2—3—4—5
Designing/ UML	19	1—2—3—4—5	1—2—3—4—5
Extensibility	16	1—2—3—4—5	1—2—3—4—5
Parallel Programming	17	1—2—3—4—5	1—2—3—4—5
Usability	7	1—2—3—4—5	1—2—3—4—5
Reliability	8	1—2—3—4—5	1—2—3—4—5
Robustness	9	1—2—3—4—5	1—2—3—4—5
Live Preview	18	1—2—3—4—5	1—2—3—4—5

Participant 2

Feature Analysis Table with scoring

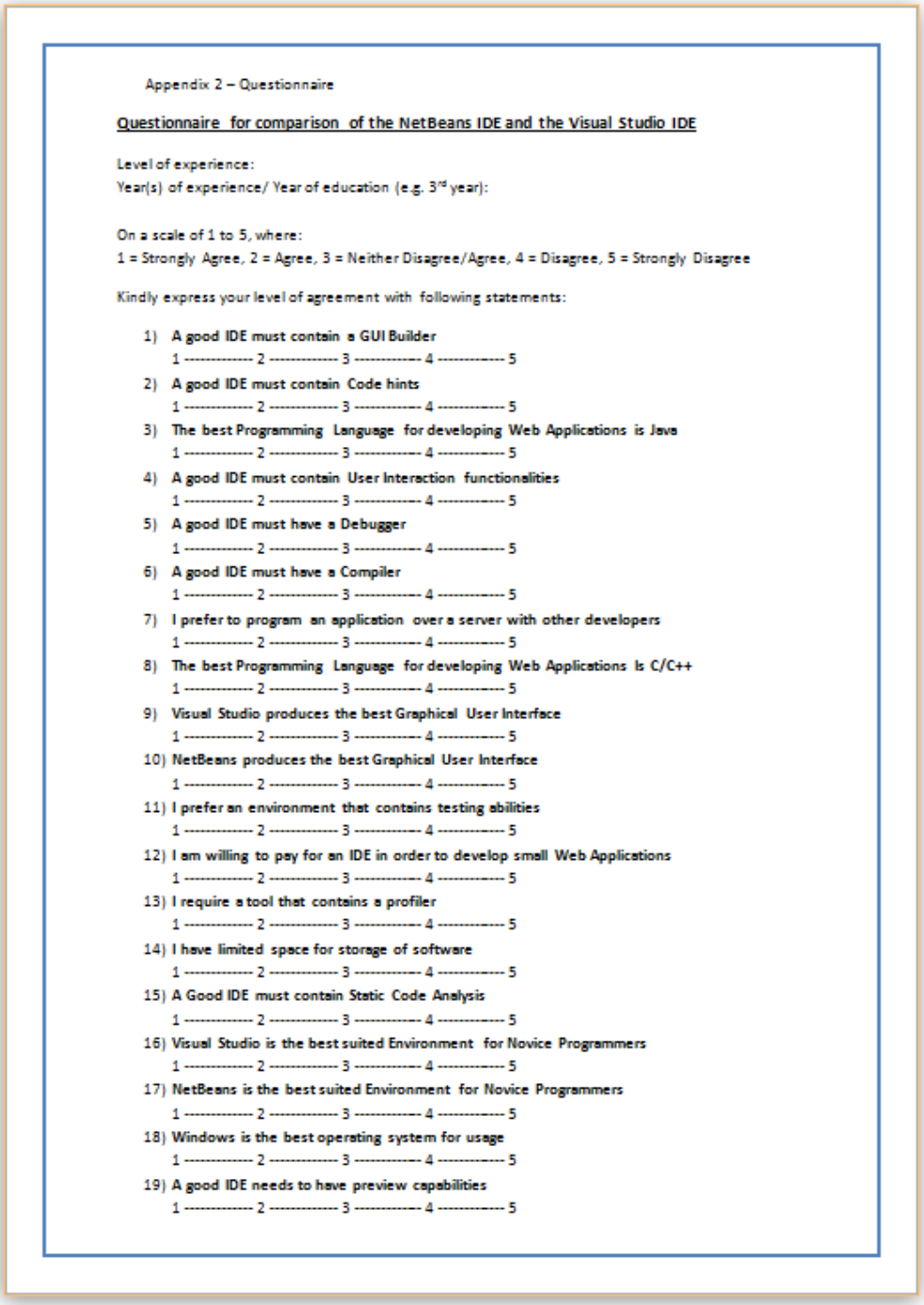
Feature		NetBeans IDE	Visual Studio IDE
	Ranking	Level of Support	
GUI Builder	5	1—2—3—4—5	1—2—3—4—5
Compiler	1	1—2—3—4—5	1—2—3—4—5
Debugger	3	1—2—3—4—5	1—2—3—4—5
Code Completion	15	1—2—3—4—5	1—2—3—4—5
Supported Languages	19	1—2—3—4—5	1—2—3—4—5
Supported OS/Platforms	21	1—2—3—4—5	1—2—3—4—5
Source Code Editor	15	1—2—3—4—5	1—2—3—4—5
GUI & RAD Tools	20	1—2—3—4—5	1—2—3—4—5
Profiler	11	1—2—3—4—5	1—2—3—4—5
Testing / Maintenance	20	1—2—3—4—5	1—2—3—4—5
User Interaction	18	1—2—3—4—5	1—2—3—4—5
Integrated Tool chain	15	1—2—3—4—5	1—2—3—4—5
Code Coverage	17	1—2—3—4—5	1—2—3—4—5
Static Code Analysis	11	1—2—3—4—5	1—2—3—4—5
Designing/ UML	14	1—2—3—4—5	1—2—3—4—5
Extensibility	12	1—2—3—4—5	1—2—3—4—5
Parallel Programming	18	1—2—3—4—5	1—2—3—4—5
Usability	20	1—2—3—4—5	1—2—3—4—5
Reliability	2	1—2—3—4—5	1—2—3—4—5
Robustness	4	1—2—3—4—5	1—2—3—4—5
Live Preview	11	1—2—3—4—5	1—2—3—4—5

Participant 3

Feature Analysis Table with scoring

Feature		NetBeans IDE	Visual Studio IDE
	Ranking	Level of Support	
GUI Builder	3	1—2—3—4—5	1—2—3—4—5
Compiler	1	1—2—3—4—5	1—2—3—4—5
Debugger	2	1—2—3—4—5	1—2—3—4—5
Code Completion	5	1—2—3—4—5	1—2—3—4—5
Supported Languages	16	1—2—3—4—5	1—2—3—4—5
Supported OS/Platforms	15	1—2—3—4—5	1—2—3—4—5
Source Code Editor	4	1—2—3—4—5	1—2—3—4—5
GUI & RAD Tools	14	1—2—3—4—5	1—2—3—4—5
Profiler	13	1—2—3—4—5	1—2—3—4—5
Testing / Maintenance	12	1—2—3—4—5	1—2—3—4—5
User Interaction	17	1—2—3—4—5	1—2—3—4—5
Integrated Tool chain	19	1—2—3—4—5	1—2—3—4—5
Code Coverage	11	1—2—3—4—5	1—2—3—4—5
Static Code Analysis	10	1—2—3—4—5	1—2—3—4—5
Designing/ UML	20	1—2—3—4—5	1—2—3—4—5
Extensibility	18	1—2—3—4—5	1—2—3—4—5
Parallel Programming	9	1—2—3—4—5	1—2—3—4—5
Usability	6	1—2—3—4—5	1—2—3—4—5
Reliability	7	1—2—3—4—5	1—2—3—4—5
Robustness	8	1—2—3—4—5	1—2—3—4—5
Live Preview	21	1—2—3—4—5	1—2—3—4—5

Appendix 2 – Survey Study Exercise Template



Appendix 2 – Questionnaire

Questionnaire for comparison of the NetBeans IDE and the Visual Studio IDE

Level of experience:
Year(s) of experience/ Year of education (e.g. 3rd year):

On a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree

Kindly express your level of agreement with following statements:

1) A good IDE must contain a GUI Builder
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) A good IDE must contain Code hints
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) The best Programming Language for developing Web Applications is Java
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
4) A good IDE must contain User Interaction functionalities
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) A good IDE must have a Debugger
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) A good IDE must have a Compiler
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) I prefer to program an application over a server with other developers
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
8) The best Programming Language for developing Web Applications is C/C++
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
9) Visual Studio produces the best Graphical User Interface
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
10) NetBeans produces the best Graphical User Interface
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
11) I prefer an environment that contains testing abilities
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
12) I am willing to pay for an IDE in order to develop small Web Applications
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
13) I require a tool that contains a profiler
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
14) I have limited space for storage of software
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
15) A Good IDE must contain Static Code Analysis
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) Visual Studio is the best suited Environment for Novice Programmers
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) NetBeans is the best suited Environment for Novice Programmers
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) Windows is the best operating system for usage
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) A good IDE needs to have preview capabilities
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Appendix 3 – Results of Survey Study

Level of experience: Beginner
Year(s) of experience/ Year of education (e.g. 3rd year): 2nd year of Study

On a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
4) **A good IDE must contain User Interaction functionalities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
9) **Visual Studio produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
10) **NetBeans produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
11) **I prefer an environment that contains testing abilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
12) **I am willing to pay for an IDE in order to develop small Web Applications**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
13) **I require a tool that contains a profiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
14) **I have limited space for storage of software**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
15) **A Good IDE must contain Static Code Analysis**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Beginner
Year(s) of experience/ Year of education (e.g. 3rd year): 1st year of Study

On a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
4) **A good IDE must contain User Interaction functionalities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
9) **Visual Studio produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
10) **NetBeans produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
11) **I prefer an environment that contains testing abilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
12) **I am willing to pay for an IDE in order to develop small Web Applications**
   1 ---------- 2 ---------- 3 ---------- 4 ----------5
13) **I require a tool that contains a profiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
14) **I have limited space for storage of software**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
15) **A Good IDE must contain Static Code Analysis**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Beginner
Year(s) of experience/ Year of education (e.g. 3rd year): 1st year of Study

On a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
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8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
9) **Visual Studio produces the best Graphical User Interface**
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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15) **A Good IDE must contain Static Code Analysis**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Moderate
Year(s) of experience/ Year of education (e.g. 3rd year): 3rd year of Study

On a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
4) **A good IDE must contain User Interaction functionalities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
9) **Visual Studio produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
10) **NetBeans produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
12) **I am willing to pay for an IDE in order to develop small Web Applications**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
13) **I require a tool that contains a profiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
14) **I have limited space for storage of software**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
15) **A Good IDE must contain Static Code Analysis**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Beginner
Year(s) of experience/ Year of education (e.g. 3rd year): 1 year

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Beginner
Year(s) of experience/ Year of education (e.g. 3rd year): 0 Years 3 Months

On a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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9) **Visual Studio produces the best Graphical User Interface**
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10) **NetBeans produces the best Graphical User Interface**
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11) **I prefer an environment that contains testing abilities**
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12) **I am willing to pay for an IDE in order to develop small Web Applications**
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14) **I have limited space for storage of software**
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15) **A Good IDE must contain Static Code Analysis**
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16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Novice
Year(s) of experience/ Year of education (e.g. 3rd year): 3rd year of study

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
4) **A good IDE must contain User Interaction functionalities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
9) **Visual Studio produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
14) **I have limited space for storage of software**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
15) **A Good IDE must contain Static Code Analysis**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Beginner
Year(s) of experience/ Year of education (e.g. 3rd year): 1st year of Study

On a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
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7) **I prefer to program an application over a server with other developers**
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Moderate
Year(s) of experience/ Year of education (e.g. 3rd year): 3rd year of Study

On a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
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17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Beginner
Year(s) of experience/ Year of education (e.g. 3rd year): 2nd year of Study

On a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
4) **A good IDE must contain User Interaction functionalities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
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7) **I prefer to program an application over a server with other developers**
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16) **Visual Studio is the best suited Environment for Novice Programmers**
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17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Beginner
Year(s) of experience/ Year of education (e.g. 3rd year): 1st year of Study

On a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
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18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Beginner
Year(s) of experience/ Year of education (e.g. 3rd year): 4th year of Study

On a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
4) **A good IDE must contain User Interaction functionalities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
9) **Visual Studio produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
10) **NetBeans produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
11) **I prefer an environment that contains testing abilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
12) **I am willing to pay for an IDE in order to develop small Web Applications**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
13) **I require a tool that contains a profiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
14) **I have limited space for storage of software**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
15) **A Good IDE must contain Static Code Analysis**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Moderate
Year(s) of experience/ Year of education (e.g. 3rd year): 3rd year of study

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1
2) **A good IDE must contain Code hints**
   3
3) **The best Programming Language for developing Web Applications is Java**
   5
4) **A good IDE must contain User Interaction functionalities**
   1
5) **A good IDE must have a Debugger**
   1
6) **A good IDE must have a Compiler**
   1
7) **I prefer to program an application over a server with other developers**
   1
8) **The best Programming Language for developing Web Applications Is C/C++**
   5
9) **Visual Studio produces the best Graphical User Interface**
   1
10) **NetBeans produces the best Graphical User Interface**
    4
11) **I prefer an environment that contains testing abilities**
    1
12) **I am willing to pay for an IDE in order to develop small Web Applications**
    3
13) **I require a tool that contains a profiler**
    ---------- 3 ----------
14) **I have limited space for storage of software**
    ---------- 2
15) **A Good IDE must contain Static Code Analysis**
    3 ----------
16) **Visual Studio is the best suited Environment for Novice Programmers**
    1 ----------
17) **NetBeans is the best suited Environment for Novice Programmers**
    4 ----------
18) **Windows is the best operating system for usage**
    ---------- 2 ----------
19) **A good IDE needs to have preview capabilities**
    1 ----------

Level of experience: Moderate
Year(s) of experience/ Year of education (e.g. 3rd year): 4th year of study

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

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16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Experienced
Year(s) of experience/ Year of education (e.g. 3rd year): 5 years industrial experience

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
4) **A good IDE must contain User Interaction functionalities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
9) **Visual Studio produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
10) **NetBeans produces the best Graphical User Interface**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
11) **I prefer an environment that contains testing abilities**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
12) **I am willing to pay for an IDE in order to develop small Web Applications**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
13) **I require a tool that contains a profiler**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
14) **I have limited space for storage of software**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
15) **A Good IDE must contain Static Code Analysis**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) **Visual Studio is the best suited Environment for Novice Programmers**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Experienced
Year(s) of experience/ Year of education (e.g. 3rd year): 5 years industrial experience

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

20) **A good IDE must contain a GUI Builder**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

21) **A good IDE must contain Code hints**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

22) **The best Programming Language for developing Web Applications is Java**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

23) **A good IDE must contain User Interaction functionalities**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

24) **A good IDE must have a Debugger**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

25) **A good IDE must have a Compiler**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

26) **I prefer to program an application over a server with other developers**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

27) **The best Programming Language for developing Web Applications Is C/C++**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

28) **Visual Studio produces the best Graphical User Interface**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

29) **NetBeans produces the best Graphical User Interface**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

30) **I prefer an environment that contains testing abilities**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

31) **I am willing to pay for an IDE in order to develop small Web Applications**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

32) **I require a tool that contains a profiler**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

33) **I have limited space for storage of software**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

34) **A Good IDE must contain Static Code Analysis**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

35) **Visual Studio is the best suited Environment for Novice Programmers**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

36) **NetBeans is the best suited Environment for Novice Programmers**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

37) **Windows is the best operating system for usage**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

38) **A good IDE needs to have preview capabilities**
1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Moderate
Year(s) of experience/ Year of education (e.g. 3rd year): 5 years industrial experience

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
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10) **NetBeans produces the best Graphical User Interface**
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
12) **I am willing to pay for an IDE in order to develop small Web Applications**
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13) **I require a tool that contains a profiler**
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Novice
Year(s) of experience/ Year of education (e.g. 3rd year): 2 years industrial experience

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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10) **NetBeans produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
12) **I am willing to pay for an IDE in order to develop small Web Applications**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
13) **I require a tool that contains a profiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
14) **I have limited space for storage of software**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
15) **A Good IDE must contain Static Code Analysis**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Novice
Year(s) of experience/ Year of education (e.g. 3rd year): 3rd Years industrial experience

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
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    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Professional
Year(s) of experience/ Year of education (e.g. 3rd year): 20+ years' experience

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
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8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
9) **Visual Studio produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
10) **NetBeans produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
11) **I prefer an environment that contains testing abilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
12) **I am willing to pay for an IDE in order to develop small Web Applications**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
13) **I require a tool that contains a profiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
14) **I have limited space for storage of software**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
15) **A Good IDE must contain Static Code Analysis**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Professional
Year(s) of experience/ Year of education (e.g. 3rd year): 20+ years' experience

on a scale of 1 to 5, where:
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Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- **2** ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- **4** ---------- 5
4) **A good IDE must contain User Interaction functionalities**
   1 ---------- **2** ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
   1 ---------- 2 ---------- **3** ---------- 4 ---------- 5
8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- **4** ---------- 5
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   1 ---------- **2** ---------- 3 ---------- 4 ---------- 5
10) **NetBeans produces the best Graphical User Interface**
    1 ---------- 2 ---------- **3** ---------- 4 ---------- 5
11) **I prefer an environment that contains testing abilities**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
12) **I am willing to pay for an IDE in order to develop small Web Applications**
    1 ---------- **2** ---------- 3 ---------- 4 ---------- 5
13) **I require a tool that contains a profiler**
    1 ---------- 2 ---------- **3** ---------- 4 ---------- 5
14) **I have limited space for storage of software**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- **5**
15) **A Good IDE must contain Static Code Analysis**
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16) **Visual Studio is the best suited Environment for Novice Programmers**
    1 ---------- **2** ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
    1 ---------- 2 ---------- 3 ---------- **4** ---------- 5
18) **Windows is the best operating system for usage**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Professional
Year(s) of experience/ Year of education (e.g. 3rd year): 20+ years of experience

on a scale of 1 to 5, where:
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Kindly express your level of agreement with following statements:

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17) **NetBeans is the best suited Environment for Novice Programmers**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Novice
Year(s) of experience/ Year of education (e.g. 3rd year): 1 year of experience

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
4) **A good IDE must contain User Interaction functionalities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
8) **The best Programming Language for developing Web Applications Is C/C++**
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
13) **I require a tool that contains a profiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
14) **I have limited space for storage of software**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
15) **A Good IDE must contain Static Code Analysis**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: beginner
Year(s) of experience/ Year of education (e.g. 3rd year): 3rd year of study

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
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8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Novice
Year(s) of experience/ Year of education (e.g. 3rd year): 2nd Year of study

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
4) **A good IDE must contain User Interaction functionalities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
8) **The best Programming Language for developing Web Applications Is C/C++**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
9) **Visual Studio produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
10) **NetBeans produces the best Graphical User Interface**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
11) **I prefer an environment that contains testing abilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
12) **I am willing to pay for an IDE in order to develop small Web Applications**
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13) **I require a tool that contains a profiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
14) **I have limited space for storage of software**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
15) **A Good IDE must contain Static Code Analysis**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Moderate
Year(s) of experience/ Year of education (e.g. 3rd year): 4th year of study

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
4) **A good IDE must contain User Interaction functionalities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
5) **A good IDE must have a Debugger**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
6) **A good IDE must have a Compiler**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: beginner
Year(s) of experience/ Year of education (e.g. 3rd year): 1 year of experience

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
7) **I prefer to program an application over a server with other developers**
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8) **The best Programming Language for developing Web Applications Is C/C++**
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16) **Visual Studio is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Moderate
Year(s) of experience/ Year of education (e.g. 3rd year): 3 years of experience

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
    1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Novice
Year(s) of experience/ Year of education (e.g. 3rd year): 1 year of experience

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

1) **A good IDE must contain a GUI Builder**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
17) **NetBeans is the best suited Environment for Novice Programmers**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

Level of experience: Professional
Year(s) of experience/ Year of education (e.g. 3rd year): 5 years of experience

on a scale of 1 to 5, where:
1 = Strongly Agree, 2 = Agree, 3 = Neither Disagree/Agree, 4 = Disagree, 5 = Strongly Disagree
Kindly express your level of agreement with following statements:

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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
2) **A good IDE must contain Code hints**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
3) **The best Programming Language for developing Web Applications is Java**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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13) **I require a tool that contains a profiler**
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   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
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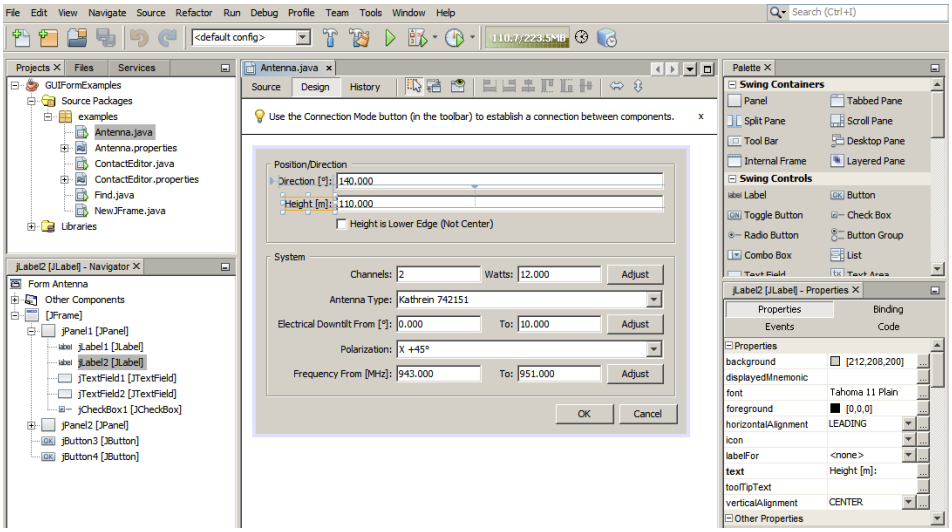
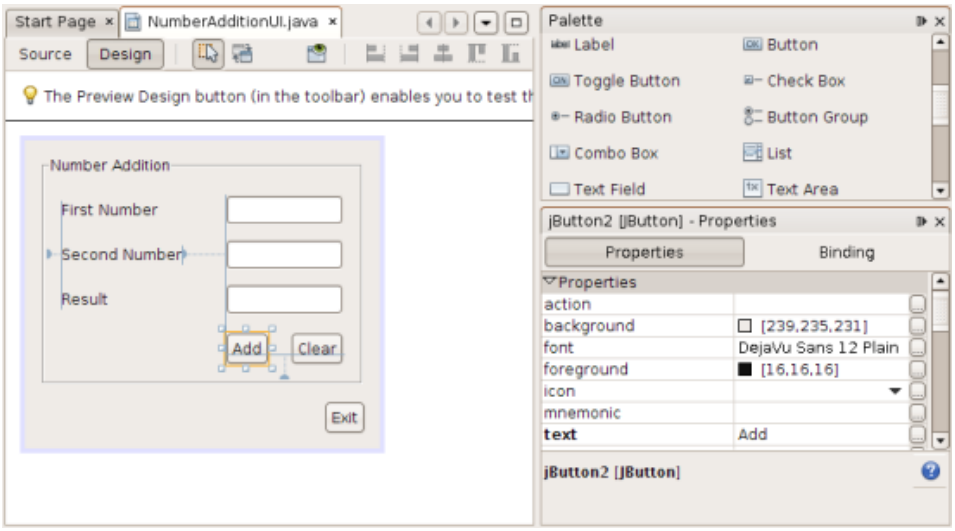
18) **Windows is the best operating system for usage**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5
19) **A good IDE needs to have preview capabilities**
   1 ---------- 2 ---------- 3 ---------- 4 ---------- 5

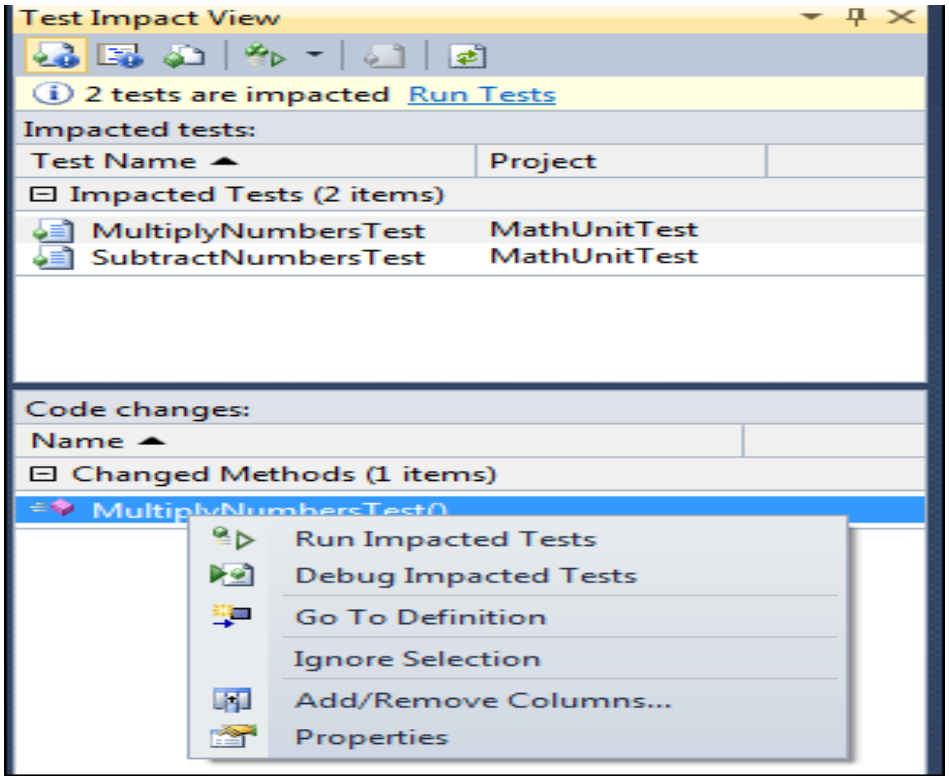
Appendix 4 – Action Research Print Screens



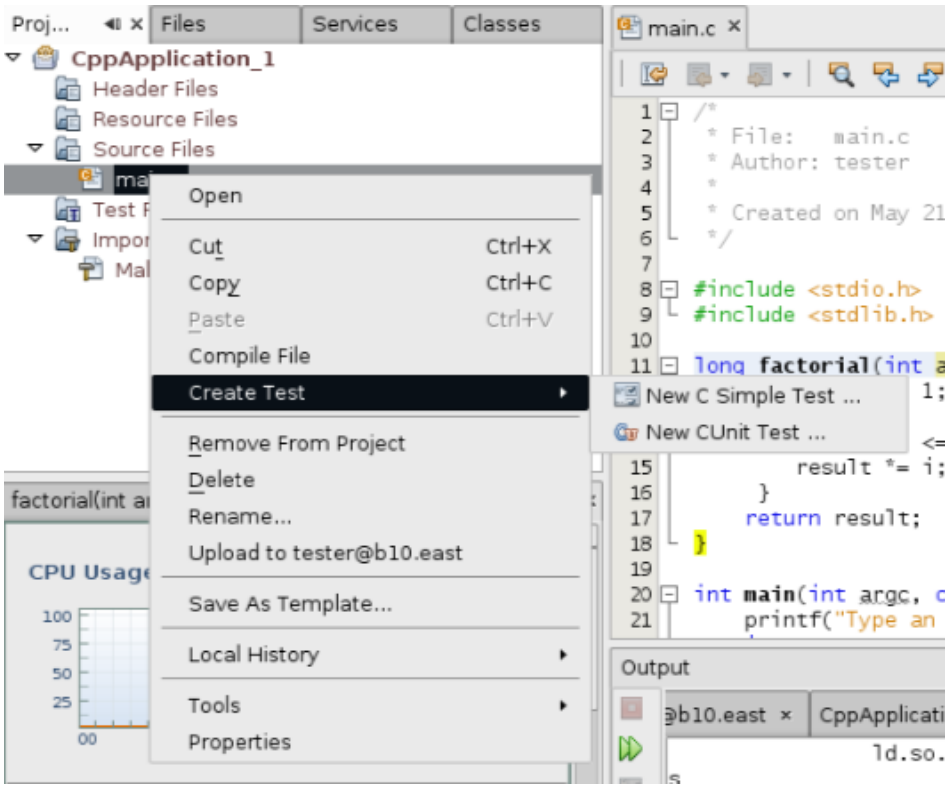
NetBeans GUI Builder



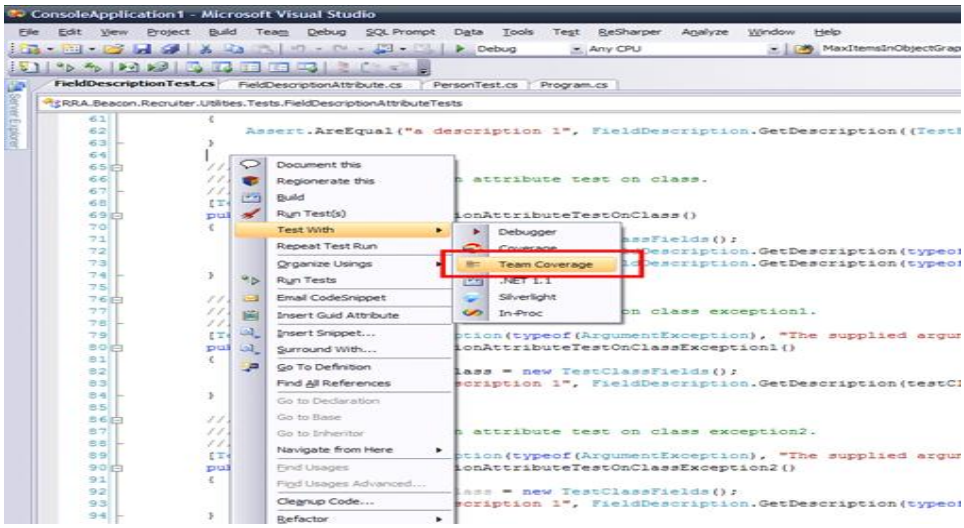
Visual Studio GUI Builder



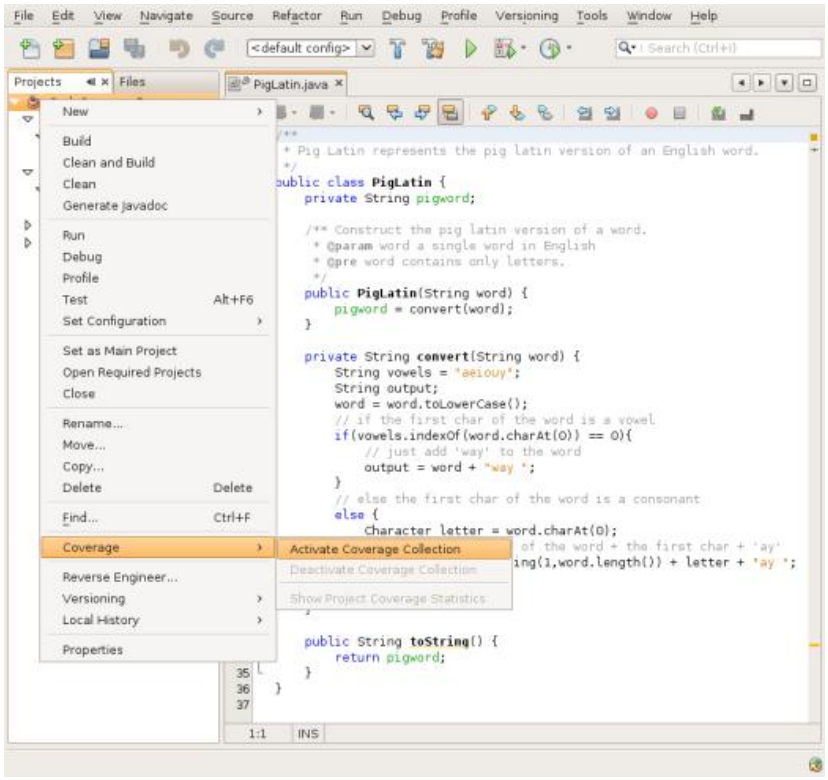
Visual Studio Test Option



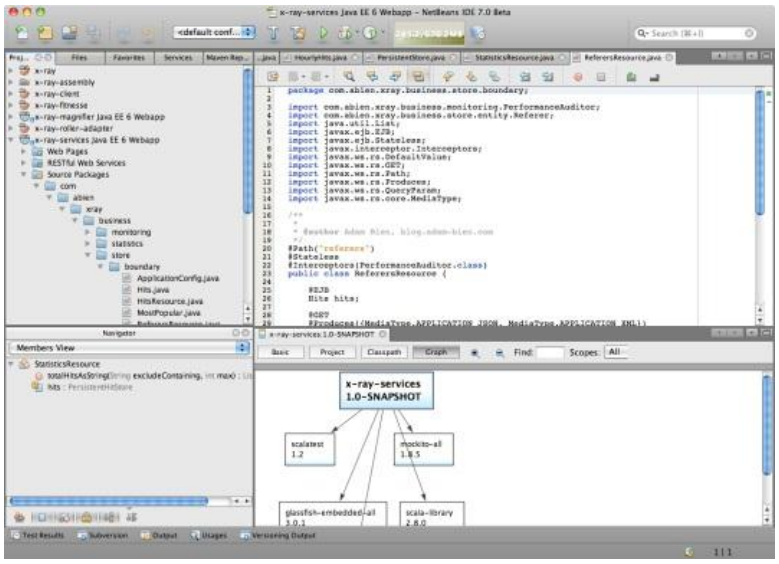
NetBeans Test Option



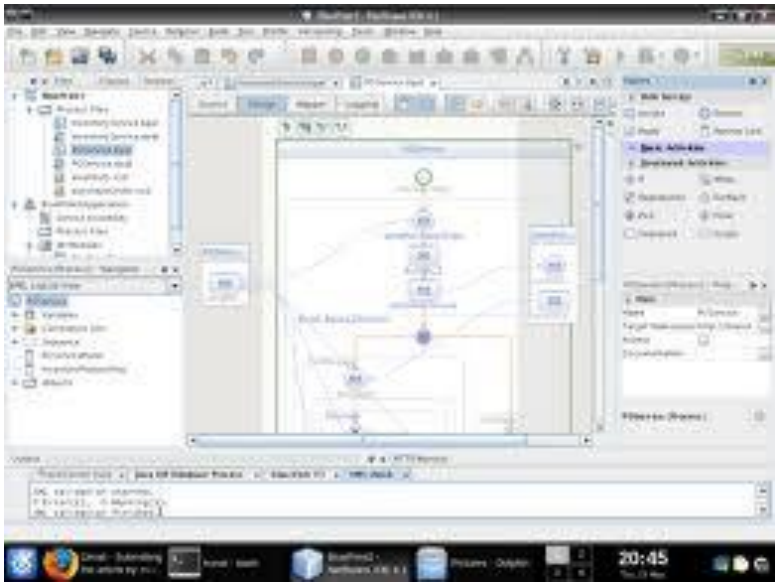
Visual Studio Code Coverage



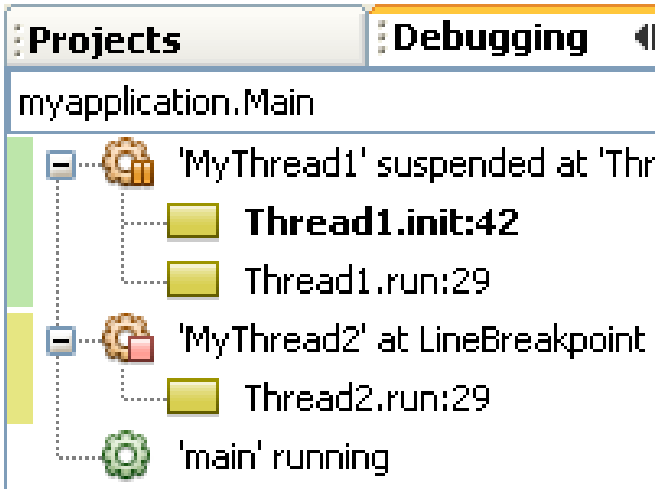
NetBeans Code Coverage



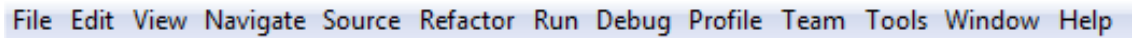
NetBeans IDE Mac



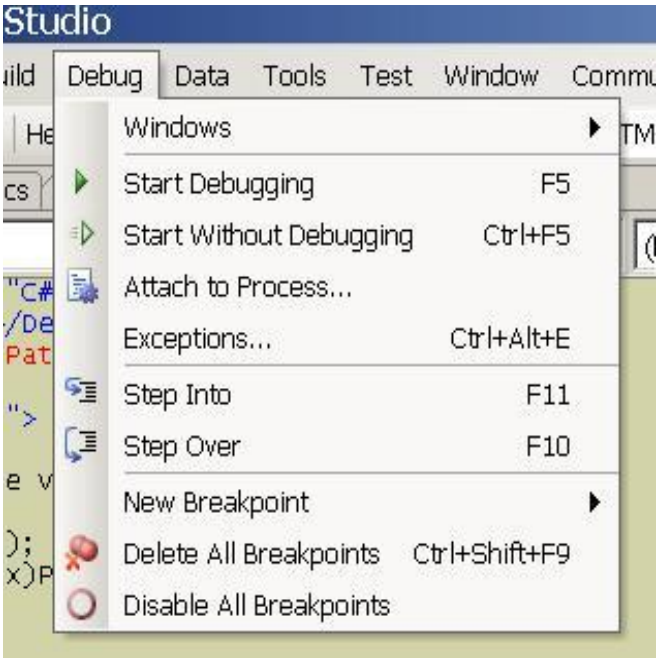
NetBeans IDE Linux



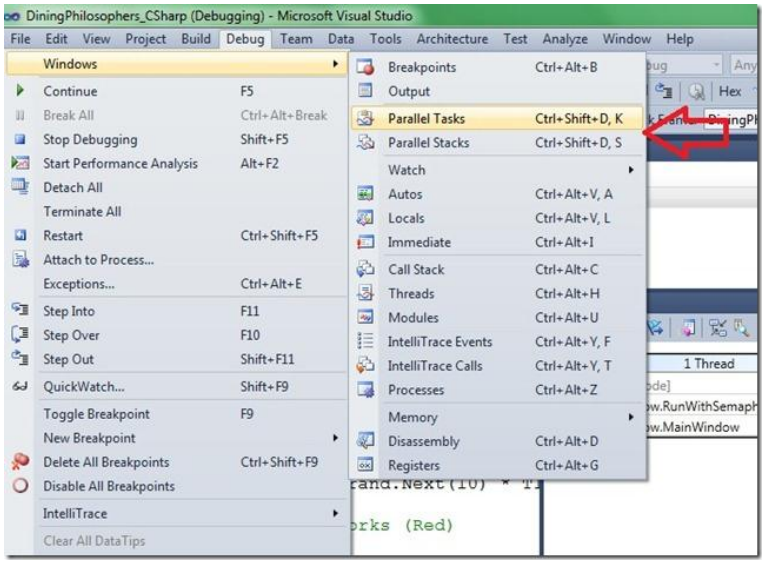
NetBeans Debugger Feature 1



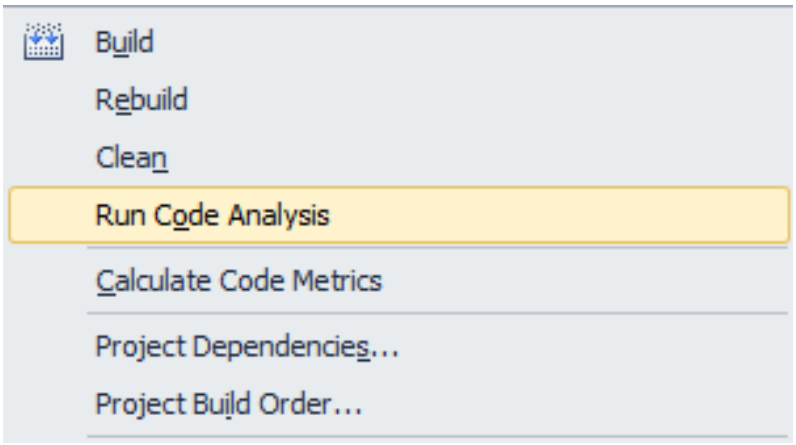
NetBeans Debugger Feature 2



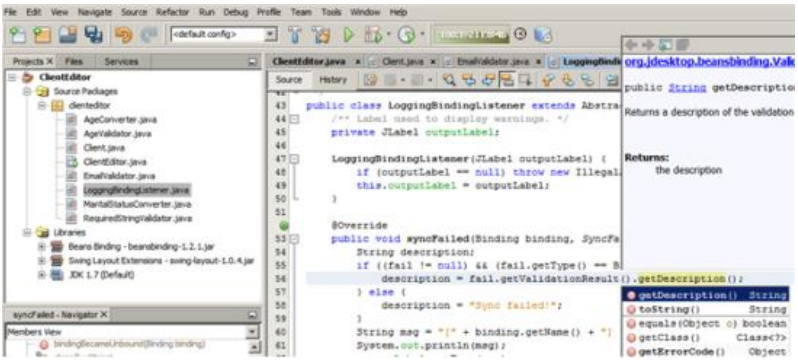
Visual Studio Debugger Feature



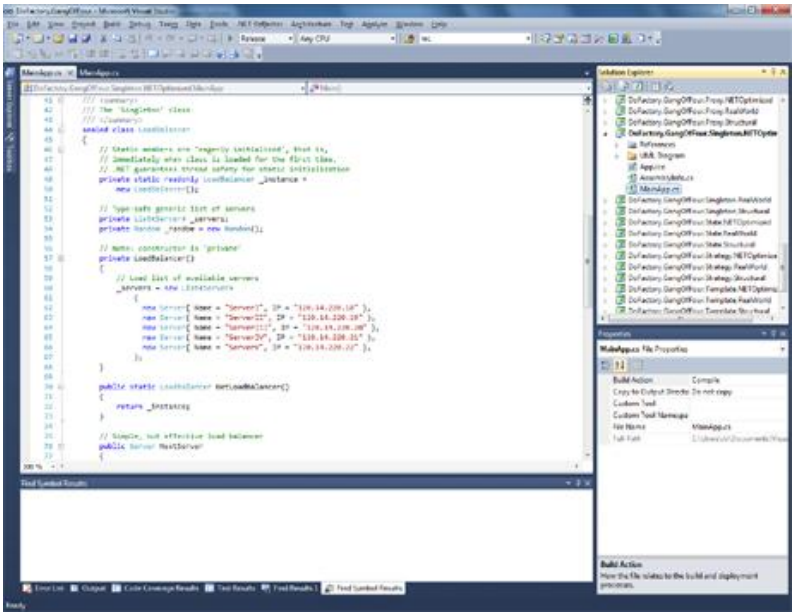
Visual Studio Parallel Programming Feature



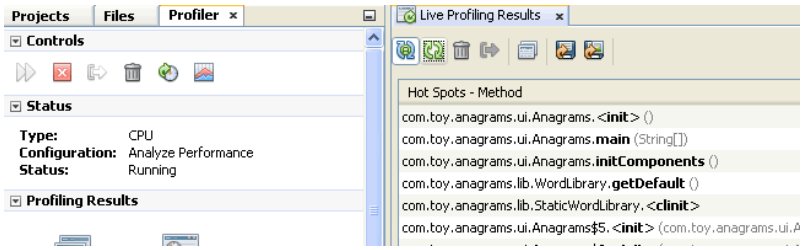
Visual Studio Code Analysis Feature



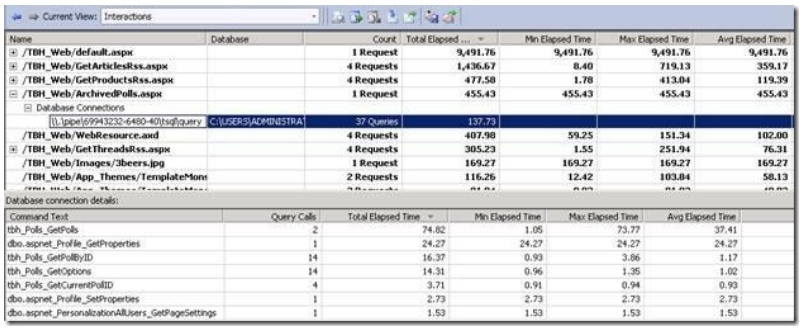
NetBeans Source Code Editor



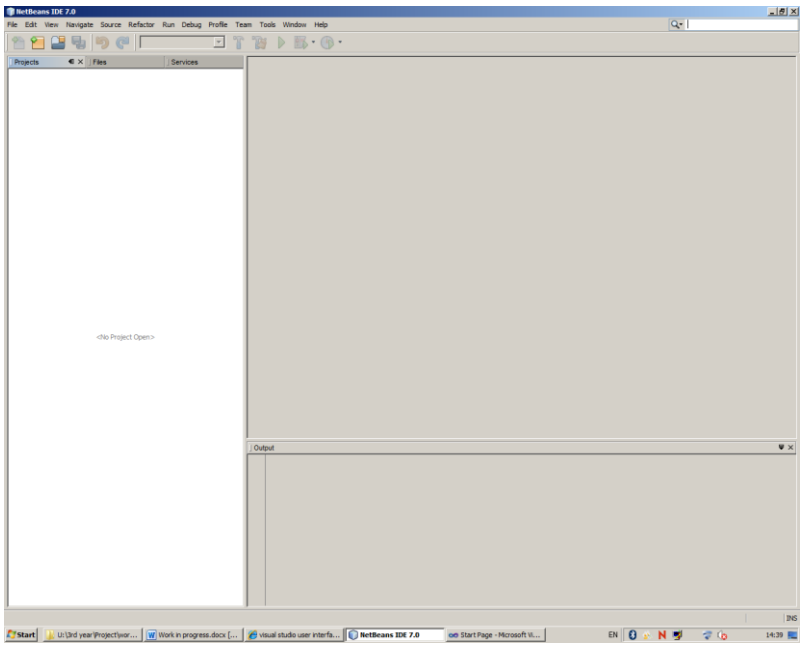
Visual Studio Source Code Editor



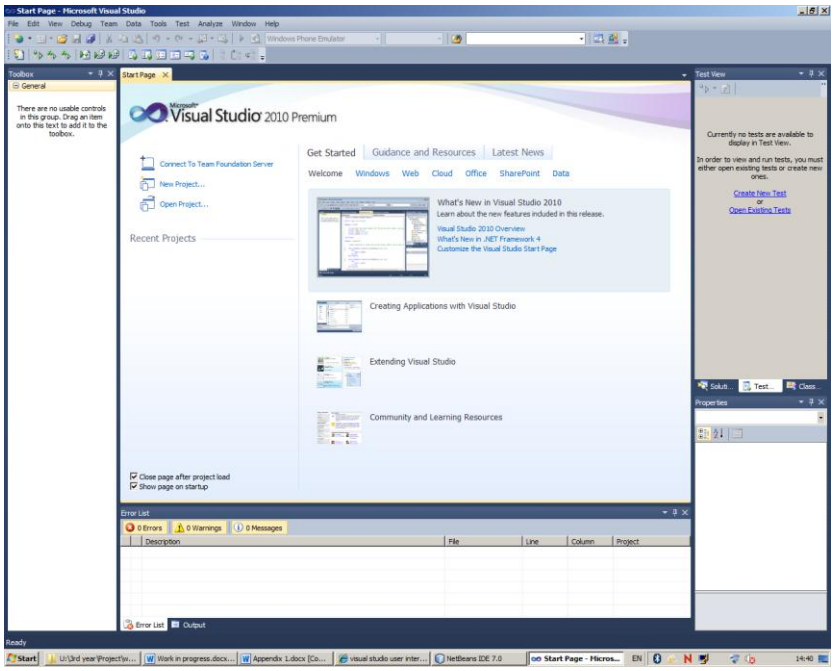
NetBeans Profiler Feature



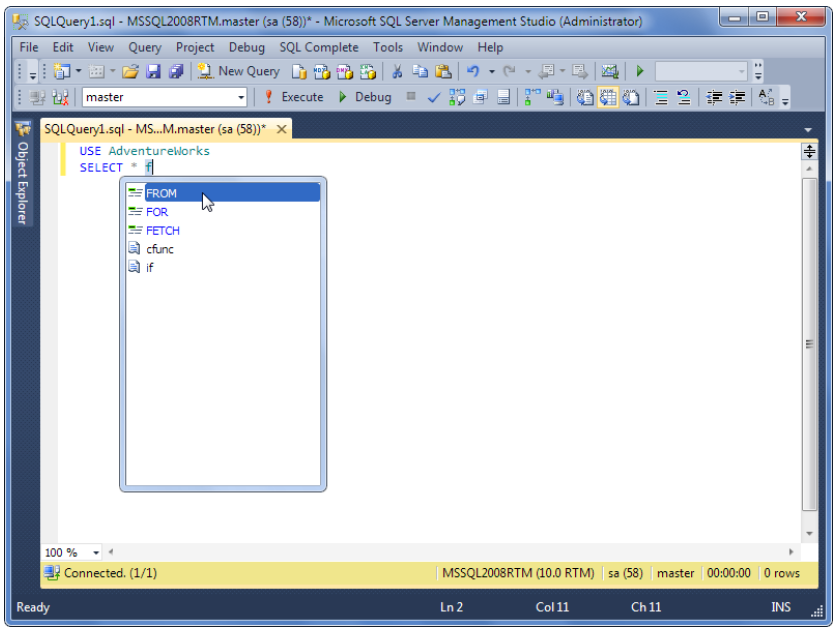
Visual Studio Profiler Feature



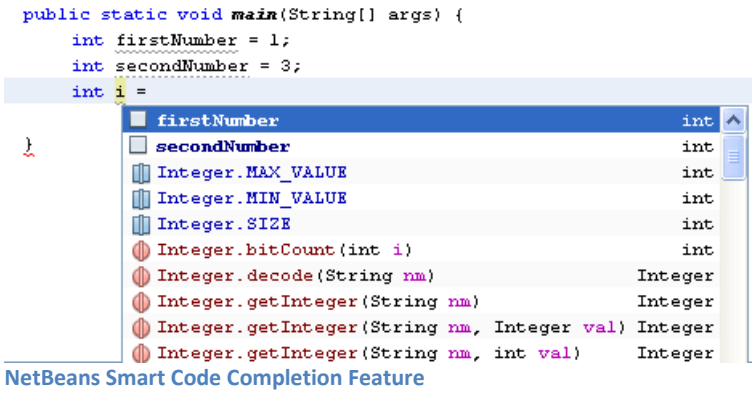
NetBeans User Interface



Visual Studio User Interface



Visual Studio Smart Code Completion Feature



NetBeans Smart Code Completion Feature

Appendix 5 – Ethics Approval

UNIVERSITY OF HERTFORDSHIRE
FACULTY OF SCIENCE, TECHNOLOGY AND CREATIVE ARTS

M E M O R A N D U M

TO	**Richard Anyaneto**
C/C	**Nathan Baddoo**
FROM	**Dr Simon Trainis – Chair, Faculty Ethics Committee**
DATE	**15 February 2012**

Your Ethics application for your project entitled:

Which IDE is more suitable for a novice programmer developing Small Java Web Applications

has been granted approval and assigned the following Protocol Number:

1112/85

This approval is valid:

From 15 February 2012

Until 9 March 2012

If it is possible that the project may continue after the end of this period, you will need to resubmit an application in time to allow the case to be considered.