

CS6750: Project

Batoulsadat Haerian

bhaerian@gatech.edu

Abstract—The project aims to redesign the "OMS Analytics curriculum" interface (GTI) by creating a wireframe prototype (WP) to enhance its efficiency in finding courses and their information within a particular specialization track. This will involve gathering information on the courses provided in the three specialized areas of the program from individuals with diverse backgrounds to gain a better understanding of the curriculum.

1. INTRODUCTION

The GTI functions as an interface designed to educate graduates from varied backgrounds to become adept problem-solvers and insight generators. The program comprises three tracks: analytical tools, business analytics, and computational data analytics. Each track includes mandatory core courses (15 credits), elective courses (15 credits) relevant to the specific area of specialization, and a concluding practicum (6 credits) intended to provide practical experience in the chosen field (illustrated in Appendix: Figure 1).

Despite its simple design, the interface contains an extensive amount of information, totaling 1,484 lines and 12,682 words. Searching for a specific course and its corresponding requirements can be a challenging task for users, as they would have to navigate through 59 A4 pages (Appendix: Figure 2). The interface's length and duplication of information can lead to users feeling overwhelmed and confused. The aim of this project is to redesign the interface, creating four primary components linked to the core, elective, tracks, and practicum courses, to enhance the user experience. The proposed design aims to improve efficiency and enable users to search for specific courses quickly on the OMS Analytics webpage.

2. INITIAL NEEDFINDING

As the first step in the design life cycle for the GTI interface, I will begin by identifying user needs through a needfinding phase. To gather user feedback, I will engage in various need-finding activities such as conducting interviews and analyzing existing product reviews. By doing so, I aim to identify the flaws in the GTI interface and address the following questions:

1. Is the GTI interface meeting the users' expectations when it comes to finding their desired course? It is unclear whether the current interface adequately satisfies their requirements. Therefore, I plan to gather their feedback and use it to design a more user-friendly and comfortable interface.

2. What are the user's expectations from the GTI for finding a specific course in various tracks based on the expertise levels? I am unsure if the GTI can effectively meet the expectations of users who are looking for specific courses across various tracks based on their expertise levels. To improve GTI features and meet the needs of all users, I will collect feedback from a diverse range of participants on how novice and expert users utilize the GTI to find specific courses across various tracks based on their expertise levels.

Problem Space: To gain a better understanding of the challenges users face when trying to search for a specific course within a particular area of specialization, it is important to consider the user-interface interaction and identify both explicit and implicit user needs. To explore the problem space, several questions need to be addressed, such as:

- ✓ *Who is the user that needs to search for the target course?*
- ✓ *Which area of specialization is the user looking for?*
- ✓ *Which track is the user interested in?*
- ✓ *Which course is the user trying to locate?*
- ✓ *What information of course is the user interested in?*
- ✓ *What information of course does the user expect to see?*

- ✓ Specifically, what course is the user trying to locate?
- ✓ What are the code and name of courses required for the track?
- ✓ What are the similarities and dissimilarities of the courses between the three tracks?
- ✓ How quickly and efficiently can the user search for the target course?

User: The GTI is designed to cater to individuals interested in pursuing an online master's program in analytics or data science, regardless of their age, gender, location, or ethnicity. The potential users may include current OMS Analytics students or those who have completed at least a bachelor's degree. They may be employed full-time, part-time, or unemployed. Some may be new to the curriculum, while others may be familiar with it and seeking to enhance their understanding. To effectively utilize the interface, users must possess the necessary physical abilities to comprehend, navigate through the tasks and subtasks, and search for information.

Plan 1: Interview

The objective of this plan is to gather feedback from users about their experience using the interface to search for information about specific courses within different specialization areas through interviews. Over the next two weeks, I will conduct interviews with ten individuals who are familiar with the OMS Analytics program, including friends and family members. Each interview will last approximately 90 minutes and consist of three phases: engagement, exploration, and exit. I will analyze the data collected from the interviews using both quantitative and qualitative methods to better understand user feedback and their interaction with the current interface. The interview procedure and relevant questions are summarized in Table 1 (Appendix). Following the interviews, my friend and I will objectively evaluate the user feedback using the "Weighted Decision Matrix" (WDM) to determine the interface's efficiency in searching for the ISYE 6501 course in any track and calculate the weighted ratios.

Data Inventory: The interviews is an effective technique to gather qualitative and in-depth feedback from users about the interface. This method can provide valuable insights to answer the questions and help with data inventory.

- ✓ **Who:** *Users of the current interface will be students or non-students with a variety of demographic features, such as age, gender, location, education, job, and expertise levels.*
- ✓ **Where:** *The user should have a quiet environment and internet access for the device.*
- ✓ **Context:** *Users search for a course in a specific area of the program using the interface.*
- ✓ **Needs:** *To efficiently search for a course in a specific area of OMS Analytics, users require a mobile or computer device, the ability to navigate the web page, and a detailed understanding of its content.*
- ✓ **Goal:** *To determine how to search for a specific course in a particular area of OMS Analytics more quickly and effeciently.*
- ✓ **Task:** *The users will use **physical** actions like clicking or tapping and **cognitive** abilities to select a course in any area of OMS Analytics, read information about it, and scroll through the page. Additionally, they can socially connect to the university's **social** media platforms to share their opinions about the content with others.*
- ✓ **Subtask:** *The users may **physically** hold Ctrl+F to search for a specific course in different areas of OMS Analytics content, open the website of the relevant course to **cognetively** obtain more information about the course and **socially** asks the lecturer more details about the course through email and follow up the conversations.*

Potential Biases and Mitigation: During the interview process, I may unintentionally create **confirmation bias** by asking leading questions or using a particular tone that influences the user's responses. Additionally, **social desirability** bias may occur if interviewees try to give answers that they think I want to hear. To minimize biases, I will ensure that the questions I ask are indirect and unbiased, framed appropriately, and delivered in a professional and friendly tone. I will also design and validate the questions, practice delivering

them in a concise and clear manner, and maintain a neutral stance throughout the interviews.

Analysis: The collected data from the interviews was analyzed (Table 2). A summary of the results is as follows:

- ✓ *The participants had an average age of 32.2 years with a standard deviation of 10.56, ranging from 19 to 58 years.*
- ✓ *The proportion of females was higher than males, with a distribution of 55% and 45%, respectively, as shown in Figure 3.*
- ✓ *Approximately 50% of the participants were either university students or employees, as illustrated in Figure 4.*
- ✓ *The educational background of the participants was as follows: 45% had a bachelor's degree, 30% had a master's degree, 30% had an MD, and 10% had a Ph.D., as depicted in Figure 5.*

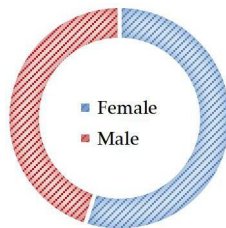


Figure 3: Gender of participants

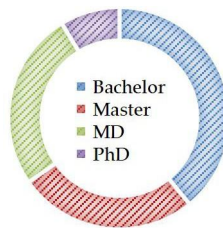


Figure 4: Education level of participants

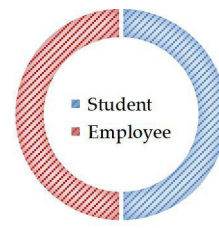


Figure 5: Career of participants

Based on the the WDM method, the descending order of weighted ratios of the factors as mentioned in Table 3, the most efficient opinions (efficiency > 1.0) will be considered in redesigning the interface and creating a prototype. A summary of these common points is as follows:

- ✓ *A wordy lengthy page*
- ✓ *time consuming to search a course*
- ✓ *Too many shared core and elective categories in each track and between the tracks*
- ✓ *Too many shared courses and their information in each track and between the tracks*
- ✓ *Not easy to find the course and its information in a long page*

Table 3. The organized feedback from the interviews regarding the GTI and the process of searching information about the ISYE 6501 course.

Criteria	Interface		
	Weight	Rate*	Efficiency**
Too many core and elective categories.	0.18	20	3.6
Most courses are shared between tracks.	0.17	20	3.4
Most course information is shared between tracks.	0.12	20	2.4
The page is too long.	0.09	18	1.62
The page has too many words.	0.09	18	1.62
Navigating the Course search is challenging.	0.08	16	1.28
The tracks are indistinguishable.	0.07	14	0.98
Insufficient course information.	0.06	16	0.96
Finding the course takes too long.	0.05	15	0.75
No link between course and lecturer page.	0.04	13	0.52
Inadequate font variety and text size.	0.03	12	0.36
Lack of guidance for navigating the webpage to find course.	0.02	10	0.20
Total	1	192	17.69

*Each factor was ranked on a scale of 1 (low) to 20 (high)

**Efficiency was calculated by Weight \times Rate

Conclusion: The interviews revealed challenges faced by users while trying to find specific course information within the GTI. The users identified several inadequacies, such as a lengthy and wordy interface that takes time to navigate, shared core and elective categories, and courses and their information across multiple tracks. Consequently, users suggested potential changes to the GTI to improve the user experience, such as a more user-friendly interface for quick and easy access to course information within their chosen specialization track.

Plan 2: Reading Existing Product Reviews

I will conduct research on the GTI by analyzing relevant online product reviews on the Reddit platform¹ between 2020 and 2023. The collected data will undergo cleaning and normalization, followed by sentiment analysis using Python and NLTK². The sentiment analysis will involve calculating the number of negative, neutral, and positive sentiment words. Additionally, I intend to use the WDM method (as explained in plan 1), to convert qualitative data into quantified data, thereby gaining a broader perspective on the GTI weaknesses, reported by users.

¹ https://www.reddit.com/r/OMSA/search?q=curriculum&restrict_sr=on

² <https://levelup.gitconnected.com/reddit-sentiment-analysis-with-python-c13062b862f6>

Data Inventory: Utilizing the existing product review technique will enable me to gather user feedback about the interface in a qualitative and effective manner. The insights gathered through this method will be instrumental in building the data inventory and answering pertinent questions related to the interface.

- ✓ **Who:** *The current curriculum's users will have diverse demographics, including age, gender, education, job, and expertise levels.*
- ✓ **Where:** *Depending on their device and internet access, users can access GTI from different locations, including homes, workplaces, gyms, stores, and during transit.*
- ✓ **Context:** *Within the GTI, users can search for courses offered in the OMS Analytics.*
- ✓ **Needs:** *To utilize GTI, users require a physical device, such as a mobile phone or computer, as well as proficiency in web navigation and comprehension of its content. Users can efficiently search for courses in a specific area of OMS Analytics. Additionally, prior to sharing their reviews, users must register on various social media platforms.*
- ✓ **Goal:** *To expedite and streamline the process of creating and sharing reviews regarding searching for a specific course within a particular area of OMS Analytics.*
- ✓ **Task:** *Users can write and share reviews regarding finding a specific course within any area of OMS Analytics content by **physically** logging in to the web page using a mouse or touchscreen. After **cognitively** creating the review, the user enters it into a specific text box and edits it before posting it to **socially** share their opinion with others on social media platforms, including Twitter and Facebook, which may be connected to the university's social media accounts. Additionally, users can reply to comments from the community on their reviews.*
- ✓ **Sub-task:** *Users have the option to share their reviews, opinions, and videos about the interface through personal blogs connected to the university's social media platforms, such as Twitter and Facebook. By accessing their blog **physically** and explaining the curriculum in more detail **cognitively**, users can **socially** communicate and discuss the task in forums with followers who may be students or non-students on the blog.*

Potential Biases and Mitigation: When using the approach of reading existing reviews, there is a possibility of encountering **self-selection biases** where the distribution of opinions is highly polarized, with extreme positive and/or negative reviews and few moderate opinions. Such biases can distort the information users rely on, leading to biased decision-making. To mitigate this, my friend and I will carefully collect and evaluate all reviews and comments relevant to the GTI, regardless of their positive or negative rating.

Analysis: After analyzing the gathered data, the findings can be summarized as follows:

- ✓ *The background of the users in terms of education is as follows: 82% had completed a bachelor's degree and the remaining had a master's degree in OMS Analytics.*
- ✓ *The majority of the users (78%) were OMS Analytics students, while the remaining 23% were non-students.*

Using the WDM model, the reviews were weighted and ranked by efficiency score in descending order in Table 4. Reviews with an opinion score above 1.0 will be taken into account for redesigning the GTI and creating a prototype.

Table 4. The organized feedback from the reading existing product reviews regarding the GTI features.

Criteria	Interface		
	Weight	Rate*	Efficiency**
Page is lengthy and text-heavy.	0.16	20	3.2
Finding a course takes long time and challenging.	0.15	15	2.25
The "Find" or "CTRL+F" function is not usable to search in collapsed accordions.	0.11	20	2.2
Only by expanding the accordions can find the course.	0.12	18	2.16
All core courses are identical across various tracks.	0.11	19	2.09
It is boring and tiresome to find a course details on a long page.	0.12	17	2.04
Most of the elective courses are identical across various tracks.	0.10	19	1.9
Merging the basic and advanced core courses into a single section named "CORES" courses is a better.	0.06	17	1.02
Merging the elective courses into a single section named "ELECTIVES" courses is a better.	0.06	17	1.02
There are no links to detailed information about each course.	0.01	12	0.12
Total	1	174	18

*Each factor was ranked on a scale of 1 (low) to 20 (high)

**Efficiency was calculated by Weight × Rate

Here are the common points summarized:

- ✓ *The web page is not very helpful as expected.*
- ✓ *There is not enough data available, so users are using alternative websites to get more information for each course.*
- ✓ *Users feel uncomfortable with the web page and prefer videos.*
- ✓ *The web page has an outdated design and is not attractive.*

Conclusion: The results of the existing product reviews revealed that users faced challenges in finding specific course information within the GTI. They found the interface to be inefficient in obtaining desired data about courses in various tracks. So, users advised their followers to use other websites to find more useful and comprehensive information in a shorter amount of time. Despite jumping to different websites for information, redesigning the interface to improve the user experience seems to be a viable solution for resolving search difficulties.

3. HEURISTIC EVALUATION

As the success of the OMS Analytics curriculum depends heavily on the interface used to search for specific courses, it is essential that the interface incorporates effective design principles. I will explore the following questions to evaluate the GTI's strengths and weaknesses:

What works well? What makes it work well?

The GTI has demonstrated its adherence to the principle of **simplicity** by effectively presenting all courses within the three analytics tracks in a clear and concise manner, with easy-to-understand explanations suitable for both novice and advanced users. Furthermore, the interface has successfully categorized all data into three tracks and further organizes the courses into core, elective, and practicum groups, with the relevant courses arranged in ascending order by their code numbers. These features attest to the GTI's success in adhering to the principle of **simplicity**.

The GTI adheres to the principle of **discoverability** as each group features a blue-colored accordion at the top which effectively presents large amounts of information within a limited space. The accordion is collapsed by default, but users can easily navigate the courses within each group by clicking on the corresponding accordion to expand its content. Furthermore, the interface ensures **consistency** between the title of each accordion and its included content. In Figure 1, the interface displays the three analytics tracks, namely "Analytical Tools," "Business Analytics," and "Computational Data Analytics," each of which consists of seven accordions with identical titles. The content of some elective courses may differ within each track. The tracks are arranged in the order of "Analytical Tools" to "Business Analytics," and finally "Computational Data Analytics." Within each track, the core groups, elective groups, and practicum are listed from top to bottom, logically distributing the relevant courses based on their corresponding track and group, thereby adhering to the **mapping** and weak **structure** principles. The interface also satisfies the **perceptibility** principle by presenting concise and easily comprehensible information categorized into groups under the three tracks.

To sum up, the interface exhibits strengths such as **simplicity**, **discoverability**, **consistency**, **mapping**, and **perceptibility**, which contribute to a relatively low gulf of execution for most features. Nonetheless, further improvements are needed in the interface **structure** to minimize the gulf of execution.

What doesn't work well? and Why doesn't it work well?

The GTI has limited **flexibility** as it only allows users to search for courses by clicking on the accordions and scrolling through the page. While it is possible to use Ctrl+F to find a course, users first need to expand all the accordions. The interface also has several limitations that increase the likelihood of errors. For example, the page is lengthy and verbose, and the core courses are repeated in all three tracks. Furthermore, many elective courses are duplicated within and across tracks, leading to confusion when searching for a specific course. Both

novice and experienced users may make **slips** or **mistakes** due to the interface's **weak structure**. Additionally, the highly duplicated content can result in errors when searching for a particular course, regardless of whether it is a core or elective course.

The limitations of the interface can cause frustration for users who may feel **discomfort** while trying to search for courses and their information. Furthermore, the interface's weaknesses contradict important design principles, which can widen the gulf of execution and reduce the overall invisibility of the interface.

4. INTERFACE REDESIGN: WF

Upon evaluating the GTI, I have identified several areas that need enhancement, such as **discoverability**, **flexibility**, **structure**, **comfort**, and minimizing the minimizing the risk of user **slips** and **mistakes**. To tackle these concerns, I have created a WP, displayed in Figure 6, which builds on the GTI. The new interface includes several new features, such as:

- ✓ A search bar that is easily available for effortless course navigation.
- ✓ The interface includes four text-filled buttons for **CORES**, **ELECTIVES**, and **PRACTICUM** courses. Clicking on any of these buttons reveals a drop-down menu that displays the relevant courses within the selected category.
- ✓ Two separate text boxes are provided: one that gives an overview of the entire curriculum, and another that explains the purpose of the buttons and their associated content.

The WP, shown in Figure 7, includes separate buttons for **CORES**, **ELECTIVES**, and **PRACTICUM** courses. Each button has multiple subgroups that display the course code and name. When a user clicks on a course, a modal window appears, providing a brief summary of the course content. To close the window, the user can click on the close icon located at the top left corner of the box. the final result of each course for one of the core subgroups titled "**BASIC**" (Figure 8).

5. INTERFACE JUSTIFICATION

After conducting an initial needfinding research and evaluating the existing interface based on design principles, I developed a WP with the goal of improving the **discoverability**, **flexibility**, **structure**, and **usability** of the interface while reducing user **slips** and **mistakes** during task completion. The prototype incorporates the following features:

- ✓ Rather than grappling with an extensive and verbose interface that has a lot of repetitive content, which enhances the chances of committing **slips** or **mistakes**. Instead, they can quickly access information about a specific course through four distinct buttons or a search window for added convenience (**comfort**). The core and elective buttons are drop-downs that provide users with a list of mutually exclusive subgroups of core or elective courses by clicking or hovering over them. When users select a subgroup, they see a list of courses that belong to that subgroup in another mutually exclusive drop-down list. If they choose a specific course, a small modal window that's linked to the course opens up, allowing users to read content that's relevant to their selected course. The search process is designed to let users to easily find courses by progressing step-by-step in a logical order (**mapping**). This is done for **discoverability** by having users click on various buttons, selecting an item from the drop-down list, and then selecting a course from the available options in the list.
- ✓ The adaptability of this prototype is rooted in the capability of users to reach the content of a particular course via either the corresponding buttons and dropdown menus or the search field. By entering the course's name or code, or a blend of both, users can effortlessly uncover the pertinent material of the intended course, thereby enhancing both **flexibility** and **discoverability**.
- ✓ The prototype design simplifies the course search process by presenting the data through four buttons instead of lengthy, wordy pages. To minimize errors (**slips** and **mistakes**), the content related to core, elective, and

practicum groups are displayed on modal windows connected to the courses on the drop-down list. Furthermore, a search box has been added to help users in case of errors while clicking on a course or if they are looking for a specific course. This approach reduces the probability of **slips** during the course search.

6. EVALUATION PLAN: EMPIRICAL EVALUATION

To evaluate the effectiveness of the WP, I will conduct interviews and compare it with the GTI, which will serve as the control. The dependent variable is efficiency, while the independent variables are listed in Appendix Table 5. I will formulate the null hypothesis (H_0) and alternative hypothesis (H_a) as follows:

H_0 : The WP 's efficiency is not different from the existing interface.

H_a : The WP 's efficiency is different from the existing interface.

The proposed approach involves using a within-subjects or repeated measures design where each participant will be testing both the prototype and current interface while providing feedback. This design does not require a large sample size since each participant will be performing tasks using both interfaces. In addition, I will be observing the participants as they use the interfaces to gather more data. This approach will allow for the collection of data twice, with random assignment of cases and controls, where each participant will perform the task once using the existing interface and once using the prototype.

The interview process follows the same structure as outlined in "**Plan 1**" of the "**INITIAL NEEDFINDING**," but I will provide a brief overview and highlight the key components, such as the interfaces, questions, and duration of each session for this part. To collect data for this study, I'll recruit participants with GTI experience using purposive or convenience sampling. I will prepare a questionnaire divided into three stages: introduction, exploration, and exit. After practicing the questions with family and friends, I'll finalize the questionnaire. To ensure a smooth interview process, I will prepare all necessary materials,

including prototypes, prior to meeting with each participant. I will also check the technology, internet connection, room temperature, lighting, and chair height to create a consistent and controlled environment. The 90-minute interview will focus on evaluating the prototype layout, including background color, foreground size and color, and text font and size (Appendix: Table 5). To ensure a clear recording, I will take measures to minimize background noise.

Each interview will be divided into three stages. First, I will introduce the study's purpose and methodology, as well as the GTI and WP to the participant. In the second stage, I will ask the interviewee to search for the ISYE 6501 course using both the GTI and WP, and provide feedback on their experience. Their feedback will be recorded in Table 6 (Appendix). Finally, I will ask if they have any additional feedback or ideas about either interface, and appreciate them for their participation in the study.

Lurking Variables: If not accounted for, various factors such as user fatigue, microphone and record player problems, slow internet connectivity, room temperature and lighting, background noise, and chair height can potentially interfere with the accuracy and interpretation of the prototype efficiency results. Therefore, these variables should be considered as potential control variables in the study, depending on their impact.

Analysis: Based on the type of data, I will apply Chi-test and independent t-Test to examine the hypotheses. After doing data entry in SPSS, I will calculate the X^2 value and compare it with the critical value from the X^2 distribution table with degrees of freedom $df = (R - 1)(C - 1)$ and chosen confidence level. If the calculated X^2 value $<$ critical X^2 value, then I will accept the H_0 otherwise I will reject it and accept the alternative hypothesis at a particularly significant level of alpha. Furthermore, I will perform Levene's Test to examine the homogeneity of variance, followed by an independent samples t-test to test for equality of means. If the calculated p-value is greater than the chosen confidence level, then the null

hypothesis will be accepted. On the other hand, if the p-value is less than or equal to the confidence level, the null hypothesis will be rejected, and the alternative hypothesis will be accepted at the specified significance level (α).

7. EVALUATION EXECUTION

To conduct the interview, I enlisted 10 participants from my personal network who were familiar with the online registration system and its interfaces. At the start of each session, I presented a concise overview of the study and its goals. Next, I directed the participants to the GTI and instructed them to locate the ISYE 6501 course. Following a 45-minute break, I asked them to repeat the task using the WP while I recorded the time and steps taken to complete the task for each interface. Each interviewee evaluated both the GTI and WP, but the order in which they assessed each interface was randomly assigned for each meeting. Then, I conducted a 30-minute interview with each participant to gather their feedback on the features of both interfaces. I concluded the interview by asking the participant for any additional thoughts on the existing interface and WP, within a 5-minute timeframe. Two interview sessions had to be rescheduled due to internet connectivity problems and a health issue. The collected data from these interviews can be found in Table 6 of the appendix.

Raw Results: Table 7 (Appendix) presents the raw data collected for the demographic characteristics of the 10 participants and their responses to the questions during the meeting.

Statistical Test: I classified the results into two categories: descriptive and hypothesis testing (HT).

1. Descriptive Results: The following are the results obtained from the analysis of demographic data:

- ✓ *The average age of participants is 28.22 ± 6.53 (range of age is 19-42).*
- ✓ *The ratio of females is more than males (Figure 9: 30% vs. 70%, respectively).*

- ✓ About 70% of participants are university students and the remaining were employees (Figure 10).
- ✓ The education level of 60%, 20%, 10%, and 10% of participants are bachelor, master, MD, and Ph.D., respectively (Figure 11).

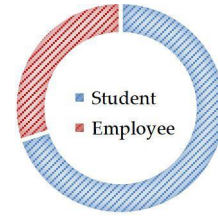
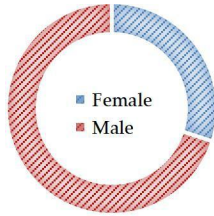


Figure 9: Gender of participants Figure 10: Education level of participants Figure 11: Career of participants

2. HT results: To analyze the data, I used different statistical tests depending on the type of data. For the time and steps taken to complete the task of finding the ISYE 6501 course and its information in each track using the GTI and WP, I conducted an independent sample t-test. For analyzing the data obtained from the answers to questions 1-17 in the discussion part of Tables 8 (Appendix), I used Pearson's chi-square goodness of fit test.

- ✓ Results of independent sample t-test showed that the difference in the mean time of completing the task by WP (12.7 ± 3.40 seconds, $n = 10$) and GTI (36.3 ± 8.77 seconds, $n = 10$) was significant ($P_t = 7.9343, df = 18 < 0.0001$) because the p-value is much smaller than alpha level ($\alpha = 0.05$). Similarly, the difference of the mean of time of completing the task by WP (3 ± 1.05 , $n = 10$) and GTI (5.3 ± 1.49 , $n = 10$) was statistically significant ($P_t = 3.9901, df = 18 < 0.001$).
- ✓ On the basis of the following hypotheses:

H₀: $\mu_{GTI} = \mu_{WP}$ for time and steps of completing the task

H_a: $\mu_{GTI} \neq \mu_{WP}$ for time and steps of completing the task

The **H_a** is accepted at the level of $\alpha = 0.05$. It means that both time and steps of completing the task by WP are unequal to GTI. The mean of time and steps of completing the task by WP (8.3 ± 4.0 , $n = 10$) and GTI (0.9 ± 0.8 , n

= 10) was statistically significant. In WP, the time of doing the task and the number of steps are much lower than in GTI.

- ✓ Results of the non-parametric Pearson's chi-square goodness-of-fit test are summarized in Table 9.

As the data of Table 8 demonstrates, the results of the answers to questions 3 and 4 were statistically significant ($P_{\chi^2=6.4} = 0.01$).

Table 9. The non-parametric Pearson's chi-square goodness-of-fit test was applied for the answers to questions 1-17 to compare the distribution of interviewees for doing the task of finding information about the ISYE 6501 course and its information through GTI and WP.

Groups	Questions																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CW	7	6	9	9	4	7	8	7	7	8	6	6	7	5	7	6	7
GTI	3	4	1	1	6	3	2	3	3	2	4	4	3	5	3	4	3
χ^2	1.6	0.4	6.4	6.4	0.4	1.6	3.6	1.6	1.6	3.6	0.4	0.4	1.6	0.0	1.6	0.4	1.6
P-value	0.2	0.5	0.01*	0.01*	0.5	0.2	0.06	0.2	0.2	0.06	0.5	0.5	0.2	1.0	0.2	0.5	0.2
Significant	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No

*: Since the p-value is smaller than the alpha level ($\alpha = 0.05$), therefore the result is significant.

H₀: Based on the interface features, the proportion of the participants for WP is equal to GTI

H_a: Based on the interface features, the proportion of the participants for WP is unequal to GTI

On the basis of the above hypotheses, the H₀ has been rejected at the significance level of alpha = 0.05, indicating that there was a significant difference in the proportion of participants who found the WP to be simpler and more satisfied to complete the task with fewer steps compared to the existing interface. Therefore, the WP is indeed simpler, user's satisfaction, and quicker to use than the GTI.

In this study, I made efforts to control confounding factors by taking several precautions. For instance, I opted for a face-to-face interview instead of a remote one, and ensured that the interview was conducted in a quiet environment with appropriate lighting and temperature. Prior to the interview, I checked the internet connection, recording device, as well as the height of the table and chair.

While these variables are known to have a small effect on the results, I still took care to address them. However, despite my efforts, I did not observe significant results for some of the features of WP as the sample size (n=10) was too small. This can be a major contributing factor to false positive or false negative results, leading to incorrect interpretations and conclusions.

To ensure future studies can replicate these findings with greater reliability, a larger sample size of both novice and expert participants will be needed. As a supplement to the key takeaways from this study, I have included some opinions from interviewees regarding both the GTI and WP for finding the ISYE 6501 and its information. While most agreed that the WP was more effective than the existing interface, they also provided negative feedback about the proposed prototype.

- ✓ *My expectation was that the WP would help me complete the task faster, but I do not believe that this wireframe can achieve that. It needs clearer guidelines and a simpler approach.*
- ✓ *Although the prototype was helpful in completing the task quickly and easy to understand, it was still a little bit confusing, and I was not entirely comfortable using it.*
- ✓ *It is not clear whether the search window of this prototype can handle different keywords, such as ISYE6501 or 6501, as efficiently as it did for ISYE 6501.*
- ✓ *I am not entirely sure about the purpose of the final modal window of the prototype or what information it contains. Are there links to other web pages included in this window to gain more insights about the ISYE 6501?*
- ✓ *I appreciate the idea of simplifying the web page, but this WP is not particularly engaging or clear to me. I think you should start with tracks instead of CORE, etc.*

8. EVALUATION SUMMARY

The key finding of this study is that the WP requires enhancements to improve its simplicity, learnability, and usability, despite its ability to assist in performing the task more efficiently and in less time than the GTI.

Additional Needfinding: Based on the previous assessments of the WP, I will initiate the subsequent iteration of the life cycle by commencing with the

needfinding evaluation phase for the WP. This phase will focus on addressing the following inquiries:

1. Does this prototype genuinely aid users in quickly and effectively identifying their target course? My primary concern is whether WP fulfills the user's requirements to perform the task and sub-tasks in a simple, efficient, and timely manner. To address these questions, I aim to gather further insights on refining the WP to provide a more comfortable and user-friendly experience.

2. Does this prototype offer significant benefits to a wide range of individuals? I have another concern that WP may have limited usefulness as I only evaluated it with 10 participants. Some of them expressed that the WP is not as efficient as expected and does not meet their requirements. To gather additional insights and feedback on the original WP's features, I plan to conduct further evaluations using paper, card, or text prototypes with a larger sample size of participants.

Design Alternatives: Based on the outcomes of the empirical evaluation, I will implement two significant modifications to the original WP to improve its simplicity, structure, and consistency. I plan to make a modification by replacing the four buttons labeled "CORE,..." with three tracks named "ANALYTICAL TOOLS,..." (Figure 7).

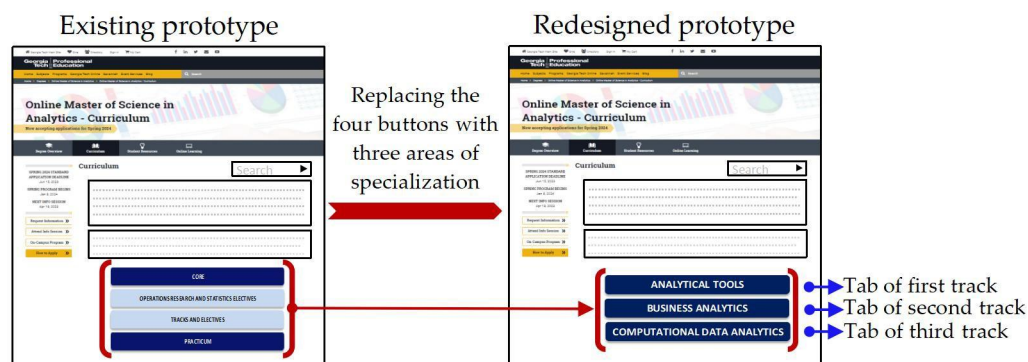


Figure 12. The first change in the WP for the OMS Analytics curriculum.

Following the first change, I proceeded to implement the second modification to the dropdown list titles (Figure 8).

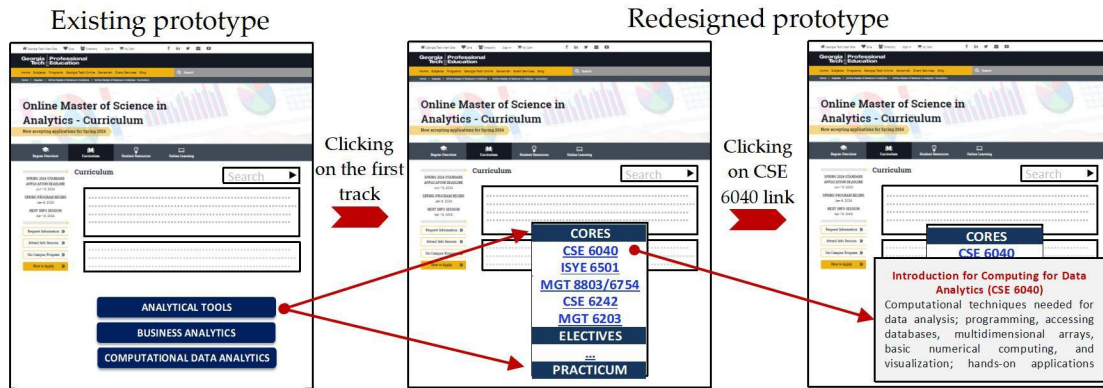


Figure 13. The second change in the WP for the OMS Analytics curriculum.

As a result, each course is now linked to its respective modal window, as shown in the figure. As depicted in the figure 8, these alterations, combined with the reordering and reclassification of courses, have resulted in a new version of the prototype that operates similarly to the original. The updated design includes three buttons that represent the tracks or areas of specialization. Clicking on each button displays the track courses categorized under three topics: CORES, ELECTIVES, and PRACTICUM. Users can click on each course to open the modal window containing information about the course.

Further Evaluation Plans: I will qualitatively assess the modified prototype in this stage by conducting FOCUS group sessions to facilitate the exchange of perspectives and resolution of discrepancies among participants. Next, I will empirically evaluate the effectiveness of the modified prototype by conducting a comparative study of its performance before and after modification. The outcomes of this study will provide insights into how the modified prototype can enhance users' task performance.

Appendix

Table 1. The process of interview for first plan of initial needfindings

1. Engagement (15 minutes): Share some information about yourself.
2. Exploration (60 minutes): View a brief video demonstrating how to search for the ISYE 6501 course and associated information within the three specialization tracks accessible on the GTI. The ensuing group discussion will cover the following questions: <ul style="list-style-type: none">✓ <i>What are your overall impressions of the interface?</i>✓ <i>How do you perceive the physical aspects of the interface?</i>✓ <i>What is your evaluation of the information presented on the interface?</i>✓ <i>What are the advantages and disadvantages of using this interface?</i>✓ <i>What is your experience with searching for process of the ISYE 6501 course in the tracks?</i>✓ <i>What is your assessment of searching for process the ISYE 6501 course for the tracks?</i>✓ <i>What is your opinion of the information provided about the ISYE 6501 course?</i>✓ <i>What are the strengths and weaknesses of this process?</i>✓ <i>Is there anything in the interface that you find confusing?</i>
3. Exit (15 minutes): Do you have any additional feedback or comments about the interface or the process of searching for the ISYE 6501 course and its related information?

Table 2. Demographic raw data of interviewees.

No.	Age	Gender	Education	Job
1	30	Female	Master	Student
2	41	Female	PhD	employee
3	31	Female	Master	employee
4	32	Male	Bachelor	Student
5	28	Male	Bachelor	Student
6	43	Female	Master	employee
7	32	Male	Master	employee
8	58	Female	Master	employee
9	25	Male	Bachelor	Student
10	19	Male	Bachelor	Student
11	27	Female	Master	employee
12	23	Female	Bachelor	Student
13	24	Male	Bachelor	Student
14	42	Male	PhD	employee
15	30	Male	MD	employee
16	21	Female	Bachelor	Student
17	48	Female	MD	employee
18	24	Male	Bachelor	Student
19	45	Female	MD	employee
20	21	Female	Bachelor	Student

Table 6. The execution steps of testing the GTI and WP through the interview method.

<p>1. Engagement (5 minutes): The aim of this study is to compare the efficiency of GTI and WP. After showing the prototypes, I will ask you 10 questions about them.</p>
<p>2.1. Exploration (5 minutes): Please look at the GTI and search for ISYE 6501 course and associated information within the three specialization tracks.</p> <p>Break (45 minutes)</p> <p>2.2. Exploration (5 minutes): Please look at the WP and search for ISYE 6501 course and associated information within the three specialization tracks.</p> <p>2.3. Exploration (30 minutes): Please answer my questions:</p> <ol style="list-style-type: none"> 1. <i>By which prototype, the process of doing the task was shorter? (functionality)</i> 2. <i>By which prototype, the process of doing the task was faster? (functionality)</i> 3. <i>By which prototype, the process of doing the task was easier? (simplicity)</i> 4. <i>Which prototype, you are more satisfied with? (satisfaction)</i> 5. <i>Which prototype, you are more comfortable with? (simplicity)</i> 6. <i>Which prototype is less confusing for doing tasks? (consistency)</i> 7. <i>Which prototype is more friendly? (learnability)</i> 8. <i>Which prototype is more informative? (functionality)</i> 9. <i>Which prototype is more attractive? (structure)</i> 10. <i>Which prototype is more colorful? (structure)</i> 11. <i>Which prototype is more relevant? (affordance)</i> 12. <i>Which prototype is more clear? (learnability)</i> 13. <i>Which prototype is more understandable? (learnability)</i> 14. <i>Which prototype is more usable? (usability)</i> 15. <i>Which prototype do you like more? (attractivity)</i> 16. <i>A number of steps in GTI to find information about the ISYE 6501 course and classes?</i> 17. <i>A number of steps in WP to find information about the ISYE 6501 course and classes?</i>
<p>3.Exit (5 minutes): Do you have any additional feedback or comments about the GTI and WP?</p>

Table 7. Demographic data of ten interviewees.

No.	Age	Gender	Education	Job
1	30	Male	MD	employee
2	30	Female	Master	Student
3	31	Female	Master	employee
4	25	Male	Bachelor	Student
5	24	Male	Bachelor	Student
6	28	Male	Bachelor	Student
7	32	Male	Bachelor	Student
8	42	Male	PhD	employee
9	21	Female	Bachelor	Student
10	19	Male	Bachelor	Student

Table 8. The answers of the participants to the questions about finding information about the “ISYE 6501 course” through GTI and WP.

Questions	Participants																			
	1		2		3		4		5		6		7		8		9		10	
	GTI	WP	GTI	WP	GTI	WP	GTI	WP	GTI	WP	GTI	WP	GTI	WP	GTI	WP	GTI	WP	GTI	WP
1	0	1	1	0	1	0	1	0	0	1	0	1	0	1	0	1	0	1	0	1
2	0	1	0	1	1	0	0	1	0	1	1	0	0	1	0	1	1	0	1	0
3	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	0	0	1	0	1
4	0	1	1	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
5	1	0	0	1	0	1	0	1	1	0	0	1	1	0	0	1	1	0	1	0
6	0	1	0	1	1	0	0	1	0	1	1	0	0	1	1	0	0	1	0	1
7	0	1	1	0	1	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1
8	0	1	0	1	0	1	1	0	0	1	1	0	0	1	0	1	0	1	1	0
9	0	1	0	1	1	0	0	1	1	0	0	1	1	0	0	1	0	1	0	1
10	0	1	1	0	0	0	0	1	0	1	0	1	0	1	0	1	1	0	0	1
11	1	0	0	1	1	0	0	1	0	1	0	1	0	1	1	0	0	1	1	0
12	0	1	1	0	0	1	1	0	1	0	1	0	0	1	0	1	0	1	0	1
13	0	1	0	1	0	1	0	1	1	0	1	0	1	0	0	1	0	1	0	1
14	1	0	0	1	0	1	1	0	0	1	0	1	0	1	1	0	1	0	1	0
15	0	1	0	1	0	0	1	1	0	1	0	1	1	0	0	1	1	0	0	1
16	0	1	0	1	1	0	0	1	0	1	1	0	1	0	0	1	0	1	1	0
17	0	1	1	0	0	1	0	1	1	0	0	1	0	1	1	0	0	1	0	1
The interviewer measures the number of steps (1) and time (in seconds) of doing the task (2) by both GTI interface and WP.																				
1	2	5	4	2	5	2	6	3	5	4	7	2	6	3	5	2	7	3	6	4
2	24	8	43	11	35	16	21	13	32	10	45	9	34	15	44	11	39	18	46	16

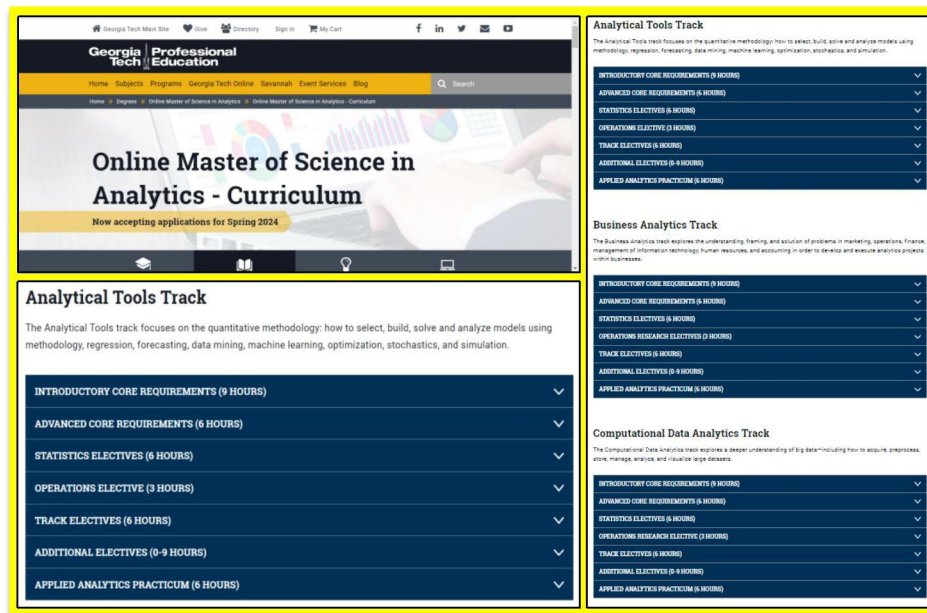


Figure 1. This image depicts the GTI, with the top left screenshot displaying the page title, and the bottom left screenshot showing the accordions for the analytical tool track. The right-hand side image displays the same accordions for all tracks (<https://pe.gatech.edu/degrees/analytics/curriculum>).

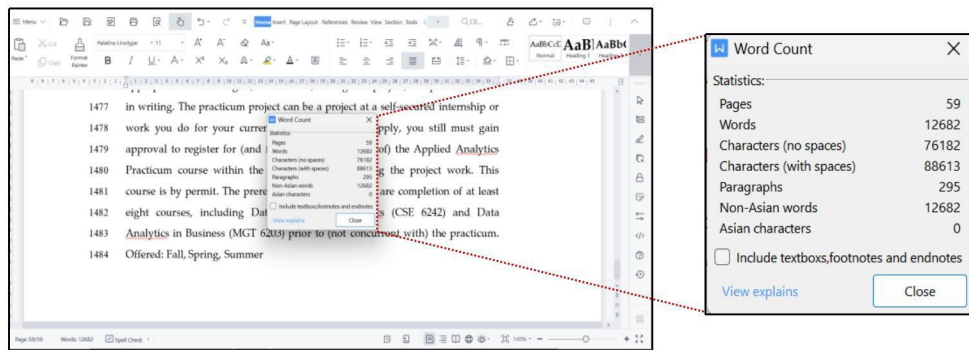


Figure 2. The GTI was analyzed and a screenshot was taken to show the word count, line count, and page count.

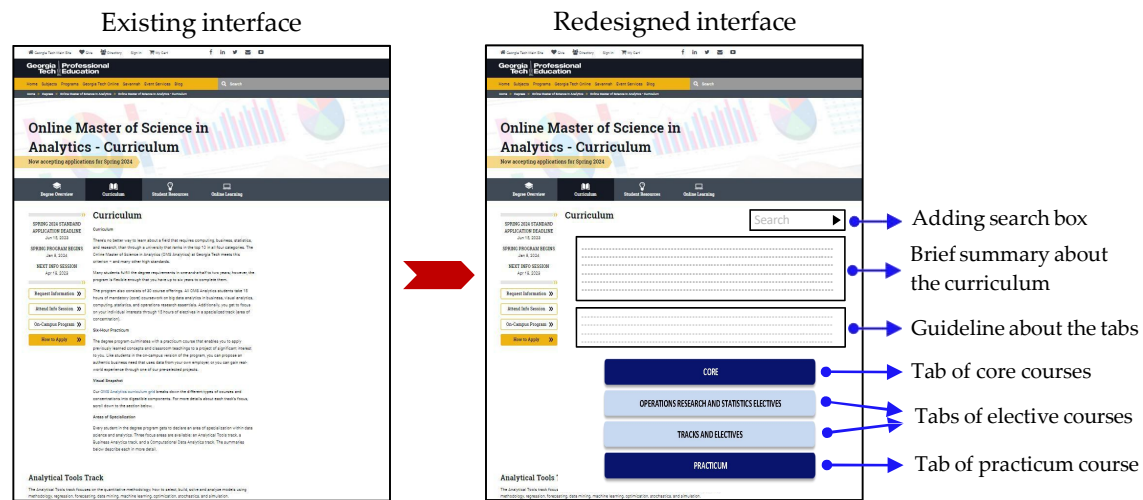


Figure 6. The redesigned GTI as a WP.

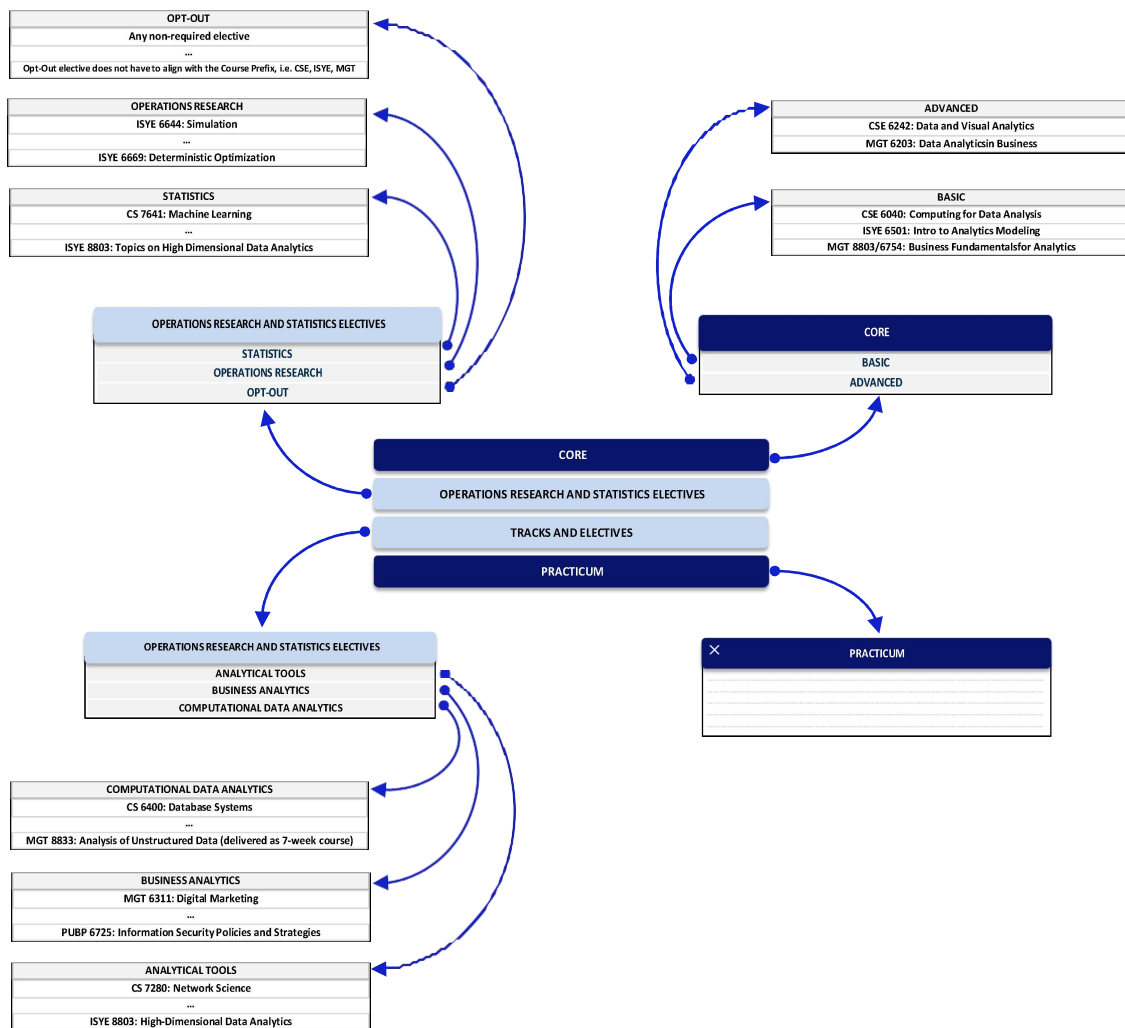


Figure 7. Clicking on each tab for core, electives, and practicum courses will reveal the relevant groups and their corresponding course content in a modal window.

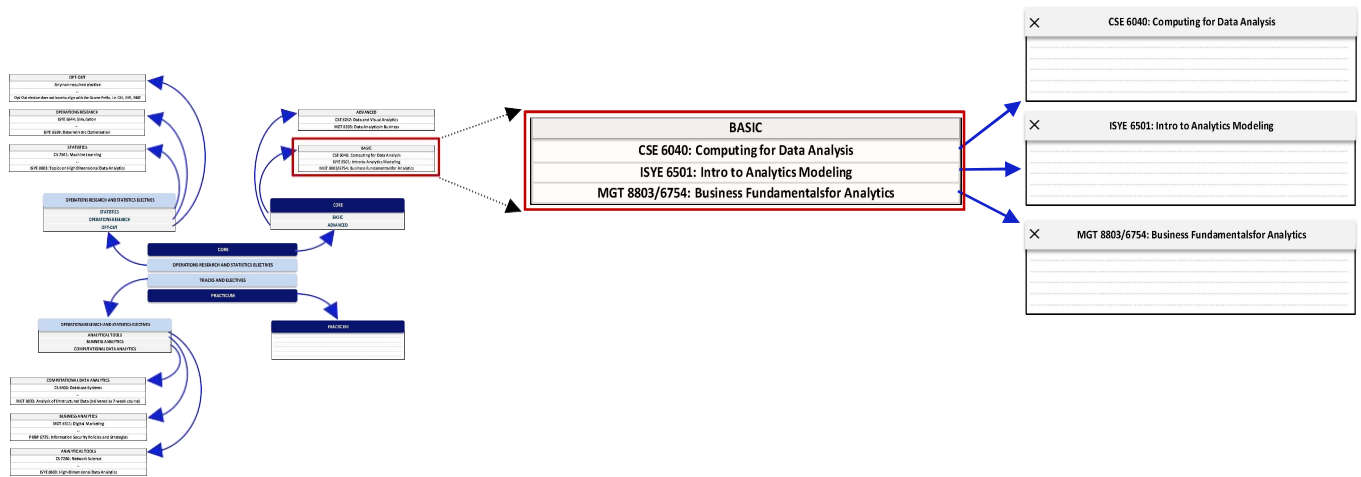


Figure 8. After selecting the "Basic" option under the "Core" button, the related courses are displayed. Clicking on each course opens a small modal window containing information about the course.