Appendix

Bibliography

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[4] "Analysis of Different Sorting Techniques." *GeeksforGeeks*, 30 Apr. 2019, www.geeksforgeeks.org/analysis-of-different-sorting-techniques/

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[A] Email 1

From developer to client (Mon, May 25, 2020 at 6:25 PM).

"Dear Mr. Kirkness,

I hope this email finds you well. I am writing to you in regards to my Computer Science IA, because I would like to have you as my client. I hope after reading this email and the explanation of my project below that you will consider helping me in a client role.

The idea that I have is related to the Merchandise Club at ISAK, which I happen to be a part of. This is also the reason I am reaching out to you as a client, because you are the primary staff contact person for us merch club students.

The idea is to create a platform where students can buy and sell items amongst ourselves. The vision is creating an online marketplace, a "miniature e-bay", but only having it accessible for ISAK members, eg. students (and optionally faculty/staff) on campus. Users will be able to sign in with their school Google account on the website, and act as both buyers and sellers. Individual users will be able to post a certain item(s) at a chosen or minimum price. Such a post can include the name of the item, a picture of the item(s), price, category of item (eg clothes/food/beverage etc.), expiration date of food/drinks, quantity and just general additional information (eg. "This is from my home country").

Other users can browse available listings (sorted by "all listings", a certain category or a searched term), and let the seller know they want to buy the product(s). An option (if you would like it) could also be to integrate a "bidding" functionality, allowing for the seller to set a minimum price and a deadline, and the highest bidder within that time gets the product.

As I believe having credit card/bank transfer payment is both inconvenient and not possible because of regulations, I am aiming for this site to be completely cash based. Finalized sales, in which seller and buyer are both happy, would rely on them both to meet for exchanging goods and money. This meeting point can be arranged through the site as well.

In a users profile, they can see all their current listings and a history of purchases.

These are the details of my project, and I hope they somewhat align with what you see as possible and necessary. Your role as a client, if you accept, would be as follows. The client provides so-called "success criteria", which are crucial for the project. These success criteria should be as measurable and detailed as possible, and include descriptions of functionality or features of the program that are needed for him/her to be satisfied with the final product. It would also be helpful if you as the client formulated a rationale for the project; why is this needed, how do you envision it benefitting students.

To simplify the demands on you, the client, I have drafted an example list of success criteria for the project, which can work as a starting point for you. Do not hesitate to add, edit or delete these as you feel necessary, because this is supposed to accurately reflect the needs of the client.

Success criteria:
The user is able to

- Log-in with school Google account
- View all listings
    - Sorting old-new, new-old and price high-low, low-high
- Filter listings based on categories
- Filter listings based on search term
- Post items for sale with the information;
    - Name of product
    - Quantity
    - Expiration date (if food/drinks)
    - Category of item (clothing, food, drinks etc.)
    - Price
    - Picture of item
    - General information, free text
- Buy item(s) from a seller
    - Specifying number of items
    - Meeting place and time for exchange

- See historical profile
  - Current listings
  - Purchase history

I hope this project sounds intriguing, and that you would like to be my client. I am very excited to start working on this project, and believe it will have a noticeable positive impact on our community.

I look forward to hearing your response and feedback. As I mentioned, I will need a confirmed list of success criteria list and a short rationale for the project. I am also copying my Computer Science teacher, Dr. Pinzon, on this email for transparency.

Kind regards,
[Developer]"

[B] Email 2

From client to developer (Wed, Jun 3, 2020 at 8:31 AM).

"[Developer],

Thank you for your professional email and apologies for the delayed response. Your follow-up message was also helpful. Good start. In fact, your professionalism is the reason I am willing to work with you on this project. Give me a few days to think it over in terms of my remit.

Best,

Dean"

[C] Email 3

From developer to client (Thu, Aug 27, 2020 at 9:56 PM).

"Dear Mr. Kirkness,

I hope you are doing well, and that your summer break was relaxing. However, I also hope you can agree that it's good being back in the old routine again. At least I am very glad to be back.

I am sending you this email to follow up our brief email exchange before summer, regarding being a client for my computer science IA. Is this still of interest to you? I am very motivated to set this project into life, with your help and guidance.

I look forward to hearing from you.

Regards,
[Developer]"

[D] Email 4

From client to developer (Fri, Aug 28, 2020 at 9:07 AM).

"Hi [Developer],

Thanks for your message. Yes, a bit of routine is welcome. I just hope we don't have to wear masks all year.

Sorry for the late reply, but it actually might be a good thing. Mr. McGibbon and I have been having a lot of discussions about merch and merch club and see a clear path for an online storefront. We think using a service like Zazzle, which can serve both Japanese and international customers is the best options. We've encouraged Katrina to embrace an approach like this so I think she is considering it. But I think considering resources and the advantages of a managed platform we would inevitably find ourselves there at some point, even if the merch club doesn't want to be part of it.

But have you had any discussions with Katrina about your idea?

So, in terms of your project, if we went with a pre-built solution like this, can you think of a way that this approach would satisfy the requirements of your computer science course? I'd like to be able to help you if we can find the right niche for your project that also covers the course requirements.

Let me know what you think.

Best

Dean"

[E] Email 5

From developer to client (Fri, Aug 28, 2020 at 4:47 PM).

"Hey Dean,

Thank you for the reply. I understand your point about Zazzle, and think that's a great idea for Merch club. I also talked to Katrina about this, and we both agree that my project would not be able to "compete" with an external service, especially because I never intended to build it for the international demand. To completely avoid miscommunication, I want to clarify specifically what my current idea is for my own project, and then we can work out how/if it fits for our community:

My plan was to build an internal digital marketplace for students/faculty, where items can be sold and purchased. These items could be personal/private food, drinks etc., among other things that users wish to exchange. Moreover, this platform *could* be used to sell merchandise internally on campus, but is not intended to do so *exclusively*. This will be entirely cash-based and with face-to-face delivery. While I would love to expand this for the capacity you and Mr. McGibbon are looking for, it is simply outside my capabilities and the scope of the computer science IA. This is the core idea I'm thinking about, and please let me know if this is unclear in any way.

In this way, I believe both Zazzle (which I understand will only sell merchandise items, internationally and domestically) and my own IA project can coexist because of their different purposes. I hope we are on the same page about this, but please let me know if there's something I'm missing.

You mentioned adapting the pre-built solution for my IA, it is sadly not possible because I am required to build the platform myself.

I can also mention that nothing about my idea is "set in stone". While i am motivated to put this project I explained above into life, I am more than willing to adapt if you identify a greater need for our school that I can help with.

Looking forward to hearing from you.

Regards,
[Developer]"

[F] Email 6
From client to developer (Wed, Sep 2, 2020 at 9:23 AM).

"Hi [Developer],

Thanks for clarifying. This certainly clears things up.

As for a school need, I'm not entirely sure. I think you've probably thought about this more than me so your thesis might be right.

But while we are discussing it, what other ideas did you have in mind as you were considering project ideas?

Otherwise, please remind me how I can step in and what you need from me at this point. Maybe we can meet to discuss.

Best"

[G] Email 7

From developer to client (Sun, Sep 6, 2020 at 11:35 PM).

"Hey Dean,

Thank you for the chat we had, and I apologize for the late follow-up. After careful consideration, I have decided not to pursue the ISAKx project at this time, and rather stick to the marketplace idea. It simply seems more feasible in this time frame. I have also thought about what you said about making something that will not "go to waste"; meaning something that will actually be used. This is really important to me, but at the same time I am realizing that the due date of the project will arrive quicker than expected, especially with the large workload in the coming months. It is therefore important for me to be able to start development as soon as possible. I hope you can understand this. Therefore, I would prefer to still have you (or someone internally in ISAK) as my client. Additionally, it is still a bit unclear to me as to why the parents association would be interested in my idea. Unless I am missing something or you really think this is a better option for the client, I would prefer not involving them at the moment.

In summary, I think the best option is having you as my client. The best steps and course of action would be as follows: you would either agree to or change/edit the success criteria I sent in the first email in this thread, as you see fit. Then, I will start developing the platform and make sure it meets all the requirements of the IA. And finally, we can sit down with the finished product and evaluate how usable it is for the school.

Let me know if this plan sounds okay. Your help will only be required for the first step of working out the success criteria (I have included these below for reference). This is very straightforward, and a simple "yes the success criteria look good" or "the success criteria look okay, but change ..." would suffice. After that, I will be out of your hair.

The success criteria I included in the first email were as follows:
The user is able to
- Log-in with school Google account
  - View all listings
    - Sorting old-new, new-old and price high-low, low-high
  - Filter listings based on categories
  - Filter listings based on search term

- Post items for sale with the information;
    - Name of product
    - Quantity
    - Expiration date (if food/drinks)
    - Category of item (clothing, food, drinks etc.)
    - Price
    - Picture of item
    - General information, free text
- Buy item(s) from a seller
    - Specifying number of items
    - Meeting place and time for exchange
- See historical profile
    - Current listings
    - Purchase history

I hope all this makes sense, and again, please let me know if you have questions or concerns.

Looking forward to hearing from you.

Kind regards,
[Developer]"

[H] Email 8

From client to developer (Thu, Sep 10, 2020 at 11:50 AM).

"Hi [Developer].

Thanks for letting me know. I'm very impressed by your professionalism.

The success criteria you laid out looks fine to me.

Let me know if you need anything else from me at this point. Otherwise, good luck!

Best"

[I] Email 9

From developer to client (Mon, Jan 18, 2021 at 8:00 AM)
Dear Mr. Kirkness,

I hope this email finds you well, especially in these crazy times. First of all, happy new year! I am contacting you to pick up the conversations we had last semester regarding my computer science internal assessment. As you might recall, I was planning to develop a marketplace website for ISAK, where people could post items for sale and buy other items. As I am in the final stages of this project, I would like to ask for your feedback and thoughts on the product I have created so far. I seek to understand if the website meets the success criteria we agreed upon in our previous email exchange (see below for that list), and if it meets your (the clients) general expectations. Additionally, I am interested to understand what type of improvements would be needed to make it even more aligned with your/the schools needs.

You can find the live website on the address: [link] (don't mind the weird address, this is just a temporary domain name used to show you the website). In addition, I made a short 7 minute YouTube video outlining the functionality of the website. If you want to have a look at that, it can be found here: [link].

Please take a look, and the application already has a mock database with fake items being sold, just to show the functionality. Play around with it freely, I have a backup of everything.

The success criteria we discussed earlier are as follows:
The user is able to

- Log-in with school Google account
- View all listings
  - Sorting old-new, new-old and price high-low, low-high
- Filter listings based on categories
- Filter listings based on search term
- Post items for sale with the information;
  - Name of product
  - Quantity
  - Expiration date (if food/drinks)
  - Category of item (clothing, food, drinks etc.)
  - Price
  - Picture of item
  - General information, free text
- Buy item(s) from a seller
  - Specifying number of items
  - Meeting place and time for exchange
- See historical profile
  - Current listings
  - Purchase history

For my computer science IA, I need a couple pointers or feedback from you as the client. For example, here are some sample questions;

- Did the website meet all your success criteria, or was any functionality inadequate?

- Is it easy to navigate and understand the layout of the website?
- Is the website visually pleasing? (e.g. not an eye-sore)
- Is the website as expected, and how so (or how not)?
- Apart from what you've answered to the questions above, is there anything else you like or don't like?
- What's missing before the website could be deployed?
- What improvements would you make to the website, either now or more long term?

Please be honest, I know the product is far from perfect and critique is very welcome! Additionally, I do not want to make this process a burden for you, so no need to spend much time on this feedback. Simple/short comments and thoughts would be great, and this will be an important part of my essay along with my own reflections on the product.

Thank you for your time and help with this!

Regards,
[Developer]

[J] Email 10

From client to developer (Fri, Jan 22, 2021 at 2:31 PM).
Hi [Developer],

Sorry for the delay in responding and congrats on getting to this stage.

Here is my feedback. Overall you did a good job and mostly nailed the functionality. There are a few items that I'd suggest focusing on:

Core Functionality:

- Allow sale items to be edited after submission
- Admin mode where I can see all the users

Design considerations:

- Change Fonts and overall positioning of text
- Change button colors and design
- Purchase confirmation could include additional information. It is functional, but a bit cold. Needs some customer service touch. Even a "thank you" would be nice.
- Optimize for mobile

But overall, I think you got done what you set out to do. Let me know if I missed anything or you need some more specific feedback on anything.

Best

Dean

[K] Beta tester interview 1

Q: What did you like about the website?
A: I liked that it was easy to navigate on the website, and I felt like I knew where everything was, and finding specific things I was looking for was easy because I could search and filter on the home page. The individual item pages themselves were nice, but maybe could be filled more out because they were a bit empty. Also, it was also easy to add the information when I posted stuff.

Q: What did you not like about the website?
A: I wish I could've added more pictures of the things I was selling. Also, a few times when I posted stuff, I made typos and errors which I couldn't change later, which was just annoying. The same goes for when I changed my mind and didn't want to sell something after all, but I couldn't delete the post.

Q: What would you like to see improved on the website?
A: I think changing the information on your posts after you've published them would be good, because it caused me a lot of frustration when I couldn't do that, and I had to make one of my friends fake buy items, just to get rid of it. At least that's what I think would make the website a lot better.

[L] Beta tester interview 2

Q: What did you like about the website?
A: It was really easy to use, so design-wise I don't have anything to complain about. Maybe a little boring, but it got the job done. I also like the easy posting form and the profile page, especially because I could see everything I bought and what I sold to other people in a clear list.

Q: What did you not like about the website?
A: The transaction itself was very underwhelming, and frankly pretty lacking. Like, when I was going to buy someone's chocolate, after I pressed "buy", I don't think they knew. So I basically had to text them on messenger and arrange when I would pay them and get the stuff. I know it's a bit picky, but it sucks that I had to do that extra step, and kinda makes the website reliant on other methods.

Q: What would you like to see improved on the website?
A: Definitely chatting or something like that. I want to be able to message the person I'm buying from, without leaving the website at all, because I never know where to text them. That would make selling items so much easier. Also, the website doesn't really work on my phone right now.

I get that it's made for laptops, but at the same time it would be easier to have it usable on my phone as well.

[M] Libraries used

Below is a complete list of all libraries used (can also be found in "requirements.txt" in the product folder).

- beautifulsoup4==4.9.3
- cachetools==4.2.0
- certifi==2020.12.5
- chardet==4.0.0
- click==7.1.2
- Flask==1.1.2
- Flask-Dance==3.2.0
- Flask-Login==0.5.0
- Flask-SQLAlchemy==2.4.4
- Flask-WTF==0.14.3
- google==3.0.0
- google-auth==1.24.0
- google-auth-oauthlib==0.4.2
- idna==2.10
- itsdangerous==1.1.0
- Jinja2==2.11.2
- MarkupSafe==1.1.1
- oauthlib==3.1.0
- pyasn1==0.4.8
- pyasn1-modules==0.2.8
- requests==2.25.1
- requests-oauthlib==1.3.0
- rsa==4.7
- six==1.15.0
- soupsieve==2.1
- SQLAlchemy==1.3.22
- urllib3==1.26.2
- URLObject==2.4.3
- Werkzeug==1.0.1
- WTForms==2.3.3

[N] Fully evaluated test plan and success criteria

Test step	Action to test	Input	Expected output	Success criteria	Accomplished?
1	Log in with Google account (user 1)	Email and password credentials of a Google account	Logged in to the webpage, shows "Welcome, [name]!"	1	Yes
2	Post item 1 for sale	Press "sell". Name: "Chips". Quantity: 5. Price: 100. Category: "Food". Expiration date: 23.04.2021. Description: "Cheap chips for sale". Picture: upload from computer	Item is displayed with correct information	2 (a,b,c,d,e,f, g)	Yes
3	Post item 2 for sale	Press "sell". Name: "1984". Quantity: 1. Price: 750. Category: "Book". Description: "1984 is one of my favorite books. Very much recommended!". Picture: upload from computer	Item is displayed with correct information	2 (a,b,c,d,e,f, g)	Yes
4	Log in with different Google account (user 2)	Email and password credentials of a Google account	Logged in to the webpage, shows "Welcome, [name]!"	1	Yes
5	Post item 3 for sale	Press "sell". Name: "Jeans". Quantity: 3. Price: 500. Category: "Clothes". Description: "Old jeans, waist size 34". Picture: upload from computer	Item is displayed with correct information	2 (a,b,c,d,e,f, g)	Yes
6	Post item 4 for sale	Press "sell". Name: "Flashlights". Quantity: 2. Price: 1000. Category: "Tech". Description: "Flashlights for sale. Batteries included". Picture: upload from computer	Item is displayed with correct information	2 (a,b,c,d,e,f, g)	Yes

7	Post item 5 for sale	Press "sell". Name: "Eggs". Quantity: 12. Price: 50. Category: "Food". Expiration date: 23.12.2020. Description: "I bought too many eggs, and need help eating them. Selling each egg individually!". Picture: upload from computer	Item is displayed with correct information	2 (a,b,c,d,e,f, g)	Yes
8	Show all listings	Click "Marketplace" in top left corner	Homepage is shown with all available listings	6	Yes
9	Sort all listings New-Old	Select "New-Old" and click "search"	Newest items are shown first	6a	Yes
10	Sort all listings Old-New	Select "Old-New" and click "search"	Older items are shown first	6b	Yes
11	Sort all listings with price High-Low	Select "Price High-Low" and click "search"	Most expensive items are shown first	6c	Yes
12	Sort all listings with price Low-High	Select "Price Low-High" and click "search"	Cheapest items are shown first	6d	Yes
13	Filter listings by category	Select "Food" and click "search"	Shows only items in food category	5a	Yes
14	Filter listings by search term 1	Input "light" into search bar and click "search"	Shows "Flashlight" item	5b	Yes
15	Filter listings by search term 2	Input "sale" into search bar and click "search"	Shows both "Chips" and "Flashlight" items	5b	Yes
16	Buy item 1	Click on the "Chips" item. Click "buy", select quantity of 2, input buyer description as "Please meet me in the cafeteria at 6pm tomorrow" and click "confirm"	Confirmation screen is shown. Quantity is decreased	3 (a,b)	Yes
17	Buy item 2	Click on the "1984" item. Click "buy", select quantity of 1, input buyer description as "I'll text you on google	Confirmation screen is shown. Item is removed from selection	3 (a,b)	Yes

		hangouts when i'm free" and click "confirm"			
18	Display personal profile page information (user 2)	Click "Profile", then "Posts" or "Transactions"	Shows item 3, 4 and 5 posted for sale. Shows transactions of step 16 and 17	4 (a,b)	Yes
19	Log in with Google account (user 1)	Email and password credentials of a Google account	Logged in to the webpage, shows "Welcome, [name]!"	1	Yes
20	Buy item 3	Click on "Jeans" item. Click "buy", select quantity of 2, input buyer description as "I'll come to your house to pick them up" and click "confirm"	Confirmation screen is shown, item quantity is reduced on homepage	3 (a,b)	Yes
21	Buy item 4	Click on the "Flashlight" item. Click "buy", select quantity of 2, input buyer description as "I'll text you on google hangouts when i'm free" and click "confirm"	Confirmation screen is shown. Item is removed from homepage selection	3 (a,b)	Yes
22	Display personal profile page information (user 1)	Click "Profile", then "Posts" or "Transactions"	Shows item 1 and 2 posted for sale. Shows transactions of step 16, 17, 20 and 21	4 (a,b)	Yes