Heartland Escapes: Software Requirements Engineering

Software Requirements Engineering – CS641

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Revision History

Revision	Revision Date	Description
0	10/14/2024	Initial Creation
1	10/20/2024	Requirements Elicitation

1. Project Outline

Heartland Escapes is a bookstore based out of Lincoln Nebraska. Over the past few years, they have seen a drastic rise in popularity due to their social media virality. Because of the increased traffic through their stores, Heartland Escapes has just recently modernized and moved their system to Google Cloud Platform (GCP). Now they're looking to expand into developing their own e-commerce site. They want to take an iterative approach to developing this e-commerce site, starting with product display and search.

Heartland Escapes current system architecture contains the following components: an inventory API, a corresponding inventory database, a point-of-sale system, an accounting database, and a public website. The public website already integrates with the inventory API, and this integration point on their public website should be the host of the product catalog prototype data.

The purpose of this document is to create a plan for the requirements engineering process needed to support this development effort for Heartland Escapes. Requirement elicitation approaches will be evaluated, and the resulting requirement outcomes will be analyzed using a variety of techniques. The importance of quality in software products will be explored, and areas of required product quality for this Heartland Escapes project will be identified. Verification and validation plans will be prepared and implemented, and finally the resulting requirements specification list will be provided.

Although this effort is a small part of the larger e-commerce system, it is not a trivial pursuit. Advanced product display will require deep integration into their existing inventory systems, and UI/UX tends to be a very opinionated sector of software development. A lot of requirements can be generated around product searching, filtering, out of stock display, search performance, category browsing, etc. Additionally, user experience design has been trending toward accessible user interface design. This includes screen reader support, sufficient color contrast for readability, and potentially color blindness friendly system themes.

2. Requirements Elicitation

Requirements elicitation is the process of gathering and identifying the features and needs for a software product directly from stakeholders. It is a key responsibility of business analysts, product owners, and scrum masters, and has evolved into a well-structured practice with numerous established techniques. This process is integral to the software development lifecycle (SDLC), fitting within the Analysis or Requirements Definition phase. As one of the first steps in defining project requirements, elicitation sets the foundation for the system's design and development.

When selecting a technique for requirements elicitation, it's crucial to consider the specific context of the project. For instance, if the project involves a large number of end users, surveys might be an effective method to gather new feature ideas and identify quality-of-life improvements. On the other hand, if the project is in its early stages of development and just engagements with stakeholders are just beginning (as is the state of this project with Hearltand Escapes), techniques such as brainstorming sessions or prototyping could be more appropriate for exploring broad concepts and gathering initial feedback (Nicholas, 2024).

2.1. Elicitation Technique Selection

Since this endeavor with Heartland Escapes is early in the development process, the first requirement elicitation method used will be facilitated brainstorming sessions with stakeholders. These brainstorming sessions will use liberating structures to ensure participation from all stakeholders. This can also gamify the process, potentially making it more enjoyable for everyone involved. The primary reason for this approach is to engage stakeholders directly and help prioritize their needs for the software product. It also enforces collaboration between stakeholders, reducing the risk of conflicting requirements. Facilitating these sessions with an agenda and a skilled facilitator, combined with the free-flowing nature of brainstorming, should help establish direction and uncover unknowns. This will be a good way to extract functional requirements from different stakeholders, and possibly nonfunctional requirements as well (Sruthy, 2024).

One major disadvantage of brainstorming is groupthink, but this can be mitigated through the use of liberating structures like 1-2-4-All, Quarantine and Combine, and Conversation Café, which encourage individual input and ensure all stakeholders are engaged. Another disadvantage is that it requires a skilled facilitator to keep the conversation on track and avoid tangential discussions. It also depends on stakeholders being open to the idea of brainstorming in this manner (McCandless & Lipmanowicz, n.d.-a)(McCandless & Lipmanowicz, n.d.-b).

The second elicitation technique that will be used is prototyping, which fits well with the needs of Heartland Escapes because this project is highly user-experience oriented. Thankfully, there are tools available that can reduce the time and resources needed to produce quality prototypes, such as Figma. Figma is a user experience design tool that allows individuals to design user interfaces without the need for code. This makes it ideal for quickly creating interactive, high-fidelity (hifi) prototypes that stakeholders can interact with to provide immediate feedback on the look, feel, and functionality of the system. By using Figma, both functional and non-functional requirements can be addressed, ensuring that the interface is intuitive, responsive, and accessible, which are essential for a user-facing platform like the one Heartland Escapes is building.

However, there are some disadvantages to prototyping. It can be time and resource-intensive, even with a tool like Figma. Creating high-fidelity prototypes can take time, and stakeholders may misinterpret the polished prototype as being closer to completion than it actually is. This can lead to unreasonable expectations regarding development timelines and the readiness of features. Additionally, prototypes often lead to scope creep, as stakeholders may generate new ideas from seeing visual representations of the system, resulting in additional requirements. To mitigate these risks, it's important to communicate clearly with stakeholders and manage scope creep through a change request process (Sruthy, 2024).

2.2. Elicitation Technique Implementation

For the application of the requirements elicitation techniques described above, I met with the Chief Executive Officer (CEO), President, and Vice President of Heartland Escapes. These stakeholders were chosen due to the organization's relatively small size and the limited number of executive-level individuals involved in the e-commerce project. As the business expands, we will employ additional techniques, such as surveys, to gather requirements from a broader set of stakeholders, including customers.

2.2.1 Brainstorming

During the initial brainstorming session, I facilitated the meeting with a clear objective: to elicit requirements for the product catalog's core features, including the product view, author view, and general catalog browsing. Based on prior scoping sessions, these were identified as key areas of interest. We began with the product view, as it seemed the most straightforward, and I initiated the conversation by asking stakeholders what information should be presented to customers.

This exercise was particularly effective. As a software engineer familiar with user interface design, I was able to guide the conversation efficiently. The stakeholders' domain expertise paired well with my technical insights, leading to productive discussions and well-defined requirements. However, as the session progressed to the author and catalog

views, I noticed the brainstorming was becoming dominated by myself and the CEO, with the other stakeholders being less vocal.

To address this, I introduced the Quarantine and Combine liberating structure to ensure diverse perspectives were captured. This technique allowed each stakeholder to contribute individually before we reconvened to discuss their ideas.

2.2.2 Quarantine and Combine & "Prototyping"

Quarantine and Combine is designed to gather individual inputs while ensuring common ground is identified. Participants are prompted to work individually on a task—in this case, creating a layout for the product view—before regrouping to discuss their ideas. For this exercise, I asked the CEO and Vice President to draw their vision of the product display while providing them with a basic example I had prepared. To see the image of the quarantine and combine example, see Figure A3 (Appendix A).

Once they were satisfied with their drawings (Appendix A. figures 2.d and 2.e), we reconvened to identify common elements and discuss the differences. One significant point of divergence was how product formats (e.g., hardcover, paperback, CD) would be displayed, especially since each format might have different stock statuses and prices. By combining ideas, we collaboratively created a refined, low-fidelity prototype, which clarified these requirements. To see images of the CEO's and Vice President's designs see Figures A4 and A5 respectively (Appendix A). To see the final low fidelity prototype, see Figure A6 (Appendix A).

This process was highly effective, allowing the stakeholders to feel more engaged and creative. They expressed that they enjoyed the hands-on approach and felt it made the process more collaborative. Moreover, the exercise immediately refined the initial set of requirements derived from the brainstorming session. This low-fidelity prototype will serve as the basis for the high-fidelity designs created by the UI/UX designer in Figma, ensuring that the final design reflects both the business needs and user experience considerations. To see the output of the brainstorming session, see figures A1 and A2 (Appendix A).

3. Requirements Analysis

TBD

4. Requirements and Software Quality

TBD

5. Requirements Validation and Verification

TBD

6. Requirements Specification

6.1. Functional

1. Product View
    a. As a user, I want to see all available images of the product so that I can identify it more easily when I see it in the store
    b. As a user, I want to see the product name, author, genres, and synopsis so I can better identify whether this product is one that I'd be interested in purchasing
    c. As a user, I want the product synopsis to be truncated and expandable so that I'm able to see all product information at once by default.
    d. As a publisher, I want my publication name and publication date to be displayed with the product to show that I've supported and managed the author's work.
    e. As a user, I want to be able to see all product formats and their respective stock availability and price
    f. As a user, I want to access information about the author from the product page.
    g. As a user, I want to see ratings and product awards so I can identify the quality of the product.
    h. As a user, I want to see a list of products that other customers viewed within the same session of viewing this product, that way I can find some other products that may be related.
2. Author View
    a. As a user I want to know the name, image, and biography of an author so I can better relate to their works.
    b. As a user I want to know the birth date, death date, and biography so I can understand what demographic information may have influenced their works.
    c. As a user I only want to see an authors death date if they are deceased, so that I don't get confused.
    d. As a user, I want to see other works that an author may have created so that I can buy more of their products.
    e. As a user, I want to see an authors works as a set of cards with the image and title, so that I can identify their works more easily by sight
    f. As a user, I want to see an authors works as a table grouped by series, so that I can better identify collections of works by the author.
3. Product Catalog
    a. As a user, I want to be able to search for products across all product attributes by default, that way I can get a more general response of products matching my search query.

b. As a user, I want to be able to futher refine my search by searching within a specific product attribute (e.g. author name, product name, genre), so I can get a more specific search response.
c. As a user I want to be able to filter search results by any particular set of product attributes (collection of genres, collection of awards, store location, etc) so I can get a more specific search response.
d. As a user I want the filtering functionality to be hidden by default on a left-hand tray accessible via hamburger button, so that the filtering functionality doesn't clutter the display of the product list.
e. As a user, I want the product response to be formatted as a table of products, ordered from left to right (paper-back image, book title, author, stars, any format stock status), so that I can see relevant information from the start.
f. As a user, I want to be able to sort the search response by any table format heading (title, author, stars, stock status).
g. As a user, I want the product display to be paginated, so that my experience is responsive and performant.

6.2. Non-Functional

1. Extensability

The product catalog feature must be extensabile. This is the first component of the e-commerce platform prototype, meaning that from this module the rest of the e-commerce system will need to be built.

2. Usability

This project is primarily user experience oriented. Heartland Escapes customers tend to range from teenagers to the elderly, so the user interface design needs to be intuitive enough to support all age demographics. Also, Hearland Escapes stakeholders would like the system to be screen reader accessible. They plan to sell audio books through this e-commerce platform, so they would like the platform to be accessible to blind customers.

3. Interoperability

The e-commerce site is expected to share inventory from across the Heartland Escapes stores. This means that the product catalog must integrate with the existing inventory system to retrieve product descriptions and availability.

4. Portability

Many individuals who utilize e-commerce platforms do so across multiple forms of devices. Heartland Escapes does not expect their customers to adhere to a specific

operating system or device type to use their platform. The e-commerce website should support all potential media sizes.

Appendices

Appendix A

Figure A1: Requirements gleaned from brainstorming session

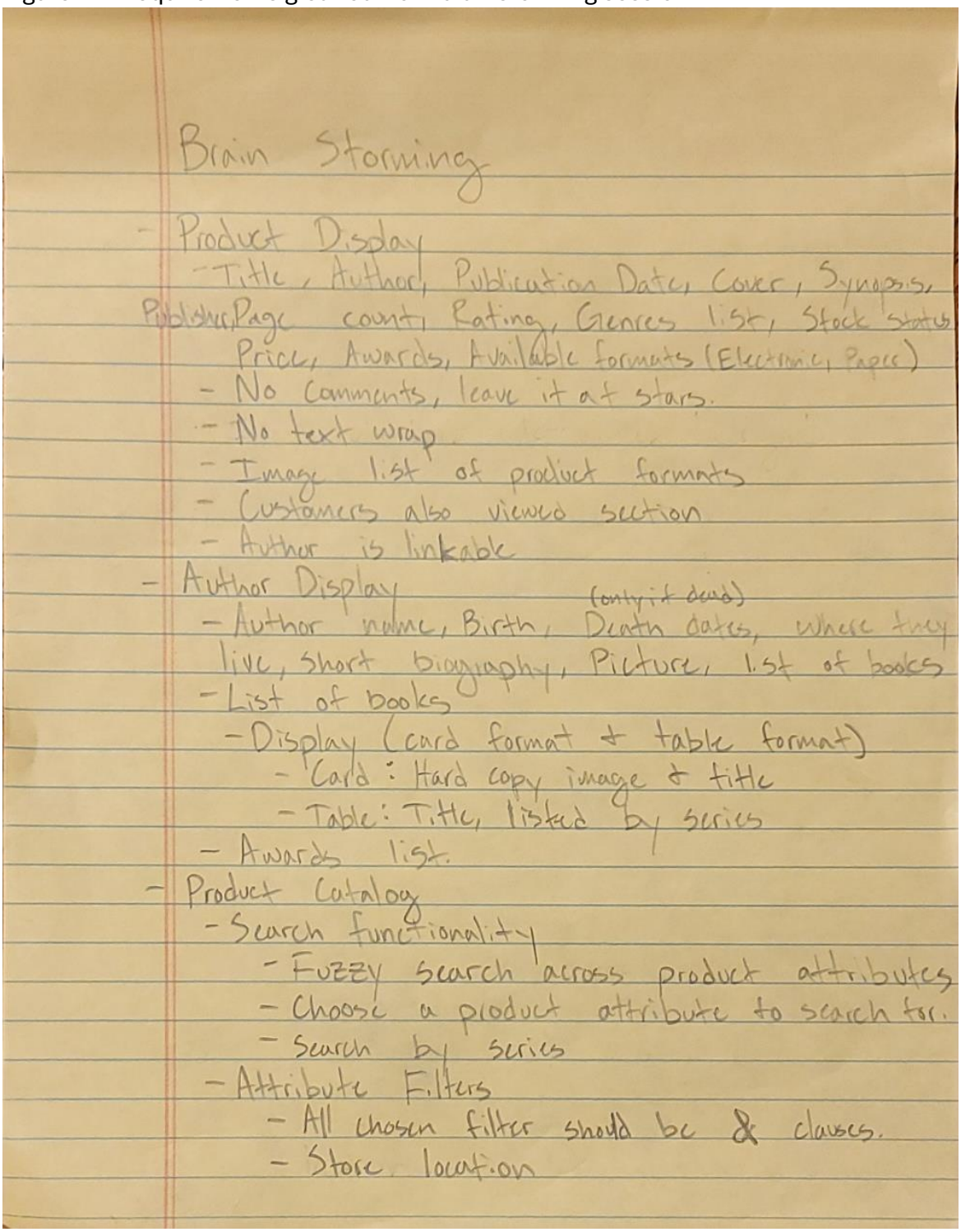


Figure A2: Requirements gleaned from brainstorming session part 2

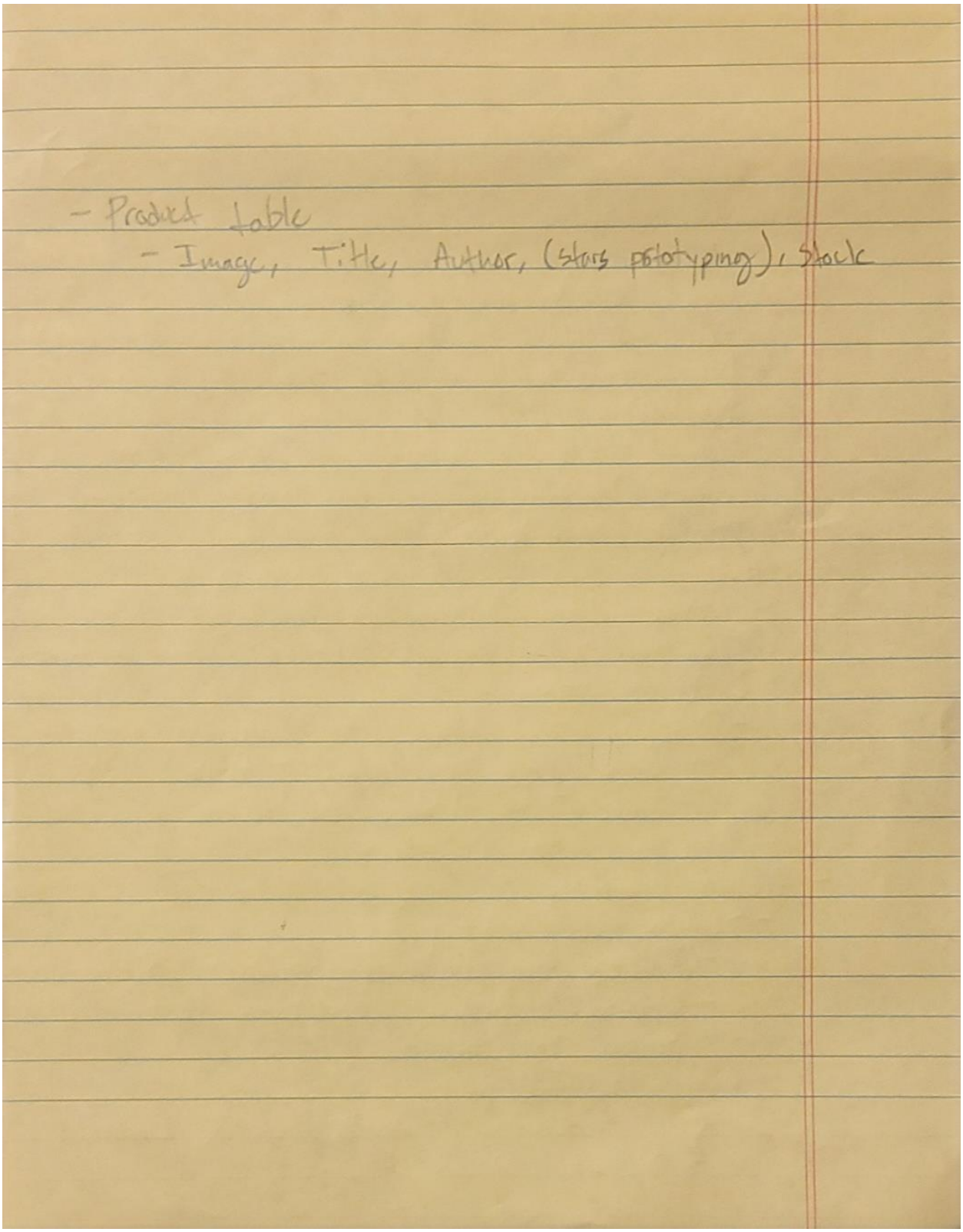


Figure A3: Example of desired quarantine and combine outcome

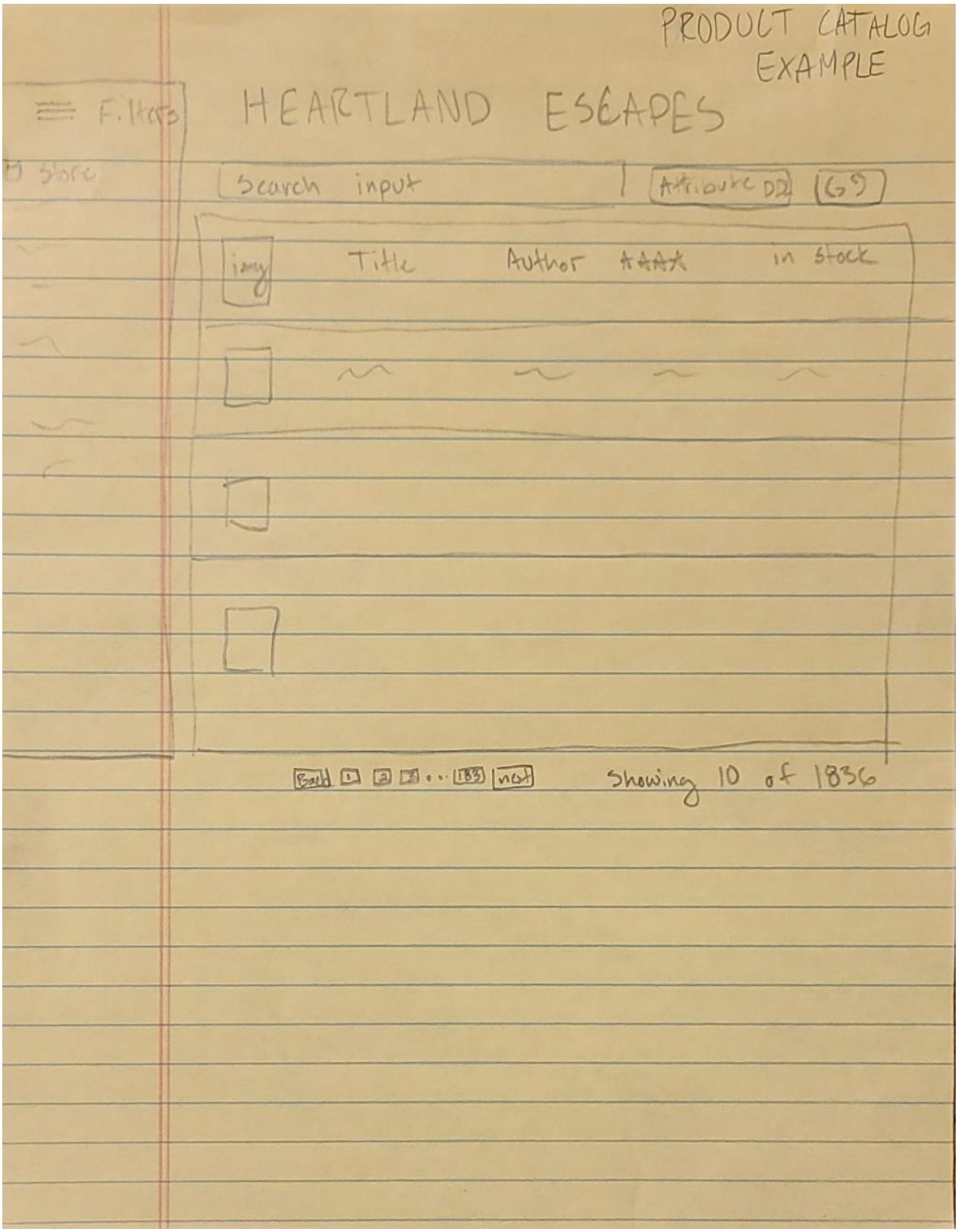


Figure A4: CEO quarantine and combine low fidelity prototype

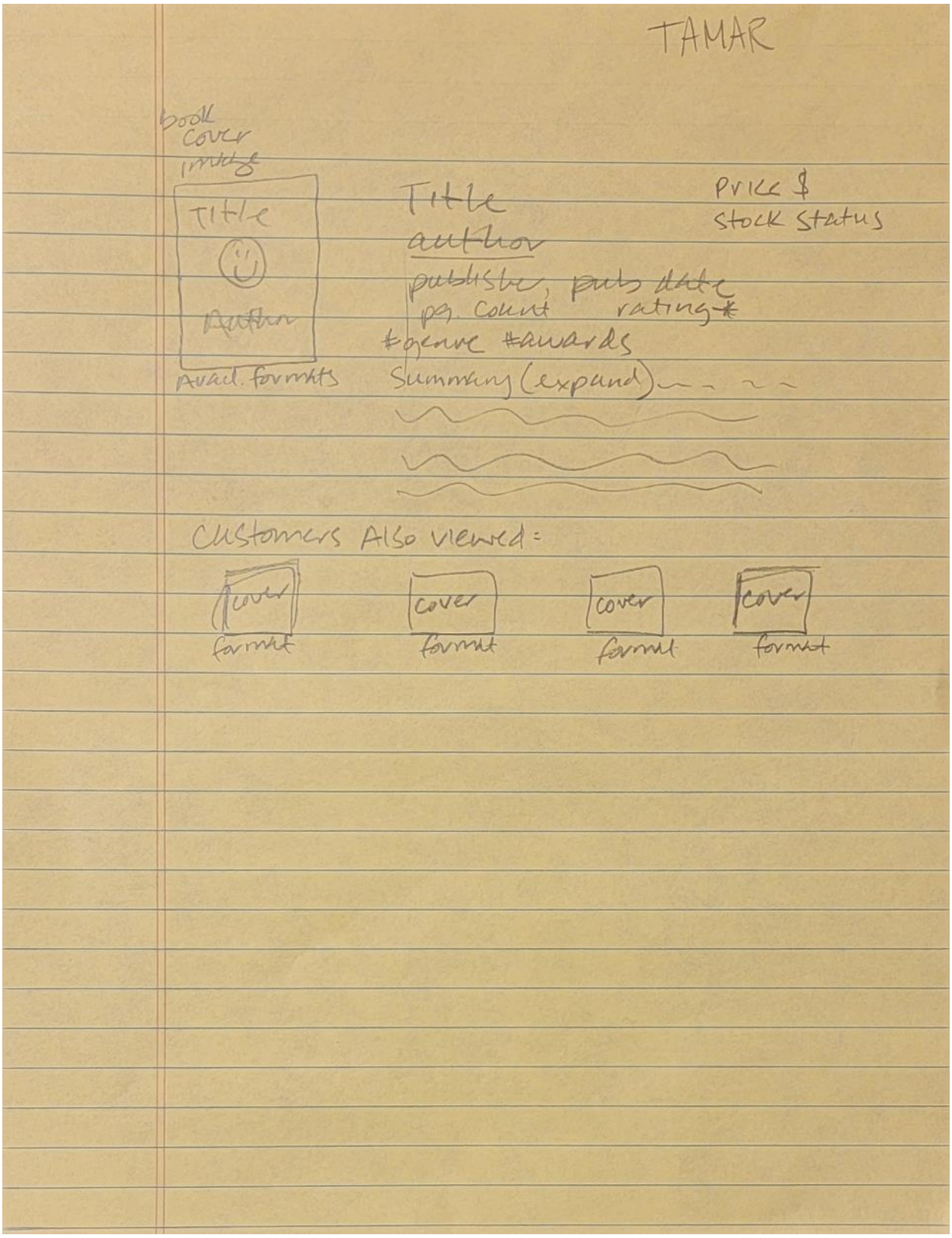


Figure A5: Vice President's quarantine and combine low fidelity prototype

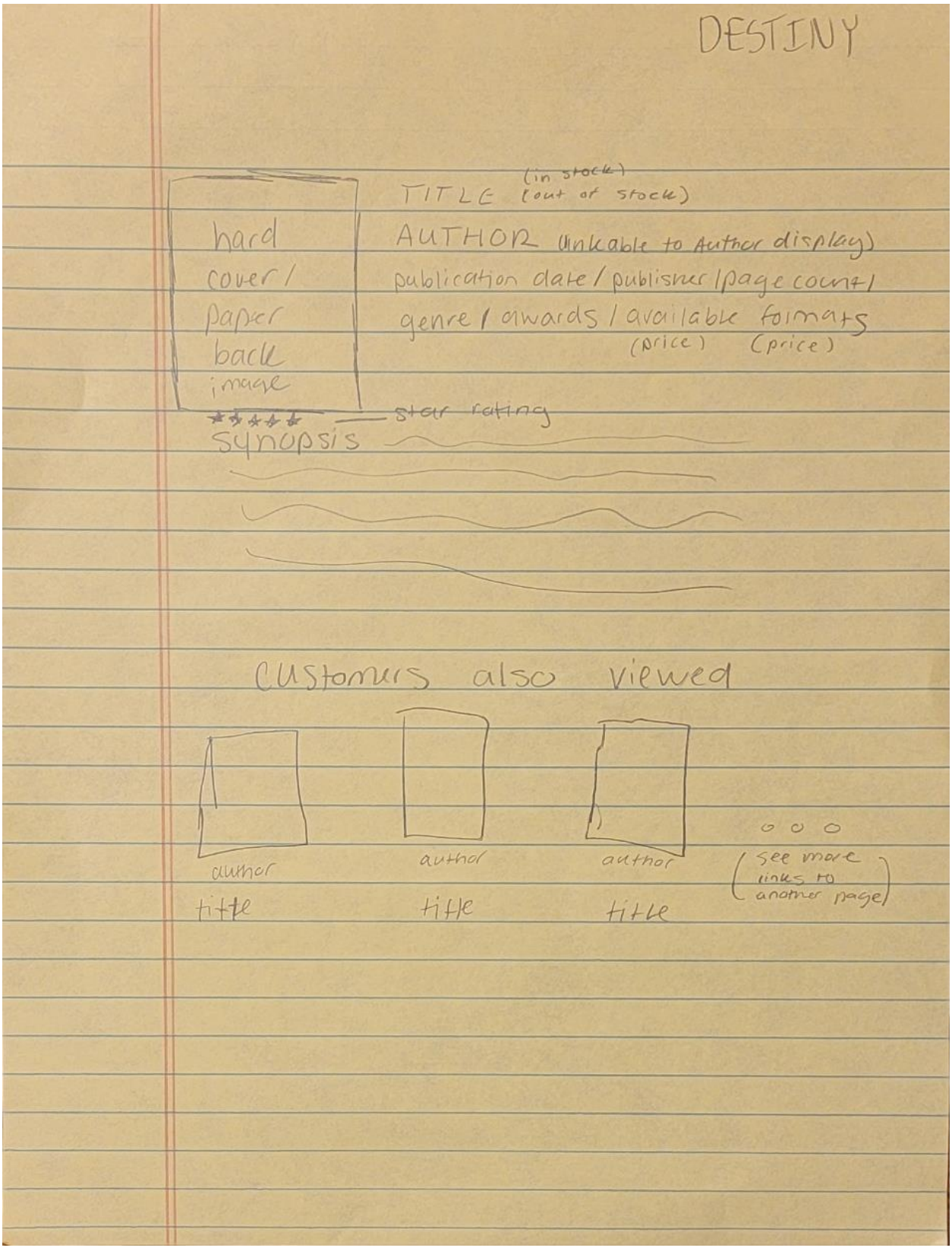
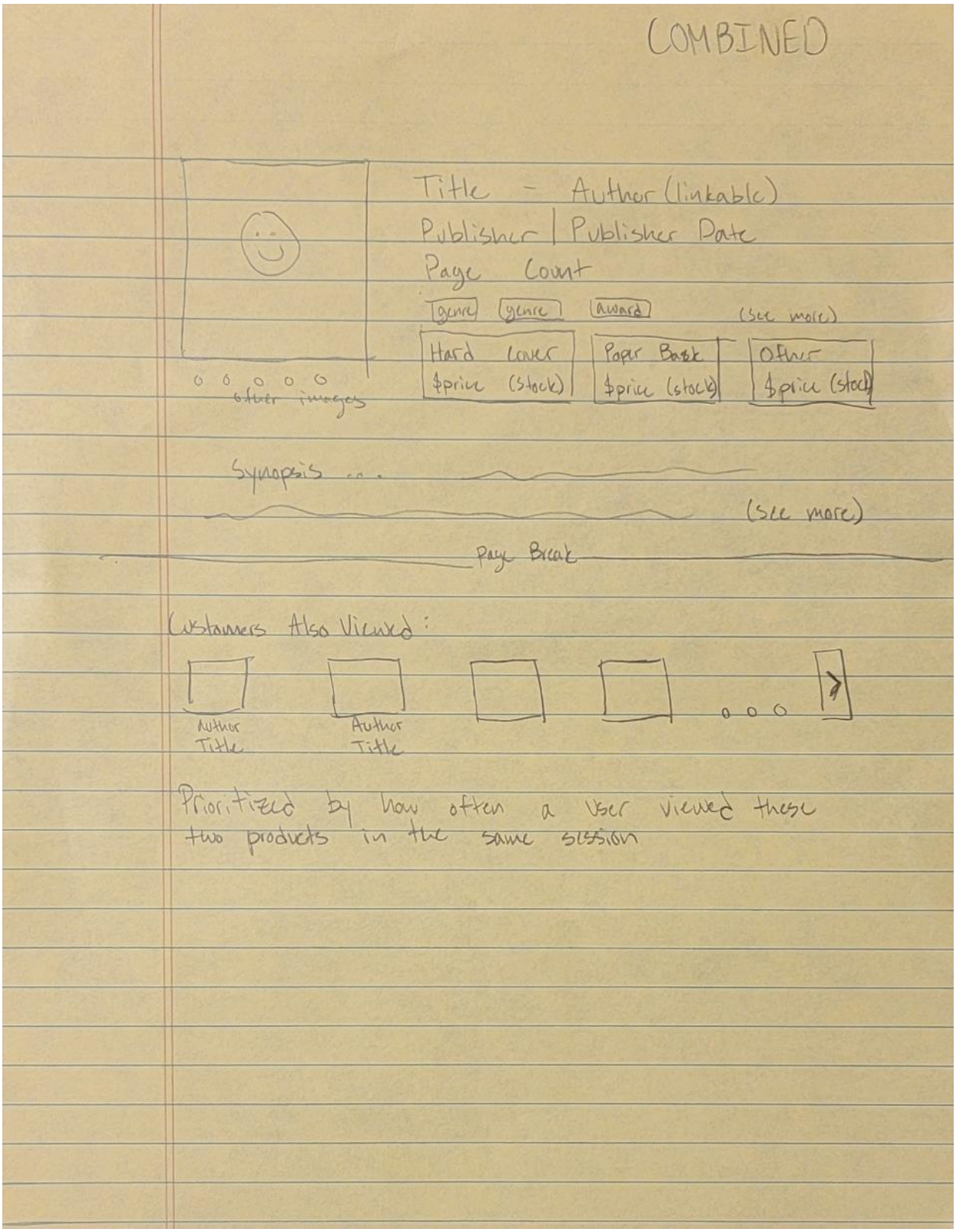


Figure A6: Final low fidelity prototype output from quarantine and combine



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