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This paper describes a needs assessment and system design process to support technology lending purchase decision making. Personal interviews with five librarians and one paraprofessional were conducted to gather both feature requirements and an understanding of the current workflow.

This paper details the results of this investigation in terms of system needs. It describes features that would support this difficult decision process. It also includes many design diagrams and models that present both the current and proposed workflows.

Headings:

Technology Lending

Web services – Library applications

Systems design

Database design

Technology – information services

Decision support systems

LIBTECHREX: BUILDING A LIBRARY TECHNOLOGY RECOMMENDATION SYSTEM

by
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Problem Description

1.1 Problem Statement

Many University libraries are investing heavily in lending technology to students. In a 2011 report about establishing a technology lending program at University of Illinois Hahn, Mestre, Ward, & Avery state that students "require a range of digital tools that are configurable to immediate needs and hold the most relevance to the digital world they inhabit" (p.1). This need and the fact that departments often lack the resources to build their own lending program led them to conclude, "require a range of digital tools that are configurable to immediate needs and hold the most relevance to the digital world they inhabit" (Hahn et al, 2011). Other academic libraries have also discovered this need.

Often when a university library decides they want to adopt or expand such a technology lending program, they have difficulty assessing which technology items to purchase. This is because most electronic devices are designed with a single user in mind. Because of this, libraries' goals are at odds with device manufacturers and with general consumers. Most recommendations and reviews are written with the general public as their audience; as a result, they do not address the concerns of a library. Currently, librarians rely on word of mouth, out of date journal articles and consumer reviews to make these purchasing decisions.

Deciding which technology to purchase and lend takes too much time and effort and produces inconsistent results.

1.2 Investigation

Currently, the technology lending purchase decision process is complicated and largely depends on institutional context. In order to get a full understanding of how these decisions are made now, I interviewed four librarians and one library paraprofessional from two large public universities. I selected my initial interviewees using a convenience sampling method and used a snowball method to find additional librarians and staff. I purposefully conducted interviews in three different departments at two different universities to get as many different perspectives and requirements as possible.

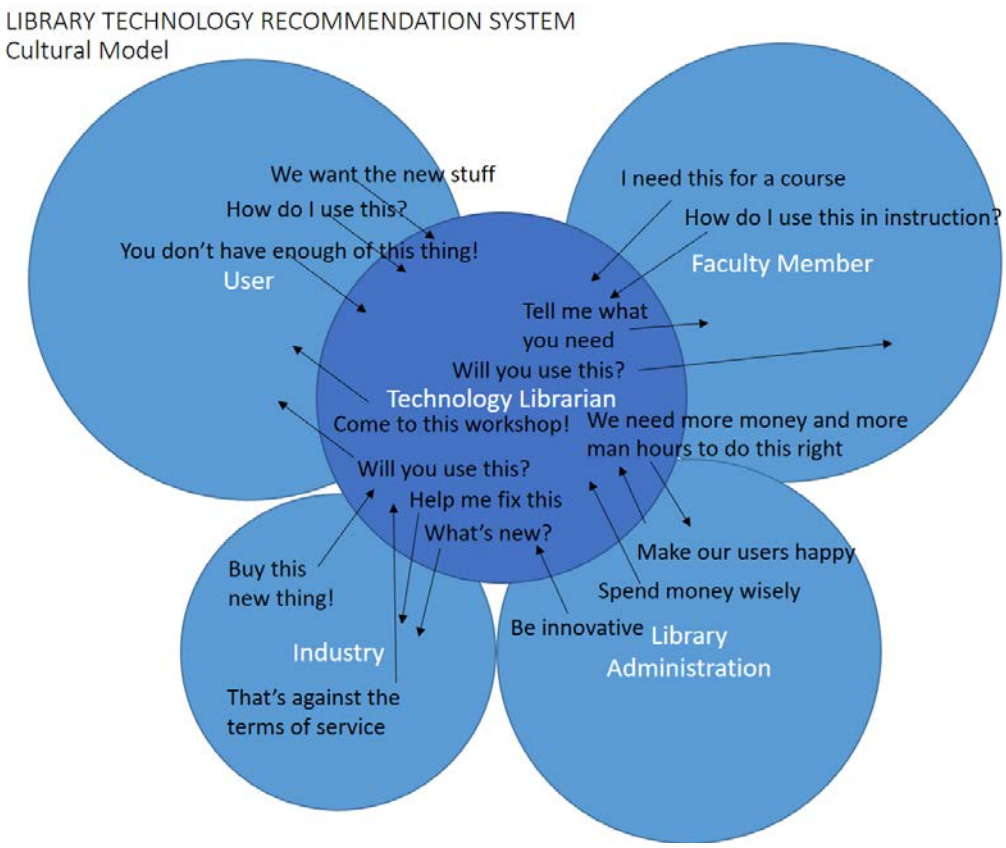
These interviews focused on two main themes: how technology librarians currently make these decisions and what features an ideal resource would have. Examining the current workflow exposed the difficulties and barriers library personnel currently face. Similarly, asking about ideal resources gave the librarians and staff a chance to describe desired features and discuss current challenges. This investigation revealed many opportunities for improvement and needs that are currently not met.

1.3 Current Situation

The current situation is complex and varied. The investigation revealed that different libraries, departments and institutions tend to prioritize different factors when deciding what technology to purchase and circulate. It also found several similarities that extended across all contexts. The results can be broken down into three categories: cultural influences, current workflow, and factors that contribute to decisions.

A cultural model "captures culture and policy that constrain how work is done. It shows how people are constrained and how they work around those constraints to make sure the work is done" (Holtzblatt & Beyer, n.d., p. 10). There are many cultural influences in the technology selection and lending process. I captured some of the most

commonly mentioned and highest impact influences found through this investigation in the model below.



This model represents the Technology Librarian in the middle and all the other actors that effect the technology selection process in the periphery. The degree of overlap between the central circle and the outer circles represents the extent to which the outer circle influences the process. The size of the outer circles represents their relative importance to the process. This model shows that the technology librarian is influenced by users, faculty members, industry, and library administration. The technology librarian is presented with different objectives and goals depending on which group he is interacting.

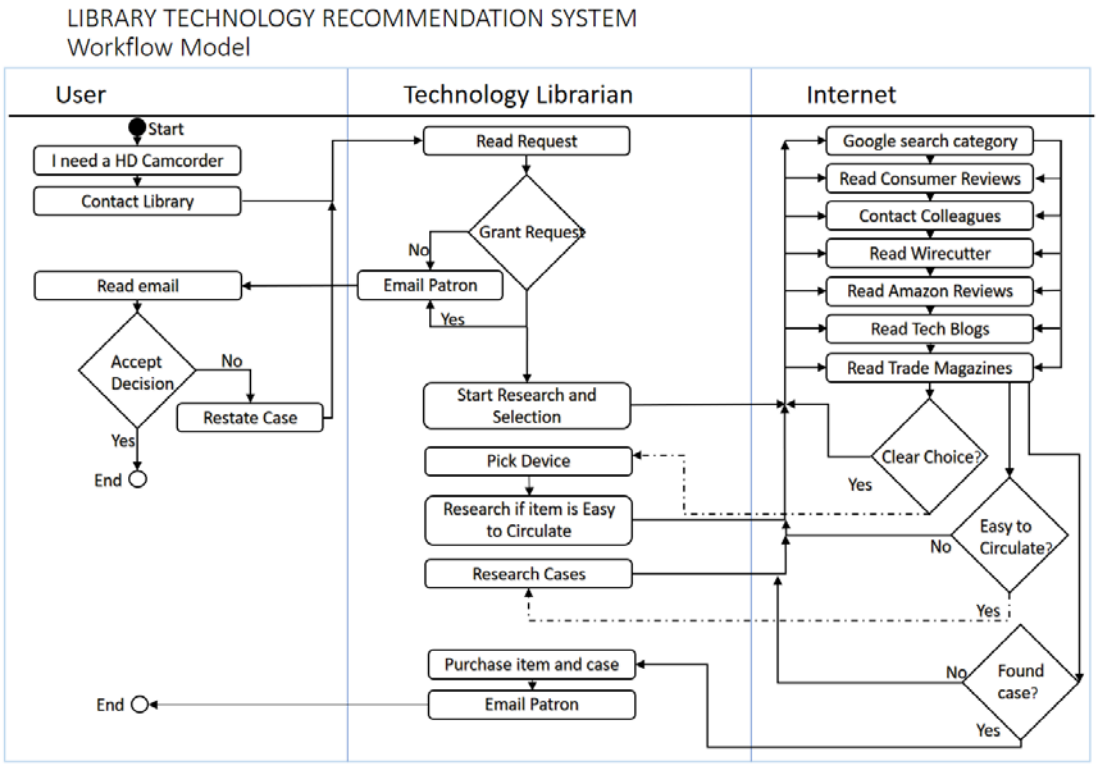
Users have the largest impact on the technology librarian with demands for new items, more items, and more instruction. All library personnel reported users were their primary focus in selecting technology.

The group that exerted the second largest influence was faculty members closely followed by library administration. Faculty members need special consideration for course integration and instructional support, while library administration wants the technology librarian to both be innovative and cautious while spending finite resources.

The final group – with the smallest impact – is the technology industry. The technology industry pushes the technology librarian to purchase new things and to adhere to terms of service that are written for the individual user rather than the shared context of a library. The librarian is torn between all these different cultural forces and has to navigate these demands by prioritizing different groups and influences.

The current workflow is convoluted and complicated. Library personnel reported spending between five and thirty hours a month researching and making these decisions with season variation tied to the financial calendar. A sequence model "shows the detailed steps performed to accomplish each task important to the work. It shows the different strategies people use, the intents or goals that their task steps are trying to accomplish, and the problems getting in their way" (Holtzblatt & Beyer, n.d., p. 10). Sequence models are frequently used to show a typical set of steps involved in a complicated process. Often, systems designers will use a sequence model to show the current and prospective workflows of their users. The following sequence model captures a typical workflow for a technology librarian attempting to make decision regarding

which technology to purchase and circulate. It is based on the librarian interview conducted to fully understand this process.



As the above model shows, the current workflow repetitive and convoluted. A technology librarian might have to utilize as many as seven different sources to answer basic questions about a device in order to determine if it is suitable for their library context. They then might have to start the search over if the item is not easy to circulate or if they are unable to find a case or bag that would keep the item safe. Librarians described the process as arduous and slow.

The largest cost in time and effort occurred when an item seemed a clear choice, but was not easy to circulate or protect. A case in point: Google Glass, which was the only choice in its category, but was not easy to circulate or support (Haefele, Personal

interview, November 30, 2016). The biggest challenge to circulation was that the Google Glass needs to be paired with both a Google account and a mobile phone (Woodbury, Personal interview, November 18 2016). This meant that in addition to the normal challenges of circulation (tracking parts, removing user data, protecting the item, etc.) librarians needed to find a way to provide a phone, a Google account, and some training. While one librarian remarked that this effort was worthwhile, another stated that the Google Glass was their "worst" technology item. Unfortunately, despite all the technology news and consumer reviews on the device, no source mentioned how difficult it would be to circulate and to switch users.

The final category of evidence was in terms of factors considered by technology librarians when making these decisions. Different libraries and different departments tend to prioritize factors differently, but most factors were common across all settings. Three main factors emerged as most important: usability, staff-time to support, and whether the item will be used.

Four out of five interviews specifically mentioned usability and learnability of the device as being as one of the most important factors. The next most frequently mentioned factor was staff processing and support: how much time it will take to learn about, circulate, package, process, and program for the new device. Finally, mentioned in four interviews was the concept of purchasing something that will be used.

Less important factors included: cost, appeal and trendiness, packaging, durability, and user requests. Outliers included factors such as: whether the product is geared at professionals or consumers, safety, and availability to purchase.

These factors seem to fall into a few main groups: technical attributes, library implementation, and user experience. Technical attributes are things that are inherent to the device: cost, specifications, packaging, software, durability, etc. Library implementation factors include staff support time, processing time, library programming and course integration. User experience factors - those of usability, learnability, appeal, whether an object will be used - seem to be the most important overall.

Proposed System

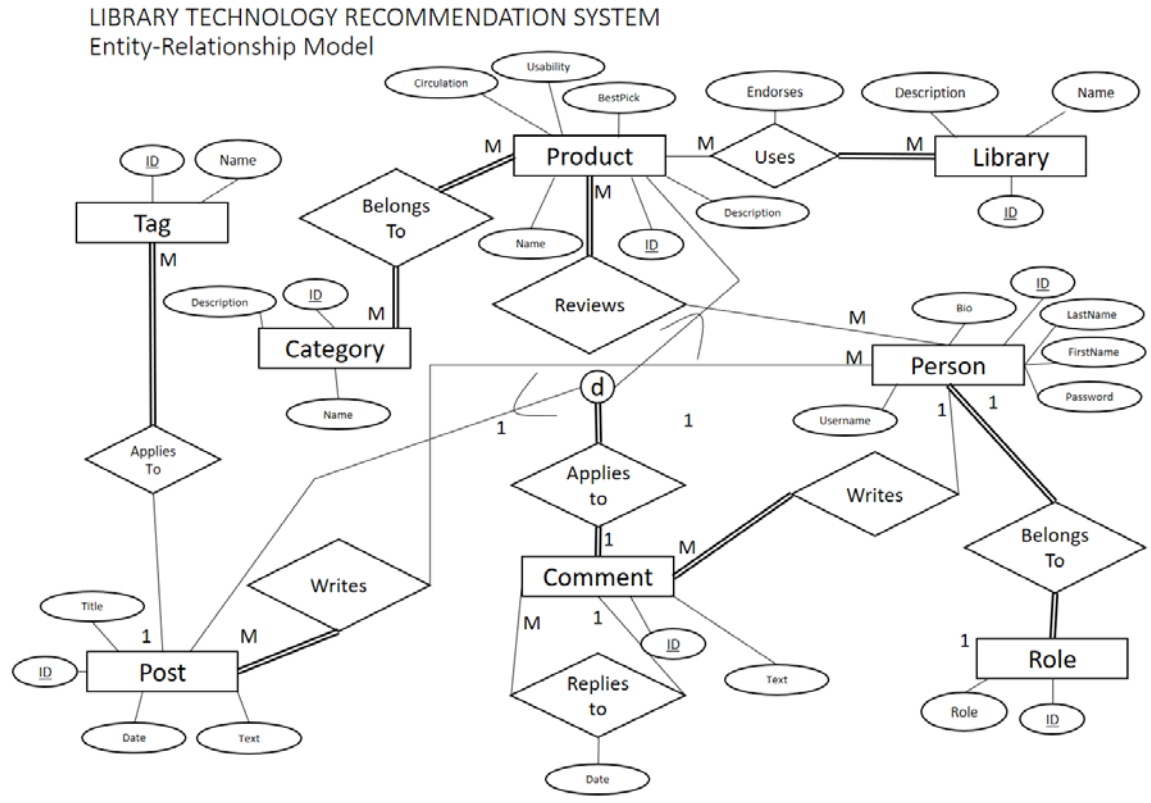
2.1 System Requirements

Based on the above analysis, a well-designed system should include library implementation stories, circulation tips, harvested information from Amazon (cost, ratings, links), some sort of usability score, best picks by category, programming ideas, and some measure of out-of-the-box readiness. The system should include common categories of items and top picks by category. Each device should be accompanied with library stories about implementation and programming. There should also be a callout box with some simple metrics: usability score, readiness score, cost, and Amazon rating. These features suggest a system with a person at the center.

Suggestions for content and tips about stories may be generated by the community, but there will ultimately be an editor who will aggregate these stories, decide best picks, and compile those base metrics. The advantage of a system centered around a person or team is that more intelligence can be brought to make suggestions and gathering actual information from real-world examples. It also ensures a level of quality that user-generated content often lacks. The disadvantage is that such a system is reliant on constant maintenance by a dedicated human: content will grow stale quickly if someone is not frequently updating it. Overall, the advantages outweigh the disadvantages for our user group: a human-centered system is the best path forward. I will refer to the proposed system as LibTechRex.

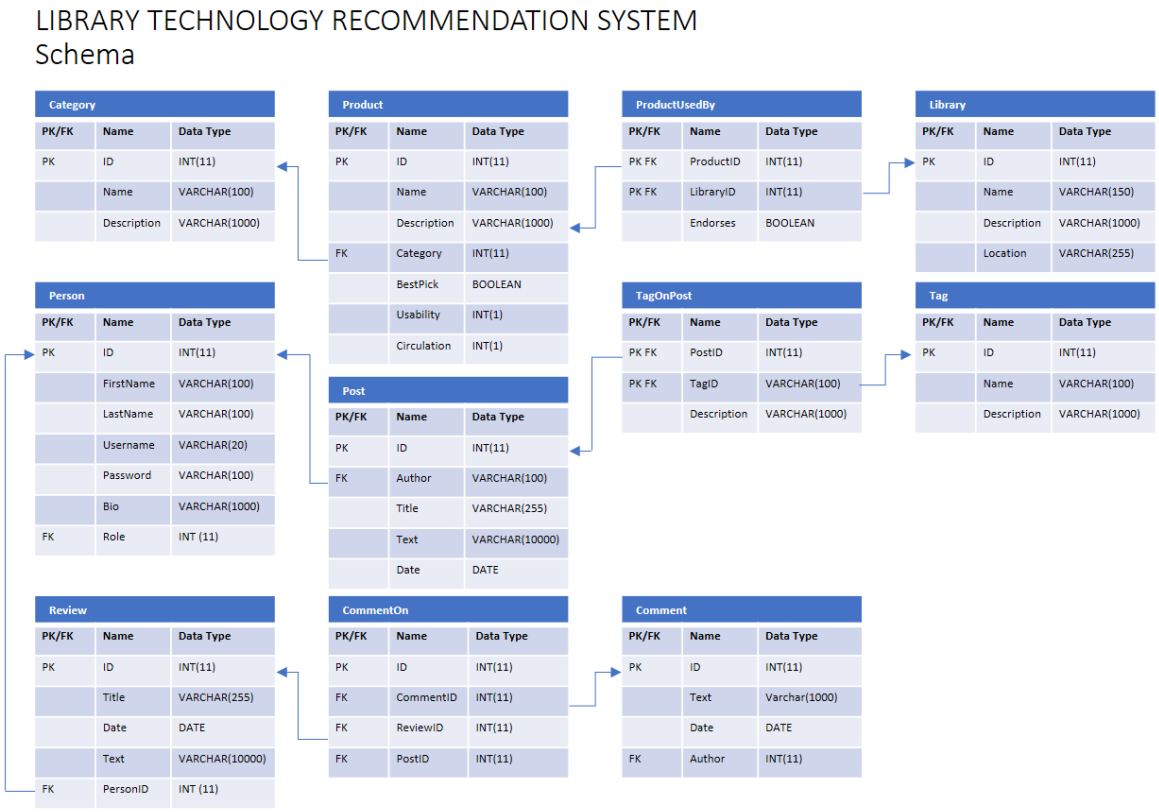
2.2 System Design

Entity-relationship (ER) diagrams "are frequently used for the conceptual design of database applications, and many database design tools employ its concepts" (Elmasri & Navathe, 2011, p. 199). ER diagrams model the data and relationships that underlie an information system. I developed the diagram below to model the "mini-world" of the LibTechRex.



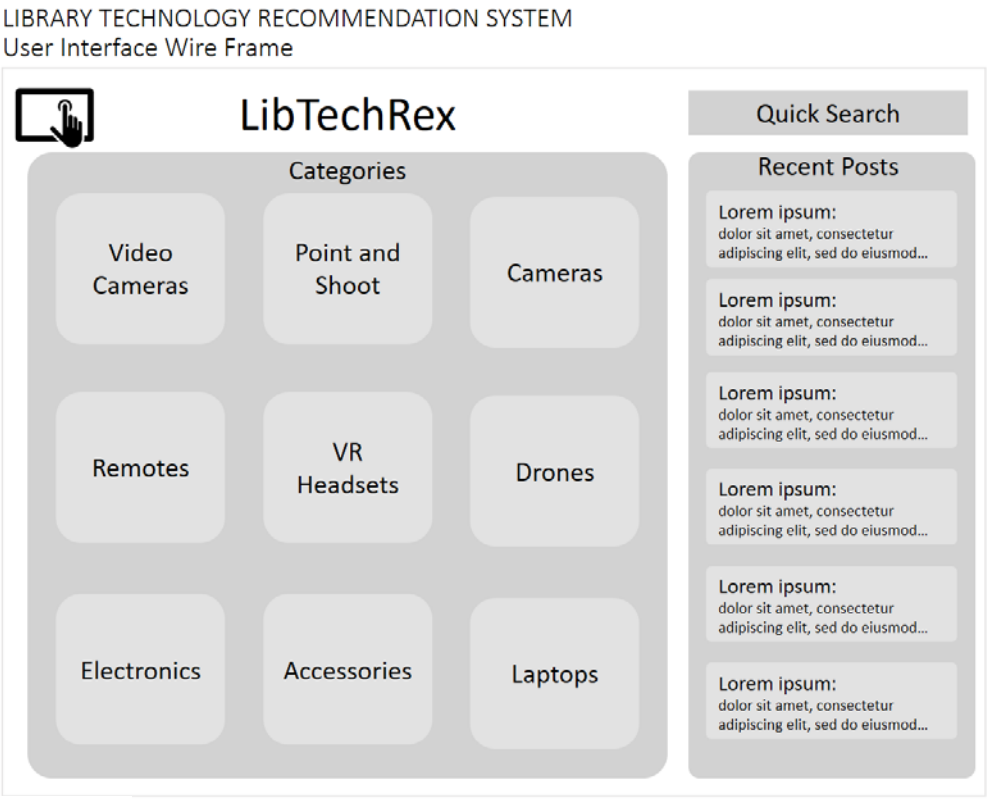
This ER diagram supports the human-centered system described by the requirements section above. The proposed system would exist as a database driven web application. It would consist of reviews of products and blog posts created by the editorial team and would allow for user interaction through comments. LibTechRex would divide technology devices into different categories and would highlight the best

pick from each category. Further, the system would show which libraries use and endorse particular products. Finally, LibTechRex would support tags for posts so that authors can better organize blog posts that are not simply reviews. Below is the database schema that would undergird this system.



2.3 Interface and Workflow

While a true user interface design is outside the scope of this project, I have included a preliminary wireframe below. This diagram shows a potential design for the homepage of LibTechRex.



The left side of the main page is devoted to branding and navigation. Technology librarians would know the category of the item they are searching for and would find this style of navigation quick and easy to use.

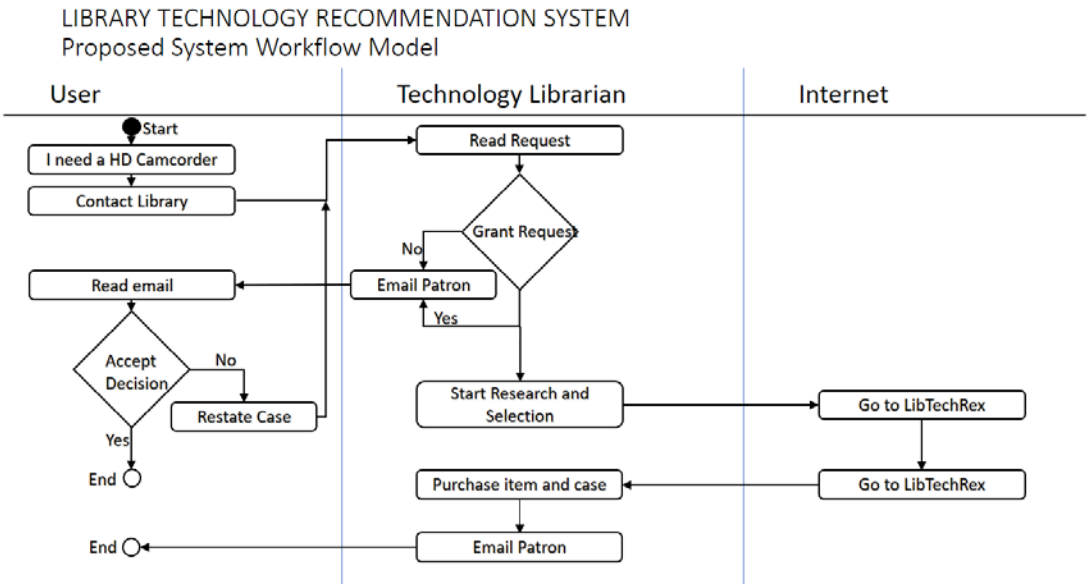
The right side highlights new blog posts and new reviews. This section would serve users who come to the site frequently while scanning the environment for new items to consider.

This interface wire-frame is basic and leaves out some features and details. While usability testing would reveal improvements to and breakdowns of this interface, it is outside the scope of this project.

Impact

3.1 Improved Workflow

The largest impact the new system will have is in the improved workflow. LibTechRex collects all the data a technology librarian needs to make this decision into one place and organizes it into one resource. On LibTechRex, the librarian's search begins and ends on one site. The new and much simplified workflow is diagramed below.



Currently, the librarian frequently performs many different searches across many different sites only to find that the device they have been researching is not suitable for their context. The diagram above shows that this is no longer the case. Now instead of several individual librarians at several institutions conducting independent searches, there is one group who determines the best options for the academic library setting. This group then makes this collected

information available to librarians. Should a librarian decide they need to determine which VR Headset to purchase and circulate, their new workflow would be short and simple: go to LibTechRex, click the VR Headset category, then read the post to see what the best pick is and what are the advantages and drawbacks. This new system reduces a multi-hour, many step process into a few clicks.

3.2 Potential Impact

While current literature does not quantify the number of institutions that lend technology, one recent article states that technology lending programs "have expanded at a rapid pace in recent years" (Chapman & Woodbury, 2012, p. 210). This non-numerical metric makes it difficult to estimate the amount of time saved or the quantitative impact of this system. One way to estimate impact is through a hypothetical: if this system reduces the amount of time spent making one decision from three hours on average to 30 minutes, then if one post is used by ten librarians, this system will have saved an average of 25 hours. Similarly, it is hard to estimate the time needed to set up the system or to populate it with categories and reviews. One advantage of the system is that it can be useful even if unfinished.

Additionally, the system is flexible enough to support the changing nature of the technology industry: while it might currently highlight cameras and VR headsets, in the future it could easily have categories for AI assistants or other emerging technologies. The open-ended nature of this system design allows for it to continue creating value for librarians into the future.

3.3 Next Steps

In order to make LibTechRex a reality, there are three perspectives to consider: hardware, software, and human resources. From a hardware perspective, an initial version of LibTechRex could be hosted on an already existing web server. The likely load, especially early on, would be low and running it on a shared host would be more than sufficient for testing and development.

There are many different options for software to underpin this system. LibTechRex could be developed on any database driven web technology. A standard web framework, such as Ruby on Rails, Laravel, or Meteor would have all the features needed to implement this system. These frameworks support web application development by simplifying database interaction and user interface implementation. The system could also be built manually using any server side language and accompanying HTML and CSS for the front end.

Finally, human resources are likely to be the most challenging aspect of implementation. Because LibTechRex is centered around a single person or team, such a person need to exist. While LibTechRex can be launched without all content being present, some content must exist to make the site useful. This person would have to generate all that content. They would have to populate several categories and make several best picks. They would also need to contact many libraries to learn what technology they use and whether they would recommend it. This could easily take 40 hours a week to get started.

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