Consulting Report

Information Quest
Data Concierge

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FOREWORD

As a newly-fledged team at the School of Information, Team 3E had the special honor of working with Information Quest to pilot its Data Concierge initiative. This collaboration took place as part of a hands-on consulting project at The School of Information through SI 501, a course in Contextual Inquiry and Consulting Foundations. The project opened our eyes to the far-reaching importance of high-quality and enhanced data and information on our campus. The goal of data-driven business intelligence is to empower decision-makers to plan and strategize for an uncertain future. To the small extent that this report might serve that function, we are both humbled and gratified. As the University of Michigan prepares to celebrate 200 years of academic leadership, we are inspired to imagine how new data applications can prepare it for the many challenges of the next two centuries and beyond.

We would like to thank the staff of Information Quest for opening their work to us, and for being unfailingly friendly, generous, and helpful with their time and knowledge. [redacted] forward-looking enthusiasm for data applications inspired us in our research. [redacted] timely assistance always efficiently steered us in an unfamiliar territory.

A special notes of thanks is due to [redacted] for his advice, and to [redacted] for her nuanced understanding of our challenges and requirements, and for her ongoing encouragement. A course such as this requires time and dedication on the part of the instructors to meet its many logistical demands. We truly appreciate the unique opportunities and experiences it has afforded us all.

We now respectfully submit this report after a semester of research and interviews across campus.

Team 3E
December 12, 2016
University of Michigan
Ann Arbor

EXECUTIVE SUMMARY

Our task to analyze the issues and opportunities that surround the implementation of a Data Concierge was unique on at least two accounts. First, unlike the projects of most of our peers, a preliminary solution to the problem of data access had already been outlined. Second, our 'contextual interviews'—where we talked through specific workflow issues in the interviewees' own work environments—were conducted with managers and executives spread across far-flung corners of campus. Such interviews are more commonly held with people in the same team or office. We therefore had two unique circumstances that did not conform to our methodological training in information consulting. Nevertheless, we have done our best to clarify the current data access issues on campus and propose medium- and long-term enhancements to the proposed Data Concierge system.

In brief, our recommendations center around deploying a more community-oriented data request and learning platform. The Online Access Request System (OARS) website[1] was seen, for all its limitations, as a starting-point for expansion. Just as the Data Concierge will be a "one-stop shop" in its own right, we saw a need for a centralized online location not only for data access requests, but for an enhanced site that is at once more user-friendly and feature-filled. Our main recommendations are for this online system are:

1. A browsable, searchable catalog to aid the discovery process, including database overviews and typical uses, and contact information of associated stewards and managers; this would include an interactive forum environment for requesters and stewards to share and learn from each other
2. A visual display of request ticket status that shows the full information from ServiceLink to requesters and their supervisors
3. Requester histories, including memoranda of understanding (MOUs) and institutional review board (IRB) documents, that, where possible, are born-digital for consistency and saved with requester profiles
4. Enhanced and searchable data dictionaries, that contain both 'institutional' definitions and unit-level knowledge in a controlled, crowd-sourced mechanism

A final, more ambitious recommendation is to reorganize the system of data stewardship. We see the current process of data requests as 'database-driven,' where access requests are associated with stewards who oversee particular databases that often do not neatly align with data analysis needs. Instead, we envision a 'purpose-drive' request system, where stewards (or some kind of intermediary) would oversee data environments of like-minded data. This would add a layer of abstraction between the actual databases and the requester, and sometimes simplify multiple requests into a single activity.

Even though our recommendations cohere around an online platform, they can be taken together or in piecemeal, and therefore implemented according to ongoing needs and constraints.

[1] https://access.its.umich.edu

CONSULTING REPORT

1. Introduction

1.1. Our Client

Information Quest (IQ) is a newly-formed department within the University of Michigan's Information and Technology Service (ITS) umbrella. More specifically, IQ is a data analytics and data decision-making team that supports higher-level university administrators and executives with their data needs. IQ envisions a 'data-as-a-service' delivery model, and their current expertise includes data integration, business analytics, reporting tools (such as M-Reports), and Extract–Transform–Load services for the University's Data Warehouse. IQ partners with campus departments, such as Teaching and Learning, as well as the U-M Health system.[2]

1.2. The Challenge

Information Quest has identified several major challenges within the University's data requesting process. In particular, campus users are often inconvenienced by long wait times and nonresponsive outcomes after placing a data request. As of now, there is no formalized system in place to process these requests; initial emails often get passed from one administrator to the next or are simply overlooked. IQ aims to address this problem through a proposed 'Data Concierge,' a one-stop-shop for requests to be triaged and fulfilled.[3] This project would contribute to IQ's data-as-a-service vision as well as amplify IQ's mission to enable U-M leaders to make strategic data-driven decisions.[4]

1.3. Team 3E Project Scope

As part of a School of Information course, 'SI 501: Contextual Inquiry and Consulting Foundations,' our team, named Team 3E, partnered with the Executive Director of Information Quest to help inform how the Data Concierge idea could facilitate data requesting at U-M over time. In preparation, our team determined two overarching research questions, which we used to guide our process:[5]

- What are the specific steps, challenges, and opportunities that currently exist in the data requesting process at U-M?
- How do the stakeholders feel about the data request process, and how could they accomplish their data needs in a more efficient and satisfying way?

[2] http://its.umich.edu/iq/about
[3] https://docs.google.com/document/d/169Pw19qyEZYOH9ilMwyP064WzZYGHjtzam4CZGHp5ec/edit
[4] http://its.umich.edu/iq/about
[5] We have shared our 'Interview Protocol' assignment at the following link (requires U-M authentication): https://drive.google.com/file/d/0B7Oh_-nbodqVZkpNMUVGVTUxMkU/view

2. Research Methodology

Using a combination of contextual interviews, field observations, affinity diagramming and secondary background research, our team aimed to uncover insights and provide recommendations to Information Quest to better understand how a 'Data Concierge' solution might alleviate current frustrations and challenges within the system. Our process is outlined below in a phase-by-phase manner.

2.1. Gathering Comprehensive Background Research

Using our team's collective skills and varied backgrounds, we each conducted individual background reports on topics relevant to Information Quest's mission to empower data-driven decision making at the University. Together, we covered the topics of:[6]

- Data stewardship roles and responsibilities[7]
- Data hierarchies and documented system limitations at the University of Michigan[8]
- The implementation of business intelligence using data systems in higher education[9]
- Data-as-a-service and how it is implemented in higher education[10]

With these themes in mind, we then moved on to the next phase of our contextual discovery process: contextual interviews.

2.2. Conducting Contextual Interviews

Our team coordinated interviews with various stakeholders across campus. We identified users on both the requesting and fulfilling ends of the data-request workflow, including data managers, stewards, and other administrators. In the end, we interviewed eight potential users of the Data Concierge platform, located in the following seven units:

- Finance
- Office of Enrollment Management
- Shared Services Center
- Human Resources Records and Information
- Ford School of Public Policy
- Stamps School of Art and Design
- School of Information, Learning Analytics and Research

[6] We have shared our four individual 'Background Research Reports' in the following links (requires U-M authentication).
[7] https://drive.google.com/a/umich.edu/file/d/0B0ZcJdsxUjBIa1g5TWRjTi1OaVE/view?usp=sharing
[8] https://drive.google.com/a/umich.edu/file/d/0B1CkwxfDCVHUMmlWaGF4MlV2QjQ/view?usp=sharing
[9] https://drive.google.com/a/umich.edu/file/d/0B7Oh_-nbodqVdm0yS1d5b1lzWWc/view?usp=sharing
[10] https://drive.google.com/a/umich.edu/file/d/0B39q8xcNHHHQbW1QVEZ6bkxneTQ/view?usp=sharing

2.3. Synthesizing Findings through Contextual Analysis

Through an extensive affinity diagramming process, our team categorized interview content, quotes, and other contextual information collected throughout the first few weeks. Our synthesis uncovered some affirming and also surprising insights as to the data request process within and across multiple institutional units, many of which are summarized in our cumulative affinity (see Appendix and here[11] for a higher-resolution version; figure 1 shows the physical affinity wall as it was being built). From this diagram, we parsed through important quotes, content, and other notes to yield three major categories for each system:

- **Pains**: In what ways are requesters and stewards challenged by their current workflow?
- **Gains**: In what ways are requesters and stewards succeeding in their current workflow?
- **Opportunities**: In what ways could Information Quest leverage the Data Concierge to address pains and expand gains identified above?

Figure 1: The affinity wall in the process of being constructed from interview research material.

The next section of this report will outline these findings in greater detail.

3. Findings and Recommendations

3.1. Browsable Catalog & Interactive Data Community Forum

Problem

Data Requesters do not know what to request, who to request from, and/or they do not have the proper language to express their needs to the stewards.

Findings

The current data request system suffers from a lack of data discoverability. During our interviews with data stewards across various units and departments in the university, many of them discussed the frequency with which they would have to assist requesters in reformulating their requests. During our interviews with some data requesters, we found that technical expertise varies amongst requesters. Some experienced requesters are 'super-users' of the datasets and have no problem finding the exact data they need.

"It's not always clear where to go when you have a question"

However, for requesters who are new to the system, there is still a steep learning curve to get familiar with the datasets. Most of the time, requesters only know what kind of outcomes they are expecting for work at their end, but do not know how to create it. For example, a requester may need data for research about the usage of a

[11] https://drive.google.com/file/d/0B39q8xcNHHHQLUZ0NGxpSXJneW8/view?usp=sharing

certain course on Canvas, but he might have no idea what datasets to request access to in order to get the data. One requester mentioned in an interview that "if a user is new to the system, it's not always clear where to go when you have a question about these different data universes. It would be a huge plus for a new person to have a resource that directs them correctly." Added to that, the lack of proper technical language for requests also bring increased logistical burdens. Data stewards and requesters send emails back and forth to communicate and make sure that requester's needs are clearly conveyed and at the same time sensitive data will be used properly, which created many extra logistical conversations.

Connecting two researchers working on the same dataset is a transdisciplinary opportunity

On the other hand, during our interviews with data stewards we found that most of the stewards have a customer-oriented attitude and they are more than willing to help requesters with any kind of questions they have. One steward mentioned in the interview that the Data Concierge is an opportunity to provide additional assistance for an idea or project that requesters cannot quite figure out on their own, and she looks forward to an easier way to connect with requesters. What is missing is a platform such as a public forum for requesters and stewards to preserve their queries for future requesters to browse and learn from, lessening the future teaching and logistical burden of data stewards. Another interviewee also envisioned the Data Concierge as providing opportunity to create serendipitous connections between requesters. For example, if two researchers are working on the same dataset but with different uses, there might be fertile ground to foster a transdisciplinary collaboration that can interrogate the data ever more deeply.

Recommendation

We found that the Data Concierge could alleviate pain points in reducing logistical conversations and lowering the teaching burden of stewards. By making information about data and data access more accessible, the logistical and teaching burden is shifted from the steward to the system or Data Concierge. Our recommendation would therefore be an interface layout (as shown in Figure 2, below) which provides users with three side-by-side capabilities:

1. The ability to browse a holistic university catalog of datasets as well as the point person associated with that particular database
2. The ability to see immediate instructions of how to file a request and what preliminary materials are necessary (i.e., MOU, IRB documentation, or relevant project proposals for which data is required)
3. The ability to immediately ask questions or discuss details regarding certain databases or data needs in a virtual community forum.

This last community-centric feature would also alleviate the pain point around tracking data questions and concerns; an aggregated knowledge base simultaneously answers questions that frees a data steward's time and also documents what those common conversations are around different datasets.

Finally, a longer-term goal would entail sharing successes around how various requesters used their datasets as inspiration and fodder for future users or researchers. These would highlight the success, and pitfalls, around the various data.

More details on the browsable database

We propose to establish a browsable interface where datasets are organized in a visually clear way (Figure 2). The university currently has nine institutional data areas, so we can adopt the

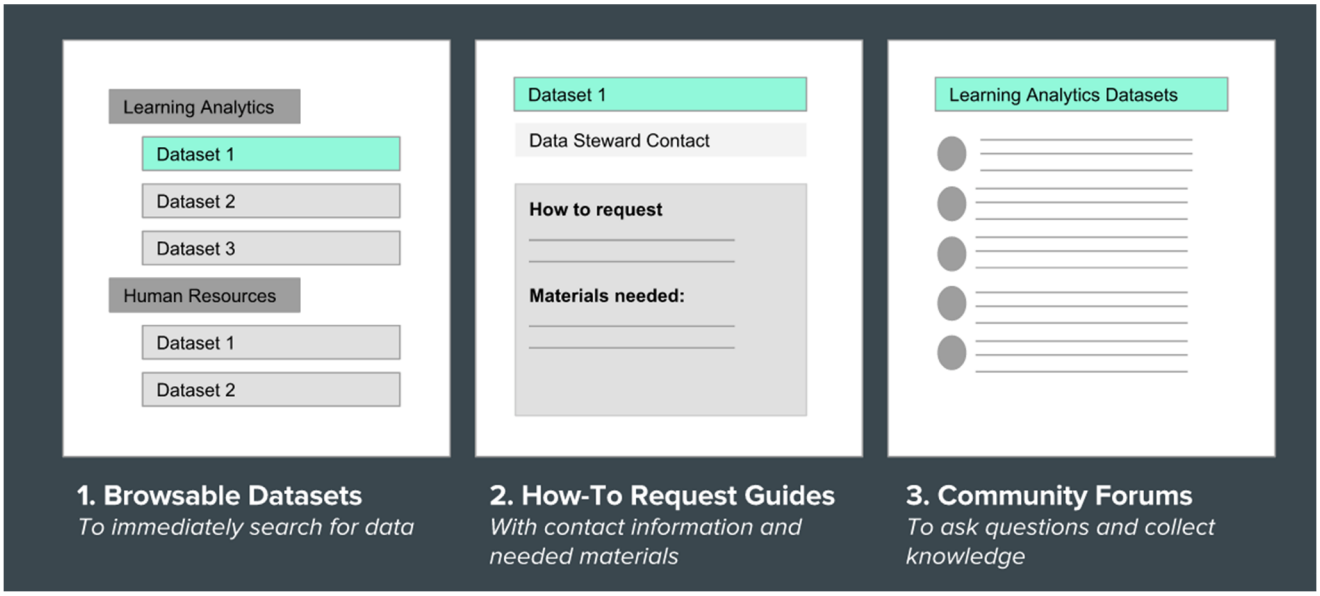

Figure 2: Potential layout for future Data concierge interface

existing structure and construct the datasets in nine main categories. Under each data category there will be more specific sub-categories to provide requesters with clear guidance on where to go, accompanied by a detailed description of the dataset provided by the data steward so requesters can browse through different catalogs of datasets and gain a better understanding of the data structures. In addition, there could be tags to label each datasets or subsets. If requesters are not familiar with the structure of the data universe or they are not sure where to find the exact materials needed, they can search for the data they want by tags (Figure 3). Requesters could click a tag to explore more datasets with the same tag, which could potentially help them find more resources related to their work.[12]

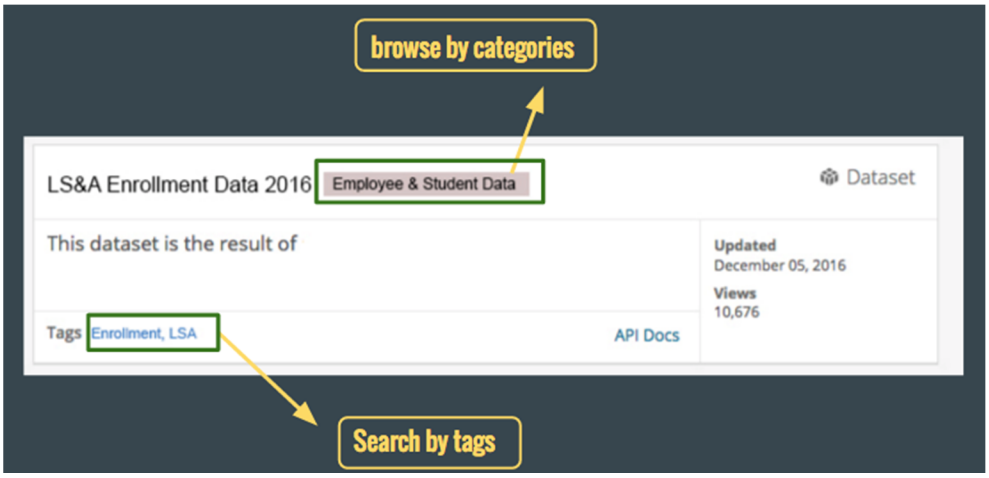

Figure 3: Search by tags and browse by categories. (Edited from source: Detroit Open Data: https://data.detroitmi.gov/browse)

[12] We lately learned that such tagged datasets are used in the U-M Medical School data catalog: https://datasetcatalog.med.umich.edu/

3.2. Visual Workflow Process of Request

Problem
Requesters do not know the status of their request fulfillment.

Findings
During interviews with data requesters, many of them mentioned the pain and inconvenience brought by the lack of transparency in the current data request system. Communication about data request fulfillment is mostly made through email, which makes it is difficult to track fulfillment progress. Requesters are often unsure if someone is working on their request, even after they have contacted somebody they know. This makes it difficult for requesters to understand how complex the request is and what kind of response to anticipate. Delays inevitably affect the requester's other work. One interviewee said, "I want visibility in the data request process. I want to know where my request is, whether I'm waiting, if my request is assigned to somebody, or if it's stuck." The uncertainty during the request process and the lack of assurance for requesters provides a poor user experience.

"I want visibility in the request process"

Requesters also expressed their dismay, in the words of one interviewee, of having to "blanket the request," and its concomitant results. It is often the case that requesters send a question to the email address of the whole steward team but receive no reply, possibly because each steward thinks other people in their team is taking care of the issue. Therefore a more transparent request process might benefit data stewards as well. We believe that delegating one steward to the request, upon acceptance, and relaying this information back to the requester in a timely fashion can help the data steward team clarify their work and avoid misunderstandings.

Recommendation
To increase the transparency behind request fulfillment workflows, we suggest implementing a visual timeline (see Figure 4) in the Data Concierge user interface that will allow users to easily visualize their request's status. Key milestones on this timeline include:

1. Request has been received
2. Request has been accepted/denied
3. Number in processing queue
4. Estimated processing time in days

With a clear visual timeline, data requesters can be informed about whether the request has been received, as well as if it has been accepted or denied by the steward. Upon denial, the requester will also get a notification with detailed explanation of why the request was denied and what he can potentially do to reformulate the request. The requester will also be notified about the estimated processing time so they can have a general idea and prepare other work accordingly. The visual timeline also shows how many people are in front of the requester in the processing

queue: each yellow circle on the timeline in Figure 4 represents one requester. Once a request is fulfilled, the yellow circle will turn blue to indicate the updated progress.

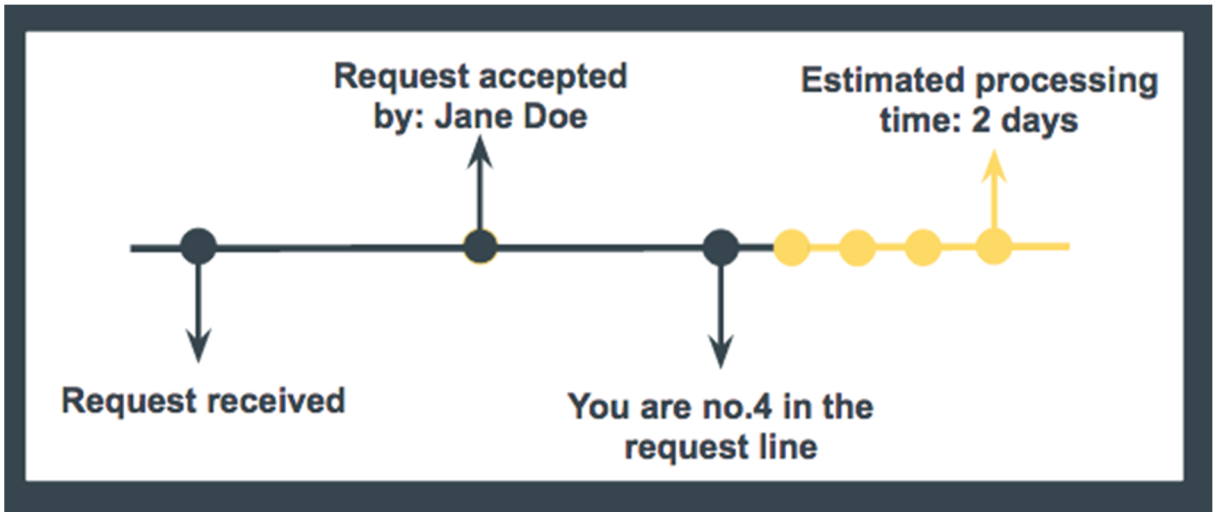

Figure 4: Visual workflow process of request

3.3. Interactive Memorandum of Understanding

Problem

The formatting of memoranda of understanding (MOUs) and related certification documents—which requesters are often required to submit—can lead to delays in the approval process and an increase in the time requesters and stewards spend in logistical conversations.

Findings

MOUs establish an agreement between a data manager and requester regarding proper use of the requested data; they are not legally binding documents. An MOU might set forth the terms that, for example, a requester must agree to: not to share access to the dataset with others who have not been identified in the MOU, to dispose of the dataset once they no longer need it, and not to attempt to identify subjects present in the dataset.

MOUs differ in the level and type of input required by requesters. In addition to outlining the stated terms and conditions of the agreement, MOUs might also ask requesters to summarize the purpose of the request in their own words, to categorize their research goals, or to describe the logistical details of their use. MOUs might require requesters to attach copies of IRB certificates or exemptions. MOUs also typically include multiple lines for signatures from the principal investigator and his or her team members.

Several of the data managers with whom we spoke distribute MOUs in the form of static PDF documents. In order to complete these documents, requesters must print, sign, and scan a copy of the MOU before submitting it. Because the resulting document is an image, stewards are often unable to efficiently parse through text in the document, which can delay the approval process. Moreover, requesters don't always submit all of the required supporting materials. This necessitates a prolonged exchange between the manager and requester to ensure the proper documents are received.

"I shouldn't have to be verifying all of those steps"

One data manager summed up his frustration with the current status of this process: "When people provide me their IRB, sometimes they don't provide enough information, and sometimes they just scan something and I can't search through it. I would love to be able to pull these documents from a system that can verify if the requester has been exempted or approved. I shouldn't have to be verifying all of those steps." The Data Concierge could address this logistical burden, alleviating pains experienced by both data managers and requesters.

Recommendation

Establish a customizable digital framework within the Data Concierge that data managers can use to generate MOUs. Digital MOUs would improve the current state of MOU documents in several key ways. First, a digital form could utilize a sign-in process to ensure a more secure signature authorization is received without requiring requesters to print the document and submit a scanned image file. Checkboxes and radio buttons would be more interactive, and could be processed more efficiently. Moreover, managers would be able to more effectively search through a digital form to review the text the requester has entered. With a digital form, managers could ensure that requesters have submitted all required documents before submitting, reducing the need to double-check that all required documents have been submitted.

3.4. Enhanced and Searchable Data Dictionaries

Problem

The entries in many data dictionaries currently managed by ITS are either incomplete or missing additional critical usability information. Some whole data universes are said to be entirely lacking proper data dictionaries.

Findings

Data dictionaries are highly technical but necessary tools with which users can access and understand data elements in a traditional database. It is true that we heard very little strong criticism of the current status of the data dictionaries managed by ITS (as pictured in Figure 5). One interviewee did, for example, note that the dictionaries were not accessible on his Linux machine—a claim that we, however, were not able to replicate. The main criticisms were that the dictionaries needed to be more complete across all databases. This is certainly already known and addressing it should merely be a matter of devoting suitable resources to the task.

Beyond this, however, there were several interviewees who suggested how the dictionaries could be more fundamentally improved. They requested more searchability of the elements. They also wanted information about related fields to be given, so that they could be compared or connected more easily.

Mostly, however, we heard that many fields were used with specific, unit-level institutional knowledge. For example, a code for the month may refer to the fiscal calendar (January = 7) or the standard calendar (January = 1). But data can also be inconsistent due to completely external factors. For the 2010 census, the government changed their race/ethnicity codes, and this is expected to happen again in 2020. Without understanding the use of these codes, it once seemed, contrary to fact, that the university had suddenly lowered its enrollment of underrepresented

Physical Element Name	Logical Element Name	Format Type	Format Length	Data Set	Table Locations	Security Code	Element Definition	Examples of Valid Values
ACAD_DEGR_STATUS	Academic Degree Status Code	Character	1	M_SRDW1	ACAD_DEGR ACAD_DEGR_PLAN	R	A code indicating whether a degree for a student has been awarded or revoked.	Example of valid values: A = Awarded; R = Revoked
ACAD_GROUP	Academic Group Code	Character	5	M_SRDW1	ACAD_DEGR_PLAN ACAD_PROG_TBL CLASS_TBL CRSE_OFFER R_TRANSCRIPT RQ_GRP_TBL RQ_MAIN_TBL ACAD_PROG_TBL_CURR_VW CRSE_OFFER_CURR_VW	R	A code representing a school or college, including Division of Kinesiology, Academic Outreach and Officer Education Programs.	Example of valid values: DEN = Dentistry; NUR = Nursing; PH = Public Health

Figure 5. A sample of the current data dictionary. From: http://www.mais.umich.edu/reporting/about-um-data-warehouse-and-dictionary.html

minorities. This would indeed be a misimpression that would bring significant social and political consequences.

Taken together there is support among several interviewees for a way for units to contribute their specific understanding of data without having to petition ITS. There was also some demand for a way to examine the historical data dictionary information. In the case of changing census codes, such historical information would be necessary for a researcher or analyst to correct for the various differing uses of the census codes across the decades.

Recommendation

We believe that a securely-controlled, crowd-sourced supplement to the existing data dictionary would not only add valuable ground-level knowledge to the system, but it would also contribute to the still-ongoing effort to provide initial data dictionary information in ITS-managed databases and data universes. We stress that this should be only a supplement to a more formal, 'institutional' definition that must pass through a more formal vetting process. Nevertheless, it is impractical to expect that a centralized data dictionary effort has the resources to fully describe the variety and magnitude of data managed by ITS. Along with adding more searchability, a crowd-sourced supplement will give data requesters better tools and information to help themselves, which should eventually lessen the burden of work on ITS and the Data Concierge.

Which will eventually lessen the burden of work for ITS

3.5. Future-Orientated Recommendation: Incorporate Purpose-Driven Facilitators into the Data Access Model

Problem

When stewards lack familiarity with a requester's research domain, they might not see the relevance of their dataset to such research and ultimately deny the requester access as a preventative security measure. This problem becomes even more pronounced—and more open to

failure on the part of the requester—when requesters seek data from multiple data areas, and thus must gain approval from multiple governance hierarchies.

Findings

Data governance at U-M is currently organized around institutional data areas. By decentralizing the management of these data areas, the university allows each unit to develop its own standards and procedures by which data users can obtain access to its data. Moreover, the hierarchical structure of data governance at the university—with layers of data stewards, delegated stewards, and managers—is meant to assist units in delegating responsibilities of responsible data use.

However, this hierarchy is organized in such a way that requesters often have to engage in a series of conversations with various data managers and delegated stewards, progressing up the chain of command, before they receive an answer regarding their access status. These conversations often require requesters to justify their need for the data by explaining how it is relevant to their research area. For example, one requester described how a learning analytics researcher might make use of building access data from Campus Safety & Security to investigate how many students are engaged in academic activities on the weekend. While the researcher can see the relevance of this dataset in his or her research, the data managers of that data area might not have an established precedent for authorizing learning analytics researchers to access this type of sensitive data. As a security measure, they will likely deny the user access to the dataset as a preventative measure.

Exploiting relationships with stewards fosters an "in-group" mentality

Some requesters, however, utilize existing relationships with delegated stewards at the top of that data area's hierarchy to bypass the aforementioned process. One requester described an experience where he "got extremely good access quickly after engaging in a flurry of emails where someone vouched for [him]." By engaging directly with stewards higher in the chain of command, requesters can receive a response about their access status more quickly. Requesters report that these direct conversations are more likely to gain them access to the dataset. This "in-group" mentality fractures the broader data community.

Recommendation

For greater efficiency of data requests, and to develop a stronger data community that reduces the "in-group" mentality between data stewards and requesters, we recommend establishing **purpose-driven data facilitators**. These people will act as liaisons when data requesters seek data from stewards outside their established domain, or when requesters seek data that crosses multiple data areas. This proposed model is visualized in Figure 6, below, where one particular data purpose spanning multiple data areas is outlined in blue-green.

These facilitators would be experienced with the broader domains in which data can be used to better facilitate human connections between researchers and data stewards across the university. They could complement the Data Concierge platform as a part of a broader data community, providing researchers with an opportunity to expand their research network.

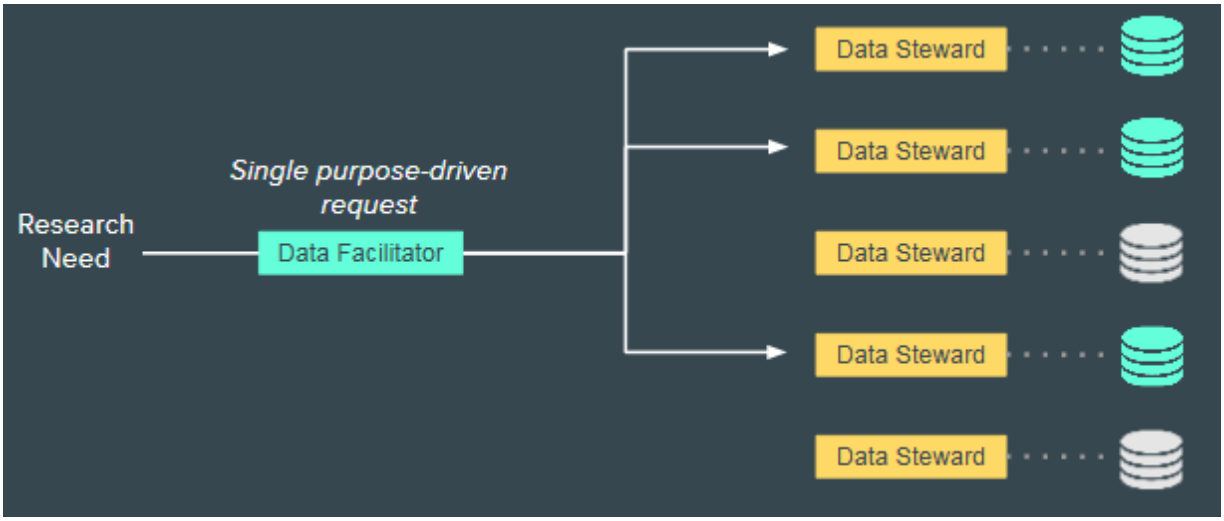

Figure 6: Diagram of proposed purpose-driven data access model

4. Conclusion

Key Learnings and Limitations

Overall, upon tackling this project, our team quickly learned how vast and varied data requesting was carried out across university units. Some departments had developed their own LEAN-style systems to track incoming requests, while others used internal tools such as Microsoft Sharepoint drives or Excel spreadsheets. Due to the multifaceted nature of these related systems, one key learning was the importance of reining in our project scope.

Our initial client meeting was both inspirational and informative as to the problem in general (i.e., data requesting at U-M), yet still remained somewhat general as to how our role would intersect with the efforts already being done at Information Quest. Our second informational interview was more specific and helped to narrow down how we could conduct our contextual inquiry to identify pain points more generally across various U-M departments. Information Quest had already been doing this to a certain degree across different IT departments,[13] and it was agreed that our team would perform parallel work across units external to ITS in recommending more future-oriented directions for the Data Concierge to evolve after its initial pilot phase.

During the affinity diagramming process, the process-oriented detail around data request and fulfillment for each department became clear. Some limitations in our analysis during this time concerned the fact that the data acquired from interviewees only represented a certain scope of the workflow—many interviewees inhabited the higher echelons of data stewardship or executive leadership and often did not interact as regularly with the data request tracking process than, perhaps, less senior unit members. For this reason, our affinity diagram outlines more

[13] https://docs.google.com/document/d/169Pw19qyEZYOH9ilMwyP064WzZYGHjtzam4CZGHp5ec/edit

overarching comparisons across units rather than specific workflows for each department, as the Information Quest team has done in their own current state evaluations.[14]

Nevertheless, as the Data Concierge hopefully develops from its initial pilot phase to greater adoption by other units, we hope that this preliminary evaluation helped provide affirmation and further direction for this Information Quest project.

[14] https://docs.google.com/document/d/169Pw19qyEZYOH9ilMwyP064WzZYGHjtzam4CZGHp5ec/edit

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3E Affinity Wall Image
https://drive.google.com/file/d/0B39q8xcNHHHQLUZ0NGxpSXJneW8/view?usp=sharing

3E Individual Background Research Reports
https://drive.google.com/a/umich.edu/file/d/0B0ZcJdsxUjBIa1g5TWRjTi1OaVE/view?usp=sharing (Ling Zhong, on data stewardship roles and responsibilities)

https://drive.google.com/a/umich.edu/file/d/0B1CkwxfDCVHUMmlWaGF4MlV2QjQ/view?usp=sharing (Chelsea Miller, on data hierarchies and documented system limitations at the University of Michigan)

https://drive.google.com/a/umich.edu/file/d/0B7Oh_-nbodqVdm0yS1d5b1lzWWc/view?usp=sharing (John Posch, on the implementation of business intelligence using data systems in higher education)

https://drive.google.com/a/umich.edu/file/d/0B39q8xcNHHHQbW1QVEZ6bkxneTQ/view?usp=sharing (Julie Cruz, on data-as-a-service and how it is implemented in higher education)

3E Interview Protocol
https://drive.google.com/file/d/0B7Oh_-nbodqVZkpNMUVGVTUxMkU/view

Data Concierge Current State (IQ Document)
https://docs.google.com/document/d/169Pw19qyEZYOH9ilMwyP064WzZYGHjtzam4CZGHp5ec/edit

Data Open Detroit Website
https://data.detroitmi.gov/browse

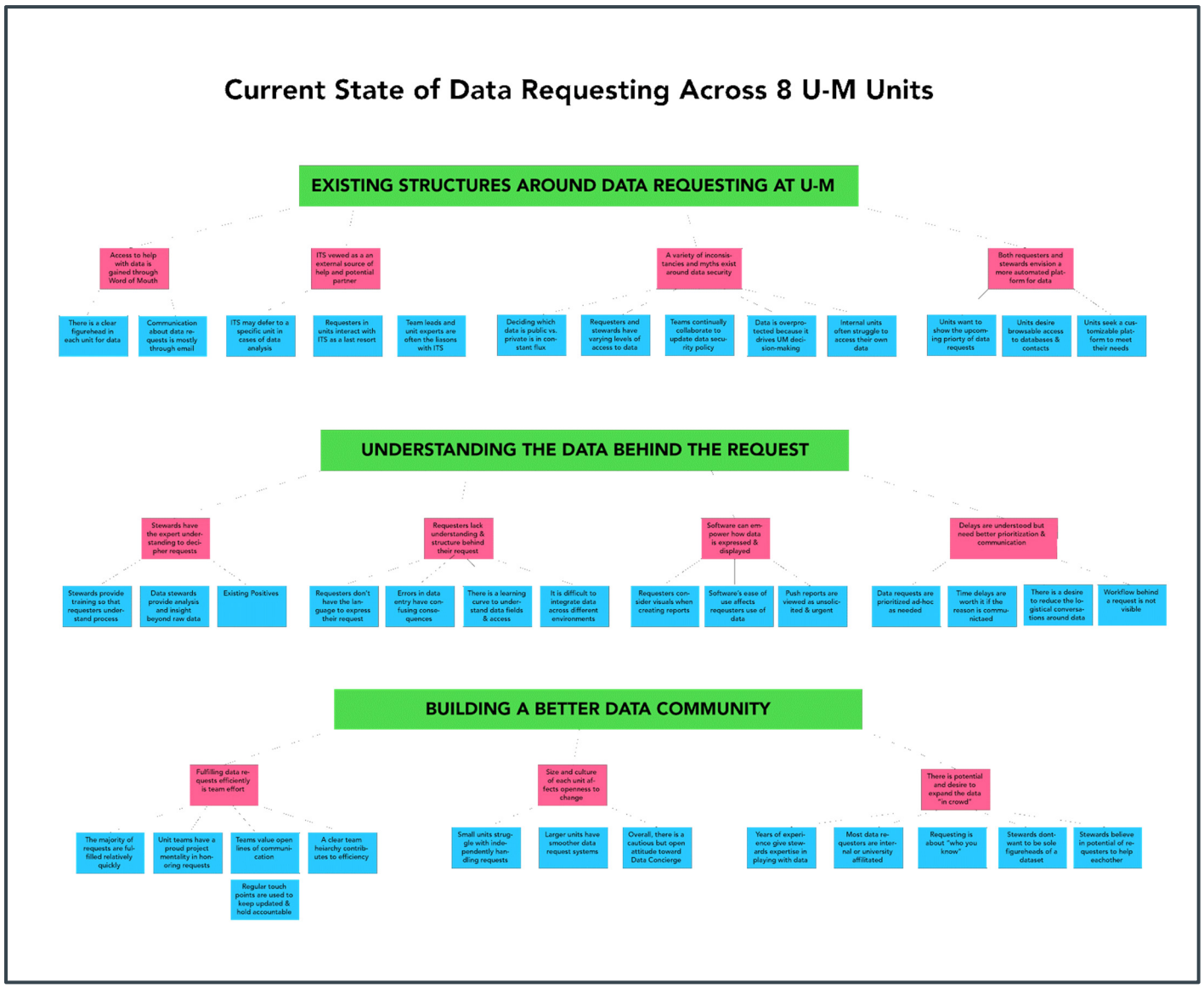
Information Quest Website
http://its.umich.edu/iq/about

ITS Data Dictionary Example
http://www.mais.umich.edu/reporting/about-um-data-warehouse-and-dictionary.html

U-M Medical School Data Catalog
https://datasetcatalog.med.umich.edu/

U-M Online Access Request System (OARS)
https://access.its.umich.edu

APPENDIX: AFFINITY DIAGRAM



Appendix: Affinity diagram of data request workflows across eight University of Michigan departments.