MICHIGAN
ROSS SCHOOL OF BUSINESS

Stephen M. Ross School of Business at the University of Michigan

Independent Study Project Report

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COURSE **Business Information Technology 399**

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TITLE **U-M Environmental Data Repository: Design Thinking Analysis**

"Design thinking relies on our ability to be **intuitive**, to recognize **patterns**, to construct ideas that have **emotional** meaning as well as **functionality**, to **express ourselves** in media other than words or symbols."

-Tim Brown

*Author of **Change By Design***
*Founder of **IDEO**, a design and innovation consultancy*

Acknowledgements:

I would like to thank the following people for their support of my IT-oriented research
in the emerging academic field of design thinking:

The Office of Campus Sustainability at U-M, for investing time and resources into my analysis.
I truly hope the conducted research adds valuable insights to
your team's continuous devotion to fostering a sustainable campus at Michigan

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all with true patience and passive leadership

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and sharing your years of acquired wisdom and stories with me

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Mom and Dad, for your everlasting support of my academic career,
from Estabrook Elementary School to the
University of Michigan Stephen M. Ross School of Business

Thank you all for your support.

U-M Environmental Data Repository: Design Thinking Analysis

Michael Hopps

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Abstract

As part of a campus-wide green initiative proposed in 2004, the University of Michigan Center for Sustainable Systems sought to increase environmental sustainability through the development and implementation of the Environmental Data Repository (EDR), an Excel-based information system used to collect environmental measurements from six categories (Energy: buildings and transportation, water use, land use: built and natural spaces, emissions: air and water pollutants, material use and solid waste, cross-cutting and emerging issues).

Since its launch in 2004, various changes, both formal and informal, have taken place to streamline the EDR reporting process. Due to the complexity of the data input process, large number of data reporters involved, various e-service systems employed and growing number of environmental metrics to be measured (i.e. new Planet Blue metric requests), the EDR reporting system's required workload is expanding and opportunities for increased efficiencies should be explored.

Design thinking: a human-centered, problem-finding consulting approach is used to assess the emotional involvement of six Environmental Data Repository stakeholders, from front-stage personnel (OCS Senior Sustainability Rep) to back-stage operations (IT Infrastructure Lead). Through a 14 week design thinking analysis in the exploration and discovery phases of the eService Innovation Design model (Melville, BIT 378 2010), I use ethnographic exploration tools, customer journey mapping and an overarching service blueprint to examine gaps in three EDR stakeholders' latent needs, and seek actionable insights for future enhancement of the Environmental Data Repository reporting process.

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Introduction

1a. Project Goals

The Environmental Data Repository was developed by a team from the Center for Sustainable Systems in order to meet the Environmental Task Force recommendation for annual environmental reporting. (Enivronmental Task Force, University of Michigan 2004)

> "The ETF report implementation plan recognizes the need for "…an effective and efficient system…to manage the data throughout the reporting life cycle (i.e. collection, compilation, analysis, storage, reporting)." The ETF also identified "…central data compilation, data analysis, conversion to appropriate measurement units, [and] normalization…" as necessary components of environmental reporting."
>
> "In response to these challenges, a team from the Center for Sustainable Systems has developed the University of Michigan Environmental Data Repository (EDR)." (Deslauriers, McMillan and Spitzley 2005)

The CSS team did an excellent job proposing, developing and deploying the Environmental Data Repository to use on campus. However, no information system is perfect. Due to the massive amounts of data being collected, large number of data reporters involved, and wide range of human dynamics encountered when communicating across divisions, there is always the possibility for improvement to the process. My goal was to bring a design thinking perspective to the table, strive to deeply understand the current data collection process, and seek ways to enhance the system, working from a bottom-up and human-centered perspective (vs. traditional top-down, solution-driven consulting methods).

The project aims to understand the environmental reporting process at the University of Michigan and make recommendations for improvement. Specific objectives include the following:

- Analyze all 80 pages of the UM Environmental Data Repository report, found here:
  - http://css.snre.umich.edu/css_doc/CSS05-11.pdf
- Create hunt statement, and employ human-centered tools to explore possible problem spaces in environmental reporting at U-M
- Meet with campus sustainability stakeholders to gather qualitative feedback
- Use Business IT 378 design thinking methods to assess processes and provide insights for improvement
- Grow understanding of carbon management systems and U-M environmental initiatives

1b. Project Framework

The project utilized design thinking methods to research the Environmental Data Repository reporting process. Design thinking is defined as:

> "Design thinking is an innovation method that employs **human-centered** tools and techniques (from ethnography, narratology, etc.) as well as others (finance, strategy, etc.) to **balance problem finding activities** with solution finding activities to produce solutions (products, services, etc.) that **meet people's needs**, are technologically **feasible**, and yield an **economically viable** business strategy." (Melville, BIT 378 2010)

Using this unique consulting approach, we examined the EDR through a framework outlined by the eService Innovation Design model, developed by Nigel P. Melville. Narrowing our focus to the "Environmental Data Repository reporting process", allowed us to treat the process as a "service" (i.e. data is collected from truck

drivers, bus drivers, building managers, etc on many front-stage/back-office levels and reported up the chain to Office of Campus Sustainability).

An *e-service* (which classifies the range of digital "services" used in the EDR process) is defined as:

> An e-service is a "service that relies partially or heavily on **information systems for its delivery**. Most importantly, e-services are a **growing category in the service field**, and are slowly complementing or replacing traditional people-operated services…Like traditional services, e-services exhibit the following characteristics**: intangible, ephemeral, experiential, emotional, provider ownership, co-creation** and **flexibility**." (Melville, BIT 378 2010)

To further narrow the scope of this research, the framework was limited to the goals of just Phase 1 and 2 of the eSID model:

> **Phase 1: Exploration** – "What is the behavior in context, what are pertinent trends and statistics, what are delivery organization capabilities?"
>
> **Phase 2: Discovery** – Synthesize ethnographic data to complete the statement: "An enhanced e-service would __"

Due to the loose ends that can be encountered when conducting a design thinking project, guidance from a strong framework is needed to ensure continuous progress is being made. In order to keep advancing through the Problem Finding stage, an established flow chart provided structure. Highlighted below are the Exploration and Discovery phase flows, drilled down into specific steps.

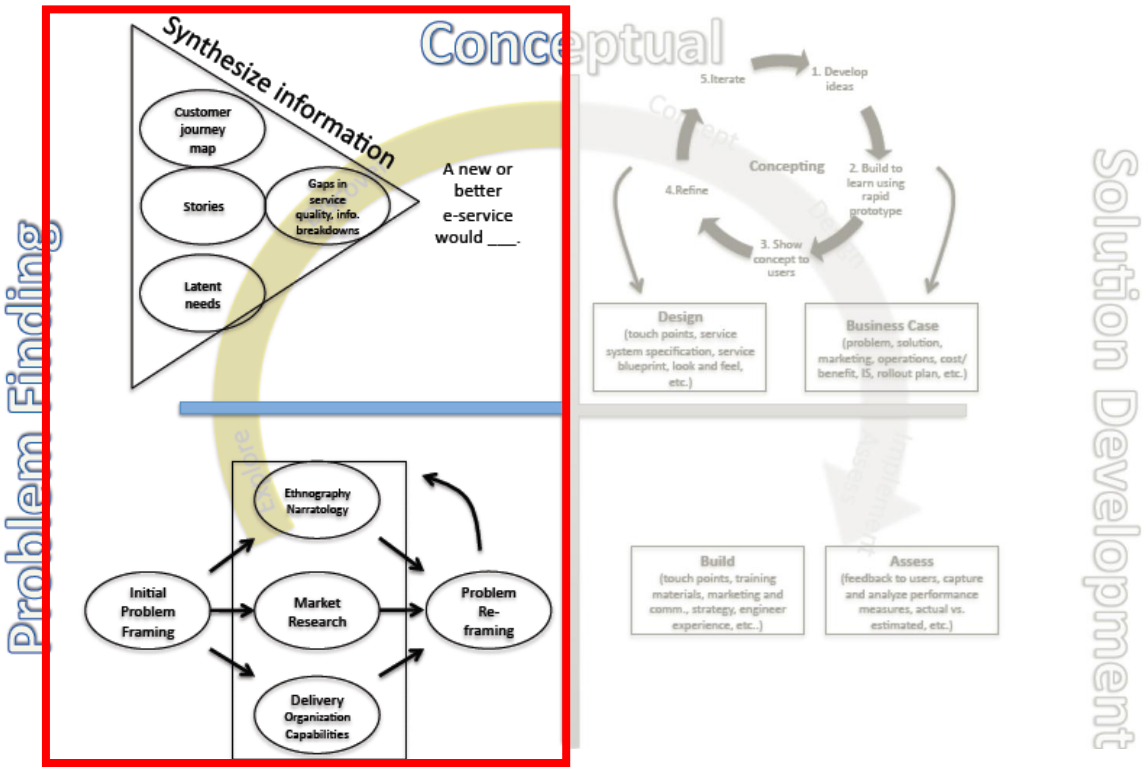

Figure 1: eSID Framework illustrating focus of this study

(Melville, BIT 378 2010)

1c. Research Methods

"Design research is the act of investigating, through various means, a product's or service's potential or existing users and environment. Design research uses a hodgepodge of methods drawn from anthropology, scientific and sociological research, theater, and design itself, among other disciplines." (Saffer 2007)

Phase One: Exploration

The employment of design thinking calls for non-traditional research techniques. Through the first phase, we utilize the following highlighted tools:

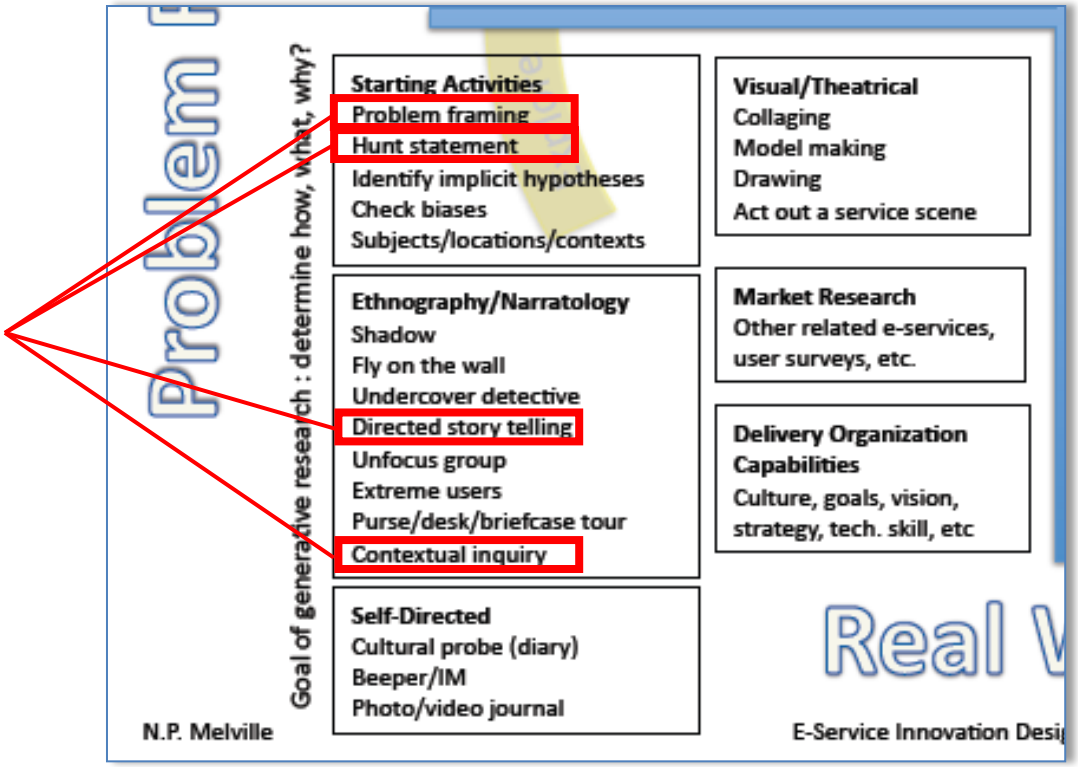

Figure 2: Array of 22 Exploration tools, narrowed to four for the study's purpose

(Melville, BIT 378 2010)

Of the possible 22+ Exploration tools, the scope was narrowed to using the following:

Problem framing, defined as: "…definitions of a situation are built up in accordance with principals of organization which govern events […] and our subjective involvement in them; frame is the word I use to refer to such of these basic elements as I am able to identify" (Goffman 1986)

Framing an open-ended problem includes three primary tasks:

- "Recognize and control for personal preferences and assumptions
- Conduct a thorough analysis of the problem subparts; analyze important information by making legitimate, qualitative interpretations of relevant information from different points of view
- Organize the available information into a meaningful description of the problem's complexities"

(Lynch, Wolcott and Huber 2000)

Hunt statement, defined as: "Designers can help themselves focus by creating a hunt statement. A hunt statement is a tool for narrowing down what the designer is researching and why. Hunt statements typically take the form: I am going to research X so that I can do Y. X is often an activity, and Y is usually a project goal or subject area… Hunt statements should be developed before doing research so that there is a purpose to each piece of research. The more specific the hunt statement, the better." (Saffer 2007)

Contextual Inquiry, defined as: "The easiest and most fruitful of all design research methods is simply observing what people are doing…[Contextual inquiry is a] variation on shadowing [and] involves going to the subjects' location and asking questions about their behaviors, such as "Why are you doing that? Could you describe that to me?" (Saffer 2007)

Directed Story Telling, defined as: "Ask subjects to tell stories about specific times they performed an action or interacted with a product or service. Moments to ask about are the first time they performed an action or used a product ("Tell me about the first time you used the system to place an order"), a time when the product or service hasn't worked ("Can you describe a time when you couldn't do something you wanted to with your mobile phone?"), and a time when they did something new ("Why did you try to use the screwdriver to pry open the phone?") (Saffer 2007)

Phase Two: Discovery

Through the phase two, Discovery, we will use background knowledge acquired from phase one, Exploration, to visualize the problem space in detail:

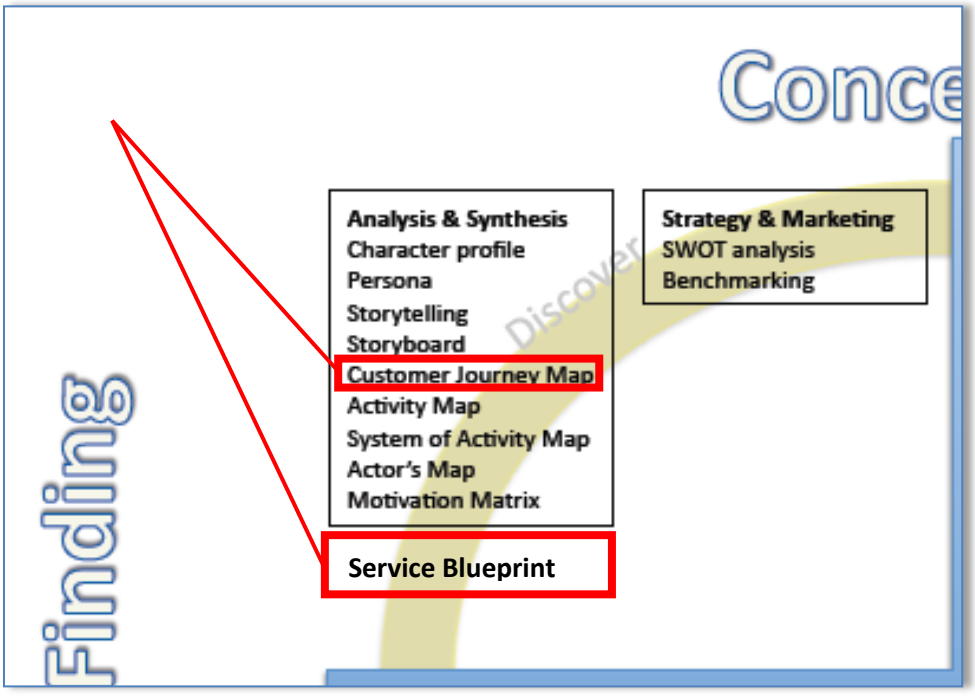

Figure 3: Array of 12 Discovery tools, narrowed to two for the study's purpose

(Melville, BIT 378 2010)

Of the possible 12+ Discovery tools at our disposal, we used:

> **Customer Journey Map**, defined as: *The customer journey map is an oriented graph that describes the journey of a user by representing the different touchpoints that characterize his interaction with the service.*
>
> In this kind of visualization, the interaction is described step by step as in the classical blueprint, but there is a stronger emphasis on some aspects as the flux of information and the physical devices involved. At the same time there is a higher level of synthesis than in the blueprint: the representation is simplified trough the loss of the redundant information and of the deepest details. (Tassi, DensityDesign and DARC 2010)
>
> **Service Blueprint**, defined as: *The blueprint is an operational tool that describes the nature and the characteristics of the service interaction in enough detail to verify, implement and maintain it.*
>
> It is based on a graphical technique that displays the process functions above and below the line of visibility to the customer: all the touchpoints and the back-stage processes are documented and aligned to the user experience. (Tassi, DensityDesign and DARC 2010)

1d. Design Thinking Case Studies

Design thinking is difficult to manage and assess. However, the end service enhancements can yield much more valuable results to the organization over traditional consulting methods. Tim Brown, founder of design firm IDEO and today's most popular figure of design thinking, states:

> "Insofar as it is **open-ended**, **open-minded**, and **iterative**, a process fed by design thinking will feel chaotic to those experiencing it for the first time. But over the life of a project, it invariably comes to make sense and achieves results that differ markedly from the linear, milestone-based processes that define traditional business practices." (Brown 2009)

What can design thinking do for an organization, like the Office of Campus Sustainability, or for particular initiatives such as an integration assessment? The following articles claim:

> "Design thinking is very similar to strategic foresight, hence the intersection theme of the seminars,"…Conway said people in the business community know what design thinking is, but view it as "the new kid on the block"…Other people will say design thinking is about art and 'we don't need that', but when you get into it is quite useful," she said. (Gedda 2010)
>
> "Design thinking empowers the design of business, the directed movement of a business through the knowledge funnel - from mystery to heuristic to algorithm - and then the utilization of the resulting efficiency to tackle the next mystery and the next and the next." (Martin 2010)

Many large corporations are using design thinking to build better products, meet the customers' latent needs, and solve organizational challenges. The following provide credible cases of design thinking being employed to solve large-scale organizational challenges:

Hewlett Packard uses design thinking to better develop merger plans:

> "Design thinking plays a key role in addressing business challenges, where there may not be a direct complementary role for applied design. For example, design thinking has been used in mergers and acquisitions at HP. By understanding what the acquiring company's customers most value and comparing these priorities to each company's capabilities, HP was able to develop a merger plan that leveraged the best capabilities of both companies to benefit the customers. Two years after the merger, HP retained practically all of the acquired company's customer base." (Sato 2009)

IBM employed design thinking to improve their global IBM Client Briefing centers:

> Prior to design thinking, visiting clients experienced a drain in emotional interest over the course of one day at IBM Client Briefing centers, as shown in the customer journey map:

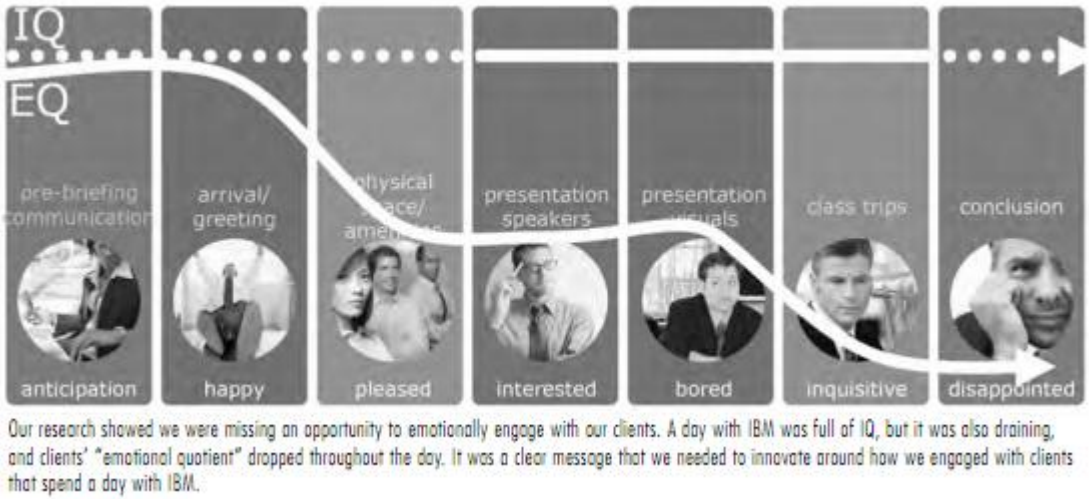

Figure 4: Customer journey map displays declining emotional quotient of IBM clients at Client Briefing centers

> "In 2006, IBM's corporate experience strategy and design department led an investigation into what it was like for clients to visit IBM at home. By home, we mean one of the more than 200 client centers IBM operates for hosting executives and client professionals around the world. At the centers, we offer workshops and hands-on experiences with products and services that can help make our clients' businesses more successful […]
>
> Takeaways: We heard the results of observational research we had done, shadowing clients and briefing teams in selected centers around the world… The design team came back loaded with ideas. Here are two things we did that have been declared as game changers by our briefing center brethren:
>
> 1. The Discovering your WOW book is a cookbook created to help each briefing center design its own unique and appropriate client experience.
> 2. The IBM client experience journey map and planning tool puts the power of design into the hands of the people closest to the client. The tool uses magnetic cards to help each briefing center team explore and track a year's worth of experience planning, or map out a single high-impact visit." (Clark and Smith Summer 2008)

Mayo Clinic was initially analyzed through a design thinking discovery tool, Territory Mapping, during an MBA course at Carnegie Mellon University. The project was one of several sparks to an internationally-known case study to solving the following problem: "Most patient satisfaction with health care comes through the delivery of that care, not necessarily the care's effectiveness. Designers at the Mayo Clinic observed that a point of patient annoyance is the check-in process." (Saffer 2007)

> "…One of the first task activities for each team is building a territory map. Students are asked to collaboratively create a diagram (or map of the territory) that is an accurate representation of what they as a team believe the scope of their project will include. This map is based on the information they have available (which in this early stage is very little). In most cases, a territory map illustrates a current-state customer process, development process, or themes that will influence uptake of a disruptive innovation."

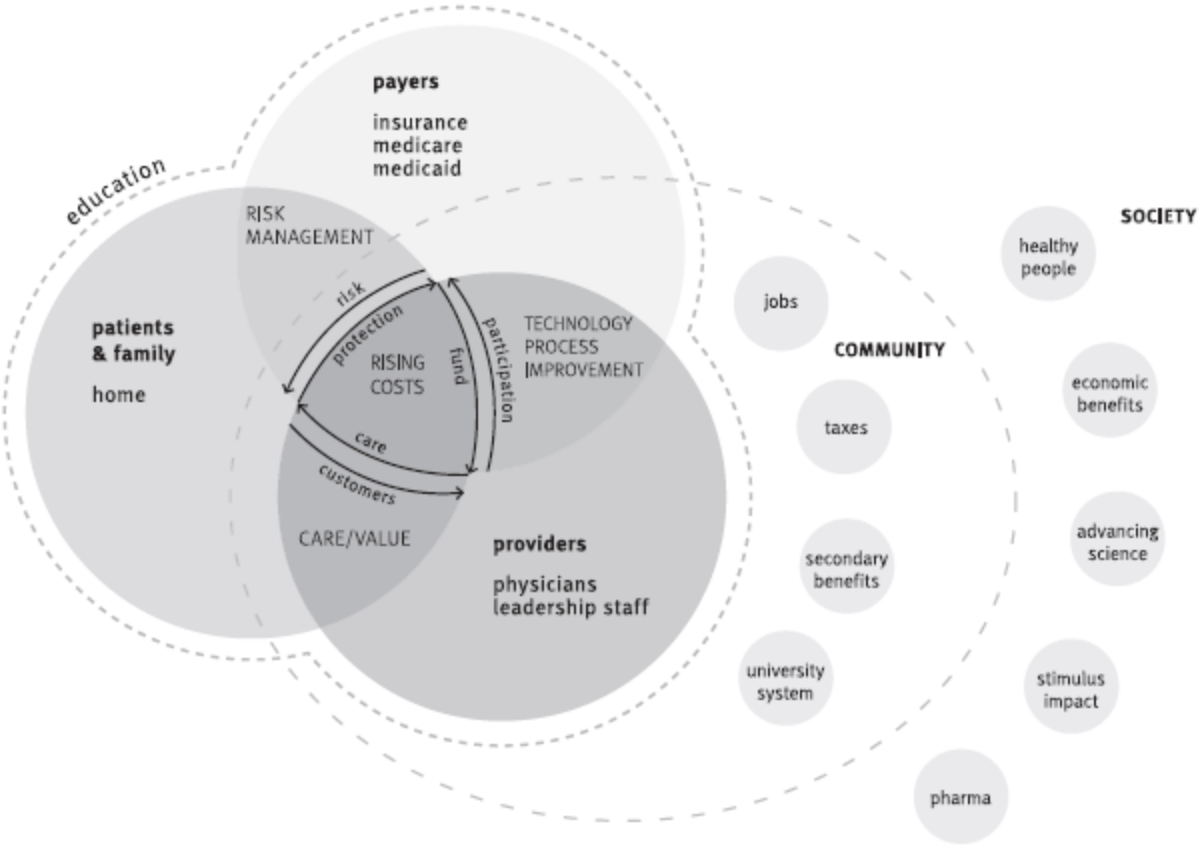

Figure 5: Territory map for the Mayo Clinic design thinking analysis

(Boni, Weingart and Evenson 2009)

1d. Project Involvement

Number of direct stakeholders interviewed	**6** Michigan Staff
Number of indirect advisors interviewed	**2** Michigan Faculty (1 from School of Information; 1 from Ross School of Business)
Project Supervisor	**1** Michigan Faculty (Stephen M. Ross School of Business)
Time invested in project by Michael Hopps	**Overall ~170 Hours** 14 weeks (Sept-Dec) Tasks Achieved (Quantified): • Researching design thinking applications to real-world scenarios • Researching background of EDR; Reading 80-page 2005 EDR report • Coordinating and conducting 9 meetings with 2 Michigan faculty to seek advice and insight for future project applications • Coordinating and conducting 7 interviews with 6 Michigan staff for direct EDR input • Coordinating and conducting 8 weekly meetings with project supervisor, Nigel Melville, to monitor progress and address challenges • Researched all direct stakeholder organizational structures; Provided insight into customer journey mapping process • Construction of 3 customer journey maps • Construction of 1 service blueprint • Construction of 40 page final report • Preparation of presentation to OSEH stakeholder, and project supervisor in February • Preparation of Winter 2011 extension proposal; Will address phases 3 and 4 of the eSID model

Figure 6: Table displays project involvement, quantified by hours invested and interviews conducted

1e. Stakeholder Biographies

Project Advisor:

Nigel P. Melville

Assistant Professor of Business Information Technology, Stephen M. Ross School of Business, University of Michigan

Nigel Melville is an Assistant Professor of Business Information Technology at the Stephen M. Ross School of Business, University of Michigan. He is also a Special Sworn Status researcher of the U.S. Census Bureau at the Michigan Research Data Center, University of Michigan. Previously, Professor Melville was the Sam M. Walton SIFE Free Enterprise Fellow and Assistant Professor of Information Systems at the Wallace E. Carroll School of Management, Boston College.

Professor Melville is an expert in information technology innovation and organizational performance. He is the author of numerous research articles appearing in leading academic and professional journals such as *Information Systems Research*, *MIS Quarterly*, *Decision Support Systems*, and *Communications of the ACM*. He is an editor of the book "Global E-Commerce: Impacts of National Environment and Policy" (Cambridge University Press, 2006). Professor Melville earned a BS in electrical engineering from UCLA, an MS in electrical and computer engineering from UC Santa Barbara, and a PhD in management from UC Irvine.

(University of Michigan Stephen M. Ross School of Business, Faculty Directory 2010)

Technical Advisors:

Robert Frost

Associate Professor, School of Information, University of Michigan

His research interests include industrial rationalization, domestic consumerism in Interwar France, industrial informatics, gender and IT, the digital divide, and the history of IT.

(University of Michigan School of Information, Faculty Directory 2010)

Scott Moore

Arthur F. Thurnau Professor; BBA Program Director; Associate Professor of Business Information Technology, University of Michigan

Dr. Moore is an Associate Professor in the Business Information Technology group at the Michigan Business School. He is also an Arthur F. Thurnau Professor in recognition of his efforts in undergraduate education. His current research focus is on supply chain management. In this research he is running experiments in which automated agents evolve under the control of genetic programming in order to improve their performance in managing inventory in a supply chain. Previously, he developed a language for automating complex electronic communication. He investigated the effects of applying this technology to EDI, workflow automation, and agents and electronic commerce. He also investigated workflow systems and office automation. This involved defining a theory of work readiness and a computerized system based on this theory. The goal of this research is to determine the effects of this system on the behavior of information workers. Previous lines of research led him to construct a DSS for investigating fleet mixes, an environment for creating and investigating mathematical

models, a prototype of a document retrieval system based on a formal language, a message management system (MMS) for an office environment, and a work management system.

(University of Michigan Stephen M. Ross School of Business, Faculty Directory 2010)

EDR Interviewees

Terry Alexander

Executive Director, Office of Campus Sustainability, University of Michigan

- Primary focal point for campus sustainability operations, both internal to the U-M and to external organizations
- Primary contact between campus operations and academic/student activities
- Develop long-term strategies for campus operations

(Office of Campus Sustainability 2011)

Ken Keeler

Senior Sustainability Rep, Office of Campus Sustainability, University of Michigan

- Develop and track environmental metrics and Annual Environmental Report
- Manage updates of UM website
- Identify and prioritize areas for further environmental effort
- Educate the university community on best practices in environmental sustainability

(Office of Campus Sustainability 2011)

Tracy Artley

Recycling Coordinator, Grounds and Waste Management Services, University of Michigan
(University of Michigan Grounds and Waste Mgmt Organizational Chart 2010)

Renee Jordan

Fleet Manager, Transportation Services, University of Michigan
(University of Michigan Transportation Services Organizational Chart 2010)

Shari Elkort

Billing Office Staff for Business Administrator, Grounds and Waste Management Services, University of Michigan
(University of Michigan Grounds and Waste Mgmt Organizational Chart 2010)

Curt Gomulinski

Infrastructure Lead for Plant and Operations, Information and Technology Services, University of Michigan
(University of Michigan Information and Technology Services 2010)

2. Design Thinking Analysis

2a. Problem Framing

Please refer to Section 1C: Research Methods, for precise definition of "Problem Framing."

Through understanding the current data collection process, a bottom-up, problem-driven, and observation-based perspective will be used to provide insights for enhancement, compared to traditional top-down, solution-driven consulting methods.

Phase 1, Exploration, of the eService Innovation Model calls for framing the problem. An unbiased, multi-lensed frame is key to assessing the correct problem space in the Environmental Data Repository collection process.

To better understand the process, we can visualize the Environmental Data Repository collection process as a "service." The EDR Excel-based database serves as the service interface between the Office of Campus Sustainability and the University of Michigan's annual initiatives and organizations.

In simple terms, system components are:

Input data: Water, Energy, Waste, GHG Emissions
Output: U-M Annual Sustainability report

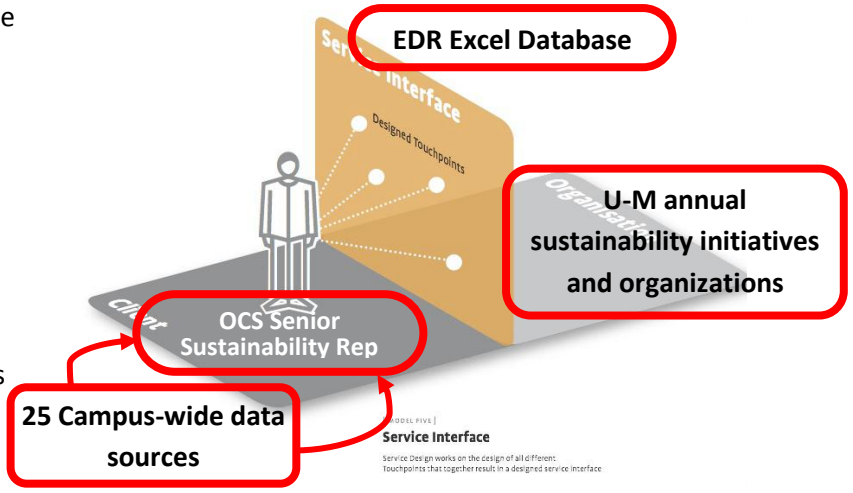

Figure 7: The EDR database serves as the service interface between OCS and the University's sustainability initiatives (Moritz 2005)

Initial framing:

As the first round of interviews was conducted with indirect advisors, several insights to frames surfaced:

> Change the focus on managing carbon emissions data, not just managing carbon emissions: "By managing these systems better, we could reduce our emissions" (Melville, EDR Advisory Interview 2010)
>
> A "repository": a place where something may be stored, i.e., a "storage place", not a process, or a service…" (Melville, BIT 378 2010)

Visualizing the EDR as an Environmental Resource Management tool provided by Melville in course BIT 378, the problem frame was drilled down into system and supporting functionality components:

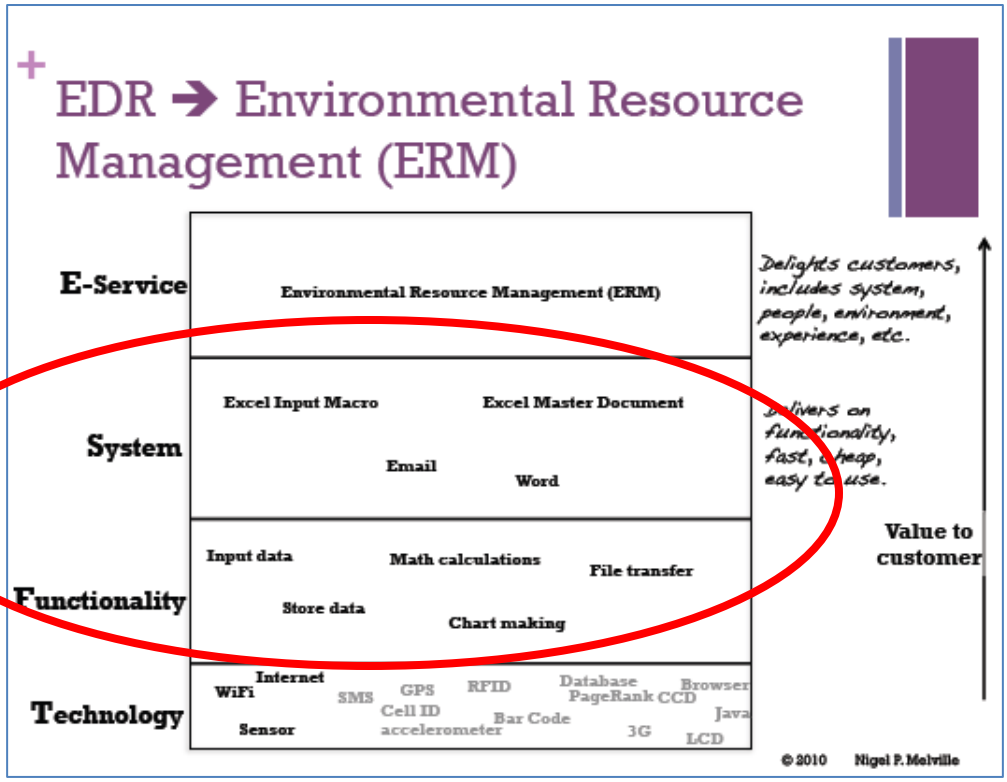

Figure 8: The EDR is visualized as an Environmental Resource Management tool, where we'll focus on "system" and "functionality" for the study's purpose

(Melville, BIT 378 2010)

Reframing:

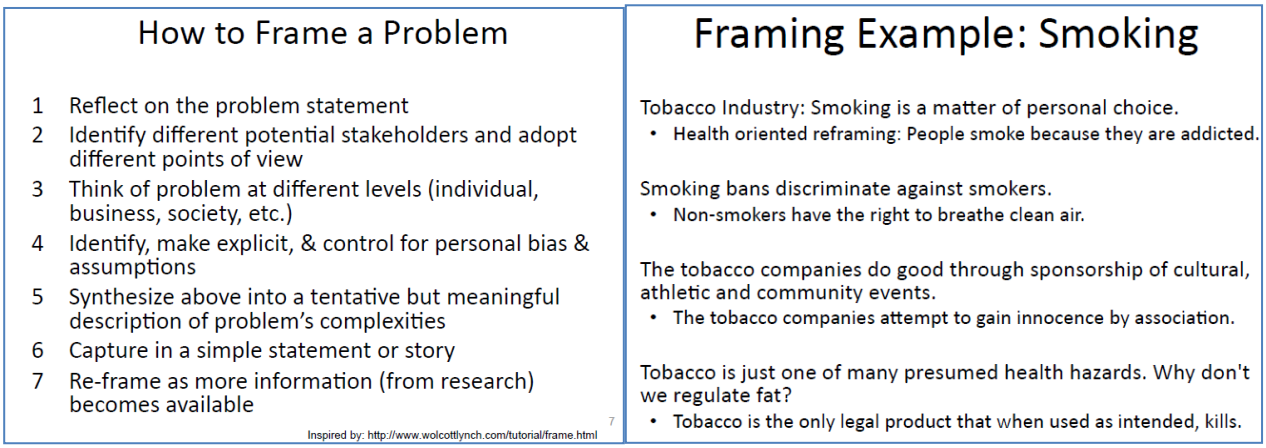

Figure 9: A problem framing example provided by Professor Nigel P. Melville

(Melville, BIT 378 2010)

Using framing techniques compiled by Melville, the problem spaces were reframed into the following:

- The EDR harnesses the structure and security of an Excel database and customized Macro-built interface to allow for manual input of data
    - **Reframe**: *From preliminary background reading, the Excel macros have not received significant upgrades since 2006. How has the static, older system affected the efficiency of annual data*

reporting cycles? While the systems have not changed, has the types of information requested stayed the same or changed?

- The EDR delivers a wide spectrum of environmental information, across six metrics. The information is collected by the Office of Campus Sustainability.
    - **Reframe**: *This is a lot of information! How many OCS stakeholders are involved in directly inputting data into the EDR Excel-based system? How is this data being validated?*
- The organizational structure for the EDR reporting process has been well established. Data inputted into the EDR is supplied by 25 cross-campus contacts, ultimately providing the foundation for the final public output: The Annual Environmental Report
    - **Reframe**: *Through what communications channel is data transferred up the organizational pipe? Do all data reporters use the same information system within their campus office? How does the raw data transform into visually appealing charts seen in the Annual Environmental Report?*

2b. Hunt Statement

Please refer to Section 1d: Research Methods, for precise definition of "Hunt Statement."

Hunt Statement #1: I am going to research the user actions of several EDR data sources, and observe how this data is requested, synthesized, analyzed and reported, to learn how this environmental data is passed up the organizational chain.

Hunt Statement #2: I am going to research user responsiveness to the EDR Excel-based interface, and other digital interfaces currently employed by several EDR data sources, to learn how EDR stakeholders have adapted to the systems and repeatedly deliver requested data.

2c. Data Collection

In order to collect data from EDR stakeholders, both directly and indirectly involved in the reporting process, a design thinking mindset guided the structure of interview sessions.

With indirect stakeholders, such as Professor Robert Frost from the School of Information, the objective was to gather insight into problem framing and hunt statement creation. Therefore, direct interview questions were employed. Interviews with indirect stakeholders assisted in establishing boundaries to the project's scope, through deciding what content of the EDR reporting process to examine and determining what direct stakeholder types (i.e. either bus drivers or building managers) to interview within the 14-week timeframe.

With direct EDR process stakeholders, the objective was to pursue directions within EDR reporting process problem framework guided by the established hunt statements (See Section 2B). An ethnographic mindset was employed during interview sessions, and interview questions were: open-ended, unbiased, and non-leading. Through the Exploration phase, observational market research provided the foundation for the Discovery phase, where the emotional interview results were synthesized into visualizing customer journey maps and a service blueprint.

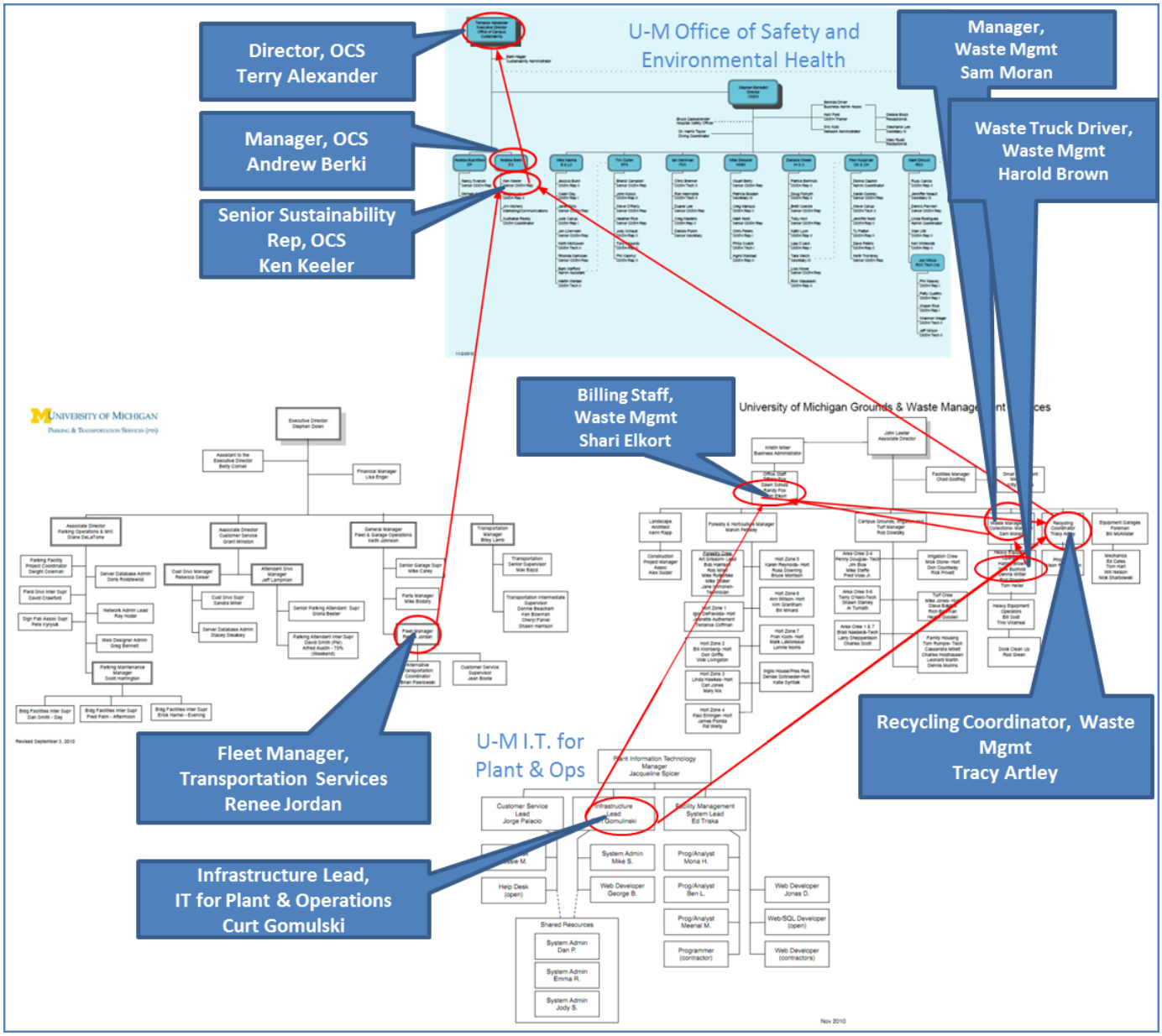

Figure 10: Compilation of organizational charts, visualizing the EDR data reporting path from an organizational standpoint as of December 2010 (For updated OSEH organizational chart as of February 2011, see Figure 24 in Appendix)

In order to analyze the EDR reporting process thoroughly, from visible front office to back stage operations, stakeholders were selected from multiple levels of the reporting process. Using organizational charts from every recommended stakeholder (See Appendix 5A), a compiled organizational tree chart outlined stakeholder relationships, shown above. Red links indicate the communication of environmental data, reported in the direction of the arrow. As a method to avoid interview stonewalling (i.e. running out of interviewees), references were always requested down the organizational chain (i.e. Asking Waste Management for a reference to their IT support personnel)

As we touched the surface of Phase Two, Discovery, in the eService Innovation Design model, an unplanned system map emerged. From the previous compiled organizational tree, the following figure is positive example of the value behind design thinking. When employed at its full potential, design thinking will take a non-linear,

spontaneous route to problem solving. The drafted "system map" provided the foundation to the polished service blueprint, examined in Section 3: Findings.

> **System Map**, defined as: *The system map is a visual description of the service technical organization: the different actors involved, their mutual links and the flows of materials, energy, information and money through the system.* (Tassi, DensityDesign and DARC 2010)

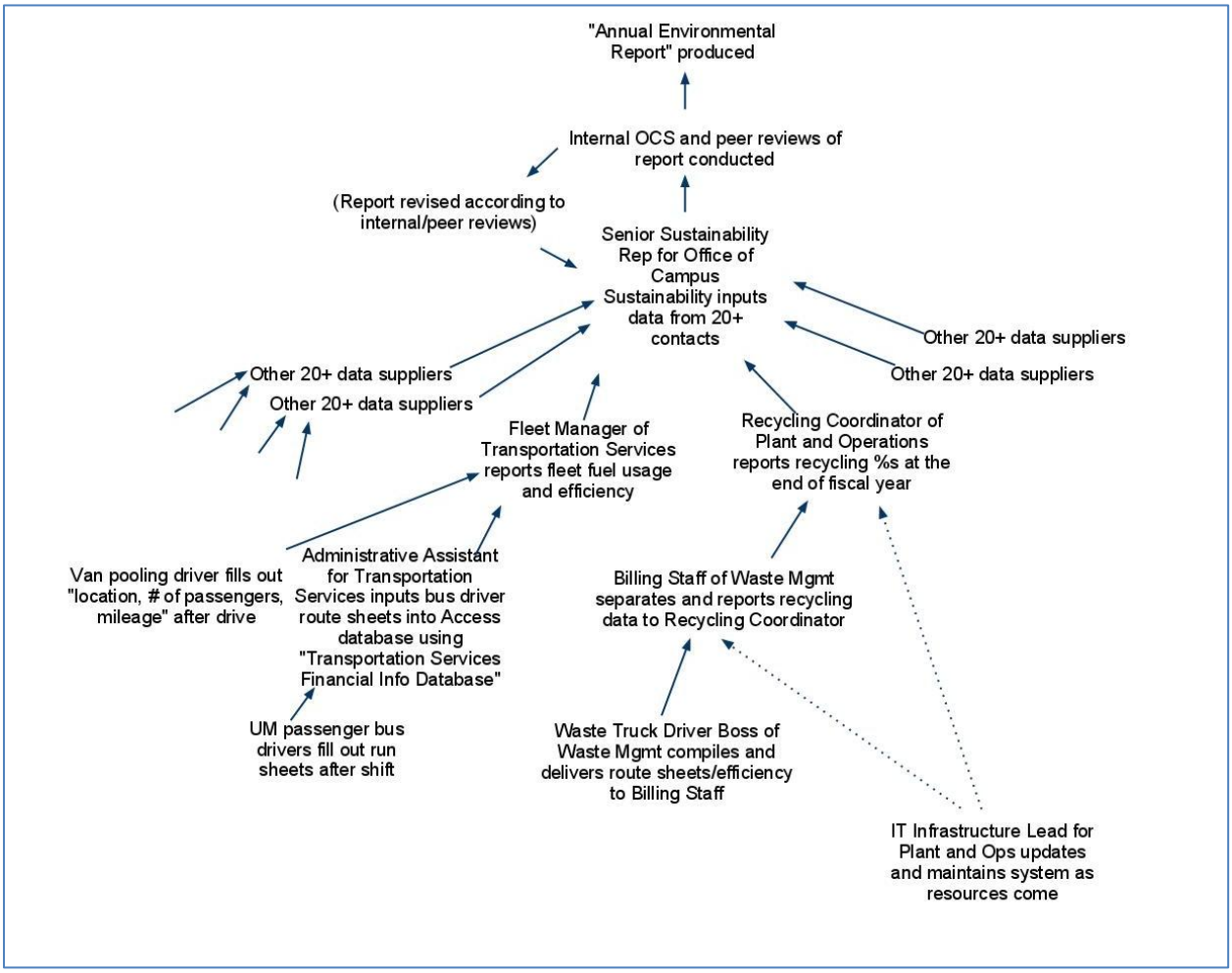

Figure 11: The EDR system map enables us to track the data's path as it is reported up the hierarchical tree of EDR stakeholders

3. Findings

The following findings are the product of seven interviews with six direct stakeholders, background research on the Environmental Data Repository, and personal growth in design thinking strategies. Throughout the interview process (See Section 2C: Data Collection), an empathetic mindset was maintained in order to acquire as much emotional insight possible. Using the recalled hunt statements for guidance, the findings resulted in a very interesting outlook.

Hunt Statement #1: I am going to research the user actions of several EDR data sources, and observe how this data is requested, synthesized, analyzed and reported, to learn how this environmental data is passed up the organizational chain.

Hunt Statement #2: I am going to research user responsiveness to the EDR Excel-based interface, and other digital interfaces currently employed by several EDR data sources, to learn how EDR stakeholders have adapted to the systems and repeatedly deliver requested data.

3a. Contextual Inquiry:

Interview quotes provide a strong verbal insight into the Exploration phase, as we are guided by the narratology tool, Contextual Inquiry, as defined in Section 1C: Research Methods. All interviews notes were recorded by hand and dated. This method improves our interview process, as it combines a traditional market research technique, called "layering," (The layered use of asking "Why?") with careful observations for emotional inflection in responses. Quotes from various interviewed EDR stakeholders (Specific job titles hidden to retain anonymity) included:

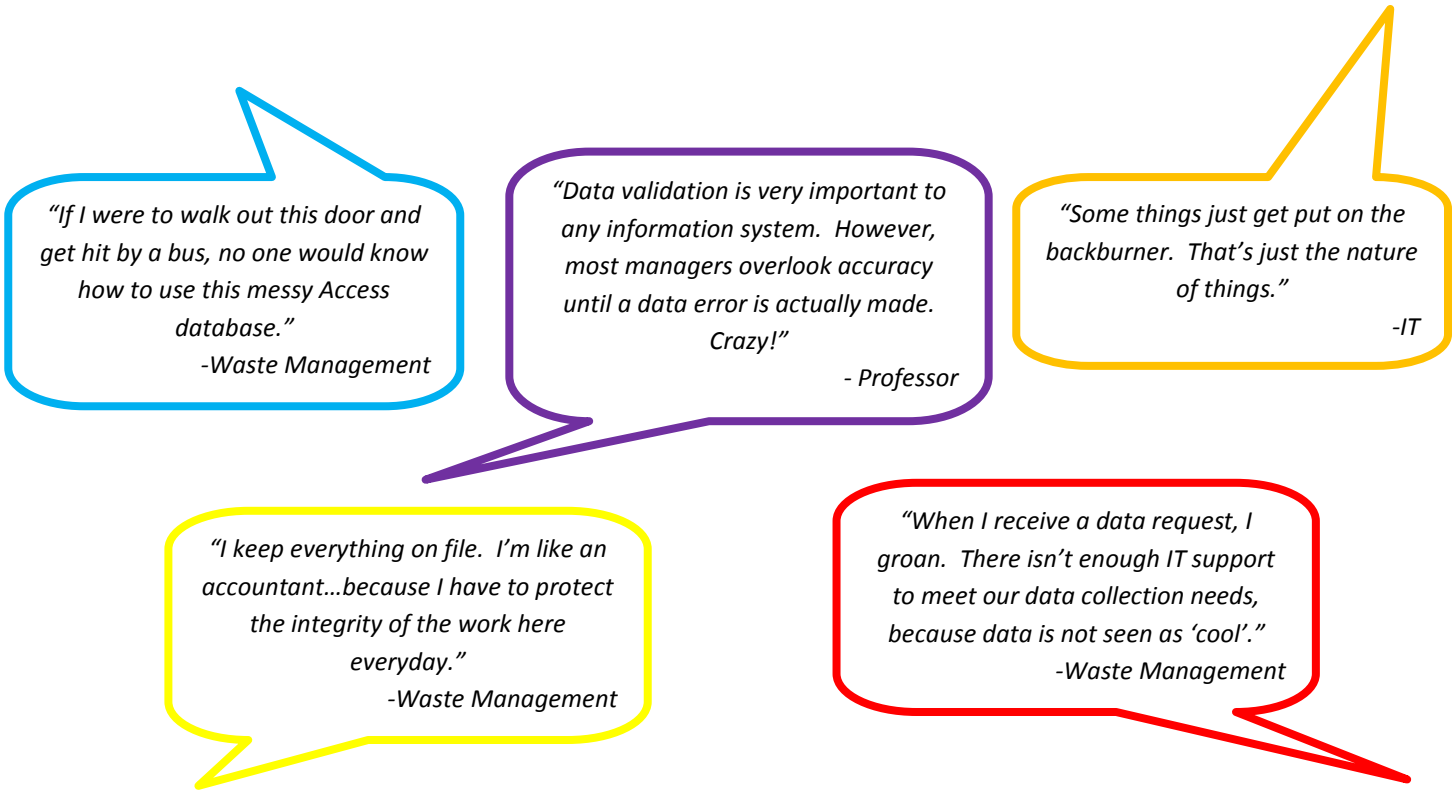

Figure 12: The dialogue callouts provide direct insight into EDR reporting challenges currently faced by the stakeholders

3b. Directed Story Telling:

As defined in Phase One, Exploration, of Section 1C: Research Methods, Directed Story Telling is a narratology tool employed to gather insights about a particular experience with the service. During interviews with the Recycling Coordinator, she was asked:

Design researcher: "*Tell me about your most frustrating experience*:"

Response story from Recycling Coordinator:

> "Hmmmm" *ponders for a minute*…"Oh yea, I got one!" *groans*

"One time, the business school submitted a data request for the last 5 years of recycling rates…for 4 different dumpster locations. One of the locations included William Davidson Hall. However, that building was torn down! *rolls eyes* I was very confused. I spent a lot of time calling around, not sure what had caused this. Well, it turns out that for one year after Williams Davidson Building was torn down for remodel, they kept the dumpster there but still called it 'Williams Davidson Dumpster.' In the system, the dumpster was named WDH, however they ignored it's actual location close to other buildings. Why wouldn't anyone update this in the database!? Anyways, it caused quite some confusion, was very time consuming to fix, required lots of phone calls, etc, but eventually I got ahold of Sam, the boss of drivers who prepares route sheets, calculates route efficiency and all that. Sure, I fixed the mistake in the system, but c'mon people!"

(Artley 2010)

3c. Customer Journey Mapping

As defined in Phase Two, Discovery, of Section 1C: Research Methods, Customer Journey Mapping is a tool developed from empathetic listening. Through the collection of verbal information gathered through in-person interviews, close observations towards emotional reactions are crucial to building customer journey maps. The three components to a CJM include: activity, feelings, and service solution. Emoticons can be used to address feelings and thoughts towards a particular service activity, which ultimately allow the design thinking researcher to assess emotional highs and lows in future phases of the eService Innovation Design model.

The next three pages present CJMs of the following EDR stakeholders:

1. Recycling Coordinator
2. IT Infrastructure Lead
3. OCS Senior Sustainability Rep

Recycling Coordinator
EDR Customer Journey Map

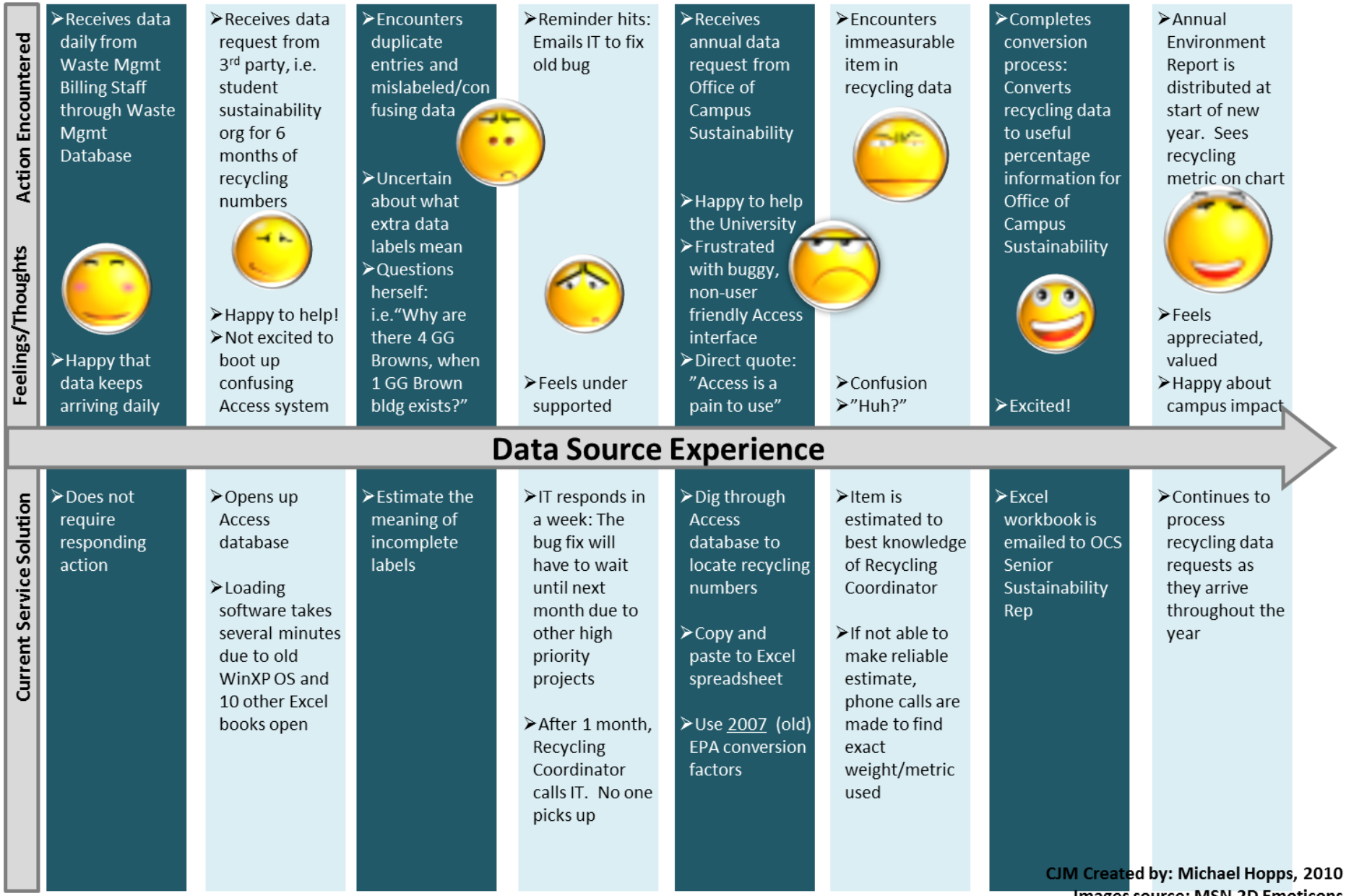

Figure 13: The customer journey map displays the Recycling Coordinator's actions, emotional responses and service solutions exhibited in the EDR reporting process

IT Infrastructure Lead
EDR Customer Journey Map

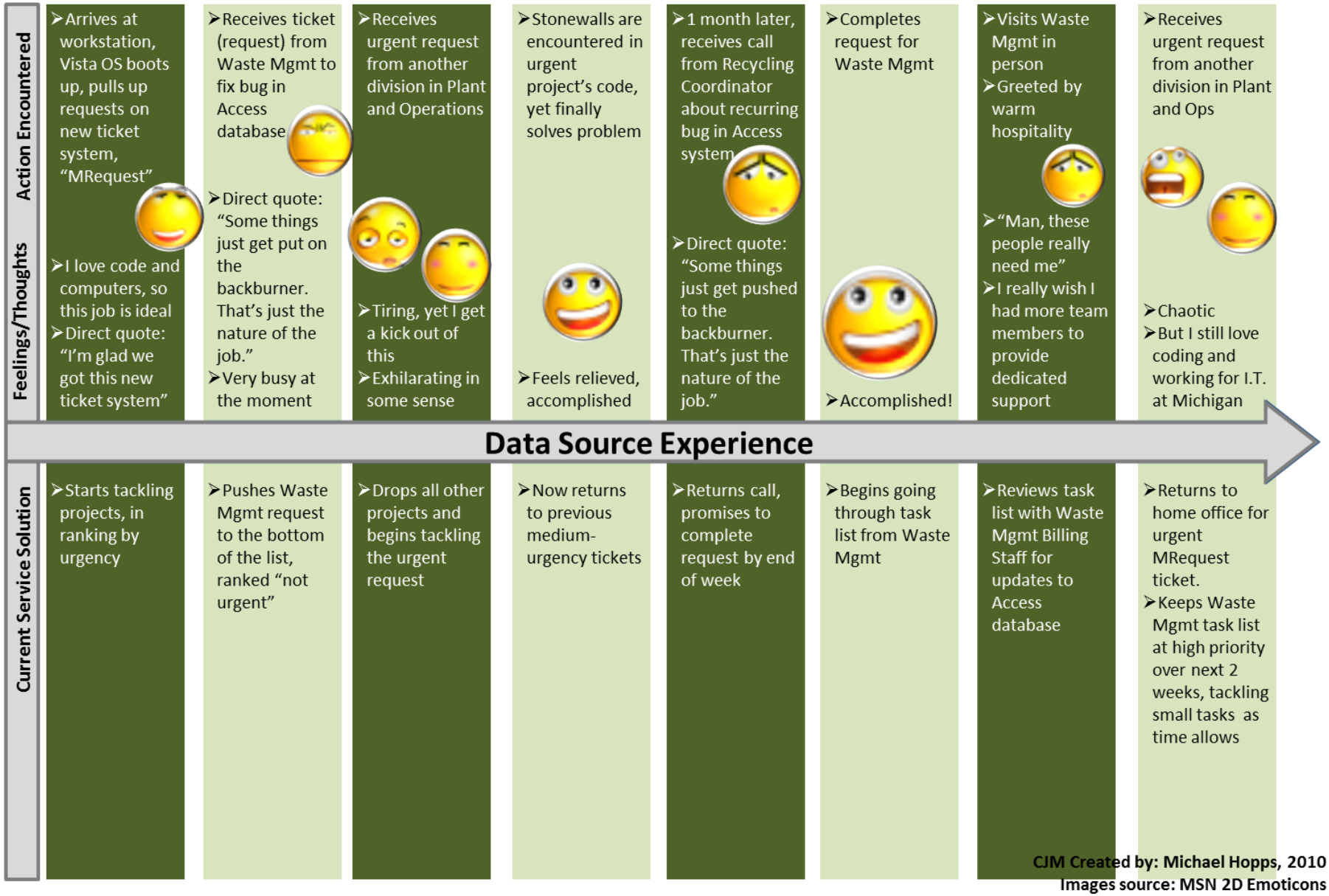

Figure 14: The customer journey map displays the IT Infrastructure Lead's actions, emotional responses and service solutions exhibited in the EDR reporting process

OCS Senior Sustainability Rep
EDR Customer Journey Map

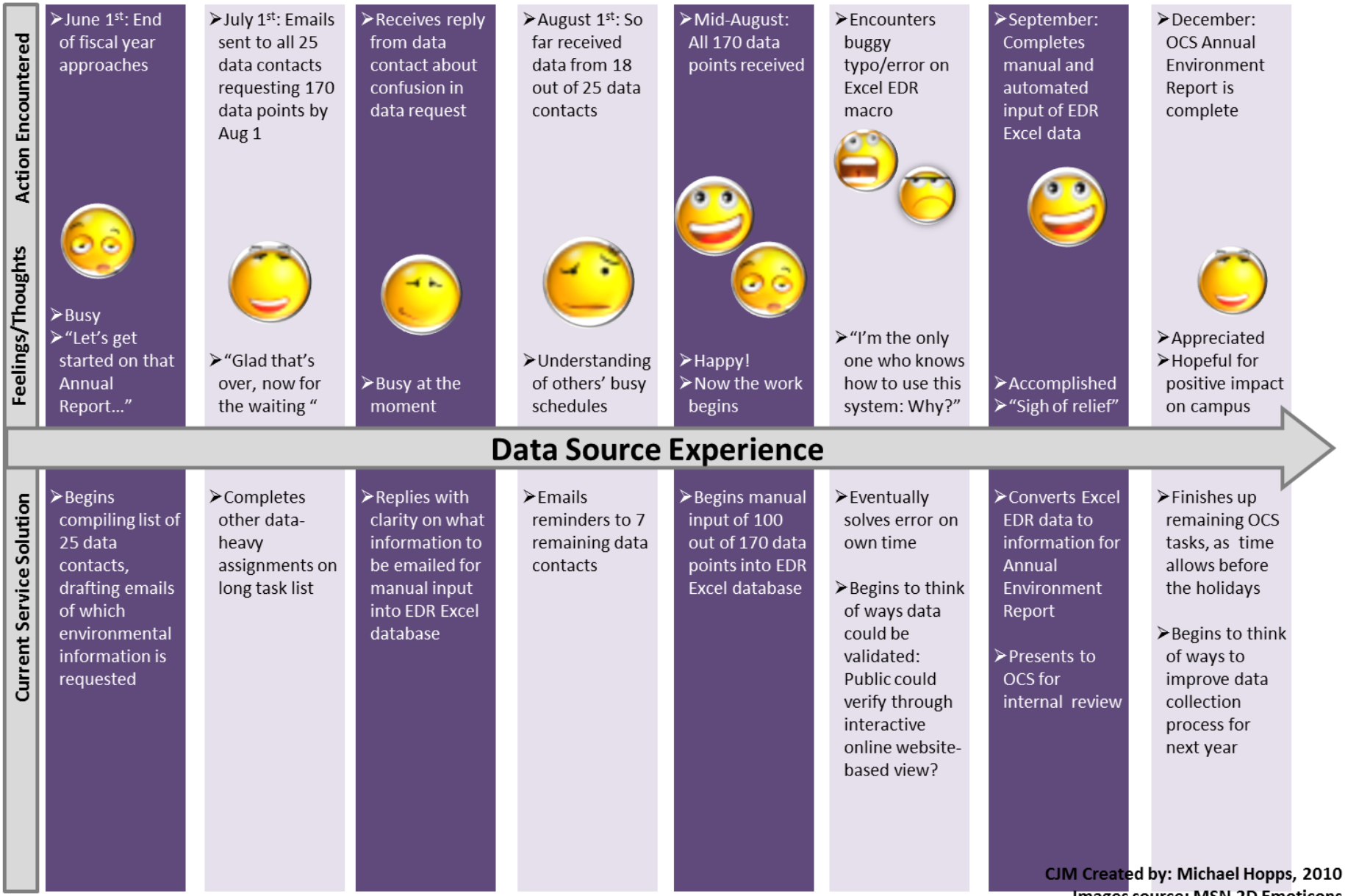

Figure 15: The customer journey map displays the OCS Senior Sustainability Rep's actions, emotional responses and service solutions exhibited in the EDR reporting process

3d. Service Blueprint

The following finding is a service blueprint, which as defined in Section 1C: Research Methods, displays a schematic diagram of links between all service components in the EDR reporting process. Due to resource limitations, the following blueprint only displays activity links between 6 EDR stakeholders, those described in Section 1E: Stakeholder Biographies. Separated into front stage and back office activities, we can locate service gaps in the EDR reporting process:

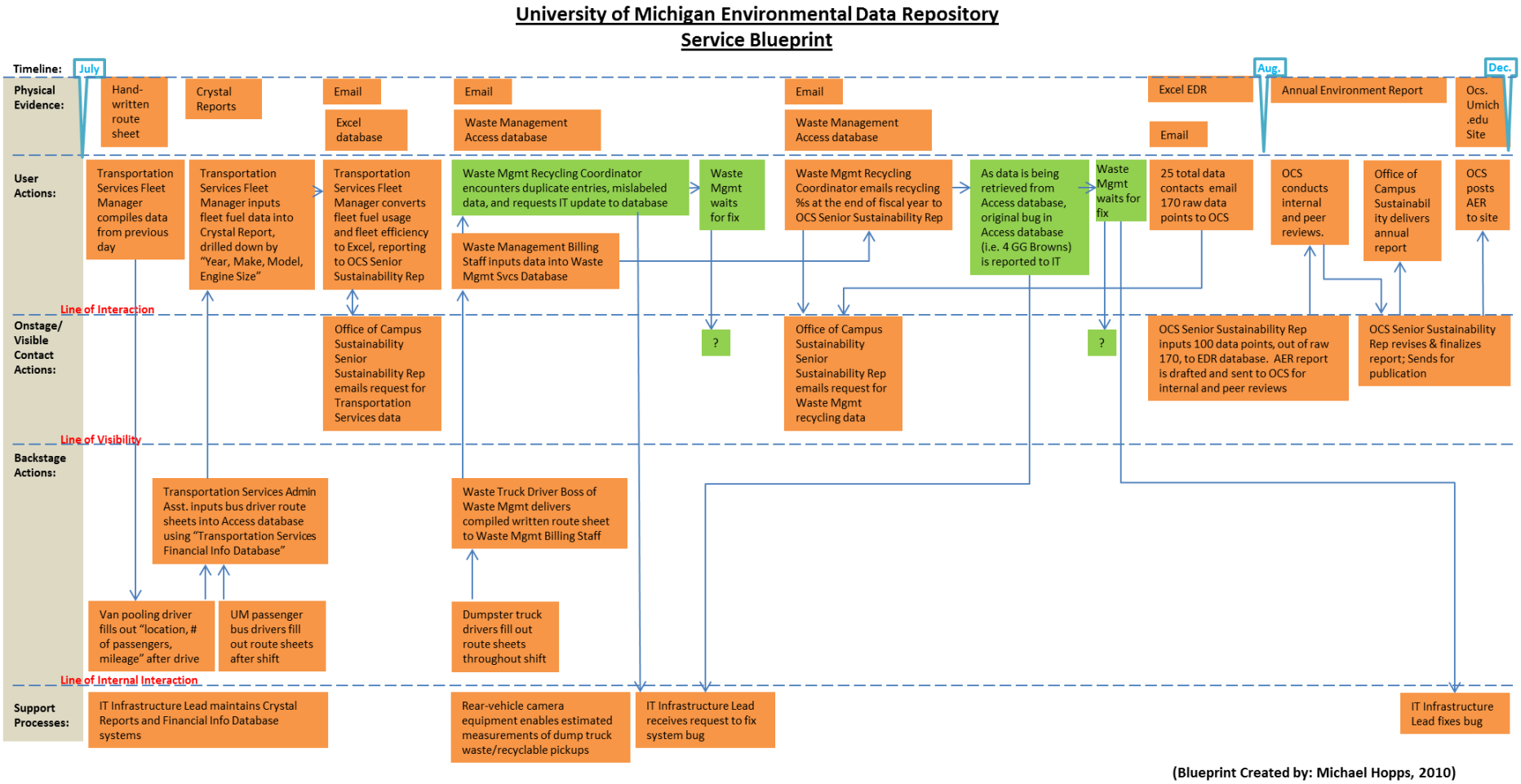

Figure 16: The EDR service blueprint exhibits service links and gaps, separated by lines of interaction and visibility

4. Conclusion

4a. Actionable Insights for Improvement

The analysis of all four findings in Section 3: Findings can lead to multiple actionable insights for improvement, on many different organizational levels. In design thinking, a major objective is to meet the "latent needs" of users. These needs are different than those examined in traditional consulting methods, and if successfully addressed, can lead to increased user satisfaction in service stakeholders. Ultimately, this increased user satisfaction can result in cost savings due to increased customer loyalty, or as in our case of the EDR reporting process: increased work efficiency.

According to Melville, services can be described as: "intangible, ephemeral, experiential, emotional, provider ownership, co-creation, flexibility." Meeting users' needs for an e-service (i.e. the EDR Excel database) entail:

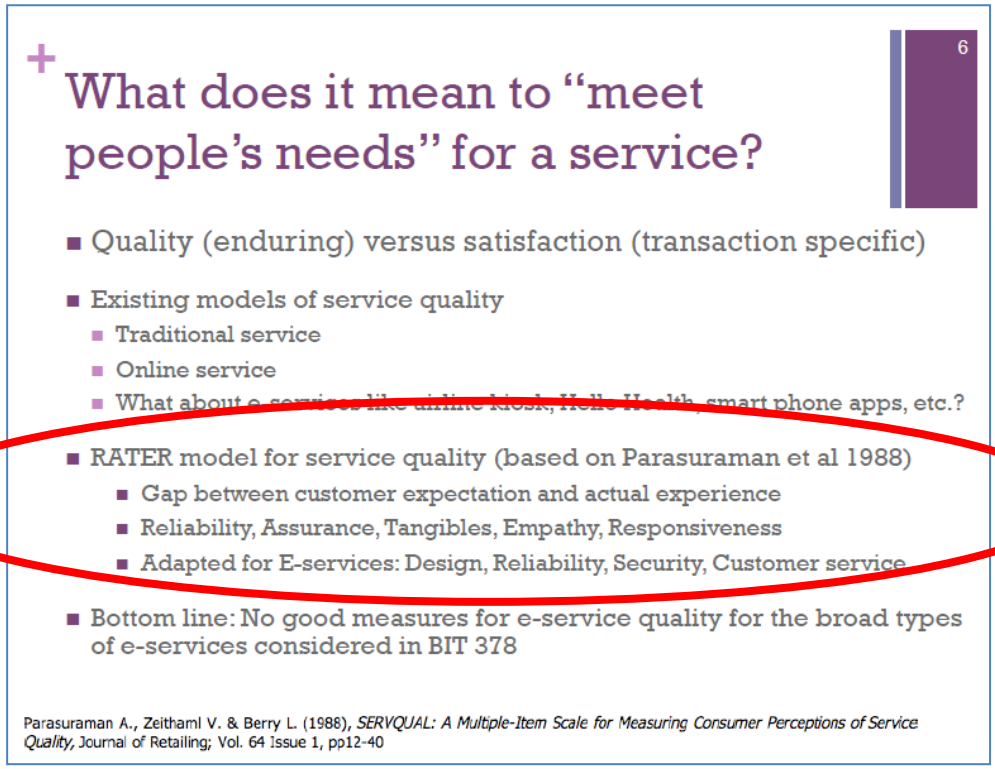

Figure 17: The RATER model provides the quality requirements of a user friendly service, adapted for e-services by Melville (Melville, BIT 378 2010)

Examining Findings 3A and 3B, Contextual Inquiry and Directed Storytelling, provide us with snippets of the user experience. While these two tools did not examine the entire EDR reporting process (or rather a chain of processes) we can begin to discover latent needs that are not currently being satisfied. In our contextual inquiry results, we discovered that two people on opposite ends of the system map reported a similar service gap.

- *"When I receive a data request, I groan. There **isn't enough IT support** to meet our data collection needs, because data is not seen as 'cool'."* *-Waste Management*

- *"Some things [i.e. work requests] just get put on the **backburner**. That's just the nature of things."* *-IT*

Both lead to an actionable insight:

- Would the EDR reporting process function smoother with more IT support?
- Would users of the e-services involved (including the EDR Excel database, Waste Management Services Access database, and Fleet Manager Crystal Reporting system) all be better trained to adapt to the systems if more IT support was on call?
- Would the cost of an additional IT personnel dedicated to Waste Management Services be outweighed by the cost savings in increased Waste Management reporting efficiency, due to faster Access database bug fixes?

Examining Finding 3C: Customer Journey Mapping can provide deep insight into the emotional responses of users at each process activity. During this exercise, three users were analyzed. From both contextual and emotional information collected during interviews, the information provided the following actionable insights:

- **OCS Senior Sustainability Rep:**
  - How can we address the busy feelings of the OCS Senior Sustainability Rep? He states "I'm the only one who knows how to use this system." Could inquiring deeper into this statement lead us to the problem's true core?
- **IT Infrastructure Lead:**
  - How can we smoothen the chaotic work demands of IT support personnel, particularly when urgent requests are received?
  - How can we improve the emotional relationship/communications between IT and Waste Management Services? IT has incurred a never-ending mental list of other highly prioritized tasks to address, before getting to Waste Management's system needs.
- **Recycling Coordinator:**
  - How can we overcome challenges faced by Waste Management Services when they encounter delay of IT Infrastructure Lead's bug fixes? Is there a better communication channel to attract more IT support than the current email and phone channels?
  - How can we improve the communications of recycling data meanings across offices in Waste Management Services? (i.e. when Recycling Coordinator encounters immeasurable item in recycling data; Or when Recycling Coordinator encounters duplicate entries and mislabeled data)

Examining Finding 3D: Service Blueprint led to a wide range of broad insights, due to its overarching span across six stakeholders. Actionable insights included:

- How can the service gaps between activities below the "line of visibility" (i.e. backstage operations, including bus driver route sheet reporting) and those above the "line of visibility" (i.e. Waste Management recycling reporting) be addressed?
- Could backstage operations be brought above the line of visibility? If so, would this improve communications between backstage and user actions?
- Would the investment in additional support processes (i.e. additional e-service software, additional accurate dump truck measuring equipment, additional IT personnel on call) improve the data reporting flow and reduce gaps of front stage user actions?

4b. Future Plans

Based on the actionable insights for enhancement developed in Section 4A: Actionable Insights, future plans include an extension of this design thinking research into Phases Three and Four of the eService Design Model. As design thinking revolves around the ongoing collection of ethnographic feedback, the current research and findings acquired in Phases One and Two will be presented to EDR stakeholders higher in the Environmental Data Repository organizational tree than the current highest level stakeholder examined: OCS Senior Sustainability Rep. Although not necessary, a wider subset of users may be interviewed and journey mapped before proceeding to Phases Three and Four.

Possible interview candidates include:

- Student sustainability organization representatives on Michigan campus
- Andrew Berki , Manager, Environmental Sustainability at Office Campus Sustainability
- Bitsy Lamb, Administrative Assistant, Transportation Services
- Colin A McMillian, for insights into how to enhance his original 2005 EDR report
- Additional IT personnel who support EDR data reporters
- Other stakeholders in the pool of 25 data sources who annually provide data points to the OCS Senior Sustainability Rep for manual EDR Excel input
- Other interview candidates highlighted in the system map below:

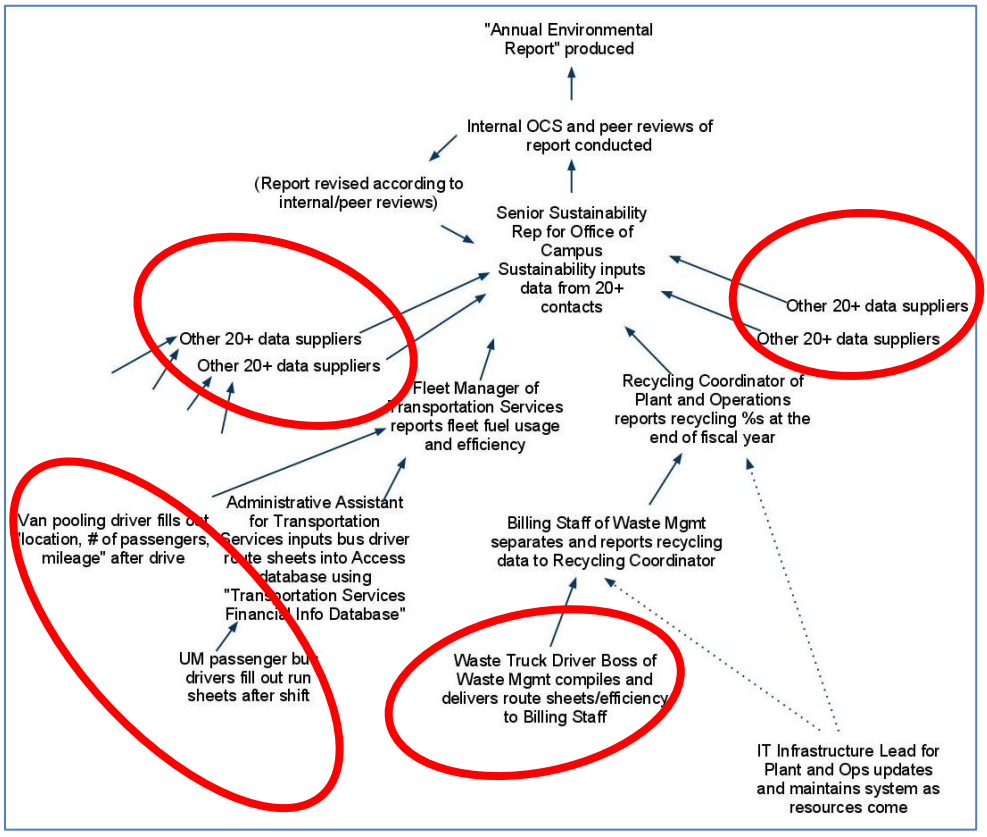

Figure 18: Highlighted stakeholders in the system map indicate potential future interview candidates

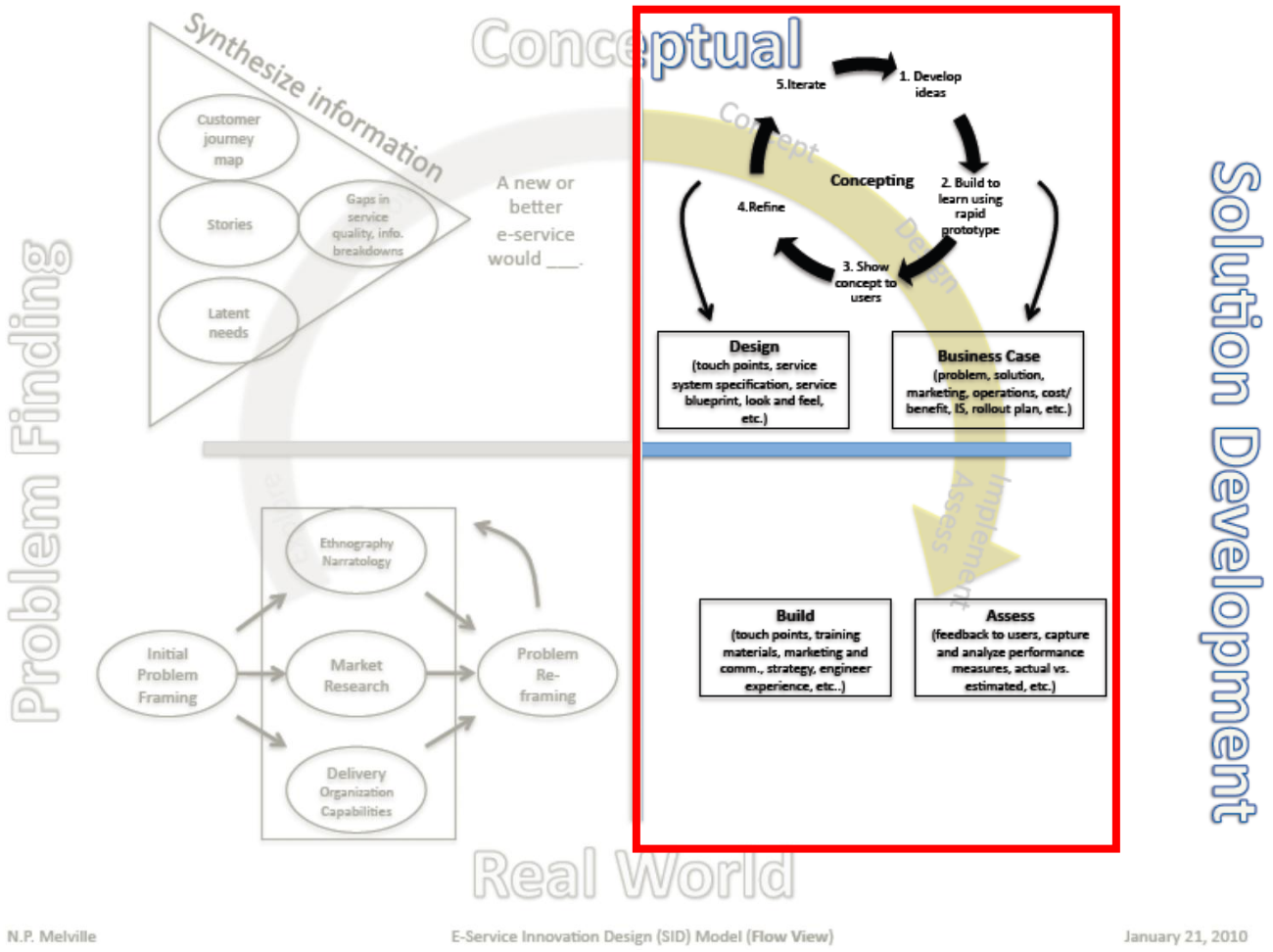

Figure 19: eSID framework illustrating focus of potential future study

As we further understand the latent needs currently not addressed by the number of different e-services employed by various stakeholders in the EDR reporting process, we can seek to build from any number of the insights in Section 4A: Actionable Insights, focusing on e-service development. However, we must be very careful not to jump to solution mode. The following are possible future directions that can be taken into concepting:

- Assess improvements to current use of the e-services (i.e. Address the functionality of the current Waste Management Access database, and observe how it is used over long periods of time)
- Weigh pros and cons of a long-term conversion to a different e-service (i.e. the switch from Access to Crystal Reports)
- Assess the financial and time/training costs of constructing an Access-based EDR system, vs the current Excel-based system
- Assess the possibility of adding an e-service to address latent needs of stakeholders (i.e. In interviews, OCS Senior Sustainability Rep suggested the possibility of adding a web-based read-only database for public verification of EDR data)

Lastly, through addressing the following goals, we can use any number of Phase 3 and 4 design thinking tools as we head into solution development:

Phase 3: Concept & Design – "Design e-service and business case"

Phase 4: Implement & Assess – "Implement e-service together with key performance indicators"

Figure 20: Array of design thinking tools at our disposal for "Concept and Design," and "Implement and Assess" eSID phases

5. Table of Figures

6. References Cited

Artley, Tracy, interview by Michael Hopps. *Recycling Coordinator, University of Michigan Waste Mgmt Services* (November 9, 2010).

Boni, Arthur A., Laurie R. Weingart, and Shelley (Carnegie Mellon University) Evenson. "Innovation in an Academic Setting: Designing and Leading a Business Through Market-Focused, Interdisciplinary Teams." *Academy of Management Learning and Education* 8, no. 3 (2009): 407-417.

Brown, Time. *Change by Design: How design thinking transforms organizations and inspires innovation.* New York, NY: HarperCollins Publishers, 2009.

Clark, Kevin, and Ron Smith. "Unleashing the Power of Design Thinking." *Design Management Review* 19 , no. 3 (Summer 2008): 8-15.

Deslauriers, Sarah, Colin McMillan, and David Spitzley. *Environmental Reporting for the Unversity of Michigan Ann Arbor Campus: the U-M Environmental Data Repository.* Report No. CSS05-11, Ann Arbor: Center for Sustaianable Systems, University of Michigan, 2005.

Enivronmental Task Force, University of Michigan. *University of Michigan Environmental Task Force Advisory Report to President Mary Sue Coleman.* Advisory Report, Ann Arbor: Enivronmental Task Force, University of Michigan, 2004.

Gedda, Rodney. "Strategy firm preaches design thinking for innovation ." *CIO.* May 07, 2010. http://www.cio.com.au/article/print/345750/strategy_firm_preaches_design_thinking_innovation/ (accessed October 2010).

Goffman, Erving. "Frame Analysis: An Essay on the Organization." 10f. Northeastern University Press, 1986.

Lynch, C. L., S. K. Wolcott, and G. E Huber. *Tutorial for optimizing and documenting open-ended problem solving skills.* January 2000. http://www.wolcottlynch.com/tutorial/frame (accessed December 2010).

Martin, Roger. "Design thinking: achieving insights via the "knowledge funnel"." *Strategy & Leadership*, 2010: 37-41.

Melville, Professor Nigel Patrick. "BIT 378." *BBA Business Information Technology Course: eService Innovation Design.* Ann Arbor, MI: University of Michigan, 2010.

Melville, Professor Nigel Patrick, interview by Michael Hopps. *EDR Advisory Interview* (October 22, 2010).

Moritz, Stefan. *Service Design: Practical Access to an evolving field.* London, 2005.

Office of Campus Sustainability. *OCS Staff.* February 2011. http://www.ocs.umich.edu/staff.shtml (accessed February 2011).

Saffer, Dan. *Designing for Interaction: Creating Smart Applications and Clever Devices.* Berkeley, CA: New Riders, 2007.

Sato, Steve. "Beyond good: great innovations through design." *The Journal of Business Strategy 30, no. 2/3*, 2009: 40-49.

Tassi, Roberta, DensityDesign, and DARC. *Service Design Tools Repository.* 2010. http://servicedesigntools.org/tools (accessed December 2010).

University of Michigan Grounds and Waste Mgmt Organizational Chart. *Organizational Chart.* November 2010. http://www.plantops.umich.edu/director/info/org_charts/OC-Grounds.pdf (accessed November 2010).

University of Michigan Information and Technology Services. *Organizational Chart.* November 2010. http://www.its.umich.edu/orgchart/Information_and_Technology_Services_Organization.pdf (accessed November 2010).

University of Michigan Office of Safety and Environmental Health. *Organizational Chart.* November 2010. http://www.oseh.umich.edu/OSEHorgchart.pdf (accessed November 2010).

University of Michigan Office of Saftety and Environmental Health. *Organizational Chart.* February 2011. http://www.oseh.umich.edu/OSEHorgchart.pdf (accessed February 2011).

University of Michigan Plant and Operations. *Grounds and Waste Management Organizational Chart.* November 2010. http://www.plantops.umich.edu/director/info/org_charts/OC-Grounds.pdf (accessed November 2010).

University of Michigan School of Information, Faculty Directory. *Robert Frost Biography.* November 2010. http://www.si.umich.edu/people/faculty-detail.htm?sid=255 (accessed November 2010).

University of Michigan Stephen M. Ross School of Business, Faculty Directory . *Scott Moore Biography.* November 2010. http://www.bus.umich.edu/facultybios/FacultyBio.asp?id=000119768 (accessed November 2010).

University of Michigan Stephen M. Ross School of Business, Faculty Directory. *Nigel P. Melville Biography.* November 2010. http://www.bus.umich.edu/FacultyBios/FacultyBio.asp?id=000711898 (accessed November 2010).

University of Michigan Transportation Services Organizational Chart. *Organizational Chart.* November 2010. http://pts.umich.edu/site_tools/org_chart.pdf (accessed November 2010).

7. Appendix

7a. Organizational Charts

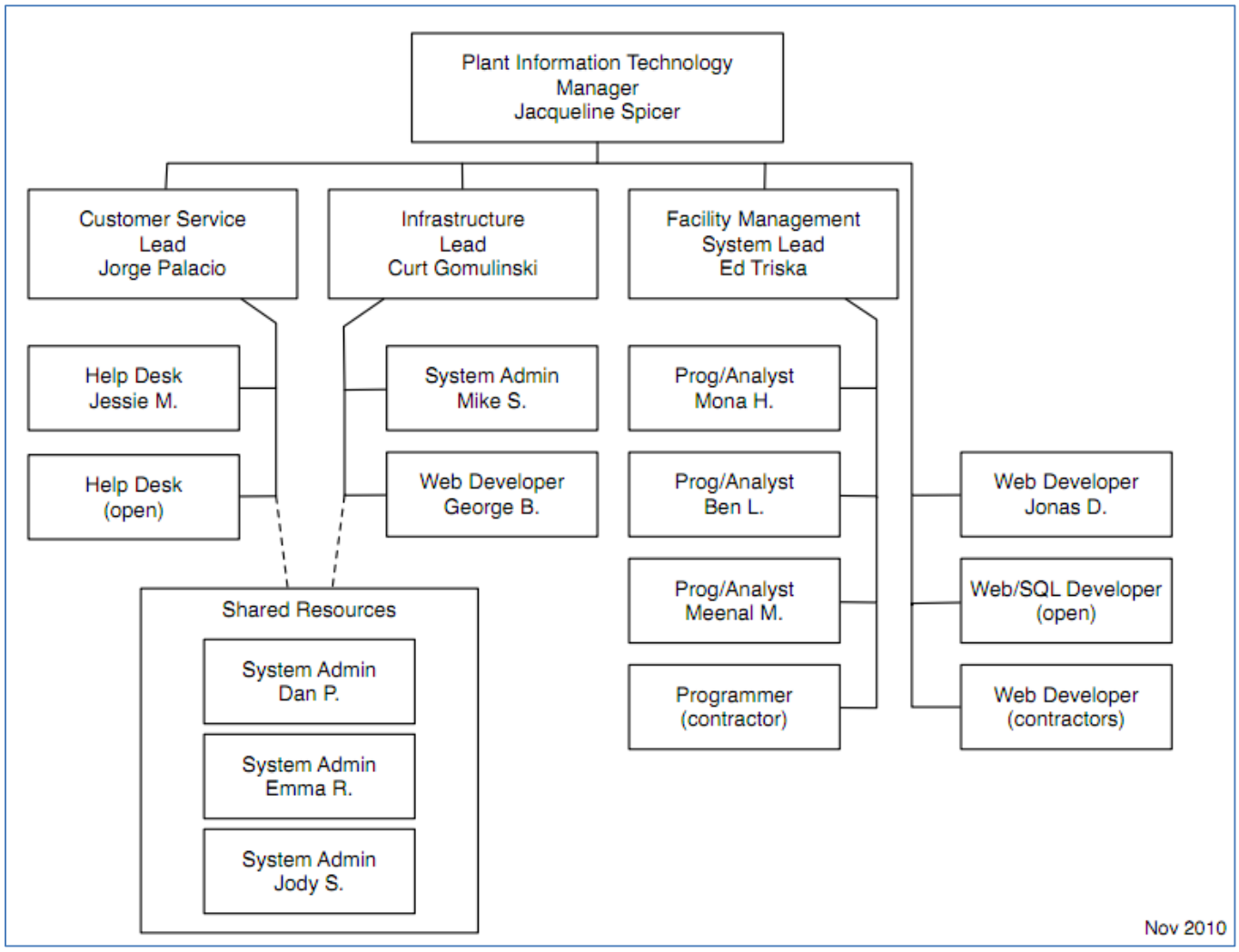

Figure 21: IT Services, Plant and Operations, University of Michigan - Organizational Chart 2010

(University of Michigan Information and Technology Services 2010)

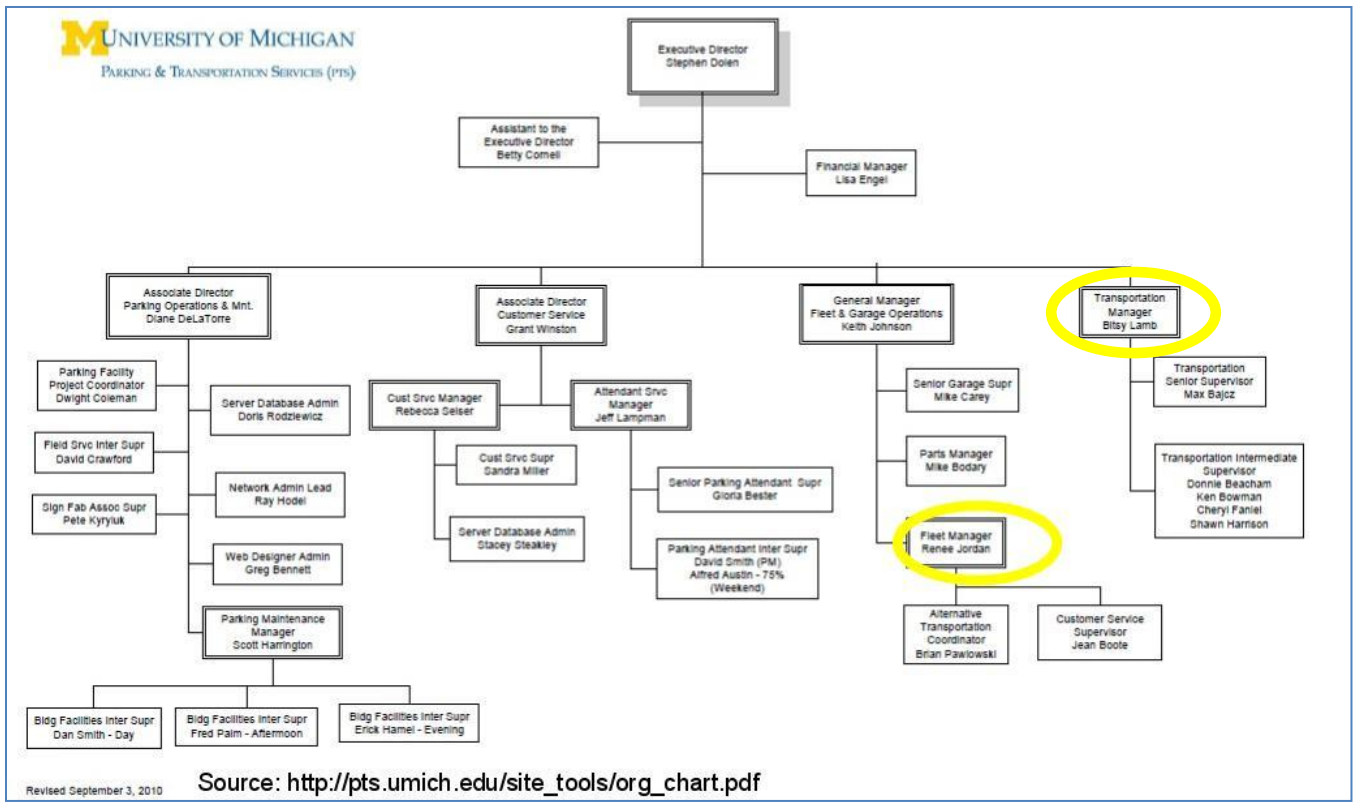

Figure 22: Parking and Transportation Services, University of Michigan - Organizational Chart 2010

(University of Michigan Transportation Services Organizational Chart 2010)

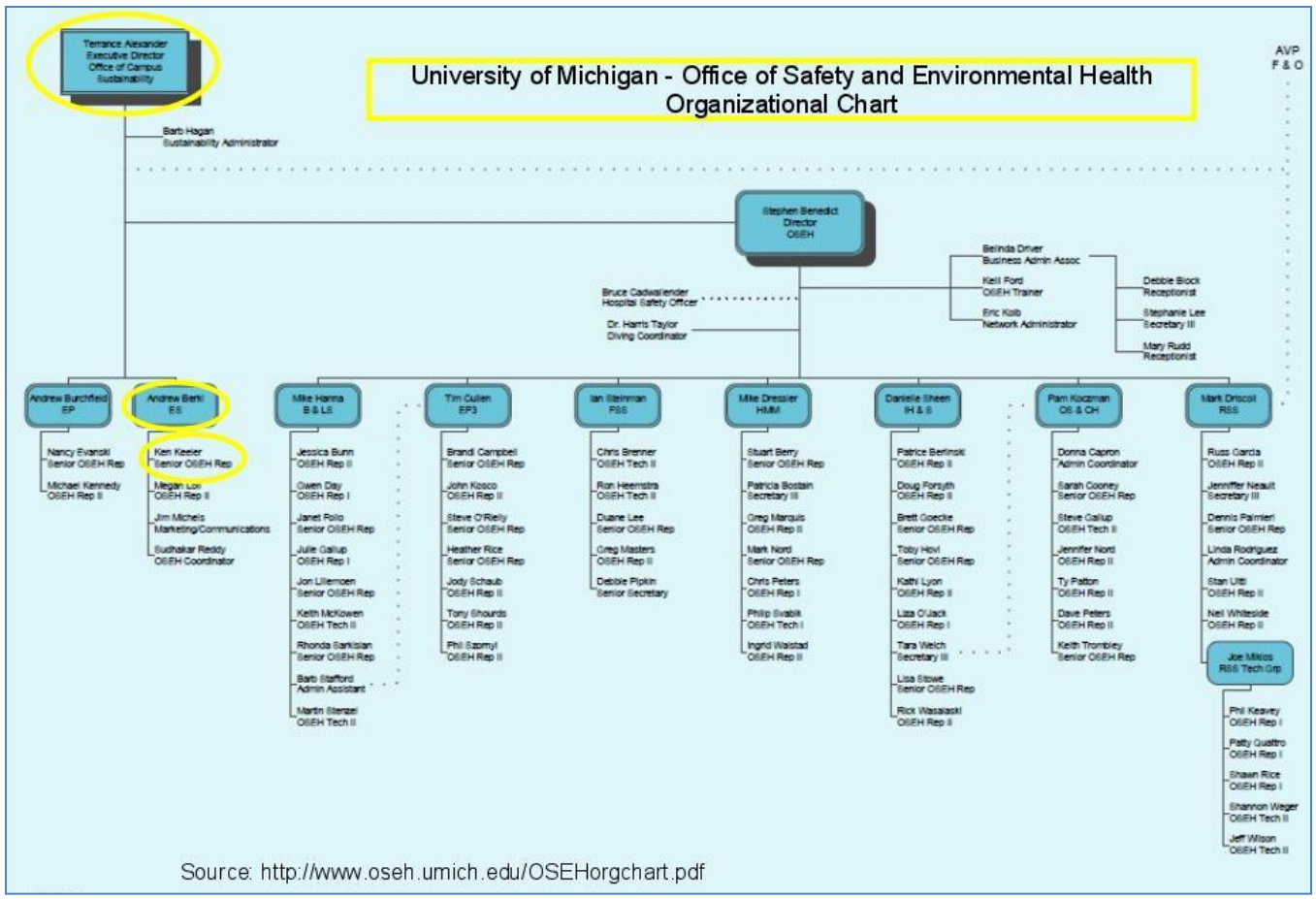

Figure 23: Office of Safety and Environmental Health, University of Michigan - Organizational Chart 2010

(University of Michigan Office of Safety and Environmental Health 2010)

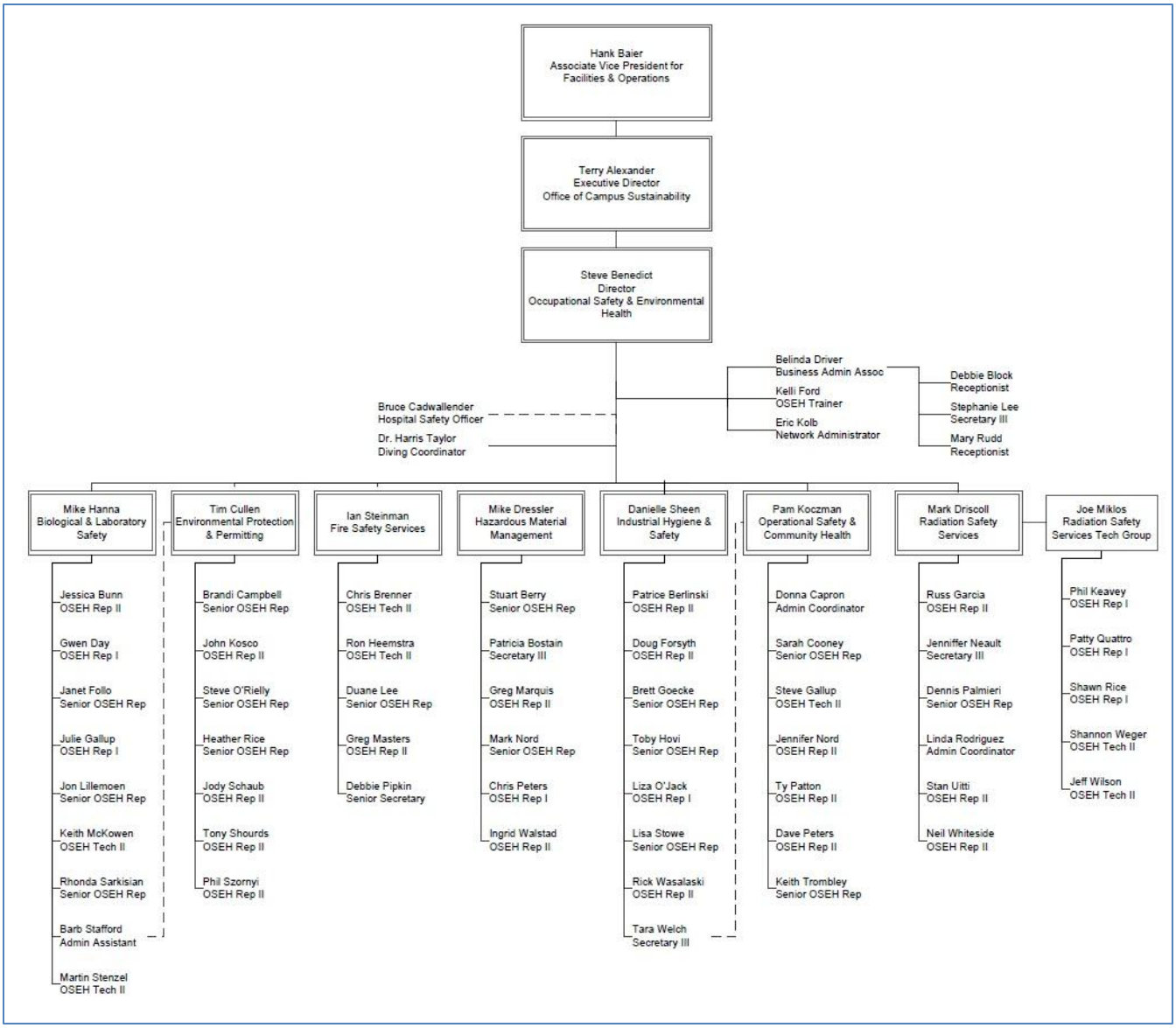

Figure 24: Office of Safety and Environmental Health, University of Michigan - Organizational Chart 2011 [Updated from Figure 23]

(University of Michigan Office of Saftety and Environmental Health 2011)

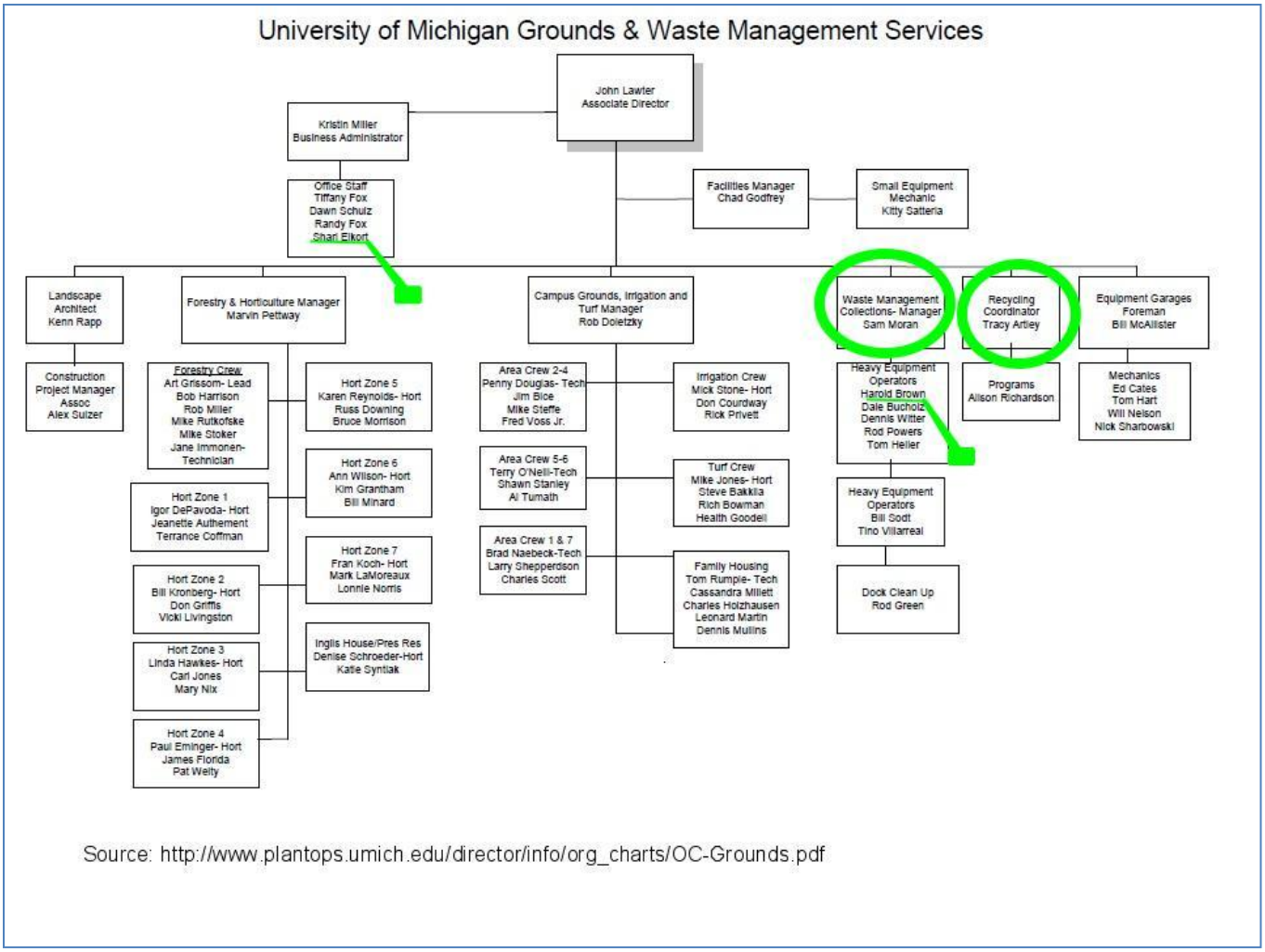

Figure 25: Grounds and Waste Management Services, University of Michigan - Organizational Chart 2010

(University of Michigan Plant and Operations 2010)