REQUIREMENTS ELICITATION AND QUALITATIVE ANALYSIS FOR STRATEGIC AND CONTEXTUAL CAPTURE FOR ENTERPRISE ARCHITECTURES USING A CASE STUDY APPROACH

by

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DISSERTATION APPROVAL PAGE

This is to certify that the dissertation prepared by Nicholas Stephen Rosasco entitled: Requirements Elicitation and Qualitative Analysis for Strategic and Contextual Capture for Enterprise Architectures Using a Case Study Approach has been approved by the thesis committee as satisfactorily completing the dissertation requirements for the degree Doctor of Science.

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ABSTRACT

REQUIREMENTS ELICITATION AND QUALITATIVE ANALYSIS FOR STRATEGIC AND CONTEXTUAL CAPTURE FOR ENTERPRISE ARCHITECTURES USING A CASE STUDY APPROACH

Nicholas Stephen Rosasco

Enterprise architectures (EAs) aim to develop a tight alignment between an enterprise's environment and its business objectives. To facilitate this, enterprise architecture frameworks (EAFs) have been used to understand both strategy and business architecture to synthesize a supporting information system (IS). This acquired understanding of the background that shapes the functions and goals of an enterprise is then used to drive decision making at the strategic, tactical, and operational levels. Problematically, a formidable barrier – the acquisition of expertise in EA – exists for any enterprise looking to use one of the common EAFs. By guiding the initial data gathering necessary for an EA with the application of a lightweight elicitation mechanism, several facets of EA use can be considered.

The research methodology employed for this dissertation uses the case study approach and the coding concepts from Grounded Theory Method to enable derivation of theory-based insights and discovery of generalized concepts applicable to EAFs. The analytic approach uses a closed interview procedure based on an adaptation of the Vision-Mission-Objectives-Strategy-Tactics (VMOST) queries. The level of alignment between other strategic capture artifacts and the interviews is investigated for explicit and implicit variations in the strategic objectives and context.

This research gives insight on the use of EAFs and provides a mapping of the VMOST queries to the inputs for an EAF, and offers an enhanced set of VMOST interrogatives. It develops an understanding on the use of qualitative data handling

methods within the context of software engineering focused case studies. The analysis of the data following the coding process delivered insights on the utility of the VMOST-derived instrument used during stakeholder interviews, providing a distinct comparison versus the existing documentation-driven approach. This work improves the usability for this powerful body of tools, providing impetus for wider adoption. By executing an active, empirical procedure with a working enterprise, various operational considerations in using the techniques are also exposed for documentation and, potentially, for future investigation based on the discovered theories.

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ADM – Architecture Development Model, a TOGAF tool

B-SCP – Business Strategy Context Process, a requirements analysis framework

BITAM - Business IT Alignment Method

CMM – Capability Maturity Model

DoDAF – Department of Defense Architecture Framework

EA – Enterprise Architecture

EA-CMM – Enterprise Architecture-Capability Maturity Model

EAF – Enterprise Architecture Framework

ESAAF – European Space Agency Architectural Framework

FEAF – Federal Enterprise Architecture Framework

GTM – Grounded Theory Method

IS – Information System

IT – Information Technology

SAM – Strategic Alignment Method

SE – Software Engineering

SOA – Service Oriented Architecture

TAFIM – Technical Architecture Framework for Information Management

TOGAF – The Open Group Architecture Framework

UML – Unified Modeling Language

VMOST – Vision-Mission-Objectives-Strategy-Tactics

Chapter One – Introduction

This dissertation presents a case study investigation of a number of questions in software engineering and, more specifically, in enterprise architecture. These questions stem, in part, from software engineering's origins in the increased scope and complexity of problems tackled with computing-based solutions, which in turn gave rise to Enterprise Architectures (EAs) as a mechanism for aligning overall strategy and institutional contexts with information system (IS) and information technology (IT) management. Similarly, the methodological choices for handling experimental needs, and the resulting qualitative data, are influenced by the overall context of the desire to ground this work in the realities and responses of a working entity.

1.1 Background and Context

Computer scientists, as the challenges of solving purely mathematical problems broadened as the problems became more general [17], became concerned with design, specification, and development of solutions and systems because of their increasing complexity and ownership costs [17]. The area of study and practice that developed in response to these needs has become known as software engineering [1][25][55], and has origins stretching as far back as the works of Dijkstra on program flow [22] and Wirth's concerns for program construction [74]. The broader modern scope of this community was devised as needs of complex software system customers was first articulated at several key early conferences [2][25], and today has cornerstones in the works of Parnas [34] and Brooks [8], among others.

A primary concern for this domain, that began as one of the original issues that concerned these early investigators and practitioners, has been the elicitation and development of software system requirements [63] that are both testable and representative of the needs of users and stakeholders. The challenges of engineering

requirements in turn gave rise to the realization that requirements are shaped by institutional context, existing systems and behaviors, and other disciplines and complexities [55][77][78]. The attempts to grapple with these considerations gave rise to the concept of the EA as a way to collect, document, and order these sorts of inputs [77][78].

1.2 Requisites for Enterprise Architecture

To answer this need, an EA aims to provide "a coherent whole of principles, methods, and models" to realize the design of an "organizational structure, business processes, information systems, and infrastructure" [41]. The overarching goal of the processes, methods, and techniques used within the EA community is to "facilitate the translation from corporate strategy to daily operations" [41]. Enterprise architecture frameworks (EAFs) express how to arrange the assets of an EA and are intended to align an enterprise's business goals and information infrastructure. This alignment is intended to allow for future growth and support a fuller comprehension of an enterprise's strategy and business architecture as well as facilitate the synthesis of a supporting IS/IT strategy [50]. The creation of an accurate alignment is a major success factor for the application of an EA, and misalignments must be found in the early stages to allow the full value of an EA to be realized and prevent unwanted outcomes for the target enterprise.

1.3 Existing Environments and Potential Applications

Numerous entities have come to rely on accumulated collections of IT-centric solutions for their operations and would benefit from being able to think abstractly both about their institutional goals and objectives and correlate their decisions regarding their computing needs to those thoughts. These enterprises can include entities as diverse as local governments, various sized businesses, and nonprofit sector institutions; this spectrum can thus span a range as diverse as a county school system to a local restaurant

franchise [50][53]. These institutions also provide a large community of potential adopters in the small and midsize categories, and therefore could widen the potential groups that benefit from EA use. It can be safely assumed that there would be a payoff in creating the alignment and embracing the notion of the information system (IS) infrastructure for these enterprises. The issue then becomes a question of approach and technique; specifically, what would the outcome be for a smaller or less-resourced institution attempting these techniques. A lightweight and simplified approach, versus the common and complex EA strategies, is the logical choice for a trial. This should allow the general question - if a single EA exercise can capture information to permit a suitable EAF to be started with a reasonable output, while accepting constraints of limited resources and expertise – to be pursued to a reasonable conclusion.

By creating a comprehensive set of cohesive models that describes the structure and functions of an enterprise, an EA can provide critical context and scoping information for the definition of a new software need [37]. In turn, by placing the idea for what is needed within the parameters of an institution, misunderstandings and intentions are better understood, as are the preferences for a solution [12]. This contextualization can help power better requirements creation within the enterprise. As the requirement is the basic working unit of software engineering practice, with which traceability, testing, and user expectations are tracked and handled, complete awareness of business context and objectives is critical to crafting well-written requirements [50]. Within software engineering, a requirement that is testable, traceable, verifiable, and potentially even contractually expressed is the preferred concept against which software development occurs.

In an enterprise environment, these requirements become the definition of functionality, constraints and quality attributes, expressing business needs and determining both costs and benefits. By creating a 360-degree awareness of the

enterprise's objectives, an EA and its artifacts can improve software engineering by helping better shape requirements for business objectives and realities. From a systems management perspective, this context can help inform IT purchase and design decisions for improvement in overall outcomes. By improving the utility, even at the risk of minor reductions in flexibility of these tools, a greater understanding of stakeholder intent is possible, as is an improved engagement on the part of all stakeholders in IT decision making, awareness, and overall institutional goals. Incorporating the broadest possible swath of stakeholder input, the resulting planning effort should be improved [50]. By engaging with the broader community, the results should reduce frustration stemming from the portfolio evolution since increased data and consideration of both individual and institutional objectives is achieved. Additionally, by engaging with individuals, the technical support staff also increase their visibility and enhances the overall perception of the computing specialist staff [39][46].

1.4 Research Questions

To help realize the larger benefits that would stem from improving the accessibility of the EA models, tools, and techniques, this research addresses questions derived from the consideration of an EA starting point selected for non-specialist application:

- Can a general lightweight elicitation, specifically Vision-Mission-Objectives-Strategy-Tactics, technique gather information suitable for conversion into enterprise vision and mission?
- Does engaging in the elicitation provide data sufficient to begin populating an enterprise architecture framework?
- Is qualitiative analysis, specifically the Grounded Theory Method, effective and applicable in an EA context?

- How do results of Vision-Mission-Objectives-Strategy-Tactics map to an enterprise architecture framework?
- Can we achieve understanding across a complex stakeholder environment?
- Which, if any, of the Enterprise Architecture-Capability Maturity Model scores improve if the Vision-Mission-Objectives-Strategy-Tactics, Grounded Theory Method, Zachman Framework chain is employed?

To broach these questions, a systematic approach is required, as is a way to meet the difficulties of demonstrating improvements in comprehension and data collection without clearly quantitative measures.

1.5 Methodology

To cover the needs of this study and meet standards of scientific rigor, the research applies a fusion of methods. The Grounded Theory Method [65] qualitative analysis technique is used to process the VMOST-elicited [64] qualitative text concerning an enterprise's vision, mission and business strategy objectives. In turn, this output is used it to populate the Zachman Framework [78], which is simple and flexible enough to be generally applicable to many environments. This work enables EAFs to better align the business environment with the IT infrastructure by accumulating required data for use as inputs with minimal resources and institutional friction. With these queries, this work addresses the uncertainties faced in current EAF compilation of strategic goals and provides a starting point for EA application.

To provide an overall structure for the investigation, this research utilizes a case study approach [24][75][76] as the primary research methodology. Specifically, this dissertation focuses on the application of our proposed lightweight EA elicitation technique with a real, representative enterprise. The implementation of the case study

provides a foundation for discussion of both the research technique and provides fixed points for future investigations that wish to vary one or more of the parameters.

1.6 Summary and Contributions

This investigation contributes a multifaceted array of results for consideration, involving both the data, the approach, and the overall conclusions. These efforts provide an example of EA application in context of a small/midsize organization, and an illustration of the potential utility of an EAF for an institution of this type. This study affords a data point for qualitative technique application, specifically Grounded Theory Method, in an EA and EA-CMM context, for strategic data collection. This collection of evidence also forms a beachhead for further consideration of similar guided, structured EA application in similar contexts, in addition to advancing the use of qualitative techniques can be utilized in a software engineering context. Since the overall approach describes the sequences of steps followed, it provides a roadmap for other users, which increases the utility of EA methods and tools for smaller or less-resourced institutions. Further, by encouraging internal discussion on overall goals and objectives within an enterprise, a greater sense of mission is also likely to result from the employment of EA techniques [50][64]**.** The case study also contributes a setting for study of the lightweight EA elicitation technique as a way to solicit the initial input for an EAF.

From the initial trials to the full qualitative analysis, this work has demonstated the utility of VMOST as a data solicitation tool, and demonstrate that VMOST-driven data gathering proved to be a wider net than a standard practice strategic capture [1][57][69][79]. In addition, the utilization of VMOST elicited data in a framework is well illustrated, as is the application of the Grounded Theory Method (GTM), providing a foundation for improved application of EA and demonstrating the potential timesaving versus the cost of separate planning exercises. The potential benefits of reducing the

learning curve and providing an easy path to the benefits stemming from full comprehension and alignment of goals and the actual vision and mission appears quite striking. By bypassing the barriers to entry to the critical elicitation functions of EA, the benefits arising from using these techniques can be made more widely available. Additionally, the use of the case study method has generated useful results for the exercise of the approaches being examined and has successfully documented the use of EA outside of the large institution and IT-specialist contexts. The combination of tools employed (i.e., VMOST and the GTM) has been within acceptable scope of effort and has created what appears to be a high level of overall comprehension regarding institutional objectives, context and goals.

This dissertation provides, with the above investigations, answers to the research questions posed in Section 1.4, and thereby provides a response set for those interested in use of EA and this toolchain. The VMOST tool provided, in an interview setting, provided a rich dataset suitable both for vision and mission construction and EA population as shown by the excerpts and the derived artifacts. The same evidence backs the conclusion that the GTM proved an effective tool for intense qualitative analysis in an EA context. That analysis, and the resulting understanding demonstrated, shows that awareness and understanding and illustrates the overall complexity of the environment. The exercise of populating the EA and references to existing information within the enterprise create an improved overall Capability Maturity Model score, especially within the process and development elements.

Additionally, this work has contributed three items to the professional works in software engineering. Collectively, the information they present covers several facets of the project. Those facets include the overall utility of the methods, the overall process, and a comparison against an alternative technique. Specifically, the first of these publications discusses the brief, initial round of interviews and the resulting data and

coverage it represents [58]. The second demonstrates the improved data gathering capability the process employed offers over conventional techniques and, potentially, use of already processed sources [57]. The third elaborates on the application of and methodology for the case study, should any other investigator or institution wish to reuse the approach [56].

1.7 Outline

The next chapter in this dissertation reviews existing literature and research work in EA, EAFs, and business strategy elicitation that form the foundation of this research. The background of the VMOST technique is also addressed. Chapter Three elaborates the research methodology and overall process. The process includes application of a qualitative method, GTM, which is employed to process and analyze the interview data. Chapter Four addresses the execution of the study. This includes the general decisions taken as a part of the case study process. The initial impressions of the information gathered and analysis of the data are also discussed in detail. Chapter Five presents the necessary discussion of extrapolation and theory development that accompanies qualitative data. The potential applicability of these results to various scenarios and circumstances. Chapter Six presents the overall conclusions, contributions, and future work.

Chapter Two – Literature Review

The work outlined in this dissertation combines and, in some cases, extends techniques from several areas, including: enterprise architecture (EA) [78], the Vision-Mission-Objectives-Strategy-Tactics (VMOST) [64] business strategy elicitation technique, and qualitative data analysis techniques, including Grounded Theory Method (GTM) [65]. Additionally, it uses the case study approach to organize and structure the overall research process [24]. This chapter discusses the background information and related work in these areas, including particular strengths and weaknesses and potential difficulties in application and contextual coverage.

These approaches provide a powerful collection of solutions but with the richness of some of these solutions comes at a tradeoff. The sheer textual volume some of the EA Frameworks (EAFs) can pose an obstacle. Similarly, the general nature of the business strategy domain's tools can make selecting among the generic assets a challenge.

2.1 Enterprise Architecture and Enterprise Architecture Frameworks

EA, as a field, was created to provide businesses with guidance to assist them in achieving and developing their strategies and objectives. The associated EAFs define how to develop and employ the architecture. This resulting architecture is tailored to a specific entity or institution, the "enterprise" of enterprise architecture. This enterprise is not a general idea, but a specific construct. Minoli, for example, provides a definition for an enterprise, taken from The Open Group, of what is meant by an enterprise in this context of EAs and EAFs [50][54]:

> "Any collection of corporate or institutional task-supporting functional entities that has a common set of goals or a single mandate. In this context, an enterprise is, but is not limited to, an entire corporation, a division or department of a corporation, a group of geographically dispersed organizations linked together by common administrative ownership, a

> government agency (or set of agencies) at any level of jurisdiction, and so on."

With this construction of an enterprise, the EA can be seen as the set of plans, models, and data that document the enterprise under consideration. The primary tools for EA are the enterprise architecture frameworks (EAFs) created to organize and guide the views, artifacts, and structures crafted for an application of EA [50]. These inform the practice of EA by shaping the thought processes and models used to create the overall enterprise-wide comprehension necessary for a successful information system (IS) [50]. While EA provides powerful mechanisms for enabling this shaping to occur, some burdens to utilization become apparent on closer investigation of the major implementations of the concepts, the frameworks. These burdens may be a hindrance to employment of these practices generally, and, even for the researcher, represent a significant operational burden. They also present some indirect biases reflective of their origins as tools for large-scale entities with fiscal or budgetary motivations.

2.1.1 Enterprise Architecture

EA aims to provide a cohesive information technology (IT) strategy and infrastructure across an enterprise's business units by aligning with its constituent business architecture(s) and organizational strategy [50]. The central purpose of an EA is to map "IT assets and business process and a set of governance principles that drive an ongoing discussion about business strategy and how it can be expressed through [information technology (IT)]" [50]. EAs become institutional assets, distinct from any particular software system or tool, and document the existing business and development processes, existing IS/IT infrastructure (e.g., hardware, software and networking

standardizations) and the various entities that assist in supporting the mission and strategic operations of an organization [11][14].

The expected output from developing a thorough EA is a plan that reflects the three- to five-year strategic business goals for an enterprise, typically documented in a Strategic Enterprise Plan [1][67]. Similarly, a Strategic Information Systems Plan describes the software systems to be developed within that same timeframe to support the business goals described in the Strategic Enterprise Plan [66][67]. These plans, in turn, provide order, focus, and context for achieving this articulated, overall goal, while helping to organize and identify a variety of data and stakeholder considerations. Overall, this creates a situation for improved deployment of resources and better overall results for participants generally [50].

2.1.2 Enterprise Architecture Frameworks

An EAF provides guidance for documenting an EA, including rules and guidance, that provide common vocabulary and conventions for dividing an IS into a set of building blocks [50]. By providing conventions and structure, the EAF is a tool for defining the enterprise architect's work product, the artifacts that describe and communicate the architecture.

2.1.2.1 The Zachman Framework

This research employs the Zachman Framework [78], which is considered one of the standard approaches for representing the essential elements of an EA [27]. The Zachman Framework presents a two-dimensional taxonomy, as shown in Figure 1, to guide business and system architects to explicitly document the "building blocks of enterprises" [41]. The approach is based on six interrogatives (i.e., what, how, where, who, when and why) and six perspectives that relate to specific stakeholder groups (i.e.,

planner, owner, designer, builder, implementer, and worker) [78]. The intersecting interrogative-perspective cells provide a "holistic view of the enterprise" [41].

Since it was first published in the 1980s, the Zachman Framework has provided a non-prescriptive approach for data organization and classification. The approach provides a simple and flexible mechanism, typically used for the creation of representations of an enterprise for and by the institutional management. When applied by information technologists, it can also provide focus on IT issues, as a subset of overall of the business-planning problem. Originating as a mechanism for information architecture construction, the framework can reach into larger and narrow questions, ranging from large-scale managerial concerns to the specifics of systems design.

The Zachman Framework (cf., Figure 1) presents as a grid defined by six communication questions (i.e., Why/How/What/Who/Where/When) and five levels of reification (i.e., Contextual/Conceptual/Logical/Physical/Detailed). It functions as a schema to sort and order various inputs, including formal design documents and other artifacts, into a layout that identifies the personnel or stakeholders and problem addressed

	Why	How	What	Who	Where	When
Contextual	Goal List	Process List	Material List	Organization Units & Roles List	Geographical Locations List	Event List
Conceptual	Goal Relationship	Process Model	Entity Relationship Model	Org. Unit & Role Rel. Model	Locational Model	Event Model
Logical	Rules Diagram	Process Diagram	Data Model Diagram	Role Relationship Diagram	Location Diagram	Event Diagram
Physical	Rules Specification	Process Function Specification	Data Entry Specification	Role Specification	Location Specification	Event Specification
Detailed	Rules Details	Process Details	Data Details	Role Details	Location Details	Event Details

Figure 1: Zachman Framework, as a grid [78]

by the information. When populated, it can encapsulate a broad swath of information, ranging from high-level objects to location and events information, for consideration in multiple areas of problem solving [77][78].

2.1.2.2 The Open Group Architectural Framework

The Zachman Framework is limited in that it does not provide for a list of possible options of how to start on the critical, initial step of eliciting the necessary information for the schema [62] when documenting an organization's EA. This limitation is not unique to the Zachman Framework. In reviewing existing EAFs, including The Open Group's Architecture Framework (TOGAF) it quickly becomes apparent that this key EAF, and those it has influenced, have solutions for an enterprise with a large software portfolio but lack answers for how and where to begin to cast institutional goals in an EA-compatible way, which creates a non-trivial problem. For example, the 780 page TOGAF [54] offers preliminary information but little concrete explanation or suggestion of how to go about it at a step-by-step level. The Open Group's approach to a framework does not prescribe any final set of artifacts, providing instead a range of options for consideration and adaptation. It also incorporates an Architecture Development Method (ADM) and extensive explanatory material. By design, it is generic, but through the ADM provides guidance on how to craft for specific problem areas.

2.1.2.3 Other Frameworks

The Zachman Framework and The Open Group Framework fit within the larger family of EAFs, including having influenced other frameworks. As shown in Figure 2 [47][61] and discussed in [50], it is possible to see the large set of available options [36] that are available, but also note the heavy degree of relationship and overlap shown as the framework authors sought to accommodate common issues, topics, and problems.

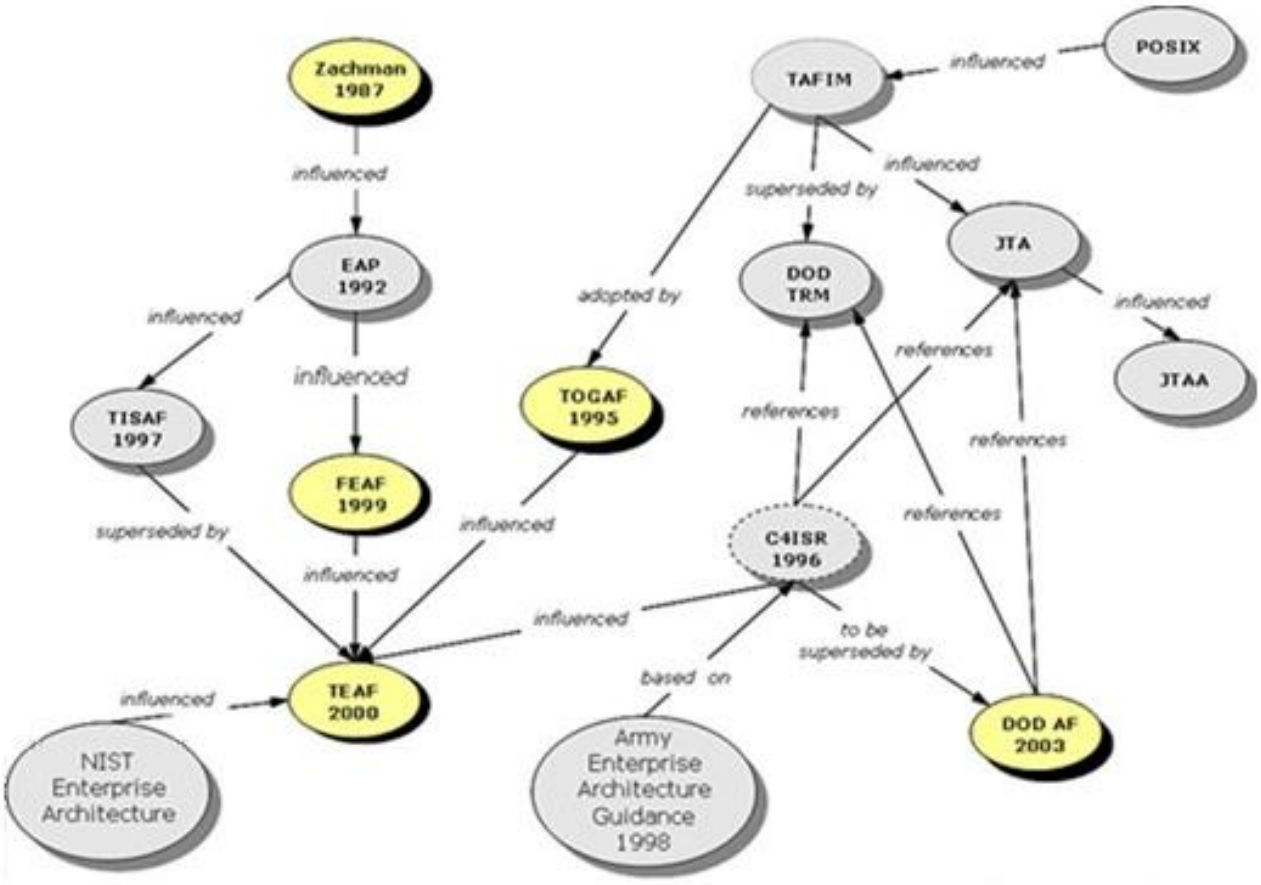

Figure 2: Relationships between various EAFs, from [47][61]

For example, the Department of Defense's framework efforts, including Technical Architecture Framework for Information Management (TAFIM) and Department of Defense Architecture Framework (DoDAF) [19], influenced TOGAF's creators, who also looked to provide common points for comparing and comprehending architectures across organizational and national boundaries. It seeks to ensure consistent development, and is prescriptive on which views are required. While military-centric, it can encompass a broad variety of enterprises, and offers an elaborate and complex family of views and concepts, permitting accommodation of a broad variety of institutions.

2.1.3 Alignment Approaches for Enterprise Architecture Objectives

The importance of verifying the alignment of EA objectives and business goals with the enterprise requirements and architecture of an enterprise software system has led to a number of approaches to ensure alignment and traceability. The Strategic Alignment

Method (SAM) advocates four cross-domain relationships (i.e., strategic execution alignment perspective, technology information alignment perspective, competitive potential alignment perspective and service-level alignment perspective) to underscore the importance and enable the alignment of IT and business strategic management [45].

Similarly, the Business IT Alignment Method (BITAM) provides twelve steps to align objectives and IT architectures. It does this by resolving the mappings between the business model, business architecture and the IT architecture layers of a business system [11]. However, as pointed out in earlier investigations [11], "these approaches both necessitate the elicitation of business drivers, architecture and strategic objectives from stakeholders and existing documentation without providing a structured, analytical process to do so." This tool, like the EAFs generally, requires significant resources, time and expertise to identify, collect, and collate these requisites before proceeding on to a full utilization. In brief, an elaboration of the ways and means to accomplish this elicitation is not provided by this method.

These various methods, while providing guidance for achieving the alignment sought in EA, still do not provide a start point for data elicitation, leaving a need for inputs required to realize the benefits of EA application. While these techniques underline the importance of the alignment between objectives and the IT/IS portfolio, and provide insight when data is in hand, the absence of the data needed craft objectives and create understanding and awareness of portfolio assets leaves a gap in the tool chain for collection of the inputs.

2.1.4 Enterprise Architecture Frameworks Synopsis

EA and the EAFs have potential for wider use and utility, particularly given their ability to offer a holistic approach to a variety of management questions. The somewhat cloistered development and employment of the frameworks and methods has created a

rich and flexible body of work whose value could be more widely distributed through broader use. The lack of examples and guideposts for the population of EAFs hinders their utility across a broader range of enterprises. An EA perspective can provide valuable insight by encouraging institutions to view their information technology resources as part of a software portfolio – allowing objectives and institutional awareness to guide questions surrounding selecting, removing, and maintaining these assets.

2.1.5 Summary

Enterprise architecture's frameworks are the most visible and dominant knowledgebase for this approach to IT/IS planning and decision making. As tools, they incorporate a wealth of concepts and approaches from business, computing, and engineering [50][54], and in ordering and capturing this knowledge are appealing as wide ranging solutions to the challenges faced by an institution looking to improve resource allocation and decision making, thereby opening a path to greater efficiency and effectiveness for all stakeholders. By increasing the number of communities that can successfully employ these approaches and, more generally, view their software and systems portfolio as a collection of assets, a balanced view of the use of technical means can be achieved that offsets the potential for erratic choices or disconnects between requirements and stakeholders.

2.2 Business Strategy Elicitation

A mechanism for business strategy elicitation and formation that was not specific to any specialty or industry was necessary to execute this study. Rather than create one from scratch, a search of the literature yielded earlier work by Bleistein et al. [1][4][5], which had been applied to information taken from investigations focused on commercial enterprises to underpin work on IS/IT needs for varied objectives. This work, while valuable, is also occasionally limited by the scope of the largely commercial domains

from which it originates. The concept of business strategy as a general managerial tool provides both great flexibility and a challenge in the absence of specificity and suitable to a particular sector or purpose, potentially imposing a cost of familiarization upon users. A further investigation provided no examples of the application of these tools in an interactive setting with a "live" enterprise, or any use of this particular elicitation structure in an interview format. The prior efforts [1][4][5] in this arena had been limited to investigations based on published materials, not as a series of one-on-one engagements with current employees in a candid setting. Additionally, by taking the technique out of the usual commercial context, there would be an opportunity to investigate and publish a dataset with fuller disclosure and discussion than normal in this arena.

2.2.1 Sondhi's Strategy Work

The adaptation by Bleistein et al. [1][4][5] of Sondhi's concepts and tools [64] for strategic capture have been previously applied to goal modeling techniques and processes. For this work, tools from that adaptation will be reused as to elicit strategic and enterprise related information.

Originally, Sondhi created the Vision-Mission-Objectives-Strategy-Tactics (VMOST) analysis as a strategic process, publishing it as an approach within his work *Total Strategy* [64]. These queries can be deployed for strategic analysis, to allow Vision, Mission, Objectives, Strategy, and Tactics to be specifically called out and discussed within an enterprise. This analytic method uses a set of interrogatives to defining the current organizational strategy [64], a subset of which, taken from the creator's presentation of the ideas, are presented below:

- ***Vision***: To what extent is there a vision? How clear is this vision? Who owns the vision? Is the vision well communicated and shared by key people in the organization?

- ***Mission***: Is there an explicit mission in the organization or is there an implied mission? Is the mission actually a mission or is it a goal? Is the mission appropriate and relevant for the vision and environment? What is the purpose of the mission? Does the mission provide a realistic view, from the management's perspective of the capabilities of the organization?
- ***Objectives***: Are these *specific, measurable, achievable, relevant, time-bound*? Do they help fulfill the mission?
- ***Strategy***: What are the basic elements of the strategy? How effectively is the strategy being implemented?
- ***Tactics***: How is the strategy being carried forward on a day-to-day basis? Do the tactics reflect the aims of the strategy? Are the tactics coordinated between different parts of the organization? Are the tactics being monitored for success?

Together, these aspects allow pursuit of the core motivations and objectives of the institution in such a way to present a coherent view of the enterprise, as well as the both current practices and management objectives. By doing so in a general way and not tied to one specific industry or area, this allows for easy modification and customization to particular formats and arenas if at the cost of more immediate reuse by a specific field or specialization.

2.2.2 VMOST Adaptation by Bleistein et al.

The work for this dissertation will employ the VMOST [1][4][5][64] set of questions to determine an enterprise's vision, mission and business strategy into the Zachman Framework [78] to better equip EAFs to align the business environment with the IT infrastructure. By applying these queries, this work will address the undirected nature of the existing EAF compilation of strategic goals by using the VMOST set of

(1) What is the overall, ideal, end-state toward which the organization strives (vision)?
(2) What is the primary activity that the organization performs to achieve the end-state (mission)?
(3) How are the responses to Question 1 and 2 (vision and mission, respectively) appropriate and relevant to the environment?
(4) Are the responses to Questions 1 and 2 (vision and mission, respectively) explicit or implied? How?
(5) What are the basic activities and their rationale by which the organization competes with industry rivals?
(6) What goals does the organization set to determine if it is competing successfully?
(7) What activities does the organization perform to achieve the goals in Question 6?
(8) How doe the goals in question 6 support the response to question 1 (vision)?
(9) What are the measurable objectives that indicate achievement of goals identified in Question 6, and what activities does the organization perform to achieve those objectives?
(10) How do the objectives identified in Question 9 support the goals identified in Question 6?

Figure 3: VMOST Queries [64], as adapted by Bleistein et al. [3][4][5]

elicitation questions [1][4][5][64] as an input to the Zachman Framework. VMOST surfaced in investigations of domain specific case studies and was created as a springboard for enterprises for crafting vision and mission statements [64].

The questions, shown in Figure 3, use language that avoids the need for deep expertise in systems engineering or business process, principally by avoiding the use of domain-specific or specialist terminology. Since the questions, as adapted for the earlier work, are general purpose and not structured around a particular industry or domain, they should be able to function as useful openers in the elicitation of EA input, as done in this work.

The Business Strategy Context Process (B-SCP) and goal modeling work by Bleistein et al. applied the adapted VMOST questions in conjunction with other tools to craft a goal model [5]. In [1][4] and [5], VMOST is used as an analysis tool for an existing institution with largely complete strategic information.

2.2.3 Strategy Elicitation Summary

The work by Bleistein et al. [1][4][5] adapting Sondhi's concepts [64] provide a general-use mechanism that offers some prior history of strategy capture for methods similar to those used in EA. These efforts should provide the elicitation starting point required for EAF application within the case study approach [24].

2.3 Summary

EA techniques, as part of EAFs like the Zachman Framework, provide the structure and tools necessary to comprehensively align complex stakeholder expectations, desires, and asset portfolios into an effective whole that advances an enterprise's overall goals. Elicitation tools like VMOST provide a starting point for collection of information that can be put together into an overall business strategy, and thereby allow an enterprise employing an EAF to have a concrete vision and mission.

This dissertation takes this background and context forward into a case study which will feed theory construction and provide overall business information. This needs of this investigation, by focusing on a more approachable, lighter weight strategy for EA will be best met by the Zachman Framework [78], as of the earliest EAFs and as one of the most flexible and least complex to apply. By extending the Bleistein et al. [3][4][5] use of the VMOST [64] concepts into an interactive interview format and implementing it in a non-commercial realm, the benefits of both a demonstrated prior feasability and an advancement in potential practice are achieved.

The combination of these ideas – the adapted VMOST as elictation technique and the Zachman Framework as a destination for the gathered data – provide a robust intellectual toolset, requiring only an overall frame with which to conduct the deployment and investigation. When placed within the case study construction as variously articulated by Eisenhardt, Yin et al. [24][75][76], an investigation to test these vehicles for their utility in conveying and ordering data for overall strategic alignment and understanding is possible.

Chapter Three - Research Methodology

To properly pursue the research questions central to this dissertation, the conventional concerns of the scientific community must be met through methodology. Reproducability, analytic mechanisms, procedural rigor – all must be provided. Further, this must be fit in with the structures of enterprise architecture (EA) and tools of business strategy, as outlined in the previous chaper, if the demonstration of a lightweight approach as outlined in Chapter 1 is to be achieved. This is particularly true in a study of this type, conducted on and with actual people, their responses, impressions. Additionally, the parameters and mechanisms must be sufficiently defined to accommodate the requirements of human subjects research. To meet these various requirements, the procedures for this research is rooted in a number of prior efforts for both case studies and qualitative methods.

This approach builds upon the parallels that can be found in qualitative methods processes, requirements engineering and enterprise architecture and further extends the high-level relationship between these three areas. With qualitative methods, text is the input, with requirements engineering the key artifact is a set of textual criteria to be met derived from data collected via a variety of potential strategies, and enterprise architecture similarly is informed and responsive to textual inputs. All three areas have objectives for their analytical processes and treatments. For qualitative methods, a composite set of information is rendered into a single overall description. Paralleling this, requirements engineering seeks an overall design that can used to build a deliverable. EA's goal is understanding, context, and alignment to an articulated goalset. Similarly, all have artifactual outputs, qualitiative methods producing diagrammatic and sensemaking outputs, which are comparable to the modeling products of requirements engineering or the planning documents created for EA. Table 1, which builds upon and extends ideas

Table 1: Relating Qualitative Methods, Requirements Engineering, Enterprise Architecture, adapted and extended from [11][12]

	Qualitative Methods	Requirements Engineering	Enterprise Architecture
Input	Text, such as interviews, field observation notes, documents	Qualitative text such as interviews, use cases, ethnography, specifications, standards, definitions/references	Stakeholders, Enterprise/Institution IT/IS assets, Goals
Analysis Objective	Synthesis of multiple perspectives into single description	Elicitation of viewpoints into specifications and system models	Understand goals, context, constraints. Apply that information in way that places data in appropriate layers
Output	*Representations* using narrative methods and process diagrams, theory	Representations of specifications in semi-formal models (UML), ER Diagrams, SysML, *requirements* documents	*Enterprise Architecture Plans*: Strategic Enterprise Plan, Strategic Information Systems Plan

from [11][12], collects and illustrates the highly analogous inputs, objectives, and outputs for the research methods, engineering tools, and architectural approaches for this problem space.

3.1 Case Study Approach

The case study approach can be used as a method to both gather observational and other data, which in turn can be used to feed a theory development process [24]. The works of Eisenhardt on theory creation [24] and Yin on the design [76][75] of a case study are foundational sources for this approach. It has been employed across a variety of disciplines – including information technology [10], medicine [70], business [6][40][73], marketing [23], and management [68] – for both scholarly and applied research.

By addressing the various concerns regarding the specificity and reproducibility of case study based data, this scholarship opens the door for application of these methods across a broad range of disciplines and questions, so long as known limitations are accommodated. This approach has the advantage of providing concrete examples to other

interested practitioners, and if executed with sufficient regard for the observed limits provides a powerful illustration of the utility of the approach.

Eisenhardt's synthesis of a variety of work, including Yin's [75][76], Huberman's and Gersick's, provides a guide for handling qualitative data from a case study for theory development [24]. It provides a general guide to the steps in the process, and details the induction of theory from case studies. It addresses an iterative method with a very tight linkage to data, and considers factors in identification of theory quality and evidentiary grounding.

3.2 Case Study Design

The work of Yin surrounding questions of case study construction and design demonstrates that the case study, as a tool, can cope with a technically distinctive solution with more variables of interest or concern than data points by providing, at completion, one result even when multiple evidence sources are relied upon [75][76]. It also provides overall guidance on how to engage in and discuss a case study, including addressing research design, and planning, methodological questions, and overall rigor [75][76].

This work also posits that a case study can cope with technically distinctive situation in which there will be more variables of interest than data points; provides one result even while relying on multiple evidence sources. The body of work encompassed by Yin's efforts addresses questions of design, of focus of study, questions of inference, and advice on practical methods [75][76].

By elaborating on the description, categorization, and classification of case study, these extensively employed references provide insight into how to view case study information, and properly articulate the nature of what will occur in the process of executing the case study and executing the subsequent analytic processes. Yin's work [75][76] also aids in avoiding pitfalls, highlighting known issues and risks identified

when engaged in this sort of work. In particular it addresses concerns over the unit of data collection/unit of analysis issue [76]. While weighted to the social science's traditional "field work" disciplines, there are forays into more quantitative communities and areas through engineering or technology grounded studies.

3.3 Qualitative Analysis

The key output of the field work process, the notes and transcripts of the interviews, are textual. These data are qualitative results, are require an analytical procedure suited to drawing conclusions from this sort of information. For this research, the Grounded Theory Method (GTM) a subset of the method, was ultimately employed for the analytic needs for this work.

It is of note that there are other methods for possible employment [15][16][18][26], including ethnographic, phenomenological, historical, critical social, and pilot (also known as cognitive) testing. Similarly, there are approaches found in the ethical inquiry, foundational research, and philosophical methods, but these are generally used in specific areas and arenas. Of those approaches not specific to particular problem spaces, there is also phenomenology, which is concerned with impressions of real events, there is critical social research is specific to symbolic needs. Another approach, the historical, permits reflection upon past events, opening the way to considering answers to current concerns and questions through examination of the past [15][16][18][26].

Another option, called called the generic or pragmatic research, is available. However, this ecletic approach is not particularly suitable for providing a suggested effort or concept. Another option, grounded theory (originally called constant comparative) [30], is based principally in and focused almost entirely on the collected data itself, and is particularly suited to interview derived and observational data sources, as well as surveys

and extant record investigations. This method, employed as part of the research process for this work, is discussed further in the next section.

3.4 Grounded Theory Method

The Grounded Theory Method (GTM) was created in a joint effort by sociologists Barney Glaser and Anselm Strauss in 1967 as a mechanism to support the creation of theory from the analysis of data [11][14][30][31][65]. Over time, varying approaches to the GTM evolved. For this research the variant described by Strauss and Corbin, which providesa sequential approach to consideration and application of the Method.. As the coding sequence described can be used as a step-wise, procedural approach, a subset incorporating the coding stages was used in combination with the case study structure. This combination may, as a less abstract approach than other techniques for employing th GTM, may also improving the likelihood of reuse and possibly reduce as some potential impacts of subjectivity.

The method is based on a multi-stage analytic treatment – codes, concepts, categories, theories – that allows for the generation of theory [65]. Codes are key ideas, taken from the qualitative data, which are then grouped into categories which in turn underpin the derivation of a theory. The theory is a hypothesis which has been arrived at backwards from the usual research construct, and is based in the information collected.

The Grounded Theory Method (GTM) is a technique created to allow creation and discovery of theory directly from qualitative data analysis. The method includes a multiple stage sequence of data coding to enable full comprehension of information [11][14][30][31][65]. For this project, the GTM coding process (shown in Figure 4) is applied to the qualitative data collected from interviews to identify core concepts and contexts necessary for an EA.

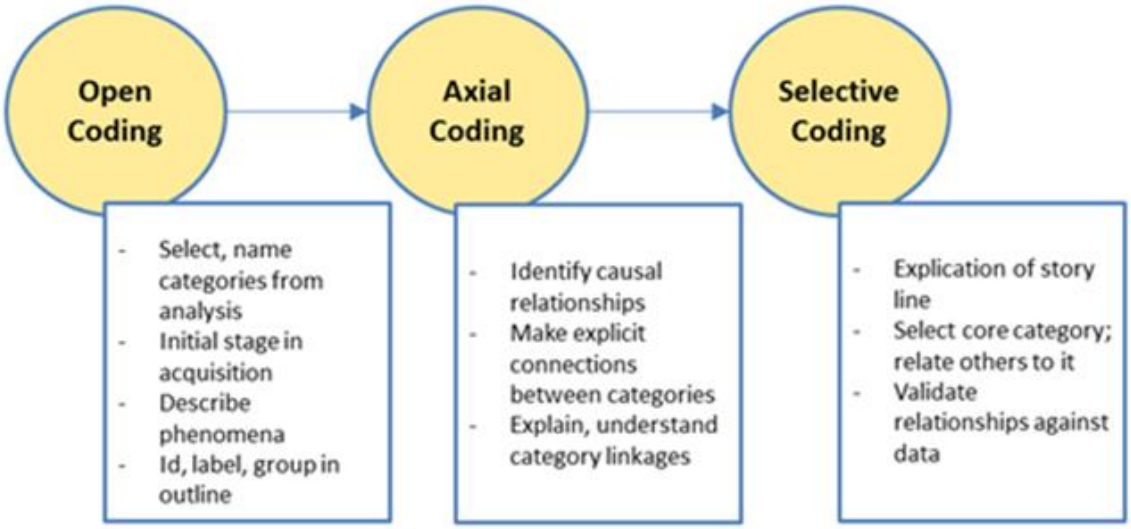

Figure 4: Normal GTM Coding Flow (Without Backflow)

3.4.1 Basic Strauss-Corbin Grounded Theory Method Application

The Strauss-Corbin approach [9][65] recommends that analysis of data and development of theory be done as concurrent steps that will be repeated until new data does not modify the theories developed, rather than conducting them as separate and distinct phases. Further, Glaser [30] claims that any item of data encountered in the process by the researcher is an input.

A primary objective of GTM [30][65] is to allow the problem to be identified and understood. With the creation of mutual comprehension, the likelihood of an effective solution is increased, and the theory generated will be reliable. This is achieved through the use of the three types of coding, show in Figure 4 and discussed in detail in the following sections, as informed by [11] and [31].

3.4.1.1 Open Coding

For this research, a case study that employs an interview as an instrument for data elicitation, the output from the fieldwork efforts is a body of semi-structured qualitative data, the transcripts of the interviews with the participants. To begin application of the GTM, open coding is the first step. This step is where phenomena are named, identified and categorized [11][12][65] and is done as a two-part process. The first phase requires

the identification of concepts, the core ideas found within the phenomena being evaluated. Anything relevant to the proposal under consideration is considered a concept that is within the scope of requirements, strategy, or objectives. The second phase of the open coding process requires the identification of properties, which enrich the description of the categories by capturing attributes. Within business objectives and EA generally, these represent the more concrete aspects that will likely shape IT and software-centric decisions. Both of these phases should involve multiple rounds of consideration, ensuring complete discovery of concepts and their aggregation into categories.

3.4.1.2 Axial Coding

Axial coding, in which codes identified in the open coding phase are related to each other either inductively or deductively, is the process of linking the categories and concepts found in open coding to each other [11][12][31][65]. By divining linkages, usually causation based, basic settings for relationships can be built that frame various elements in a way that includes conditions, consequences, and the phenomena themselves. The axial codes customarily describe circumstances like causation, group membership, and concept hierarchy so as to build a conceptual picture from the data. By allowing the relation of codes, categories, themes, and other relationships, a more ordered picture of the data emerges from the mass of open codes. Given a target context of an EA/EAF, and, indirectly, requirements and decisions as the outputs from the coding stages, the axial codes resulting from this process are to present as broader collections and themes for objectives and criteria for decision making, as well as distinguishing points for differentiation between large classes like user types for systems and modes and patterns of operation.

3.4.1.3 Selective Coding

Selective coding is the stage where one category is selected to use as the core or central category [11][12][31][65]. This selection is then used as a fixed point, and all other categories are then related to it. By choosing this unifying thread around which all other ideas can be related and drivers for the overall institution are identified [65], and allows overall perspective on the storyline that underpins the nature and contexts for the institution. This code is used to join the other codes, and should be reflective of the main participant concern. The selection of this code can also enable filtering and focus on the principles constructs and ideas that unify the overall data. For EA/EAF, and software engineering needs, this selective code should provide insight into where the point of balance is for decision making and design tradeoffs, the motivation and overall desire of the institution.

3.4.1.4 Sensemaking

Sensemaking involves turning circumstances into a situation that is comprehended explicitly in words and that serves as a springboard into action [65][71]. This sensemaking step is what links this technique effectively to problems found within the requirements engineering area of the computing disciplines, as overall it informs an overall comprehension of the problems and considerations found within the community that will be impacted by the software or system. This enablement has been demonstrated in other work in this area, including in [11].

3.4.2 Grounded Theory Method for Software Engineering

GTM has been previously applied to the derivation of enterprise system requirements in the area of requirements analysis [11][31][32][33]. This work demonstrates that the application of GTM to a software engineering problem space can be effective, and enables systemization of alignment and enhanced traceability. Other

investigators have undertaken to validate the application of GTM within a general requirements engineering context, and as input for system model solutions including Unified Modeling Language (UML) [11][12]. These studies noted the similarities between GTM constructs and the more customary formalisms of software engineering. Traceability through the interim documentation was also noted as a benefit of using GTM for such problems [11][12].

By applying the textual-data-driven coding procedures of GTM to datasets taken from complex multiple stakeholders, varied-objective, multi-faceted institutions, the GTM conceptual constructs (e.g., concepts, categories, properties, etc.) allow for enhanced traceability and documentation trails. These incremental pieces can improve both the overall alignment of and traceability to design features and goals. Such artifacts also increase the analyst's perception of any missing items of information as well demonstrate orientation toward enterprise- and stakeholder-sought outcomes [31][32].

3.5 Summary

The case-study body of literature provides solid evidence for the employment of a mature family of techniques and processes for the level of study necessary to accumulate sufficient data and context to use as input into a theory development activity.

GTM provides a rigorous method for analysis of semi-structured, conversation-derived data, allowing for significant concepts to be discovered and theory to be evolved and developed from a variety of sources. This method is uniquely suited to working with the broad variety of data-types and inputs accumulated and solicited in the process of working across a broad spectrum of disciplines, objectives, and environments typical of a modern multiple role enterprise. By allowing for this data to be processed and analyzed in a discipline and specialization agnostic fashion, a fuller and more comprehensive conception of the enterprise and conformance to its strategic goals is likely to result.

The case study process, combined with the GTM for qualitative data handling, will provide an overall structure for the research effort, as detailed in Chapter 4.

Chapter Four – Case Study Execution

In the preceding chapter, the basic scaffolding for employing a case study is presented, as is the background and methodology for accomodating the qualitative data with scientific rigor. Prior to that, the mechanisms and frameworks of enterprise architecture (EA) as well as the business strategy tools for eliciting input are elaborated. This follows the articulation of the motivation for this dissertation, the concept that the portfolio approach that EA advocates for decision making on information system (IS) and information technology (IT) needs and assets.

This chapter elaborates on the configuration of the case study approach conducted for investigation of these concepts, beginning with the selection of the enterprise to be studied, as this was the primary driver for the research process. The case study approach utilized here is informed by the work of Eisenhardt [24] on design and theory creation and Yin [75][76] on the design and conduct of the study itself. Their foundational scholarship addresses a variety of concerns and considerations surrounding the specificity and reproducibility of case study acquired data, and allows for the application of these methods across a broad range of disciplines and areas of study, so long as known limitations are acknowledged.

The results of this approach have the benefit of providing actual usage feedback, based in concrete examples and become illustrative to other interested practitioners and scholars. Yin's work also posits that a case study can cope with a technically distinctive and intricate situation in which there will be more variables of interest than data points, and provide one result even while relying on multiple evidence sources. It also provides overall guidance on how to engage in and discuss a case study, including addressing

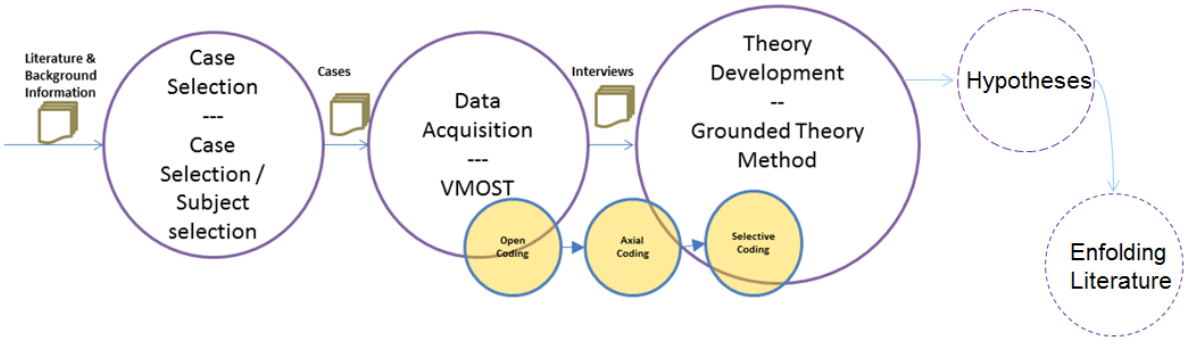

Figure 5: Overall Research Process

research design, and planning, methodological questions, and overall rigor. The research methodology utilized in this dissertation, outlined in Figure 5, to evaluate our proposed lightweight EA elicitation technique utilizes Yin's case study approach [75][76] with an overlay of the Grounded Theory Method (GTM) coding steps [65]. Each of the steps of the research methodology is discussed in the following subsections.

4.1 Selecting the Case

A case study begins with a definition of the entities and population under consideration for the study, so that the appropriate controls, scoping and eventual limitations are apparent and identified. This selection defines the overall context and, therefore, the generalizations from and applicability of the overall results and any theory based on the data.

Eisenhardt's synthesis of the various considerations in executing of a case study emphasizes the centrality of selecting an appropriate group for study. This definition is a central factor in reducing the opportunities for "extraneous variations" and allows for generalization of limits [24]. Within that model, two rounds of population choice would be necessary. The first would be driven by the theoretical objectives, the second by statistical and coverage considerations.

4.1.1 Selecting the Enterprise for the Case

After identification of the chief question(s) for the research and adoption of the case study approach, the next step was identification of and engagement with an enterprise. Concerns at this point in the sequence included willingness to participate, toleration of the presence of outsiders in the form of the research staff and permissibility of using data. The latter, with commercial enterprises, sometimes limits the publication of results with complete, unfiltered examples.

In this dissertation, a representative of the staff of a regional U.S. University's library, during an unrelated discussion, expressed an interest during the initial planning stages for this study. The use of an institution of this sort in this research afforded numerous advantages, chief among them the core of the staff, which numbered in excess of 50, are all generally accustomed to research and researchers. Local conditions also included a complex set of committees for internal management, a diverse set of roles and functions, responsibilities spanning everything from curricular concerns to legally mandated records retention, frequently including off-hours and off-site expectations.

The local information technology (IT) environment was also of significant complexity, involving multiple public and internal web presences and mechanisms, a complex set of standards for data interchange, local support mandates for multiple sets of systems, and stewardship responsibility for the licensing of a variety of digital and physical data sources. Investigating an enterprise with an IT asset portfolio but limited access to specialized staff, the research team was presented with a set of circumstances that is not unusual for an academic sector entity, including the absence of the profit/loss metric, which offered an opportunity to distinguish this work from various prior studies [1][4][5].

The diversity of both the stakeholder population, including a primary user community of 23,000, and the varied objectives and needs they present, as well as relationship to external and parent entities, combined to make this a rich environment for

application and evaluation of our approach. These connections included involvement in the collective university and library system created by the state government, plus interaction with the larger academic library community. The relative ease of scheduling and access, and willingness of the staff to participate, also proved a significant asset.

Overall, the library is comparable to a large number of peer institutions, and shares a profile generally similar to even more entities. As an institution with stakeholders, external and internal objectives, assets, a budget, staff, and a need to reconcile all these facets, it is no less an enterprise than those previously studied [3][4][5][49]. It exists as an IS "heavy" institution, confronted with an evolving ecosystem of social media systems and choices, and is constrained – again like the original enterprises employing EA – by staffing availability and technology expertise. It also has an evolving mission and, like any enterprise, a need to budget both time and resources.

4.1.2 Choosing Participants

With a subject enterprise for this case study evaluation identified and with the management allowing staff to participate, the next step in the case study approach is the selection of which staff or stakeholders would be asked to participate as subjects in the case study. In order to cast as wide a net as possible while conforming to the human subjects research parameters that were approved, the second set of decisions required consideration of the library as a system and the multiple roles and functions it and the staff performed.

This stage established which staff within the enterprise under consideration would be interviewed as a part of the data collection process by starting with an existing organization chart and staff directory of the library. To maximize coverage and cast as wide a net as possible, participation by as broad swath of the staff was targeted; ultimately over 40% of the full-time/professional staff would become participants.

Additionally, involvement by staffers representing the operating groups of the four major functional divisions was achieved, allowing consideration across multiple roles, viewpoints and sets of responsibilities.

4.2 Instruments and Protocols

To avoid unnecessary variables and to ensure consistent behaviours, the instruments and protocols for a case study must be defined. In this research, that required a standardized set of questions as survey/elicitation instrument, and a well specified interview strategy.

The Vision-Mission-Objectives-Strategy-Tactics (VMOST) method, adapted as questions in [1] from [64], was the initial instrument used for this study; this instrument was later extended as a result of the initial round of interviews based on the initial data. The original VMOST questions (shown in Figure 3), were selected as a generic mechanism for developing an enterprise architecture (EA), are phrased in such a way as to make them meaningful outside the specialist realms of business strategy or software engineering. The VMOST questions are also not tailored to a specific industry and have been used previously in both business strategy [64] and information technology scenarios [1], giving a reasonable confidence to their reuse in this new application.

The interviews conducted using the VMOST questions generated a set of seven and a half hours of recordings from the 23 participants that form a broad base of responses to the VMOST questions, made broader still by allowing participants to request clarification of the question and otherwise comment on the phrasing of and impression made by the question. These recordings, more than 100 pages of qualitative text once transcribed, are combined with the concurrent notes for each interview for asynchronous analysis of the responses by asecond person, experienced in application of qualitative analysis, , which the literature [24] posits as a step likely to increase complementary insight and in this instance serve as a check on the application of GTM. Such additional

insights lead to richer data and identification of several additional insights. The additional consideration of the information also, generally, leads to greater confidence in the analysis, as differing perception adds to the empirical grounding of the hypotheses derived. When this method was joined to a qualitative data collection form, and applied in a recorded close interview format with open-ended responses, a multi-format data collection strategy was created.

The resulting transcripts required some additional manual processing before further use. The transcripts were produced by an external, independent transcribing firm to ensure accuracy and clarity, and then are redacted to remove certain types of identifying information, including names, for protection of the identity of participants. Extraneous capture, including occasional anomalies and interruptions, acknowledgement of interview parameters, and some conversational pauses and digressions were also removed.

By going beyond a routine pigeonholing of answers-to-questions, it is possible to have a holistic interpretation of a full interview. This is in accordance with the Mintzberg synergy concept [51], discussed in [24], that says that theory can be constructed from "rich description". It also led to greater notice of subtle shadings in phrasing and vocabulary and of differences arising from distinct specialties and responsibilities amongst interview participants. It also distinguished areas where "backtracking" to answer prior questions by respondents and other, conversational interaction "moments" occurred.

4.3 Fieldwork

After the institution, personnel and study instruments had been selected using the case study approach [24], the next step called for by the methodology is the fieldwork. This is the actual execution of the designed study upon the selected subjects and with the chosen instruments. In this work, this was the actual conduct of the interviews. This was

followed by transcription of the collected recordings and some post processing of the transcripts. The processed transcripts were then united with the notes taken during the interviews.

It became apparent as the fieldwork application and evaluation continued that the one-on-one interview format exercised the questions in such a way as to capture nuanced reaction. The combination of notes and recordings provided the required mechanism, one that permitted interaction and feedback. This approach also appeared to reassure the participants on any concerns they may have had concerning the use of the resulting data and the objectives of the experiment, a critical consideration with human subjects. Multiple subjects were curious about both the goals and the ultimate outcomes of the experiment, and the in-person encounters allowed a much more fluid discussion. The interview format proved that it could provide for the need to acquire both the responses to and about the questions.

4.4 Data Analysis

Following the data collection and initial processing in the fieldwork stage, the case study sequence moves into the analysis portion of the investigation. This entails attempting to identify trends, repeated themes, and other constructs and concepts in order to understand the overall nature of and information contained in the data. The interview sessions and subsequent processing and editing yielded a set of transcripts based on the primary interviews of staff. A subset of the Grounded Theory Method (GTM) was used to analyse the qualitative data [65]. This subset was the three phase coding technique (i.e., open**,** axial, and selective coding). A set of sample intermediate data is shown in Table 2, with associated codes and demonstrates the stages of the GTM coding sequence used in this research as a part of the sensemaking process of analysing the data elicited from conducted interviews using VMOST questions. The “Interview excerpt” (shown in the second column of Table 2) cells contain key words or phrases, with fuller context

beneath, that are used to inspire the initial, “open” codes that identify concepts, vocabulary and ideas for consideration [65]. The open codes (shown in the third column of Table 2) are words and phrases driving understanding and comprehension of the overall enterprise, generated from both the phrases and contextualization of the interviews [65]. With the given examples, the open codes are annotated based on impression and initial reflection(s) of the coder. The open codes are then grouped and ordered with axial codes (shown in the fourth column of Table 2), which typically emerge as the set of open codes are considered and studied. Selective coding entails choosing one of the axial codes as the central or primary idea (not shown in figure), which is what is perceived to be the touchstone to which the others can be related for overall consideration of the situation [65].

Table 2: Examples of interview excerpts and quotes, with open and axial codes

Ex.#	Interview Excerpt *Quote*	Generated Open code(s) underlined, with note(s)	Axial Code(s)
1	research center for students, faculty (I-1) *…where does the library want to end up?* *Oh, I think as being a research center for both students and faculty.* *Interviewee: The place where they turn for their research needs.*	1. research center – idea that enterprise is key to investigations 2. Students,Faculty – differentiation between customer types	• Larger goal • Stakeholders
2	Gathering place (I-1) *…We acknowledge that we want to be a gathering place for students.* *Interviewee: But also, that we serve as the portal. The place where they can go to get information, …*	1. Gathering place – perception of library as a physical space to use	• Provided service (specifically physical)
3	expectation that search be suitable easy straightforward as Google (I-5) *but they've sort of come up with this expectation that everything that they search for ought to be as suitable or as easy…and straightforward as Google is, which we would like to see as well but it's a whole different model.*	1. User expectation – what is desired 2. Scoring – as a target, this should be measured by surveys, etc	• Assessment/Metrics
4	tailor to what is being taught (I-21) *Or it's not just up to us. But we try to tailor our collection to what's being taught at Towson and it does have a curricular slant to it.*	1. Curriculum support – course support often identified as key aspect of functions/goals	• Provided service (specifically curricular)
5	Phone calls, Jing, Captivate… (I-1) *people would phone me for help. Can you walk me through this? Now, with tools like Jing and Captivate, you can send them a little mini tutorial that shows them how to do something, and a picture is worth a thousand words.*	1. Provided service – multiple interviews included lists of technologies for interaction	• Provided service (specifically virtual)
6	learning how to learn (I-3) *… our profile is that we offer this service that is valuable to you as you are a student and we hope you can take this, it's all, learning how to learn and libraries can connect you to information…*	1. Provided service – varied forms of training for students	• Provided Service (General)

Ex.#	Interview Excerpt *Quote*	Generated Open code(s) underlined, with note(s)	Axial Code(s)
7	feedback from faculty (I-2) *Some level of faculty feedback. …* *Yeah. Yeah, we have our liaison, liaison [to the] speech department, so I think it's just being mindful of the needs that your user population has expressed.*	1. Faculty feedback – numerous inputs from faculty, including committees and surveys/forms	• Assessment/Metrics
8	information literacy instruction – handouts (I-22) *I would say that information literacy instruction, classes, and, … all of the handouts and everything on the web and everything the administration does to communicate and further those goals.*	1. Information literacy aid – standard item, created to support classes and research areas	• Providing Service (General)
9	LibQual (various; I-20) *Measurable objectives. Well every 2 years we would have a LibQUAL survey to measure satisfaction. There's a heavy effort to recruit people to answer that survey.*	1. LibQual (survey tool) – institution-type-specific survey instrument	• Assessment/Metrics
10	provide access – physical virtual, on campus or remotely (I-4) *…we provide access to materials that support the curriculum so in that way it's relevant. We don't purchase or subscribe or provide access to material that doesn't directly support the classes, the degree programs …* *providing that access both on campus and remotely.*	1. Provided service – being available in formats, at times needed by customers	• Provided service (general)
11	support academic enterprise (I-5) *… supporting academic enterprise as a place to find and access information, process it, and analyze it, and presumably produce it in some cases.*	1. Academic enterprise – fit with overall institutional objectives, style/culture	• Larger goal
12	"what rises to top" in search (I-5) *one of the things that the libraries provide as compared to something like Google is how the sort of selection or what rises to the top*	1. Search order – providing integrated search capability with useful behaviors	• Providing service (virtual)
13	collection use as a measure (I-10) *… expensive to buy these databases so we keep usage statistics and that goes into…*	1. Usage measure – budget for assets is carefully managed, requires tracking for utility justification	• Assessment/Metrics

Ex.#	Interview Excerpt *Quote*	Generated Open code(s) underlined, with note(s)	Axial Code(s)
14	student and faculty success is foremost in mind of university (I-23) *…our goals are to support again the success of our students and our faculty and that is … foremost in the mind of the university.*	1. Larger goal – parent organization has multifaceted objectives that must be considered	• Larger goal (General)
15	academic to business model (I-17) *Quite frankly academia is moving toward that business model.*	1. Mental model – evolution of considerations, practices within peer group	• Service Quality, Models, Practices
16	Protecting privacy (I-16) *within our bounds of protecting people's privacy… we keep quite a bit of aggregate information on what's done here.*	1. Protect privacy – expectation within community of practice; general expectation of stakeholders	• Larger goal
17	Collection maintenance (I-15) *….maintaining a collection that supports those activities as well so we are doing collection development and acquiring new materials or even reading new materials to make sure that we have a collection that supports the needs of the institution…*	1. Collection upkeep – physical, electronic assets require curating to remain useful, up to date	• Providing service (physical, virtual)
18	"other communities we serve" (1-16) *…we have that other.... Those other communities that we serve.*	1. External customers – as public institution, and within peers, cooperation expected	• Stakeholders
19	and leading in university system (I-15) *…functions of the organization are aligned with our user's needs, forging partnerships, and demonstrating leadership on campus and in the university system.*	1. System Role – within immediate group of peers, staff/institution can take lead on common issues	• Providing service • Service Quality, Models, Practices
20	at table – thought of(I-21) *We're not always at the table, we're not always thought of. So maybe that redoubles the pressure on us to sort of generate all this stuff on our own.*	2. Role considered – As service component of larger institution, engagement with other arms important	• Larger goal (intra-institutional)
21	collaboration space(I-20) *… a place that students think of to be a sort of a central location where they can do research, they can collaborate well with one another.*	1. Collaboration resource –as hosting location, collaboration enabler	• Providing resource (physical)

Ex.#	Interview Excerpt *Quote*	Generated Open code(s) underlined, with note(s)	Axial Code(s)
22	effectiveness surveys(I-18) *…done a LibQUAL survey so we've done a standardized survey, to measure how we're doing. We ask faculty and staff one on one…*	1. Survey results	• Assessment/Metrics
23	thinking about metropolitan (I-21) *being metropolitan, …in some sense I think it is really valid.*	1. Metropolitan	• Larger goal (general)
24	content management services (I-15) *all functions of many areas of the library including research services and our content management technical services and collection development… providing more support to our distance learning students and faculty…*	1. Electronic content	• Providing service (virtual)
25	annual staff review (I-14) *…comes into play when you have annual reviews and stuff like that…*	1. Staff review	• Assessment/Metrics

4.4.1 Open Coding

To apply the GTM, the first step, open coding, requires the identification of key concepts, ideas, and phrases. Given that the data in this instance is derived from interview data, open coding will also help eliminate unintended or conversational artifacts. Ultimately, the identification of ideas and phrases results in a set of open codes that embody the concepts presented by the data.

In this case, more than 500 open codes were identified. This was recorded in a spreadsheet, and in this instance the phrases and quotes that underpin the open quotes were also recorded. This is shown in Table 2; a complete copy of this data is presented in the appendices. Some open codes reflect reactions to the questions themselves, or the overall process, however the built of these touch on actual strategy-related responses of the staff of the enterprise. Using a spreadsheet as an organizational tool allowed for easy traceability between quotes and open codes, which simplified both discussion and linkage tracking between interviews, quotes, and codes.

Several memos also originated from this first pass through the data; the memoing process is discussed in more detail in the section 5 of Chapter 4. Even given the well-educated community, the environment question required frequent clarification. Additionally, it became apparent that questions whose wording referred to prior questions generated frequent requests for clarification and repetition. More surprisingly, the questions like those touching on competition that were unusual to the context of an educational and non-profit entity, often generated thoughtful, diverse, and interesting responses.

4.4.2 Axial Coding

Once open codes had become consistence and stable, the data was taken into the second stage, axial coding. This phase is intended to identify repeated ideas, overall categories – in effect to "sense make" the bigger picture from the open code jigsaw pieces. The GTM allows for looping back to the the prior coding stages, in order to capture things not noticed or overlooked on the initial pass through the data. With the axial coding stage, instances of conceptual overlap and duplication were identified, and as understanding increases generally, some occasional return to the open coding also accommodated the need to correct occasional clerical and labeling oversights. From the data, five major categories emerged. These, categories, generally reflected the subject enterprise's own strategic document used and discussed in [57].

The other groupings were readily apparent upon review of the data. The *stakeholders*, who fall within subgroups defining an individual's context for certain services and providing an indicator of sophistication, are the ultimate individuals with expectations with respect to the library. The library's own staff are concurrently users and providers of the services, as are those who oversee the structure of which it is a part. The students are, in some cases involving education and training related services, are themselves end result of the service provided as well as stakeholders, for example.

A table, built around a 25 item subset of data, showing progress from raw quote to reduced excerpt to open code to axial coding is shown as Table 2. The table demonstrates traceability from original interview inputs to ultimate strategic story results, illustrating the grounding of the final artifacts in the data. The axial coding was performed from the full version of this table, included in the appendices. The codes grouped under the *assessment and metrics* axial code, which include the various statistics collected and reported, are keys to the library being able to discuss and demonstrate. This category also capture, with granularity, the roles, functions, and services provided by the enterprise and notes the measures used to compare the enterprise against peers. It was necessary to ensure that application of an axial code like *models/practices/assessment* received careful scrutiny; if misused or overused it is possible for it to become a kind of catchall/miscellaneous grouping, which impedes the generation of a full understanding. In this instance, it is the strictly used as a to collect the measures and reporting and scoring – something critical to the operating of this services based enterprise.

One set of open codes helps illustrates the sifting and comprehension process that accompanies open coding, the "larger goals" category. The *larger goals* of the library are defined both by things external to the parent institution and by interactions with the other institutional components. The codes grouped under this axial code are somewhat more loosely connected, and the linkage is perhaps less clear cut than other groups. This in some cases reflects opinions of subjects and the nature of institution. Ultimately, the goals are there, regardless of source or precise hierarchy, and represent the more abstract drivers for the library.

As it emerged from the data, it was clear that some goals were generally intra-institutional, applicable to how the inside-university stakeholders want activities carried out, and a more general grouping that derives from impact to the customers. The other collected codes fit into the more usual group and hierarchy configuration.

As an additional step, input from someone with expertise in and prior experience with applying GTM method in a software engineering context was solicited. This scrutiny resulted in some changes, largely in the interests of greater clarity of language, to the top-level headers; for example "*scoring*" became "*assessment/metrics*". This step also functioned as a basic validation on the execution of GTM. Other modifications included using "*service quality, models, practices*" as a replacement for the initial, more casual term "*backoffice*" as a header/group label. With this information and revisions in hand, it became possible to view data in several additional formats, including Euler style circle diagrams[1] that function as category cluster diagrams, as in Figure 6.

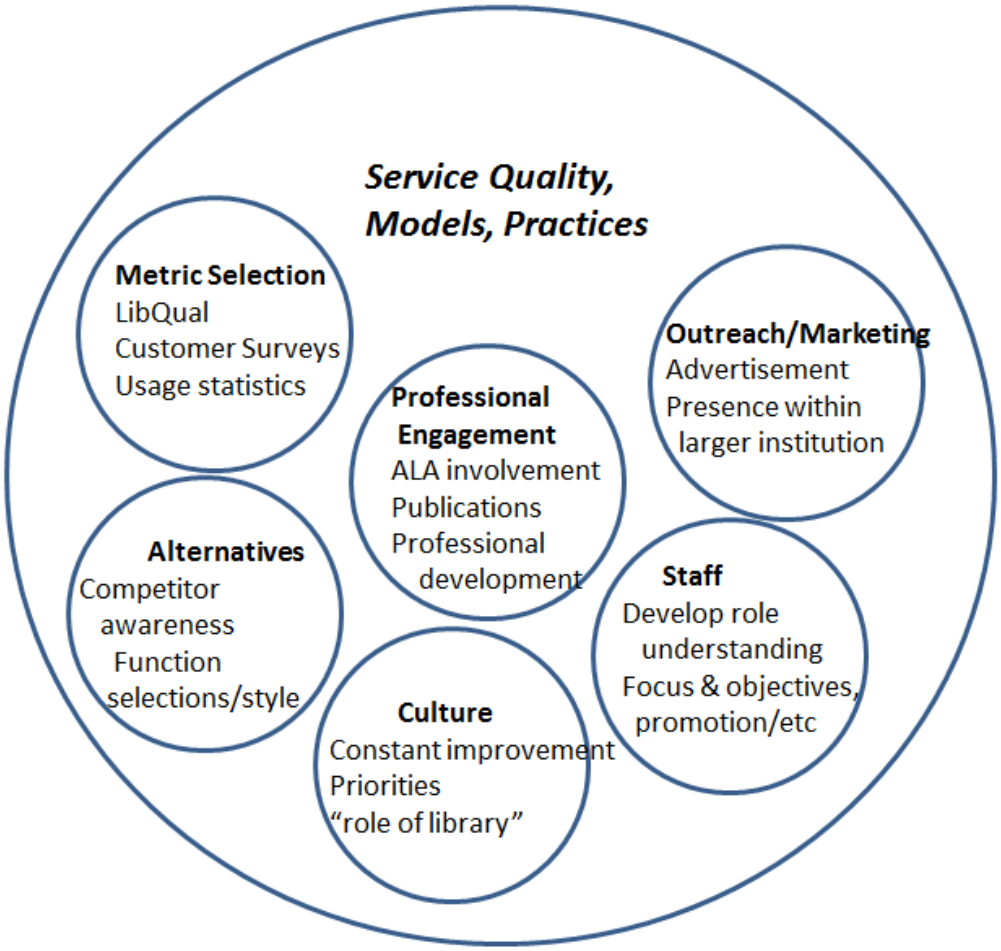

Figure 6: Example Euler Diagram - Service Quality/Models/Practices

[1] A complete set of the artifacts created can be found in the Appendices.

4.4.3 Selective Coding

Selective coding requires selecting, from the concepts and categories resulting from the axial coding stage, one code to be the core category. Once this is chosen, the relationships of the others to it are defined. In this instance, the core is the "*provided service*" concept. This addresses specifically which service(s) are provided by the library and in what ways and for whom provision is made. This became the central concept because it is apparent that all other activities either define or help close the loop on decisions made and implemented on this concept. This concept, after intensive study of the open and axial codes, emerged from the data as the principle activity. Services - how to provide, measure, and report them, and at what level – is what the data defines as the ultimate product of the library and its ongoing decision loop. The larger goals of the library are defined both internally and by interactions with the parent institution and its components, and inform the service provision decision making.

4.5 Memos and Memoing

In GTM, a memo is used by the researcher to reflect what they have learned from the data; these contain the traces of concepts and their relationships as they are written by the investigator [28]. These artifacts evolve through the progression of the research process and become part of the researcher's documentation and working notes during the process.

With this data set, several memos provide some insight into the overall execution and process, and open up discussion points for future investigation. For the stakeholders, the full discussion, not a single or subset of the VMOST based questions led to their identification. Additionally, from the overall data set, it was apparent that a high level of customer consideration was already, which helped in a generating particularly rich results and thorough coverage. The data, generally, supports a conclusion that there is little to no need to create or modify questions for this idea. Another memo is used to collect a small

set of “stray” pieces of data, that didn’t clearly fit into one axial code or category, but where nonentheless interesting and potentially useful. Memoing provides a useful way to manage these, allowing for easy consideration later on in the process. These notes also provide side considerations that might require clarification, for which GTM doesn’t explicitly provide a separate stage.

4.6 Shaping Hypotheses Stage

In both a theory development case study and an application of the GTM, one objective is to discover theories that are grounded in the data. In this research, the initial review of the coded data has led to several preliminary conclusions. The initial review of the data demonstrated remarkable coverage of the target EA framework (in this case the Zachman Framework [78]), indicating a general validity to the initial concepts behind the study [57]. Additionally, after the first set of interviews was conducted an opportunity for additional data collection presented itself. The enterprise under consideration had been conducting an internal strategy capture exercise in response to an institution-wide effort, and the concluding document was finished and made available. This allowed a comparison to be made between the library’s internal efforts and the research results [58].

The results of this comparison indicated an improvement in areas of coverage for the VMOST methodology, even though incomplete, versus the more conventional exercise conducted by the library. This sequence of results also tracked with the overlap between collection and analysis, observed by Eisenhardt in several studies [24], and permitted some perspective on the overall responses, and increased the awareness of the investigative staff to the additional contexts associated with a number of specialist terms and constructs.

After these two rounds of analysis with the initial data, a full application of the GTM was conducted once the complete data was available. The results of the coding and review resulted in a number of artefacts and perceptions. A sample of one of these

artefacts is shown in Figure 6, demonstrating the identification of groups and concepts. Code 2 ("students, faculty") from the first row in Table 2, referring to the different types of customer is, for example, reflected in the classifications being presented as part of the larger group "*stakeholders*"). Similarly, row 3's code 2, "scoring" finds a home – along with a wide variety of other metrics and tracking related concepts – under "*assessment/metrics*". Several of these artefacts were delivered to the institution's liaison to the project team, who responded positively to the overall understanding and modelling they represented.

As expected, several syntax and phrasing issues in the VMOST queries were identified, along with several general considerations for application of this process. Enhancements and modifications to the original VMOST questions are currently being considered for adaptation specifically in an EA context. Also, the coverage of the Zachman framework, while generally good for the relatively low time and effort impact on the subjects, could be improved by relatively brief additions to the VMOST questions. These additional VMOST questions were drafted, and further interview sessions were conducted with a subset of the original members of the staff of the enterprise. This additional result set shows promise for even higher coverage levels of the framework and overall interest as a future departure point for deeper investigation.

4.7 The Story

With the hypotheses, driven by the data, that the provided services are what define the library to stakeholders and to itself, and that various concepts, hierarchies, and activities - *service quality/models/practices*, *stakeholders*, *assessment/metrics*, *larger goals* – inform and shape these activities, it is necessary with the GTM as a qualitative method to provide a "story" to elaborate and expose the linkages found among the data. To provide an articulation for the idea, as an example in this instance, that the stakeholder is both customer and, sometimes, product both of library and of larger institution is

necessary for those not engaged in the coding to be able to follow the view thus developed.

To accompany the explanation of this "story," typically delivered informally, and to demonstrate the interconnections among the high level axial codes, labels, lines and arrows were overlain on the composite diagram of the circles to create Figure 7, which doubles as an alternate view of the tree representation, two ways to view ultimate construct. All of these artifacts and the conversations they generated serve as an indirect ratification of the integrity of the explanations and view developed from the data. In this case study, some informal conversations served as a checking tool; the interest of the staffers in copies of these artifacts, and general agreement with the perspective developed, serve as confirmation of the basic integrity of these evolved concepts.

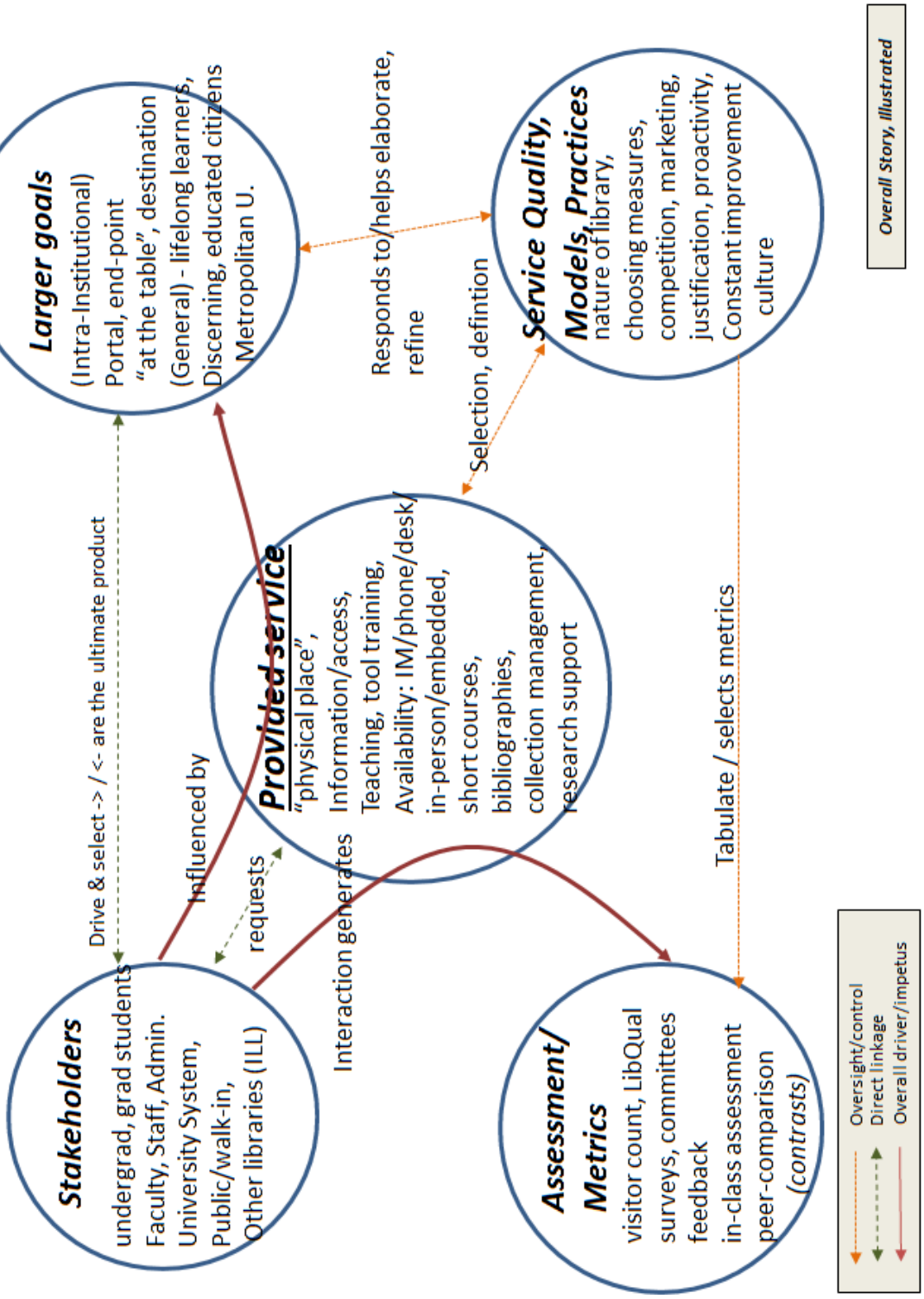

Figure 7: Euler diagram with arrows for interrelationship illustration

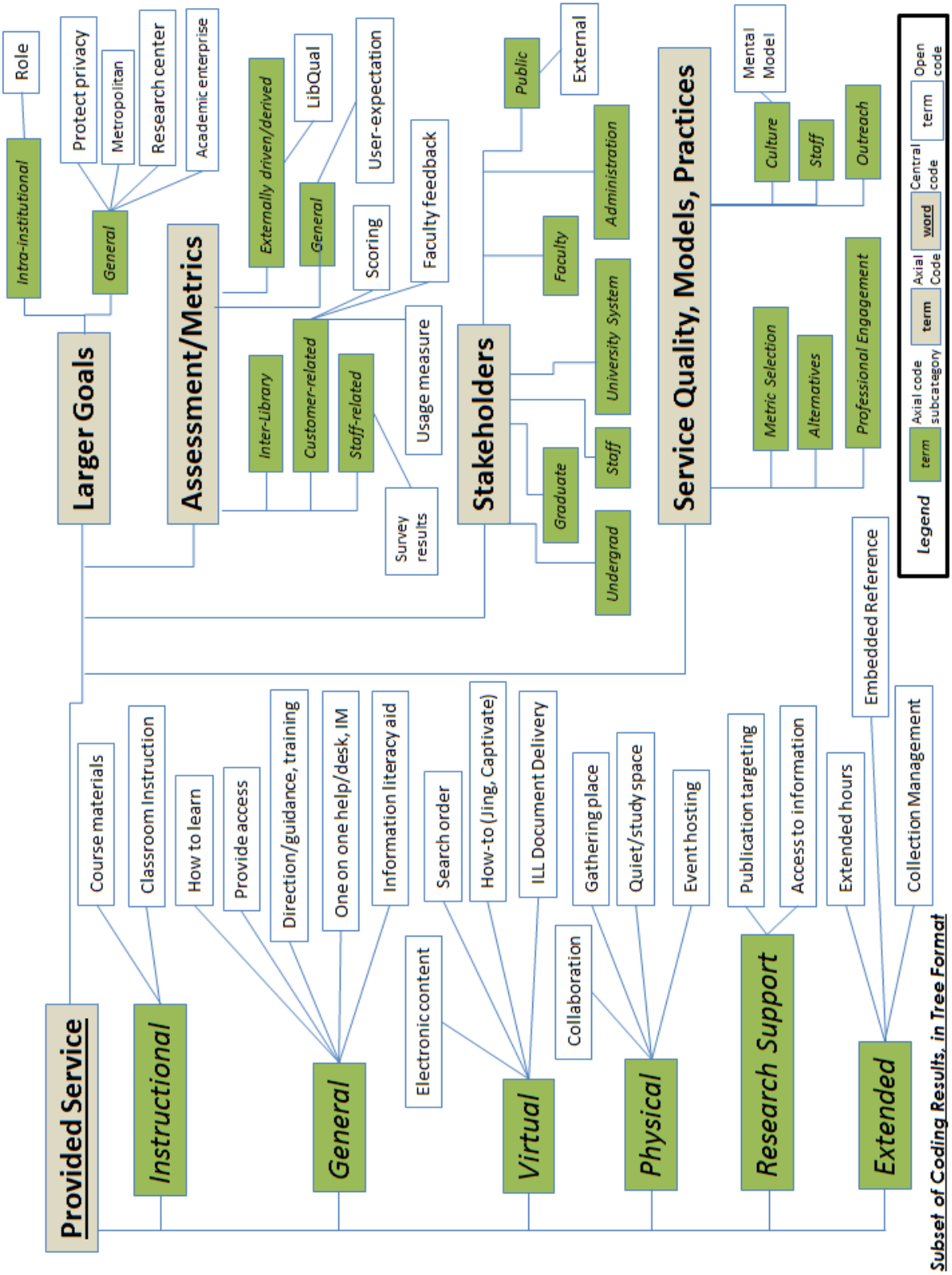

Figure 8: Coding Results, in tree format

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4.9 Enfolding Literature

The Eisenhardt strategy for case study execution allows for consideration of "enfolding literature" – data text and artefacts that inform the understanding of the research team [24]. In a commercial, governmental or other structured entity, these will often include various external and internal documents. This sort of input can include organizational charts, process diagrams and asset inventories, for example, as well as regulatory and oversight data.

The enterprise in this study participates in several larger institutional constructs and possesses a well-defined internal structure. Consideration of various governing, strategic and planning materials related to these larger and complex entities could prove relevant as feedstock for theory and context capture. This investigation and research, as a part of the longer-term project, is still underway. Successful evaluation and identification of these items, if any, may prove useful for other entities, in terms of determining either inputs into an EA process or overall consideration of questions of operational control,

scope, stakeholder expectations and general accountability. This also embraces the GTM concept of sensitization [7], which provides direction for investigation and comprehension. This provides assistance in instances of differing professional and practictioner terminologies, guides to structures, and "inform the overall research problem" [13].

With this research, the enfolding literature is not particularly elaborate. Primary informational items for the research problem included the staff directory, organizational chart, and some minimal reference material regarding the interpretation of particular positions and titles provided by several of the staff. This information was used to ensure overall coverage of the internal divisions and components, and to ensure a wide spectrum of ranks and responsibilities was solicited. Potential additions, ultimately not employed for this investigation, could include various inputs and documents from outside entities, stakeholders, and professional or practice documentation. The interview data set, since the interviewer was seen as a nonspecialist, effectively negates any need for this information as the participants largely, through their comments, provided adequate reference or summary of potential points of interest.

4.10 Examination and Initial Conclusions

Following the GTM-based analysis of the case study qualitiative data, and consideration of the data in the context of EA, it became apparent that while the overall collection of information was compelling it would be possible to increase coverage of the Zachman Framework with a minimal increase in effort required by adding additional questions. These would be directed at the areas of the Framework covered only slightly or indirectly by the results from the GTM processed interviews. For this new set of interviews, a subset of the original participants would be selected for a second interview, and the overall fieldwork and qualitative data treatment processes would be repeated.

4.10.1 Better Coverage Desired

To the initial ten questions, two new queries were added with the aim of increasing coverage of the “when” and “what columns with the Zachman Framework. While some data for these Zachman columns was collected incidentally, anecdotally, or as a derivate of the original interview responses, it was evident that the data for the these areas was lacking, and that a more thorough coverage would be better for sparking discussion and communicating context for EA construction. The first new question, “What are the key assets and resources of the organization?”, was crafted for to spark collection spanning material lists, models, and data (“What”). The second interrogative, “which of those assets do you use as a matter of routine - daily or weekly? What do you use quarterly, or otherwise routinely but less commonly?”, was intended to elicit “when” information like schedules and routines to better populate areas like event lists, details, and specification, many of which are critical for identification of reporting and automation aspects of an enterprise.

These two questions would be posed to thirty percent of the original participants, who were selected from the initial participant group based on their role and position within the overall enterprise, so as to retain coverage of the various institutional divisons. The same closed interview format and approach was reused from the initial interviews, and the additional qualitative responses would be processed with the GTM. The data and resulting coding were appended to the original results and are included in the full set of information in the appendices as a part of the processed interview and coding tables.

4.10.2 Second Question Set Results

While the elicited responses to the new questions were less verbose or intricate than the more abstract original questions, the responses still appeared thorough and useful for EA population. Additionally, the questions remain general purpose, and are not industry or profession specific even with this addition, and the total additional time taken

for each session was typically between five and fifteen minutes, which would allow for an interview of just over a half hour when combined with the original question set.

The difficulties in scheduling one individual to complete the investigation necessitated one deviation from the process; the questions were submitted and responses collected via email. This minor exception to the in-person process afforded a useful collateral point for consideration, namely that, once a relationship with the subject was in place, alternative forms of communication did not impede data collection. While not necessarily a fully tested conclusion, the essential similarity of depth and consideration provided by the responses elicited provide an interesting starting point for future research and investigation.

4.10.3 A "Zero" Question

Following a period of consideration of the full data set, overall theory based on the responses would indicate one additional question would be a good addition to the process. Beginning the interviews either by asking "What is the organization? How would you define the environment of the organization?" or by offering up a definition for this would seem useful for focusing the discussion slightly. Participants, given the questions that include terms like environment and competitor, often were uncertain how this could be considered without clarification or directly requested it from the interviewer.

(0) What is the organization? How would you define the environment of the organization?
(1) What is the vision of the organization? That is, what is the overall, ideal, end-state toward which the organization strives?
(2) What is the primary activity that the organization performs to achieve that end state? What is the organization's mission?
(3) How are the mission and vision appropriate and relevant to the environment, as you defined it?
(4) Are the institutional mission and vision explicit or implied? How?
(5) What are the institution's basic activities? How are those performed to allow the institution to be competitive with industry rivals? What industry do you think this institution is in, and what rivals does it have?
(6) What goes has the organization set, and does it set goals? How does the organization determine if those goals are successful against competition?
(7) What activities does the organization perform to achieve those goals?
(8) How do the goals support the vision?
9) What metrics or scores are kept? Are they linked to objectives? Are the objectives linked to goals? What if anything is done to achieve those objectives?
(10) How are the objectives identified earlier tied to goals?
(11) What are the key assets and resources of the organization?
(12) Which of those assets do you use as a matter of routine - daily or weekly? What do you use quarterly or otherwise routinely?

Figure 9: Revised, Extended VMOST Queries

4.11 Summary

This research and the elicited results indicate that the adapted questions, while powerful elicitation tools, might benefit from minor adjustments in language for clarity, one additional point for initial context, and two additional questions for EA coverage should they be employed as a initial elicitation mechanism. The complete set, with lightly adjusted language for use in an interview format and including the suggested context and additional new queries, is shown in Figure 9.

This set of elicitation questions successfully elicited data for all Zachman's columns, and provided data for input for many of the blocks. The elicited data shows an enterprise aware of an evolving set of roles, a rich set of services, and a need to be cost and infrastructure aware particularly with IS/IT resources. Overall, this strategic capture has acquired both a solid sense of the library's role and has elicited the type of information that could prevent costly rework – exactly the goal of the creators of the

original EA concepts. By encouraging engagement and understanding, subsequent software decisions will be made with an eye to the needs and goals both short and long term of the library.

While both rationale for the modifications and potential utility of the reuse of the questions can be reasonably taken from the grounding in the data, some further discussion and elaboration is required. Additionally, an acknowledgement of the limitations of the tools and the overall process is a requisite for proper use of this technique, in part so that those good decisions can be made after this exercise. A treatment of these questions follows in the next chapter.

Chapter Five – Discussion and Limitations

The modified questions, laid out at the close of the preceding chapter, form a part of the initial conclusions of this work. These questions provide a partial fulfillment of the overall goals laid out in Chapter 1 of this dissertation. As initial results, they stem from the application of a variety of tools and processes, including a lightweight approach to enterprise architecture (EA) elicitation employed within a real, representative enterprise, in the scaffolding of an executed case study as discussed in the third and fourth chapters. The Vision-Mission-Objectives-Strategy-Tactics (VMOST) technique, as adapted by Bleistein et al. [3][4][5], was used, and the Grounded Theory Method (GTM) was employed to analyze the qualitative data elicited by the VMOST strategy elicitation technique, as discussed in Chapter 2.

This combination of techniques allows for generalization but requires acknowledgement of potential limitations of both the individual techniques and the overall chain, so that this research can be considered safely and appropriately. This chapter presents the set of generalizations, grounded in both the qualitative data and a variety of trends found within the results, as well as considerations regarding the processes and limitations employed both singly and as a complete set.

5.1 Validity Concerns

As this research required a variety of tools and data collection techniques, is based on qualitative responses, and derives a variety of conclusions from intensive examination of data, an assessment of the risk factors for use of these conclusions is in order, to consider overall validity as defined for the case studies [38]. These risks can be viewed as as a threat to the internal validity, which is concerned with the overall quality and process of both data collection and subsequent analsyis. The data collection mechanisms, the responses, and even the questions asked, for example, pose risks to the overall

connections and integrity of the data, which are all considered internal risks for the specific linkage and summation of the data. Risks are also present to the external validity, which can impact the extent to which the conclusions can be taken as general or extrapolated for other uses, particularly as the conclusions are taken from specific enterprise which may or may not have features or attributes unique to its general category or specific staff, arrangements or practices.

5.1.1 Internal Concerns and Considerations

Internal threats to the outcomes are those that are based within the data and study itself, threats that jeopardize the integrity of the conclusions or analysis. In this case, the case study approach [24][75][76] has been shown an effective arrangement for handling numerous considerations in studies of this type, including variability and overall research approach, as well as providing overall structure. This can be said with some confidence since, when using the Zachman Framework [77][78] as a measure, execution of the initial interview round alone produced inputs for all but one of the columns, when the responses to the two additional questions were used, the "When" column (see Figure 1) had input data as well. While informal, there is agreement from staff members from the studied enterprise that the diagrammatic artefacts, shown in Chapter 4, derived from the GTM-coded data do correctly present a working understanding of the institution also affords an attestation of the validity of the results.

As with any experiential research, the nature of a case study makes it is necessary to consider to the limitations of the data and process. As this particular research study ultimately generated requirements engineering artifacts in the form of qualitative data, and in using the GTM [65] applied a qualitative analytic technique, there are potential risks of subjectivity present. There are also the customary challenges of results replication where working institutions are concerned. For example, the roles of some personnel interviewed have evolved over the time of the project. In addition, having

"been studied," the researcher is unlikely to get the same response to the same question, if only because the subject has had an opportunity to think about their initial response. Potential Hawthorne Effect issues, where social effects including a desire to please interviewer or management impact answers, must also be considered [39], but are unlikely to be a significant risk as the collection of data, vice specific responses, being a goal. While the specific responses could potentially impact any EA drawn up from this data, the consideration remains for any event seen to have feedback to management; as this study was conducted under parameters that anonymized individuals.

Additionally, for this research, the staff of the enterprise were already engaged in strategic thinking during part of the effort [57] which may have been a positive and negative for this exercise. While the subjects may have been already focused and have considered the larger picture, this may have led to repetition of prior answers or otherwise limited their answers to those from prior thoughts or discussions which could have unintentionally constrained the data elicited and collected. Countering this risk is the potential benefits to the fluency and articulation of the responses, and the possibilities of additional broadness in response due to the activities associated with the institutional effort. It is difficult to point, save in one or two very isolated moments, to any specific realization of these consideration but there is a possibility of impact both conscious and unconscious, which should be noted.

The overlay of a subset of the GTM with the case study method, as a combination of techniques, also raises points to consider. As processes sharing a goal of full comprehension and theory development plus having considerable construction and, in some instances, terminology similarities the use of the GTM coding concepts as an overlay to the case study method to accommodate qualitative data worked well. Some additional care in the discussion and application of the one within the framework of the other was necessary, but could be accomplished with the awareness of the need for that precision in place. When the combination is informed by the employment of an EAF as a

target destination, the results are reinforced by the scaffolding created by the specifics of an operational objective and context.

5.1.2 External Concerns and Considerations

External threats to the conclusions are concerned with the reuse of conclusions and extension and extrapolation of any patterns or effects seen in the course of a study, particularly those that, like this research, is burdened with the complexities of human subjects, qualitative analysis, and working environments. In this specific instance, use of the GTM imposes certain restrictions on how generalized any set of conclusions can be, as use of this method leads to conclusions that are rooted in the data as received from the subjects. While anomalous responses can be mitigated by drawing a wide net across an institution, any reflection of institutional life wether accurate or inaccurate that are widely shared are likely to be perpetuated either as underlying assumption or a central tenet in the elicited data. In this instance, the basic structure of the institution and the fact it has numerous and generally similar peers provides greater confidence in the general conclusions reached.

The case study method potentially obscures, by centering on one enterprise as the studied institution, both general conclusions and considerations unique to the studied enterprise. In this case, the studied enterprise is an example of a community of institutions with a long history of self study and continuous reform and improvement [35], informed by a large body of professional literature [20][21][42][43][44][79]. For example, these considerations could have led to artificially high data collection outcomes, especially given the preference for openness and assistance that defines usual behavior for an institution of this type.

Given the origination of the research project as a reaction to possible barriers to adoption of EA, it is worth noting that the particular analytic method applied could itself be a hurdle for an enterprise embracing the precise approach discussed in this work to

date. While it is possible that the GTM could be taken up by this specific enterprise without outside personnel, given the background and levels of education and expertise represented, the method could prove impractical for some possible users. Further investigation and evaluation of other approaches and options to achieve similar ends certainly merit investigation. The flexibility of the combination of GTM and the VMOST elicitation mechanism, in particular, offers interesting possibilities for further study.

Lastly, the application of the lightweight EA elicitation mechanism proposed in this work has garnered a remarkable body of data, represented in the appendices, at cost to the institution that, so far, has proven to be an acceptable additional burden – less than a dozen hours of interview time. While this implementation is unlikely to scale to large institutions, other approaches for high headcount institutions are already present within the existing, heavyweight EA frameworks. The application of the combination of tools employed has been within acceptable scope of effort, and has created what appears to be a high level of overall comprehension regarding institutional objectives, context and goals.

5.2 Elicitation Process Results

The adaptation of VMOST created by Bleistein et al. [3][4][5] proved remarkably effective at going well beyond the business strategy areas for which it was designed [57][58]. Some caution in extrapolating this utility for other purposes is merited as the tool was not designed as an all-inclusive elicitation mechanism. While this resulting is promising, caution is merited in predicting similar data coverage in all situations. This stakeholder community is, largely compromised of academic professionals disposed by professional training and day-to-day role to be helpful and quick to provide data. Further study would be required before the success in this instance, at least in terms of data collection, could be termed indicative of a fullly elaborated process for success with EA data collection. The startling collection of data, included as appendices, includes much

detail and information outside scope of the business strategy arena these questions were created to map would also justify further examination of the success of these queries is also merited, if only to determine if this success was anomalous.

5.3 Summary

The lightweight EA elicitation approach proposed and evaluated here, with these caveats, could be reused by another, similarly professionally-staffed institution. No limitations in this study have surfaced that would prohibit a comparable academic, non-profit, or governmental institution from successfully using as a guide the approach demonstrated by this case study. This study helps open the way for such an institution to apply EA and, thus, improve its IT management. In providing a pattern, this work constitutes a contribution to the technical materials inventory available to practitioners.

The application of the VMOST questions [64] as a mechanism for EA elicitation and the utilization of the GTM [65] sensemaking of the qualitative data shows promise for enabling alignment of the information technology (IT) / information systems (IS) portfolio with a variety of goals, as well as providing a route to improved understanding and governance of institutional goals. The large set of data VMOST elicited illustrates the power of this simple tool to collect an impressive amount of data; by allowing for open answers and asking general questions, this technique proved effective, possibly because it is not directly derived or based in the EA structure but more concerned with understanding and data collection. This indirect approach may, itself, be a technique that can be generalized for other needs. The elicitative, discussion nature of the questions also encouraged engagement with the interviewer, and probably helped offset any Hawthorne tendencies. The face-to-face approach also appeared to facilitate creating channels of discussion and opening conversation with the “outsider” visiting researcher/interviewer.

Chapter Six – Conclusions

In Chapter 1, a variety of considerations and concerns regarding the application of Enterprise Architecture (EA) were presented, including a central question regarding the application of a lightweight approach to the elicitation of strategic and institutional data and creation of alignment between objectives and assets in the Information Technology (IT) / Information Systems (IS) portfolio, as articulated in both the Introduction and Chapter 2. Chapter 3 provides a construction plan for a case study which was employed and underpins Chapter 4's execution which incorporates the use of the Grounded Theory Method. This study, and its limitations, is, in turn, brought under rigorous examination in the fifth chapter, which probes both the overall evaluation of the data and the procedural chain created to underpin this dissertation.

This chapter closes this dissertation and provides a discussion of the fulfillment of the overall research objectives and the entirety of the project it entailed. It also discusses a number of publications have been contributed and a number of future avenues for further investigation show promise as well. It also provides some final reflections on the motivations and applications of this research.

6.1 Research Enquiries

Chapter 3 of this dissertation provides an illustration of a qualitative data elicitation program for EA, and Chapter 4 lays out the execution of that plan. With the resulting efforts, a number of research questions were addressed, and the overall utility of this toolchain in a nonprofit, government and education context was demonstrated. The overall effort and research project has collected data that support a number of answers and conclusions successfully in spite of the variables inherent in working with a live, working community and their enterprise.

Collectively, the research questions posed in the Introduction and address below can in large part be addressed by the outcomes of this project:

- *Can a general lightweight elicitation, specifically Vision-Mission-Objectives-Strategy-Tactics, technique gather information suitable for conversion into enterprise vision and mission?*

  The wealth and variety of information, collected as coded in the Appendices, provides information that well addresses the mission and vision of the studied enterprise. Every interview touches on concepts – "support research activities," "support teaching," "provide access", "metropolitan university" – that would be points to consider and incorporate into vision and mission artifacts.

- *Does engaging in the elicitation provide data sufficient to begin populating an enterprise architecture framework?*

  The elicitation, particularly when combined with the analytic methods, provided impressive inputs for filling the Zachman's matrix. The results far exceeded the expectations, even before the advanced analyses was completed and were put before the research community even before the completion of the project.

- *Is qualitiative analysis, specifically the Grounded Theory Method, effective and applicable in an EA context?*

  The subset of the Grounded Theory Method employed was, in the view of consideration of an EA, more generally software engineering needs, a valuable and powerful tool for consideration of this information. It effectively enabled consideration of both whole interviews, the complete dataset, and the individual concepts that populated them.

- *How do results of Vision-Mission-Objectives-Strategy-Tactics map to an enterprise architecture framework?*

  As discussed in regards to the first paper, mapping VMOST queries or responses specifically to an EAF, Zachman or otherwise, is not entirely applicable

particularly in the light of the overall comprehension of the data allowed by the qualitative analysis. While this particular construction of the question may have been overcome by the nature of the results and process, the more general idea that VMOST would do well with an EAF is within the scope of the outcomes.

- *Can we achieve understanding across a complex stakeholder environment?*

  While accepting that understanding is a moving target, a solid overall picture can be achieved and, perhaps more importantly, working ground can be established for further work. The reaction to the artifacts, and the overall richness and common vocabulary created by the sequence used for this work and shown in the combination of data and artifacts, can be reasonably accepted as a

- *Which, if any, of the Enterprise Architecture-Capability Maturity Model scores improve if the Vision-Mission-Objectives-Strategy-Tactics, Grounded Theory Method, Zachman Framework chain is employed?*

  By engaging in this exercise, the Capability Maturity Model score for this enterprise was improved if only by collating and demonstrating data and creating another artificat set for holistic institutional understanding. Through investigation of an EA, maturity was improved, moving from a 0 or 1 level (none, informal) to a 2 or 3 level (development, defined) on a variety of EA-CMM elements, including Architecture communication, development, and process, simply by the organization of the data for consideration and investigation necessary to consider the results of this study. Business linkage documentation and consideration may also have increased in score, but were somewhat outside the scope of the initial investigation and are harder to evaluate without deeper investigation into the initial state than permitted by the techniques employed.

As shown in the papers[2] VMOST elictation did successfully provide vision and mission and populate an EAF. Additionally, the GTM did prove effective and applicable for qualitative analysis in an EA context, as illustrated by the sophistication of the various artifacts as passed back to the institution. The VMOST queries mapped generally, not specifically, to the needs of EAF as evidenced by the scale of the information collected in the appendices. All of the artifacts and analysis, taken collectively, demonstrate both the creation of significant understanding of and the overall complexity of the stakeholder and enterprise environment.

6.2 Contributions

This dissertation offers a roadmap for future practitioners' efforts to employ the proposed toolchain, this research also contributed three items to the professional literature corpus of computer science and information technology. These included [58]:

> Rosasco, N., & Dehlinger, J. "Eliciting Business Architecture Information in Enterprise Architecture Frameworks Using VMOST." 2011. In *1st ACIS/JNU International Conference on Computers, Networks, Systems and Industrial Engineering*, pages 474–478, 2011.

This first publication, written with a partial set of data in hand from the initial interviews, illustrates the initial effectives of the Vision-Mission-Objectives-Strategies-Tactics (VMOST) [64] elicitation mechanism without the full Grounded Theory Method (GTM) [65] processing of the data. This work offers only an initial consideration of the data. This early appraisal of the results provides a demonstration of the overall utility of the interview technique; this success was presented at the 2011 International Association for Computer and Information Science (ACIS) Conference on Computers, Networks, Systems and Industrial Engineering after acceptance of the paper.

[2] See Section 6.2, Contributions, for specific references to each paper.

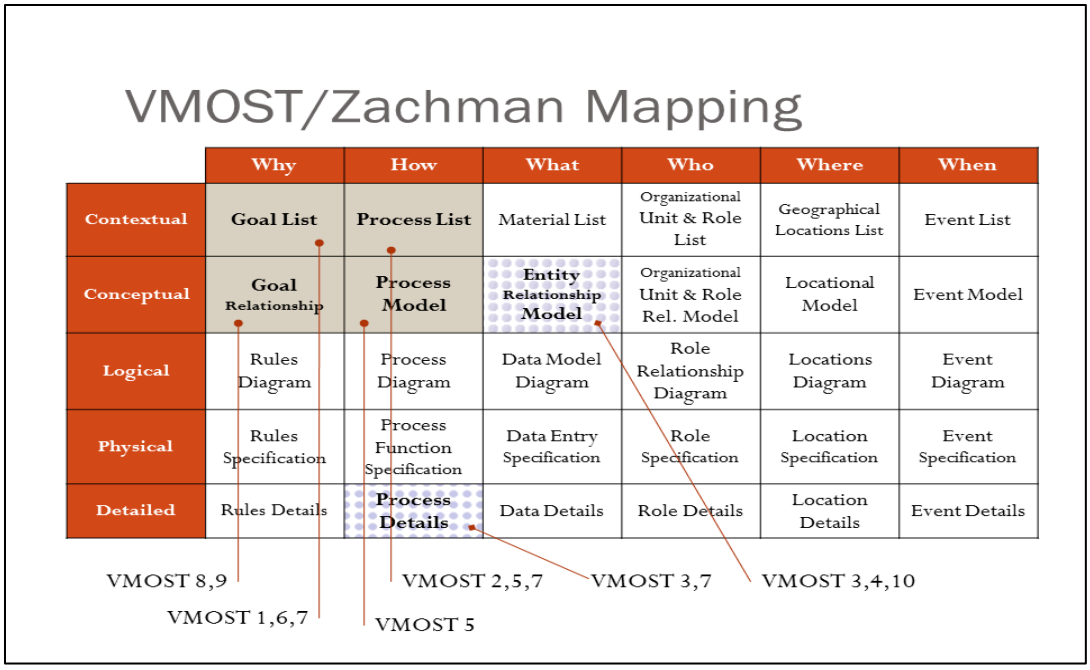


Figure 10: Zachman Cells/VMOST Questions Initial Mapping, as presented

This paper provided a somewhat limited presentation of the data garnered by the the first interviews, which had not yet been considered with the coding stages subset of the GTM. It presented a simple mapping of the VMOST questions to Zachman cells, shown in Figure 10, was based on a rapid evaluation of the initial data without benefit of the insights provided by a full processing with three stage coding. The GTM coding for qualitative analysis provided insight of the limitations of this initial conclusion. These insights included a realization that consideration of both the individual interviews as whole documents and the full dataset, in addition to excerpts of the results, created a far more complete view and comprehension of the data. The GTM-based qualitative analysis steps, by requiring immersion in the data, rather than just single readings, significantly enhanced the utility and usability of the results. The richness and command of the dataset as elicited by VMOST and collected as interview transcripts was powerfully enhanced by the coding concepts taken from the GTM, and illustrates the power of the coding concept as described for GTM method. An illustration of this, mapping examples from the coding results to the Zachman cells, is provided as Figure 11.

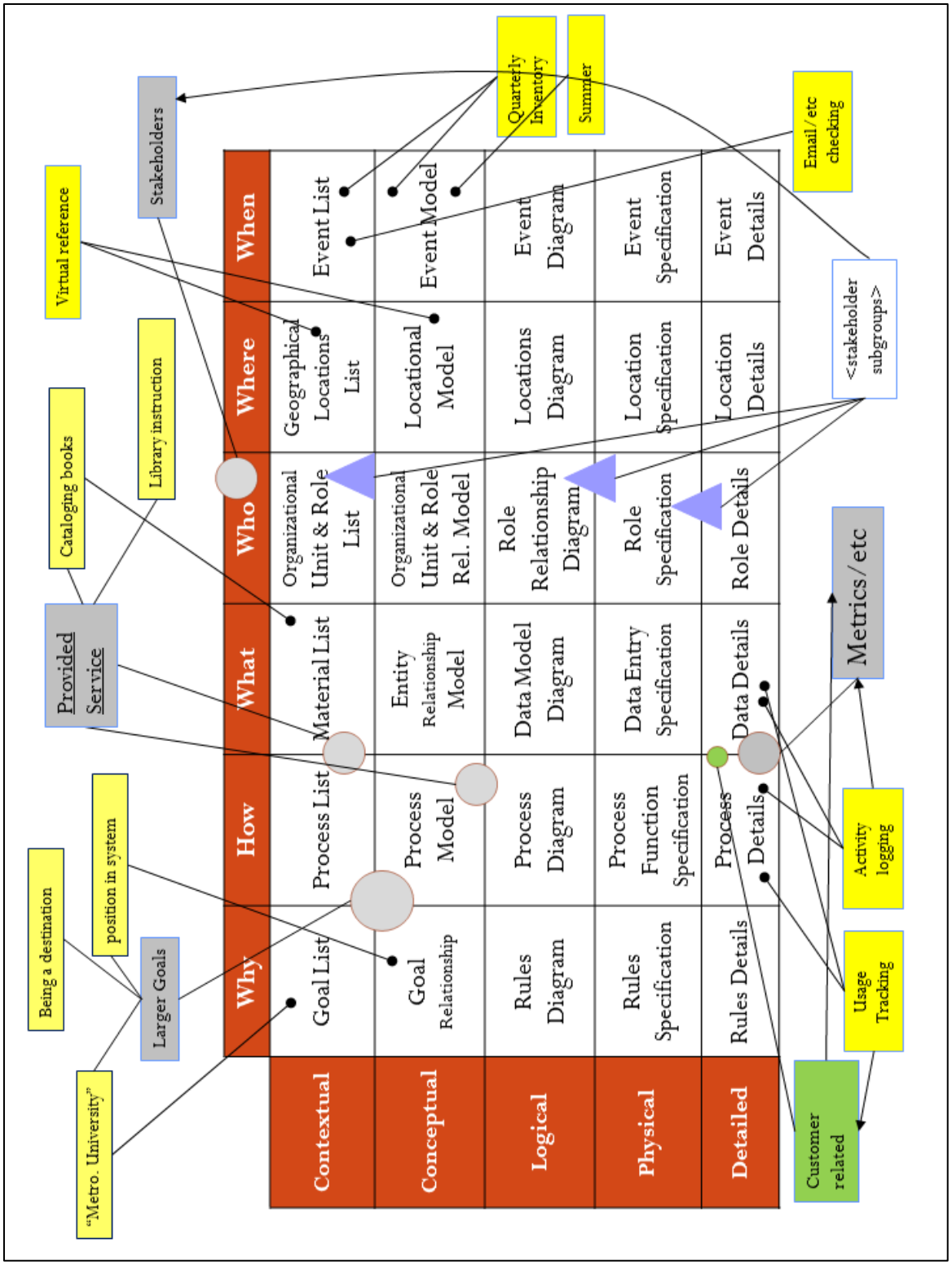


Figure 11: Example GTM Coding Results Mapped to Zachman Framework

Further results were presented in [57]:

> Rosasco, N., & Dehlinger, J. "Business Architecture Elicitation for Enterprise Architecture: VMOST versus Conventional Strategy Capture." In *SERA 2011 - Ninth International Conference on Software Engineering Research, Management and Applications*, pages 153–157, 2011.

The second contrasts this initial data set to the coverage created using an elicitation process for strategy employed internally by the enterprise itself, using Zachman Framework coverage as a comparison mechanism. The overall results of this paper posit that VMOST when joined to EA provides a powerful tool for overall data capture to better inform business strategy efforts. Finally, the overall methodology including GTM, VMOST, and the case study process, was presented in [56]:

> Rosasco, N., & Dehlinger, J. "Application of a Lightweight Enterprise Architecture Elicitation Technique using a Case Study Approach." In *ENASE 2014 - Ninth International Conference on Evaluation of Novel Approaches to Software Engineering*, 2014.

The third work elaborates on the case study approach and elaborates on the utility of GTM as a operational and comprehension tool for qualitative data, and describes many parameters and limitations of the efforts that underpin this dissertation. The principal thrust of this publication, presented at the Evaluation of Novel Approaches to Software Engineering (ENASE) conference in Lisbon, Portugal, discusses the overall methodology and process, as well as the data derived theory and the limitations that limit the generalizability of the conclusions.

6.3 Future Work

Planned future work will include soliciting additional feedback on those constructed artefacts and assembly of the various stages into a fuller presentation of the process, to better assess their impact will be done. Further investigation of the capabilities and operational considerations for the application of this lightweight methodology are merited, to test the utility of the approach with other enterprises and institutional

contexts. The utility of this process and EA generally for prioritization of security needs, meeting the challenges of complex system integration also merit investigation. This approach and technique chain may afford a middle path between “heavy” and “lightweight” techniques for overall enterprise decision making, especially given the modern trend towards mashups and high flexilibity environments. Operations and informed decision making given the evolution of social media platforms and service-oriented architecture (SOA) needs also could benefit from the approaches discussed, as EA informs overall change and process management and contextualization. Additionally, a publication targeted at the library specialist professional community, laying out the strategic understanding advantages and overall rationale for building an EA, already in preparation, will follow this dissertation.

6.4 Summary

As addressed in the first section of this chapter, the questions posed for this research in Chapter 1 are effectively addressed by this dissertation. The use of a general lightweight elicitation technique used does, in answer to a primary investigative query, provide information suitable for coversion into an enterprise vision and mission. As addressed earlier in the first section The VMOST elicitation technique, as adapted by Bleistein et al. [3][4][5], successfully gathered not only information to create a vision and mission statements, its application provided a broad spectrum of information. This information, in terms of coverage of the Zachman Framework as an enterprise architecture framework (EAF), went well beyond the expected data as discussed in [57] and [58]. The institutional maturity, when considered in the context of EA and Capability Maturity Model (CMM), was also enhanced through the conduct of this exercise, if only through the data collection and collation exercise. By moving to informal or developmental (levels 1 and 2, respectively), possibly even level 3 (defined), of EA-CMM in terms of architectural process, communication, and development. The business

linkage area may also have improved but are harder to evaluate; in all, an overall starting point for future EA efforts is demonstrated through achieved maturity [54]. It is reasonable to conclude that the strategy of applying lightweight guidance for the initial data elicitation and analysis of the artefacts necessary for an enterprise architecture (EA) plan has shown promise, and, with a locally-informed EA plan in hand, there appears to be a high likelihood of delivering the expected benefits of this area of practice including clear objectives and good requirements context information.

The use of the case study method has provided useful results for the exercise of the approaches being examined. The use of EA outside of the large institution and IT/IS specialist contexts has been demonstrated with a configuration that is not enterprise or institution-type specific. In addition, the GTM was shown to be applicable in the context of EA. Ultimately, it may need additional investigation and development to bring it fully into the toolkit of IS/IT practice, but successfully allowed for a full view and comprehension of a wide variety of qualititative data.

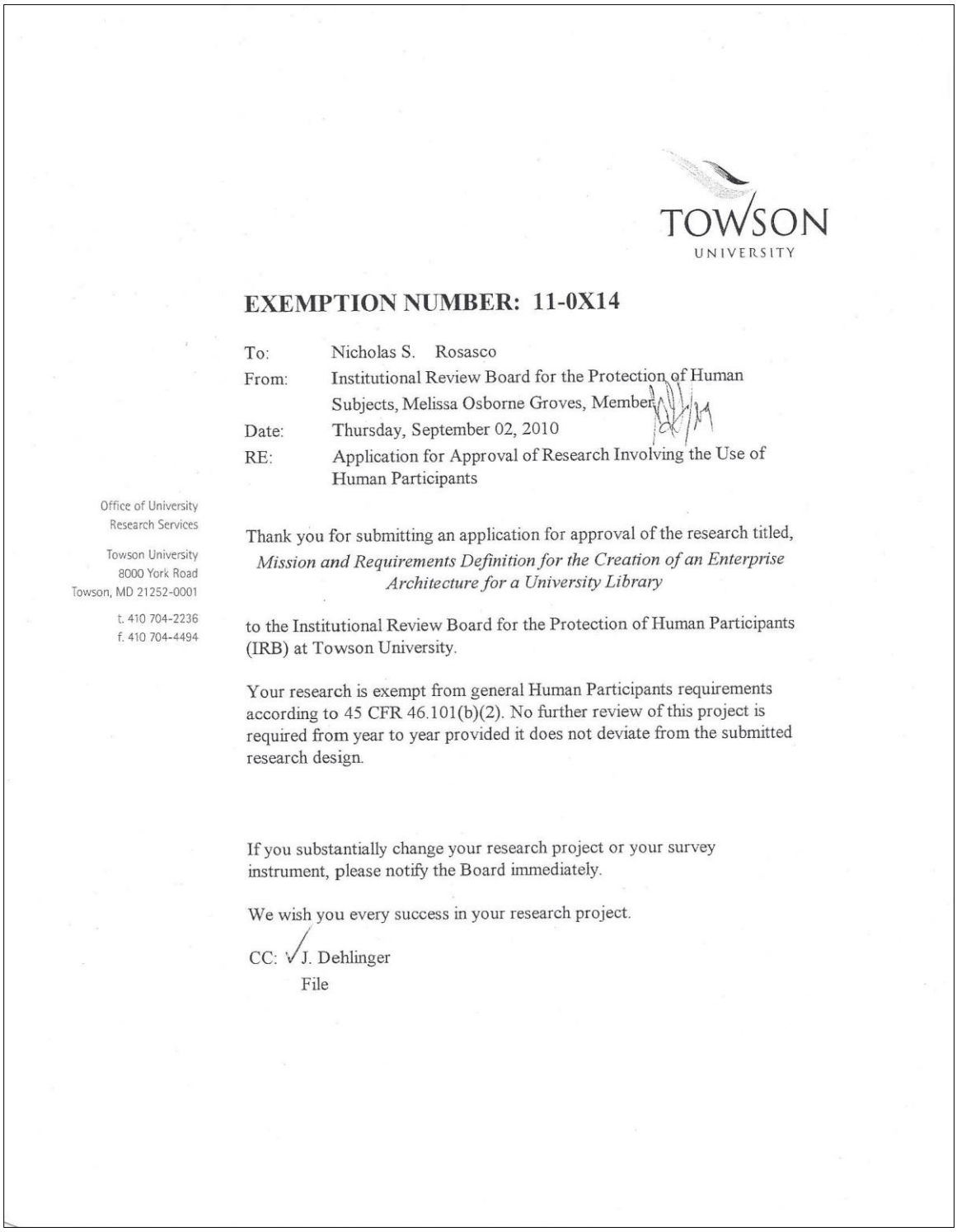
While the mapping of VMOST to the Zachman Framework is explored in [58], further investigation with a complete data set indicates that the elicitation is not as susceptible as originally thought to a straightforward question to cell mapping. The overall execution of the interviews and resulting dataset, instead, provide broad understanding and coverage when viewed through the lens of the GTM. Understanding of a complex stakeholder environment is achievable, but requires a commitment to deep consideration of data. The process of elicitation when structured as an interview proved to be a compelling mechanism; the essential interactivity created an environment of engagement and feedback that lent itself well to the sensemaking requirement.

In terms of the overall project questions, lightweight elicitation techniques have exceeded the initial expectations for collecting data to populate an EA framework (EAF), as exemplified by the easily identifiable information contained in the interview results even before processing. Additionally, the lightweight techniques have succeeded in

fulfilling the need for vision and mission capture, as demonstrated by the richness of the resulting summary artefacts. The need for a systematic approach to demonstrate overall comprehension and improved data collection has been met by the case study approach and the multiphase coding of the GTM.

Appendix A: Human Subjects Related Documents

[Exemption Letter from Towson University Institutional Review Board for the Protection of Human Subjects]



TOWSON
UNIVERSITY

EXEMPTION NUMBER: 11-0X14

To: Nicholas S. Rosasco
From: Institutional Review Board for the Protection of Human Subjects, Melissa Osborne Groves, Member
Date: Thursday, September 02, 2010
RE: Application for Approval of Research Involving the Use of Human Participants

Office of University Research Services

Towson University
8000 York Road
Towson, MD 21252-0001

t. 410 704-2236
f. 410 704-4494

Thank you for submitting an application for approval of the research titled,

Mission and Requirements Definition for the Creation of an Enterprise Architecture for a University Library

to the Institutional Review Board for the Protection of Human Participants (IRB) at Towson University.

Your research is exempt from general Human Participants requirements according to 45 CFR 46.101(b)(2). No further review of this project is required from year to year provided it does not deviate from the submitted research design.

If you substantially change your research project or your survey instrument, please notify the Board immediately.

We wish you every success in your research project.

CC: J. Dehlinger
File

[Below is the text of the Exempt Research Cover Letter, as required by Towson University's Institutional Review Board for the Protection of Human Participants.]

August 1, 2010

Dear Participant,

My name is Nicholas S. Rosasco and I am a graduate student in the Information Technology program of the Department of Computer Science at Towson University. As part of the research for my doctoral dissertation, I will be conducting a series of interviews to gather information on the business processes and software engineering strategies used by college and university libraries. Participation in the interviews is voluntary. If you opt to participate, you will be asked to respond to a series of questions. It is not necessary to answer every question, and you may discontinue participation at any time. Your decision whether or not to participate in the project or to withdraw from the project at any time will in no way affect your employment status. Your supervisor has given me permission to conduct my study at your workplace.

If you have any questions about the project, you may contact me at (443) 306-8992, my faculty advisor, Dr. Josh Dehlinger at (410) 704-4536, or the Chairperson of Towson University's Institutional Review Board for the Protection of Human Participants, Dr. Debi Gartland, at (410) 704-2236. A copy of the collected responses can be sent to your Towson email address, along with background information on the software engineering assessment process, if you would like to see it upon completion.

[Below is a copy of the form used during the interview session by the interviewer.]

Subject: _____

Role: _____

Date: _____

State:

___ It is being recorded.

___ Aware identity can be derived, use of role necessary.

___ End this interview at any time.

___ Voluntary.

___ Results available, goal is publication.

___ IRB, Library leadership approval solicited.

Vision/Mission	Response…	
(1) What is the overall, ideal, end-state toward which the organization strives (vision)?		Key words/Descriptives: Technology role: Input into current Mission Statement? Role of assets, selection? Internal/External customers, priorities? Role of library within/without TU?
(2) What is the primary activity that the organization performs to achieve the end-state (mission)?		Key words/Descriptives:
(3) How are the responses to Questions 1 and 2 (vision and mission, respectively) appropriate and relevant to the environment?		Key words/Descriptives:
(4) Are the responses to Questions 1 and 2 (vision and mission, respectively) explicit or implied? How?		Key words/Descriptives:

Goal/Strategy		
(5) What are the basic activities and their rationale by which the organization competes with industry rivals?		Key words/Descriptives: "Rivals" defined as:
(6) What goals does the organization set to determine if it is competing successfully?		Who picks these?/How defined? Is effort made to tie them back to above?
(7) What activities does the organization perform to achieve the goals in Question 6?		Role of assets, selection? Internal/External customers, priorities?
(8) How do the goals in question 6 support the response to question 1 (vision)?		Do they?
Objectives/Tactics		
(9) What are the measurable objectives that indicate achievement of goals identified in Question 6, and what activities does the organization perform to achieve those objectives?		Who picks these?
(10) How do the objectives identified in Question 9 support the goals identified in Question 6?		

Appendix B: Complete Coding Dataset

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Original	1	research center for students, faculty		research center Students Faculty	larger goal	
Original	1	“turn to for research needs”		research need	provided service	
Original	1	portal		Portal	provided service	
Original	1	gathering place		gathering place	provided service	
Original	1	[staff are] more than info geeks		specialized staff	provided service	backoffice
Original	1	get, ask about, trained in finding information, evaluation		training in evaluation finding information	larger goal	
Original	1	provide access electronic and print		provide access	provided service	
Original	1	“elucidation and tools”		Elucidation	provided service	
Original	1	subject [specific] gateway versus Google		subject specific	provided service	
Original	1	departmental communications [as channel for outreach]		Outreach	backoffice	
Original	1	serve virtually and in person; IM chat for example		virtual service In-person service	provided service	
Original	1	phone calls, Jing, Captivate		Jing Captivate	provided service	
Original	1	graduate students [example of unusual time schedules]		Grad students	customers	
Original	1	appropriate tools to share technology		technology sharing	provided service	
Original	1	[explicit versus implicit] brainstorming		-	-	
Original	1	customer service [as a product[		service as product	provided service	
Original	1	Google, College Park, Term paper selling sites (as a competitor)			backoffice	
Original	1	educating people'; 'questioning' aspect		educate and question	larger goal	
Original	1	[[scope of basic activities question is very variable]]			-	
Original	1	information quality/source of information itself		info quality	provided service	
Original	1	assignments and grading [as tool]; Library gen ed classes		library classes	provided service	
Original	1	dean and assistant dean and instructor feedback [as a metric]		management stakeholders	scoring	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Original	1	committee service both undergrad grad and system, “out of building”		out of building	provided service	customers
Original	1	faculty status recognition		status	scoring	
Original	1	“new seminars”		unclear	-	
Original	1	“teaching library” [affirmed but from interviewer]		teach library	provided service	
Original	1	hits, calls, door count		metrics	scoring	
Original	1	types of inclusion – requests for collaboration		collaboration requests	scoring	
Original	1	integration research and scholarship at student faculty staff levels		integration Scholarship	larger goal	
Original	1	2nd non primary instructor role		classroom role	provided service	
Original	1	where to submit work for outside publication		outside publication	provided service	
Original	1	successful academic experience		academic experience	larger goal	
Original	2	timely and relevant service		relevant timely service	larger goal	
Original	2	“user population” - students faculty staff walk-ins		user population	customers	
Original	2	meeting information needs, information literacy concepts		information needs Information literacy	provided service	
Original	2	how to evaluate sources		source evaluation	larger goal	
Original	2	collection development– having the right resources		collection development	provided service	
Original	2	constantly keeping resources up to date and relevant – findable and accessible		findable Accessible Relevant	provided service	
Original	2	references services		reference service	provided service	
Original	2	education institution – essential support – a core function within the academy		education essential	provided service	
Original	2	“implicit is/in our everyday”		-	provided service	
Original	2	providing resources serves to meeting information needs		resource provision	provided services	
Original	2	versus Towson Public Library or Goucher Library (as competitor)		-		

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Original	2	curriculum research and degree programs		Research need Curriculum need	customers	
Original	2	primary user population “here on campus”		user population	customers	
Original	2	regular service and collection assessment		collection assessment Service assessment	provided service	scoring
Original	2	“used”? Relevant? [questions asked]		unclear	-	
Original	2	peer library holdings' 'standardized survey instruments' – comparison		survey instrument	scoring	
Original	2	logged statistics including from the reference desk		logging statistics	scoring	
Original	2	feedback from faculty		faculty feedback	scoring	
Original	2	asking patrons questions to implement survey		survey implementation	scoring	
Original	2	[University goal] meet workforce needs of area		-	-	
Original	2	service unit within a larger campus		service unit	-	
Original	2	circulation and interlibrary loan statistics	(give and take here – loading partners)	circulation statistics	scoring	
Original	3	research and study support to faculty and students		research support Study support	scoring	
Original	3	“box we put books in” perception/issue		-	backoffice	larger goal
Original	3	flying trapeze' delivery of precisely the kind of info required as an ideal		ideal service level	backoffice	larger goal
Original	3	walk up to the computer' in the wall (as ideal)		ideal service level	backoffice	larger goal
Original	3	Access		access	provided service	
Original	3	beyond physical to the virtual		physical Virtual	provided service	
Original	3	being a destination		destination	provided service	
Original	3	access point and public service desks		access point Public service	provided service	
Original	3	technical services – brought in from vendors, usually		vendor provided services	provided service	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Original	3	cataloging as availability		cataloging Availability	-	
Original	3	“gatekeeper” [role and function]		gatekeeper	-	
Original	3	function as a kind of portal		portal	-	
Original	3	clearly there is competition – web assign lexis nexis ebsco - popular vs academic		-	backoffice	larger goal
Original	3	Rigor / quality assurance		data rigor Assured quality	larger goal	
Original	3	Libqual – focus groups – open suggestion/feedback		focus groups Suggestion Libqual	scoring	
Original	3	library web-page		webpage	scoring	
Original	3	“learned how to change what we do” - instruction relative to students		student instruction	-	
Original	3	relevancy and value – human touch – customer service		relevant Human touch Customer service	-	
Original	3	meet customer wherever they would want to be / point of need		point of need	provided service	
Original	3	IM email call in person – maybe skype next – newsletter		skype In-person Phone IM	provided service	
Original	3	jazz in library		jazz	-	
Original	3	middle and high school outreach		Pre-college outreach	-	
Original	3	learning how to learn		how to learn	larger goal	
Original	3	want to guide – tough to continue to compete		-	-	
Original	3	Google analytics [used as tool]		google analytics	scoring	
Original	3	question of scoring across media formats		scoring with formats	scoring	
Original	3	Non-measurable as non-meaningful [issue]		-	-	
Original	3	connection with patron		patron link	provided service	

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Original	3	Facebook - “don't care” from students [reaction]		facebook use	provided service	scoring
Original	3	[[post-discussion chat useful]]	unstructured chat useful here		-	
Original	4	support university curriculum		curriculum support	provided service	
Original	4	individual student and faculty support		individual support	customers	
Original	4	provide access – physical virtual, on campus or remotely		access provision	provided service	
Original	4	buy and subscribe to support classes and degree programs	data portfolio mgmt	obtain to support	provided service	
Original	4	easily access authenticated information – peer reviewed		peer review	provided service	
Original	4	easy seamless manner to get weighty authoritative information		seamless	-	
Original	4	monitoring of availability of website		monitor uptime	provided service	backoffice
Original	4	budget as primary component		budget component	-	backoffice
Original	4	serial review committee		serials review	-	backoffice
Original	4	trial periods – with feedback and surveys		trial period	scoring	
Original	4	usage statistics		usage	scoring	
Original	5	good resources or good information		resource quality	-	
Original	5	Support – including staff in form of guidance to correct and relevant information		support	provided service	
Original	5	space for study and for research		space	provided service	
Original	5	aggregation of resources and making them available in streamlined fashion		streamlined access	provided service	backoffice
Original	5	promotion of [capability] to public		capability publicity	-	
Original	5	institution does research at faculty level [thing to support]		faculty research	-	
Original	5	lifelong learner – better user of information – use in employment		lifelong learner	larger goal	
Original	5	scholarly articles/research support – instruction – location		instruction Place Research support	provided service	
Original	5	cataloging books		book catalog	provided service	backoffice
Original	5	maintaining space (with appropriate		space with features	provided service	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
		outlets etc)				
Original	5	“student ability to evaluate”		evaluation ability	larger goal	-
Original	5	bibliographies		bibliographies	provided service	
Original	5	updating infrastructure with Office of Tech Services [[partner / control point]]		-	-	backoffice
Original	5	journal usage		journal use	scoring	
Original	5	incremental notion of success or valuer		notion of success	scoring	-
Original	5	[[Question 9, 6 language]] | still clearly a problem		-	-	
Original	6	access to materials – making things available		material access	provided service	
Original	6	discoverable findable and easily delivered		findable	provided service	larger goal
Original	6	info needed for lifelong learning		lifelong learning	provided service	larger goal
Original	6	info needed for specific research		specific research	provided service	larger goal
Original	6	info needed to facilitate scholarship		scholarship	provided service	larger goal
Original	6	support academic enterprise		academic enterprise	provided service	larger goal
Original	6	resource provider		provide resource	-	
Original	6	provide tools services – license things – hub for this function / help in locating		provide tools	provided service	
Original	6	[[recurrent need to clarify environment]]			-	
Original	6	“the academy” will allocate resources		resources	-	
Original	6	“interdisciplinary”/”broad-based”		Broad-base	-	larger goal
Original	6	perspective on what people are trying to do		In-progress	-	larger goal
Original	6	trying to become explicit [[this question – needs retool]]			-	
Original	6	define library in face of new technologies – across web		define library	providing service	
Original	6	how we get our resources – in their reach – book and electronic assets		resource acquisition	providing service	
Original	6	“what rises to top” in search		search order	providing service	-
Original	6	resources deemed valuable by faculty		faculty input	scoring	
Original	6	expectation that search be suitable easy straightforward as Google		user expectation	scoring	larger goal
Original	6	how to combine organize – search		search combination	providing service	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
		syntax an issue				
Original	6	criteria for search scoring – popularity (Google) not appropriate		search scoring	larger goal	-
Original	6	LibQual ModQual surveys		Libqual Modqual	scoring	
Original	6	idea that everything is scorable measurable documented (issue???)			scoring	-
Original	6	[[again]] self ref. Questions confusing			-	
Original	6	[[request to use notes]]	This is a mechanical thing.		-	
Original	6	[[9 and 10 cause confusion – little additional data]]			-	
Original	7	an academic center of the University	of, not for? Or implied both?	academic center	-	larger goal
Original	7	specifically to assist faculty students with research – access, aid/instruction – physical space		assist customers	providing service	
Original	7	reference services – library instruction		reference service	providing service	
Original	7	robust on-line presence		On-line presence	providing service	
Original	7	one on one consults, in and outside library		one on one	providing service	
Original	7	comfortable place to work [specific: students]		place	providing service	
Original	7	variety of technology (within library)		-	-	
Original	7	long hours (availability tool)		great availability	providing service	
Original	7	finding the relevant		find relevant info	larger goal	
Original	7	building critical thinkers – able to do research		critical thinking	larger goal	
Original	7	build employable better citizens		employable citizens	larger goal	
Original	7	face of the library constant changing	awareness here...	define library	-	
Original	7	strive to keep up with things that change, & Univ. needs that change		keep pace	-	
Original	7	seen as having just books [[issue?]]	aware of downsides	just books	contrast	
Original	7	Access to materials – including physical		material access	providing service	
Original	7	professionally trained – keep up with students and community		professional training	providing service	larger goal

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Original	7	Google / coping with information overload – students sift to find useful		info overload	providing service	
Original	7	guidance (unlike competitors)	differentiator	guidance	providing service	contrast
Original	7	good academic experience – good education – grades and graduation rate		academic experience	-	larger goal
Original	7	[[last few questions a bit... tortured again]]			-	
Original	8	[[vision mission confusion, again]]			-	
Original	8	information clearing house		clearinghouse	providing service	larger goal
Original	8	all things to [students faculty public]		roles	customers	larger goal
Original	8	to be “a place”		place	providing service	
Original	8	even if information is not in-house		info access	providing service	
Original	8	showing up to work		being there	providing service	-
Original	8	accessible virtually and physically		access via	providing service	
Original	8	with the State of MD, & University System		USM	providing service	
Original	8	hold records of 1st teachers college in state		unique assets	providing service	unique
Original	8	[major back and forth on explicit vs implicit]			-	
Original	8	wealth of material		materials	-	
Original	8	“some specific guidelines”	whose/where from?	guidelines specific	-	
Original	8	competition for money and attendance		institution competition	scoring	
Original	8	“more we get in” - higher rankings		rankings	scoring	
Original	8	go to them or wait (question)			providing service	contrast
Original	8	[unique materials] [[is this a system function]]			-	
Original	8	proactive approach to librarian-ship		proactive	providing service	
Original	8	[goals didn't spring to mind]			-	
Original	8	[very honest reactions to this interview]			-	
Original	8	reach across University - branch out		reach out	providing service	
Original	8	conference and professional engagement		professional efforts	-	backoffice
Original	8	think outside your 'day to day' [expected?]		mental scope	-	backoffice

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Original	8	encouraged to go to workshops		workshops	-	backoffice
Original	8	University committees		institutional service	-	backoffice
Original	8	foster the community – metropolitan University discussion		foster community	backoffice	larger goal
Original	8	counting questions – iTime – body count – measure of relevance		scoring	scoring	
Original	9	[quotes official version]			-	
Original	9	vibrant accessible academic central enterprise for intellectual inquiry		central enterprise	providing service	larger goal
Original	9	facilitate continual discovery creation and exchange of knowledge		continuous discovery	providing service	larger goal
Original	9	dynamic information environment enhance scholarly endeavors for students faculty and staff		dynamic and scholarly	providing service	larger goal
Original	9	streamlining access to information		streamlined	providing service	
Original	9	foster lifelong learning		lifelong learner	larger goal	
Original	9	[No USM mention]			-	
Original	9	[[total awareness of vision mission distinction]]			-	
Original	9	facilitating intellectual inquiry, inspire innovation, foster effective collaboration create pathways to lifelong discovery		facilitate inquiry	providing service	larger goal
Original	9	“in wider community”		wider community	-	larger goal
Original	9	references University mission – excellent education		excellence in education	-	larger goal
Original	9	metro area of state – “Commission of University”	interesting phrase	metropolitan commission	?	larger goal
Original	9	“We've written it down”			-	
Original	9	[question/issue: made versus given explicit...]			-	
Original	9	“compete with other higher education institutions”		competitor identification	scoring	larger goal
Original	9	student and faculty – especially curricular – need		curricular need	providing service	
Original	9	what should be available in this type of institution		availability decisions	providing service	scoring

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Original	9	[who defines type?]	polished answers provided chance to think things over more.		-	
Original	9	"do as good or better job than other institutions"	[what job, what others?]	success measures	scoring	contrast
Original	9	LibQual mentioned			scoring	
Original	9	statistical comparison to peers and aspiration peer institutions			scoring	
Original	9	university sets those - "performance peers" - institutional research		performance peers	scoring	contrast
Original	9	[interesting: few referenced materials offered pointers – something you would think 2nd nature to this community]		-	-	
Original	9	"teach more"		teaching	-	
Original	9	[much discussion: what drives – integrates this?		-	-	
Original	9	budgeting discussions		budget	scoring	
Original	9	more and more google-like resource access		easy access	providing service	larger goal
Original	9	"easy overall search"		easy search	providing service	
Original	9	students not able to find resources - #1 thing		location skills	providing service	?
Original	9	enhance support scholarship		scholarship support	providing service	
Original	9	worth the money'		value	scoring	
Original	9	usage stats		statistics	scoring	
Original	9	how to interpret/act on survey results.		survey	scoring	
Original	10	a parallel vision': information independent; makers of critical judgments		judging information	skills	
Original	10	able to solve intellectual career or personal problem		problem solving	skills	
Original	10	Faculty – successful at teaching research publication		faculty publication	-	

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Original	10	“craft a collection” - printed and electronic		shaping collection	providing service	
Original	10	teach how to access, interpret collection		use collection	providing service	
Original	10	environment, relevant – [confusion here]		-	-	
Original	10	citizens of Maryland'		stakeholder	customers	
Original	10	age of institution “in current state” - metro university idea relatively new		institutional role	larger goal	-
Original	10	strategic plan reference / stairs metaphor		-	-	
Original	10	day to day activities		routine	providing service	
Original	10	teaching in the classroom, reference desk – virtually and in person		teaching Desk support	providing service	
Original	10	acquisitions collections & circulation		collection functions	providing service	
Original	10	colleagues not rivals		view of role	contrast	
Original	10	service to students orientation		student service	providing service	
Original	10	answer a lot of questions for campuses around us who aren't open as long		opposite of competition	contrast	
Original	10	[versus] tiered reference desk support with required appointments		opposite of competition	contrast	
Original	10	students generally successful in research [How? What does this mean?]		research success	-	-
Original	10	students do/don't know how to use library / versus faculty expectations that they do		-	skills	
Original	10	collecting materials – teach how to research and manage what they find	manage what they find – interesting	managing found items	providing service	
Original	10	ENDnote Refworks, Spreadsheet skills		tool training	providing service	
Original	10	information literacy instruction		info literacy	providing service	
Original	10	collection use as a measure		usage measure	scoring	
Original	10	specialization [liaison role]		specialization	providing service	
Original	10	return to print collection in some cases/disciplines		print collection use	providing service	-
Original	10	[q10] [question 10 issue] [described as tortured]			-	
Original	11	research resource needs – faculty staff and students of the university		research needs	providing service	
Original	11	provide tools necessary to help researchers		research tools	providing service	

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Original	11	strong instruction		instruction	providing service	
Original	11	“constituents” - materials		users	customers	
Original	11	“matter of support”		support	-	
Original	11	Relevance – [question generated don't know confusion]		-	-	
Original	11	“libraries don't compete”		Non-compete	scoring	
Original	11	huge into resource sharing – inter library loan		Non-compete	providing service	backoffice
Original	11	“what” - “how” “we provide” is changing		changing nature	-	
Original	11	quiet place to study		physical location	providing service	
Original	11	[wanted to use notes]			-	
Original	11	trained staff to serve		specialist staff	providing service	
Original	11	environment conducive to providing the resources		environment a resource	providing service	
Original	11	scores “helping anyone but us” uncertainty		-	-	scoring
Original	11	monitor all questions		tracking questions	providing service	scoring
Original	11	graduate student better off at job (q?) / (“dilemma”)		grad students	customers	
Original	11	peer evaluations – statistics		peer statistics	scoring	
Original	11	[check tape] “Albert is a friend”		-	-	
Original	11	Libqual		libqual	scoring	
Original	12	accessible		access	providing service	
Original	12	learn at own pace		Self-paced learning	-	larger goal
Original	12	assistance and teaching		help and guidance	providing service	
Original	12	open inclusive environment		inclusion	providing service	
Original	12	inclusivity	requirements to do so an EA consideration	inclusion	providing service	
Original	12	small staff winds up being important		-	providing service	backoffice
Original	12	shelving books		collection support	providing service	
Original	12	availability		availability	providing service	
Original	12	display to community		public use	providing service	

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Original	12	patron helping		one on one	providing service	
Original	12	Help – accommodate – go out of way		accommodate need	providing service	
Original	12	Non-students and non-traditional students		diversity	customers	providing service
Original	12	q1/q2 explicit implied [confusion here]		-	-	
Original	12	Definition of a rival – other universities?		competitor definition	backoffice	scoring
Original	12	explore and implement new technologies		implement new technology	providing service	
Original	12	exhibits and community outreach		community outreach	providing service	
Original	12	name recognition for University		name recognition	scoring	-
Original	12	"upstairs" → goals		-	-	
Original	12	staff development		staff development	-	backoffice
Original	12	"librarians are concerned" / staff vs librarian [is this significant]		-	-	backoffice
Original	12	"objective" metrics		metrics	scoring	
Original	12	administration Making decisions		-	-	
Original	12	get people to come		patron use	scoring	-
Original	12	Starbucks			-	providing service
Original	12	different events – hosting		new outreach	providing service	
Original	12	physical availability		access	providing service	
Original	12	jazz series		new outreach	-	providing service
Original	12	speaker series		new outreach	-	providing service
Original	12	use as ultimate objective		Objective – use	scoring	larger goal
Original	13	[distinct difference in background and credentials]			-	
Original	13	support student activities		student support	providing service	
Original	13	support classes		curriculum support	providing service	
Original	13	research and instruction of students		research support	providing service	
Original	13	whole goal: prepare students for career and life		prepared customers	larger goal	
Original	13	"very defined" [Univ. goals and Lib. Goals]		-	-	
Original	13	Basic activities ? [confusion!!]		-	-	

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Original	13	hands on access		-	providing service	
Original	13	subject area coverage		specialization	providing service	
Original	13	Q7 – [major issue] [don't know]			-	
Original	13	does best to fulfill vision		fulfill vision	providing service	
Original	13	research and answer location questions		patron support	providing service	
Original	13	“not prepared”		-	-	
Original	13	[briefest of interviews]		-	-	
Original	14	information literacy		information literacy	providing service	
Original	14	all levels including social media		multiformat support	providing service	
Original	14	“how to find”		location aid	providing service	larger goal
Original	14	cutting edge (but less so for faculty research)		support role	providing service	
Original	14	students who are capable – practical		able customers	larger goal	
Original	14	apply [skills etc] outside of student career		career impact	larger goal	
Original	14	[explicit implicit question – on the cusp of more data here]			-	
Original	14	rivalry no collaboration more the thing		Non-compete	backoffice	-
Original	14	avoid creating rivalry		Non-compete	backoffice	-
Original	14	[[goal determination]] [muddled]			-	
Original	14	Assessment – teaching success – uncertain		assessment question	scoring	
Original	14	annual staff review		staff review	scoring	
Original	14	risk of some disconnect – closing the loop [where was this]		disconnect concern	scoring	-
Original	14	query(media) format [im vs other] – record evaluation sophistication – complexity scoring		request complexity	providing service	scoring
Original	15	[distinctly different role here, shared really by only one other subject]			-	
Original	15	access to information		information access	providing service	
Original	15	Research – teaching needs		teaching needs Research needs	providing service	
Original	15	“campus community”		campus community	customers	
Original	15	special collections [notions of different		role distinction	providing service	backoffice

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		roles]				
Original	15	access to resources		resource access	providing service	
Original	15	physical (vs virtual?) library		nature of library	providing service	
Original	15	“hub of activity”		activity hub	providing service	
Original	15	making space and resources available (physical place for students)		assets	providing service	
Original	15	support teaching		teaching support	providing service	
Original	15	support research activities		research support	providing service	
Original	15	student engagement/promotion		student engagement	providing service	larger goal
Original	15	[[q1 q2 run together]]		-	-	
Original	15	[[confusion Towson the City vs the U]]		-	-	
Original	15	“everyone within library understands”		overall goals	backoffice	
Original	15	[[vocab issue on explicit vs implicit]]		-	-	
Original	15	routine activities → contribution		routine activities	providing service	
Original	15	easy to lose linkage		-	-	
Original	15	confusion as to rivals [[confused again]]		-	-	
Original	15	[[awkwardness over activities and rationale]]		-	-	
Original	15	university's positioning		university role	larger goal	
Original	15	new employee orientation		new hires	providing service	
Original	15	metro university		metropolitan idea	larger goal	
Original	15	teaching and applied research		teaching Applied research	providing service	
Original	15	engagement with community		community engagement	providing service	larger goal
Original	15	specific disciplines		specialization	providing service	
Original	15	Immediate region [stakeholders?]		local area	-	
Original	15	position in system [with respect to competition, unique role]		USM role	providing service	-
Original	15	collection maintenance		collection upkeep	providing service	
Original	15	librarian instruction		classroom teaching	providing service	
Original	15	interlibrary loan		system role	providing service	scoring
Original	15	surveys		surveys	scoring	

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Original	15	feedback [adjust activities]		results response	scoring	
Original	15	user needs		user need	scoring	
Original	15	new initiatives feedback		feedback	scoring	
Original	15	measurable objectives		measurable	scoring	
Original	15	priorities outcome performance measures		priorities Goals	-	scoring
Original	15	no detail on measures		measurement limitations	-	scoring
Original	15	flexible learning organization		learning organization	larger goal	
Original	15	Anticipate [[!!!]] and respond		anticipate need	larger goal	
Original	15	Information/research/instructional technology		broad service list	providing service	
Original	15	dynamic academic environment		academic and dynamic	larger goal	
Original	15	HR ties			backoffice	
Original	15	skilled knowledgeable staff		skilled staff	providing service	
Original	15	University Community ???		community idea	-	
Original	15	teaching and learning center for community		center idea	providing service	larger goal
Original	15	Services – resources – programs		broad service list	providing service	
Original	15	academic centrality		centrality in academy	larger goal	
Original	15	existing and created services		service list upkeep	providing service	
Original	15	forging partnerships		partnerships	providing service	backoffice
Original	15	leadership on campus		campus role	providing service	backoffice
Original	15	and leading in university system		system role	providing service	backoffice
Original	15	visible and valued		visibility	providing service	backoffice
Original	15	staffing numbers [[as feedback]]		staffing budget	scoring	
Original	15	portfolio of services		service portfolio	providing service	
Original	15	internship			providing service	
Original	15	digital library initiatives		digital library	providing service	
Original	15	content management services		electronic content	providing service	
Original	15	collection development		collection upkeep	providing service	

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Original	15	distance learning students		distant customer need	customers	
Original	15	institutional competition		-	-	
Original	15	adjust environment [[?]]		-	providing service	
Original	15	funding and grants as metric		budget as score	scoring	
Original	16	community resources services		community resource	-	
Original	16	[[q1 vs q2 issue]]			-	
Original	16	sorting information as a skill		information sorting	providing service	larger goal
Original	16	“other communities we serve”		external customers	customers	
Original	16	“somebody else” has written this down		-	backoffice	
Original	16	Barnes & Noble [as competitor]		competition id	backoffice	
Original	16	other campus units as rivals, also Google		competition id	-	backoffice
Original	16	End-point [??]		End-point	larger goal	
Original	16	physical location		physical service	providing service	
Original	16	numbers focused		metrics driven	scoring	
Original	16	photography to document [?]		-	-	
Original	16	university: dollars as metric		budget	scoring	
Original	16	spreadsheet of metrics		compiled metrics	scoring	
Original	16	“sell the story”		-	backoffice	
Original	16	return statistics are NOT kept		privacy consideration	larger goal	
Original	16	protecting privacy!		privacy consideration	larger goal	
Original	16	aggregated data only		privacy consideration	larger goal	
Original	16	wish for more (impact) stories		anecdotal lost	larger goal	
Original	17	efficient and effective service		effective service	providing service	
Original	17	“pushing” to let people know		build awareness	backoffice	
Original	17	academic to business model		mental modeling	backoffice	
Original	17	moving beyond university		external customers	customers	
Original	17	[?] DECO outreach		-	-	
Original	17	Cherry Hill [outreach initiative]		community outreach	providing service	larger goal
Original	17	University plan, library plan		university goals	backoffice	larger goal
Original	17	public libraries		-	-	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Original	17	not USM rivals – symbiotic		system role	providing service	customers
Original	17	number of items in collections – electronic included		collection count	scoring	
Original	17	teaching role		teaching service	providing service	
Original	17	“on the road” reference service		outreach	providing service	
Original	17	LibQual		libqual	scoring	
Original	17	middle states		external score	scoring	
Original	17	complicated questions !! [something watched for; also refers to these questions]		-	-	
Original	17	teaching replacing collection count		teaching	providing service	scoring
Original	18	information to students		information need	providing service	
Original	18	research access to information		research access	providing service	
Original	18	“go to website” (for mission)		-	backoffice	
Original	18	providing information		information provision	providing service	
Original	18	relevant(as in the ?) → ESSENTIAL		-	providing service	backoffice
Original	18	usability studies		usability studies	scoring	
Original	18	available hours of operation		facility availability	providing service	
Original	18	ease of finding information		ease of use	providing service	
Original	18	effectiveness surveys	who do these reach?	survey results	scoring	
Original	18	go out into the community (patrons – constituents – individuals)		community outreach	providing service	larger goals
Original	18	Phone – im – web – virtual – in-person		Support in multimedia	providing service	
Original	18	“hopefully” on par		scoring/comparison	scoring	
Original	19	information acquisition		asset acquisition	providing service	
Original	19	Vision versus mission ? [q1 vs q2 problem, again]		-	-	
Original	19	teaching future professional; academics		student results	customers	larger goal
Original	19	research support		research support	providing service	
Original	19	teachers teach; students learn; complete research		customer roles	providing service	larger goal
Original	19	written down; reinforced in other ways		-	backoffice	
Original	19	AV books print		broad services	providing service	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Original	19	material use (“how to”)		material use support	providing service	
Original	19	instruction		teaching	providing service	
Original	19	collaboration with faculty, selection		collaboration	providing service	
Original	19	Google as rival		competitor id	backoffice	-
Original	19	databases as competitors to Google		competitor id	backoffice	-
Original	19	bookstore competition	no one singles out amazon	competitor id	backoffice	-
Original	19	specific customer base		customer scope	customers	
Original	19	internal education and staff development		internal tools Large scope response	backoffice	
Original	19	short courses		service aspect	providing service	
Original	19	use of rival (Google)		competitor id	backoffice	
Original	19	[[questions hard to follow]]		-	-	
Original	19	[[terms very abstract]]		-	-	
Original	19	interlibrary loan – broader system		system role	providing service	customers
Original	20	“culture and identity”		-	-	backoffice
Original	20	central location for research		centrality	providing service	larger goal
Original	20	collaboration space		collaboration resource	providing service	
Original	20	mechanics of information use		teaching goal	providing service	
Original	20	net access		service	providing service	
Original	20	social aspect of search	what does this imply?	-	backoffice	-
Original	20	blend with urban environment		metropolitan role	providing service	customers
Original	20	university in Maryland environment		system role	providing service	customers
Original	20	“hungrier”		-	backoffice	-
Original	20	hands on instruction		teaching function	providing service	
Original	20	“discrete steps in research process”		research teaching	larger goal	
Original	20	Google, Wikipedia as competitors and allies		competitor id	backoffice	
Original	20	3rd electronic books versus whole collection		collection mix	-	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Original	20	assessment committee (Standing)		internal thinking	scoring	
Original	20	physical details: noise levels, group and quiet spaces		asset mix	providing service	
Original	20	marketing efforts – go out (including committee), overlap		outreach	backoffice	
Original	20	collegiate experience		collegiate experience	larger goal	
Original	20	exhibits displays		outreach	providing service	
Original	20	tiered service – Univ Md National	interesting thought here	system role	providing service	customers
Original	20	LibQual		libqual	scoring	
Original	20	Conferences – publication … included as a measure		external notice	backoffice	scoring
Original	20	MD Library Association involvement		external notice	larger goal	
Original	21	active participation; partner		engagement	larger goal	
Original	21	“Towson community”		community role	customers	
Original	21	proactive outreach		proactive Outreach	backoffice	larger goal
Original	21	different [vision vs mission [confusion]]		-	-	
Original	21	student research support		research support	providing service	
Original	21	broad range (not all futuristic)		-	-	
Original	21	flexible		flexible	providing service	
Original	21	mobile technology		mobile tools	providing service	
Original	21	bring to the table – institutionally		institution role	customers	
Original	21	faculty staff community		community	customers	
Original	21	lifelong learning		lifelong learning	larger goal	
Original	21	producing citizens		student outcome	larger goal	
Original	21	greater vision – appropriateness ??		-	-	
Original	21	thinking about metropolitan		metropolitan	larger goal	
Original	21	competition question (?? [confusion])		-	-	
Original	21	academic and google competition		competitor id	backoffice	
Original	21	“certain standards” for information		customer outcome	larger goal	
Original	21	search and find without noticing library		ease of use	providing service	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
		has paid for things				
Original	21	purchaser of information - book collection		collection upkeep	providing service	
Original	21	“fighting for a certain kind of survival”		changing role	backoffice	
Original	21	“classic library may be on its way out”		overall role	backoffice	
Original	21	“administrators don't want to pay for it” even at R1 schools		getting budget resources	scoring	
Original	21	difference forms of outreach / “too much”		outreach overkill	backoffice	
Original	21	at table – thought of		role considered	larger goal	backoffice
Original	21	select materials for collection		collection upkeep	providing service	
Original	21	tailor to what is being taught		curriculum support	providing service	
Original	21	support faculty research “only to an extent”		research support	providing service	
Original	21	grad programs can take that [faculty] support further		research support	providing service	
Original	21	in Google-version “not happening”		-	-	
Original	21	“respond”		responsiveness	providing service	
Original	21	“for the portfolio” in response to competing successfully		competition scoring	scoring	
Original	21	seat occupancy		physical patron count	scoring	
Original	21	“don't know” hard number targets		scoring evaluation	scoring	
Original	21	ACRL stats		ACRL metrics	scoring	
Original	21	justification stats		metrics use	scoring	
Original	21	libqual		Libqual	scoring	
Original	21	“want-got gap”		aspirations	larger goal	
Original	21	quiet space for study		physical resource	providing service	
Original	21	departments “that are interested in efficiency”		metrics application	scoring	
Original	21	don't want service to drop		service numbers	scoring	
Original	21	embedded librarian program (reference svc on site)		internal outreach	providing service	backoffice
Original	21	“difficulty with priorities”		prioritize	backoffice	
Original	21	Integral – being a partner & to be seen going out		being seen	backoffice	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Original	21	[cannot answer[[question on objectives achievement[			-	
Original	21	“overwhelmed” [q 9 and 10]			-	
Original	22	information literacy instruction – handouts		info literacy	providing service	
Original	22	everything on the web		access goal	providing service	
Original	22	everything done to communicate and further goals		goal application	providing service	larger goal
Original	22	“anything done to make information accessible”		accessibility	providing service	
Original	22	enterprise variant on this idea [me] how to do that within $ etc constraints			-	
Original	22	[environment needs clarification]			-	
Original	22	self sufficient students		student goals	larger goal	
Original	22	mission vision visibility		visibility	backoffice	
Original	22	book circulation and public use computers		varied assets	providing service	
Original	22	study space		varied assets	providing service	
Original	22	rival: bookstores		competitor id	backoffice	
Original	22	ACRL libqual goals		External-driver goals	scoring	
Original	22	[nested questions – problems on later parts if they shrug/don't-know]			-	
Original	23	High quality support; students faculty staff overall univ. community		support identification	providing service	
Original	23	resources to further academic and scholarly endeavors of that community		scholarly, academic endeavors	providing service	larger goal
Original	23	student and faculty success is foremost in mind of university		customer success	larger goal	
Original	23	[implicit versus explicit] issues			-	
Original	23	“goals included in everything we publish”		goal driven	providing resources	larger goal
Original	23	provide resources, and teaching		resources Teaching	providing resources	
Original	23	competitors: internet and google		competitor id	-	
Original	23	“value added” of library; vetted scholar reliable way to get information		value added	providing resources	larger goal
Original	23	space for access reading study		physical asset	providing resources	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Original	23	competition handled with interlibrary loan of USM system		USM role	-	
Original	23	user satisfaction assessment done with respect to service personnel staff knowledge resources (content and access) space and hours		feedback on utility	scoring	
Original	23	liaison setup and feedback		liaison setup	providing resources	backoffice
Original	23	teaching and info literacy skills		teaching info literacy	providing resources	
Original	23	space and noise considered		physical asset tuning	providing resources	
Original	23	“constant improvement” - culture of this		constant improvement	backoffice	larger goal
Original	23	access to resources – where to get and how to get		resource access	providing resources	
Original	23	[[activities question sidestepped]]		-	-	
Followup	24	Workstations for public	public machine service what apps to offer?	public workstations general availability software maintenance licensing	Specific asset group - public	new bubble
Followup	24	Fac/staff have own computers.	Internal needs are?	staff workstations custom tool choices unique configurations	Specific asset group - staff	
Followup	24	PCs deployed close to assets/work locations	Mobility/convenience for staff	task-centric workstations multiple staff users	Specific asset group - staff (task/location)	
Followup	24	Handout generation tools	Basic office suite? How chosen?	publication tools output for public use	Role/task specific apps - publish	
Followup	24	Jing	Collaboration tool - purchased?	collaboration need staff tool	Role/task specific apps - document/collaborate	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Followup	24	Snippit	Screen capture tool	capture/documentation need staff tool	Role/task specific apps - document/collaborate	
Followup	24	Screen hunter	?	need more info	?	
Followup	24	iTunes	Role specific app.	role specific application use staff toolbox item	Role/task specific apps	
Followup	24	music handling applications	Role specific app.	staff toolbox item(s) how used?	Role/task specific apps	
Followup	24	Streaming DBs for audio/visual	Both service	role specific application use staff toolbox item	Role/task specific apps - info	
Followup	24	Grad students work from home	Suggests remote access considerations	remote access needs scoping/decision on what offerings	Patron need Selection/configuration impact	
Followup	24	databases	DB as provided asset for users	discipline specific	Managed choices/asset selection	
Followup	24	most items daily to weekly	Span includes weekly	daily/weekly usage for many tools	Frequency - weekly	
Followup	25	hardware - staff	This needs more…	staff workstation	-	
Followup	25	hardware - public pcs	This needs more…	public workstation - itself a service	-	
Followup	25	aleph (ILS tool)	ILS as central point	ILS - major item (Aleph)	Key Asset - ILS	
Followup	25	phones		Basic communication service separate management/etc chain	Key Asset - Phones	
Followup	25	MS Office	Which components?	General use tool	Key Asset - Office Apps	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Followup	25	communications tools minute to minute use	Reliability consideration here.	communication toolset time factor->critical asset	Key Asset - Comms tools	
Followup	25	Aleph - less frequent on circulation component	ILS	Aleph/ILS frequency suggests critical	Key Asset - ILS	
Followup	25	usage statistics for databases	Score keeping capability	metrics needs for assets tracking usage	Expectation - usage tracking	
Followup	26	SPSS often requested	SPSS request;provided?	Requested service item	User request	
Followup	26	Math program(s)	Math apps.	Requested service item	User request	fits in earlier category
Followup	26	Databases (subscription)	Which DBs - licensing consideration	Managed assets Part of info and service portfolio	Asset selection	fits in earlier category
Followup	26	ILS (Aleph)	ILS again.		Key Asset - ILS	
Followup	26	"Aleph use" is hourly.	ILS again.	ILS as key item	Usage frequency	
Followup	26	Phones - daily	Phones as component; score keeping link?	Customer interaction tool reliability consideration	Usage frequency	
Followup	26	Internet access	General interconnect	Customer interaction tool reliability consideration foundational asset	Dependency Communication Usage frequency	
Followup	26	email	General tool - email	Customer interaction tool Internal comm. Link	Dependency Communication Usage frequency	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Followup	26	shared drives - routine	Staff internal big item	Internal workspace Managed how? Followup needed?	Dependency Usage frequency Key asset	
Followup	27	Network	General interconnect	Backbone item	Dependency Communication Usage frequency	
Followup	27	Workstations	Workstations for…?	//Vague//		
Followup	27	sharepoint	Staff internal; others?	Staff use communication tool	Key asset - check	
Followup	27	remote access/control suite ("for me")	Remote admin capability	Staff use mgmt/maintenance tool	Role/task specific apps	
Followup	27	daily use for the above	Some routines daily task driven	Task-driven routine	Frequency - daily	
Followup	27	quarterly use for PDQ inventory tool	Asset tracking - inventory & assess	Inventory tool (PDQ) Regular but not daily use	Frequency - quarterly	
Followup	27	virtualization technology mostly during the summer	Virtualization - support tool	Staff use item internal/maintenance tool Regular but not daily use	Frequency - quarterly	
Followup	28	Technology expertise (used asset)	Expertise - also an asset	Staff expertise --Unique mention--		
Followup	28	Software for reports and planning	Reporting, planning apps	//Need list here?	Role/task specific apps	
Followup	28	communications apps	Which apps? (email?)	Communication-internal Communication-outward facing	Key asset	
Followup	28	daily (for comms.)	Management relies on comms flow.	Reliance on comms.	Frequency -daily Dependency	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Followup	28	Tech support, regularly	Internal tech support	//vague//		
Followup	29	ILS is core item - inventory for library	ILS=most of inventory	ILS as inventory	Key asset	
Followup	29	peripheral items handle newer items	Newer items=other systems	Inventory tools (other) //need elaboration	Key asset	
Followup	29	web presence, web servers & services	web presence systems web presence services	Web presence Required assets Presence availability linkage	Key asset Dependency	
Followup	29	access to digital collections (or index them)	digital collections links to general search/etc	Findability need Indexing Access requirement	key asset - service	
Followup	29	individual staff computers	What on staff PCs? Not all same thing	Staff used/defined asset Local toolbox(?)	Specific asset group - staff	
Followup	29	lab environment	Public pc config.	Public service asset Granular config?	Specific asset group - public	
Followup	29	"big four" pieces	-	//interesting but vague	-	
Followup	29	Daily uses for most items mentioned	varied usage	Routine activities	Frequency - daily	
Followup	29	maintenance of lab environment is daily/hourly effort	lab control and support	Cost of ownership Maintenance burden Oversight burden?	Frequency - daily Operational consideration	
Followup	29	ILS use "infrequent"	ILS use varies	ILS again	Key asset	
Followup	29	Web content/support is more a weekly item	web presence systems web presence services	Web editing/upkeep Public facing web (here)	Frequency - weekly	
Followup	30	Content DM	digital collections tool	Digital collections Public tool Internal tool	Key asset	
Followup	30	Word	Document generation	Office apps (explicit)		

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Followup	30	Excel	Numeric data app	Office apps (explicit)		
Followup	30	Social Media (needed a prompt)	Catchall social media	Category of apps	-	
Followup	30	Facebook	publishing forum	Specific social app	Specific asset - public	
Followup	30	Google Plus	publishing forum	Specific social app	Specific asset - public	
Followup	30	Twitter (sort-of)	publishing forum	Specific social app	Specific asset - public	
Followup	30	History Pin (geolocation plus pictures)	publishing forum	Specific social app	Specific asset - public	
Followup	30	blog tool	publishing forum	Specific social app	Specific asset - public	
Followup	30	google analytics (routine but not daily)	tracking mechanism	Record/scoring for usage	Frequency - weekly	
Followup	30	individualized tasks	nature of job	daily routine (comment)	Frequency - daily	
Followup	30	google Form	Input collection	Data collection need Implies data collection Implies data analysis need Business/forms requirement	Role/task specific apps	
Followup	30	Sharepoint (internal)	Internal/supporting tool - sharepoint	Internal process/etc tool	Key Asset	
Followup	30	Shared drives & network (hourly use)	Internal/supporting tool -drives	Internal "file cabinet"	Key Asset	
Followup	31*	The ILS -- Aleph	*:Interview 31 conducted via email for schedule reasons	ILS again	Key Asset	
Followup	31*	Microsoft Office products	Tool for creation	Office apps (explicit)	General use	
Followup	31*	Outlook	Example of above	Office apps (explicit)	General use	

Original/ Followup	Interview #	Interview quote/observation C1 *[ ] or [[]] indicate observation*	Note/comment/ clarification	open code(s)	axial code (primary)	axial code (secondary) *Optional*
Followup	31*	SharePoint	Internal depository	Internal process/etc tool	Key asset	
Followup	31*	ILLiad	Specific tool/nature of position	Role specific app	Role/task specific apps - highly specific	
Followup	31*	Various databases	Might require a revisit	Managed assets Part of info and service portfolio	Role/task specific apps	
Followup	31*	Pidgin (chat widget)	Collaboration tool	Specific social app	Role/task specific apps	
Followup	31*	Website/Content Management System (soon to be ... Drupal?)	Internal depository	Social/publication app	Specific asset - public	
Followup	31*	Blackboard / Learning or Course Management System	How used?	Social/publication app	Role/task specific apps	
Followup	31*	Google Docs	Internal depository/tool	Social/publication app	Role/task specific apps	
Followup	31*	FourSquare, Facebook, Twitter	Internal depository/tool	Specific social apps	Specific asset - public	
Followup	31*	Blog	Internal depository/tool	Specific social apps	Specific asset - public	
Followup	31*	ContentDM	Internal depository/tool	Social/publication app	Specific asset - public	
Followup	31*	CampusVoice		Specific social app	Role/task specific apps	
Followup	31*	Daily or Weekly --> Aleph, Office, Outlook, ILLiad, databases, Pidgin, Blackboard	Interesting distinctions	daily routine (comment)	daily/weekly frequency	
Followup	31*	Quarterly --> SharePoint, Website/Content Management System, GoogleDocs	No mention of dates/specific events..	quarterly use	quarterly frequency	

Appendix C: Complete Post-Coding Figures Set

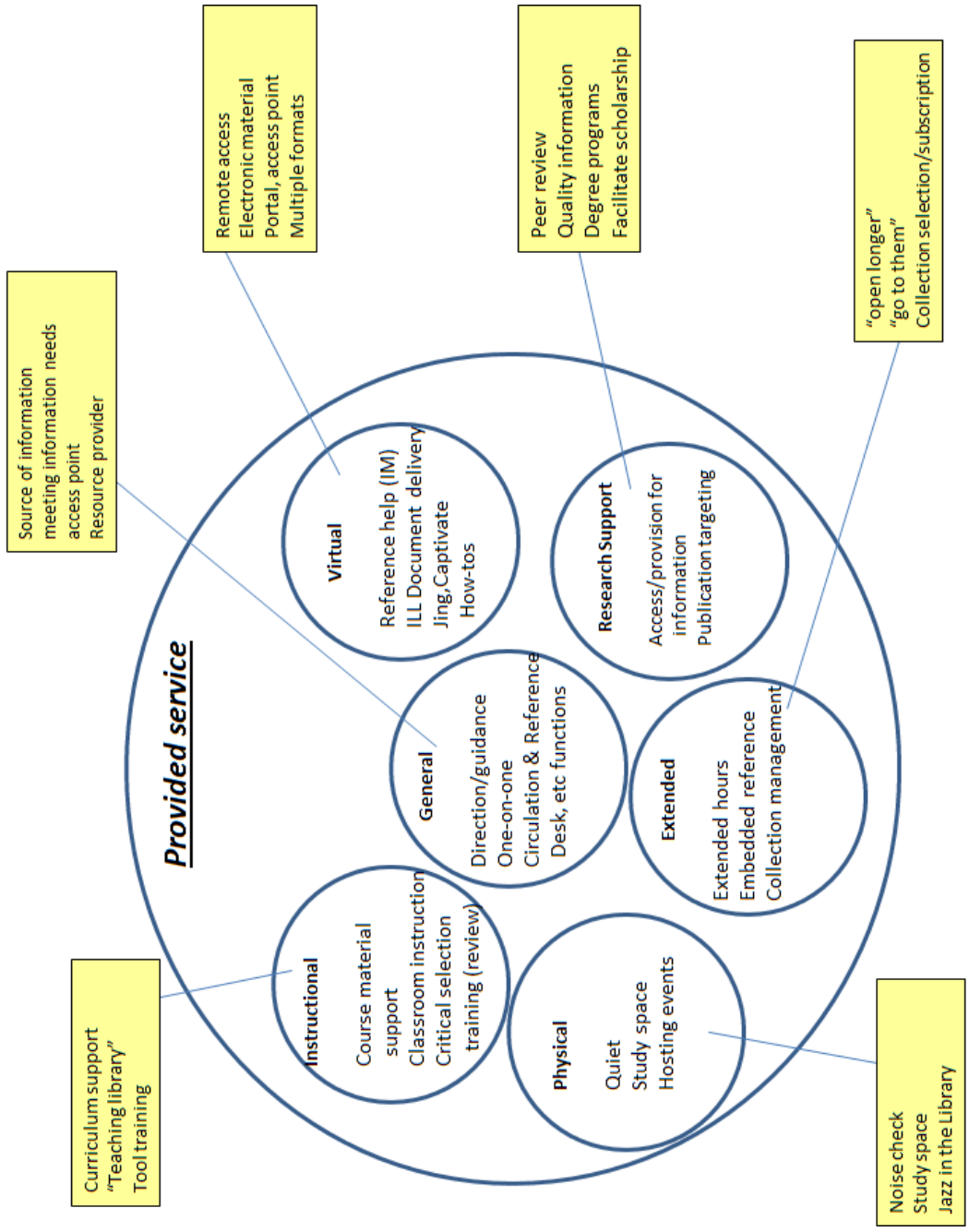

Figure 12: Example Grouping Circle with Overlain Example Codes/Coding

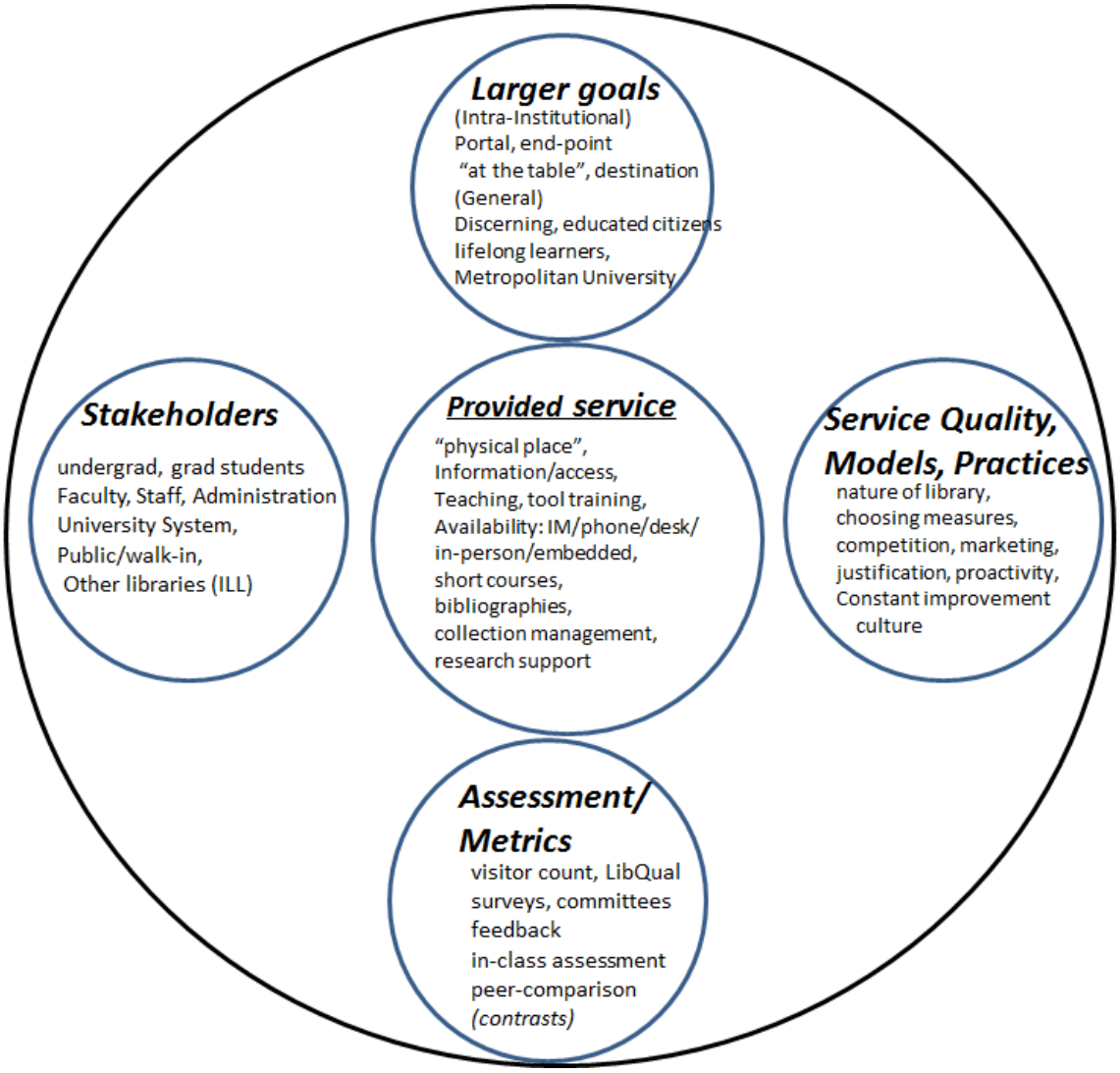

Figure 13: Composite Diagram - Groupings Based on Codes/Coding

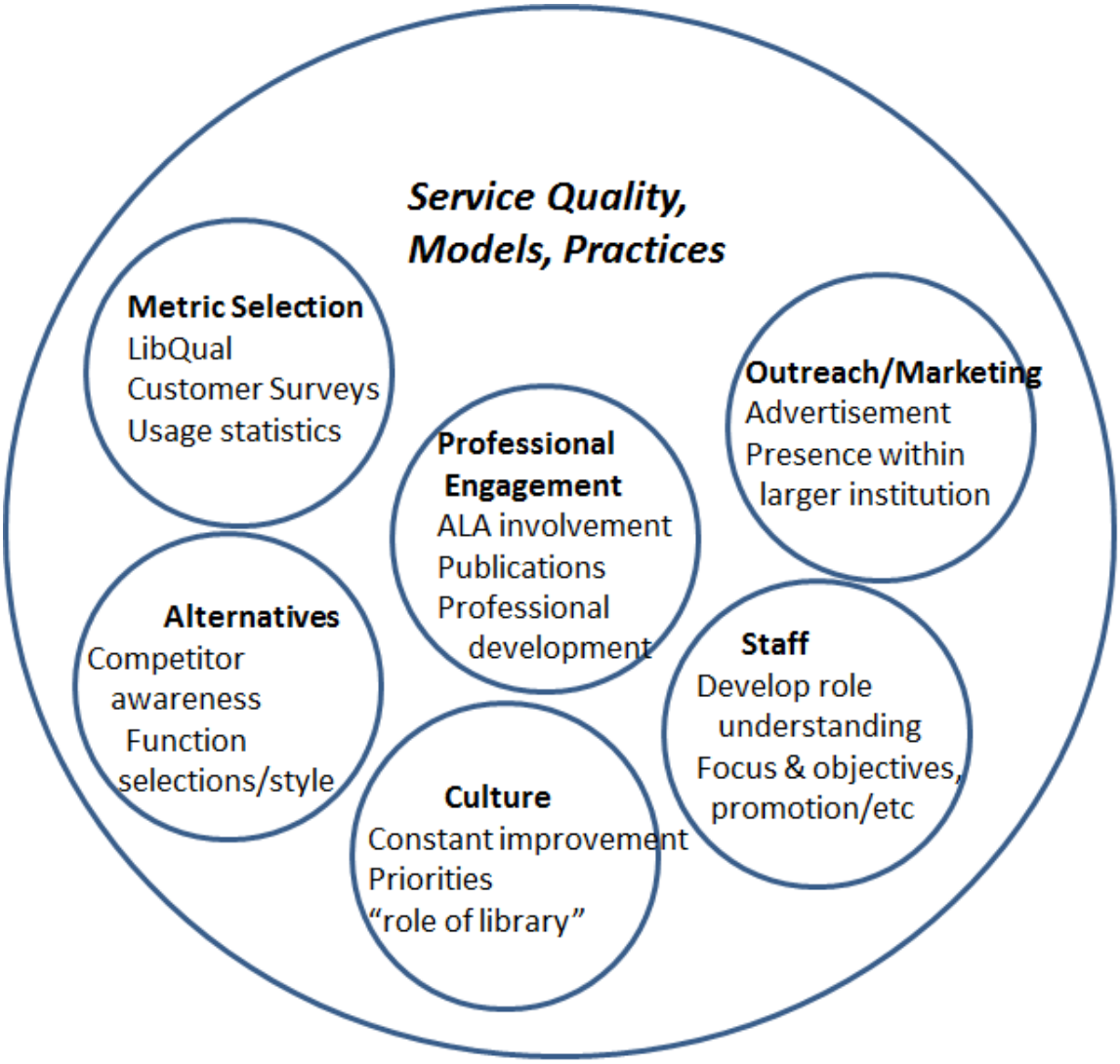

Figure 14: Service Quality, Models, Practices - Grouping From Codes/Coding

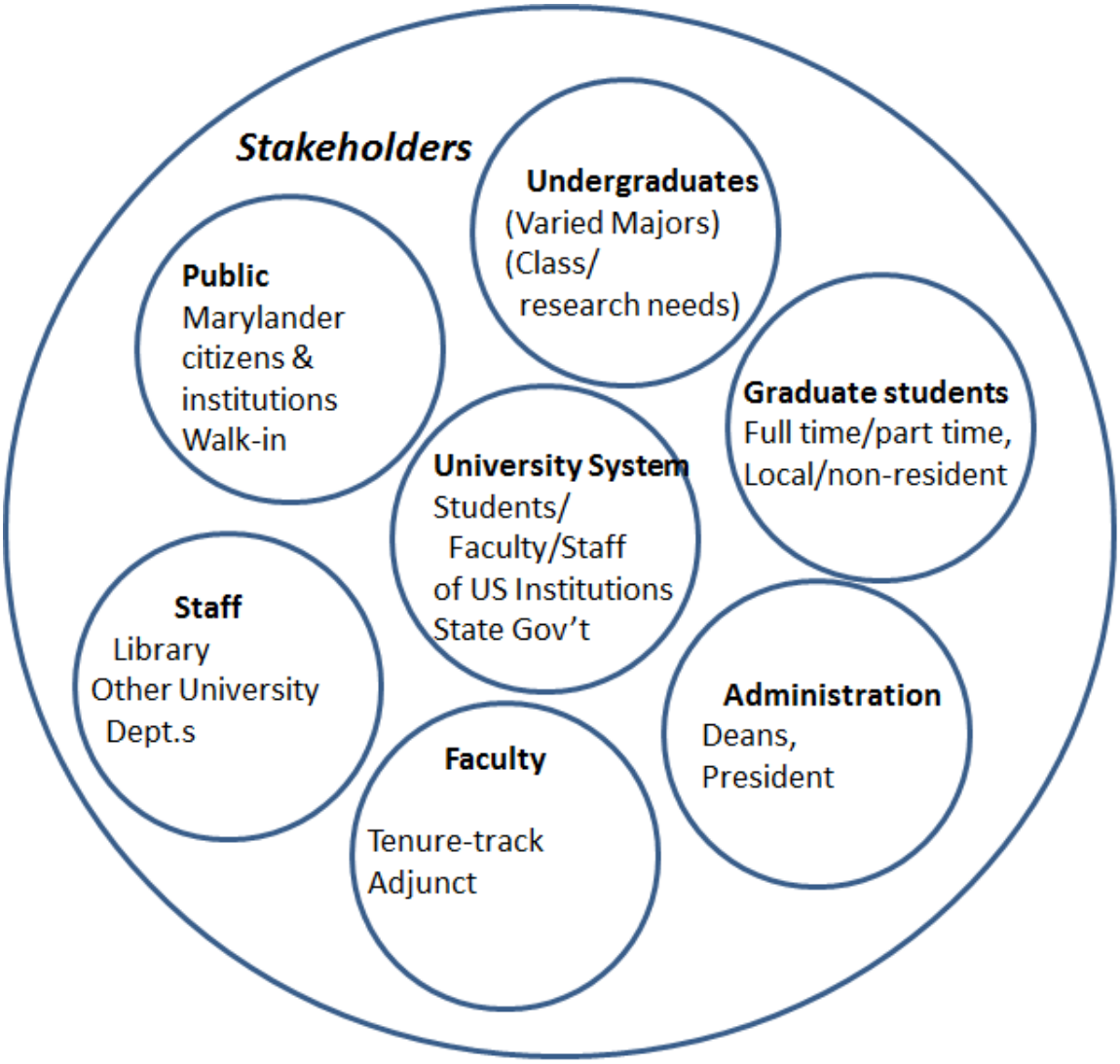

Figure 15: Stakeholders Grouping, Based on Codes/Coding

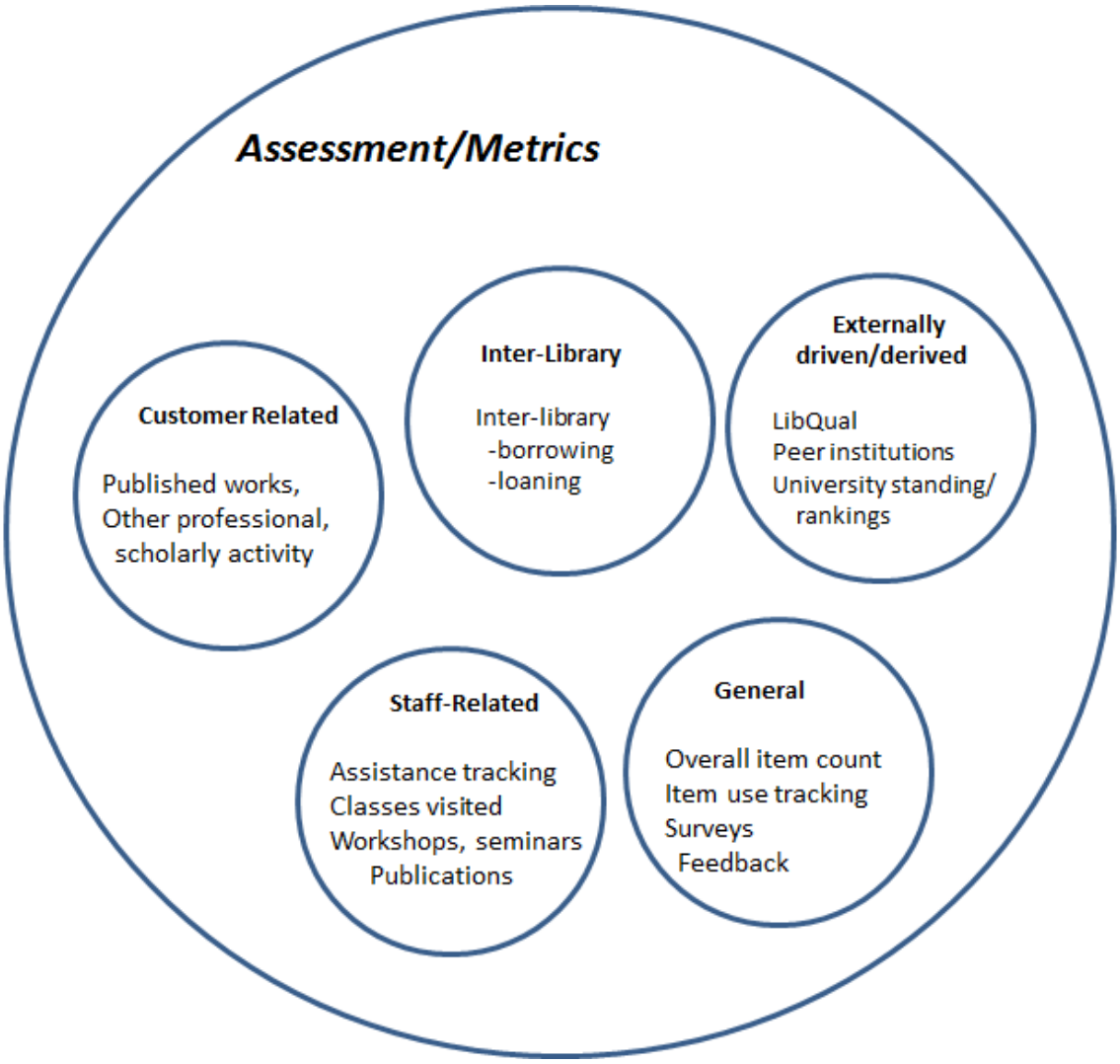

Figure 16: Assessment/Metrics Grouping, Based on Codes/Coding

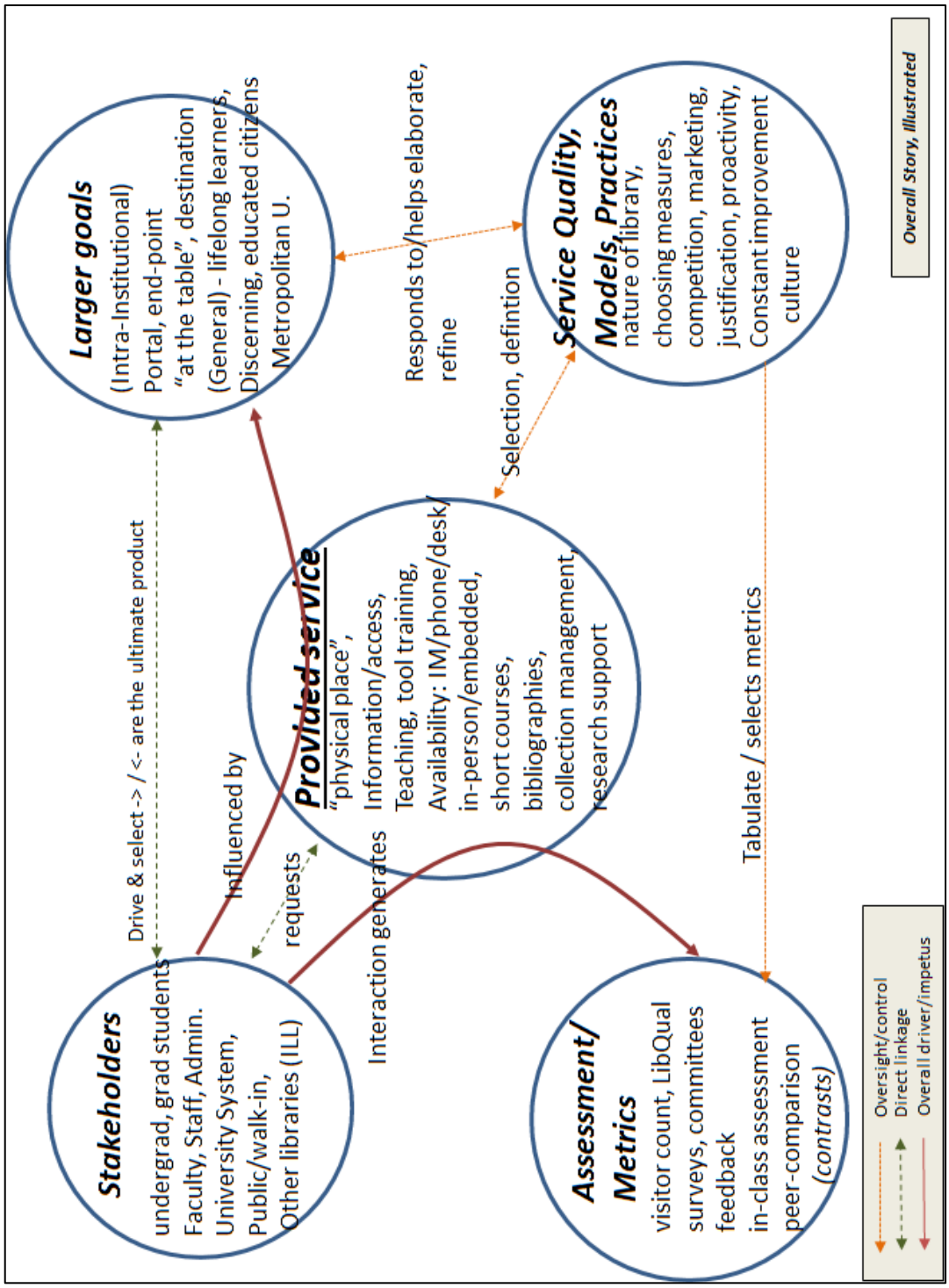

Figure 17: Interrelated Concepts Diagram, Based on Codes/Coding

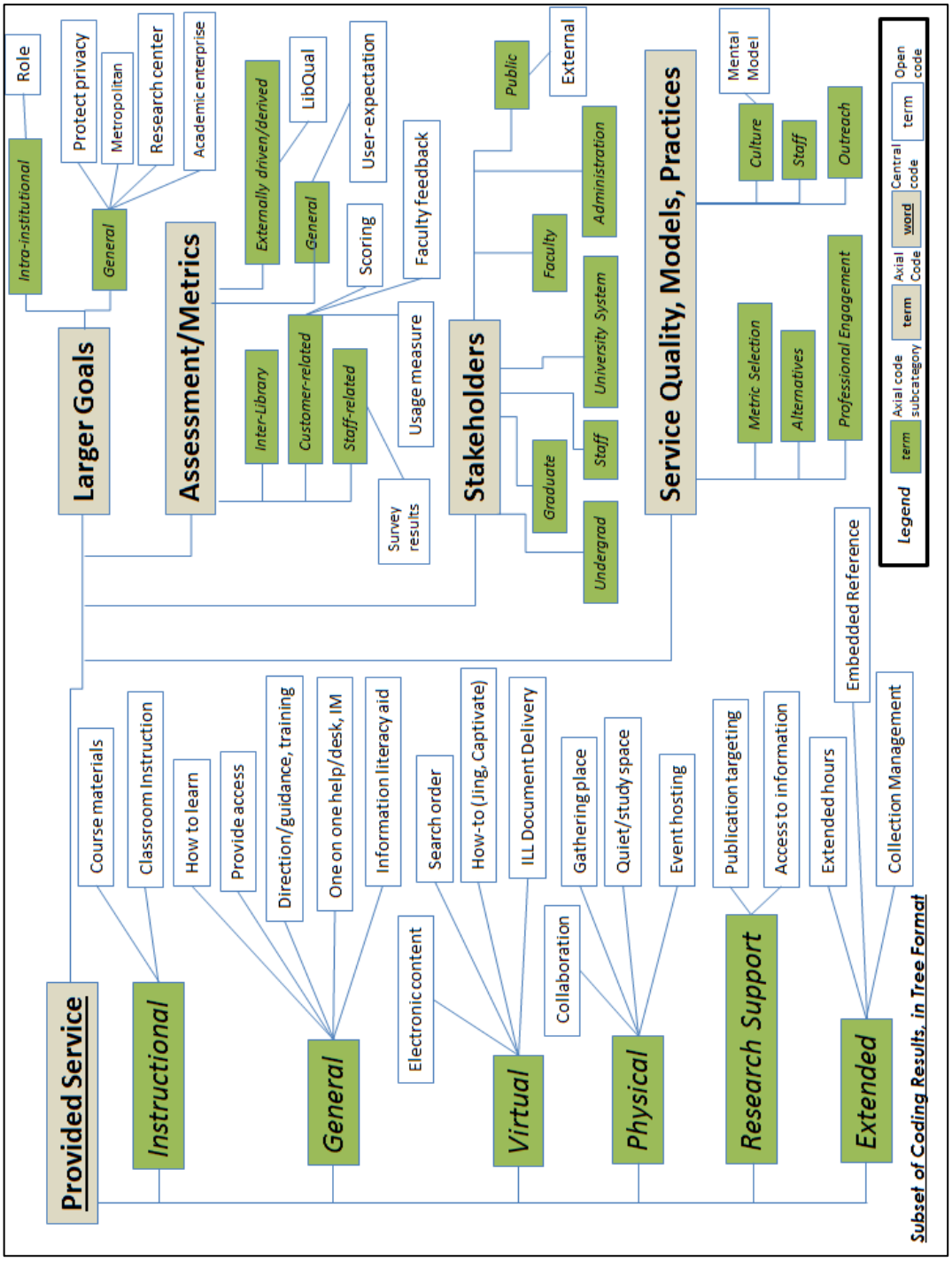

Figure 18: Tree View of Concepts Based on Codes/Coding

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