**Digital Ecosystems: EA Governance Impacts to Future Planning**

by

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**Abstract**

The Internet of Things (IoT) and digital ecosystems are on the rise as more advanced technology and data are presented and implemented in companies. With this rise, there are risks and costs which companies may fail to recognize over time. This can result in a digital ecosystem failing to provide benefit to a company over time and a lack of processes to maintain the ecosystem. As the systems become more complex, the costs over time will increase at a growing rate. In order to help control costs, this research explore the relationship between effective enterprise architecture management governance practices and costs over time. This paper investigates the steps to effective Enterprise Architecture Governance (EAG) and address how it can benefit companies with a digital ecosystem over time.

*Keywords*: *IoT, Internet of Things, EA, Enterprise Architecture, Governance, EAG, digital ecosystems, risks, costs, CIO, TOGAF, SOA, System Oriented Architecture, SaaS, PaaS*

**Digital Ecosystems: EA Governance Impacts to Future Planning**

Connected technology is technology that consists of mobile devices, social networks, smart devices, intelligent homes/cars, and computers. By combining these technologies, we begin to see an interconnected web of abilities that have advanced business capabilities. This interconnected web becomes an ecosystem of data and information, which can be used by companies for their benefit. According to Zhang & Jacob (2011), “a key principle to digital ecosystems is the interactivity which is found in most companies.” One frequent problem associated with the ecosystem is complexity, which prevents the effective use of data and information. Companies can benefit from large amounts of data and can experience continuous growth if they establish methods and processes to use this data and information to sustain the digital ecosystem through scalable solution. As stated in Li et al., (2012, p. 119) “scalability is the ability of a system, network, or process to handle growing amounts of work in a graceful manner to accommodate that growth.” According to Li et al., (2012, p.119), researchers have analyzed digital ecosystems and have found issues ranging from costs, poor management, and no enterprise architecture standards or methods. Li et al., (2012, p.119) stated, “due to digital ecosystems being so complex and little known research has been done, challenges arise with the development and system architecture due to the uncertainty of governance over time and stakeholders’ involvement.”

Governance can be defined as “the combination of activities of developing and managing cohesive and consistent policies, processes, and decisions right for a given area of responsibility” (Chang & Uden, 2008, p. 340). Governance is one aspect of Enterprise Architecture and it plays a critical role in process improvement needed to align the vision and strategy. An IT definition of Enterprise Architecture is defined by Tambo & Baekgaard (2013) as “generally a representation of systems and processes in the organization derived from the alignment between business strategy and technology implementation.” When we look at EA as a strategy, it can help control the costs of the program. Before we delve into costs associated with ecosystems, we need to see why there is a problem with the lack of governance and how upper management feels about governance as part of their future plan. Some researchers discovered through surveys of CIOs/CEOs that 75% felt Governance was critical; however, only 40% were only taking actions towards this direction (Bhattacharjya & Chang, 2007). Thus, it seems that urgency is lacking for executives to establish Governance, nor was it of concern to have it in place for future growth.

As we continue to look at the Governance, we will shift our focus back to ecosystems and see how Governance will help Digital ecosystems maintain steady growth and becoming less complex. In 1997, with the creation of Web 2.0, digital ecosystems became more involved and systems began “talking” more and more. As technology continues to grow, we will see service-oriented architecture (SOA) based frameworks becoming a more frequent occurrence and a need to have Governance to help maintain these processes, security, models, etc. (Schepers, Iacob, & Van Eck, 2008)

In this research project, the basic terms and definitions of digital ecosystems will be explored followed by Enterprise Architecture and Governance. Then, the paper looks at how digital ecosystems are established and how EA will benefit continuous growth through various steps of planning and risk management by establishing methods and guidelines. By addressing these topics, the question of why it is important to establish EA and EAG for digital ecosystems and how costs are impacted over time by showing effective measures of EAG. Lastly, the research findings provide insights and steps in an established governance best practices to help reduce costs in IT growth of digital ecosystems.

**Literature Review**

As systems get more complex and reliant on each other, they are used by businesses to help grow and market their business. According to Briscoe & De Wilde (2006), “An Ecosystem-Orientated Architecture, called a Digital Ecosystem, is built upon a SOA and that uses a novel form of Distributed Evolutionary Computing (DEC) for automatic combining of available and applicable services to a scalable architecture.”

According to Li et al., (2012, p.119) an IT centric definition of digital ecosystem is “a digital environment populated by digital components which can be components, services, business processes, and models.” With the creation of cloud-based networks, it is easier to connect these nodes together, which make delivery even easier.

Other advancements in technology led to improvements in communication through Voice-Over Internet Protocol (VoIP), electronic mail (e-mail), instant messaging, two-way video calls, mobile technology, blogs, forums, social networking, online shopping, etc. (Karakas, 2009). All of these items are now interwoven into the infrastructures of businesses to collect information about markets, people, businesses, products, etc. by capturing and delivering data in order for the businesses to become better for the consumer though cloud-based infrastructures (Karakas, 2009).

With the continuous growth of technology and advancement of systems, the need for these complex ecosystems is the wave of the future. According to Darwish & Lakhtaria (2011), the key concept behind digital ecosystems is the ability to capture data to help generate a continuous and autonomous growth. Data have become a focal point of most companies because of Web 2.0 and soon Web 3.0 practices are being introduced (Darwish & Lakhtaria, 2011). It seems that most companies have a connector to a social media outlet (Facebook, Twitter, and Instagram), mobile device (tablet or cell phone), computers (laptops or desktops), etc. interconnected through clouds transmitting data back and forth to these systems (Ravenscroft, Warburton, Hatzipanagos, & Conole, 2012). As someone connects to a business and looks at a key area on their site, the users’ metadata is captured and leaves a thumbprint. This thumbprint tells a business a lot about the individual and what they are interested in. This data is housed and then analyzed for relationships and interpreted for other businesses (Ravenscroft et al., 2012).

Digital ecosystems are found across businesses of all sizes. Regardless of size, the systems are still complex in nature and still have to work together through an interwoven network. As for small and medium businesses, they may utilize more open-source technologies through an open-source distributed environment to help create and deliver their applications whereas a global business will use all means to help delivery of its applications across the globe (Dini et al., 2008). Global businesses would have subject matter experts (SMEs) to help in the cooperation of components and application adaption to local needs. By doing so, allows businesses the capability to become active players in a global network by creating networks on a global scale (Gerard Briscoe & De Wilde, 2006). For global businesses, they will have a many to many SME relationship meaning businesses will have SMEs in their locations across the globe to help with any application delivery needed for their established clients and new customers (G. Briscoe & Marinos, 2009). With these global businesses, their processes are even more complex requiring more resources to maintain and monitor these various technologies and systems (G. Briscoe & Marinos, 2009). Again, the smaller business will still have to monitor and maintain their systems as well. According to (Stanley & Briscoe, 2010), SMEs have some of the following issues when it comes to knowledge and process management:

* Lack of technical knowledge and expertise amongst SMEs.
* Lack of technological solutions and issues of interoperability.
* The costs of setting up the e-business architecture, deflecting capital from the firm’s core business.
* Legal/regulatory mismatch when trading digitally across borders.

With the complexity of systems, we see companies integrate on a more service-oriented architecture with their current infrastructure and encompass more of an Enterprise Architecture Model to help model their processes to see where gaps are in the business (Gerard Briscoe & De Wilde, 2006). According to Zimmermann et al. (2013), the current state of businesses lacks the understanding of enterprise architecture for services and cloud computing and the management of these processes. This is a major problem with digital ecosystems today and one of the main reasons why costs are high. By turning our attention to Enterprise Architecture, we start to look at management of digital ecosystem processes, methods and capabilities. By integrating EA practices, we have the potential to enhance these systems and possibly reduce the cost.

**Enterprise Architecture**

According to IEEE standard 42010:2011, architecture is defined as “fundamental concepts or properties of a system in its environment embodied in it elements, relationships, and in the principles of its design and evolution (Drews & Schirmer,2014).” Enterprise Architecture in a holistic digital ecosystem has the capability of aligning business constructs with the IT constructs to help manage the evolution of the ecosystem (Gerard Briscoe, 2010).

When trying to apply the term of enterprise architecture to digital ecosystems, we have to break down the ecosystem into the various services, technologies, processes, models, and business terminology. This will allow us to evaluate the pieces and see how enterprise architecture relates to the ecosystem. The challenge with introducing Enterprise Architecture to digital ecosystems is the complexity of the processes and systems involved. Also, couple this with the lack of understanding from management makes it difficult to establish effective practices of Enterprise Architecture. The understanding comes from experience and time. With experience and time, the company needs to encompass the processes, resources, and establish a framework to help the business processes around the data. Upon further research, individual analysis was performed to see the breakdown of the analysis techniques used for Enterprise Architecture Meta data. It was discovered that eight types of analysis techniques could be used on a company to evaluate how their enterprise architecture looks at the metadata. These analysis techniques are broken down and listed below by (Winter & Schelp, (2008), pg. 549):

* *Dependency analysis* is used to exploit the associations between the various EA artifacts to derive direct and indirect dependencies. This is done through cross-reference reporting.
* *Coverage analysis* spawns two layers of EA and the results are usually represented through matrices relating the two dimensions of interest. Redundancies and gaps are identified.
* *Interface analysis* focuses on the interfaces within a class of EA artifacts. This is usually represented through the software components specified within software architecture. The goal is to minimize coupling and maximize cohesion.
* *Heterogeneity analysis* is used to identify those architecture elements that should be reconsidered or refactored to improve overall architecture homogeneity. These structures have a tendency to reduce the costs for maintenance, software/hardware licenses, and treat similar concerns equally.
* *Complexity analysis* is related to interface analysis. This analysis is measured through metrics as well. These metrics calculate a complexity measure based on the number of architectural components and the dependencies between the components. The goal is to reduce the overall EA complexity. Some of the questions are answered through certain policies (like process and data ownership) and are defined on a certain organizational level of abstraction.
* *Cost analysis* is analysis that calculates and reports the costs induced by certain and maintenance of various EA artifacts (e.g. costs of implementing a new program.) An important application of costs techniques is through the IT related costs and the allocation of these costs to products, services, processes, organizational units, and other artifacts on a strategy layer and on an organizational layer.
* *Benefit analysis* is analysis used to show the contributions of the products, services, processes, organizational units, and other artifacts on a strategy layer and on an organizational layer. This is used to show how the overall goals are achieved for the organization and are documented thoroughly with a set of KPIs.

The various analyses are very important in determining where in the EA process the technique is being applied in the organization. By looking at Enterprise Architecture as a strategy, it can be used to present a case to management on how the processes, methods, etc. will align with the business goals and achieve the big picture overview that management will need to review and communicate between the various units of the business and IT. By addressing EA as the over-arching process and structuring these processes to align the goals of the company through the business and through IT, it can help paint the picture of the need for EA. According to Korpela et al (2013), it is usually best to draw a model of the digital ecosystem and see how EA overlays onto the model. The processes and methods discussed should be broken down in the layers and documented thoroughly. Then, the evaluation of the model will be able to see the gaps and the needs for improvement. Models should take into account the requirements of different business stakeholders for designers; architecture must be usable by end users, acquirers, the system's owner and operator, etc.

The issue encountered in the literature is there was limited data on designing and analyzing a digital business ecosystem. This made it difficult in applying EA industry standards and determining the best approach to enterprise architecture with the development of digital ecosystems. When applying Enterprise Architecture, it is important to establish the correct framework, whether it is (CADM, RM-ODP, 4+1 View Model, TOGAF, DoDAF and the Zachman Framework) (Korpela et al, 2013). Next, it is important to perform a gap analysis in business processes and work with the key stakeholders involved. After identifying the gaps, it is suggested to use the business processes along with the models to design the layers involved (Korpela et al, 2013). Then, analyze the layers using the key analysis techniques to lay out the artifacts for enterprise architecture. Once the artifacts are presented (Data models, Portfolio Management, Maturity Assessment, etc.), then it will be able to present the design process involving the ecosystem.

**IT Governance**

As the interest of Enterprise Architecture continues to grow, so does the need for governance in the world of digital ecosystems. Earlier, we saw how Enterprise Architecture was hard to establish for businesses especially aligning Enterprise Architecture with the digital ecosystem (Gerard Briscoe, 2010). The main reason is that enterprise architecture is still being established in many corporations. For those that have already established it, governance is often overlooked and needs to be integrated into these businesses (Zimmermann et al., 2013). When we hear the word “governance”, we think of controls or standards to processes. With the establishment of EA, corporations have the ability to maintain the controls through governance (Chang & Uden, 2008, p. 340). Although companies have established EA, it does not mean they have effective EA governance or IT Governance in place.

On a corporate level, governance is known as the set of processes, customs, policies, laws, and institutions affecting the decision-making of management on an administered/controlled level (Kooper et al, 2011). As for the term, IT governance, it is a subset discipline of corporate governance focused on information technology systems and their performance and risk management. Due to compliance initiatives, like Sarbanes-Oxley and Basel II, companies are shifting their focus to establishing these guidelines and principles. Therefore, companies use IT governance as an instrument of strategic business-IT Alignment along with EA. IT governance is said to lack a clear and commonly agreed upon definition and it has been difficult to master (Kooper et al, 2011). Also, it is based on two frameworks like COBIT and ITIL. COBIT is defined as an IT governance framework with a supporting toolset that allows managers to bridge the gap between control requirements, technical issues and business risks. ITIL is defined as a framework of IT services that aligned to the needs of the business and support its core processes. The limitations of IT governance are a given when trying to implement it as strategy. According to (Kooper et al, (2011), pg. 196), the limitations with IT governance are as follows: not concerned with the way information can be created, sought, consumed, processed, and exchanged in order to add value but solely focused on managing resources, exclusively inhabits the “control” half of the business universe and avoids the elements of innovation, business development, creativity, value creation, experiment, and it suffers from half-hearted implementations which impacts the way service levels are measured, information security projects are delayed, and failing controls go unchecked. These limitations greatly impact the effectiveness of governance in a company with EA present. In lieu of IT governance, there is EA Governance.

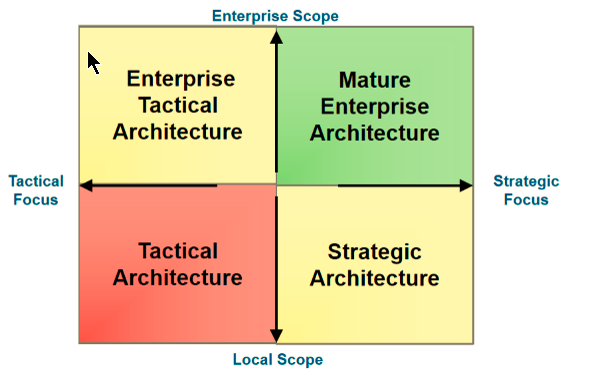
**EA Governance/Architectural Governance**

EA governance, also known as Architecture governance, is defined as “the practice and orientation by which enterprise architectures and other architectures are managed and controlled at an enterprise-wide level.” According to (Gartner, 2013) some characteristics of architecture governance are:

* Implementing a system of controls over the creation and monitoring of all architectural components and activities, to ensure the effective introduction, implementation, and evolution of architectures within the organization.
* Implementing a system to ensure compliance with internal and external standards and regulatory obligations.
* Establishing processes that support effective management of the above processes within agreed parameters.
* Developing practices that ensure accountability to a clearly identified stakeholder community, both inside and outside the organization.

When looking at digital ecosystems on an enterprise level, we tend to look at architecture governance; however, it is not its own entity due to the need of IT and the governance practices behind their processes. Management involvement is critical and the need for them to have full understanding impacts the linkage between the business and IT. Below are some key steps towards effective governance process, which will help sustain the growth of the company, and it should reduce the costs over time. Conceptually, architecture governance is an approach, a series of processes, a cultural orientation, and a set of owned responsibilities. According to Gartner Toolkit (Short, 2013), there are five recommended steps for implementing effective governance into an organization. These steps are:

* 1. Incorporate IT and Corporate Governance Principles
     + Disclosure and Transparency – refers to the financial and operational information of the organization and foreseeable risk factors.
     + Responsibility of the Board of Directors – involves the strategic guidance to the organization, effective monitoring and responsibility to the stakeholders
  2. Identify the EA Archetype to Guide EA Governance
     + Quadrant approach shows Tactical to Strategic Focus on the Horizontal axis and looking at Enterprise to Local Scope on Vertical axis (**Figure 1**)



**Figure 1: Understand EA Archetype**  
**Source: Gartner of IT Conference Presentation – Dave Guevara(n.d.)**

* 1. Identify your Organizational Culture
     + Look at the organization at a whole and see where the culture resides. If beliefs reside on the fact EA and Governance can improve the culture, then the organization will work together better.
  2. Identify your Governance Style
     + What type of Governance fits the organization and aligns the digital ecosystem with the business?
     + How will this benefit the organization
  3. Match the Governance Style with your EA approach
     + Ask what approach are you taking as an organization, see how it aligns with the 3-5yr. plan
     + Based on results, determine the best governance practice for the organization.
     + Out of the companies surveyed, 66% responded that they are a blended type of EA approach.

These steps provided by (Short, 2013) are a great way to ensure that guidelines are set and maybe in a checklist format. These steps should help provide guidance in determining the governance style needed to help sustain growth and costs for the longevity of the EA program. Along with EA artifacts, the company should have a great ideal of how their program will continue to grow in the future.

The review of literature suggests that governance is successful if you treat the company as one entity and not multiple units. Also, it was discovered that the necessity of having EA already established in the appropriate layers in an organization is critical as long as it is functioning correctly and meets the demand of the business. While establishing the EA processes as strategy to digital ecosystems, it is important that the strategy aligns with the business. This was shown in the cases where there is a strong EA program. However, if managers and processes are not aligned then the business can falter. It will not have the sustainability and the manageability for any potential growth and could result in failure of programs and processes.

**Research Question**

In this research project, the basic terms and definitions of digital ecosystems are explored followed by Enterprise Architecture and Governance. Then, the paper looks at how digital ecosystems are established and how EA will benefit continuous growth through various steps of planning and risk management by establishing methods and guidelines. By addressing these topics, the question of why it is important to establish EA and EAG for digital ecosystems and how costs are impacted over time by showing effective measures of EAG. Lastly, the research findings provide insights and steps in an established governance best practices to help reduce costs in IT growth of digital ecosystems.

The general research looked at digital ecosystems and the impacts of not having governance in place. The initial question that started the research was: What impacts did EA Governance have to cost and future growth of the organization? During the literature review, the research showed some effective practices could benefit organizations if effective EA practices are in place. Also, the concerns of not having these practices resulted in higher cost but still had continuous growth. When applying this concept to Healthcare A, the company did not have these practices in place. The effective processes and practices in place were not working for the company. These broken processes resulted in miscommunication, ineffective meetings, and poor data quality. This propelled the idea and research into the Health Learning A and the ability to establish governance at the company. By having a target, the research conducted would be able to support the findings for the need of Governance and potentially a new department.

Next, the interviews were with senior leadership to get an understanding of the processes and systems involved. The data collected and compiled helps deliver a plan for the organization and answers the research question below.

**Research Question:**

*Keeping the digital ecosystem in mind, how do you as executives of Healthcare A see EA Governance being established to help reduce cost and have continuous growth for the company?*

The need for research involving digital ecosystems and Governance was important especially since the growth of systems and technology are growing at unprecedented rates. It was important to look at EA, break down the ecosystem by layers, and then see where the significant gaps occurred. The current research allows the ability to look at digital ecosystems and see the importance of EA Governance. This captures the information and delivers the benefit of the research to the company.

**Methodology**

A Qualitative case study serves as the main methodology for this study. This section describes the background of case study research, defines case study methodology, examines the relevance of case study methodology, and describes the case study design as created from the case study research. All of these components are interrelated. Robert K. Yin had extensive knowledge for case study research. He had several techniques for organizing and conducting case study research.

According to (Yin, 2009), all case study research should be used when the researcher would like “how” and “why” questions to be answered and focus was based on answering the research questions. The case study was a great contribution to research; however, there are some misunderstandings of case study research. According to (Flyvbjerg, 2006), there are five misunderstandings that researchers should be aware of. These misunderstandings are as follows:

1. Theoretical knowledge is more valuable than practical knowledge.
2. One cannot generalize from a single case and it cannot contribute to scientific development.
3. The case study is the most useful for generating hypotheses, whereas other methods are more suitable for theory building.
4. The case study contains bias verification.
5. It is often difficult to summarize specific case studies.

The initial part of the qualitative research is the case study. The case study involved time and activity along with a variety of data collection methods over the period of time. For this study, the phenomenon under analysis was the impact of EA Governance to digital ecosystems. For the current study, managers and senior leaders, who acted as SMEs, were selected for the main population for the semi-structured interviews. The semi-structured interviews were recorded to ensure no information was lost between interviewer and interviewee. Furthermore, the recorded tapes were transcribed and put into Word and Excel documents for reference. The semi-structured interview guide can be found in **Appendix A** and the data collection guide can be found in **Appendix C**. Another component of the case study was the analysis portion or the area of focus of study. For this study, the unit of study was the maturity of EA in the ecosystem and how these systems rank in the need for Governance.

(Yin, 2009) named five components of effective case study research design:

1. Research questions
2. Propositions or purpose of study
3. Unit Analysis
4. Logic that links data to propositions
5. Criteria for interpreting findings

The most appropriate questions for this type of case research were “how” and “do”. Specifically, how much influence does governance have on growth and do effective steps help reduced long-term costs for the company?

The second component of the case study was to define the study purpose clearly. The purpose of this case was to understand EA governance impacts to cost and growth within the company.

The third component of the case study was the unit of analysis. Yin wrote that appropriate unit of analysis occurs when the research was accurately specified. The unit of analysis was directly tied to the research question. This study’s unit of analysis was the impact of governance to the cost and growth of a digital ecosystem at Healthcare A.

The fourth component of the case study research design was connected to data propositions. This connection was made through the data collection phase. As the data was analyzed, it allowed for pattern matching to the theoretical propositions of the case study.

The fifth component of the case study research design was the criteria to interpret findings. According to (Yin, 2009), the researcher codes the data to the developing themes. Following the theme stage, data extracted was used to find meaning from the findings and determine future research and practice. The research design does a great job in building the foundation for the research method.

**Qualitative Research**

Qualitative research was the best option for several reasons. In general, it helped with learning more about the company, the impacts to the future planning of the company, and it allowed for the researcher to supply the knowledge gained during the Literature Review and apply it during the interviews with the SMEs. The main purpose of the study was to establish EA Governance on Healthcare A digital ecosystem and improve their future planning (growth and costs) for the company.

Qualitative approach requires exploration of the research questions. Since the research questions begin with “how” or “do”, the researcher gained in-depth understanding of what was relative to the topic.

Second, a qualitative study allowed the researcher to explore phenomena, such as processes, that are difficult to learn through conventional methods. For the current study, Healthcare A was explored for current processes and the impacts of Governance on tracking processes and establishing effective guidelines.

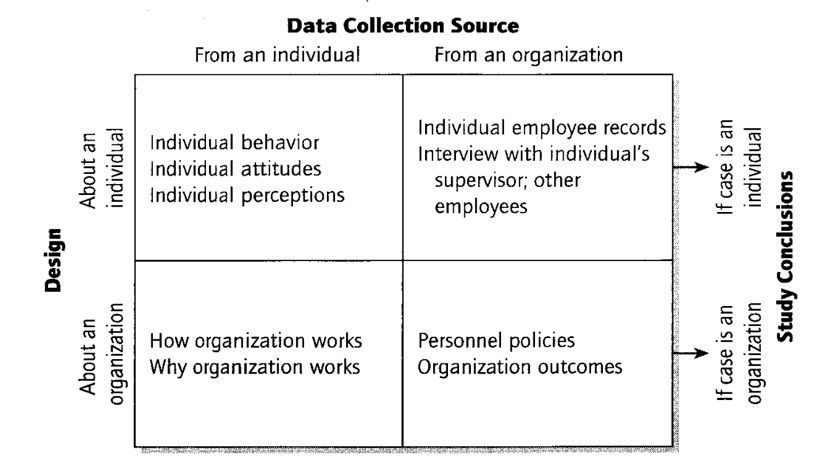
Third, qualitative research methods are best approached when studying phenomena in their natural setting. Since Healthcare A was a medium-sized company of about 1,000 employees, the researcher had the ability to show the complexity of EA practices for the digital ecosystem.

Fourth, qualitative methods help identify the role of researcher in the active study. For the present study, the interviewer was data collector and interpreter of the analyses. By establishing the roles early, it allowed for better focus on the tasks at hand and a time standard for the research involved for the study.

Qualitative research methods used in this study: semi-structure interviews, case study, and systematic and concurrent data collection and data analysis procedures. By ensuring these methods, it helped build trust at the beginning of the interview, it allowed the SMEs to share their thoughts, and it allowed data to be recorded accurately for the study. The interview consisted of various level of questions pertaining to the company’s plan on establishing EA governance. The information collected from the company was collected effectively and efficiently. Also, it made data collection a lot simpler from the standpoint of time. See **Appendix A** for the list of interview questions.

**Results**

After establishing the details of the interviews, the analysis performed was done on all of the data. By using the Design versus Data Collection Source **Figure 2**, it allows viewing the different units of analysis by unit of data collection (Yin, 2009). By viewing the data as an individual and as an organization, it shows the differences on an individual level and on an organizational level. After analyzing the responses to the questions, it showed how the executive leadership thought on an enterprise level; whereas, the middle management responses were more focused on their individual areas. For example, Question 1 from Governance interview questions, what knowledge do you have of Governance? The executive participants stated, “it begins at the top with the board of directors and establishing strong Corporate Governance.” This response coincided across all Executive participants. For Individual A and B, the response was the need to focus on Data Governance aspect of the company. The most bottom layer should be established to ensure Healthcare A data is secured and the content is delivered as desired. The participant believed the bottom-up approach was the best way to deliver Governance. The data method used contains some data collection especially through the individual level. The data was entered and placed in an Excel sheet. See **Appendix C** for the categories of data collection.



**Figure 2. Design versus Data Collection   
Source: Case Study Research, (Yin 2009)**

As data was collected for the analysis portion, a table method similar to **Figure 2** was used to determine pattern matching to the theoretical propositions presented through the semi-structured interviews. By breaking the data down, pattern matching was the basis of numerical measures based on the responses of the interview questions. The labels are on an individual level and an organization level. Also, a communication table was used with the anonymity of the individuals and how they responded to the questions in **Appendix C**.

Another prospective measure will be the breakdown of EA maturity assessment to show how senior leadership feels about the architecture of the digital ecosystem. This is done through interview questions pertaining to some metric scores as explained in **Appendix C**. According to (Yin, 2009), triangulation was an important aspect of case studies because it converges the data sources to provide more accurate results of the participants.

When analyzing the data from the interview questions, it was discovered that C-level executive leadership are in tune with each other compared to Executive participant 4 and Individual Participants A & B. The answers of the questions were more individualized and focus on their key areas instead of an organizational level. As for the executive leadership, they appear to have knowledge about EA practices and have put them to use. For instance, Executive participant 5 felt the company was aligned with its strategy and vision and thus the result of growth. The processes and people put in place and made what Healthcare A is today. The leadership over the teams provide exceptional thought-process and leadership and have put plans in place to keep the company growing over time. The other executive participants felt the same way in that EA is key and scored it with a maturity of 3 to 4. This still leaves room to improve but that most of the groundwork has been laid in line with the vision and strategy to move forward. One key area to improve in the company was on Data Governance. Another key area, the digital ecosystem in place needs to connect all aspects of the business instead of some of the business. By adding the importance of a digital ecosystem with the vision and strategy, then there is some work needed to integrate the information, systems, and data to talk across the enterprise.

All the participants except for Executive Participant 4 believed that Healthcare A has a digital ecosystem. Executive participant 4 did not feel there was full integration between the systems and that the data is still from varying resources not centralized. Therefore, the participant could not fully support the idea of a digital ecosystem. As for the rest of the participants, they felt the systems put in place have the means to utilize the data if moved to a centralized data repository or data lake and be used to connect our partners, marketing, IT, company acquisitions, sales, accounting, etc. The vision of seamless integration is a need and can be achieved by getting the data source to feed all systems at Healthcare A. The framework is envisioned and still in line with the vision and strategy. The future plan is to move from a Software as a Service (SaaS) base company to become more of a Platform as a Service (PaaS) base company per all the participants. The systems are virtualized, servers are virtualized, cloud services are handled by 3rd party vendors, and data is handled through a data lake supporting the company’s growth. Healthcare A platform is utilizing micro-services and APIs to support the change with the way customers interact with the system. This is supporting the framework put in place to continually grow and have a scalable solution in place for the future.

The digital ecosystem is partially in place but it still has potential to bring other data sets like social media and integrate it with Sales, Marketing, other company acquisitions and enhance the growth of the systems and reduce the costs across the enterprise. According Executive participant 3, the 3 to5 year plan is to build this out and maintain the growth. The biggest challenge is keeping the main platform running while building the scalability into the system to support the technology growth and shift for customer demand. If the system goes down, the enterprise shuts down. The EA Architecture layers are built out to support this need and is the main reason for the maturity being scored at a 3 to 4. The participants felt the digital ecosystem is growing and they are integrating other parts of the business into their digital ecosystem. According to Executive participant 1, 3, and 5, if EA is not supportive of the digital ecosystem, then the company could not maintain the growth and the costs would be exorbitant. Also if Governance is not established then there are no controls and security in place to help drive the changes aligning the business with the vision and strategy. The participants attribute the employees and the leaders of the company as key roles in sustaining the growth and being thought leaders in their solutions. Also, they attribute the success and growth by acknowledging a strong Corporate Governance from the Board of Directors.

Governance is very important to the participants. Most of the participants provided a score of 3 to 4; whereas, Executive participant 3 gave a score of 5. The reason is governance is needed at all levels and starts with being as a top-down approach. If the Corporate Governance is not great, then the company will fail according to Executive Participants 1,2,3, and 5. There is a must for strong Corporate Governance to lay the foundation for it to flow down the enterprise. By defining the maturity of as a 3 to 4, this means they are close to having a Mature Enterprise Architecture. They each have a knowledge of EA and how Governance helps them with the alignment of processes between the business and IT. According to Executive Participant 1, the governance was very involved and have brought in best practices to adopt across the management level. They have a solid Audit committee and have recently created the Enterprise Operations Council to start improving Data Governance since they know this is a key area of improvement. Individual Participant A and B are involved on this data council and can see the benefit of identifying the Business Owners and Data Owners to ensure better data controls. Executive Participant 4 stated, “the changes brought forth and have been for the greater good of the company.” The other participants felt the best practices have made a difference in the way the teams work together and provide better communication and documentation around processes. Executive Participant 5 stated, “Governance starts strong with the Corporate level, then gets weaker as it reaches the lower levels.” The participant believes that if the governance on the lower level is improved then the cost definitely decrease but it can’t happen until the culture buys into it. The Enterprise Operations Council is designed to get this involvement and focus on the lower level of Data Governance and improve the Governance practices.

Lastly, they felt Governance in the organization should have balance and scalability. However, they have not been able to achieve this due to the rapid growth and the decisions made to get the systems up and running instead of thinking the right course of action. Also, due to the acquisitions, the systems are not aligned between Healthcare A and the companies that were acquired. They just load the data because it needs to be loaded according to Executive participants 1, 3, 4, 5, 6, and 7. According to Executive Participant 4 and 5 and Individual Participant A, they need to take the time to make sure everything is aligned first before moving the data from these systems. By establishing the controls in place, the data loading should be reviewed prior to loading.

**Summary**

By establishing qualitative research design and method, the research question was supported through effective semi-structure interviews along with providing findings on an organization level pertaining to the digital ecosystem. The information collected shows, on an individual level, some lack of knowledge about governance processes. Individual Participants A and B focused on the bottom-up approach. By focusing on this approach, they cannot see how it fits in the strategic initiatives. By applying the analyzed data, it proves that Governance is needed on all levels of the enterprise instead of just the bottom-level. If it is not available for the entire enterprise, then the company will never have a complete governance in place to support the growth of the company.

On an organizational level, they have strong Corporate governance in place and it does not need any improvement. The focus needs to be shifted to the digital ecosystems and Data Governance. By adding the data lake, adding some seamless integration, and building the platform around the data to sustain the demands of the customer, then there is potential to show a reduction in costs and sustainable growth over time. Governance needs to be questioned on who will support the alignment of the acquisitions, their products, and how the data is going to be used for the company. Healthcare A is well on their way in implementing Governance throughout the organization and the teams are beginning to align with the strategy. They still have the balance by controlling the processes to help maintain control but allow for innovation to continue to find improvements with systems, processes, methods, etc. Once the Enterprise Operations Council focuses on the Data Governance aspect of the business, then the data can be controlled and managed better. They still to make sure processes are in place to handle the data from the acquisitions and other Healthcare A entities. In turn, this should help shore up the costs and allow for better growth over their 3 to 5-year plan. In regards to planning after 5 years, I see the growth being sustained and continuing to reduce the costs over time.

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**Appendix A - Pilot Interview and Assurance**

Once again thank you for agreeing to be interviewed today. My name is Chris Dawson and I am a graduate student with the College of Information Sciences and Technology at Penn State University. Currently, I have earned graduate certifications in Project Management, Enterprise Architecture, and Enterprise Information Architecture Security. In my down time, I enjoy researching technologies, astronomy, and relaxing with the family. I have been with HealthStream for a 1 year now, originally as a Reporting and Metrics Specialist. Now, I am a Program Manager with the SAO team. The purpose of the interview is to evaluate the company’s digital ecosystem and see how EA Governance can help reduce costs and improve growth over time. Currently, in my role, I see issues where Governance would help with Data integrity, business processes, and set standards across the board for teams to follow. By having Governance in place, our data and systems can align across the business and have the potential to build out methods and procedures to follow when implementing a new product and prepping for new audit measures. This is how I see Governance in being used.

As for the interview, we will spend about 60 minutes together. During this time, I will ask you questions about enterprise architecture, digital ecosystems, and governance practices. I am interested in everything you have to say about these topics, so feel free to say whatever comes to mind. I will begin by getting some general information, followed by more focused discussion of some specific situations. Also, if you don’t mind, I would like to record the interview for the purpose of data research and integrity of the questions. The recordings will be deleted once all data collection has been done. I will not refer to you by name in the paper for the integrity of the research and I have used the company as Healthcare A.

**General Information Questions:**

1. Tell me about yourself? Where you went to school? What previous jobs did you hold? How long have you been at Healthcare A?
2. What is your current role within the organization? How do you see the role evolving over the years? How has the role evolved over the years? How the roles work together from the perspective of the role and each relate? How has the company changed the role over time?
3. What are some of your hobbies that you enjoy the most?
4. What do you feel are some of the biggest struggles with technology today?
5. How would you like for Healthcare A grow in a 3 to 5 years?

**Technical system questions**

1. Overall, Healthcare A has steadily increased in size over time. Where do you see the company over the next 5 years regarding infrastructure and systems?
2. Currently, we have numerous systems that do not integrate. How do you feel about seamless integration with data and systems? What type of things are you considering for seamless integration? Provide some examples.
3. What is your thought on getting a centralized repository like SharePoint for all documentation related to processes, audits, etc.
4. How would you rate the Maturity Level (1 to 5) of our Enterprise Architecture? Why so?
5. What concerns do you have with the way the architecture layers are setup to date?
6. Overall, as an Enterprise Architect, we look at people, resources, methods, systems, architecture layers in the current state and align it with the company strategy to take it into the future state. How important would you say enterprise architecture is to an organization? Do you feel that it could help build out continuous growth and reduce costs over time?
7. Would you classify Healthcare A. as a digital ecosystem? In not, Why? If so, Why? Keep in mind about the definitions

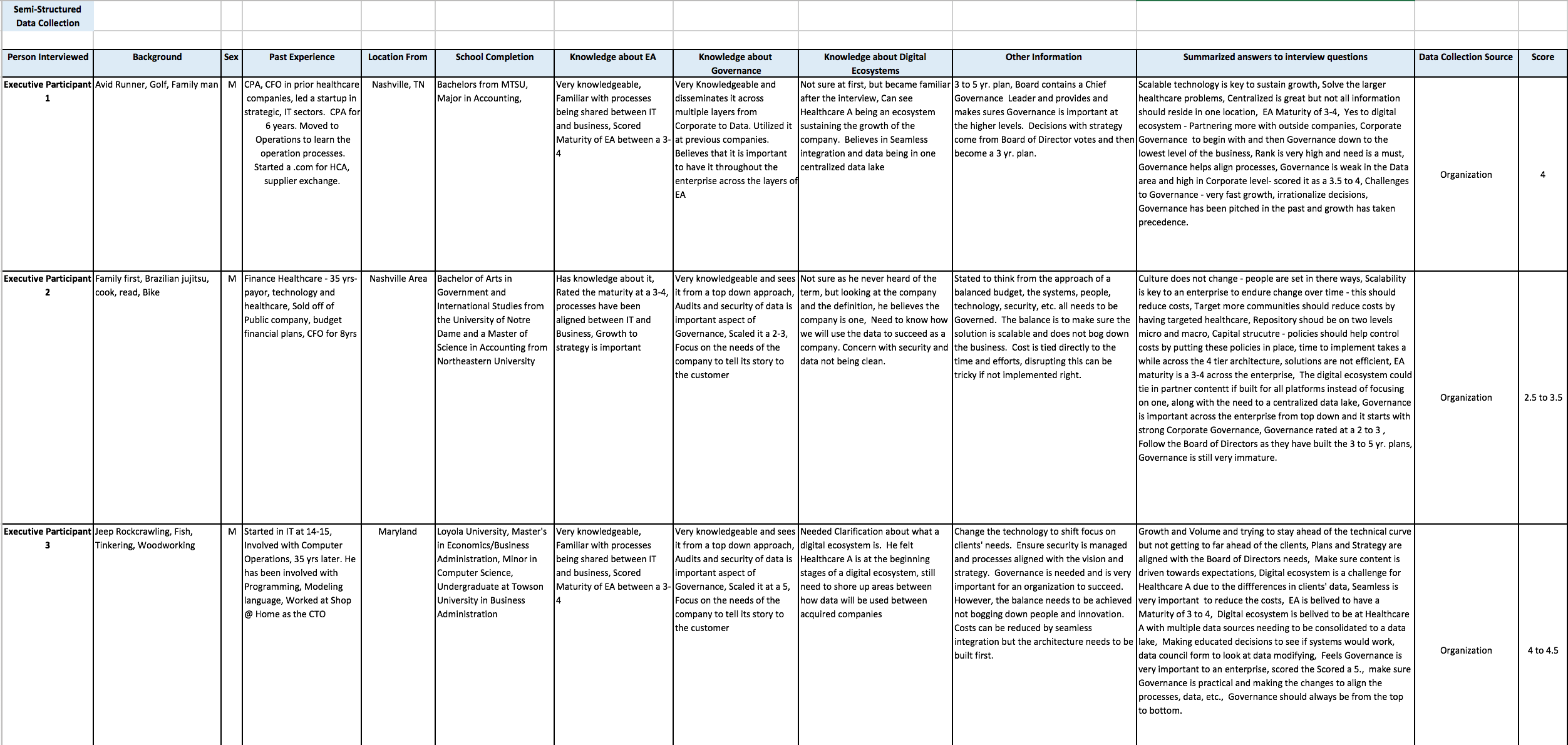
**Governance Related questions**

1. What knowledge do you have of Governance? How would you best describe it? Peers at other companies and what they have seen.
2. Where do you rank the importance of Governance within the corporate strategy? Explaining
3. How do you see us using Governance to help align processes and improve integrity of the systems?
4. Do you feel Healthcare A. has Governance in place? If so, can you elaborate further? If not, why do you think it has not been looked at?
5. In the paper, I discuss 6 steps to effective EA governance practices to help build governance in the company. How would you encompass governance within the company? List them out and structure it to the assessment
6. What challenges do you face to date in the language of Governance?
7. Over time has governance has been pitched? If so, can you provide some examples to this? How effective is this?

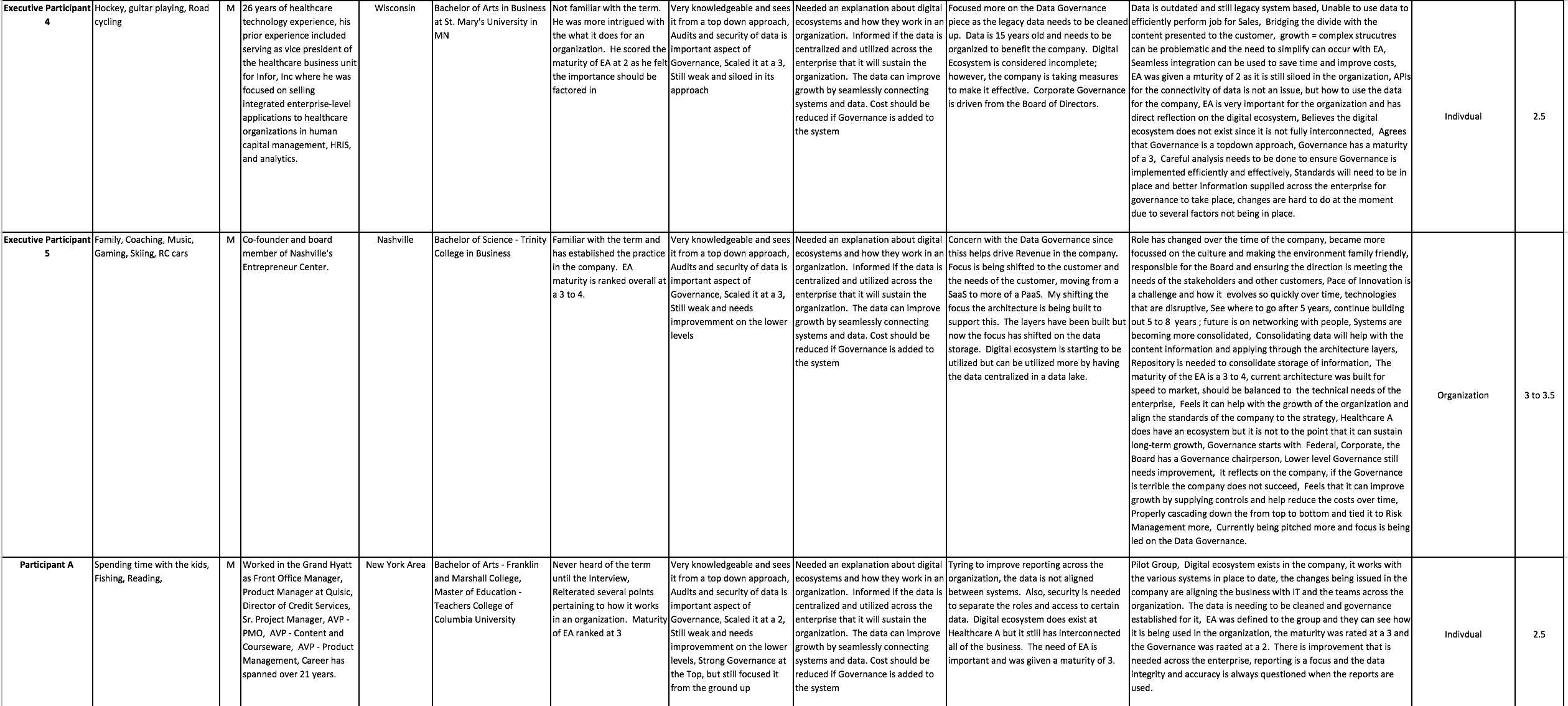
**Appendix B – Outline for Interview Results**

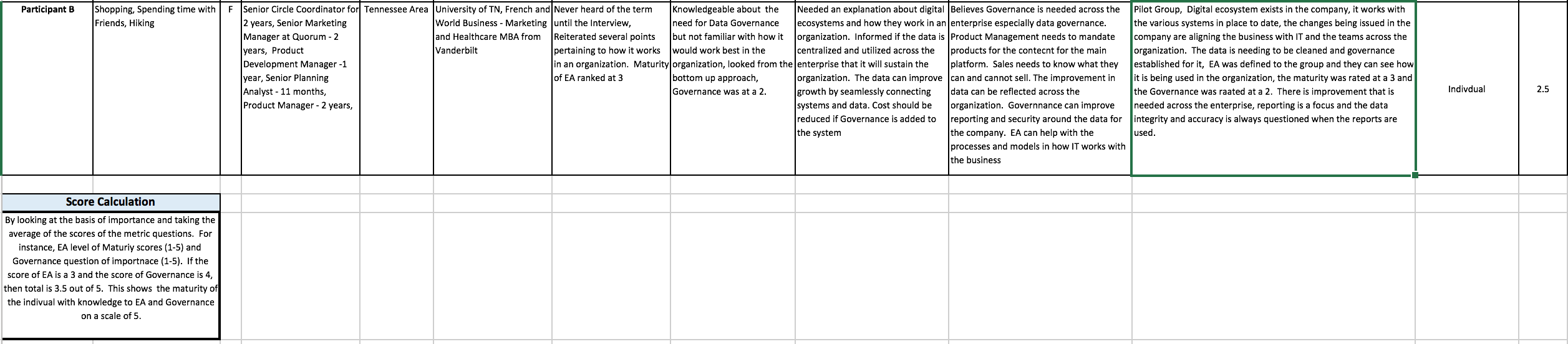
1. **Introduction to the Interview and Purpose of Protocol**
2. Interview questions, hypotheses, and propositions
3. Theoretical framework for the case study (reproduces the logic model)
4. Role of protocol in guiding the case study investigator (notes that the protocol is a standardized agenda for the investigator's line of inquiry)
5. **Data Collection Procedures**
6. Names of departments to be interviewed, including contact persons (SMEs)
7. Data collection plan (covers the type of evidence to be expected, including the roles of people to be interviewed, the events to be observed, and any other documents to be reviewed when on site)
8. Expected responsibilities, # of employees, (identifies specific information to be reviewed and issues to be covered)
9. **Outline of Interview Report**
10. Innovativeness of the company and establishing a digital ecosystem
11. Outcomes from the company, to date
12. IT context and history pertaining to the company
13. Exhibits to be developed: chronology of events covering the implementation and outcomes of IT systems and data gathering; logic model for the company; arrays or presenting outcome or other data; references to relevant documents; list of persons interviewed
14. **Analysis of Data**
15. Check data for Keywords
16. Check for clear answers
17. Ensure Data addresses questions accurately
18. Compare answers with other interviewees
19. Compile data on Excel Sheet
20. **Interview Sheets**
21. Reviewed Data from Interviews on Interview Sheets
22. Listen to recordings for data capture
23. Group data with Keywords
24. Breakdown data for hypothesis

**Appendix C – Data Collection Tool**



**Appendix C – Data Collection Tool cont’d**

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