

EXAMINING OPEN ACCESS INFORMATION INFRASTRUCTURES

EXAMINING OPEN ACCESS INFORMATION INFRASTRUCTURES: A
SOCIOTECHNICAL EXPLORATION OF INSTITUTIONAL REPOSITORY MODELS IN
JAPAN AND THE UNITED STATES

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Jennifer E. Beamer

Dissertation Committee:
Dr. Rich Gazan, Chairperson
Dr. Noriko Asato
Dr. Wayne Buente
Dr. Lorne Olfman
Dr. Christine Sorensen Irvine



Abstract

This dissertation investigated the relationship of organizations with open access institutional repositories (IRs), the institutional and social contexts in which the IRs and the organizations evolved, and the social contexts in which they have been deployed and used (Kling, Rosenbaum and Sawyer, 2005). In terms of organizations supporting and maintaining IRs on a national level, the Scholarly Publishing and Academic Resources Coalition (SPARC) in North America and its global affiliate SPARC in Japan are similar, and for this research they were examined and compared as case studies. Thus far, the literature has explored some aspects of the technical infrastructure of IRs, including various social practices and processes that have led to IR growth. Still, fewer studies have been conducted on how organizations shape IR socio-technical contexts in one society compared to another.

For its analytical framework, this research used social informatics (SI) principles, i.e., the premise that technology user practices and research outcomes are mutually constituted by the interactions between technology affordances and broader context (Kling et al., 2003). Moreover, Scott's (2008) Institutional theory was used as a lens to understand organizational characteristics, including norms, rules, and activities of the organizations, thus providing a framing device for establishing boundaries via pillars and carriers to shed light on how SPARC NA and SPARC Japan have supported IR development.

This study's methods of data collection and analysis, i.e., Kling et al.'s Socio-Technical Interaction Networks (STIN) and Scott's Institutional theory, provided direction for bounding, collecting, and analyzing of SPARC NA and SPARC Japan. Multiple research field-site visits were made, and qualitative semi-formal and in-depth interviews were performed with selected individuals in these organizations. Additionally, the analysis of data from supporting documents, websites, reports, and participant observations at organization-sanctioned activities contributed to the findings of this research. This study aims to contribute to the expansion of the Socio-Technical framework for understanding organizations and IRs in specific, and to the literature on the technological transformation and communication of research in general.

Acknowledgements

While I was still writing this research up in the year 2020, the world was faced with the COVID-19 pandemic. Although this dissertation is not about that pandemic, fundamentally it is about moving forward conversations on sharing access to research. Such research if shared openly and therefore much more rapidly (rather than locked behind paywalls) could hasten the discovery of possible cures and vaccines for what we have experienced in 2020-2021.

The organizations I examined are passionate about sharing work in the scholarly communication ecosystem. That ecosystem is built on both social and technical relationships that require enormous trust. Historically librarians and researchers have trusted that the gatekeepers and publishers of scholarship were truthful and acted in the public interest. Additionally, the general public trusted that researchers, the government, and academic institutions were acting in their best interests. However, publishing models are profit-driven, and many of those publishers are now purchasing as much infrastructure as they legally can. They present many obstacles to scholars who wish to share their work in a fully open access ecosystem. Thus, building our own open infrastructure can help build trust in the system, as well as empower researchers to build trust within their communities. The time more now than ever to do what is right—to share our research, make it openly accessible, to share.

Finishing this dissertation would not have been possible without the tremendous support, motivation, trust, and encouragement I received from many kind individuals. I am deeply indebted to SPARC North America and SPARC Japan, both organizations allowed me to ask many questions, dig into documents, and observe their work.

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Chapter 1 Introduction

1.1 Research Context and Aims

Since the first Open Access (OA) institutional repositories (IRs) in the mid 2000s, IR numbers globally have rapidly grown to more than 3000 institutions today (OpenDOAR.org, 2018). However, little has been studied about the organizations who have initiated and supported this rapid information infrastructure development. One such case of notably fast IR growth has been in Japan. As of December 2018, Japan's National Institute of Informatics reported that Japan had more than 712 academic research institutions with IRs ("IRDB: Institutional Repositories Database" National Institute for Informatics, 2019a). This number has exceeded the number of IRs in the United States (502 IRs), making Japan the country with the most IRs internationally. Perhaps surprisingly, Japan had a late start with its IR program starting in 2007, a little over 10 years ago, whereas countries with earlier starts have lagged behind; the United States by 2007, for example, had already established more than 150 IRs. Why have IRs in Japan been able to not only catch up with, but also surpass everyone else in such a short time?

This research argues that the support and use of IRs could not be fully understood without understanding the cultural, institutional, and social contexts in which they evolved, and in the social contexts in which they have been deployed and used (Kling, Rosenbaum, and Sawyer, 2005), particularly when similar organizations between the United States and Japan are compared. This research considered how their IRs have been created through the social context of information and communication technologies (ICTs) within institutional and cultural contexts. In other words, studying how human users (organizations) successfully interact with technology (and vice versa) in different situational environments may shed light upon how IRs have developed more successfully in one social context than another, offering lessons on how IRs may

take root and proliferate worldwide to make information and research more available to everyone.

IRs are essentially ICTs that have contributed to the access of scholarly research in an OA system.¹ In terms of an organizational structure, IRs are digital-asset management systems associated with a university or research institution, on which the intellectual content of an academic community is organized, preserved, and made openly available via the internet to the public. IRs are thus broadly defined as “a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members” (Pinfield, 2009, p. 165). To this end, IRs have been organized “by discipline or by institution” (Suber, 2012). Many works within them are peer-reviewed with a similar version also appearing in a research journal. Other works may not be peer-reviewed but still hold some intellectual value. Further, according to a 2002 Scholarly Publishing and Academic Resources Coalition (SPARC) position paper, an IR acts as a “digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside of the institution, with few if any barriers to access” (Crow, 2002, p. 16).

Global trends in the communication of research have moved almost entirely into the digital environment, made possible by developments in electronic publishing, the OA movement, the sharing of data, and open collaboration (Harnad, 2001a; 2001b, 2003; Peters and Roberts,

¹ According to the Budapest Open Access Initiative, Open Access is defined as “free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.”

2015; Suber, 2016; Willinsky, 2005). From 2002, with the dissemination of the Budapest Open Access Initiative (BOAI), a large number of institutions and organizations, both national and international funding organizations, gave their pledge to OA for scholarly literature (Suber, 2004). Governments, universities and institutions in the United States, United Kingdom, Germany, Netherlands, and Australia began to look into the issue of public access to taxpayer-funded research results, and how that research would be provided freely to the public via IR systems (Neto, Willinsky, and Alperin, 2016).

Thus, the communication of scholarly research over the past thirty years has become largely facilitated by digital technologies, and IRs over the past decade have facilitated this in several ways. First, institutions with IRs perceive the IR system as a cost-effective way of providing access to the results of research funded by taxpayers, as they do not have to re-purchase the research from a publisher, which in turn allows the research to reach a much wider audience (Harnad, 2001a; 2001b; 2003; Van Noorden; 2013). Second, some institutions believe IRs can be an avenue to highlight and expand the diversity of scholarly material that is available, and to collect and preserve materials that would not be normally available, thus improving instruction, the ability to learn, and future inclinations towards research at the institutional level and beyond (McCord, 2003, Lynch, 2003, 2017). Third, IRs play a role in building and emphasizing an institution's prestige or brand by highlighting its research output (Crow, 2002). Finally, as will be described in more detail below, IRs have been viewed as a potentially disruptive infrastructure for the transformation of the present system of communication of research and scholarly publishing (Borgman, 2010; Guedon, 2003; Bilder, Lin, and Neylon; 2015).

1.2 Studying Institutional Repositories: A Socio-Technical and Institutional Approach

The focus of this research was to examine IRs as socio-technical systems. That is to say, IR systems have both technical and social characteristics. Technically, IRs are defined by the large servers that are networked to the web. For example, an important quality of the IR as a digital-asset management system is that it must be interoperable with other IRs, employing the Open Archive Initiative Protocol for Metadata Harvesting via the web. However, IRs as a technical system are also embedded with the social, that is the “formal and informal rules (e.g., shared beliefs and values, routines, regulations, institutionalized practices, capabilities, etc.) that mutually construct and are constructed by actors in a system” (Geels, 2004). As, IR infrastructure incorporates the strategic planning of institution-wide digital-asset management as suggested by Lynch (2003), IRs are “most essentially an organizational commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organization and access or distribution” (p. 5).

Accordingly, the purpose of this dissertation is to understand the socio-technical issues related to supporting and using IRs. Further, this research is part of the central research agenda in the interdisciplinary field of social informatics (Kling et al., 2005). Kling defines social informatics as the “body of research that examines the design, uses, and consequences of information and communication technologies in ways that take into account their interactions with situational and cultural contexts” (2000, p. 218). IRs in this research will be examined using a holistic approach, by means of the conceptual framework of Socio-Technical Interaction Networks (STINs) based on Kling, McKim and King’s methodological strategy (2003). Using the representation of a network, the STIN strategy captures the social actors (individuals and/or groups) and technical factors that create and constitute each system. The STIN strategy further

draws attention to internal and external influences, and the trajectories of implementation of the system, including its historic aspects. As the STIN strategy is designed to analyze socio-technical systems, IRs may then be understood and analyzed as such.

Another major premise of this research is that technologies are socially entwined (i.e., they are inseparable from their human user interface), and that people's perceptions, organizational expectations and implementation contexts are as important as their raw functionality. Institutional Theory, which is primarily concerned with examining the "ways in which belief and rule systems affect social behavior and structure" within organizations (Scott, Ruef, Mendel, and Caronna, 2000, p.14), will aid in understanding how organizations inscribe ICTs with regulative, normative, and cultural-cognitive elements that produce meaning, stability and order, and how IRs mutually inscribe organizations in return. As the IR is a technical system embedded into a social context, which both adapts to and helps to transform or reshape the social world through the processes of design, development, implementation, and use (Kling 1980; Avgerou, 2001; Land and Hirschheim 1983; Orlikowski 1992); observing institutional elements for IR organizations may reveal four types of carriers—symbolic systems, relational systems, routines, and artifacts (Scott, 2003).

Scholarly literature to date has not fully explored IRs using a holistic, integrated approach, social, technical, or organizational method. Most research to date has focused on individual faculty and researchers' contributions and behaviors (some related directly to university IRs, and some related such as arXiv, PLOS and PubMed Central as exceptions; however, these are disciplinary repositories and not IRs) (Davis and Connolly, 2007; Lawal, 2002). Other research has considered the advocacy of faculty and researchers with repositories (Buehler, 2013; Foster and Gibbons, 2005). Moreover, the literature focuses mainly on how

organizations, institutions, funders, or other agencies have developed IR policy mandates to increase usage, or adherence to policy (Lariviere et al., 2012; Pinfield, 2009). Finally, international or global IR trends have been explained particularly by research on the Diffusion of Innovation Theory (Rogers, 2003; Jones, Andrew and MacColl, 2006; Xia, 2012). However, none of these methods sufficiently explain how, as mentioned above, Japan has been able to become the world leader in IR development in a remarkably short amount of time. To explore that, we need to look at the data through the lens of a socio-technical approach from a comparative perspective.

1.3 Research Questions

This research examines the ways in which information infrastructures consist of an assemblage of technical infrastructure, social norms, and organizational practices (Edwards et al. 2007). Therefore, the main research questions of this dissertation are:

R1. What socio-technical influences have contributed to variances in institutional repository infrastructure?

R2. What organizational characteristics influence choices and uses of institutional repositories?

R3. How do the variances illuminate the progression of IRs in organizations in Japan compared to similar organizations in the United States?

1.4 Research Strategy

The STIN approach is used in this research to examine organizations and IRs, as the STIN approach supports the exploration of social and technical aspects, especially the relationships between various factors, including groups of people. The application of the STIN framework informed the data collection for the purposes of creating STIN models (STIN

studies). Institutional Theory is a theoretical framework that may help recognize how structures, rules, norms, and routines, become established as guidelines for organizations (Scott, 2001).

The organizations in this research are the main two social groups who appear to be supporting, maintaining, or coordinating the use of IRs in Japan and the United States. Two organizations were purposely selected for study: The Scholarly Publishing and Academic Resources Coalition, 1) SPARC North America (SPARC NA), located in Washington, D.C., and SPARC Japan (SPARC JP), located in Tokyo Japan. While both organizations initially originated from the Association of Research Libraries in the United States in the early 2000's, they have had different courses of development and affiliations, as this research will reveal. Data was collected in several ways. This research used qualitative methods. The two case studies involved fieldwork in the form of invited visits (approximately 2 weeks long each) to the headquarters (in Washington DC, and Tokyo), and included participant observation in multiple events at both SPARC locations.

Methods involved semi-structured interviews, analyses of documents both presented to me, documents publicly available on the organization's websites, and observations at organization meetings and events in Japan and the United States. As I am a member of SPARC NA, it was expected that there would be opportunities for me to observe as an insider at various meetings, events, and activities via emails. Organizational documentation included memos, minutes of meetings, white papers, reports, and publicly available websites. Specific methods for dealing with interview and documentation data collection is discussed in Chapter Four. Data was collected and coded using the STIN approach and Institutional Theory. Data collected at the field sites and documents was analyzed and coding based on three coding processes: open, axial and selective, as defined by Strauss and Corbin (1990). Following Kling et al.'s (2003) STIN

approach, this research presents the construction of STIN diagrams, narratives and timelines to visualize relationships and reveal important network nodes; however, STIN is not a method of analysis in and of itself.

1.5 Findings and Contribution

The intellectual merit of this study lives in promoting a deeper understanding of IR infrastructure and the social and organizational activities that support IR technology. Furthermore, the field of social informatics is an original interdisciplinary approach to studying technology in society (Kling, 1999). This research was novel as it examined how IRs (as relatively new technologies) were being influenced by the activities of organizations and then used in the communication of research, which could lead to innovative practical solutions for new ways of using technology to communicate. It also contributes to the field because it explores one of the main ideas of social informatics, i.e., a) that ICTs offer important and sometimes unexpected outcomes to the social context (that are hopefully transformational or disruptive to outmoded ways), and b) that these outcomes are decided not as a simple consequence of technology, but in ways that are fundamentally embedded in complex socio-technical interactions and networks.

More broadly, this research seeks to contribute to the understanding of the relationship between new technologies and changes in social organizations. While IRs have been adopted globally, very little systematic research had been conducted to understand the capacity of IR technology and the interactions across countries in a comparative perspective. It is hoped that this research contributed to a broader research plan in the future. It focused on examining how repository technologies could be understood and theorized as they become more commonly used, which is a central premise of social informatics research.

Finally, by using STIN strategy, this research also hopes to contribute to the literature on the technological transformation of the communication of research. The results of this research are to be disseminated as a completed dissertation available via OA on the University of Hawai'i IR. The findings will be published in journal articles, one in the information sciences field and one in the social informatics field. Further findings may be presented after completion of the dissertation through presentations at field-specific conferences as a poster or short paper, so as to solicit feedback. In addition, I plan to use this research as a base for my career research agenda that will examine information science, the communication of research, and the building of infrastructure for institutional repositories over the next several years.

1.6 Operational Definition of Terms

Operational definitions for the purposes of this research are as follows:

Social vs. Technical: As mentioned above, the premise of this research is that the social and technical are intertwined; however, in some cases, it may be necessary to classify or elaborate on which activities, behaviors, or infrastructure in turn tend to be more or less social or technical. Kling et al. (2003) suggest that “socio-technical behavior should be used to refer to more tightly integrated conceptions of the interaction between people and technologies” (p. 48). I understand this to mean that what is referred to as technologies/technical are developed within a society/people—a world—and supported by technicians and others with specialized skills (Kling et al., 2003). Thus, for the purposes of this research, when behavior must be classified as “social”, consideration was given to the level of participation of people, viewed at the organizational level of analysis and as social actors. Technical generally encompassed the “products of the social” developed within those social arrangements (Kling et al., 2003 p. 48).

Infrastructure: This is most often classified as a type of ‘technical infrastructure’, although in some definitions the technical infrastructure is the machinery used inside an organization. Scholars have proposed wider definitions of infrastructure as well, which include education and banking (Okunoye 2006), or qualifiers like human resource infrastructure and economic infrastructure (Williamson et al., 2004).

Information Infrastructure: This is described as possessing various “measures of actions” (Ribes and Finholt, 2009; p. 377). There are three actions in information infrastructure: one is a technological undertaking, which supports and enables collaborative work activities (p. 377); the second is a social venture, which needs humans to work, organize, and maintain the infrastructure so it will persist (p. 378); and the third is an institutional venture, which provides accessible and stable features to organizations and communities at both national and international levels (p. 378). Information infrastructure consists of an assembly of technical infrastructure, social norms, and organizational practices (Edwards et al. 2007). The expression “information infrastructure” occurred in scholarly literature during the 1990s to describe “scaled-up, geographically dispersed, computer networks” (Star, Bowker and Neuman, 1998; p. 4). Information infrastructures may be grouped as: a) collections of information (such as lists, technical specifications and standards), then b) combined with work practices (rules), and finally c) integrated with material elements, such as wires and devices (Borgman et al., 2013; Mongili and Pellegrino, 2014; Star 1999, 2010).

Institution versus an Organization: According to Scott (2008, p. 48) “institutions are comprised of regulative, normative and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life”. Scholarly work in the field of institutions and organizations has striven to define the differences between the two terms. In

general, an organization is defined as “groups of individuals bound by some common purpose to achieve objectives” (North, 1990 p. 5). On the other hand, an institution is “any form of constraint that humans devise to shape human interaction” (North, p. 4). North discusses “formal” institutions, such as laws and rules, and “informal” institutions, such as norms, guidelines, and codes of conduct. North goes as far as to use sports as a metaphor for these two definitions; organizations are the “players of the game” and institutions are the “rules of the game.” Ostrom (2005) provides a more detailed definition of institutions that focuses on its characteristics and where institutions emerge. He states that, “Broadly defined, institutions are the prescriptions that humans use to organize all forms of repetitive and structured interactions including those within families, neighborhoods, markets, firms, sports leagues, churches, private associations, and governments at all scales” (p. 3). According to Ostrom, institutions specify what people may, must, or must not do under particular circumstances with particular costs for non-compliance. For this dissertation the terms institution and organization are used interchangeably,

Institutional elements: They are the three pillars (regulative, normative and cultural-cognitive) of institutions (Scott, 2001).

Institutionalization: Defined by Scott as establishing something, typically a practice or activity as a convention or norm in an organization or culture (2001, p. 15).

Institutional Repository: This is an organized collection of digital objects, pertaining to a particular research or educational organization (Jones et al., 2006). A SPARC position paper further defines an IR as a “digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside of the institution, with few if any barriers to access” (Crow, 2002, p. 16).

Open Access: In scholarly literature, this refers to materials having;

“free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.”

(Ten Years on from the Budapest Open Access Initiative: setting the default to open, 2012 Retrieved: <http://www.budapestopenaccessinitiative.org/boai-10-recommendations>).

STIN Approach: This refers to a research strategy that uses the Socio-Technical Interaction Network metaphor and derives some of its method from STIN heuristics. The STIN framework is used to describe the STIN heuristics, or categories or questions derived from them, to organize elements of research, either in data gathering or analysis. STIN models or STIN studies are the outputs of STIN analysis (Kling et al., 2003).

1.7 Organization of the Research

This dissertation research follows a traditional sequence. In Chapter Two, a review of the literature is presented. The background of the research in terms of a brief history of the socio–technical development of IRs and the organizations is developed, including the context within the literature of IRs, followed by Scott’s (2001) Model of Institutionalization for examining organizations such as SPARC. In Chapter Three, an overview of the framework for using Kling et al.’s (2003) Socio-Technical Interaction Network (STIN) approach is discussed. Finally, the strategy for using STIN for this research is presented, its eight heuristics explained, and the limitations of the strategy shown.

Chapter Four explains the methodological approach, followed by an overview of its implementation. Two organizations were selected as case studies for this research. Each

organization has had different historical, contextual, and organizational trajectories and influences; however, together they share the same goals of providing access to research information produced at their institutions that is openly accessible on the world wide web. Further, the methodology chapter provides the strategy for the collection of data, its analysis and how the work should be evaluated, including challenges and bias of fieldwork, limitations of the study, and the ethical procedures underpinning the research.

Chapter Five presents the research results in two ways. The first set of analysis and results focuses on the STIN methodology, characterizing the two organizations as STIN cases. The second set focuses on data analysis through the lens of Scott's Institutional Theory framework, revealing the prominent influences, characteristics and variances of the organizations within the context of Scott's (2001) institutional pillars and carriers. The findings, predominant influences, and characteristics of the cases compared as they relate to the literature are discussed in Chapter Six. Finally, a summary of the research, its significance, and future implications are provided in Chapter Seven.

Following the References section, three appendices are included: Appendix A, Informed Consent in English, and Japanese - the organizational permissions in both English and Japanese language presented before conducting interviews. Appendix B includes the STIN Coding Hierarchy and Question/Strategy, and Appendix C includes the Institutional Framework Coding Hierarchy and Question/Strategy.

Chapter 2 Literature Review

2.1 Overview

This chapter discusses IRs as socio-technical infrastructures, with the aim of discussing how a social informatics perspective is warranted (more in Chapter Three). Then it defines IRs, with a brief history of the origins of IRs and SPARC, before looking at the literature on IR development with a focus on volume and content. The second part of the chapter turns to Institutional Theory, in an attempt to understand organizational characteristics and how we might investigate the social aspects of the institutions. After considering Institutional Theory as a means to answer the above-mentioned research questions, institutional pillars and carriers are presented as a model for Mapping Scott's Institutional Theory to Socio-Technical Interaction Networks.

2.2 Information Infrastructures

This research examines the ways in which information infrastructure consists of an assembly of technical infrastructure, social norms, and organizational practices (Edwards et al., 2007). The expression "information infrastructure" appeared in scholarly literature during the 1990's to describe "scaled-up, geographically dispersed, computer networks" (Star, Bowker and Neuman, 1998, p. 4). To date, the literature has presented information infrastructures as groupings: collections of information, such as lists, technical specifications and standards, combined with work practices (rules), and material elements, such as wires and devices (Borgman et al., 2013; Mongili and Pellegrino, 2014; Star 1999; 2010). Ribes and Finholt (2009) describe information infrastructure as possessing various "measures of actions" (p. 377).

They suggest that information infrastructure a) is a technological undertaking, which supports and enables collaborative work activities (p. 377); b) is a social venture, that needs

humans to work, organize, and maintain the infrastructure so it will persist (p. 378); and c) is an institutional venture, which provides accessible and stable features to organizations and communities at both national and international levels (p. 378).

2.3 Defining IRs as Information Infrastructures

IRs have been defined as web-based digital-asset management systems, through which research institutions and universities can promote and preserve research, scholarship, conference papers, and (in some cases) creative works. IRs are often organization-wide services when compared to other campus technology platforms such as email, websites, or integrated library systems. Due to the organizational nature of IRs, their contents, as well as policies that reflect the selection and retention of the content, IRs may be defined by the particular institution (Johnson, 2002). In much literature the IR is still considered to be a digital library, as an organized collection of digital objects pertaining to a particular field of research or to an educational organization (Crow, 2002; Lynch and Lippincott, 2005; Jones, Andrew and MacColl, 2006).

However, Lynch (2003), defines IRs as:

“a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members ... A mature and fully realized institutional repository will contain the intellectual works of faculty and students—both research and teaching materials—and also documentation of the activities of the institution itself in the form of records of events and performance and of the ongoing intellectual life of the institution. It will also house experimental and observational data captured by members of the institution that support their scholarly activities”. (p.1)

Lynch also imagined a broad array of materials produced by an institution and preserved over time:

“Institutional repositories also have roles beyond disseminating and managing the works of individual scholars that are part of the dialog of scholarly communications. ... [At] least a few 444

institutions themselves are changing their culture and are making commitments to globally disseminate extensive teaching and learning materials through the Net ... [Or], at a less systematic but still important level, to digitally capture and preserve many of the events of campus life: symposia, performances, lectures. Institutional repositories offer a framework for organized stewardship and accessibility of these materials.” (2003, p. 331)

Other initial definitions of IRs were expansive about the range of materials that they would hold, including “pre-prints and other works-in-progress, peer-reviewed articles, monographs, enduring teaching materials, data sets and other ancillary research material, conference papers, electronic theses and dissertations, and gray literature” (Crow, 2002a, pp. 17-18). IRs have also been defined as infrastructures that combine information policy, content, taxonomy, curatorial aspirations and institutional objectives: “an IR consists of formally organized and managed collections of digital content generated by faculty, staff, and students at an institution” (McCord, 2003, p.1). Johnson (2002) identified an IR in terms of function, as “scholarly, cumulative and perpetual, and open and interoperable” (p.3).

Furthermore, Buckland (1991) writes that IRs and their “noncommercial provision of information sources is of particular interest because it provides empirical evidence of the values and social goals of individuals and groups providing information and of perceptions of the cost-effectiveness of information systems” (p. 182). In other words, IRs can serve multiple purposes including establishing an institution’s value and impact (Chan, 2004; p.277).

IRs have six major characteristics according to Jones et al. (2006, p. 115). These features are all pointed out by Crow (2002), Johnson (2002), Lynch (2003), and Genoni (2004). The characteristics of IRs are:

1. Institutionally defined
2. Scholarly
3. Cumulative and perpetual
4. Open and interoperable

5. Capturing and preserving events of campus life
6. Searchable within constraints

Initially, the choices for IR infrastructure, software development and platforms to host scholarly works was limited. Software platforms were developed; for example, a platform called DSpace designed at Massachusetts Institution of Technology (MIT), and another platform named EPrints developed at the University of Southampton, and these platforms created open-source choices for the future of IR development (Smith et al., 2003). According to Pinfield et al. (2014), IRs were initiated that employed open-source software typically used the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) (Chan, 2004, p. 278). These IRs were thought to provide permanent access to digital objects and allow for increased accessibility through and allowed for greater access via initiatives like OAIster² or Google Scholar³ (Pinfield et al., p. 2045). Today, as communicated on the Directory of Open Access Repositories⁴ (www.OpenDOAR.org), there are more than 25 different platforms being used as IR software globally.

2.4 Institutional Repositories and the Role of Organizations

The early literature on IRs suggests that a convergence of technologies and social conversations driven by what is known as the “serials crisis” led to the development and the growth of IR infrastructure (Jones, Andrew and MacColl, 2006; Michalak, 2000).

Technologically, the introduction of the world wide web in the late 1980s and into the 1990s established a network which freely connected scholars to each other, and allowed for non-traditional (i.e., digital) ways to disseminate their work via listservs and directly via email

2 OAIster is an Open Archive Initiative that provides compliant metadata harvester that can search any digital repository.

3 Google Scholar includes IR contents, thus making the scholarly works more discoverable.

4 <http://v2.sherpa.ac.uk/cgi/search/repository/advanced>.

(Harnad, 2001a). Further, the establishment of Google in 1998, which connected a larger audience and organized their exchange of information, allowed for scholars and librarians to start conversations around the development of open-source repository software in 2000 (Bevan, 2007; MacLeod, 2004). Finally, bringing together technology and social actors, in 2002 the Budapest Open Access Initiative (BOAI) served as a declaration of commitment for scholars to self-archive their work in IRs and for the creation of open access journals globally (Suber, 2003). Since the gathering at BOAI, 17 years ago, IRs have grown in number and size and have spread internationally. As of February 2019, the Directory of Open Access Repositories (*OpenDOAR.org*) listed a total of 3,859 “quality-assured ... open access repositories around the world” from various repository organizations (*OpenDOAR.org*, 2019), 3,323 (86.1%) of those repositories were institutional ones (as opposed to disciplinary, aggregating, or governmental repositories).

While the research in the next sections addresses a variety of literature about IRs related directly and indirectly to their contents and growth, little has been studied about who or how IRs have initiated and supported direct IR development. This research has chosen to examine two countries’ instances of repositories: Japan and the United States. They were chosen for two important reasons. First, Japan and the United States each have the largest number of IRs worldwide. Second, both countries have what appears to be similar organizations (i.e., SPARC) that have initiated or supported IRs. The following sections depict my initial findings in the primary documents and scholarly literature on how IRs emerged both technically and socially. Scholarly literature is limited in these areas, so it is hoped that the findings of this research will demonstrate a better understanding of the processes involved, and how the trajectory relates to support in Japan and the United States today.

2.4.1 Establishment of Organizations and IRs in the United States

Reference to “institutional repositories” as an online collection of scholarly materials first appeared in the literature under the terminology “institutional repository” in 2002, most notably in a July 2002 position paper from the Scholarly Publishing and Academic Resources Coalition (SPARC) by Raym Crow. Prior to that, it is believed that there were references to an “institutional model” on behalf of repositories and archives mentioned during the Santa Fe convention in October 1999, at the meeting of the Open Archives Initiative (Van de Sompel and Lagoze, 2000; Tansley and Harnad, 2000). However, the use of the exact term “institutional repository” appears to begin being discussed more frequently in 2002 (Tansley and Harnad, 2000).

One notable moment prior to the more formal scholarly discussions of IRs in literature was in June of 1994, when a scholar named Steven Harnad, writing to his colleagues on the VPIEJ-L (“An Online Discussion Group for Electronic Journal Publishing Concerns”), declared “that all scholarly authors should have public FTP or web sites from which to publish their scholarship freely and electronically” (Okerson and O’Donnell, 1995, pp. 11-12). This exchange from Harnad is thought to have been important because it is believed to have started a conversation among scholars which might ultimately disrupt the present way of publishing one’s scholarly works. The conversation included scholars and librarians who suggested that the library was the appropriate part of the academy to provide an “institutional archiving function” (Okerson and O’Donnell, 1995, p. 13).

Harnad (a cognitive scientist) was likely influenced by disciplinary repositories that existed in the 1990s, which were started principally in academic departments such as physics and the sciences, and were the most prevalent (Zuber, 2008). Some examples of the early discipline-

specific systems (that still exist today) are arXiv.org for physics (<https://arxiv.org/>), CogPrints for the cognitive sciences (<http://cogprints.org/>), and RePEc for economics (<http://repec.org/>) (Van de Sompel and Lagoze, 2000). While disciplinary repositories were developed by researchers who were starting to understand the characteristics of the Internet as a medium for document storage and preservation (and, in some cases, for the sharing of their work) (Pinfield et al., 2014), many other stakeholders (e.g., computer developers, academics, librarians, and publishers) became involved in the processes and economics of academic publishing, combined with the new ability for scholars to disseminate their own research electronically (Jones, 2006).

In the 1990's, many academic libraries were having conversations about the sharing of scholars' work, except now from the perspective of what is known as the "serials crisis" (Chrzastowski and Schmidt, 1997). Libraries had been considering issues around the ever-rising cost of subscriptions to journal prices, to the point where they were warning about the impending crisis by publishing, presenting, and discussing issues together at conferences (Carpentier and Alexander, 1993; Chrzastowski and Schmidt, 1997, Ketchum and Born, 1994). In 1997, at the spring meeting of the Association of Research Libraries (ARL), Ken Frazier, then Director of Libraries at the University of Wisconsin, proposed "a form of collective action to address the serials pricing crisis" (Michalak, 2000, p. 13). Within several months of Frazier's appeal, and "with the help of a group of two-dozen individuals who were willing to take action, Frazier solicited ideas for names for the undertaking, and the name 'SPARC,' or the "Scholarly Publication and Academic Resources Coalition" was adopted (Michalak, 2000, p. 13).

As also noted by Michalak (2000, p. 13), SPARC's main goals at the time of formation was threefold:

1. To solicit and encourage the introduction of new publications of high quality and fair price,
2. To guarantee a subscription base and to market new products to potential subscribers,

3. To generate support for SPARC projects from distinguished faculty, educational organizations, professional societies, and scholarly publishers.

Parallel to the ARL and SPARC discussions, publications on the impact of IRs from “influential higher education organizations, like the Coalition for Networked Information (CNI) and SPARC, began to emerge” (Michalak, 2000, p.14). Furthermore, Crow’s (2002) position paper written for SPARC entitled “The Case for Institutional Repositories,” and a 2003 article by CNI’s Clifford Lynch entitled “Institutional Repositories: Essential Infrastructure for Scholarship in the Digital Age,” were much-cited reports on the definitions of IRs and their scope (Michalak, 2000). Both versions of the papers were published in the ARL newsletter, entitled *ARL: A Bimonthly Report* (Crow in August 2002 and Lynch in February 2003), and featured at both CNI and ARL membership meetings, which brought their potential as a new service to the attention of library technology experts and library directors (Johnson, 2007; Lagoze and Van de Sompel, 2003). Thus, IRs in the US were being discussed and established by 2003, and the existence of IRs as a new component in the scholarly communications infrastructure was being discussed regularly in conference papers, academic articles, and the press (Peters 2002; Tennant 2002; Young, 2002).

2.4.2 Establishment of Organizations and IRs in Japan

The initial motivation for adopting IRs in Japan took a similar path to North America, in that it was in response to the convergence of technology and Japanese libraries were also involved in discussions around journal pricing and the serial’s crisis. However, technologically there were significant differences. While North America was being exposed to the development of Google, as well as the growth and mainstream use of the world wide web and internet, Japan’s strategy for advancement was largely guided by a national system of technological and economic governance (Johnson, 1982).

Japan since WWII had been focused on the advancement of technology. After the war the Japanese government developed a national system of technology policy-related industrial governance (Fransman, 1999; Johnson, 1982). This national system has been characterized by Fransman (1990) in the following three distinct periods: Early Catching-Up Period, 1945-1965; Late Catching-Up Period, 1966-1980; and the Frontier-Leading Period, 1980-present (pp. 266-276). During those periods, national industrial policies were used to promote Japanese economic confidence and to change from a technology “catching-up system to a technology-producing system” (Ozawa, 2007; p. 121). At the end of the 1990’s, Japan realized that it was lagging in terms of the Frontier-Leading Period and in the creation of new technologies, so the Japanese government established an IT Strategy Headquarters, and began planning a new national plan called e-Japan Strategy (Kudo, 2010; p.74). The purpose of this new e-Japan strategy and the establishment of the IT Strategy Headquarters was to “enable all Japanese citizens to enjoy the benefits of the IT revolution and to comprehensively promote measures aimed at developing Japan into an internationally competitive nation built on information technology” (IT strategy Headquarters, 2000; Section 1).

The e-Japan Strategy coincided with the formation of the National Institute of Informatics (NII) in April of 2000, which today is responsible for IRs in Japan. NII was not a new institution, as it originated from the Ministry of Education, Science, Sports, and Culture (MEXT) in October 1973, and was called the Improved Circulation System for Academic Information (“About NII History” National Institute of Informatics, 2019c). The contemporary NII as we know it today went through many reformations and iterations, and until 1986 was linked to and was part of the University of Tokyo. In April 1986, it was reformed again as the National Center for Science Information Systems (NACSIS). This reiteration was independent of the University of Tokyo,

and NACSIS grew in accord with advances in computer and Internet technology (“About NII History” National Institute of Informatics, 2019c). Again, in April 2000, NII was officially established with following the “reorganization of NACSIS and assumption of its functions” (“About NII History” National Institute of Informatics, 2019c). Over the past nineteen years, NII has reestablished its connections with academic institutions in Japan, and the Initiation of Project to “Improve Infrastructure for International Circulation of Scholarly Information” was launched (“About NII History” National Institute of Informatics, 2019c; Murakami and Adachi, 2006).

Further, academic discussions at Japanese universities and their libraries regarding IRs were taking place as well. According to Murakami and Adachi (2006), beginning in 2003, MEXT circulated a report on IRs that prioritized the role of university libraries in the distribution of academic information (p. 542). After this report, investigation into IRs followed, and NII started working with six Japanese universities to conduct trials and introduce experimental implementation of IRs (Murakami and Adachi, 2006; Murakami et al., 2007). In June 2005, the MEXT Council followed up with a second report on university libraries, stating the primary role of IRs in the dissemination of academic works as information resources (Murakami and Adachi, 2006; p. 543). At the end of 2005, with collaborations between NII and academic libraries, there were approximately 19 IRs associated with university libraries in Japan (Matsuura, 2008; Murakami and Adachi, 2006; Murakami et al., 2007).

Parallel to the growth of institutions who were embracing IRs, NII also began creating strategies, reports and education initiatives for supporting and maintaining the development of IRs and highlighted their significance for the reform of academic information (Matsuura, 2008). In 2003, SPARC Japan, also known as the Committee for the Promotion of Scholarly Communication, was formed (About Us, SPARC Japan, 2017). Its objectives were to:

“promote open access, to encourage further distribution of scholarly information and academic resources, and to strengthen ability for dissemination of information, cooperating with domestic and international OA initiatives and organizations on the matters concerned” (About Us, SPARC Japan, 2017)⁵.

SPARC Japan’s initial project was also to encourage the “digitization of scholarly journals, especially English language journals published in Japan, with SPARC Japan Publishing Partners” (About Us, SPARC Japan 2018)⁶. The publishing partners were journal publishers in Japan in the sciences and social sciences (“SPARC Japan Publishing Partners”, SPARC Japan, 2018).

By June 2006, NII in collaboration with academic institutions had gathered over 60,000 items in Japanese IRs (Murakami et al., 2007). It was concluded that the submission of such a large number of scholarly works indicated that plans for the introduction of IRs to Japan were needed (Murakami and Adachi, 2006; Murakami et al., 2007). Over the past two decades IR deposits in Japanese repositories have continued to grow; Yamaji et al. (2015) predicted that, following the introduction of a new type of cloud-service-based IR (the JAIRO Cloud) in 2010, that by 2015 the total number of IRs in Japan would outnumber those in the United States, reaching almost 561 IRs out of the almost 700 potential universities (p. 399).⁷

2.4.3 Relationship between SPARC NA and SPARC Japan

According to the ARL Activities report (2002), SPARC North America (NA) carried out networking activities that included reaching out to like-minded academics and librarians in Japan. In 2002, SPARC NA reported that they were “actively advising a working group of Japanese library directors and government officials who aim to create a SPARC-like

⁵ SPARC JP About Us, Overview. Retrieved December 2019 <https://www.nii.ac.jp/sparc/en/about/>

⁶ SPARC JP About Us, Overview. Retrieved December 2019 <https://www.nii.ac.jp/sparc/en/about/>

⁷ JAIRO stopped service in March 2019, and integrated to the IRDB (Institutional Repositories Database). Retrieved August 2021 https://iss.ndl.go.jp/information/2019/03/26_jairo/

organization that will funnel grants to scientific society journals, enabling them to become more competitive” (p. 12). Further, the ARL report notes that SPARC NA also participated in the formation of the International Scholarly Communications Alliance, launched in 2002 (p. 12). However, the report does not communicate who was part of the alliance. Further in the 2003 edition of the ARL Activities Report (2002), it is noted that SPARC NA worked with Japan’s Association of National University Libraries (ANUL) and National Institute of Informatics (NII) to help plan a strategy for assisting Japanese scientific societies to digitize their journals and disseminate them internationally (p. 13). The report states that SPARC NA held a number of meetings with NII officials, publishers, editors of scientific-society and math journals, and others interested in creating an organization that would introduce SPARC NA’s objectives to Japan (p. 13). Additionally, at two large library conferences in Japan in December 2002, SPARC NA presented information to their Japan colleagues about SPARC NA history and consulted at length with Japanese librarians (p. 13). The relationship today between SPARC NA and SPARC Japan remains somewhat unclear. The SPARC NA webpage (2018a) provides information on SPARC Japan and refers to them as a global affiliate.

2.5 Literature on IR Development

The expansion of IRs and supporting organizations has thus far been indirectly addressed in the literature. While the underlying causes for IR development may have emerged from the expansion of internet technology and the progression of information linked with it, much of the literature has concentrated on the development, volume, content, and impact of IRs—not IR proliferation itself. Presented in the following sections is a brief overview of the literature in these areas.

2.5.1 Studies on IR Development within Institutions

A large portion of scholarly literature specific to the usage of IRs and open access repositories in general exists. However, most literature focuses what factors make IRs successful (Hoorens and Villalba-Van Dijk, 2010; Westell 2010). For example, Clements, Pawlowski and Manouselis (2016) carried out a review of Open Access Repositories which they stated could lead to four systematic measures of successful repositories. They suggested that measuring the following factors would help developers, communities and future IR projects succeed: a) contributors (i.e., people) and their corresponding number of active, frequent and collaborative contributions; b) numbers of resources, and their size and growth; c) interactions, i.e., visits, views, downloads, reuses, contributions; and d) repository lifetime (p. 71).

Kim and Kim (2008) also provided a quantitative analytical framework to examine IRs, but most of the early literature in general has been concerned with IR success factors and performance indicators, therefore it has tended to provide a way for planning IRs and methods for measuring an IR's success. The literature is lacking in that it does not explain how to plan and or implement an IR. Campbell-Meier (2008) attempted to address that by providing a case study in her dissertation on IR implementation and development in six United States doctoral universities. Campbell-Meier found that "project planning was an area that did not get much attention from the project teams" (p. 128). One of the primary findings was the "importance of incorporating project management practices into IR development" (p. 145).

Another study performed by King and Marks (2008) used a case study which investigated a "Decision Science Support department of a large multinational corporation" (p. 10). Their study provided an understanding of the "planning and execution of a repository project in a sector where project management techniques are common practice" (p. 13). Another project by

Afshari and Jones (2007) made use of the PRINCE2 project management methodology to construct an IR system. Their research provided detailed descriptions in the higher-education sector (p.340). They claimed that using a standard methodology increased the institutions repository buy-in. They stated that it “put the repository team in an excellent position having Project Management and Institutional Repositories with both top-down and bottom-up support for the endeavor” (p. 341). However, this did not address how IRs proliferate at different rates across different organizations and societies, which will be the subject of this research.

2.5.2 Studies on the Volume and Content of Research in IRs

A considerable amount of contemporary literature on IRs has focused largely on the volume and content that exists in IRs and the processes and practices of individual faculty contribution. While publications are too numerous to mention here (with much not directly related to this research), some notable examples are Thomas and McDonald (2007), who examined hesitancy on the part of faculty to deposit work in an IR; Schoenfeld and Housewright (2010), who reported that “our national sample found only 15% of faculty members have deposited into an institutional repository” (p. 28); and Dubinsky (2014), whose survey uncovered the mean growth rate of individual faculty IR deposits was 165 items per month, about twice the rate recorded in a similar study conducted by McDowell in 2007 (p. 15).

Consequently, most research related to IRs shows a general reluctance for individuals within institutions to deposit their research in IRs, and thus the resulting volume (or lack thereof) and contents of IRs. As this research is concerned with groups of people (i.e., organizations) and there is little literature in this area, Sections 2.5.3 and Section 2.5.4 will briefly highlight the literature on the volume and content for Japan and North America, as this will may provide some insight into the growth and development of IRs over time.

2.5.3 Growth, Volume and Contents of IRs in North America

Much of the research on North American IRs focused upon the actual volume and contents deposited by faculty and their practices around IRs. McDowell (2007) found that the implementation of IRs (from 2005 onward) was growing more slowly than anticipated in terms of the total number of instances and overall holdings (p. 9). However, McDowell does not offer any further indication of how IRs were being implemented other than an accounting of the main contents of IRs, i.e., electronic dissertations and theses, accounting for “41.5% of all items in American academic IRs” (p.9); 37% were “faculty scholarly output”; 13% were photographic collections; 5% non-scholarly publications, and 3% historical texts (p. 6). Only 1% of the faculty content came from “other non-published and non-peer reviewed materials related to faculty scholarship, including conference presentations, learning objects, podcasts and other multimedia, and datasets” (McDowell, 2007, p. 8).

Pinfield et al. (2012) had conducted research on the growth worldwide of OA IRs but provided thorough statistics on the United States that are now out of date, reporting then that the United States had a “noticeably larger number of repositories than other countries” (p. 2411). They also examined repository characteristics such as the type (institutional or disciplinary), language of the repository, number of items contained, quality of the content (i.e., full text or links) and a count of the various types of repository platforms used (pp. 2408-2415). Pinfield et al. suggested that “major factors affecting both the initial development of repositories and their take-up include IT infrastructure, cultural factors, policy initiatives, awareness-raising activity, and usage mandates” (p. 2404).

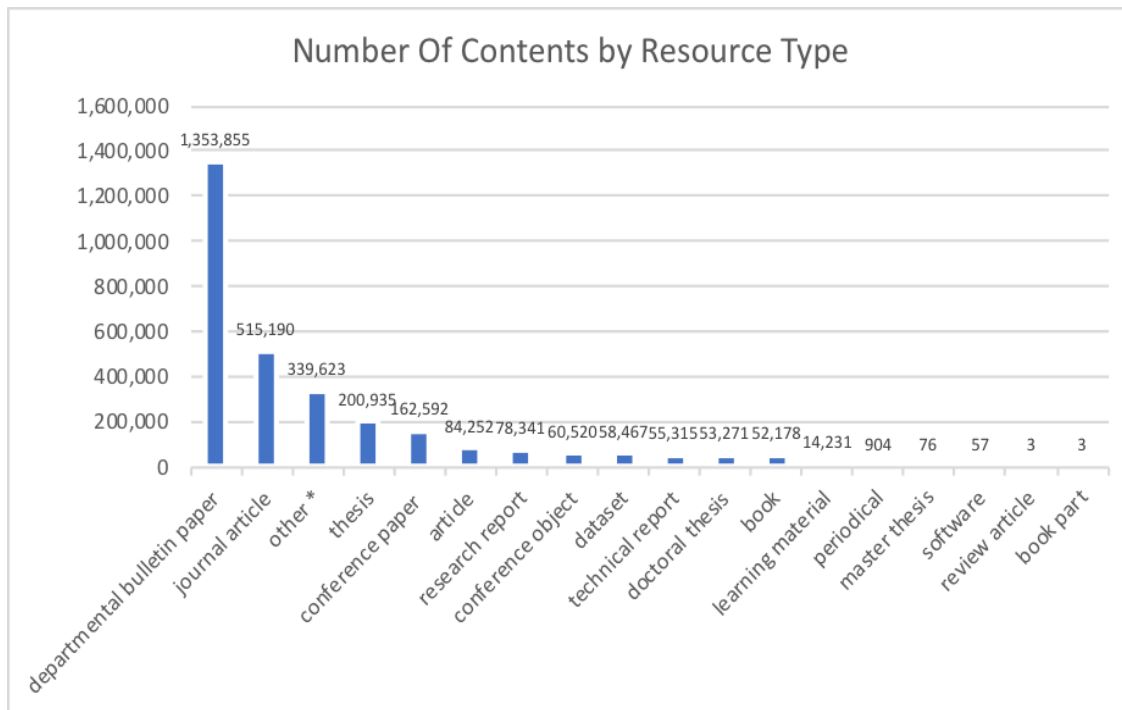
As content and volume in IRs is still being explored, there are also contrasting views from within the United States as to the future of IRs. One such view taken by Romary and

Armbruster is that US IRs have “failed to deliver” and that “large, central repositories would be more effective” (2010, p. 2). Further, Clifford Lynch, who seemingly endorsed IRs in their early years, in his 2017 paper suggested that IRs are perhaps no longer relevant for scholarly works, and “must be disconnected from the OA agenda for journal articles and repositioned in the broader context of managing and preserving institutional community assets” (p. 127).

2.5.4 Growth, Volume, and Content of IRs in Japan

Research on Japanese IRs also included discussions regarding contents, volume and the relationship to growth (for example see Abrizah, Noorhidawati, and Kiran, 2017; Shuto et al., 2014; Tsuchide et al., 2013). IRs in Japan appear to have a lot of content, but a closer inspection shows that contents of Japan’s IRs differ in that more than half are departmental bulletins (Kiyō) that are quasi-research announcements unique to Japan’s academic environment (Harayama, 2016). Next are academic journal articles, as seen in Figure 1 showing the Count of Items in Japan’s Repositories by Resource Type (IRDB: Institutional Repositories Database National Institute of Informatics, 2019a).

Figure 2.1 Count of Items in Japan Repositories by Resource Type (all time total)



Source: National Institute for Informatics, 2019d.

<https://dev.irdb.nii.ac.jp/en/statistics/all?year=2019andmonth=All>

Note: * “Other” could refer to university or department newsletters, notices, documents of university importance, administration and some archival materials, including images.

Kiyo Departmental Bulletins are distinctive to Japan as they have several features

(Harayama, 2016):

1. Most authors are the department faculty members.
2. They are edited and published by the department faculty.
3. The cost to publish is covered by the department.
4. They are not for sale and have small circulations.
5. Peer review is sometimes loose, and articles in them are not so highly regarded (especially in natural sciences).

Comparatively, *Kiyo* are perhaps closest in nature to gray literature (Kamada, 2007; Takeuchi and Tutiya, 2007). In 2007, a similar study of United States IRs found that 23 percent of the content consisted of “gray literature” authored by faculty members, and most had not been “subjected to peer-review but are scholarly in nature” (McDowell, p. 9). In Japan, however, this

gray literature alone account for more than 50 percent of IR content (National Institute of Informatics, 2019).

2.6 Studying the Impact of IR Usage

Finally, much literature exists on whether disciplinary repositories where faculty deposited their work is more impactful and rewarding than institutional repositories as places to share their research. In 2015 the Ithaka S+R US Faculty Survey conducted by Wolff, Rod, and Schoenfeld queried faculty whose research was openly available on the Internet, i.e., “whether each [article] is available through their institution’s repository, an open access disciplinary repository, or elsewhere” (p. 48). The conclusions were that “books or scholarly monographs had the largest share available at the respondents’ institutional repositories, pre-prints of peer-reviewed journal articles had the largest share in open access disciplinary repositories, and blog or microblog posts had the largest share elsewhere online” (p. 48). From this finding the authors concluded that “non-institutional channels, that is, those that the institution doesn’t monitor or control, are driving a substantial share of open and free access online” (p. 48).

However, these four foci of the research literature on IRs, be it the development of IRs within individual institutions, the volume of deposits within IRs, the actual deposited content, or the research impact those deposits have generated, have not addressed why IRs have had more success proliferating in Japan and not as much in the United States. “Cultural” explanations (such as the Japanese are culturally more inclined to cooperate as a group to deposit data, while the individualistic Americans are less likely to cooperate and share) (see Ardichvili et al., 2006; Bhagat et al., 2002) are generally unsatisfying as explanations. Instead, this research proposes an *institutional* and *organizational* approach, where the interactions of people with technology in

institutions from a socio-technical perspective may better illustrate why IRs are more likely to succeed in one place than another.

2.7 Institutional Theory and Organizational Contexts

Institutional Theory takes into account the “processes by which structures, including schemes, rules, norms, and routines, become established as authoritative guidelines for social behavior” (Scott, 2004; p. 408). This research is interested in the neo-Institutional Theory established by contemporary Institutional Theory scholars, such as DiMaggio and Powell (1983) and Scott (2001). Institutional Theory is about understanding “the ways in which belief and rule systems affect social behavior and structure” (Scott, Ruef, Mendel, and Caronna, 2000, p. 14). Other definitions of Institutional Theory highlight that institutions can be representatives of social orders or patterns that can continually reproduce, and therefore institutions continually exist through self-activating or automatic social processes (Brint and Karabel, 1991; DiMaggio and Powell, 1991; Jepperson and Meyer, 1991; Zucker, 1977, 1983, 1987).

Grounded in Scott’s (2001) explanation of an institution or organization, SPARC NA and SPARC Japan are examples of such institutions. Both are based on three different elements, or “pillars of institutional patterns; regulative, normative and cultural-cognitive elements that produce meaning, stability and order” (p. 75). Moreover, Scott (2002) suggests that the “three institutional elements can move from place to place and time to time with the help of four types of carriers—symbolic systems, relational systems, routines, and artifacts” (Scott, 2001; p. 77).

For this research, using an Institutional Theory lens provided insights into how social actors are influenced by institutional pressures from their institutional environment (Scott, 2001), particularly on how organizations cope with external pressures to conform, how they share notions of desirable and appropriate behaviors, and how they secure resources and social support

(DiMaggio et al. 1983; Tolbert 1985). Finally, examining the organizations and their social behaviors might help us consider the legitimacy of social behaviors, and how they contribute to the processes and practices of institutionalism (DiMaggio and Powell, 1983).

2.7.1 Institutionalization and the Institutional Environment

Berger and Luckmann's writings on the "social construction of reality" (1966) is counted as a foundational source of contemporary Institutional Theory (Scott, 2001; p. 16). In their work, institutions are established through a process known as institutionalization (Meyer and Rowan, 1977; Tolbert and Zucker, 1983), which occurs "when rules and behaviors become taken-for-granted and legitimized" (Meyer and Rowan, 1977; p. 341). When institutions are started, they provide their social actors with constraints that work as imposing guides for social behaviors and then become accepted as norms, rules and practices (DiMaggio and Powell, 1983; p. 149).

Barley reinforces this when he suggests in his research about technology and organizational structures that individual beliefs are then formed by notions of legitimacy that are constructed by institutions (1986, p. 79). Additionally, Berger and Luckmann (1966) suggested that "social reality is a human construction created through interactions" (p.50), and therefore, institutionalization happens when there is "reciprocal typification of habitualized actions by types of actors" (p. 51).

Stated another way, the basic premise of institutionalization occurs when regular patterns of action (for example managed messages, coordinated activities) are "reproduced again and again, and shared and taken for granted by all the members of organization and or its community" (DiMaggio and Powell, 1983; p. 155). Institutionalization can therefore be thought of as the act of establishing and reproducing norms in an organization. Further, DiMaggio and Powell proposed that the "processes of institutional reproduction" fall into three patterns:

“coercive, normative, and mimetic processes of reproduction” (p. 150). Thus, reproduced patterned actions become and exist as institutions (Jepperson and Meyer, 1991; p. 151) that guide human actions by creating a pattern of conduct (Berger and Luckmann, 1966; p. 135), and are associated with particular actors (Tolbert and Zucker, 1996, p 232).

The institutional environment provides an interesting framework from which to examine the social expectations and norms in an organization. Using an institutional lens may allow for the examination of social actors performing behaviors, developing normal practices, and understanding structures and processes (DiMaggio and Powell, 1983; Meyer et al., 1977; Scott, 2001). Social actors can adapt to social expectations and norms in order to maintain legitimate structural forms—i.e., legitimacy (DiMaggio and Powell, 1983; Heugens and Lander, 2009). Scott (2001) describes the process of institutional legitimacy, which works in that comparable tensions or pressure may feed into the three pillars (elements) of institutions: regulative, normative, and cultural-cognitive.

Further within the institutional environment exist institutional components: (1) institutional logic, (2) institutional actors, and (3) governance systems, that may help to understand change in the institutional environment (Scott et al., 2000; p. 171). Institutional logic is the belief systems that “specify what goals or values are to be pursued within a field and indicate what means for pursuing them as appropriate” (Scott et al., 2000, p. 171). A shared social meaning or shared knowledge helps guide member activities. The institutional actors are “carriers and creators of institutional logics, and actors possess identities, capacities, responsibilities, and rights as they relate to the organization” (Scott et al., 2000 p. 172). Moreover, “the role of coordinated activities and routines may also be considered a carrier of institutional elements” (Scott, 2001; p. 70).

2.8 Scott's Model for Institutional Analysis

Miller and Loess (2002) suggest that Scott's model may be used to observe complex institutional phenomena (p. 754). In Scott's model, the three pillars and the carriers of institutional elements can provide a lens through which to "organize, categorize and analyze data that will be collected (p.754). Scott's framework applied to my own research may assist in understanding the formal and informal rules (e.g., shared beliefs and values, routines, regulations, and institutionalized practices) that mutually construct and are constructed by the social actors as they interact with the IR.

2.8.1 Understanding Institutionalization: Pillars and Carriers

As Scott suggests, "institutions are comprised of regulative, normative and cultural-cognitive elements, which provide legitimacy and social conformity" (2001; p. 51). The three pillars can be viewed as a continuum "from the conscious to the unconscious, from the legally enforced to the taken for granted" (Hoffman, 1997; p. 36). Table 2.1, adapted from Scott (2001), serves as a guide and outlines the three pillars of institutions. The columns contain the three elements—regulative, normative and cultural-cognitive—as making up or supporting intuitions. Scott states defined are some of the "principal dimensions along which assumptions vary and arguments arise among theorists emphasizing one or another element" (p. 59)

The Regulative pillar includes the rules, laws, regulations, governance systems, surveillance, conformity, sanctioning, rewards and punishments that constrain and regularize behaviors (Scott, 2001; pp. 52-54). Institutions may use sanctioning as a regulative mechanism to govern themselves and their members (p. 58). Regulative elements could be formal or informal, and one example Scott suggested is that of law enforcement agencies. They are comprised of

formal actors and may use folkways (such as shaming and shunning) and mores as more informal mechanisms for normalizing behavior (p. 60).

Table 2.1 Scott’s Three Pillars of Institutions

	Regulative	Normative	Cultural-cognitive
Indicators	Formal rules, laws, sanctions, incentive structures, reward and cost structures, governance systems, power systems, protocols, standards, procedures	Values, norms, role expectations, authority systems, duty, codes of conduct	Priorities, problem agendas, beliefs, bodies of knowledge (paradigms), models of reality, categories, classifications, jargon/language, search heuristics
Basis of compliance Mechanisms	Expedience, Coercive pressure (force, punishments)	Social obligation Normative pressure (social sanctions such as ‘shaming’)	Taken for granted, mimetic, learning, imitation
Logic	Instrumentality (creating stability, ‘rules of the game’)	Suitability, appropriateness, becoming part of the group (‘how we do things’)	Orthodoxy (shared ideas, concepts)
Basis of legitimacy	Legally sanctioned	Morally governed	Culturally supported, conceptually accurate

Source: Adapted from Scott, 2001; pp. 55-85.

The Normative pillar highlights “shared values and norms, including values, expectations, taboos, roles, conventions, practices, protocols, and traditions (Scott, 2001; p. 64). The normative “emphasizes appropriate standards of behaviors and stipulates how behaviors may exist within the existing structures” (p. 64). This pillar focuses on the prescriptive, evaluative and obligatory scope. In the normative process, specific roles become identified with certain actors (p. 64). Scott contends that “normative systems constrain on social behavior as

well as empower and enable social action. They confer rights as well as responsibilities, privileges as well as duties, licenses as well as mandates” (p. 65).

The Cultural-cognitive pillar includes “shared convictions and frames that give a perception about the world and its meaning” (Scott, 2001, p. 67). This pillar also includes “beliefs, mental models, categories, identities, schemas, and scripts” (p. 67). Scott (2001) suggests that “the beliefs are ‘cultural’ because they are socially constructed symbolic representations; they are ‘cognitive’ because they provide vital templates for framing individual perceptions and decisions” (p. 67). Therefore “meanings arise in interaction and are maintained and transformed as they are employed to make sense of the ongoing stream of happenings” (Scott, 2001; p. 67).

2.8.2 The Four Carriers

Institutional elements can “move from place to place and time to time with the help of four types of carriers-symbolic systems, relational systems, routines, and artifacts” (Scott, 2001; p. 70). The four types of carriers as outlined by Scott (2001, pp. 77–83):

1. Symbolic systems (rules, standard processes, values, beliefs, and ideas) are present in the mind as ideas and values; “they are at the same time external to actors and internalized by actors as cognitive frames and beliefs” (p. 77).
2. Relational systems (governance and authority systems, and identities) are related to role structures, i.e., patterned expectations people cultivate through being embedded in social networks. Relational systems are made up of associations among individual and collective actors (p. 78).
3. Routines are patterned actions and procedures (repetitive activities).
4. Artifacts are tangible objects, such as information technology, which have mandated specifications, “but are interpreted and appropriated by people in different ways, depending on conventions and symbolic values associated with them” (p. 82).

To highlight the connections of Scott’s classification of institutional pillars and carriers see below Table 2, which portrays “the organization of the carriers of institutions in corresponding to their respective pillars” (2001; p. 77).

Table 2.2 Institutional Pillars and Carriers

	Pillars	Pillars	Pillars
Carriers	Regulative	Normative	Cultural-cognitive
Symbolic systems	Rules, Laws	Values, expectations, standards	Categories, typifications, schema
Relational Systems	Governance systems, power systems	Regimes, authority systems	Structural isomorphism, identities
Routines	Protocols, standard operating procedures	Jobs, roles, obedience to duty	Scripts
Artifacts	Objects complying with mandated specifications	Objects meeting conventions, standards	Objects possessing value

Source: Scott, 2001; p. 77.

Something to note in Table 2.2 above is what is included in the regulative column relating to relational systems: the place of governance systems. Scott (2001) presents two types of governance systems authority and power. Scott suggests that “such governance systems are viewed as creating and enforcing codes, norms, and rules and as monitoring and sanctioning the activities of participants” (p. 80).

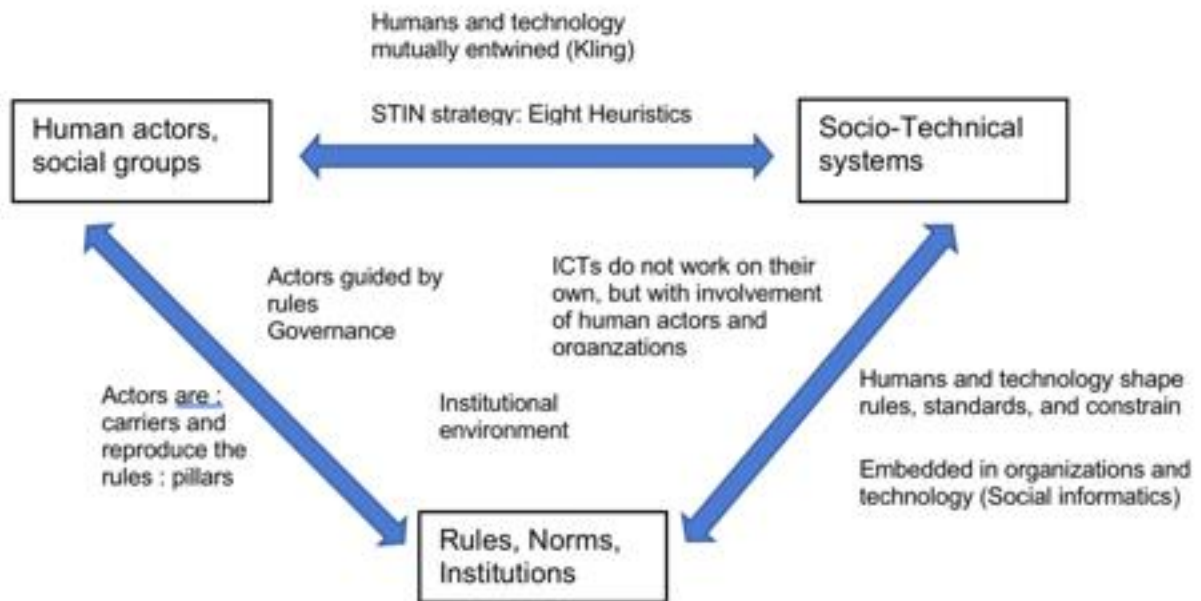
2.9 Mapping Socio-Technical Influences to Fit Scott’s Institutional Theory

Institutions are comprised of social actors. DiMaggio (1988) discussed social actors as “agents, and their roles in institutional creation, maintenance, and demise” (p. 3). Scott (2008)

clarifies DiMaggio's point by adding that an actor in an organization is not a single unit but comprises "a variety of roles and functions distributed across diverse players" (p. 98). Scott further argues that the connections among actors produce "relational systems" (p. 98). In contrast, social informatics also focuses on the connections among social actors, technology and the larger social context in which they exist (Sawyer and Tyworth, 2006).

In this research, people are viewed at the organizational level of analysis as social actors. When examining the socio-technical, the social actor is "an organizational entity whose interactions are simultaneously enabled and constrained by the socio-technical affiliations and environments of the firm, its members, and its industry" (Lamb and Kling, 2003; p. 212). Therefore, the use of Institutional Theory as a framework for examining the interconnections between the social and the technical aspects of IRs will allow for the discovery of interactions among people, organizations, institutions, and a range of technologies to be observed and made concrete. Institutional Theory permits us to look for complex belief and rule systems and how they affect social behavior and structure, while using a Socio-Technical Interactions Network (STIN) strategy allows us to examine the increased interconnections among the social and the technical aspects of contemporary life. Figure 2 is a "map" of how the two frameworks are interrelated and what types of interactions may be observed and analyzed.

Figure 2.2 Conceptual Map of Institutional Theory and Socio-Technical Systems.



Source: Created by Jennifer Beamer 2019

2.10 Summary

This dissertation research addresses IRs, the institutional and social contexts in which they evolved, and the social contexts in which they have been deployed and used (Kling, Rosenbaum and Sawyer, 2005), particularly when similar organizations in the United States and Japan are compared. The literature thus far has examined some aspects of the technical infrastructure and the social practices and processes that have led to an IR's institutional growth. There is, however, limited literature examining organizational characteristics of IR support. The relationship between technologies and the social contexts in which they operate will be expanded upon in Chapter 3, discussing the use and application of Kling's STIN approach in this research.

Chapter 3: Theoretical Approach

3.1 Overview

The framework chosen for this research combines both a social and technical understanding of technology's role in IR formation, including a) what technology can do, b) how technology is actually used, c) what are some of the characteristics of the technology in questions, and d) what discourses surround the technology; this framework shapes the technology's development and use (Kling and Iacono, 1988; Meyer, 2007). In terms of research on social informatics, these frames are central to analysis, and they can also be found in other fields, such as computerization movement studies (Kling and Scacchi, 1982). Various technological-frame approaches provide systematic methods to record and analyze people's ideas about technology as empirical data (Davenport, 2005; Kling and Iacono, 1988; Meyer, 2007). This chapter outlines the framework, called the Socio-Technical Interaction Network (STIN), to be used in this research.

3.2 The STIN Theoretical Framework

Kling's STIN approach is "an emerging conceptual framework for identifying, organizing, and comparatively analyzing patterns of social interaction, system development, and the configuration of components that constitute an information system" (Scacchi, 2005, p. 2). The STIN framework assists in examining the relationships among information, technology, and people. For example, other research (Kling et al., 2003; Kling et al., 2005; Kling, Sawyer, and Rosenbaum, 2000) has shown that a STIN can also include the relationships among "people (including organizations), equipment, data, diverse resources (money, skill, status), documents and messages, legal arrangements and enforcement mechanisms, and resource flows" (Kling, et al. 2003; p. 48). These relationships may also include people both as individuals and at the

organizational level of analysis (Meyer, 2006). Additionally, included in the STIN strategy are aspects of technology (referred to as equipment), information (referred to as data), documents and messages, and legal arrangements (Kling et al., 2003). Furthermore, economic features such as money and the flow of money, and political components such as status, may be taken into account (Kling et al., 2003).

STIN developed from other contemporary theories and perspectives at the time including the Social Construction of Technology (SCOT) used by Pinch and Bijker, (1987) and Actor Network Theory (ANT) (Latour, 1993). SCOT, summarized by Klein and Kleinman (2002), has four main and related components, including interpretive flexibility, relevant social groups, closure and stabilization, and socio-cultural and political development (p. 29). Klein and Kleinman state that the four components may be used in a way that “structural concepts can be applied to the study of the design, development, and transformation of technology to improve our understanding of the social shaping of technology” (p.29).

Under ANT, Latour (1993) hypothesized that “the world is full of hybrid entities containing both human and non-human artifacts and that actor-network theory was developed to analyze situations where separation of the technical and social elements is difficult” (Callon, 1997; p.3). ANT does not question whether the elements are technical or social (Latour, 1993). As summarized by Tatnall and Gilding (1999), “ANT considers both social and technological determinism to be flawed and proposes instead a socio-technical account in which neither social nor technical are privileged” (p. 958). Latour (1991) adds, “Contrary to claims of those who want to hold either the state of technology or that of society constant, it is possible to consider a path of an innovation in which all the actors co-evolve” (Latour, 1991, p. 117).

The STIN strategy itself is not usually referred to as a theory because it does not lead to strong extrapolations (Kling et al., 2003). Rather, it is mentioned as a framework, approach, or a strategy for organizing and analyzing data (Meyer, 2007). For example, Eschenfelder and Chase (2002) call STIN a heuristic tool for “understanding the mutual shaping between technology and social context and the consequences of ICTs use” (p. 3). They further state that STIN strategy examines elements that include actors and dependencies (p. 3). Actors are defined as “individuals, groups, or organizations that interact with the ICTs (p. 3). Dependencies are broken into two parts: resource dependencies and account taking dependencies (p. 3). “Resource dependencies” are access to funding and people, and “account taking dependencies” are links or interactions based on imitation or social benchmarking (p. 6). Rosenbaum and Joung (2004) claim that the STIN strategy can also help determine network boundaries, which is typically a difficult task in socio-technical analysis (Meyer; 2006; Suri, 2011). Looking at these resource dependencies are instructive in setting those boundaries for my research.

For the purposes of my research, STIN is used as a framework with which to begin identifying patterns of relations among concepts. These socio-technical relationships are examined by following eight steps defined by Kling, McKim and King (2003), and include the identification of the following in the STIN (see more in sections 3.4 and 3.5): identifying a relevant population of system interactors; understanding who are the core interactor groups; finding the incentives or motivations; examining the excluded actors and undesired interactions; exploring the existing communication systems; identifying resource flows and the system’s architectural choice points; and mapping architectural choice points to socio-technical characteristics (p. 57).

STIN is similar to ANT in terms of some of its methodological approaches. For example, ANT identifies relevant social groups,⁸ analyzes the interpretative flexibility for possible unintended uses of technological artifacts (Klein and Kleinman, 2002; p. 29), and assists in the understanding of the processes of translation⁹ and enrollment.¹⁰ However, STIN differs from ANT in that STIN is more “conservative in attributing agency to non-human actors” (Meyer, 2006; p.38). Another important aspect of the STIN approach is that it is more problem-oriented and takes a normative stance (Meyer, 2006; Sawyer and Tyworth, 2006). Based on the review of literature in the following sections, STIN as an analytical approach assists researchers and organizations in developing strategies to address problems related to use of ICTs, helping them to improve their design, deployment, management and use (Kling et al., 2003). Additionally, STIN uses a critical approach by interrogating unquestioned assumptions and conventional wisdom that pervade the design and use of ICTs (Kling et al., 2003; Meyer, 2006). STIN may help theorists to critically examine how designers and users construct the meanings and concepts related to ICTs (Robbin, 2007; Day, 2007).

3.3 STIN as a Research Approach

Social Informatics (SI) is a method to study ICTs focusing on the “interdisciplinary study of the design, uses and consequences of information technologies that takes into account their interaction with institutional and cultural contexts” (Lamb, Sawyer, and Kling, 2000, p. 1614). SI research has been approached from normative, analytical, and critical orientations (Agre and Schuler, 1997; Kling,1980; Sachs,1995; Wynn, 1979). My study takes a normative approach to

⁸ Relevant social groups are the embodiments of interpretations: “all members of a certain social group share the same set of meanings, attached to a specific artifact” (Pinch and Bijker 1987, 30)

⁹ Translation means that stability and social order are continually negotiated as a social process of aligning interests (Monteiro, 2000, p. 77),

¹⁰ Enrollment is a continuing process of persuasion and control in which the behavior of diverse actants is kept in accordance with a specific set of technological arrangements (Law, 1999, p. 4).

social informatics rather than an analytical or critical approach. The normative approach provides for “alternatives for professionals who design, implement, use or make policy about ICTs” (Lamb et al., 2000, p. 1614). The objective of normative research is to contribute to practice by providing evidence illustrating the varied outcomes that occur as people work with technology. One outcome of this research may be to influence the development of IR policy and/or information systems in general.

In contrast, an analytical orientation (Lamb, Sawyer, and Kling, 2000) may contribute to a richer comprehension of how the trajectory of IRs used in a particular setting can be generalized to other IRs (p. 1614). Finally, although there are critical approaches examining technology from perspectives that do not automatically and uncritically “adopt the goals and beliefs of the groups that commission, design, or implement specific ICTs” (Lamb, Sawyer, and Kling, 2000, p. 1614), my research does not intend to adopt a critical approach, as typically critical approaches “challenge assumptions” about the roles, values, and design features embedded within technologies (Meyer, 2006).

SI research focuses on studying ICTs within institutional and cultural contexts (Kling, 2000). Accordingly, the ontology at the foundation of SI research examines how ICTs are mutually constituted by a) the technology, and b) the social context. This relationship shows how they are embedded to the point where IRs and the institutional context are not meaningfully separable (Kling, et al., 2003). Furthermore, the inseparability of the social and the technical have important epistemological and theoretical implications for the complex ways in which ICTs intersect with social activity (Orlikowski and Baroudi, 1991; Orlikowski and Iacono, 2001). Therefore, in thinking about theory, SI research provides a level of analysis more complex than that of the examination of the individual (Kling et al., 2003). By description, “social context”

infers more than just the actions of an individual. Several examples of theories that have been applied to SI research include Institutional Theory (Avgerou, 2002), Structuration Theory (Orlikowski, 1992), and Socio-technical Theory (Friedel, 2007).

The epistemological and theoretical perspectives for this research are subjective and interpretive. An interpretive approach assumes a subjective perspective, so the following discussion will address mainly the interpretive approach. As the STIN strategy assumes an interpretive, critical perspective, it fits well with this research study and my position as a researcher. The STIN strategy attempts to provide a richer description of the phenomenon but also attempts to impact practice through the development of standard and alternative models (Meyer, 2006; Suri, 2011). Orlikowski and Baroudi (1991) suggest that the attempt to alter practice is what adds substance to the critical perspective, clarifying this by suggesting, “more than either the positivist or the interpretive research perspectives, the critical researcher attempts to critically evaluate and transform the social reality under investigation” (p. 19).

Orlikowski and Baroudi (1991) claim that unlike in a positivist perspective, which assumes researchers discover an objective reality, interpretive researchers can only interpret a social reality (p. 5). Therefore, in the data collection, SI researchers often conduct field studies to understand the context of the specific phenomena under study (Saywer and Eschenfelder, 2002). However, one caveat according to Orlikowski and Baroudi is that “researchers’ prior assumptions, beliefs, values, and interests always intervene to shape their investigations” (p. 15). (This will be addressed in more detail in Chapter 4, Section 4.7.2, Limitations and Researcher Bias.)

The literature on using STIN strategy in specifics varied in its approaches. Kling et al., (2003) examined electronic scholarly communication forums (e-SCFs) as the preliminary STIN

research. They attempted to understand “not only the system, but also the business models and the supporting organizations for eSCFs” (p. 47). Furthermore, they suggested that the social relationships embedded in the STINs helped “to explain how the technological innovations of electronic publishing are used and sustained” (p. 47). Kling et al. (2003), proposed that earlier research on systems examined “standard models”, and it had focused only on the information-processing capabilities of scholarly communication forums (p. 48). The STIN heuristics that Kling, McKim, and King developed provided an “alternative model” (i.e., STIN), which exposes a) the relevant actors and groups, and b) the social relationships that had an impact on the design and use of the system (p. 48). Kling, et al. (2003) also perceived STIN as a way to not only understand complex relationships within systems but also to further the sustainability and possible enhancement of system design of the system itself, rather than simply offer an information processing approach (pp. 56–57).

The STIN framework was also used by Eschenfelder and Chase (2002) to understand web information systems at four large U.S. manufacturing companies. They used STIN as an after-the-event “heuristic tool” (p. 3). An important conclusion in their research was that certain external actors, such as “order fillers and professional peer groups, were key players in the success and use of the web IS” (p. 6). The actors identified in Eschenfelder and Chase’s study “participated in the social construction of web IS by lobbying for configurations most suited to their needs, with the interests of some groups inevitably being privileged over those of other groups” (Eschenfelder and Chase, 2002; p. 8).

A study by Rosenbaum and Joung (2004) showed that that it may not be possible to differentiate between successful and unsuccessful STINs (p. 210). The authors examined the Library of Congress’ American Memory Project. Even though the question of what makes a

successful STIN was not the main question of this dissertation research, it was argued that using STINs as a strategy might raise important questions about the assessment of systems as a success or failure, and by what criteria should the analysis be based upon, if the research is based in practice.

Meyer (2007), who was a student of Kling, used STIN to study the movement from traditional to digital photography among a group of marine mammal researchers. Meyer used the standard model to describe the conceptions behind the transformation. His findings showed that the marine mammal researchers accounted for perceived positives with the use of digital technologies but failed to account for potential negatives like information management and sharing (p. 234). Moreover, Meyer revealed many of the strengths and weaknesses of using STIN as an approach.

More recently directly related to IRs, Kim (2010) used STIN and Social Exchange Theory to study how faculty archive their research, by conducting surveys and interviews with faculty and their IR archiving practices. The findings revealed that, “Faculty are motivated open access advantages to users, disciplinary norms, and no negative influences on academic reward” (p. 1909). However, Kim found that the “barriers to self-archiving—including concerns about copyright, extra time and effort, technical ability, and age—imply that the provision of services to assist faculty with copyright management, and with technical and logistical issues, could encourage higher rates of self-archiving” (p. 1909).

Finally, Crowston (2015) used STIN strategy for “systematically analyzing the current system of scholarly publishing to understand why and how the system is changing and what might be blocking other changes” (p. 358). Using all eight steps of STIN, Crowson provided an analysis of how the system of scholarly communications, via the tensions and contradictions

found in the relationships, leads to growth, excluded actors, organizations, and alternative models (p. 363).

3.4 STIN as an Analytical Approach

Kling, McKim and King (2003) originally conceived the STIN approach while examining information infrastructures, where a system is studied as a socio-technical network. All of its diverse parts are considered as a node or communication point (p.48). These “nodes may include people, groups, devices, infrastructures, resources, processes, content, and policies” (Kling, et al., 2003, p. 48). Nodes are not considered static elements, but as interactors. Thus, the “networks are dynamic, and the focus is on the relationship *between* elements” (p. 48).

Kling, et al.’s (2003) suggested that their framework for researching STINs is meant to be “illustrative rather than exhaustive” (p. 57). This framework supports the researcher to identify these elements, and to explore the relationships between them, through eight steps, or heuristics (p. 57). The eight heuristics are (Kling, et al., 2003; p. 57):

- H1. Identify a relevant population of system interactors
- H2. Identify core groups
- H3. Identify incentives
- H4. Identify excluded actors and undesired interactions
- H5. Identify existing communication forums
- H6. Identify resource flows
- H7. Identify system architectural choice points
- H8. Map architectural choice points to socio-technical characteristics

These heuristics are intended to serve as characteristics that Kling et al. had identified as significant to the implementation and use of ICT systems (Meyer, 2006). For example, H1 assists in identifying all of the system interactors that are non-human actors (Kling et al., 2003, p. 66);

they also include non-material elements such as standards or practices (Star, 2010), processes and traditions, and potentially including *dispositifs*¹¹ (Kling et al., 2003; p. 61).

Kling et al. (2003) next suggested that STIN researchers should group the H2 interactors in a way that would “draw attention to their interactions” (p. 66). Revealing the organizational relationships between groups of people may have a greater impact within the STIN than only pairing (e.g., two individuals) in examining human-computer interactions (Contractor, Monge and Leonardi, 2011; Lamb and Kling, 2003).

Incentive structures (H3) are recognized as business models on a large-scale level. Kling et al. (2003) recommended that the researcher also look for motivations at a more personal level. For example, scholars who are considering adopting a new technology also must contemplate the opportunity costs, (i.e., how time spent on this will impact on time available for activities which traditionally further their career, such as publishing papers, or teaching (Suri, 2011). Kling et al. (2003) used the terms “communications systems” (H5), “communication ecologies” and “existing communication forums” to portray the social actors’ ways of communicating, this included non-digital systems (p. 57-58). Communication systems may be comprehended as networks of people, however not devices and wires (Kling, et al., 2003; Lamb and Kling, 2003).

One of the strengths of the STIN approach, according to Meyer (2014), is Kling et al.’s suggestion to look beyond the network being examined. This can be done by first identifying excluded actors (H4) and then by identifying the wider communication ecosystems (H5) that interact with the STIN (p. 9). Meyer notes that possibly “looking at external elements can reveal critical perspectives, both in terms of the impacts of a system and influences on its development

¹¹ Using Foucault’s concept of the “*dispositif*,” Kling is referring to the idea of “material and social (institutional and organizational) structures and processes which maintain the exercise of power” (Foucault 1991, cited by Bowker, 2014, p. 116; Bowker and Star, 1999, p. 38; Suchman, 2014, 2015).

and use” (p. 10). Furthermore, identifying the undesired interactions of those who are excluded (H4) “draws attention to the experiences supported by the system” (p. 10). Examples of undesired interactions are those that may be poorly implemented or have unintended consequences (Kling et al., 2003, p.57). Finally, H4 and H5 interactions may also be considered in terms of “privacy and surveillance” (Kling et al., 2003, p. 57).

Resource flows (H6) may be thought of in terms of flow of money, and in terms of resource dependencies and account-taking dependencies (Eschenfelder and Chase, 2002; Kling et al., 2003). Resource dependencies concern exchanges which may “need funding, knowledge, skills, prestige or trust, while account-taking dependencies concern links or interactions based upon social rating” (Eschenfelder and Chase, 2002, p. 102). Additionally, identifying resource flows may also draw attention to infrastructural elements, which as Eschenfelder and Chase state, “sooner or later these need skilled attention and financial investment” (p. 102)

For H7 mapping architectural choice points, Kling et al., while concerned foremost with examining the technical system, suggest this can also refer to social processes (2003). Examples of social processes may include investigating the history of the system, including the points where choices have been made, which may be considered as trajectories in the path of the development of the system (p. 102).

The final step, H8, investigates the viable configurations and trade-offs, Kling et al. suggest “the system as configurational, and that choices made have additional outcomes” (p.102). This final step encourages the researcher “to think beyond the present system and consider potential changes (i.e., alternative configurations)” (p. 102).

3.5 Adapting STIN for Examining IRs and Institutions

In this study, a methodological approach that will combine Kling et al.'s eight STIN heuristics (and SI principles implied in the STIN approach) with Scott's Model of Institutional Theory, in an effort to contribute to an expanded socio-technical framework to study institutions and institutional repositories. The STIN approach is flexible and interpretive rather than prescriptive (Kling et al. 2003; Meyer, 2006), and therefore it has been adapted to this research context. One of the bigger advantages derived as a result of this combined approach is that it will help to bridge the gap between theory and practice. Two contributions of STIN strategy are particularly significant. First, using STIN will provide a framework to adopt a complete approach, by drawing attention to the importance of considering the relationship of SPARC NA and SPARC Japan within the IR socio-technical networks. Second, the eight heuristics used in the STIN strategy may prove to be an extremely valuable tool to translate the theoretical aspects of SI to assist in answering the research questions, availing the researcher of data that can be observed, coded, and analyzed (Meyer, 2007). Furthermore, Institutional Theory may assist by paying closer attention to the organization's context, choices, and influences on IR technology's adoption and use.

Other STIN implementations were reviewed through published literature and are reflected in Table 3.1. This enhanced my understanding of how STIN heuristics could be operationalized.

Table 3.1 STIN Studies That Contributed to Interview and Document Analysis Instrument

Publication	Subject of study
Barab, Schatz and Scheckler, 2004	International Learning Forum (online learning community).
Eschenfelder and Chase, 2002	Web-based information systems from four U.S. manufacturing companies.
Meyer, 2006; 2007	Use of digital photography by marine mammal scientists. Emerging use of digital photography in law enforcement. Digitization of library resources.
Kling, McKim and King, 2003; Meyer and Kling, 2002.	Information infrastructure to support research (Scholarly Communication Forums).
Rosenbaum and Joung, 2005	Digital libraries.
Scacchi, 2005	Open-Source Software Development Processes.
Suri, 2011	Use of GIS by historians.
Walker and Creanor, 2009	E-learning network.

Source: Table created by Jennifer Beamer 2019

Data on which STIN models are based may be gathered through various methods, “including interviews, observation, and studying materials associated with the network” (Kling et al., 2003, p.66). Kling et al. recommend that if the STIN approach is established before the research begins data collection, “the eight heuristics can be used to inform the design of instruments, such as the interview questions and protocols” (p.66). Meyer (2007) followed this approach in his study of the emergent use of digital photography by marine mammal scientists and communication practices. Suri (2011) took this approach in his study of the emergent use of GIS by historians, combining it with a grounded theory approach. Instead of modeling research

questions based on Kling et al.'s (2003) original description of the STIN approach (Meyer, 2007), I have used the heuristics described in the original conceptualization of STIN in conjunction with the SI principles to develop questions, which I used in my interviews and in the analysis of documents along with Institutional Theory.

Furthermore, the STIN approach was adapted by adding sub-questions to Kling et al.'s eight heuristics to model a STIN framework (2003, p. 57) and by adding diagrams. The sub-questions (see Appendix C: Interview Questions) were designed to bridge different contexts (Kling et al., 2003), and to describe multiple STINs within each case. For example, heuristic H3, "identify incentives", is interpreted in terms of motivations. The questions also aim to surface the themes of social informatics research that are captured within the STIN framework (Kling, et al., 2003; Meyer, 2006; 2007; Meyer and Kling 2002; Suri, 2011). The questions are influenced by factors as identified in Chapter Two's literature review.

3.6 Limitations of STIN-Based Analysis

The STIN strategy has limitations, as does any theory or methodological approach. First, STIN is neither a theory nor methodology. Robbin (2007) has pointed out that Kling's work generally did not "create, (re)construct, or extend theory, or generate new methodologies for understanding the empirical world of computers in organizations" (p. 23). Robbin further contends that Kling's approach is simply practical, in that it appropriates theory and methods necessary to build a body of research that "made the unobvious, the taken for granted, and the ignored explicit, problematic, and visible" (p. 24). However, other researchers have referred to STIN as a methodology (Meyer, 2006), an entity and framework (Barab, Schatz and Scheckler, 2004; Scacchi, 2005), and a post-heuristic tool (Eschenfelder and Chase, 2002). Meyer (2006) describes STIN as an analytical strategy where the researcher can use a range of methods to

gather data to develop STIN explanations for understanding the relationship between the social and the technical in a socio-technical network (p. 44). Meyer further elaborates that the term “strategy” refers to a way of doing things from an analytical perspective, based on a specific way of looking at a phenomenon, a strategy or approach, a research problem, or a selection and analysis (p. 44). However, Kling is resolute that STIN is not a strategy or a method:

“STIN model shares the views of many socio-technical theories: that technology in use and a social world are not separate entities, they co-constitute each other. That is, it is fundamental to STIN modeling that society and technology are seen as highly (but not completely) intertwined” (Kling et al., 2003, p. 54).

One important limitation of the STIN approach, as identified by Meyer (2006), is that STIN has an inherent organizational bias, thereby limiting its application in broader non-organizational contexts where the implications of technology are significant (p. 44). A second important challenge identified by Meyer (2006) is that STIN analytical strategy in many instances requires the use of a variety of methods. Further, combining “extensive data collection with the complex conceptualizing of socio-technical phenomena means that it is a difficult methodological toolkit for many scholars to adopt and use” (Sawyer, 2005, p. 5).

Another important limitation is that the success of using the STIN approach is dependent upon the investigator’s interviewing skills to elicit information from their research subjects, and “their ability to gain access to individuals and institutions” (Meyer, 2006; p. 44). In addition, STIN brings the excluded actors and undesired interactions into focus, and the influence of social change in socio-technical networks (Sawyer, 2005, p. 6). Thus, the STIN approach, despite some of its weaknesses, may prove to be a very useful analytical tool to study the relationship between IRs and SPARC.

3.7 Summary

The questions examined by this research are framed at the broadest level by the relationships among information, technology, and people. These relationships are explored throughout the following sections and are in direct response to many traditional analyses of ICTs. For example, Sawyer and Rosenbaum (2000) state that many analyses assume that “ICTs have direct effects upon organizations and social life; these effects depend primarily upon an ICT’s information processing features; and the information processing features of new ICTs are so powerful relative to preexisting technologies that they effectively determine how people will use them and with what consequences” (p. 92).

The literature reviewed in Chapter 2 and Chapter 3 introduced IRs and the concepts of Institutional Theory, and Scott’s Model of three pillars and four carriers, as frameworks to support the exploration of the contents and contexts of IRs. This chapter presented the Socio-Technical Interaction Network strategy, devised by Kling et al., (2003), which provides a framework for modelling the relationships among the organizations and IRs, the focus of this research. The next chapter will introduce the specific methods for conducting the research

Chapter 4: Research Methodology

4.1 Overview

Research in the field of social informatics may be conducted using qualitative methods, since information collected may require interpretation beyond that of statistical analysis. Using qualitative methods to support interpretive research is consistent with Trauth (2001), who expresses two reasons for selecting them. The first is the type of research problem. The research in this study takes a socio-technical approach, and contextual information is needed to discuss the social issues related to answering the research questions. The second reason relates to the degree of uncertainty. Trauth (2001) suggests that the less there is known or understood about a phenomenon, the harder it can be to measure. This research found that many of the organizational and technology-systems issues are not well addressed in the academic literature. Therefore, this research will explore and understand these issues to bring to light their complexities and share them for continued study. This chapter presents the methodology, the methods, sources of data and data analysis, and discusses the evaluation and ethical issues in conducting the research.

4.2 Preliminary Exploration

To gain a good understanding of the field research on the various aspects of the social and technical nature of IRs, I have been exploring them since 2015. Prior to this research, I also engaged in preliminary networking at academic conferences with both the Japanese and American branches of the Scholarly Publishing and Academic Resources Coalition (SPARC). The goals were to (a) find out the feasibility of the study, getting a feel for the interest in the organizations about taking part, (b) name key players, and (c) find potential research sites. In November of 2014 and 2016, I attended OpenCon, sponsored by SPARC NA in Washington DC,

a conference of 200 students and early-career academic professionals selected from around the world.¹² OpenCon introduced me to a variety of IR systems and organizations operating in different capacities in Africa, South America, North America and the United Kingdom. (Asia was largely missing.) I was able to network, ask researchers questions about IR domains and what organizations were involved, and receive many valuable introductions to the social actors.

However, these contacts were introductory in nature, and did not include any formal interviews. I was initially able to get preliminary understandings and find many of the key gatekeepers. This led to the development of professional acquaintances, offers of research sites for interviews, and offers of information in the form of documentation; individual representatives of organizations initially agreed to take part in the research (permission from both organizations can be found in Appendix A). The research also was inspired by interest in this work from the scholars and organizations that were approached; they have requested access to the results. Thus, attending OpenCon was a vital first step to beginning this research.

4.3 Methods: Sources of Data

The methods and sources of data for this qualitative research had two distinct and ongoing phases guided by the STIN framework (see Table 4.1). Phase One began with the content analysis of organization documents generated by the institutions to be included. Many publicly available official organizational publications, scholarly publications, unpublished book chapters, grant reports, grant proposals, technical work manuals, and publicly available websites were gathered. Additionally, documentation included memos, minutes of meetings, white papers, reports, and websites. These materials were collected throughout the course of the research. Using the STIN heuristic, documents were systematically analyzed for pertinent information.

¹² More information on OpenCon can be found at <https://www.opencon2018.org/>

Specific methods for dealing with interview and documentation data will be discussed in the next section.

Table 4.1 Data Collection Sources for STIN Strategy: Case Studies

Primary	Research Question	Concepts	Strategy for Analysis
Phase I:			
Website, Publicly Available Organizational data, White Papers, Artifacts	R1, R2	Identify the larger relationships and interactions among people (organizations), equipment, data, diverse resources (money, skill, status), documents and messages, legal and enforcement mechanisms, and resource flows	Open, Axial, Selective Coding. STIN Diagrams and Timelines
Phase II:			
Field sites: Interviews, Participant Observation, Field notes, Artifacts	R2, R3	Rules, standard processes, values, beliefs, and ideas governance and authority systems, and identities, repetitive activities	Open, Axial, Selective Coding. STIN Diagrams and Timelines Cross – Case comparison

Source: Table created by Jennifer Beamer 2019.

Phase II included fieldwork in the form of semi-structured interviews at organizational OA IR sites in Japan and the United States. There were opportunities to observe various meetings, events, and activities of the various organizations. Real-world cases were chosen for this research: a) organizations that create a stewardship in the Japanese OA university IR system, and b) organizations that create a stewardship in the North American OA university IR system. Both cases focused on university-bound systems, as they are the main producers of communication in scholarly research. However, each system represented different contexts and

processes for sharing research. Multiple sources of data were collected from these two cases through semi-structured interviews, documentation, and field observations. Data collection and analysis was conducted simultaneously, so that the researcher could begin to see emergent themes (Miles, Huberman and Saldana, 2013, p. 13). For each case, all three research questions were explored by a within-case analysis. Finally in Chapter 6 the cases are compared for a cross-case analysis.

This research proposed multiple methods for data collection to allow for triangulation of results (Mason, 2002). Further triangulation (as will be discussed in the data analysis section below) for the purposes of this research was used to enhance the quality of data using different methods for data collection. Mason (2002) supports this use of triangulation when she states that it “encourages the researcher to approach their research questions from different angles”, exploring alternatives to problems in a rounded and multifaceted way (p. 190).

The two main geographical field work sites selected for this research were chosen by means of purposive selection, by examining recent research articles in Asia and the United States that describe OA IR infrastructure, and as mentioned above, by networking at two OpenCon conferences (2014, 2016). As infrastructure is largely invisible (Star and Ruhleder, 1994), the visible product of knowledge infrastructure development—the IR (Bietz, Baumer, and Lee, 2010) was used as the entry point for selecting cases. In addition, I spoke with and attended sessions of scholars presenting papers and posters at the 2017 Open Repository Conference in Brisbane, Australia. I became aware that there were very few organizations or individuals representing Asia and, specifically, Japan. This seemed peculiar, as Yamaji et al. (2015) suggested that Japan would soon surpass the number of OA IRs in the United States, noting “the United States has the most such deployments, with 351 IRs... the number of Japanese IRs at the

corresponding date was 498... Japan could soon catch up with the United States in terms of IR activity” (p. 400). As of March 2019, Japan’s National Institute for Informatics (2019b) reports that there are 786 institutions that have IRs.

4.4 Methods: Multiple Case Study Approach

This research contends that the most appropriate approach for answering the research questions is that of case-study research. Presently, IRs and the socio-technical aspects will be examined within the bounded system of geographical regions, managed differently by various institutions in different countries, which is helpful for the case-study method (Stake, 2000; pp. 19-26). Moreover, the reason for selecting multiple case studies for comparison (Creswell and Creswell, 2017; Nadai and Maeder, 2005) is to advance a socio-technical case study that may contribute to theory, as opposed to developing an “intrinsic case study designed primarily to understand the phenomenology of a particular case” (Stake, 2000; p. 20). The multiple sites at SPARC Japan and SPARC NA may be considered specific sub-cases of the main case (Yin, 2014, p.38). These sites have been chosen not for generalizing about phenomena, but for developing general concepts about theory, because “if two or more cases are shown to support the same theory, replication may be claimed” (Yin, 2014, p. 38). Myers (1997) states, “Case study research is the most common qualitative method used in information systems,” and may use a positivist, interpretive, or critical approach; this is a “commonly-accepted tool in information systems research” (pp. 7-8). Furthermore, this is endorsed by Yin (2014) when he suggests selecting the means of case studies, particularly when case-study research “investigates a contemporary phenomenon in a real-life context when the boundaries between phenomenon and context are not clear and in which multiple sources of evidence are used” (p. 16).

Yin (2014) notes that “the analysis of case study evidence is one of the least developed and most difficult aspects of doing case studies” (p. 133). Yin adds a preference for the analysis of case study information by starting with the theoretical propositions, which are offered as a series of research questions (p. 133). The research questions for my research have been provided above, and they follow the overall principles related to the STIN strategy. For this research, qualitative data collected will be coded, examined, and analyzed for answers to each research question, and also for evidence that the research question was correctly posed (for example, not fixed in any misunderstandings). Extra consideration will be made in designating precisely the social context occupied by organizations, by maintaining an open mind to complementary interpretations, and by maintaining a healthy skepticism about the narratives of insiders (Klein and Myers, 1999; pp. 67-93).

The case-study method was selected over other methods (e.g., ethnography), as it has an advantage of enabling researchers to ask “how” or “why” questions about “a contemporary set of events ... over which a researcher has little or no control” (Yin, 2014, p. 14)—a state reflected in this dissertation. Furthermore, Yin (2014) has a two-fold description of case studies: (1) “a case study is an empirical inquiry that investigates a contemporary phenomenon in depth in its real-world context, especially when the boundaries between the phenomenon and context are not clearly evident” (p. 16); and (2) “a case study will have many more variables of interest than merely the number of data points, with results contingent upon data collection and analysis from multiple sources, guided by prior development of theoretical propositions” (p. 17).

Finally, by using multiple sources of data (documents, interviews, observations), collecting data from two organizations (Japan and the United States), and maintaining a case-study database may address some of the weaknesses that could occur in qualitative research.

Termed as triangulation, the researcher tried to secure what Denzin and Lincoln (2011) refer to as “in-depth understanding of the phenomenon in question, since an objective reality may be difficult or impossible to capture” (p. 2). The many methods of data collection—including personal interviews, observations of activities, and the inspection of documents—can help with triangulation to clarify meaning by verifying that observations may be reproducible, and correspondingly, by identifying ways the activities may be seen differently by multiple actors (Stake, 2000; p. 23).

4.4.1 Establishing the Two Cases

The two organizations selected to examine were based in two different geographical locations - SPARC North America (NA), located in Washington D.C., and SPARC Japan (JP), located in Tokyo, Japan. Both organizations focused on scholarly publishing in the academic community, promoting open access, encouraging distribution of scholarly information and academic resources, and strengthening ability for dissemination of information, via governance and policy, strategic planning, community activities, and partnerships.

However, each organization had different socio-technical practices. It is important to note that while each organization has a director and employees, all individuals (social actors in the organization) were considered representatives of the organization for purposes of this research. I expected several scenarios in obtaining data via interviews and visiting field sites. First, while I tried to comprehensively identify individuals within the organizations who were coordinating activities for IR infrastructure, I could eliminate the possibility for discovery: during the fieldwork the actors at the organization provided other stakeholders for me to interview. Kling et al. (2003) in their STIN strategy left room for this in their heuristics, however this was one of the challenges in attempting to bound the cases and decide when to stop discovering new core

interactors. This often assisted in the discerning of considering who is left out in excluded actors and undesired interactions. Also, not all fieldwork sites could be done face-to-face, due to time, geographical distance, and the intervention of the COVID Pandemic, and thus some interview data was collected by telephone, internet conferencing techniques, and by email. This will be elaborated upon below in the section on field site visits.

Next, a brief description the fieldwork sites:

4.4.1.1 Case Study 1: SPARC NA

SPARC is an international alliance of academic and research libraries developed by the Association of Research Libraries in 1998 to promote open access to scholarship (Brown, 2008). According to Subramanian (2003), Kenneth Frazier, a librarian at the University of Wisconsin, proposed that at the meeting attendees create a source of funding for a new publication model for academic journals—where academic libraries would contribute, and they would create new publications based on a model that lowered the costs of all journals. The founding director, Rick Johnson, then led the establishment of SPARC in 2002 after many librarians expressed the desire for reform (Groen, 2007). Present-day SPARC NA Director Heather Joseph (2005-present) and her staff of approximately 10 employees are financed by member dues that support operating and program expenses (SPARC North America 2018a). SPARC members include 200 North American members representing 45 American states and the District of Columbia, as well as seven Canadian provinces.

4.4.1.2 Case Study 2: SPARC JAPAN

While SPARC NA's membership covers North America, it has had a long history of global affiliates: SPARC Europe, SPARC Japan, and SPARC Africa (SPARC North America, 2018b). According to SPARC NA, "this broad and comprehensive representation from libraries

helps reinforce the coalition’s international focus” (SPARC North America, 2018b). SPARC Japan - The International Scholarly Communication Initiative was launched in 2003 with the support of the Japanese government (Murakami and Adachi, 2006). The objective was to “encourage the digitization of scholarly journals, especially English-language journals published in Japan, along with various Japanese scholarly societies for their Japanese scholarly journals, and also to improve their reach and recognition overseas” (National Institute for Informatics, 2019d).

Presently SPARC Japan is now under the National Institute for Informatics (NII), with an overarching goal to strengthen electronic journals and scholarly publications from Japan’s academic societies. Akira Niitsuma, the present Chief of Research Products Team in the Scholarly and Academic Information Division and the Cyber Science Infrastructure Development Department, states that the NII has been involved in the planning of various phases of the organizational activities as they relate to IRs (National Institute for Informatics, 2019a.) SPARC Japan’s website refers to their organizational activities as to “promote open access, advocacy activities, pointing to enhance [sic] a sense of participation of librarians and researchers for encouragement of distribution of scholarly information and academic resources, while strengthening much more working with [sic] the Institutional Repositories Promotion Committee and the Japan Alliance of University Library Consortia for E-Resources (JUSTICE) under the Cooperation Promotion Council which links between the National Institute of Informatics (NII) and university libraries” (National Institute of Informatics, 2018d).

4.5 Field Site Visits

Visits to the field locations were planned ahead of time through e-mails and/or telephone calls to the primary social actor at each site. Scheduling with primary contacts was arranged

several months prior to the author's arrival, and that specific interview schedules and locations with each participant were arranged prior to arrival.

Interviews occurred in the participants' offices and work locations, so that they could potentially demonstrate examples of their work. The site visits ranged from several hours to 1-2 days each, dependent on the number of actors being interviewed. As expected, there was a "snowball effect", whereby other interviewees/organizations were identified by an initial interview subject who then provided another key relationship to meet with, interview, or to gain more information from (Bryman, 2015). While these relatively short visits to field work sites were not ideal compared to longer exchanges, I believe that the multiple interviews proposed and conducted, and the numerous site visits (including participating in activities planned and hosted by the two case study sites, such as Japan Open Science Summit in Tokyo in May 2019), may have diminished some of the limitations of the data collection.

4.5.1 Semi-Structured Interviews

Semi-structured interviews for multiple-case-study research are required to ensure cross-case comparability (Bryman, 2015; p. 469). The aim of the researcher interviewer is to elicit all manner of information. However, Kling (1992) suggests that a goal of researchers studying technology "through a social lens is to understand and relate the narratives talked about technology by the users" (p. 355).

Levy and Hollan (1998) explain that a "person-centered interview approach" may be helpful for examining "the nature of the relations... between individual members of the community and their historical and current socio-cultural and material contexts. How are community members constituted by their contexts?" (p. 333). Additionally, they state, "person-centered interviewing moves back and forth between the informant and respondent modes" (p.

336). Therefore, the interview schedule for this research incorporated person-centered interview styles and techniques.

The tentative questions that were developed in the interview schedule (Appendix B) were questions that were formulated from the author's attendance at discussions held at various IR events and conferences, from reading peer-reviewed scholarly works, and from Kling's (1992) method for studying STINs.

The interviews were recorded using a digital recorder that saved digital files (with the interviewees' consent; see below). The interviews were copied to the author's laptop computer, then backed up to an external hard drive and a cloud-based password-protected server each evening during the fieldwork research trips. According to Bryman (2015), making notes about each interview and site visit should be done immediately, so that observations will be current in the researcher's mind. Interviews were thus transcribed into a software database for the research as soon as possible after each interview, usually the same evening.

4.5.2 Additional Telephone/Video Interviews

A small number of follow-ups to the interviews were conducted by video when travel was not possible after the first site visits had been completed. This is due to the costs involved in travel to Japan and the continental United States, and the COVID pandemic. I believe that telephone or video interviews were not the best for the initial interviews, as they provide limited context or an understanding of the setting in the same way that in-person visits would. However, following up with telephone interviews may have allowed the researcher to have a heightened appreciation and a better-thought-out series of questions for participants' explanations.

4.5.3 Document Approach

One advantage of multiple interviews is they may help reveal alternative narratives or highlight information from differing views of events. Documents can offer supplementary information for understanding the relationships between interview accounts and work practices. For this reason, I collected and examined internal and external documents created within and about the organizations. The types of documentation included memos, minutes of meetings, white papers, reports, and websites. Yin (2014) suggests for case studies that “documents are useful even though they are not always accurate and may not be lacking in bias... the most important use of documents is to corroborate and augment evidence from other sources” (p. 107). Accordingly, organizational documents were helpful in triangulating descriptions of events by using the documentation as multiple sources of information. Finally, to understand the roles and relationships of each organization, the organization’s websites were consulted ahead of time, and documents relevant to the history, activities, and policies reviewed. As described below, documents were categorized, added to the NVivo, and analyzed as part of the collected data.

4.5.4 Field Sites and Observations

The final category of data that was collected is direct observation of the actors or organizations in the surroundings. Through a field site visit, a case-study researcher may document observations of an actor’s social behaviors and organization conditions (Yin, 2014). Yin (2014) points out that case studies can be useful in “learning about a new technology; for instance, observations of the technology at work are invaluable aids for understanding the actual uses of the technology or curriculum and any problems being encountered” (p. 114).

Observation might appear to be a passive activity, but the researcher must plan thoughtfully to avoid being either marginalized, or to become an active participant interfering

with and shaping the observations (Morgan, et al., 2017). Furthermore, Creswell and Creswell (2017) propose a list of steps for collecting data while observing social environments. The steps include (1) finding the key informants and gatekeepers for access into a field work site; (2) recording notes in the field of both a descriptive and a reflective nature; and (3) recording details about individual behaviors, the physical setting, events, and activities, as well as one's own reaction to these details (pp. 238-242). These steps were followed by this study and documented in the case-study database.

Observations were documented. Similar to ethnographic field notes (for anthropology), observational notes have been discussed in scholarly writing. Most scholars support writing up field notes as soon as possible, as they are more vivid and detailed the sooner, they are recorded (Berg, 2004; Lofland and Lofland, 1995). As mentioned above, I spent several hours after interviews and observations writing up what was observed at the worksites. This helped with the organization of data and allow for easier coding in the data analysis program being used in this research (NVivo; more below), and in the creation of a case-study database.

4.6 Data Analysis

Qualitative data analysis is an iterative process and takes place at the same time as data collection (Yin, 2003). For the purposes of this research, data analysis consisted of “examining, categorizing, tabulating, testing, or otherwise recombining both quantitative and qualitative evidence to address the initial propositions of a study” (Yin, 2003, p. 109).

There are many different disciplines that could apply to my research. It is an interdisciplinary research effort and encompasses various domains: ICTs, Organizations, Information Science and Systems Analysis. However, I believed using both STIN and Institutional Theory frameworks could provide a comprehensive understanding of the social

context, as well as institutional and cultural contexts, for examining the two case studies of SPARC, and IRs assisted in the interpretation of the proposed data collection and its analysis.

4.6.1 Coding Data Strategy and Process

“Coding in most qualitative studies is a solitary act— the ‘lone ethnographer’ intimately at work with her data” (Galman, 2007, p. 28).

All interviews (as transcripts), documents, and other relevant support documents were coded by me within the software platform NVivo 12. As I was the sole qualitative coder for this research, issues of quality of analysis are addressed in Section 4.7: Evaluating Qualitative Research. In the first phase of Initial or Open coding, the social informatics-based research used the STIN eight heuristic (preexisting) categories and Institutional Theory for help in collecting data and for analysis. Initial Coding is useful for “breaking down qualitative data into discrete parts, closely examining them, and comparing them for similarities and differences” (Strauss and Corbin, 1998, p. 102). The goal of my Initial Coding was “to remain open to all possible theoretical directions indicated by your readings of the data” (Charmaz, 2006, p. 46).

Other categories emerged from within the data. Data was also collected through observations, open-ended interview questions, and documents, and then coded into these initial categories. In the second phase of analysis, axial coding was employed, which generated several sub-categories. Axial coding in grounded theory is “the process of relating codes (categories and concepts) to each other, via a combination of inductive and deductive thinking” (Strauss and Corbin, 1990; pp. 12-15). Then data was re-grouped into clusters of similar themes. Finally, the third and final phase was selective coding,¹³ where all the data was categorized into a finite set of main categories and sub-categories that appeared to have strong theoretical underpinnings. This

¹³ Some publications in grounded theory refer to Theoretical Coding as “Selective Coding” or “Conceptual Coding”.

systematic repetition between data and categorization concluded when theoretical saturation was reached; that is, when all the data was classified into categories and no new categories emerge after these iterations. Table 4.2 provides a summary of the theories and approaches related to this research. From the outset of the research, all notes from observations and transcribed interviews were deposited and kept in the software program NVivo. The NVivo software platform aided with collection of qualitative research data, allowing for representation of the data with the research questions (Bong, 2002; Bryman, 2015). The field site notes, interviews, and documents were coded to help with analysis (Creswell and Creswell, 2017).

It should be noted that the organization of qualitative data in a software program is largely for keeping the data collected in a structured and organized manner. While data analysis software can provide some automated statistics—such as the number of codes, and the sorting of the data into useful themes for transcribing the descriptions—NVivo (and computer coding in general) encompasses extensive manual coding by the researcher with the data (Creswell and Creswell, 2017; Lincoln and Guba, 1985).

Table 4.2 Summary of the Theories and Approaches Related to this Research

Theory/ Field	Background/ Domain	Main Concepts	Strengths	Limitations related to this study
Institutional Theory	Organizational studies	Institutional environment Institutional actors, actions and roles Governance	Understanding of institutionalization	Wide scope in theoretical concept that cannot be covered in this study. Scott's model fits.
Socio-Technical Interaction Networks	Social Informatics	Eight Heuristics Relationships among people (organizations), equipment, data, diverse resources (money, skill, status), documents and messages, legal and enforcement mechanisms, and resource flows	Analysis of relationships of social and organizational contexts surrounding information and communication technologies (ICTs) and the people who design, implement, use, and maintain them	Not a theory but practical strategy and analytical perspective. Model to breakdown parts

Analytical Approaches Adopted for this Research

Scott's Model	Institutionalism	Pillars: Regulative, Normative, Cultural-cognitive Carriers: Symbolic systems, Relational systems, Routines, Artifacts	The theoretical contribution is an expanded socio- technical framework to study institutions and institutional repositories.
Kling, McKim, King	Socio - Technical Interaction Networks	Eight Heuristics	

Source: Table created by Jennifer Beamer 2019.

4.6.1.1 Within-Case Analysis and Cross-Case Analysis

Finally, data from the case studies were analyzed both within-case and cross-case to look for emergent themes and patterns (Stake, 2006). Within-case analysis provides a description of each case (Creswell and Creswell, 1998). To do this, I read the data collected at each field site to understand each case as a whole. This included data from the interviews, the documents, the meeting observations/minutes, field notes, and analytical memos.¹⁴ Reading all of them holistically enabled me to describe the organization and the information infrastructure. The full descriptions will be integrated into the findings and results chapters below.

After the within-case analysis of each case, a cross-case analysis was performed to find themes and patterns that emerge across the cases (Stake, 2000). Patterns and themes that emerged from each data set were iteratively compared and contrasted to identify main issues. This allowed me to make “cross-case assertions” (Stake, 2000) and “naturalistic generalizations” (Creswell and Creswell, 1998) from the data. To perform the cross-case analysis, the coding worksheets with substantive categories for both cases were compared to determine the themes that emerged collectively from the data. Additionally, the STIN diagrams, timelines and narratives assisted in the cross-case analysis, as emerging themes, characteristics, resource flows, and interactors were identified as relationships that exist between various elements within the STIN.

4.7 Evaluating Qualitative Research

For this qualitative research, I have considered positivist conceptions and measures of validity, reliability, and generalization (Bryman, 2015). Qualitative research is often reviewed

¹⁴ According to Saldana (2013, p. 42), “Analytic memos are somewhat comparable to researcher journal entries or blogs—a place to ‘dump your brain’ about the participants, phenomenon, or process under investigation by thinking and thus writing and thus thinking even more about them.”

based on quality of analysis (Miles, Huberman, and Saldana, 2013). My strategies to check for quality during this research and to address trustworthiness include:

1. An account of my personal biases which may have influenced findings (Morse, Barrett, Mayan, Olsen and Spier, 2002).
2. Acknowledging biases in my sampling and ongoing critical reflection of methods to ensure sufficient depth and relevance of data collection and analysis (Sandelowski, 1993).
3. Thorough record keeping, demonstrating a clear decision trail and ensuring interpretations of data are consistent and transparent (Long and Johnson, 2000).
4. Establishing a comparison case/seeking out similarities and differences across accounts to ensure different perspectives are represented Morse et al., 2002).
5. Demonstrating clarity in terms of thought processes during data analysis and subsequent interpretations (Sandelowski, 1993).
6. Respondent validation, which includes inviting participants to comment on the interview transcript and whether the final themes and concepts created adequately reflect the phenomena being investigated (Long and Johnson, 2000; Sandelowski, 1993).
7. Data triangulation (Long and Johnson, 2000), whereby different methods and viewpoints help produce a more comprehensive set of finding (Fraser and Greenhalgh, 2001; Kuper, Lingard and Levinson, 2008).

While each of these techniques by themselves cannot promise quality, jointly I believe they supported my ability to make statements about the domain of IRs being studied (Lincoln and Guba, 1985).

As this research focuses on an under-examined field (although within the well-studied general area of communication of research), it is exploratory in nature. It examines an understudied technology: IRs. In the literature, the STIN approach to asking research questions has not been extensively used. Therefore, it was not possible to design a formally sanctioned survey or implement a standardized test that would yield meaningful information about the socio-technical realm of the organizations that support OA IRs. Nevertheless, the STIN strategy allowed me to enter the field with a list of pre-defined boundaries and categories, guided by my three main research questions, the eight heuristics of the STIN framework, and an understanding of Institutional Theory.

4.7.1 Fieldwork challenges in Japan and the United States

“Whether you are an anthropologist, sociologist, or political scientist documenting on-the-ground activities, or a scholar buried in an archive, as a researcher arriving in Japan, you must learn to navigate unfamiliar social protocols to see your project move from idea to tangible result.” McLaughlin (2010)

As McLaughlin suggests above, the researcher coming to study in Japan (moreover, to any country not native to the researcher) may face many challenges throughout the research experience. Several obstacles needed to be overcome at the outset. First, it may be difficult to connect with gatekeepers at the various organizations and other affiliated academic institutions. However, as I have established connections at other institutions (for example, SPARC NA in November 2014 and 2016; Japan’s NII in October 2016), I had several previously established

gatekeepers who helped establish communication with other universities, governments, and institutions. Additionally, colleagues with whom I have discussed this research also introduced me to other agencies and organizations.

Second, networks in Japan are usually structured hierarchically, meaning it was necessary for me to learn quickly where organizations and individuals “fit” within the social network. The interconnected nature of the government and top-down organizational structures had knock-on effects on introductions to other organizations, thus affecting the research as a whole. In past research, data collection at one institution was reported to a network of people, so that when I arrived at another institution, I was treated as a welcome and already-known guest.

Finally, I am not a native speaker of the Japanese language (I am a native English speaker, American-born, Canada-raised), thus necessitating several steps be taken to minimize misunderstandings. First, I had already studied the Japanese language both at university for one year and intensively in Japan for eight months had have been trained in Japanese for research purposes. Moreover, all questions and translations were double-checked by a fluent Japanese speaker, reader, and writer. Second, before any interviews were performed, the interviewer sent prior to the interview a list of questions to be asked in Japanese, then the interview was recorded and meticulously transcribed in two languages. The same occurred for any observational events; I recorded the events and watched them multiple times to ensure accurate understanding. When reading and interpreting documents, I was able to read beginner- to intermediate-level Japanese documents and used translation software and a human in case of more difficult documents.

4.7.2 Limitations and Researcher Bias

It is expected that many challenges will face any researcher intent on conducting detailed studies of organizations. The objective of this section is to present a reflective dialogue of the

choices made prior to conducting this research, and of the protocol that was used during the study. First, as noted above, I have chosen a topic that could be considered cross-cultural or multi-geographical. According to cultural anthropologist Marvin Harris (2001), I am an “outsider” to Japanese society. The same could be said of my experiences in the United States, as I was not raised in the United States, and therefore have no formal education or socialization to understand the formal and informal structures of government agencies or non-profit organizations (beyond what is required to interact with them in daily life). As mentioned above, I am a native English speaker. I have lived and worked in the United States for approximately seven years. I worked and lived for approximately five years in Japan (2000-2001, 2007-2011) for the Japanese Government and as a self-contracted researcher. I had some introductory university level training in Japanese, and I spent 8 months between 2007-2008 at the Japan Foundation Language Training Program for Researchers learning to speak, read, and write Japanese. I have conducted qualitative and quantitative research on organizations in both Japan and the United States.

I have made various choices for this research, not only based on personal interest for my dissertation, but also on a variety of other factors. First, I have limited funding methods to support this research—using personal funds to support the research travel, but not the type that would have permitted me to do a long-term ethnographic study, where I would move to the location and reside for a lengthy period of time. Second, in addition to my role as a doctoral student, I have a full-time job and support a family. While my position as a librarian at a university has time-off policies, I am still limited to about seven weeks of personal time per year and was be able to take more than two or three weeks at one time. Thus, studying any one organization for an extended period would prove to be impractical for this research.

Finally, the boundaries presented here are important, as they necessarily shaped the format this research must took. The aim of this reflection and discussion, however, is to argue that specifically for this research and its questions, performing an in-depth discrete ethnography would possibly not have produced the answers that this research hopes to attempt. In exploring and understanding the technology of OA IRs, one of the fundamental ideologies of social informatics that Kling and Scacchi (1982) recommended is that identical or highly similar “computing packages” (I interpret their meaning as technology or infrastructures) have different consequences in different settings. Therefore, by doing an ethnographically informed multi-sited case study instead of single long-term ethnographic study, it may be possible to understand the different ways in which organizations, with similar goals in communicating research, and maintaining and supporting a specific technology into everyday practice. Marcus (1995; 2005) argued that treating multiple sites “thickly” or “thinly” is a decision that should be made in the context of the researcher’s goals. I believe I have coordinated my site research in a way appropriate to my abilities and limitations.

4.8 Ethical Procedures

The ethical procedures for this research are based on Miles, Huberman, and Saldana’s (2014) checklist: a) the worthiness/contribution of the project; b) my competence as a researcher and an interviewer; c) informed consent and disclosure of purpose and information; d) benefits to both the participants and future researchers, costs, and reciprocity; e) harm and risk to participants; f) honesty and trust between researcher and participants; g) privacy, confidentiality, and anonymity; h) intervention and advocacy; i) research integrity and quality; j) ownership of data and conclusions; and (k) use and misuse of results (pp. 58–66). These were followed carefully.

Institutional Review Board (IRB) documents. All research was performed following IRB protocol for human research using proper information and consent forms. A copy of my completed CITI Training Certificates were submitted with the IRB application indicating that I have met the qualifications to conduct interviews and understand the limitations and consequences of this type of research. All interviewees, and those being observed, were given a personal pseudonym to represent their names through the study; however, they were also made aware that the real organizations names may be used.

Ethical concerns. Fieldwork involved flexibility and adaptability; participants were informed of their option to decide to leave the study before completion, or to object to certain questions. Interviewees were offered the choice to drop out of the research process at any time with no consequences. There were no foreseen professional or personal conflicts of interest in performing this research.

Treatment of data. Data collection was the sole responsibility of the author and was stored on a personal laptop computer, backed up daily with a flash drive, and additionally on an online cloud server. All hardware and software were protected by password. Written documentation and transcriptions were kept in the researcher's home office in a locked filing cabinet. All data were kept confidential except for information shared with my supervisor and committee. A research summary was be offered to each participant when all the interview transcriptions were completed for the purposes of their review. When the research is finished, the data will be securely stored for five years, then destroyed.

4.9 Research Timeline

Table 4.3 reflects the research timeline that was used to guide this research.

Table 4.3 Research Timeline

Year	Month	Activity
2019	Jan/Feb/Mar	Prepared Proposal / Applied for IRB/ Secured Permissions from SPARCs Began collecting data, collected from publicly available organizational websites
	Apr/May	IRB approval received as per Dr. Gazan Receive Committee Feedback on Draft / Field site visit to Japan: Interview data collection at NII SPARC JP Attendance at 2-day Japan Open Science Summit
	June/July/Aug	Prepared Proposal Draft and received Feedback form Committee /Began phase one data analysis and JP interviews
	Aug/Sep/Oct	Continued phase one data analysis and phase two JP interviews/ Proposal defense completed/ NA request for interviews and permissions for events
		JP 2 nd visit of Interview site /2 nd Participant observation SPARC JP Activities/ Initial analysis and writing of memos/ Follow-up questions to JP
	Nov/Dec	SPARC NA interviews site-3 separate interviews Ongoing analysis of data and memo writing
2020	Feb/Mar	Began sharing my draft/ map overview with chair 2 nd Participant observation SPARC NA Activities
	Apr/May	Pandemic! Lockdown! Disruption! Low Concentration! High Demand for me as an Open Access expert!
	Jun/July/Aug	Coding Data STIN and Institutional Frameworks Simultaneous Writing of findings, discussion, and conclusion
	Sep/Oct/Nov	Surgery! Job Promotion! Institutional Theory is difficult for analysis! Blurry! New Code Book! Recoded data!
2021	Mar – Aug	Polish and Best Draft to Chair Discuss & Schedule Defense Date
	Aug	Draft to Committee Receive Committee Feedback on Draft Schedule Defense Date
	Oct	Defense
After Defense ends		Results to be presented in peer-reviewed journals, present findings at conferences in information science, social studies of science and technology, and IRs.

4.10 Summary

To explore a wide variety of rules, norms, and activities in two organizations as they relate to ICTs, this chapter described how this dissertation gave boundaries to the research—by limiting the boundaries of analysis to the organizational, norms, rules, practices, and activities (as opposed to individual uses) of IRs using STIN strategy. This chapter also offered a reflection of the strategies for fieldwork, requirements for research compliance, methods of observation and analysis, strategies for evaluation, latent challenges in the field, and potential researcher biases. The goal was to offer transparency behind the intended practices of this research, and to be forthright about this research’s potential for success and anticipated challenges from a methodological perspective.

Chapter 5: Research Findings

5.1 Overview

This chapter attempts to examine the research questions by presenting an analysis of the data collected using the methods outlined in Chapter 3 and Chapter 4 and is motivated by an interest in understanding the ways in which two organizations, SPARC Japan (JP) and SPARC North America (NA), supported institutional repository (IR) information infrastructure. The research questions were:

- R1. What socio-technical influences have contributed to variances in institutional repository infrastructure?
- R2. What organizational characteristics influence choices and uses of IRs?
- R3. How do the variances illuminate the progression of IRs in organizations in Japan compared to similar organizations in the United States?

Instrumental in the development of the research questions were the insights from my prior interactions with both organizations as an early career researcher and PhD candidate. Those interactions included attending SPARC sponsored events, visits to SPARC offices in the US and Japan, conversations with SPARC communities, and participation in conferences, workshops, and events.

In this analysis and findings chapter, I have attempted to synthesize and present the findings in two distinct ways. First, to address the overarching objective of this research, I examined the cultural, institutional, and social contexts of organizations supporting IRs, and how IRs have evolved in social and institutional contexts. Section 5.3 presents the first set of data analysis and results, which focused on using the STIN methodology. STIN was fundamental in examining how IRs were not meaningfully separable from the organizations' social context

(Kling et al., 2003). Thus, the data presented in section 5.3 was collected and analyzed in several phases, then coded into two STINs models, one for each of the SPARC case studies. The STIN analysis of each case is essentially structured data, where the main points are extracted with narratives and diagrams presented in sections 5.3.1 and 5.3.2 for each organization.

Second, section 5.4 offers data analysis and findings as they relate to the organizations through the lens of an Institutional Theory framework, i.e., understanding the characteristics of organizations examined within Scotts' pillars and carriers. Concepts around Institutional Theory "propose that organizations consist of several pillars (regulative, normative, and cultural-cognitive) and that the structures and activities can provide insight into meaningful social behavior" (Scott, 2004, p. 409). Therefore, it is through the lens of Scott's institutional pillars and carriers that data was coded and analyzed, and the significant results presented for each of the SPARC case studies in Section 5.4.

Next, in section 5.2, I address how the two SPARC organizations wished to be recognized in this dissertation, the quantity of data collected, the methods of data analysis for this research, and practices used for interviewing and transcription of the interview data.

5.2 Data Analysis for SPARC's Case Studies

The findings for this research reveal the observations and analysis of the data collected for SPARC NA and SPARC JP as case studies. For both the STIN strategy and institutional framework analysis and findings, the data was based on evidence obtained from examining the cases by means of document content analysis, observations of events, and fieldwork interviews. Furthermore, the two case studies examined are representative of the many complex issues within information infrastructure, including policy, education, and membership. Regardless of

the limitations of examining case studies (discussed in chapters 3 and 4), both cases may provide significant insights for this research and for future work.

5.2.1 Quantity of Data Collected

The quantity of data collected and analyzed for this research is summarized in Table 5.1.

Table 5.1 Quantity of Documents, Observations, and Interview Data Collected and Analyzed

Content	SPARC NA	SPARC JP
Websites	1 Org Web (100 pages) 2 Connected Sites	1 Org Web (100 pages) 2 connected sites
Newsletters	42	152
Emails	8	31
Pamphlets/Handouts	7	3
Reports	15	17
Interviews	4	3
Observations (Events)	5 events	4 events

5.2.2 Data Analysis Approach

The approach used for both the STIN strategy, and the coding of the data was a mixed practice of coding down (piori) and coding up (emergent and open) (Saldana, 2013; p. 62). The emergent codes were categories found in the data collected. When I began the process of open coding, I started by highlighting codes and categories within the data, collected from the organizations’ websites, my interviews and field notes, and documents. Using open (initial)

coding (Saldana, 2013, p. 100) technique, the data was then divided into dissimilar and individual categories, which helped me to identify connected concepts in the data. Once the concepts were found similar themes were grouped together, and the categories containing the concepts emerged.

The relationships in the data between the concepts and the categories were found by using an “axial coding process” (Saldana, 2013, p. 218); and by asking questions around the STIN strategy and institutional framework as the sub-categories emerged, they were then related to those categories. Using selective (conceptual) coding (Saldana, 2013, p. 223); I was able to note the most prominent categories, which emerged inductively through the reading of the data, by paying “selective attention to the elements, nuances, and complexities” of the data, (Saldana, 2013., p. 53) as belonging to general STIN heuristics or to institutional pillars and carriers.

The selection of the coding approach “open, axial and selective” (Saldana, 2013) adhered to the strategies for rigorous data analysis procedures modeled after Saldana’s (2013) examples for non-grounded theory study. The connections between these coding methods and the practice of memo writing, coupled with a deep understanding of the two frameworks, helped me generate main categories. However, my experience was that also some of the categories were nascent prior to the analysis and assignment of the codes into core categories.

The next two sections present the findings using the STIN strategy for analyzing the socio-technical relationships for each of the two SPARC organizations. Using the eight heuristics (mentioned in chapter 4 and again below), the data collected from the two organizational websites, publicly available organizational data, white papers, and artifacts was coded using the mixed strategy of “coding down priori” and coding up (emergent and open) (Saldana, 2013; p. 62).

5.2.3 Interview Protocol

As per the protocols laid out by the University of Hawaii'i at Mānoa Human Subjects Review Board, I presented consent forms to both organizations and people interviewed indicating that they would be provided with anonymity and pseudonyms to protect their identity. However, both organizations rejected the concept of being anonymous, and strongly advised me that their preference was to be identified as members of SPARC, and their personal names used where necessary. Therefore, in this dissertation, I have used the names of the organizations and the people interviewed and identified them where relevant. In the case of observations at events or meetings of the larger system interactors, unless I asked for the individual's consent, I have not identified any human subjects at observed events.

The findings for this research and in particular the data from interviews and observations are presented so that the interviewees are allowed to “speak for themselves” and as such some representative quotes have been selected from the transcribed interviews, documents and reports. Weiss (1994) identified several ways of presenting excerpts from interview data. The first is a preservationist approach, whereby researchers present the original interview excerpts verbatim, without correcting any grammatical errors. The second approach is where quotes may be presented with some minor edits so that the ideas presented in the quotes are easily understandable to the readers. For this research I have chosen a preservationist approach for presenting quotes from the interview transcripts, to preserve the original voice. However, in places for the sake of grammatical flow, I deleted repetitive words and some vocal sounds such as “um” or “ah” to maintain continuous flow of the sentences.

5.2.4 Observations

The observations in this study were conceived of as participant observation. Though they were not the main method of data collection, observation of various organizational activities provided opportunities for engagement in the organization's worlds (Van Maanen, 1979). Participant observation was used in this way as one method of data triangulation (Hara 2008; Snow and Trom, 2002). Notes from the observations of events, meetings, and activities hosted by the organizations were not coded, however, but instead were used to help with the organization of data and provide context for (and memory of) situations, actors, and happenings.

5.3 STIN Findings

The use of STIN strategy allowed for the description of the characteristics of the organizations and their practices, their socio-technical relationships, and the "identification of technologies and groups of technologies, including people, to be understood as complex, and bounded phenomena" (Kling et al., 2003, p. 57). For the analysis of the two case studies as STINs, the heuristics were used as questions to guide the examination of the data, and are summarized as follows as per Kling et al. (2003, p. 57):

STIN Heuristics:

- h1. Identification of system interactors (likely actors, their roles, and their needs);
- h2. Identification of core groups;
- h3. Identification of incentive structures (motivations);
- h4. Identification of excluded actors and undesired interactions;
- h5. Identification of existing communication forums (communications systems or "ecologies" (Kling et al., 2003 p. 57) and their relationships to the STIN;
- h6. Identification of resource flows (money);
- h7. Identification of the architectural choice points (the main focus is the technological features or social arrangement in which the organization had historically selected various alternatives);
- h8. Identification of viable configurations and trade-offs.

A more expanded coding hierarchy of questions, and the strategy used to model the data (documents, materials, activities, groups, organizations as STINs), is in Appendix B.

The STIN framework findings are described in sections 5.3.1 and 5.3.2 for SPARC NA and SPARC JP respectively. Following the STIN model described and outlined by Kling, McKim and King (2003, p. 57), the eight heuristics have been identified, and wherever possible data have been collected particularly as relates to research questions 1 and 2:

R1. What socio-technical influences have contributed to variances in institutional repository infrastructure?

R2. What organizational characteristics influence choices and uses of IRs?

5.3.1 STIN Case One: SPARC NA

5.3.1.1 HI System Interactors

STIN Step one included identifying a relevant population of system interactors (Kling et al., 2003). The main inquiries for this step include the ways and the roles in which the interactor (group/organization) would participate in the system (p. 55).

The SPARC NA’s organization documentation outlines the main purpose and articulates its missions, program plans and strategies, and actions to achieve its purposes in almost every formal document. That purpose is to enable the “open sharing of research outputs and educational materials in order to democratize access to knowledge, accelerate discovery, and increase the return on investment in research and education”.¹⁵ SPARC NA focuses on “collaborating with other stakeholders such as authors, publishers, libraries, students, funders, policymakers and in some cases the general public—to build on the opportunities created by the

¹⁵ Who We Are SPARC. Retrieved August 2020, from, <https://sparcopen.org/who-we-are/>

Internet, promoting changes to both infrastructure and culture needed to make open the default for research and education”.¹⁶

According to the SPARC NA staff (Heather Joseph, personal communication, October 15, 2019), and as further articulated in their 2019 SPARC Program Plan¹⁷ SPARC NA’s routines and activities center around three main program areas:

1. educating stakeholders on issues in scholarly communication,
2. advocating policy changes that support the potential of digital systems to advance scholarly communication, and
3. incubating market-based initiatives that demonstrate business and publishing models that advance changes benefitting scholarship and the academy.¹⁸

SPARC NA is comprised of various system interactors the staff-people who move forward the mission facilitate the activities of the program areas. At the time of this research, the organization had twelve formal staff listed on its website. The SPARC NA staff, titles, and images are presented in Figure 5.1.

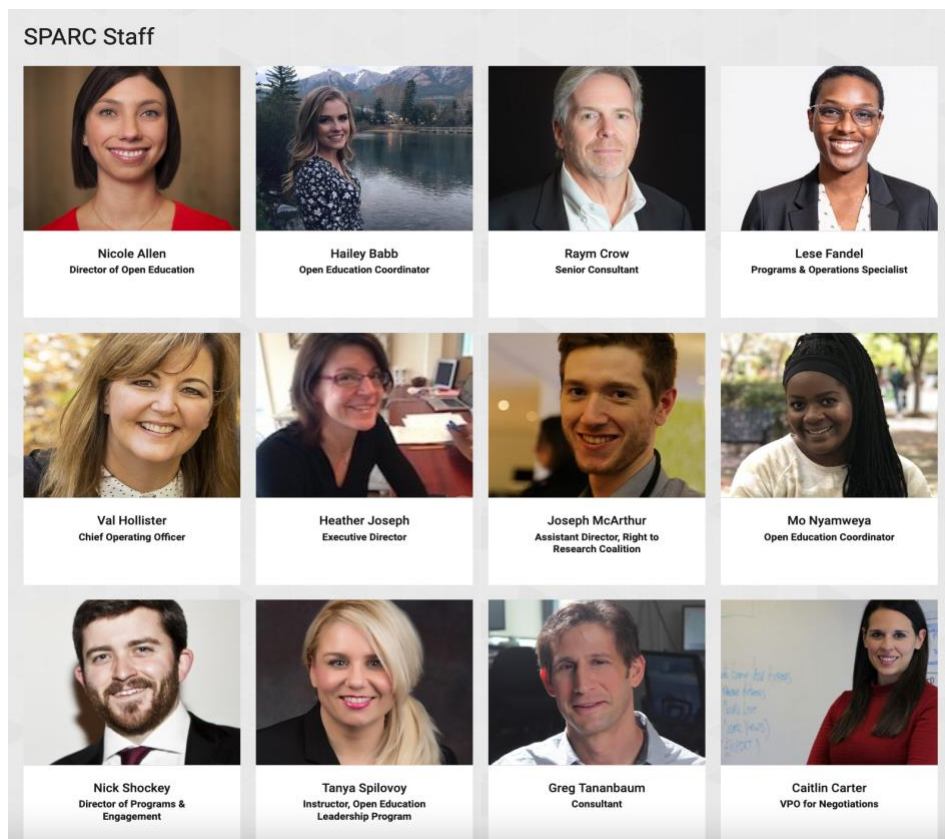
Nick Shockey, Director of Programs and Engagement, states that “one of the most important ideas that SPARC NA represents is that the organization is a catalyst for action in the open access and education space. The staff at SPARC, provide governance and leadership to our members, but built into everything we do is a space for action” (personal communication, November 7, 2019).

¹⁶ Who We Are SPARC. Retrieved August 2020, from, <https://sparcopen.org/who-we-are/>

¹⁷ 2019 SPARC Program Plan <https://sparcopen.org/who-we-are/program-plan/>

¹⁸ 2019 SPARC Program Plan <https://sparcopen.org/who-we-are/program-plan/>

Figure 5.1 SPARC Staff as of 2019



Source: SPARC NA-Organizational Staff System Interactors SPARC NA <https://sparcopen.org/people/> (Retrieved December 2020).

Other staff that were interviewed within the SPARC NA organization also emphasized the role of the organization as a place where “actions were taking shape”, and while plans and strategies of the organization were very important to the work, facilitating and supporting “doing” for all of the members, and for moving forward were also very important to the goals of SPARC NA. (Nick Shockey, personal communication, November 7, 2019; Heather Joseph, personal communication, October 15, 2019; Nicole Allen, personal communication, November 6, 2019).

The SPARC NA organization was initially formed at the spring meeting of one of the Association of Research Libraries (ARL) meetings. Heather Joseph, Executive Director of

SPARC NA, states that a similar motive existed back then in the 1990s as to today. “ARL members were proposing at the time a form of collective action to address the journals/ serials pricing crisis facing libraries” (Association of Research Libraries, 2002). Today, similar stakeholders are members of SPARC and take an active role in the routines and activities of the organization. Members are comprised of the professional library associations that historically came together to form SPARC NA, libraries in the Association of College and Research Libraries (ACRL), and the Association of Research Libraries (ARL).

The Members of SPARC NA are comprised of 240+ institutions¹⁹ in the United States and Canada. Members included on the list are on mostly universities, colleges, and research institutions. SPARC NA membership, however, is also comprised of several institutions from outside North America and affiliate memberships of four major library associations: American Theological Library Association (ATLA), Association of Academic Health Sciences Libraries (AAHSL), Association of College and Research Libraries (ACRL), Association of Research Libraries (ARL).

The membership base is important to the SPARC NA leadership as they report that “broad and comprehensive representation from libraries helps reinforce the coalition’s international focus.”²⁰ Members of the SPARC NA organization pay a yearly fee to join and belong. The membership fee is based on the role they wish to play in the organization and governance. For example, if a member institution wishes to be a voting or non-voting members, they pay a different fee. Also factored in are the size and position of their institutions. More about membership and incentives in section 5.3.1.3, H3 Incentives.

¹⁹ Who We Are SPARC NA Retrieved December 10, 2020, from <https://sparcopen.org/who-we-are/>

²⁰ Who We Are SPARC NA Retrieved August 2020, from <https://sparcopen.org/who-we-are/>

The membership guides the plans and activities of SPARC NA. In addition to the main staff of SPARC NA, the people in the organization create yearly program plans guided by a steering committee of individuals selected from the various member institutions.²¹ According to SPARC NA documentation, “the steering committee represents the membership and provides rapid programmatic decision-making support.”²² Members who are individual representatives on form the member organizations are selected to serve 3–5-year terms.²³ The steering committee is selected by the SPARC voting membership, and members are made publicly available on SPARC NA’s website.

Additionally, program activities for SPARC NA are guided by “four-member advisory groups, composed of representatives from the SPARC Membership specializing”²⁴ in the following areas:

- Communications and Engagement Advisory Group Members
- Open Data Advisory Group Members
- Open Education Advisory Group Members
- Student Program Advisory Group Members

Advisory group members all hold upper level or senior ranking positions at higher education institutions, research institutions, or affiliated policy institutions, and are publicly viewable on SPARC NA’s website.

²¹ Who We Are SPARC NA Retrieved December 10, 2020, from <https://sparcopen.org/who-we-are/>

²² Who We Are SPARC NA. Retrieved August 2020, from <https://sparcopen.org/who-we-are/>

²³ People SPARC NA. Retrieved December 10, 2020, from <https://sparcopen.org/people/>

²⁴ Who We Are SPARC NA. Retrieved August 2020, from <https://sparcopen.org/who-we-are/>

5.3.1.2 H2 Core Interactor Groups

STIN step two involves taking the system interactors from step one and grouping the organization together with respect to their roles with other groups in the system. Kling et al., (2003) state that roles of the system interactors and core groups may overlap (p. 55).

The core groups that interact with SPARC NA working “to support open sharing of research outputs and educational materials in order to democratize access to knowledge”²⁵ are diverse and growing. SPARC NA identifies that it works with multiple coalition partners and other large groups and organizations whose work intersects with SPARC NA. They provide support to the larger SPARC NA organization in terms of education, advocacy, and project assistance. Heather Joseph states that SPARC NA is “committed to sponsoring, managing, and partnering with a diverse group of coalitions that work to open up research and education” (H. Joseph, personal communication, October 15, 2019).

In the SPARC 2018, 2019 and 2020 Program Plans, these core groups are listed as coalition partners of SPARC NA. According to SPARC NA staff, many of the coalition partnerships were at first “projects” initiated by SPARC NA (Nick Shockey, personal communication, November 7, 2019), (Heather Joseph, personal communication, October 15, 2019; Nicole Allen, personal communication, November 6, 2019). Table 5.2 lists the 2020 SPARC NA coalition partners.

SPARC NA also lists on its website three international affiliates that are organizations with similar organizational structures and missions and purposes: SPARC Africa, SPARC Europe and SPARC Japan.²⁶ SPARC NA interacts with many other groups in its advocacy role, including professional groups within the academic and higher education community, such as

²⁵ Who We Are SPARC NA. Retrieved January 2021 from <https://sparcopen.org/who-we-are/>

²⁶ Who We Are SPARC. Retrieved May 2019 from <https://sparcopen.org/who-we-are/>

administrators, faculty, librarians, student groups, lawmakers, and even the national bookstore association.

In addition, SPARC NA prioritizes its interactions with lawmakers as extremely important to the mission and actions of the organization. This includes U.S. Congresspeople, Canadian Parliamentarians, U.S. State Governors, Canadian Provincial Premiers, and their advisors and staff.

In summary, the SPARC NA system interactors and core interactors are comprised of Coalition Partners, International Affiliates, Professional Associations, and Legislative Government Groups as outlined in Table 5.3.

5.3.1.3 H3 Incentives and Motivation

STIN heuristic three shows the incentive structures involved with developing and working with the system. As with Kling et al.'s (2003) study of communication forums, SPARC NA and their system interactors play an important role in incentive structures. Incentives may motivate SPARC NAs member organizations, or the individuals who are members of SPARC NA via an institutional SPARC membership, and/or individuals who access the freely available SPARC NA materials at the public SPARC NA website. Understanding the incentives and motivations of SPARC NA helped identify why an interactor would want to participate in the development and use of the system.

Table 5.2 SPARC NA Coalition Partners as listed on the SPARC NA Website.

Partner	Description of Partner/Group
Right to Research Coalition (R2RC)	“International alliance of more than 90 undergraduate and graduate student organizations in over 100 countries around the world, that work to promote openness in research through advocacy and education (founded in 2009).” ²⁷
Alliance for Taxpayer Access	A group composed of “patient groups, physicians, researchers, educational institutions, publishers, and health all of these organizations support barrier-free access to taxpayer-funded research”. ²⁸
Coalition of Open Access Policy Institutions (COAPI)	Representatives from “North American universities, colleges, and research institutions with established faculty open access policies and those in the process of developing such policies.” ²⁹
Open Access Working Group (OAWG)	Similar “organizations that began meeting in the Fall of 2003 to build a framework for collective advocacy of open access to research.” ³⁰
Open Research Funders Group (ORFG)	“Members include large funders, e.g., Alfred P. Sloan Foundation, American Heart Association, Bill and Melinda Gates Foundation, Laura and John Arnold Foundation, Robert Wood Johnson Foundation, Wellcome Trust” ³¹ - partnership of funding organizations committed to the open sharing of research outputs.

Source: SPARC NA What we do. Retrieved August 2020, from, <https://sparcopen.org/what-we-do/projects>.

²⁷ What we do. Retrieved August 2020, from, <https://sparcopen.org/what-we-do/projects/>

²⁸ Alliance for Taxpayer Access. Retrieved August 2020, from, <https://www.taxpayeraccess.org/>

²⁹ What we do. Retrieved August 2020, from, <https://sparcopen.org/what-we-do/projects/>

³⁰ What we do. Retrieved August 2020, from, <https://sparcopen.org/what-we-do/projects/>

³¹ What we do. Retrieved August 2020, from, <https://sparcopen.org/what-we-do/projects/>

Table 5.3 SPARC NA System and Core Group Interactors

System Interactors	Core Groups
<ul style="list-style-type: none"> • SPARC NA Employees • Steering Committee • Member Advisory Groups • 200+ Members (universities, colleges, research institutions) 	<ul style="list-style-type: none"> • Coalition Partners • SPARC International Affiliates • Professional Associations- Association of Research Libraries • Government groups

Source: Table by Jennifer Beamer 2020

To become involved with SPARC NA, an organization must become a SPARC member by applying and paying a fee. SPARC NA suggests that membership fees are “proven, effective way for members to leverage library resources to the fullest to achieve their missions as academic and research libraries”. The incentives are listed on the SPARC NA website as follows:³²

“Included in the membership is:

- Monthly member communications and special reports on new developments in Open Access, Open Educational Resources, and Open Data.
- Member webinars, conference calls, and position papers deliver expert perspective from specialists on critical topics.
- SPARC NA national, state, and international advocacy programs drive new and expanded Open policies and practices.
- Campus resources (including brochures, posters, and best practice guides) save staff time and help expand your local programs.
- The opportunity to connect and bring experts on key issues to speak to your campus community and participate in local events.
- Discounts to SPARC-hosted events allow your staff to participate in the global Open community.
- A member badge that member libraries and organizations can add to your websites to inform visitors about your institution’s work to advance Open.”³³

³² Become a Member SPARC NA. Retrieved December 10, 2020, from <https://sparcopen.org/become-a-member/#options>

³³ Become a Member SPARC NA. Retrieved December 10, 2020, from <https://sparcopen.org/become-a-member/#options>

The fee scale is based on the size of the institution, and at this time only groups of institutions may join as members of SPARC NA; while institutions may be members, individuals may not apply (they must be members of a member institution). Membership fees range from \$7500 per year for full voting members at Association of Research Institutional affiliated institutions, to \$785 two-year institutions (single campus) and Supporting Members or affiliated (non-voting members). According to the SPARC NA website, “the fees are based on a the calculated 0.22% of library’s total annual library materials expenditure”.³⁴

However, something to note when visiting the website is that many of these benefits, in the form of information made openly available without SPARC NA’s membership, provide numerous advocacy resources and educational materials for free. Therefore, anyone with a computer and internet connection can benefit from the open access, and non-members may also be system interactors.

The staff at SPARC NA state that what motivates their work is a focus on open infrastructure—research and materials that are openly accessible for education (N. Allen, personal communication, November 6, 2019). SPARC NA’s members are mainly from the United States and Canada, and they are mostly universities, colleges, and research institutions. Therefore, SPARC NA directly influences members who may have an interest in open practices in their geographic locations. SPARC NA’s 2018, 2019, and 2020 Program Plans state that the mission of SPARC NA is to promote the “barrier-free sharing of research and educational materials to enable a global, open ecosystem for scholarship—democratizing knowledge sharing,

³⁴ Become a Member SPARC NA. Retrieved December 10, 2020, from <https://sparcopen.org/become-a-member/#options>

accelerating discovery, and increasing societal and economic returns on research and education investments.”³⁵

Thus, there are several motivations and incentives articulated for the SPARC NA organization. First, it is highly focused on leadership and policy advocacy for taxpayer-funded research. This means they take an active role on behalf of members as lobbyists in the United States and Canadian Governments, encouraging legislation and influencing policy related to the open dissemination of research. One recent example that this research observed was the process of advocacy and eventual stoppage of a proposed merger between textbook publishing goliaths Cengage and McGraw-Hill Education. According to the SPARC website,³⁶

“SPARC NA submitted a detailed 49-page antitrust analysis to the [Department of Justice] in August 2019, and continued to seek opportunities to educate antitrust officials, international authorities, lawmakers, and state attorneys general about the harms of the merger, along with broader issues around the academic publishing industry’s shift toward data and data analytics as a core business.”³⁷

SPARC NA was also able use their network of established system interactors to further educate and gather support (by way of letter writing and contacting government representatives) in helping to stop the merger.

Nicole Allen, the Director of Open Education, who led the merger-stoppage said, “The merger would have combined the second and third largest higher education publishers, turning the college textbook market into an effective duopoly that would have stifled competition in an industry already known for rapidly rising prices” (personal communication, November 6, 2019).

Nicole states that this work to educate members of Congress about open textbooks and the

³⁵ 2020 Program Plan. Retrieved December 10, 2020, from <https://sparcopen.org/who-we-are/program-plan/>

³⁶ Policy and Advocacy Stopping the Cengage/McGraw-Hill Merger. Retrieved March 2020 <https://sparcopen.org/our-work/oppose-cengage-mcgraw-hill-merger/>

³⁷ Policy and Advocacy Stopping the Cengage/McGraw-Hill Merger. Retrieved March 2020 <https://sparcopen.org/our-work/oppose-cengage-mcgraw-hill-merger/>

publishing industry is fundamental to the role of the SPARC NA organization (personal communication, November 6, 2019).

A second stated incentive of SPARC NA is that they are highly focused on tangible, actionable outcomes (N. Shockey, personal communication, November 7, 2019). The organization communicates these outcomes to members as incentives for remaining members in their monthly newsletters, and regular email communications. Other situational reports occur where there is current news, and are released to the membership, then shared more widely and made open.

Nick Shockey, the Director of Programs and Engagement, stated that he felt that SPARC NA's;

“most important role is as ‘a catalyst for action. We don’t define ourselves by any one specific thing, but more broadly we are taken with creating change to open up research. Using a mix of strategies to affect that change, but the “acting” in all projects, events, and communications that are supported and produced by SPARC NA we are focused on motivating others to act. SPARC is a catalyst for action.” (personal communication, November 7, 2019).

Motivating others to act is important for SPARC NA, especially as it relates to open access infrastructure in North America. While SPARC NA can influence policy, people, and practice, technology in the form of institutional repository infrastructure is supported and managed at an individual university/college or institutional level. Nick emphasizes that the lack of one large institutional repository for North America:

“Unlike say some of the other countries we know, the United Kingdom, Japan, et cetera, it’s not a disadvantage for us in North America, because creating the spaces for action and the places for people to interact can have an effect that can lead other opportunities. That action leads to creating new norms, practices, and policies that ultimately lead to open and equitable access to, the use of, and participation by all people in research and education.” (personal communication, November 7, 2019)

5.3.1.4 H4 Excluded actors and non-interactions

STIN step four is based upon the previous steps by identifying excluded actors and undesired interactions. For example, what do the system interactors not want the system to do?

It might seem that for those who are not members of the SPARC NA organization, as they are “membership”-based, would be considered excluded. It could be assumed that “members only” would benefit from privileged access to the organization’s information resources on education and advocacy. However, SPARC NA’s organizational materials are generally available to the public on their website, freely accessible to anyone with access to an internet connection; there is no “member area” on the website where members log in, or that has restricted access to any to the organization’s resources.

Member benefits come in the form of SPARC NA outreach. Over the past few years, SPARC NA has intensified some of its policy advocacy, and in 2018 the organization secured a respected market analyst Claudio Aspesi to produce a comprehensive analysis of commercial strategies in infrastructure across the higher education sector (personal communication, October 15, 2019). The research produced often was sent out via member communications, i.e., sent only to members via email, and was marked to indicate that the content could only be shared with SPARC NA members. This labelling of information as “confidential” or “member-only” occurred around announcements related to the arrangement of meeting for member regarding planning, and strategies widely shared around the reports and presentations to the membership offered by Claudio Aspesi.

In addition to SPARC NA’s regular annual members meetings which are often held at the Coalition for Networked Information (CNI), and in concert with their library professional association meetings (usually at the American Library Association and the Association of

College and Research Libraries, and the Association of Research Libraries), SPARC NA has convened members-only events both online and in person, on the topic of “community-controlled Infrastructure for Scholarly Communication”. Heather Joseph mentioned that while many things are private, “eventually SPARC NA has been making many the outcomes and materials, resources, reports, and all of its governance, and organizational documentation freely available to anyone especially non-members” (personal communication, October 15, 2019).

These include, many of the advocacy materials that SPARC NA has put together, such as:

1. Big Deal Knowledge Base³⁸ (for leveraging serials negotiations),
2. Author Rights and the SPARC Author Addendum³⁹ (for negotiating and retaining copyright when publishing an article, so that an author may share the work openly), and
3. SPARC Landscape Analysis,⁴⁰ a report contracted in response to the growing trend of commercial acquisition of critical infrastructure in the SPARC member institutions.

Heather Joseph stated that those resources were first available only to members, but “it seemed that they were widely needed by the library community in general and this seemed counter to what we are trying to accomplish. So, they are now on our website for everyone” (personal communication, October 15, 2019).

However, SPARC NA staff state that non-members may still be excluded from participation in members-only activities, events, and the planning of the organization. For example, “voting members participate in the governance of SPARC, including eligibility to serve on the SPARC Steering Committee and provide direct input on SPARC’s strategic direction.”⁴¹

³⁸ Big Deal Knowledge Base. Retrieved December 10, 2020, from <https://sparcopen.org/our-work/big-deal-knowledge-base/>

³⁹ Author Rights and the SPARC Author Addendum. Retrieved December 10, 2020, from, <https://sparcopen.org/our-work/author-rights/>

⁴⁰ SPARC Landscape Analysis. Retrieved December 10, 2020, from, <https://infrastructure.sparcopen.org/landscape-analysis>

⁴¹ Become a Member. Retrieved December 10, 2020, from <https://sparcopen.org/become-a-member/#options>

It is also clear that actors who may be opposed to the practices of open access would not be members of SPARC. While some activities that occur at large library events mean that sometimes journal vendors, or actors who would not have the same values could attend events or activities hosted by SPARC NA.

Non-interactions also occur within those who subscribe to the SPARC NA membership. For example, newsletters, emails, and reports are only delivered to members within a subscribing organization who sign up to receive them or even are aware of the SPARC NA membership. For example, at the University of Hawai'i generally only the library faculty (librarians) were aware that the University was a member of SPARC NA, and therefore only those individuals at the library who wanted to receive information (or know about the SPARC NA membership) were active or chose to participate.

5.3.1.5 H5 Communication Systems

STIN step five is concerned with identifying existing communication systems; Kling et al. (2003) referred to this as the “communication ecology of the system interactors” (p.50). Kling et al. (2003) used the following phrases: “communications systems, communication ecologies; and existing communication forums to describe the participant’s communications systems”; these terms even included “non-digital systems” (p. 57-58). To several social informatics scholar’s communication systems were mainly understood as networks of people, rather than devices and wires (Kling et al., 2003; Lamb and Kling, 2003).

For SPARC NA, communication systems (see Table 5.4) consisted of:

Groups and networks. SPARC NA has developed relationships over time, starting with the Association of Research Libraries and in the academic field by attending events. It has also created social networks by hosting and coordinating events in the government, library, and

international communities. The SPARC NA organization is a system or network with its staff, directors, and members; internally it is also considered a sub-network, communicating amongst themselves. The above-mentioned system and core interactor groups also communicate across and within the SPARC NA system.

Meetings and in-person gatherings. Prior to and during the case-study and data collection period, thousands of documented SPARC NA meetings and face-to-face gatherings occurred. For example, during the Fall 2019 Coalition for Networked Information (CNI) Meeting, SPARC held a member-only meeting for members in attendance. This historically has been the case for meetings that may occur at conferences that SPARC members may attend, such as the American Library Association (ALA), and the Association of College and Research Libraries. After 2016, Heather Joseph states:

“SPARC NA has eliminated much of its travel burden from the yearly SPARC NA’s annual meeting in favor of meeting our members where they live. To do this we’ve increased our team’s regular campus visits and actively support local and regional community events to make sure that more of those in our member libraries who want to participate have more equitable opportunities to do so.” (personal communication, May 2020)

Media (email, newsletters, reports, educational materials). SPARC NA communicates online in multiple ways. There is an email list for members. It is used to share specific news as it happens and a regular Monthly Member Update newsletter that summarizes the activities of the organization and significant projects of members. Additionally, timely reports, white papers, and educational materials are released as relevant to various communities. Email is the main method of communication for invitations to online events such as monthly webinars, and invitations to communities of practice to meet up and schedule work together.

Online spaces. SPARC NA’s main online spaces are modelled as communication ecologies. I have chosen the word “ecologies” as per Kling et al. (2003) because in some cases they are places to post educational materials and reports; at other times they are used for group

meetings, or as a website that shows all the organizations materials, strategies, and plans. SPARC NA's website is the main space that everyone can go to find resources and materials around the practices of openness, for use by both members and non-members. In addition to a static location for materials, there are also online spaces as networks of interactors working together to solve problems, advocate for open, and discuss issues.

Within these ecologies are communities of practice, for example the OpenCon community. They have regular monthly calls to discuss issues of the moment. OpenCon interactors are not necessarily SPARC members, but rather global participants of an Open conference that was hosted by SPARC yearly in November from 2014-2019.

Another example of a community of practice is more recently the development of several working groups dedicated to taking institutional level actions for breaking big deals, serial packages, and journals (which cost libraries millions of dollars, and are originally one of the initial motivations for the formation of SPARC NA); the groups are focused on negotiation, cancelation, and reinvestment of funds for libraries that wish to change the status quo and create a more fair and sustainable system. According to SPARC NA staff Caitlin Carter VPO for Negotiations:

“[the members and community] ...meet once a month with their group leaders and report out during Journal Negotiation Community of Practice calls (held every one or two months throughout the year). There is no minimum or maximum time commitment for members because we would like work to develop (and sunset) organically. We understand individuals may need to drop out or take a step back from this work depending on their schedules. We also understand some work may require different lengths of time to complete. As the group comes together, this may become clearer” (observed on email call for participation February 7, 2020).

Meetings are held over Zoom and work is performed and recorded in Google documents by all members. SPARC NA also has several social media sites, including Facebook, Twitter, and LinkedIn. These social media spaces are used to connect with members and the public.

Events. On the SPARC NA website there are 74 past events listed (as of March 2020) beginning in 2014⁴² that SPARC has hosted, partnered with to host, or sponsored. Each has a narrative of the type of event, its purpose, and the level of participation of SPARC. Table 5.4 summarizes many of the ways that SPARC NA communicates.

5.3.1.6 H6 Resource flows

STIN step six contributes to the understanding of how resources flow throughout the network. These resource flows can have “both direct and indirect influence on interactions within the network” (Kling et al., 2003, p. 57). Examining resource flows include looking at the relationships among “people (including organizations), equipment, data, diverse resources (money, skill, status), documents and messages, legal arrangements and enforcement mechanisms, and resource flows” (Kling et al., 2003, pg. 48). Two main areas of resources were found: 1) space and operations, and 2) staffing and expertise.

Space and Operations. Historically, SPARC NA has a space and address at 1201 Connecticut Ave NW, Suite 30 in Washington, DC. This seemed logical as the day-to-day activities, including interactions with members of legislative bodies in the United States government, required face-to-face meetings in the nation’s capital. However, recently the spaces where they conduct their activities have become virtual operations (even prior to COVID-19), as many internal and membership meetings, working groups, and events are held online due to the diversity of location and geography of SPARC NA members.

⁴² Events. Retrieved March 2020 from <https://sparcopen.org/past-events>

Table 5.4 SPARC NA Communication Forums Examples

Forum	Occurrence	Space/Location	Interactors
OpenCon	Every year from 2014-2019 From 2019 onward moved to regional OpenCon (eg. OpenCon Colorado, OpenCon NY)	Global meeting location	SPARC and ~ 200 attendees selected globally to meet face to face for 2 days
OpenCon Monthly Calls	Monthly	Online meeting platform and Google documents	SPARC and OpenCon alumni
Working Groups and Communities of Practice	Monthly	Online meeting platform and Google documents	SPARC Members and non-members focused on Journals
Face to Face meetings	At (non-SPARC) association meetings and conferences	Parallels conferences usually meet at conference venue	SPARC Members only
Email	As deemed necessary by SPARC leadership, highlight news, updates	Online email listserv	SPARC Members
Newsletters	Monthly	Via SPARC Member listserv /email	SPARC Members

Source: Table created by Jennifer Beamer 2020.

Heather Joseph stated in a May 2020 Member newsletter: “We have chosen to support a team working from wherever they live and opting for flexible co-working spaces instead of leasing expensive D.C. offices. Meaning that SPARC NA is agile and responds to the changing open landscape to best serve their members.” (November 7, 2020; Heather Joseph, personal communication).

According to Heather Joseph, SPARC NA staff and its operations are to some extent reliant on financial transactions funded by membership fees, therefore the SPARC NA staff feels fiscally accountable to its members. For example, this fiscal responsibility is articulated back to

the membership, in a recent member newsletter. Further, Heather Joseph stated in the same Monthly Member Update email:

“In 2016, we eliminated the overhead and travel burden of SPARC’s annual meeting in favor of meeting our members where they live and where they work. We’ve increased our team’s regular campus visits and actively support local and regional community events to make sure that more of those in our member libraries who want to participate have more equitable opportunities to do so. We’ve also upped our online game, adding regular just-in-time programs on everything from preparing for “Big Deal” negotiations to running a one-person scholarly communications office to developing campus open access policies.” (November 2019, SPARC NA Monthly Member Update email).

At the start of the SPARC NA organization in 1998, some fiscal arrangements were tied to the Association of Research Libraries (ARL). However, over the years, both organizations expanded their policy advocacy programs. Therefore in 2014, ARL and SPARC NA⁴³ announced:

As our advocacy successes have accumulated, so have our opportunities for policy engagement, and we have found ourselves at a crossroads. SPARC currently operates as a “restricted budget” within ARL, and thus SPARC NA’s lobbying activities are added to those of ARL’s for reporting purposes and, cumulatively, we are at the point where the volume of joint lobbying activities are coming close to the allowable limit for nonprofit organizations of our size.

In 2014, SPARC NA signed an arrangement with New Venture Fund (NVF), which is a fiscal sponsorship organization located in Washington, D.C. The NVF is a nonprofit organization that houses projects for people or groups who want to engage in charitable activities.

Staffing and Expertise. As mentioned in section 5.3.1.1, SPARC NA staff are people who move forward the mission and facilitate the activities of the program areas. At the time of this research, the organization had twelve formal staff listed on its website. Each staff member is responsible for an area of oversight in the program plan. There is little or no hierarchy in terms of upper, middle, or lower management. The positions are each responsible for the whole of the

⁴³ SPARC Enters Administrative Agreement with New Venture Fund. Retrieved August 2020 from. <https://www.arl.org/news/spar-enters-administrative-agreement-with-new-venture-fund/>

work. This is assisted in some cases by SPARC NA membership and SPARC NA working groups, which as a community are sometimes the source of labor for the “actions” that take place. There appear to be advantages to this model, as it means that membership can advise on directions for SPARC NA, and as Heather Joseph suggests, it means that SPARC NA staff can “review programming priorities and shift supporting resources quickly as the need arises” (personal communication, October 15, 2019).

SPARC NA staff expertise is also resource flow as it relates to information infrastructure. Staff in the SPARC NA organization are highly focused on taking a leadership role in advancing policy. SPARC NA staff describe themselves as the leaders in open access advocacy. Many of the SPARC NA staff interviewed reported having prior expertise and experiences working in higher education as faculty, administration, and the library, with government agencies and/or advocacy, the publishing industry, and market analysis.

The expertise accumulated among the SPARC NA staff is used any given day for educating key policymakers in the U.S. Congress, U.S. Executive Branch/Administration, Canadian Administration/Parliament, state and provincial governments, and global public and private funders regarding their policy priorities. This expertise is perhaps SPARC NA unique resource flow. Focusing on several of staff, Heather, Nick, Nicole, and Joe all have had varied and deep experiences in the publishing industry, as lobbyists, and as participants in public interest research groups. That is why were selected to work for SPARC NA and are passionate when they talk about the work they do related to policy and education (Nick Shockey, personal communication, November 7, 2019; Heather Joseph, personal communication, October 15, 2019; Nicole Allen, personal communication, November 6, 2019; Joe McArthur, Personal Communication, September 20, 2019).

Some SPARC NA staff have been doing this kind of work for most of their professional lives. For example, as students they undertook campaigns to lobby for change, usually intersecting at some point with the key policymakers in the U.S. Congress and the U.S. Executive Branch/Administration. Nicole Allen, the Director of Open Education for SPARC, began her lobbying work as an undergraduate student. In 2006, she worked with the Student Public Interest Research Groups (PIRGs). Nicole stated that “I worked with students across the United States to organize a grassroots campaign on higher education affordability and related issues (personal communication, November 6, 2019). According to the SPARC NA website, Nicole was able to “organize more than 3,000 professors to sign a statement endorsing the idea of open educational resources.” In addition, Nicole “led a cross-country van tour that mobilized more than 10,000 students in support of open textbooks.”⁴⁴

5.3.1.7 H7 System Architectural Choice Points

STIN step seven occurs after identifying the major socio-technical characteristics of the SPARC NA case and determining all the interactors (Kling et al., 2003). Step seven is used to identify the major systems’ architectural design choice points. According to Kling et al. (2003), “a choice point refers to a technological feature or social arrangement in which the designer can select alternatives” (p. 58). As Kling et al. (2003) suggest, choice points will differ depending on the nature and architecture of the forum/case. These technical and social choices are listed in Table 5.5 and an explanation of some of the points is provided as narrative.

Choice Point 1. 1997: Librarians organize for collective action leads to the Formation of SPARC NA Organization. Historically,⁴⁵ the first choice point was the founding

⁴⁴ SPARC Staff Nicole Allen. Retrieved May 2019 from <https://sparcopen.org/people/nicole-allen/>

⁴⁵ While conducting this research I was unable to find a written history of SPARC NA that may have helped with “choice points”. Heather Joseph stated while being interviewed that a “comprehensive and

of the SPARC NA organization. Originally conceived in the spring of 1997 as “a project of ARL”, SPARC NA was founded at a meeting of the Association of Research Libraries, with “the original mission of meeting as a group of librarians to start a discussion about collective action and the formation of a group, with the goal of reducing the barriers to the access and use of academic information”⁴⁶ (Association of Research Libraries, 2002). When SPARC NA was formed in 1998, the goal of the organization was to organize to retain and regain control of scholarship as seen from the viewpoint of libraries. For example, helping libraries not pay so much for serials to publishers, when faculty could make scholarly journals individually available at no charge via green open access. This involved educating the stakeholders at universities, including administrators, librarians, faculty, and students.

Choice Point 2. 2000s: SPARC NA focused on Education and Legislative Action.

Although libraries were still a major focus, the goals of SPARC NA broadened over time to include more stakeholders in the system of scholarly communication assisting in the goal of making research open. This included lobbying and educating the legislative branch of the United States Government. SPARC NA began influencing policy around open access to research and funder mandates, culminating in 2013 when then-President Obama issued an Executive Directive on Public Access. The directive “requires U.S. Government agencies with annual extramural research and development expenditures over \$100 million make the results of taxpayer-funded research—both articles and data—be made freely available to the general public with the goal of

well-documented history of the organization would be welcomed, as she knows of none” (personal communication, October 15, 2019)

⁴⁶ Case, M. M. (2009). Scholarly Communication: ARL as a catalyst for change. *portal: Libraries and the Academy*, 9(3), 381-395.

accelerating scientific discovery and fueling innovation.”⁴⁷ SPARC NA has continued to take a leadership role in education and legislation into present day.

Table 5.5 SPARC NA Choice Points

Choice point	Technical/Social	Reasoning
1. Librarians gathering formation of SPARC NA Organization 1997	Social	1990s in light of “serials crisis”, parties from academic libraries meet at ARL meeting to propose collective action against publishers
2. Focused Education and Lobby for Policy and Legislation 2000	Social	SPARC NA develops strategies for education, begins working to lobby American legislators for Open Access Policies around research
3. Change in SPARC NA operations model 2014-2016	Technical	SPARC NA, reconfigures its spaces, funding and operations, to be more flexible and less tied to one location.
4. Securing community-controlled infrastructure 2017	Social	SPARC NA shifts focus after a major publisher buys a long open access platform. SPARC NA commits to education, documentation, and working groups that focus on the development of community-owned infrastructure, they use this opportunity for positive community action.

Source: Table created by Jennifer Beamer 2020

Choice Point 3. Change in SPARC NA Resource Flows. The third choice point occurs from 2014 to 2016, when according to Heather Joseph, SPARC NA reconfigured some of the ways that it used its resource flows. In 2014, SPARC NA still operated under a “restricted

⁴⁷ Executive Directive on Public Access SPARC NA. Retrieved January 2021 from <https://sparcopen.org/our-work/2013-executive-directive/>

budget” program area of the association of research Libraries (ARL).⁴⁸ As a result, SPARC NA pursued an agreement with the New Venture Fund (NVF), a “type of fiscal sponsorship serves as the administrative host of projects so that projects don’t have to go to the trouble and expense of establishing themselves as independent nonprofit organizations”.⁴⁹

Additionally, the nature of SPARC NA meetings and office pace changed. SPARC NA now allowed staff to work from where they live, and SPARC NA came to the meetings where others already were (for example, at related conferences). Also, SPARC NA leveraged the use of their website to begin sharing large projects and policies, making them available to non-members, as they have worked to connect with anyone interested in the open access community rather than to only engage with paying members (H. Joseph, personal communication, October 15, 2019).

Choice Point 4. Securing Community-Controlled Infrastructure. In the Fall of 2017, another choice point changed the direction and program plans quickly. SPARC NA began redefining parameters for commercial arrangements and discussing how its members and the open community could acquire its own open infrastructure. The turning point was when “bepress”, an open repository platform developed by a group of faculty members at UC Berkley in the 1990s, had been purchased by Elsevier, sending a “shockwave” through the SPARC membership (H. Joseph, personal communication, October 15, 2019).

SPARC NA staff say they pivoted very quickly to be better positioned to “understand who the players in market environment and the strategy at play are”. SPARC NA’s Nick Shockey told me that after the Elsevier acquisition, SPARC NA listened to the member

⁴⁸ Positive Changes SPARC’s Operations Structure, Retrieved Jan 2020, from www.sparc.arl.org/news/positive-changes-sparcs-operating-structure

community and noticed that their members and the open community had a tendency to think about infrastructure in two ways; one group believed that “together they should build their own platform to compete with the commercial players”, while the other group suggested that “we should all just boycott use of commercial platforms and only invest in working with ‘academy friendly’ players”. SPARC NA believed these were both valid answers, but the path to building shared repositories is complex and there are not presently resources to address the challenges we face in the infrastructure space” (Nick Shockey, personal communication, November 7, 2019).

This may be because open access repositories in North America are not centralized, rather localized at individual institutions. While SPARC NA offered education and policy assistance, they had not been in the business of suggesting that the community begin thinking about building infrastructure together. Most of the attention on open access was on the visible problem of “gaining access” and “providing education on breaking down barriers created by paywalls and licensing restrictions” (Heather Joseph, personal communication, October 15, 2019).

The 2017 SPARC NA choice point has changed the role of SPARC NA somewhat, adding to its already full plate of education and policy, committing to enabling conversations with its’ members and the community. This strategy may lead to the development of community-owned infrastructure as a priority. Thus, SPARC NA developed a new vision for the future of scholarly communication, the principles associated with that vision, and action to ensure that research communications is a community supported and owned enterprise (Nick Shockey, personal communication, November 7, 2019).

5.3.1.8 H8 Viable configurations and trade-offs in support of IRs

Step eight considers the socio-technical information, together with the architectural choice point information, and attempts to map them to each other. This according to Kling et al. (2003). This step assists in describing viable configurations and trade-offs. Although it was not possible for the researcher to understand all the configurations of this system for purposes of this dissertation, I did examine the data collected to look for mentions of alternatives, and also asked several interview questions that might provide data on the perceived choices of the SPARC NA staff, which would suggest their past choices may have resulted in additional or alternative outcomes. This was fruitful in that I was able to understand some of the future hopes and values beyond the present system.

To that end, I asked numerous SPARC NA staff members, “What alternative choice could SPARC NA have made, and can you envision an alternative to what SPARC NA does now”? I received several answers. The first themes of their answers focused on the alternative of having a national open access policy. Several members noted that if there was such a policy, the SPARC NA organization would have a different approach to the way in which they do things—namely a national open access policy that would mean SPARC NA would be able to advocate for a national repository, fulfilling their wish for one infrastructure that would not be owned by publishers or driven by profit motives.

The second question was, “Looking back, what would you do differently?” Heather Joseph suggested that she would have focused on two things earlier in SPARC NA’s trajectory. The first would have been building a community owned infrastructure: “We should have been building our own repository or purchased one many years ago” (personal communication, October 15, 2019). Nick Shockey emphasized this point, noting that that “community could have

been being built around such an infrastructure earlier on, rather than build something now, based on a reaction to a buyout” (personal communication, November 7, 2019).

Then configurations changed. During the writing up of this research in Spring 2020, and after interviews with SPARC NA had resumed, The White House began considering a national open access policy. Together with the Office of Science and Technology Policy (OSTP), there was a series of stakeholder meetings and a Request for Information (RFI) process that closed in May of 2020. SPARC NA posted information about the policy on their website.⁵⁰ The Standard and Alternative models for SPARC NA are presented in Table 5.6.

Table 5.6 The Standard and Alternative models for SPARC NA

Standard Model	Alternative Model – Aspirational
Education and Legislation	National OA policy
Membership Model	Building Community through infrastructure

Source: Table created by Jennifer Beamer 2020

Next, I focus on the SPARC JP organization.

5.3.2 STIN Case Two: SPARC JP

5.3.2.1 HI System Interactors

STIN Step one is about identifying a relevant population of system interactors (Kling et al., 2003). The main questions for this step include in what ways and roles the interactor would participate in the system, and what proportion of time the interactor would spend in the system (p. 55).

Purpose and mission. SPARC Japan (SPARC JP) is known as the International Scholarly Communication Initiative (also titled on their website “The Committee for the

⁵⁰ National Open Access Policy Retrieved June 30, 2020, from, <https://sparcopen.org/our-work/us-national-open-access-policy/>

Promotion of Scholarly Communication.”⁵¹ According to their website, their mission is within “the academic community in Japan to promote open access, to encourage further distribution of scholarly information and academic resources, and to strengthen ability for dissemination of information, cooperating with domestic and international OA initiatives and organizations on the matters concerned.”⁵²

In 2003, activities around open access education and exploring infrastructure began with The International Scholarly Communication Initiative (SPARC JP) as a “project of the National Institute of Informatics (NII)”.⁵³ However, in 2017 SPARC JP began being referred to as “The Committee for the Promotion of the Scholarly Communication”. SPARC JP is part of the larger mission of NII, which is to focus on two pillars: 1) “be engaged in research and education” and 2) “project operation”. Further, as explained by the staff of the Cyber Science Infrastructure Development Department, their mission involves “research and education [that] is focused on advancing and integrating research and development in the field of informatics, and then the aim of its project operations in general is to promote the Cyber Science Infrastructure for dissemination of academic information.”⁵⁴

The NII, known as an inter-university research institute in its past iteration, had supported the promotion of scientific research at universities. Presently, the role of NII is the development, improvement, and operation of “state-of-the-art infrastructure for scholarly communication in order to facilitate the shared use of equipment and science materials that are useful in the

⁵¹ SPARC JP About (English Website) Retrieved December 2020, from, <https://www.nii.ac.jp/sparc/en/about/>

⁵² SPARC JP About Us (English Website) Retrieved December 2020, from www.nii.ac.jp/sparc/en/about

⁵³ SPARC JP About Us, Overview. Retrieved December 2020 www.nii.ac.jp/sparc/en/about/

⁵⁴ NII About. Retrieved May 2019 from <https://www.nii.ac.jp/en/about/>

educational and research activities of all the national, public, and private universities.”⁵⁵ In cooperation with university libraries, NII implements programs related to scholarly communication, including publications and IRs.

The SPARC JP organization is situated in and operates as part of the larger NII organization by way of the Cyber Science Infrastructure Development Department. SPARC JP (though not listed), according to Akira Niitsuma, the Chief of the Research Products Team, is part of the Scholarly and Academic Information Division of the Cyber Science Infrastructure Development Department at the NII (personal communication, May 23, 2019). The organizational chart with the place where SPARC JP staff are located is in Figure 5.2.

According to the NII website, the Cyber Science Infrastructure Development Department is responsible for many services aimed at the entire academic community, e.g., Science Information NETWORK (SINET), Catalog Information Service (NACSIS-CAT/ILL), the Institutional Repositories Program (IRP), and the Academic Access Management Federation (GakuNin).⁵⁶

The Cyber Science Infrastructure Development Department is also responsible for other technical academic infrastructure.⁵⁷ According to NII, some examples of the other infrastructure services that NII provides services for are shown in Table 5.7:⁵⁸

⁵⁵ Science Information Infrastructure Working Group Research Environment Infrastructure Group Report” Infrastructure Development for Strengthening the Capacity of International Scholarly Communication” July 2012

⁵⁶ NII Promoting the Cyber Science Infrastructure Retrieved April 2019 from <https://www.nii.ac.jp/en/service/general/>

⁵⁷ NII Promoting the Cyber Science Infrastructure Retrieved April 2019 from <https://www.nii.ac.jp/en/service/general/>

⁵⁸ NII Promoting the Cyber Science Infrastructure Retrieved April 2019 from <https://www.nii.ac.jp/en/service/general/>

According to the SPARC JP 2014 Annual Report,⁵⁹ the main staff of SPARC JP are the employees who work in the Scholarly and Academic Information Division and the Cyber Science Infrastructure Development Department. They set the agenda for education, strategy, programming, activities, and events related to open access and the repository program.⁶⁰ The employees that I met with for formal interviews for this research, and who provided me with several reports, let me observe activities were all assigned at the time to the Scholarly and Academic Information Division under the Cyber Science Infrastructure Development Department.

The individual SPARC JP staff are not listed on the *International Scholarly Communication Initiative* (SPARC JP) website. Instead, they offer only one main generic contact for more information. However, the research faculty of the NII are listed on the main NII website.⁶¹ I hypothesize that this is most likely due to a practice in Japanese government in which uses the process of “job rotation” within the SPARC JP organization, i.e., the transfer of employees regularly to different departments every two or three years. For instance, after being initially assigned to a department, an employee could be transferred to an entirely different department, and then to an unrelated department after that. This had occurred when I made contact initially with SPARC JP for my pilot fieldwork, and then returned two years later conduct interviews I found that different employees were in the positions.

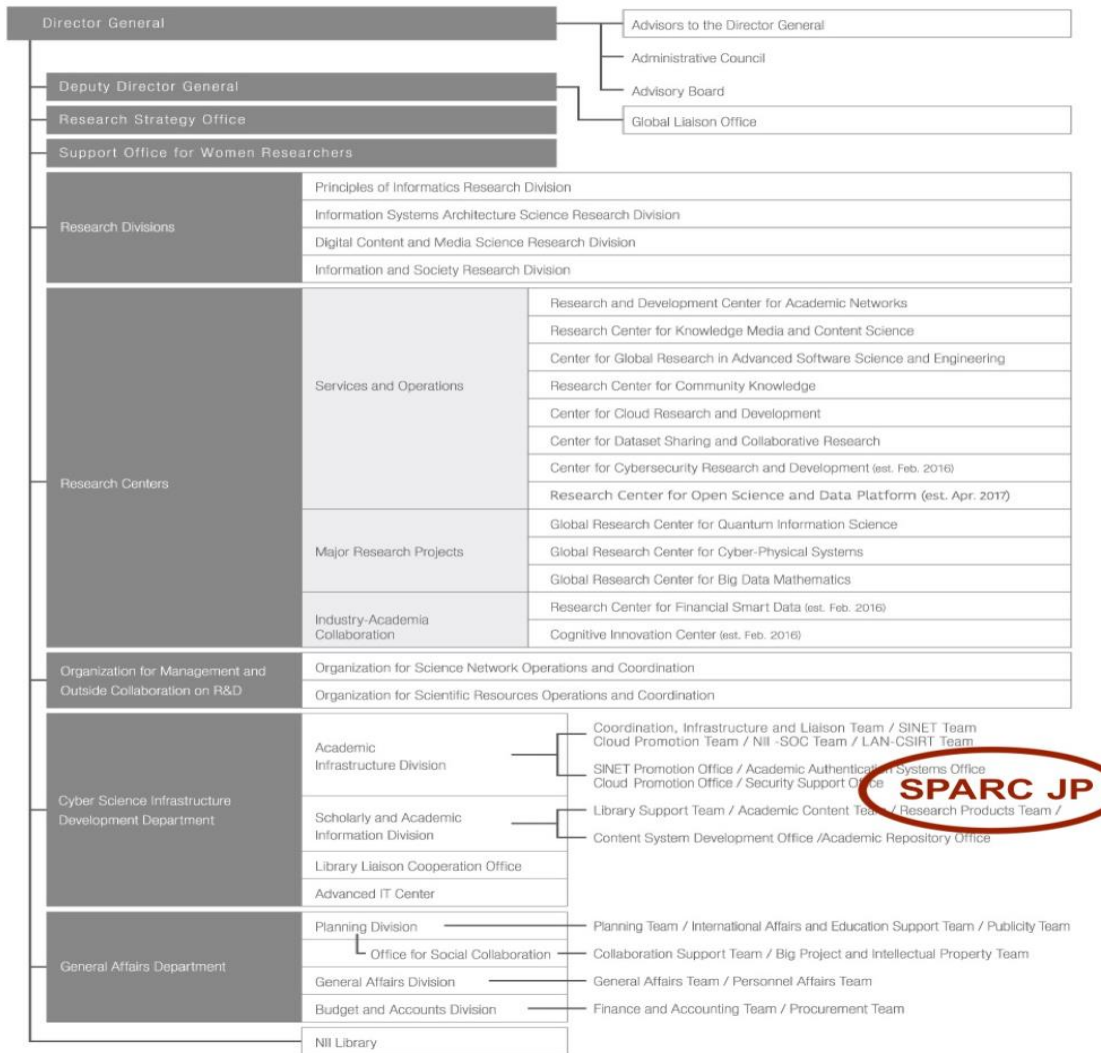
⁵⁹ SPARC JP 2014 Annual Report Retrieved April 2019, from https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2014-E.pdf

⁶⁰ SPARC Japan Publishing Partners Brochure. Retrieved April 2019 from https://www.nii.ac.jp/sparc/publications/brochures/partners/e10_SparcJapanPartners.pdf

⁶¹ Directory of faculty and Staff, NII, retrieved October 2020, from, <https://www.nii.ac.jp/en/faculty/list/project-profs/>

Figure 5.2 NII Organization with SPARC JP indicated

Organization



Source: Organizational Chart provided during personal interview with Akira Niitsuma, personal communication, May 23, 2019.

Table 5.7 NII Other Examples of Technical Services that the NII Provides

CiNii (NII Scholarly and Academic Information Navigator)

Displays of citation references information on treatises and links to full text.

KAKEN (Database of Grants-in-Aid for Scientific Research)☐

Provides a brief overview on themes (themes when initially adopted) and results (e.g., reports and reviews) of the research themes funded by grants-in-aid for scientific research from the Ministry of Education, Culture, Sports, Science and Technology and the Japan Society for the Promotion of Science.

NII-DBR (Academic Research Database Repository)

Search of specialized databases created by Japanese societies and research groups

JAIRO Cloud

A service providing cross-search of Institutional Repositories which makes it possible to discover educational and research outcomes (journal articles, theses or dissertations, departmental bulletin papers, research papers, etc.) disseminated from universities and academic institutions in Japan. * JAIRO's content search service (not its repository service) ended in March 2019. IRDB -Institutional Repositories Database took over and began in April 3rd

NII-REO (NII Repository of Electronic Journal and Online Publications)

Search of journal articles across the publishers.

SINET4

The Science Information Network (SINET) is an information communication network connecting universities and research institutions throughout Japan via nationwide nodes. SINET4 plays an important role as the core component of the Cyber Science Infrastructure (CSI) as the successor of SINET and Super SINET.

NACSIS-CAT/ILL

The Catalog Information Service supports operations at institutions such as university libraries, offering Online Shared Cataloging System (NACSIS-CAT) and the Interlibrary Loan System (NACSIS-ILL).

NII Institutional Repositories Program (IRP)

Universities and NII jointly work for various scholarly contents to realize the next generation scholarly content infrastructure. Institutional repositories are to serve for acquiring, organizing, preserving, and disseminating such scholarly information. They are a set of services by academic institutions for their academic communities to manage and publish digital contents they create.

International Scholarly Communication Initiative (SPARC NA)

SPARC JP is a project to strengthen the electronic journals of the scholarly publications of Japan's academic societies.

Table 5.7 NII Other Technical Services that the NII Provides (continued)

Support Project for Research Bulletin Dissemination (Japanese)

NII conducts a joint project for constructing metadata database of academic information resources which are provided by universities and research institutes in Japan on the Internet. National Institute of Informatics Electronic Library (in Japanese only)
An information service that allows researchers to store the pages of academic journals published by academic societies as image data as they are and search them together with bibliographic information.

National Institute of Informatics Education and Training Project

The National Institute of Informatics develops human resources who support Japan's academic information infrastructure at universities, etc.

Source: NII Services "Promoting the Promoting the Cyber Science Infrastructure" Retrieved May 2019 from, <https://www.nii.ac.jp/en/service/general/>

According to the SPARC JP Annual Report in 2014,⁶² SPARC JP was initially formed via a series of meetings starting in August of 2002 at the Japan Association of National University Libraries (ANUL, as of 2002) at the University of Tokyo Library. A series of preparatory meetings from 2002 to 2003 officially established SPARC JP. The meetings were held to discuss the formation of SPARC JP, as the NII sought assistance in developing a business model for Japanese electronic journals. These journals were to be supported by SPARC JP, who would promote the use and sales of the journals to Japanese universities and university libraries. ANUL at the time agreed with this arrangement.⁶³

⁶² SPARC JP 2014 Annual Report Retrieved April 2019, from https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2014-E.pdf

⁶³ FY2002 Activity Report of the SPARC/ISCA Project Team Retrieved November 2020, https://www.janul.jp/e/projects/isc/sparc/report_FY2002.html

According to the SPARC JP Annual Report 2002⁶⁴ a number of topics at the meetings were discussed with various interested stakeholders, focusing on how to establish the SPARC JP project under the NII. Some of the topics included:

- “the budget of a hundred million yen for the SPARC JP operation”
- “the organization system to carry out the operation, the concrete activities, the schedule, etc. “
- “the members of the Taskforce on Electronic Journals and SPARC/ISCA Project Team”
- “the on-site license models for electronic journals”⁶⁵

The first SPARC JP Board meeting was held on June 25, 2003, at the newly established NII organization and building (referred to as exploratory meetings in the report).⁶⁶ Then on July 2, 2003, SPARC JP was introduced as a project of the NII, at the Japan Education Center.⁶⁷ The meeting was hosted by the NII.⁶⁸ According to the 2002 report, there were 153 people from 128 organizations. There was a second meeting on August 19, 2003 at Tohoku University, again hosted by NII and the Tohoku University Library where 52 people attended the meeting.⁶⁹ It was explained that the main activities of SPARC JP in 2003 at the time would be;⁷⁰

- 1) “make a leaflet for advocacy of SPARC JP, as a Japanese version of the “Create Change”

⁶⁴ SPARC JP 2014 Annual Report Retrieved November 2019, from https://www.janul.jp/e/projects/isc/sparc/report_FY2002.html

⁶⁵ SPARC JP 2002 Annual Report Retrieved November 2019, from https://www.janul.jp/e/projects/isc/sparc/report_FY2002.html

⁶⁶ FY2002 Activity Report of the SPARC/ISCA Project Team Retrieved November 2020, https://www.janul.jp/e/projects/isc/sparc/report_FY2002.html

⁶⁷ FY2002 Activity Report of the SPARC/ISCA Project Team Retrieved November 2020, https://www.janul.jp/e/projects/isc/sparc/report_FY2002.html

⁶⁸ FY2002 Activity Report of the SPARC/ISCA Project Team Retrieved November 2020, https://www.janul.jp/e/projects/isc/sparc/report_FY2002.html

⁶⁹ FY2002 Activity Report of the SPARC/ISCA Project Team Retrieved November 2020, https://www.janul.jp/e/projects/isc/sparc/report_FY2002.html

⁷⁰ SPARC JP 2014 Annual Report Retrieved November 2019, from https://www.janul.jp/e/projects/isc/sparc/report_FY2002.html

- 2) take a survey of the subscription state of the scholarly journals supported by SPARC JP and SPARC in Europe and the United States, and
- 3) carry out advocacy activities at the start of SPARC JP organization which included several forums, explanatory meetings and seminars”.⁷¹

In November of 2003, the SPARC JP project held a forum, explanatory meetings, and seminars under the joint auspices of the Japan Association of National University Libraries Consortium (JANUL) at Tohoku University in cooperation with NII.⁷²

Present-day SPARC JP has many system actors who guide their work and activities. First and foremost is the staff of the NII. As previously mentioned, SPARC JP is part of the Scholarly and Academic Information Division under the Cyber Science Infrastructure Development Department. Another system actor is the Governing Board. The board members are comprised of several NII staff as well as faculty, administrators, librarians, and researchers from universities in Japan.⁷³ SPARC JP staff stated that the board offers advice on yearly program plans, goals and objectives, as well as on the focus and planning of the SPARC JP activities and seminars for each yearly cycle.

Third, SPARC JP staff mentioned a large partner and system interactor is Japan’s academic societies and other e-journal organizations, known as the “SPARC JP Publishing Partners” (Akira Niitsuma, personal communication, May 23, 2019). The SPARC JP website explains that they work closely with publishing partners as they believe that this is the way to disseminate widely research results from Japan to the international community.⁷⁴ In my

⁷¹ FY2002 Activity Report of the SPARC/ISCA Project Team Retrieved November 2020, https://www.janul.jp/e/projects/isc/sparc/report_FY2002.html

⁷² FY2002 Activity Report of the SPARC/ISCA Project Team Retrieved November 2020, https://www.janul.jp/e/projects/isc/sparc/report_FY2002.html

⁷³ SPARC JP 2014. Annual Report Retrieved November 2019, from https://www.janul.jp/e/projects/isc/sparc/report_FY2002.html

⁷⁴ SPARC JP About, Retrieved April 2019 from, <https://www.nii.ac.jp/sparc/en/about/>

observations of SPARC JP activities, the SPARC JP staff mentioned that they have played a large role in strengthening the capacity of scholarly communications in Japan (personal observation at the Japan Open Science Summit, May 26, 2019).

As described above, the perceived main system interactors have been presented. In the next section these institutions identified as core interactors will be elaborated on, as SPARC JP has shared tasks in the implementation of their programs for the digitization of important journals. For example, the Japan Society for the Promotion of Science (JSPS) implements grant programs through “Grants-in-Aid for Publication of Scientific Research Results”, and the Japan Science and Technology Agency (JST) provides a platform for the digital distribution of journals through “J-STAGE” (Japan Science and Technology Information Aggregator, Electronic Database).⁷⁵

5.3.2.2 H2 Core Interactor Groups

STIN Step two involves taking the system interactors from step one and grouping the organization together with respect to their roles with other groups in the system. Kling et al. (2003) state that roles of the system interactors and core groups may overlap (p. 55). There are many core groups that interact and intersect with SPARC JP.

The Scholarly and Academic Information Division of the Cyber Science Infrastructure Development Department staff elaborated on these relationships during interviews, and the activities of many of these partners are mentioned throughout the documents, reports, and on the

⁷⁵ J-STAGE is a system established and operated by the Japan Science and Technology Agency (JST) for the purpose of supporting the publication of and access to electronic journals published by academic societies. Starting in fiscal 1999, JST has made available a system necessary for the publication of electronic journals in an effort to support academic societies’ information dissemination functions. Academic societies can use the system to publish journals. MEXT – JSTAGE, Retrieved May 2019, from, https://www.mext.go.jp/component/b_menu/shingi/toushin/___icsFiles/afieldfile/2012/10/25/1323890_4_2.pdf

SPARC JP Website. Many of the core interactor groups have changed names throughout the almost 20 years since the formation of SPARC JP, and the interactions and relationships at times overlap, making it difficult to tell the extent of SPARC JP interactions. The main groups that directly interact and are presently connected with SPARC JP are as follows.

Direct group interactors⁷⁶ (or as Kling et al. [2003] would call them, resource-dependency or direct relationships) are a “project of NII”. They work together in an overlapping capacity to plan and/or promote activities related to IRs. These are:

- The Japan Consortium for Open Access Repository
- The JAIRO Cloud Community
- Japan Alliance of University Library Consortia for E-Resources (JUSTICE)
- NII Open Science Infrastructure Research Center (RCOS)
- 774 Universities in Japan

Direct group interactors (Kling et al. (2003) would call these accounts-taking, or direct relationships) influence the work of SPARC JP and the NII, through government policies and/or governmental arrangements. These are:

- The Council for Science, Technology, and Innovation (CSTI)
- The Ministry of Education, Culture, Sports, Science and Technology (MEXT)
- The Japan Science and Technology Agency (JST)
- The Japan Society for the Promotion of Science (JSPS)

A brief description of each core interactor and their relationship with SPARC NA follows:

5.3.2.2.1 SPARC JP Direct Interactor Groups

I define a direct interactor group as a group that has been established or is presented as a “project of the NII”, i.e., they work together in a close capacity to plan and/or promote activities

⁷⁶ Note: I use “direct” and “indirect” to organize the group interactors for the purpose of this research. However, they are not terms used by Kling et al. in STIN analysis. This will be discussed further in Chapter 6 discussion and analysis.

related to IRs. All the Direct group interactors have similar organizational structures to one another (which will be further explained in section 5.4.2.3 Cultural Cognitive Pillar)

The Japan Consortium for Open Access Repository and The JAIRO Cloud Community (JPCOAR)

The Japan Consortium for Open Access Repository (JPCOAR) was formed in July 2016 from the Institutional Repository Promotion Committee (2013). *SPARC JP appears at times to be deeply connected with JPCOAR, as SPARC JP directly supports its activities. JPCOAR is focused on hosting activities that promote open access, identifying the issues around open access, and continuing the advocacy activities of the Institutional Repository Promotion Committee, which included “enhancing a sense of participation of librarians and researchers for encouragement of distribution of scholarly information and academic resources.”⁷⁷ The JPCOAR board describes itself *as a* nationwide community in Japan⁷⁸ whose mission is to:

1. Accelerate Open Science and Scholarly Communication
2. Co-operate with JAIRO Cloud (nationwide institutional repository platform)
3. Increase and Enrich IR content (e.g., journal articles, research data...)
4. Plan and Conduct Training Courses, and
5. Collaborate with International Efforts with 586 member institutions (as of March 2019).⁷⁹

During the fieldwork (and collecting data during the interviews) for this research, it was disclosed that JPCOAR was comprised of multiple working groups and task forces, which I learned change over time as activities change in importance, and as various working groups and

⁷⁷ Translated from Japanese: Overview of the Open Access Repository Promotion Association. Retrieved March 2019 from <https://jpcoar.repo.nii.ac.jp/>

⁷⁸ Translated from Japanese: Overview of the Open Access Repository Promotion Association. Retrieved March 2019 from <https://jpcoar.repo.nii.ac.jp/>

⁷⁹ Translated from Japanese: Overview of the Open Access Repository Promotion Association. Retrieved March 2019 from <https://jpcoar.repo.nii.ac.jp/>

task forces complete their assigned work.⁸⁰ A running list of the past and present working groups and task forces can be found at the JPCOAR website under 作業部会・タスクフォースの活動. (Note: The JPCOAR website is in Japanese only.)

At the time of the interviews for this research there were three working groups and six task forces. Akira Niitsuma, head of the Cyber Science Infrastructure Development Department, explained the activities of each group during the time of my fieldwork in 2019.

*The JPCOAR Working Groups for 2018-2019 were as follows.*⁸¹

1. JAIRO Cloud Operation Working Group—which focused on the 2019 JAIRO Cloud repository system migration
2. Promotion Working Group—which focused on producing communication via an Online newsletter called CoCOAR that has the latest topics on Open Access, Open Science, IRs aimed at a very broad audience of every stakeholder in Japan
3. Training Working Group—which focused on institutional repository training for beginners.

*The JPCOAR Task Forces for 2018-2019 were as follows.*⁸²

1. Next Generation Metadata Schema Task Force—which created a new JPCOAR Metadata schema to expand the identification of items on the various platforms run by NII for research, as well as focus on interoperability with an established international standard of metadata (for example, with other international organizations like OpenAIRE, DataCite, COAR Resource Type vocabulary)
2. System Interoperability Task Force – responsible for the ways in which JAIRO Cloud “connects” to other NII systems
3. Mid-Long/Term Planning Task Force
4. Open Access Policy Task Force (completed in 2017)
5. Research Data Task Force
6. Society Copyright Polices in Japan Task Force – focused on society journals

The JAIRO Cloud Community

⁸⁰ Translated from Japanese: JPCOAR Organization and operation. Retrieved March 2019 from <https://jpcoar.repo.nii.ac.jp/>

⁸¹ Translated from Japanese: Research Data Working Group Retrieved March 2019 from https://jpcoar.repo.nii.ac.jp/?page_id=124

⁸² Translated from Japanese: Research Data Working Group Retrieved March 2019 from https://jpcoar.repo.nii.ac.jp/?page_id=124

JAIRO is also referred to in documentation and via interviews as the “JAIRO Cloud” or the “JAIRO Cloud Community”. JAIRO is an acronym for Japanese Institutional Repositories Online (Akira Niitsuma, personal communication, May 23, 2019), and members of the JAIRO platform are considered a to be a community (Akira Niitsuma, personal communication, May 23, 2019). JAIRO Cloud is the present-day IR platform/infrastructure that is an iteration of the first repository built prior to 2012, and at that time the community was formerly named the Digital Repository Federation (DRF) which was formed in the year 2006.⁸³

Supported by the NII, the JAIRO Cloud is the technical repository infrastructure called Software as a Service (SaaS) hosted at the NII, and it is essentially software that is provided as a service via a network. The institutions who wish to use it pay a service fee (Akira Niitsuma, personal communication, May 23, 2019). Assessed based on the number of researchers at the organization, the fee is composed of a base membership fee to belong to JPCOAR (between approximately USD 288.00-550.00, based on the size of the institution), and then the members pay a JAIRO Cloud Service Fee for the platform use (between USD 395.00-6440.00 based on the size of their institution). Table 5.8 outlines the fees for JPCOAR, memberships and JAIRO Cloud.

JAIRO Cloud runs on a platform known as WEKO, which is referred to as “Net Commons” based institutional repository software. WEKO is a platform used as the system configuration, and institutions that use JAIRO Cloud can use WEKO to build IRs on the JAIRO Cloud.

⁸³ The Future of Institutional Repositories: Seeking Major Advances in Quantity and Quality NII Institutional Repositories Program Phase 3 Report, March 2014. Retrieved March 2019, from https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2014-E.pdf

Beginning in 2016 when the abovementioned group known as JPCOAR was formed, JAIRO Cloud also became jointly operated by the group the NII, and the operation of community sites and user contact points are promoted by JPCOAR. Figure 5.3 shows the features of JAIRO Cloud, along with other points of interoperability.

The JPCOAR website outlines the “rules for usage, and many of the technical considerations for joining JPCOAR and using the JAIRO Cloud for an institution works.⁸⁴ The number of members and usage of JPCOAR has increased dramatically since its launch in 2016. Figure 5.4 shows the growth in adoption over time as per the NII.

Table 5.8 JAIRO Cloud Fees NII



JAIRO Cloud Fee

Number of organization researchers	JPCOAR membership fee(JPY)*	JAIRO Cloud service fee(JPY including TAX)	Total cost (JPY including TAX)
0 – 100	20,000	43,200	63,200
101-200	20,000	86,400	106,400
201-300	20,000	129,600	149,600
301-400	20,000	172,800	192,800
401-500	20,000	216,000	236,000
501-600	20,000	259,200	279,200
601-700	40,000	302,400	342,400
701-800	40,000	345,600	385,600
801-900	40,000	388,800	428,800
901-1000	40,000	432,000	472,000
1001-1100	40,000	475,200	515,200
1101-1200	60,000	518,400	578,400
1201-1300	60,000	561,600	621,600
1301-1400	60,000	604,800	664,800
1401-1500	60,000	648,000	708,000
1501-	60,000	691,200	751,200

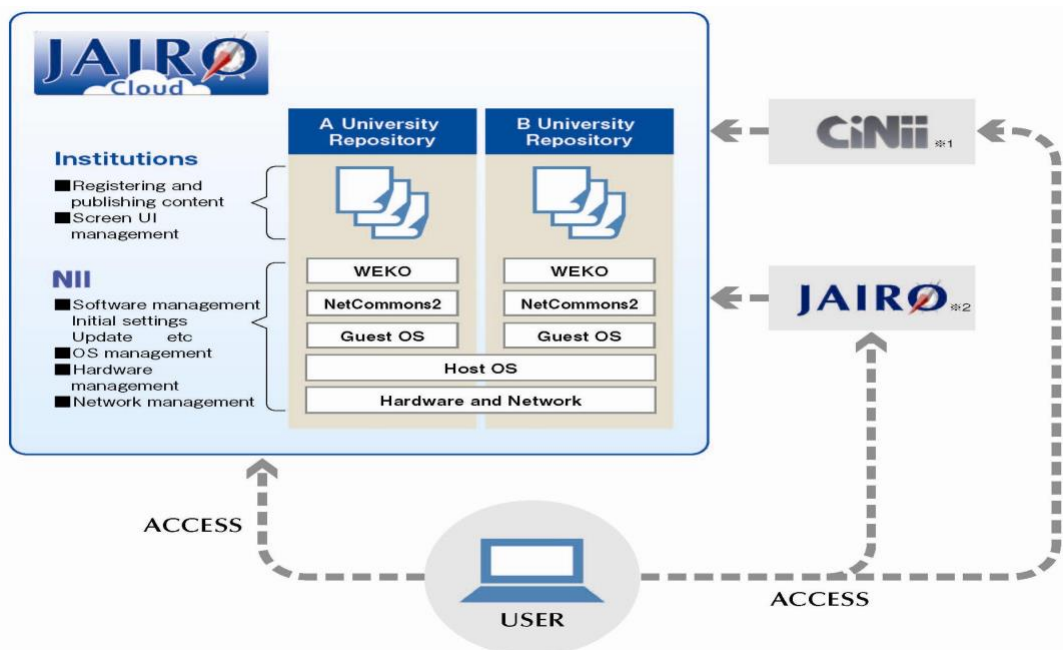
*If an institution requires to use JAIRO Cloud service, the institution should join JPCOAR with paying membership fee.

5

Source: materials provided during personal interview with Akira Niitsuma, personal communication, May 23, 2019.

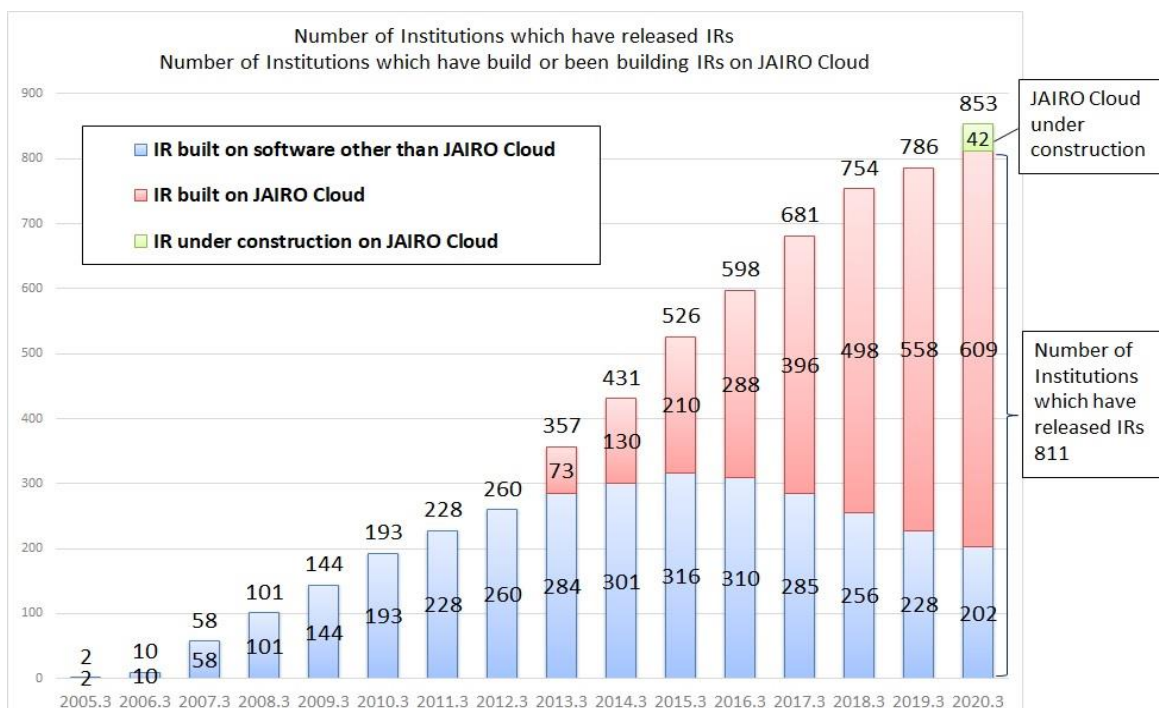
⁸⁴ JPCOAR Rules, Regulations. Retrieved May 2019 from https://jpcoar.repo.nii.ac.jp/?page_id=43

Figure 5.3 JAIRO Cloud Technical Platform



Source: National Institute for Informatics, materials provided during personal interview with Akira Niitsuma, personal communication, May 23, 2019.

Figure 5.4 Growth in Japanese IR Adoption



Source: Provided by Akira Niitsuma, personal communication, May 23, 2019.

Japan Alliance of University Library Consortia for E-Resources (JUSTICE)

Established in April 2011 with the support of the NII, the Japan Alliance of University Library Consortia for E-Resources (JUSTICE) is another Core group interactor with SPARC JP. JUSTICE a consortium established to promote activities and provide consistent and reliable academic information to Japanese universities and their academic libraries. According to the JUSTICE website, their mission is “to enhance the nation’s academic information infrastructure by contracting, managing, providing, and preserving e-resources and by training personnel with necessary skills.”⁸⁵

Presently there are over 500+ participating research and university libraries, making JUSTICE is “the nation’s largest organization of library consortia.”⁸⁶ Additionally, according to the SPARC JP staff, JUSTICE publishes an e-journal that “often includes content and information that SPARC JP assists with, including topics of education on Open Access and Journal Publishing” (Koh Sugawara, personal communication, May 23, 2019). The JUSTICE organization is composed of a steering committee, various working groups, and a secretariat, which is under the control of the Library Liaison Cooperation Office of the NII’s Cyber Science Infrastructure Development Department (notably similar to the SPARC JP Unit).⁸⁷

NII The Research Center for Open Science and Data Platform (RCOS)

RCOS is another core interactor that has ties to SPARC JP and the NII. RCOS was established in 2017 to address technical infrastructure around the sharing and collaborative activities that have become dramatically easier within the context of Open Science.⁸⁸ RCOS is

⁸⁵ About JUSTICE. Retrieved Jan 2020 from https://www.nii.ac.jp/content/justice_en/

⁸⁶ About JUSTICE. Retrieved January 2020 from https://www.nii.ac.jp/content/justice_en/

⁸⁷ Organization JUSTICE. Retrieved January 2020 from https://www.nii.ac.jp/content/justice_en/org/

⁸⁸ About RCOS, Inauguration of the Research Center for Open Science and Data Platform (RCOS). Retrieved May 2020, from <https://rcos.nii.ac.jp/en/news/2017/04/post/>

responsible for developing the academic foundation for managing, publishing, and searching academic papers and research data required by Japan’s Open-Science policies. When I attended the 2019 Japan Open Science Symposium (JOSS) hosted by RCOS and the NII, I learned RCOS used to be called the “Research Data Cloud”, which is a large technical infrastructure composed of other interoperable technical platforms developed and managed by the NII. The Research Data Cloud consists of three platforms: a research data management platform (GakuNin RDM for data), a repository platform (WEKO3, which is run on JAIRO Cloud), and a discovery platform (CiNii Research which is supported by Japan researchers). Figure 5.5 shows the connections of interoperability with the NII existing systems.

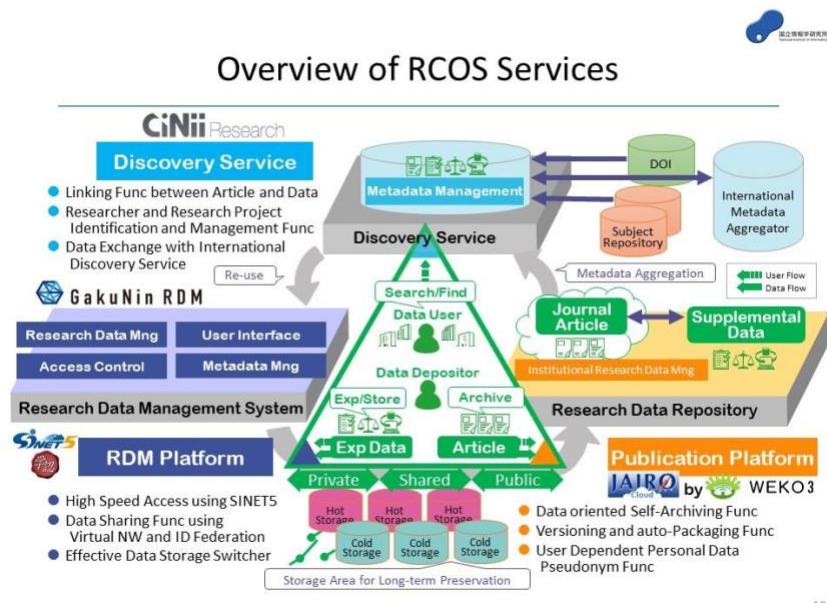
SPARC JP has a relationship with RCOS, as RCOS uses those three infrastructures to educate and serve researchers throughout the different research stages, encouraging them to put their work in the open.

Faculty and Staff at Universities in Japan

Finally, SPARC JP’s many activities are planned by and delivered to its direct interactors at Japan’s 774 universities.⁸⁹ Any Japan university member may participate in the activities of SPARC JP and access the information, education, advocacy, and activities offered on their website; there is no membership requirement and no fees. The SPARC JP website provides access to past programs and videos of past events, reports, surveys, newsletters, in both English and Japanese.

⁸⁹ According to MEXT there are 86 national universities, 83 public universities and a majority of 605 private universities. Retrieved January 2020 from <https://www.mext.go.jp/en/about/relatedsites/title01/detail01/1373673.htm>

Figure 5.5 RCOS Platforms and the interoperability of Open Science with already existing NII infrastructure



Source: Overview of RCOS Services. Retrieved May 2019 from <https://rcos.nii.ac.jp/en/service/>

5.3.2.2.2 SPARC JP Indirect Interactor Groups (account taking)

I define indirect group interactors as those groups that have a direct influence on the work of SPARC JP and the NII, generally via government agencies that through government policies and/or governmental arrangements create an agenda for IRs or Open Access.

The Council for Science, Technology, and Innovation (CSTI)

The Council for Science, Technology, and Innovation (CSTI) is an indirect group interactor. The council was created by the Prime Minister of Japan in collaboration with the Japanese Minister of State for Science and Technology Policy.⁹⁰ CSTI is the government leader for the promotion of science and technology policy in Japan and was set up by former Prime Minister Shinzo Abe in 2001. CSTI is responsible for all of Japan's science and technology

⁹⁰ Cabinet Office Brochure about the Council for Science, Technology and Innovation 2015. Retrieved Jan 2020 from <https://www8.cao.go.jp/cstp/english/panhu/index.html>

policy, and “formulates comprehensive and basic policies and conduct their overall coordination.”⁹¹

CSTI has important control over science, technology, and innovation in Japan. In March 2015, CSTI presented an agenda that intersected directly with the NII, and the programs offered by SPARC JP, when CSTI issued a White Paper on Science and Technology 2015.⁹² Part II of the white paper/plan was titled “Measures Implemented to Promote Science and Technology”. The purpose of the plan was to not only to outline a national policy in the domain of its agenda, but also discuss and provide a plan for “open access to provide access to Japan’s scientific results”. This included “1) defining the ways of mastering the dissemination of scholarly result, 2) exploring the possibility of a more pro-active policy in the domain of scientific article deposit in publication repositories, and 3) experimentation regarding new scientific publishing models based on public platforms”.⁹³

Furthermore, CSTI main activities /responsibilities include producing the Japan Science and Technology Basic Plan (every 5 years), creating policies for the Allocation of Resources of the Science and Technology Budget (annually), and evaluating strategic government-funded Research and Development.⁹⁴ These activities have a direct effect on the Cyber Science Division at the NII.⁹⁵

⁹¹ Cabinet Office Brochure about the Council for Science, Technology and Innovation 2015. Retrieved Jan 2020 from <https://www8.cao.go.jp/cstp/english/panhu/index.html>

⁹² CSTI Japan white paper on Science and Technology Part II: Part II Measures Implemented to Promote Science and Technology. Retrieved September 2020, from, https://www.mext.go.jp/component/english/_icsFiles/afieldfile/2016/02/23/1367533_012.pdf

⁹³ CSTI Japan white paper on Science and Technology Part II: Part II Measures Implemented to Promote Science and Technology. Retrieved September 2020, from, https://www.mext.go.jp/component/english/_icsFiles/afieldfile/2016/02/23/1367533_012.pdf

⁹⁴ CSTI Cabinet Office. Retrieved September 2020 from, http://www8.cao.go.jp/CSTI/english/panhu/p2_roles_of_theCSTI.pdf

⁹⁵ CSTI Cabinet Office. Retrieved September 2020, from, http://www8.cao.go.jp/CSTI/english/panhu/p2_roles_of_theCSTI.pdf

The Ministry of Education, Culture, Sports, Science and Technology (MEXT)

An additional core interactor is the Ministry of Education, Culture, Sports, Science and Technology (MEXT). MEXT is one of eleven ministries in the Japanese Government and is also part of the executive branch of the Government of Japan.⁹⁶ The main role of MEXT is “to progress Japan relative to the international community.”⁹⁷ MEXT is responsible for the funding of research under their jurisdiction, including the funding of the NII. MEXT funds the scientific publication platform, and in particular the work carried out on journal management environments and publication IRs supported by the NII.⁹⁸

Initially, in 2002, MEXT had proposed the use of IRs initially in 2002, in collaboration with a report from a subdivision of CSTI.⁹⁹ While IRs were not specifically mentioned in the report, it was emphasized that “libraries played an important role in supporting and reforming academic information infrastructure, and facilitating access to digital information, particularly in the areas of humanities and social science.”¹⁰⁰ After the 2002 MEXT report, research into IRs soon followed, and in 2004 the NII in collaboration with six universities in Japan began exploring IRs, with the purpose of conducting trials and the eventual introduction and implementation of open access repositories in Japan (Murakami and Adachi, 2006; Murakami et al., 2007). While IR development successfully continued, MEXT in April 2013 revised its theses

⁹⁶ MEXT About. Retrieved July 2020, from, <https://www.mext.go.jp/en/about/mext/index.htm>

⁹⁷ 板東 久美子, 学術における男女共同参画の加速化に向けて, 学術の動向, 2011, 16 卷, 8 号, p. 8_24-8_27, 公開日 2011/12/09, Online ISSN 1884-7080, Print ISSN 1342-3363, https://doi.org/10.5363/tits.16.8_24, https://www.jstage.jst.go.jp/article/tits/16/8/16_8_8_24/_article/-char/ja

⁹⁸ MEXT About. Retrieved July 2020 from, <https://www.mext.go.jp/en/about/mext/index.htm>

⁹⁹ Ministry of Education, Culture, Science and Technology (MEXT). (2002). *Jinbun shakai kagaku no shinko ni tsuite*. Retrieved January 2021 from https://www.mext.go.jp/b_menu/shingi/gijyutu/gijyutu4/toushin/020601.htm

¹⁰⁰ Ministry of Education, Culture, Science and Technology (MEXT). (2002). *Jinbun shakai kagaku no shinko ni tsuite*. Retrieved January 2021 from https://www.mext.go.jp/b_menu/shingi/gijyutu/gijyutu4/toushin/020601.htm

and doctoral degree regulations from “publication in the form of printing” to “publication via the Internet.”¹⁰¹ This was essentially an “open access mandate” for all PhD theses in Japan. The mandate states that all Japan University doctoral dissertations/PhD theses must be deposited in the IR of the PhD-awarding institution in Japan.

The Japan Science and Technology Agency (JST)

The Japan Science and Technology Agency (overseen by CSTI and MEXT) is also an interactor group with SPARC JP. JST is also a government agency with the purpose of building infrastructure that supports knowledge creation and dissemination in Japan.¹⁰² JST was formed in 2003, and at the time it was originally named the Japan Science and Technology Corporation (which is now NII).¹⁰³

JST runs the electronic platform known as J-STAGE, the electronic journal platform for science and technology information in Japan which is capable of “publishing and providing access to the electronic versions of publications featuring academic journal articles released in Japan.”¹⁰⁴ J-STAGE was launched in 1999 through an agreement with two large STEM publishers, Swets and Elsevier, “to disseminate research output efficiently and effectively by encouraging Japanese academic societies to publish their journals electronically”.¹⁰⁵ It is non-profit, and the largest electronic journal platform for academic journals in Japan.¹⁰⁶

¹⁰¹ Ministry of Education, Culture, Sports, Science and Technology: Enforcement of Ministerial Ordinance to Partially Review the Degree Regulations (only in Japanese) retrieved January 2020 from, http://www.mext.go.jp/a_menu/koutou/daigakuin/detail/1331790.htm

¹⁰² JST Overview About Retrieved November 2020 from <https://www.jst.go.jp/EN/about/overview.html>

¹⁰³ JST’s History Retrieved November 2020 from <https://www.jst.go.jp/EN/about/history.html>

¹⁰⁴ J-STAGE Overview. Retrieved November 2020, from <https://www.jstage.jst.go.jp/static/pages/JstageOverview/-char/en>

¹⁰⁵ Japanese academic journals will be searchable on the world’s premier databases Retrieved November 2020 from, https://www.jst.go.jp/pr/info/info783/index_e.html

¹⁰⁶ Japanese academic journals will be searchable on the world’s premier databases Retrieved November 2020 from, https://www.jst.go.jp/pr/info/info783/index_e.html

Organizationally, JST is one of the funders of research in Japan and requires its grantees to follow its policy on open access and open science. Those funded are required to post an open access copy in an open repository.¹⁰⁷

The Japan Society for the Promotion of Science (JSPS)

An additional core interactor, the Japan Society for the Promotion of Science (JSPS) and JST (mentioned above) both fall under the umbrella of MEXT. JSPS's mission is to carry out "a diverse program that includes funding scientific research, fostering young researchers, promoting international scientific exchange, and supporting the reform and globalization of universities."¹⁰⁸

JSPS (like JST) also requires a mandatory publication of research results in open access venues for those researchers who participate in their programs.¹⁰⁹ SPARC JP collaborates in the education of those participants in JSPS, providing several seminars for participants of JSPS focusing on different fields of publishing to encourage the practice of open access.¹¹⁰

Summary of core group interactors

In summary, the system and core group interactors for SPARC JP are summarized in Table 5.9.

¹⁰⁷ JST Policy on Open Access to Research Publications and Research Data Management (April 1, 2017) Retrieved November 2020 from https://www.jst.go.jp/EN/about/openscience/policy_openscience_en.pdf

¹⁰⁸ JSPS About US. Retrieved November 2020, from <https://www.jsps.go.jp/english/aboutus/index.html>

¹⁰⁹ JSPS International Joint Research Program (February 2017) Retrieved November 2020 from https://www.jsps.go.jp/english/e-bottom/data/h29_yoko_PIRE_e.pdf

¹¹⁰ For example, in 2018 SPARC JP held a seminar on the 4th SPARC Japan Seminar 2018 "Open Science in the Humanities and Social Sciences: For Problem-Solving" focused at JSPS participants. Retrieved November 2020 from <https://www.nii.ac.jp/sparc/en/event/2018/20190129en.html>

Table 5.9 SPARC JP System and Core Group Interactors

System Interactors	Core Groups	
	Direct interactor groups	Indirect interactor groups
1. SPARC JP Employees (NII employees) 2. Steering Committee 3. Member Advisory Groups 4. 600+ Members (Japanese JPCOAR members universities, colleges, research institutions)	1. The Japan Consortium for Open Access Repository 2. The JAIRO Cloud Community 3. Japan Alliance of University Library Consortia for E-Resources (JUSTICE) 4. NII Open Science Infrastructure Research Center (RCOS)	1. The Council for Science, Technology and Innovation (CSTI) 2. The Ministry of Education, Culture, Sports, Science and Technology (MEXT) 3. The Japan Science and Technology Agency (JST) 4. The Japan Society for the Promotion of Science (JSPS)

Source: Table created by Jennifer Beamer 2020

5.3.2.3 H3 Incentives and Motivations

STIN step three reveals the incentive structures involved with developing and working with the system. As with Kling et al.’s (2003) study of communication forums, SPARC JP and their system interactors play an important role in incentive structures.

Since its inception as a project of the NII in 2003, SPARC JP has offered its advocacy and educational activities free of membership. According to the staff at NII (Akira Niitsuma, personal communication, May 23, 2019), those who are generally interested and participate in the activities of SPARC JP are the employees and staff of 782 universities. The 86 national and 93 public universities, and with the 603 private universities¹¹¹ must comply with open access

¹¹¹ As of 2018, Number of Japanese Universities, MEXT, Retrieved November 2020 from, https://www.mext.go.jp/component/b_menu/other/_icsFiles/afieldfile/2018/12/25/1407449_1.pdf

practices/policies. Additionally, the staff at NII mentioned that a large number of librarians work for their university IRs (Koh Sugawara, personal communication, May 23, 2019).

In examining the types of activities of SPARC JP, I found multiple incentives for participants in SPARC JP activities. The majority of activities have been documented in SPARC JP's yearly reports, advocacy documents (many available at their website archive), and field interviews with SPARC JP and NII. It was found that the incentives for participants in the activities of SPARC JP included access to information, leadership, collaboration, and information on international initiatives. SPARC JP has created a web-based archive that includes video, slides, and reports from past activities, which are freely accessible at SPARC JP's website. Additionally, the archives have materials in Japanese and are available sometimes in English. Most of the reports, activities, and extra materials have been translated into English.

Participants who use and attend SPARC JP activities receive the following:

Information regarding the distribution of scholarly information and academic resources. This includes open access, open research, and the international dissemination of academic societies' publications, in partnership with organizations like the Cooperation Promotion Council, and with connections between the National Institute of Informatics (NII) and university libraries.¹¹²

Leadership. SPARC JP is considered the leader in Japan of advocacy activities to encourage participation in the development of scholarly communication. Thus, participants receive information in the Japanese context and training in IRs. SPARC JP brings together information in one central place, with the endorsement of The Japan Alliance of University

¹¹² The SPARC JP 2016 Annual Report, Retrieved October 2020 from https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2016-E.pdf

Library Consortia for E-Resources under the Cooperation Promotion Council, with links between the National Institute of Informatics (NII) and university libraries.¹¹³

Collaboration. According to the SPARC 2017 Yearly report, SPARC JP participants also have the opportunity to influence policy that could “advance further development of scholarly communication, through cooperation with domestic and overseas OA initiatives, and with other core group interactor organizations via the promotion of open access and related activities.”¹¹⁴ The report elaborates this includes “the international dissemination of open access activities in Japan in alliance with US SPARC, and at international conferences and seminars.”¹¹⁵

Exposure to international open access initiatives. Participants also receive information and education on activities where SPARC JP partners with other organizations that are related to open access. For example, recently SPARC JP stated that one of their activities is cooperation with international OA initiatives, such as the Confederation of Open Access Repositories (COAR), ORCID identifier, Sponsoring Consortium for Open Access Publishing in Particle Physics (SCOPE3), and ARIVIX.org (an open-access repository of electronic preprints).¹¹⁶

5.3.2.4 H4 Excluded actors and non-interactions

STIN step four is based upon the previous steps, by identifying excluded actors and undesired interactions. For example, what do the system interactors not want the system to do?

¹¹³ The SPARC 2016 Annual Report, Retrieved October 2020 from https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2016-E.pdf

¹¹⁴ The SPARC 2017 Annual Report, Retrieved October 2020 from https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2017-E.pdf

¹¹⁵ The SPARC 2017 Annual Report, Retrieved October 2020 from https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2017-E.pdf

¹¹⁶ The SPARC 2018 Annual Report, (in Japanese Only) Retrieved October 2020 from https://www.nii.ac.jp/sparc/jp/publications/pdf/sparc_annual_2018-J.pdf

It appears on the surface that the education and activities hosted by SPARC JP have no obvious excluded actors. Many of the core group interactors that intersect with SPARC JP in the course of their activities are journal publishers and scientific societies, referring to them as SPARC JP Publishing Partners.¹¹⁷

As SPARC JP is not a member-based organization, anyone who wishes to access information related to SPARC JP may do so. However, if an institution wishes to participate in the activities of JAIRO Cloud, the affiliated IR, then they would have to pay a membership fee as described in section 5.3.2.2, according to core interactor groups and SPARC JP staff (Akira Niitsuma, personal communication, May 23, 2019).

Many of the seminars and trainings offered by SPARC JP and its affiliated core interactor groups also have a small fee to provide a day long training. I was interested to learn in one interview with several library science information faculty members (who were not part of SPARC JP) that while the bulk of SPARC JP information is freely available to all, “unless you are a member of the steering committee and/or working groups and taskforces. It was mentioned in one of my interviews with non NII staff that some university faculty members feel excluded from the process of decision making around Open Access and Japan repositories.¹¹⁸

Additionally, in my observations of several seminars/activities of SPARC JP (usually sponsored by the NII) there were also other “publishing partners” who were named as sponsors and who shared costs. Those partners were in some cases major vendors of academic journals, including those that dominate the journal publishing industry. (I observed the participation of Elsevier and Springer Nature at several SPARC JP/NII events.) I found this interesting and

¹¹⁷ SPARC Japan Publishing Partner’s list. Retrieved October 2020 from <https://www.nii.ac.jp/sparc/en/partners/>

¹¹⁸ I had the opportunity to interview several faculty members at Tsukuba University to discuss their perceptions of SPARC JP and the NII repository program. They wished to remain anonymous.

somewhat counter to the reason that SPARC JP was started. The SPARC website states they were founded “to keep in the hands of Japanese researchers the outstanding research results that they currently published abroad, to further promote international dissemination of research results, and to create a self-sustaining cost-recovery model that would enable stable transmission of Japanese scholarly journals and improve their name recognition overseas”.¹¹⁹

5.3.2.5 H5 Communication Systems

STIN step five is concerned with identifying existing communication systems; Kling et al. (2003) referred to this as the “communication ecology of the system interactors” (p. 50). For SPARC JP communication systems consisted of the following groupings:

Groups and networks:

As mentioned in section 5.3.2.1, there is a SPARC JP steering committee that meets regularly to discuss the priorities of SPARC JP, including task forces and working groups that will be of priority for the coming fiscal year. The reports of these groups are available openly at the SPARC JP website as fiscal year year-end documents.¹²⁰ Many of SPARC JP’s activities are in collaboration with other working groups and task forces, many intersecting with JPCOAR. A running list of the past and present working groups and task forces can be found at the JPCOAR website under the heading 作業部会・タスクフォースの活動 (The JPCOAR website is in Japanese only).¹²¹

Media (email, newsletters, reports, educational materials)

¹¹⁹ International Scholarly Communication Initiative About Us. Retrieved December 2020 from <https://www.nii.ac.jp/sparc/en/about/>

¹²⁰ Publication SPARC Japan Retrieved December 2020 <https://www.nii.ac.jp/sparc/en/publications/#2>

¹²¹ JPCOAR Organization and Operations. Retrieved September 2020, from, https://jpcoar.repo.nii.ac.jp/?page_id=39

SPARC JP sends out regular emails to its community interested in open access news and practices, typically to those who have signed up for them and/or who have attended events or seminars (Akira Niitsuma, personal communication, May 23, 2019).

SPARC JP publishes a regular newsletter in both Japanese and English. The newsletters beginning in February of 2009 are archived at the SPARC JP website.¹²² The contents of the newsletters are a variety of information on Open Access and practices. Usually there is a main story about SPARC JP activities, and any recent reports or news and updates on SPARC collaborations with other groups or infrastructure. Often the newsletter consists of the contents of past seminars. For example, the speakers at a seminar or activity will be highlighted and the summary of their talk is written up. The report of the seminar typically includes an outline, a program with speakers' introductions and abstracts, panel discussion, attendee feedback, and often an afterword. There is sometimes even feedback from those who attended activities of SPARC JP or the NII.

Meetings and face-to-face gatherings

SPARC JP believes its most impactful way of communicating is via the SPARC JP seminar that they plan and run. The seminars are held three or four times every fiscal year and are essentially advocacy activities. SPARC JP Seminar Planning Working Group (WG), which consists of researchers and librarians who are assigned to plan the annual seminar themes and then implement the seminars. All content from the seminars is then posted to the SPARC JP website which was launched in the 2000's and has provided information in English since 2016. SPARC JP has also been delivering streaming videos of seminars since 2017 (Akira Niitsuma, personal communication, May 23, 2019).

¹²² SPARC Japan Newsletter. Retrieved February 2020 from <https://www.nii.ac.jp/sparc/en/publications/#1>

According to SPARC JP and the NII, the seminars are well attended. For example, staff at SPARC JP shared the 2018 seminar topics and attendance numbers for each seminar for 2018-2019 presented in Table 5.10. The overall annual theme was “What Should We Do to Establish Open Science?” (Akira Niitsuma, personal communication, May 23, 2019).

Activities that Communicate Information about SPARC JP and the NII’s Support for IRs

SPARC JP and the NII provide activities for those Japanese institutions that are interested in IRs. One example of this is the JAIRO Cloud Community. When an institution enrolls with JARIO Cloud the NII invites librarians in charge of IRs to a designated mailing list to share experiences with the IR. In addition, the NII also provides an information website with manuals and reports on IRs in Japan, such as the installation manuals for WEKO (IR system infrastructure) for libraries (Akira Niitsuma, personal communication, May 23, 2019).

Table 5.10 Examples of Meetings and Trainings help by SPARC NA 2018 – 2019

SPARC JP 2018 – 2019 Annual theme: “What Should We Do to Establish Open Science?”

Date	Title	Attendance
Sep 19 2018	“To promote a data management policy and roles of researchers and librarians”	70
Oct 25 2018	“Quality control in the age of open access”	53
Nov 9 2018	“Roadmap for open access: the road to OA 2020”	102
Jan 29 2019	‘Open Sciences in the Humanities and Social Sciences: For problem solving’	66

Source: Provided at Interview with Akira Niitsuma, personal communication, May 23, 2019.

SPARC JP and the NII also provide translated materials (from English into Japanese) on IRs—for example, documents published by organizations and institutions such as JISC (Joint Information Systems Committee in the United Kingdom) as well as SPARC NA. SPARC JP

staff state that “although most Japanese librarians can read English, it is much easier if they can access the information in Japanese” (Koh Sugawara, personal communication, May 23, 2019).

Table 5.11 provides a summary of SPARC JP’s communication forums.

5.3.2.6 H6 Resource flows

STIN step six contributes to the understanding of how resources flow throughout the network. These resource flows can have “both direct and indirect influence on interactions within the network” (Kling et al., 2003, p. 58). Examining resource flows to include looking at the relationships among “people (including organizations), equipment, data, diverse resources (money, skill, status), documents and messages, legal arrangements and enforcement mechanisms, and resource flows” (Kling et al., 2003, p. 48). Two main areas of resources were found: space and operations and staffing and expertise.

Table 5.11 SPARC JP Communication forums examples

Forum	Occurrence	Space/Location	Interactors
Groups and Networks	Regularly as needed	In- person at NII or other locations	SPARC JP, steering committee including task forces and working groups
Seminars and Trainings	3 – 4 times per year as per planning committee	Face to face in person	SPARC JP and various core interactors, interested universities
Media (email, newsletters, reports, educational materials)	Fiscal year end and after seminars and trainings	Online email listserv, archive of reports and materials at main website	Anyone with online access
Newsletters	Monthly to every 3 Months	Via SPARC listserv and archived at website	Anyone with online access

Source: Created by Jennifer Beamer 2020.

Resource Flows

The SPARC JP offices are in situated within the NII, and thus operate as part of the larger NII organization by way of the Cyber Science Infrastructure Development Department. Consequently, many of the activities of SPARC JP, are hosted within the offices/spaces of the NII, inside the National Center of Sciences Building in Hitotsubashi, Chiyoda-ku, Tokyo. A picture of the NII building is displayed in Figure 5.6.

The operations of the NII were funded by a budget of 117 million US dollars for the fiscal year of 2020).¹²³

Staffing and Expertise

A listing of research faculty and staff for all the NII is available on the NII Staff directory page.¹²⁴ Most of the faculty are researchers listed on their staff/budget webpage¹²⁵. This is because, as mentioned above, the NII is the central institution for collaborative research activity involving universities and other academic institutions. Therefore, a number of faculty/experts from universities and institutions in Japan work at the NII. According to SPARC JP staff and the NII website, research is conducted in partnership with numerous public and private universities and some types of other research institutions (Yukata Hayashi, personal communication, May 23, 2019). According to SPARC JP staff and the NII website, research is conducted in partnership with numerous public and private universities and some types of other research

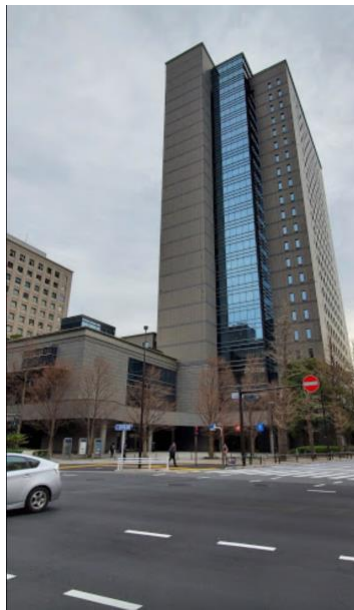
¹²³ Number of Staff/Budget 2020 (in Japanese) Retrieved January 2021 from <https://translate.google.com/translate?sl=auto&rtl=en&u=https%3A%2F%2Fwww.nii.ac.jp%2Fabout%2Foverview%2Fbudget%2F>

¹²⁴ NII Staff directory. Retrieved Sept 2020 from <https://www.nii.ac.jp/en/faculty/list/project-profs/>

¹²⁵ Number of Staff/Budget Retrieved January 2021 from <https://translate.google.com/translate?sl=auto&rtl=en&u=https%3A%2F%2Fwww.nii.ac.jp%2Fabout%2Foverview%2Fbudget%2F>

institutions (Yukata Hayashi, personal communication, May 23, 2019). According to SPARC JP staff and the NII website, research is conducted in partnership with numerous public and private universities and some types of other research institutions (Yukata Hayashi, personal communication, May 23, 2019).

Figure 5.6 National Institute of Informatics is inside the National Center of Sciences Building in Hitotsubashi, Chiyoda-ku, Tokyo



Source: Photo Taken by Jennifer Beamer 2019.

According to SPARC JP staff and the NII website, research is conducted in partnership with numerous public and private universities and some types of other research institutions (Yukata Hayashi, personal communication, May 23, 2019). Additionally, the NII is connected with the Graduate University for Advanced Studies,¹²⁶ which has offered a doctoral program in informatics since 2002.¹²⁷ The NII's primary goal is enhancing the knowledge of informatics in

¹²⁶ Concept of our Graduate Studies Retrieved September 2020 from <https://www.nii.ac.jp/graduate/en/curriculum/>

¹²⁷ While observing activities at the NII, I was aware that there were other researchers and also graduate students (some international students), attending various seminars at the same time as me—as they introduced themselves.

Japan. The NII staff work closely with international and exchange researchers and institutes, for several reasons including the development of international standards in informatics (Akira Niitsuma, personal communication, May 23, 2019). The NII is a hub for joint research activity involving universities and other academic institutions (Akira Niitsuma, personal communication, May 23, 2019). The NII's mission is "to promote informatics research, develop state-of-the-art infrastructure for transmission of academic and scholarly information, and offer graduate-level education and cultivate human resources in the field of information technology."¹²⁸

5.3.2.7 H7 System Architectural Choice Points

STIN step seven occurs after identifying the major socio-technical characteristics of the SPARC JP case and determining all of the interactors according to Kling et al. (2003). Thus, step seven is used to identify the major systems architectural design choice points (described above) which, as Kling et al. (2003) suggest, will "differ depending on the nature and architecture of the forum/case" (p.58). The technical and social choices are listed in Table 5.12 and then an explanation of some of the points is provided as narrative.

Choice Point 1. The Japanese Government's Development of e-Japan 2000

In the 1990s, Japan's national policy prioritized transforming the nation into an information-intensive society. The relationship between the public and private sectors in Japan sets the country apart from other industrialized nations and is often cited as the main cause of its post-war economic boom (Johnson, 1982). The actions of government officials that relate to Japan's economic outlook are generally known as part of "Industrial Policy". Leading up to the development of the NII, SPARC JP and the idea of open access repositories, for several decades a series of choices and developments around IT, informatics, organization of government

¹²⁸ NII Mission and Strategies. Retrieved May 2019 from <https://www.nii.ac.jp/en/about/introduction/mission/>

agencies, and information systems were taking place. (This research does not have the space for a long historical narrative; see Johnson [1982]).

Table 5.12 SPARC JP Technical and Social Choice Points

Choice point	Technical/Social	Reasoning
1. “Japan 2000 Strategy” and subsequent Law	Social	Japan is lagging behind other nations in its IT infrastructure
2. 2000 establishment/ reformation of NII	Technical	Centralized government agency tasked with integrated research and development activities in information-related fields, including networking, software, and content
3. MEXT 2002 report and SPARC JP Project	Social	1990s Serials Crisis, Libraries need a way to take back control of the articles that they own
4. JAIRO Cloud 2012	Technical	Individual IRs were offered and moved to a cloud-based repository system
5. Government Mandated PhD OA policy 2013	Social	Policy to Mandate that all Doctoral PhD must be made openly available at the University’s IR

Source: Table created by Jennifer Beamer 2020.

Perhaps the most influential choice point came a decade before SPARC JP or the NII. In 1993, a vision statement of the type of infrastructure that was needed in Japan was presented by the (then-) Ministry of Posts and Telecommunications. It proposed that for “Reforms toward the intellectually creative society of Japan in the 21st century,” the ministry would need to commit itself to creating a nation-wide IT and broadband network.¹²⁹

“Japan needs to create a social environment that can fully capitalize on information and knowledge in order to resolve the increasingly more complex problems facing the country and to build a society that emphasizes intellectually creative activities. To facilitate this resolution, it will be essential to have a new, high-performance info communications

¹²⁹ MPT (Ministry of Posts and Telecommunications). (1993a). Reforms toward the intellectually creative society of the 21st century. Retrieved May 2019 from <http://www.mpt.go.jp/Report/Report1993No5/>

infrastructure in which both information and knowledge can be freely created, circulated and shared. Accordingly, a shift in perspective is already occurring in which the goods- and energy-oriented society is giving way to one oriented toward information and knowledge”. (MPT, 1993a)

The “e-Japan Strategy: The plan to enhance the technical infrastructure of Japan” *was* approved by the PM Mori Cabinet in 2001.¹³⁰ The e-Japan strategy consisted of four policy areas: establishing e-government, creating ultra-high-speed network infrastructure, facilitating e-commerce, and developing high-quality human resources.¹³¹ This led to a series of reformations of the Japanese e-government strategy, as e-Japan Strategy II (2003), the New IT Reform Strategy (2006), i-Japan Strategy II (2009), and New Strategy in IT (2010). In 2016, Japan enforced a Basic Act for Data on the advancement of utilizing public and private sector data. Japan changed its e-government strategy to a digital government strategy in 2017 (Asato, 2016).

Choice Point 2. The Establishment of the NII (converted from NACSIS)

The second choice point, a direct result of the e-Japan Strategy, was the changing of the restructuring of the National Center for Science Information Systems (NACSIS). The NACSIS was responsible for the information service NACSIS-IR beginning on April 1, 1987, which was composed of 13 databases: six databases obtained from overseas, five union catalogs and machine readable catalogues (MARC)s, and two databases prepared independently by NACSIS.¹³² NACSIS would be now known as the National Institute for Informatics (NII). The NII would then be tasked with advancing integrated research and development activities in information-related fields, including networking, software, and content.¹³³ The NII began

¹³⁰ Ministry of Foreign Affairs of Japan. Retrieved March 2020 from <https://www.mofa.go.jp/policy/economy/it/index.html>

¹³¹ Ministry of Foreign Affairs of Japan. Retrieved March 2020 from <https://www.mofa.go.jp/policy/economy/it/index.html>

¹³² Short History of NACSIS-IR. Retrieved March 2020 from <https://www.nii.ac.jp/ENEWS/NL15/1507.html>

¹³³ History NII. Retrieved November 2019 from <https://www.nii.ac.jp/en/about/overview/history/>

offering next-generation content services, infrastructure for scholarly information resources, and collaboration between the NII and Japanese universities.¹³⁴

Choice Point 3. SPARC JP Phased Project of MEXT and the NII 2003

The next choice point was the SPARC JP project, launched in 2003 through support by the Ministry of Education, Culture, Sports, Science and Technology.¹³⁵ According to the NII website “it encouraged digitization of scholarly journals, especially English language journals published in Japan, with SPARC JP Publishing Partners”¹³⁶ (a group of approximately 30 Japanese publishers and scholarly societies). The NII’s goal via the SPARC JP project was to

“keep in the hands of Japanese researchers the outstanding research results that they currently published abroad, to further promote international dissemination of research results, and to create a self-sustaining cost-recovery model that would enable stable transmission of Japanese scholarly journals and improve their name recognition overseas.”¹³⁷

Additionally, SPARC JP’s tasks were to:

“promote open access, to encourage further distribution of scholarly information and academic resources, and to strengthen ability for dissemination of information, cooperating with domestic and international OA initiatives and organizations on the matters concerned.”¹³⁸

There were various phases set up over the years, in three-year intervals:

- Phase 1: 2003-2005
- Phase 2: 2006-2009
- Phase 3: 2010-2012
- Phase 4: 2013-2015
- Phase 5: 2016-2018
- Phase 6: 2019-2021

¹³⁴ History NII. Retrieved November 2019 from <https://www.nii.ac.jp/en/about/overview/history/>

¹³⁵ SPARC JP About US. Retrieved May 2019 from <https://www.nii.ac.jp/sparc/en/about/#1>

¹³⁶ SPARC JP About US. Retrieved May 2019 from <https://www.nii.ac.jp/sparc/en/about/#1>

¹³⁷ SPARC JP About US. Retrieved May 2019 from, <https://www.nii.ac.jp/sparc/en/about/>

¹³⁸ SPARC JP About US. Retrieved May 2019 from, <https://www.nii.ac.jp/sparc/en/about/>

Each phase focused on various objectives around the promotion of open access. For example, Phase 1 included general education, the building of intercollegiate relationships, and providing assistance for “the digitalization of journals and for introduction of an electronic article peer review system and determining that e-journal publication needed further backing by this project”.¹³⁹

Later Phase 3 for the 2010 to 2012 academic years was announced. At the 2nd SPARC JP Steering Committee meeting for the 2008 academic year, it was decided that the direction for Phase 3 would be:

“building on the results up to now, moving to actions designed to improve academic information distribution for all stakeholders including academic community members, university libraries, researchers, and academic societies”.¹⁴⁰

Phase 3 was as a choice point. It was dedicated to “the comprehensive advancement of academic communication as a whole, in close collaboration with the NII Institutional Repositories Program”.¹⁴¹

Choice Point 4. Initiating the JAIRO CLOUD

The initial motivation for adopting IRs in Japan took a similar path to North America, in that IRs could aid in the response to journal pricing and the serials crisis. However, technologically there were significant differences. Japan’s strategy for advancement was largely guided by a national system of technological and economic governance. Similar to the SPARC JP project, the NII JAIRO CLOUD repository program, according to Murakami and Adachi (2006), was rolled out in managed phases.

¹³⁹ NII Repositories Program 2014 Annual report. Retrieved July 2020, from <https://www.nii.ac.jp/sparc/en/publications/>

¹⁴⁰ NII Repositories Program 2014 Annual report. Retrieved July 2020, from <https://www.nii.ac.jp/sparc/en/publications/>

¹⁴¹ NII Repositories Program 2014 Annual report. Retrieved July 2020, from <https://www.nii.ac.jp/sparc/en/publications/>

Phase One occurred during 2003 – 2005:

- The Subdivision on Science in the Council for Science and Technology at Ministry of Education, Culture, Sport, Science and Technology (MEXT) of Japan published a report that emphasized the role of university libraries in the dissemination of academic information, in particular in the areas of humanities and social science.¹⁴²
- NII launched projects for IRs in 2004, coinciding with MEXT report on Governmental Reports on Dissemination of Academic Information.
- NII started a collaborative experiment in 2005 with 19 university libraries. The project's purpose was the deployment and coordination of IRs in Japan.¹⁴³

By the third phase in 2012:

- the NII JAIRO Cloud project, had provided initial support for the implementation of IRs for 70 universities. (Akira Niitsuma, personal communication, May 23, 2019; Yukata Hayashi, personal communication, May 23, 2019).
- Every year after, the number of JAIRO Cloud based repositories has doubled until the most recent report of IRs: increase of 43 repositories in 2020, making it a total of 853 repositories in Japan – 651 on JAIRO Cloud and 202 on legacy or other platforms (Akira Niitsuma, personal communication, May 23, 2019).

¹⁴² Part 3 Measures Adopted for Promotion of Science and Technology 3.3. Reform of Japan's Science and Technology System Retrieved Jan 2021 from https://www.mext.go.jp/b_menu/hakusho/html/hpag200301/hpag200301_2_113.html

¹⁴³ Part 3 Measures Adopted for Promotion of Science and Technology 3.3. Reform of Japan's Science and Technology System Retrieved Jan 2021 from https://www.mext.go.jp/b_menu/hakusho/html/hpag200301/hpag200301_2_113.html

Choice Point 5. MEXT Mandated Open Access for all PhD Theses March 2013

The next choice point was in March 2013, when MEXT communicated to all doctoral-granting universities in Japan that PhD theses would need to be made “openly available via the Internet”.¹⁴⁴ Prior to the MEXT mandate all PhD theses were obligated to be made openly available in print at university libraries or at the National Diet Library (NDL) (Akira Niitsuma, personal communication, May 23, 2019). However, the new mandate required that an electronic version of PhD theses must be submitted to the university institutional repository. If the institution had a repository at the time, this was fine. However, those institutions without an IR would have to get one (Akira Niitsuma, personal communication, May 23, 2019).

5.3.2.8 H8 Viable configurations and trade-offs

Step eight takes the socio-technical information as well as architectural choice point information and maps them to each other. According to Kling et al. (2003), this helps in describing the viable configurations and trade-offs. For the purposes of this dissertation, it was not possible to understand all the configurations of this system, but I did examine the data collected for mentions of alternatives. I also asked several interview questions that I thought might provide data on the perceived choices of the SPARC JP staff that would indicate whether their past choices may have had additional or alternative outcomes. This was fruitful in that I was able to understand some of the future hopes and values beyond the present system, and to consider potential changes.

¹⁴⁴ Ministry of Education, Culture, Sports, Science and Technology: Enforcement of Ministerial Ordinance to Partially Review the Degree Regulations (only in Japanese) retrieved January 2020 from, http://www.mext.go.jp/a_menu/koutou/daigakuin/detail/1331790.htm

In response to my questions regarding what alternative choices SPARC JP could have made, and if there were any alternatives to what SPARC JP does now, Akira Niitsuma told me that there were neither alternatives to the infrastructure, nor ways they could see a different model or system. However, they would like to have more exposure to the international community (Akira Niitsuma, personal communication, May 23, 2019). The Standard and Alternative models for SPARC JP are presented in Table 5.13.

Table 5.13 The Standard and Alternative Models for SPARC JP

Standard Model for SPARC JP	SPARC JP Alternative Model
Technological Infrastructures and Interoperability	No alternatives at this time
Education in Japan on OA	More international exposure

Source: Table created by Jennifer Beamer 2020.

5.4 Applying Scott’s Framework Analysis

Phase two of the data analysis used Scott’s framework of institutional pillars and carriers (see Table 5.14). For each SPARC organization, institutional elements were classified using the pillars and carriers from the data analysis of documents, interviews, and observations. The focus was on the following two research questions:

R2. What organizational characteristics influence choices and uses of IRs?

R3. How do the variances illuminate the progression of IRs in organizations in Japan compared to similar organizations in the United States?

For this research, the institutional framework was used to understand “complex organizational phenomena” (Miller and Loess, 2002). Arranging the concepts into institutional pillars and carriers provided a structure for organizing, categorizing, and analyzing data using Scott's (2001) typology, as shown in Table 5.14. The framework also assisted in the coding of each case study, analyzing data from documents, interviews, participant observation, field notes,

and artifacts. For a more detailed guide for my coding please see Appendix C: Institutional Framework Coding Hierarchy and Question/Strategy.

Table 5.14 Scott’s (2001) Framework/ Adapted as a Guide for Coding R2 and R3

	Pillars		
Carriers	Regulative	Normative	Cultural-cognitive
Symbolic systems	Rules, laws	Values, expectations, standards	Categories, typifications, schema
Relational Systems	Governance systems, power systems	Regimes, authority systems	Structural isomorphism, identities
Routines	Protocols, standard operating procedures	Jobs, roles, obedience to duty	Scripts
Artifacts	Objects complying with mandated specifications	Objects meeting conventions, standards	Objects possessing value

Source: Adapted from Scott, 2001; pp. 55-85.

Each pillar and carrier were used to code under “an institutional framework that was theory driven” to explain institutional characteristics of these research sites. The use of the carriers aided me in the understanding which carriers or pillars were most observed or unseen in the documents, interviews, and observations of the two organizations, as bounded by their relationships to information infrastructure and IRs. Throughout the data analysis, I reflected on the coding developed from the previous procedures (i.e., the use of open coding) to synthesize my data analysis. The following sections present the findings of the data collected via the lens of institutional framework.

5.4.1 Organizational Characteristics and Influences: SPARC NA

In this section data collected and then analyzed via the lens of Scott's Institutional Theory framework is presented. Table 5.15 provides the main findings for this research within an institutional analytic framework when SPARC NA was examined. Within each pillar and institutional carrier, the organization's main characteristics (drawn from the case studies data sources) are listed. They will be further described in the narratives presented in the rest of the section.

5.4.1.1 SPARC NA: Regulative Pillar

The regulative pillar of institutionalization is composed of the influences associated with “rule setting, monitoring and sanctioning activities” (Scott, 2001, p. 257). Therefore, data analysis in this pillar included examining the rules, laws, regulations, governance systems, surveillance, conformity, rewards, and punishments that constrained and regularized behaviors for the SPARC NA organization. Scott (2001) requires that the regulative pillar and the rules have an “instrumental rationale, and they are legally sanctioned, which is the basis for their legitimacy” (p. 257).

Table 5.16 summarizes the regulative pillar elements' findings in the data collected for SPARC NA. The results show the data coded within the four types of carriers: “symbolic systems, relational systems, routines, and artifacts” (Scott, 2001; p. 70). After the summary presented in the table, a narrative of the findings of the carriers explains in more detail the regulative elements in the pillar for SPARC NA.

Table 5.15 SPARC NA Main Findings of the Institutional Framework Applied

Carriers	Pillars		
	Regulative	Normative	Cultural-Cognitive
Symbolic Systems	<u>Rules, Laws</u> -Mission -Program plan -Legislative interactions -Memberships	<u>Values, expectations</u> -Leadership -Yearly plans and strategy -Achieving results with policy -Action oriented	<u>Categories, typifications, schema</u> - IRs (at member institutions)
Relation Systems	<u>Governance and Power Systems</u> -Governance Docs -Relationships with -Steering committee boards, members, Advisors	<u>Regimes, authority systems</u> -Communities of practice -Industry, associations, and relationships	<u>Structural Isomorphism Identities</u> -Relationships with other SPARCS -Relationship with Library organizations -Relationships with coalition partners
Routines	<u>Protocols, SOPs</u> -Regular Groups Meetings -Regularly Timed Communications	<u>Jobs, roles, obedience to duty</u> -Oversight of the field	<u>Scripts</u> -Program Advocacy -Education and Training
Artifacts	<u>Objects complying with mandated specifications</u> n/a	<u>Objects meeting conventions, standards</u> n/a	<u>Objects possessing symbolic value</u> -Branding-membership logo -Awards and Recognition

Source: Data Analyzed by Jennifer Beamer and Framework Adapted from Scott, 2001; pp. 55-85.

Table 5.16 SPARC NA Regulative Pillar and Carriers

Carriers	Regulative
Symbolic Systems	<p style="text-align: center;"><u>Rules, Laws</u></p> <ul style="list-style-type: none"> -Mission -Program plan -Legislative interactions -Memberships
Relational Systems	<p style="text-align: center;"><u>Governance and Power Systems</u></p> <ul style="list-style-type: none"> - Governance Docs - Relationships with Libraries, Steering committee boards, members, Advisors
Routines	<p style="text-align: center;"><u>Protocols and Standard Operating Procedures</u></p> <ul style="list-style-type: none"> -Regular member communications -Member groups -Legislative updates and resources/materials Educational/advocacy materials
Artifacts	<p style="text-align: center;"><u>Objects complying with mandated specifications</u></p> <ul style="list-style-type: none"> -Sharing legislation on social media

Source: Data Analyzed by Jennifer Beamer and Framework Adapted from Scott, 2001; pp. 55-85.

5.4.1.1.1 Regulative Symbolic Systems

Regulative Symbolic Systems include the “rules and regulations, group rules, the purpose of the group, ownership and protocols” (Scott, 2008, p. 261). Rules and regulations are considered the “legitimate” regulative pillar of the groups, and as such officially sanctioned regulative symbolic systems which may provide legitimacy to the organization (p. 261). For SPARC NA, symbolic systems present in the regulative pillar were found in documents such as their Mission, Yearly Program Plans, Membership Schema, Legislative Plans and Outcomes, and Events and Meeting Code of Conduct.

SPARC NA is a chartered organization led by a designated director with compensated employees, and as noted above has a large member base. Analysis of the data showed that regulative symbolic systems include a mission statement, yearly program plans, and multiple written advocacy and policy actions via United States government legislative interactions. These legislative interactions are powerful contributors to the regulative pillar of SPARC NA, as they provide a legally sanctioned basis for legitimacy relative to SPARC NA's stakeholder groups and members.

SPARC NA is generally recognized as the lead organization in the field of open access, which oversees directing and supervising the distribution of a particular program outcome to its members (Heather Joseph, personal communication, October 15, 2019; Nicole Allen, personal communication, November 6, 2019). Their work involves driving open policy at the federal government level, monitoring, and supporting state policy, supporting its membership, and providing education and training. It also lives in the public domain, dealing with any number of initiatives and projects as they arise.

One key observation I made of SPARC NA regarding regulative symbolic systems is their work on open-practices legislation in the United States. This requires the organization to have direct and highly public involvement with the United States Congress. These activities are a dominant source of SPARC NA's legitimacy. In its beginnings, SPARC NA's legitimacy originated from library professional organizations, as a project of the Association of Research Libraries. However, now SPARC NA's legitimacy is firmly established in the legislative role within the United States Government and its branches.

SPARC NA staff emphasized, in both interviews and organization documentation, that one of their biggest roles is in advocacy for policy at the local, national, and international level

for promoting openness in both research and education. Every few months and prior to developing their yearly plan, they have several membership meetings revealing the current legislative agenda, the trends, and opportunities in the current legislative session (personal observation, 2019 – 2021- two years of membership meetings).

SPARC NA highlights these legislative interactions by creating a public listing on their main website of both past and active policy that they are working to achieve.¹⁴⁵ Some examples of policies on the local, national, and international level to promote openness in research and education include the following:

1) The OPEN Government Data Act, which was passed by the US House and Senate on December 31, 2018 and signed into law on January 14, 2019.¹⁴⁶ The OPEN Government Data Act (S. 760 / H.R. 1770) codifies former President Obama’s Executive Order making “open and machine readable” the default for all government data.¹⁴⁷

2) The Open Textbook Pilot, a federal grant program that supports projects at institutions of higher education that create or expand the use of open textbooks to achieve savings for students.¹⁴⁸ When this deal was announced in early 2018, SPARC and the United States Public Interest Research Group (PIRG) prepared a month-long campaign to secure some of this funding for open textbooks.¹⁴⁹

¹⁴⁵ SPARC NA Policy and Advocacy. Retrieved March 2021 from <https://sparcopen.org/what-we-do/active-policy/>

¹⁴⁶ SPARC NA Passed into Law: OPEN Government Data Act (S. 760 / H.R. 1770), Retrieved December 2020 from <https://sparcopen.org/our-work/open-government-data-act/>

¹⁴⁷ SPARC NA Passed into Law: OPEN Government Data Act (S. 760 / H.R. 1770), Retrieved December 2020 from <https://sparcopen.org/our-work/open-government-data-act/>

¹⁴⁸ SPARC NA Open textbook Pilot Grant Program. Retrieved December 20, 2020, from <https://sparcopen.org/our-work/open-textbook-pilot/>

¹⁴⁹ SPARC NA Open textbook Pilot Grant Program. Retrieved December 20, 2020, from <https://sparcopen.org/our-work/open-textbook-pilot/>

3) Executive Directive on Public Access issued February 22, 2013. SPARC NA lobbied for the White House Executive Directive on Increasing Access to the Results of Federally Funded Scientific Research, which requires U.S. Government agencies with annual extramural research and development expenditures of over \$100 million make the results of taxpayer-funded research (both articles and data) freely available to the general public, with the goal of accelerating scientific discovery and fueling innovation.¹⁵⁰

SPARC NA also provided an analysis of agencies and many educational resources.¹⁵¹

Additionally, listed on SPARC NA's website are fifteen other active policy priorities at the time of this research.¹⁵²

5.4.1.1.2 Regulative Relational Systems

Regulative Relational Systems are the governance systems that comprise either authority or power (Scott, 2004). "Such governance systems are viewed as creating and enforcing codes, norms, and rules, and as monitoring and sanctioning the activities of participants" (Scott, 2008, p. 82). According to Heather Joseph, SPARC NA is often afforded by its members and core interactors the authority, resources, and responsibility for specific program outcomes through legislation and policy advocacy (personal communication, October 15, 2019). These are reflected not only in the legislative policy outcomes that SPARC NA advocates for, but also in SPARC NA's own organizational relational systems outlined in the organization's Governance

¹⁵⁰ SPARC NA Executive directive on Public Access. Retrieved December 2020 from <https://sparcopen.org/our-work/2013-executive-directive/>

¹⁵¹ SPARC NA Executive directive on Public Access. Retrieved December 2020 from <https://sparcopen.org/our-work/2013-executive-directive/>

¹⁵² SPARC NA What We Do. Retrieved December 20, 2020 from, <https://sparcopen.org/what-we-do/active-policy/>

Documents and the Steering Committee and Advisory Board, and then articulated to the greater membership via the Membership Communication.¹⁵³

Furthermore, the SPARC NA organization and its legislative activities have been accepted and institutionalized within the library community, as many of the members are libraries. They are also within the global open access movement, as its mission, strategies, and activities and have been adopted and modeled by the other organizations (SPARC Europe, SPARC Africa).

5.4.1.1.3 Regulative Routines

For the regulative pillar, regulative routines and activities are those protocols and standard operating procedures (SOPs) that become entrenched in the daily operations that they can impart regulative legitimacy to the institutional actor (Scott 2014, p. 102). For SPARC NA, regulative routines include regular member communications, the facilitation of member groups (events for, and working groups based on, arising issues), the communication of legislative updates and resources/materials, and the provision of regular educational/advocacy materials.

5.4.1.1.4 Regulative Artifacts

Regulative artifacts are material objects that are discrete and created by people under physical/cultural influences (Suchman, 2003). Artifacts that carry the regulative pillar of institutionalization include “objects that comply with and show compliance with legal/regulatory requirements, such as policy documents and displayed certification/documents conforming to legal constraints” (Scott, 2001 p. 61).

¹⁵³ SPARC NA Who we are Program Plan. Retrieved Dec 2020 from, <https://sparcopen.org/who-we-are/program-plan/>

Social media could be considered a regulative artifact, and in this case, SPARC NA helps in the “regulation” of members’ interactions and behaviors with legislators, consequently creating a governance structure (Hercheui, 2011). SPARC NA extends itself into the online community often; for example, after a legislative victory, it will ask for members to share or thank those responsible, including Senators, or Congresspeople who sponsored open policy. Here is an example email:

Subject: Re: [SPARC] Letter to Congress requesting FY18 funding for open textbooks

From: Nicole Allen-To: sparc-members@sparcopen.org-Cc: Date: March 15, 2018 at 6:08 AM

Dear all,

Well, we have a case of best laid plans... Late last night Congressional leaders conceded that they would need to further delay release of the bill due to ongoing negotiations over a set of contentious policy issues. They are now shooting for release over the weekend or early next week, ahead of the must-pass deadline of March 23 to avoid another government shutdown.

While negotiations are still ongoing, it is CRITICAL that we keep up advocacy efforts to ensure our goal of \$10 million for open textbook grants gets in—and stays in—the final FY18 omnibus appropriation bill. So we’re asking for your continued help between now and Monday.

TAKE ACTION BY MONDAY

(1) Call Congress. Below are a set of key Congressional decision-makers. If any of them represent you, please consider picking up the phone to call and support a \$10 million appropriation for open textbook grants in the FY18 omnibus bill. Calls make the biggest difference with timely advocacy campaigns and are essential to reinforce the message in our letter. Any/all help makes a difference.

(2) Tweet with #opentextbooksFY18. Be sure to mention your senators and congresspeople in the tweet, and

link to our action page so others can join in too: <https://sparcopen.org/open-education/open-textbooks-action/>

ACT NOW: Call Congress to support \$10M for open textbook grants in the FY18 omnibus bill. We need #opentextbooksFY18! <https://sparcopen.org/open-education/open-textbooks-action/> @SPARC_NA

Hey [mention congress person]! NY students need you to support #OpenTextbooksFY18: \$10M in the FY18 omnibus to support open textbook grants to make college more affordable.

Fellow [state demonym, e.g. New Yorkers]! Call [mention congress person] and say you support a \$10M appropriation for open textbooks in the FY18 budget to make college more affordable. <https://sparcopen.org/open-education/open-textbooks-action/#OpenTextbooksFY18>

5.4.1.2 SPARC NA: Normative Pillar

The normative pillar “emphasizes appropriate standards of behaviors and stipulates how behaviors may exist within the existing structures and therefore includes values, expectations, taboos, roles, conventions, practices, protocols, and traditions” (Scott, 2008, p. 64). The carriers of the normative pillar include: the values and principles that underpin practice; the expected standards; prevailing customs; and accepted patterns of appropriate practice (Scott 2014).

Table 5.17 summarizes the normative elements present in the data collected and situated within the four types of carriers: “symbolic systems, relational systems, routines, and artifacts” (Scott, 2001, p. 70). After the table the findings of the carriers are explained in more detail.

5.4.1.2.1 Normative Symbolic Systems

The normative symbolic system reflects the values and expectations of actors involved in the SPARC NA organization. The normative elements, i.e., norms and roles, are rigid expectations relevant to social order (Scott, 2004). For the SPARC NA organization, I observed that examples of normative symbolic systems included elements that mirrored the professional values and expectations of leadership surrounding the library profession. SPARC NA’s

leadership in open access is one of the influential normative characteristics that is taken up by the organization. SPARC NA can use its “expertise” to get “buy-in” from the library profession, and then the organization can “enforce” rules when expectations are not complied with.

Table 5.17 Scott’s (2008) Normative Pillar and Carriers SPARC NA

Carriers	Normative
Symbolic Systems	<p style="text-align: center;"><u>Values, Norms, Expectations</u></p> <p>Leadership Focus Social-Technical expertise</p>
Relational Systems	<p style="text-align: center;"><u>Regimes, authority systems</u></p> <p>Communities of practice Association relationships</p>
Routines	<p style="text-align: center;"><u>Jobs, roles, obedience to duty</u></p> <p>Oversight of the field</p>

Source: Data Analyzed by Jennifer Beamer and Framework Adapted from Scott, 2001; pp. 55-85.

For example, SPARC NA Director Heather Joseph in 2017 spoke to the membership about perceived concerns around the current trends and developments in the infrastructure space. Thereafter SPARC NA hosted discussions on exactly what was meant by the term “community-controlled infrastructure.” (H. Joseph, personal communication, October 15, 2019). SPARC NA was then able to convene membership meetings to discuss the role of the SPARC NA organization and IR infrastructure, a space in which SPARC NA has not led before.

However, because of the expertise of the SPARC NA staff, there was immediate turnaround and agreement from the membership that this was an area appropriate for SPARC on which to further engage. Subsequent to those conversations, “SPARC secured respected market analyst Claudio Aspesi to produce a comprehensive analysis of commercial strategies in

infrastructure across the higher education sector” (N. Shockey, personal communication, November 7, 2019). SPARC NA then tasked Aspesi to help the organization identify key areas of vulnerability, and to highlight specific points of potential community leverage, and “community-controlled infrastructure”. This has now become a leadership area and part of the SPARC NA socio-technical expertise (N. Shockey, personal communication, November 7, 2019). The observed easygoing acceptance of this change in SPARC NA’s role is due to the organizations’ and memberships’ similar values and expectations around open access.

5.4.1.2.2 Normative Relational Systems

For the normative pillar, relational systems that act as carriers include: the institution’s authority structure; the way authority-based relationships work to ensure compliance to norms; the legitimacy of the power of those within that structure; and the institution’s accountability structure (Scott, 2004). For SPARC NA, as a voluntary membership organization many of the norms are not enforceable; rather conformance to the norms depends on the professional standards of members and their sense of professional obligation.

The authority systems that give legitimacy to the activities of SPARC NA are the membership, particularly the high-level administrations that in general are the decision makers of the institutions who choose to become members of SPARC NA. SPARC NA and the members appear to maintain a number of relational systems based on normative expectations. Members joined the group for resources and to contribute voluntarily to a community of practice. Within the communities of practice, they have shared interests in open access. They build normative relational systems based on a sense of responsibility towards the purpose of the group, and most likely due to their roles in the profession.

Additionally, normative relational systems are those regimes and authority systems grounded in valued professional expertise, as validated by experience, education, training, and professional certifications (Scott, 2004). SPARC NA has focused since 2019 on building Open Education Leaders, through their Open Education leadership program, “an intensive (yearlong) professional development program to empower academic professionals with the knowledge, skills, and connections to lead successful open education initiatives that benefit students.”¹⁵⁴

An additional way that the SPARC NA organization creates authority-based relationships to ensure compliance to norms is through the facilitation of places/spaces for conversations that lead to action. Some examples of recent projects that SPARC NA has provided a regime of support for open infrastructure have included:

1. “Catalyzing the creation, funding and staffing of the new global ‘Invest in Open Infrastructure’ initiative to create an avenue for critical collective investments”
2. Developing plans for multi-stakeholder approaches to collectively fund open resources
3. Advising nonprofit publishers and other resource providers on designing effective open business models”¹⁵⁵

5.4.1.2.3 Normative Routines

Normative routines at SPARC NA are the daily activities that directly result from the professional roles, duties, and responsibilities held among the leadership and staff (Scott, 2004). In my observations of activities, interviews, and informal discussions, in observations at activities and meetings, I witnessed a “sense of obedience to duty” that was characterized by a general sense of wanting to help and share. The SPARC NA staff communicated that they feel an obligation to be transparent in “sharing the ‘what they do’ of their everyday work, as they feel that they are responsible

¹⁵⁴ SPARC NA. Open Education Leadership Program. Retrieved Sept 2020 from <https://sparcopen.org/our-work/open-education-leadership-program/>

¹⁵⁵ SPARC NA Program Plan 2020. Retrieved November 2020 from <https://sparcopen.org/who-we-are/program-plan/>

for showing the ‘value of the membership dues’, not only just with the ‘bigger events or happenings that occur’ (N. Shockey, personal communication, November 7, 2019; H. Joseph, personal communication, October 15, 2019; N. Allen, personal communication, November 6, 2019).

Heather Joseph shared that they frequently remind the membership the ways that SPARC NA does their daily work (Heather Joseph, personal communication, October 15, 2019). This is articulated on the SPARC NA website and in many of the membership communications.

Here is an example of their day-to-day routines:

“We have opted for flexible co-working space that reflects our distributed structure and reduces our overhead...We have revamped our programs, eliminating our large annual meeting in favor of increased campus visits and local events to meet our members where they live, ensuring greater opportunities for community participation.” (November 2019, SPARC NA Monthly Member Update email).

Other day-to-day routines of the SPARC NA staff include specialized activities requiring unique projects, task activities that arise in an unpredictable fashion, and system-driven but cyclically occurring activities that occur within the higher education calendar. There are also the legislative cycles of the United States Congress, or when libraries and institutions decide to break a “big deal” vendor agreement. Therefore, a prevailing normative routine of the SPARC NA organization is conducting formal communications with their members. They may include for example, official requests for information, membership meeting drafting positions on policy, and formal communications with legislators—all of which are in the sole purview of the SPARC NA organization (rather than at the level of consultations with membership). This is an expected normative routine of SPARC NA, rooted in the delegations of authority and experience and professional training of the SPARC NA staff.

More informal routines for SPARC NA include providing advice to membership and colleagues, attending meetings, preparing draft documents, and facilitating working groups.

5.4.1.3 SPARC NA: Cultural Cognitive Pillar

The cultural-cognitive pillar includes shared convictions and frames that give a perception about the world and its meaning. It includes beliefs, mental models, categories, identities, schemas, and scripts (Scott, 2004).

Table 5.18 summarizes the Cultural-Cognitive elements present within the data collected and situated within the four types of carriers “symbolic systems, relational systems, routines, and artifacts” (Scott, 2001, p. 70). After the table the findings of the carriers are explained in more detail.

5.4.1.3.1 Cultural-Cognitive Symbolic Systems

Carriers of the cultural-cognitive pillar are concerned with shared conceptions of the nature of reality and common sense-making. They are also symbolic in nature, and relate to classifications, groupings, frameworks, and models (Scott, 2014, p. 227). For SPARC NA, the open access IR is a cultural-cognitive symbolic system. SPARC NA’s members are the owners of their own IR’s infrastructure’s. Each university or research institution purchases and manages it. However, the SPARC NA organization has no “direct influence” on the content or management of that infrastructure. SPARC NA shares their conception of “how IRs should be”. The most influential symbolic system is the SPARC NA 2002 position paper written by Rayn Crow. Still referenced by SPARC NA and used in IR work, the paper set the classifications, groupings, frameworks and models that IRs should follow to present day (Crow, 2002, p. 16).

Table 5.18 Scott’s (2008) Cultural-Cognitive Pillar and Carriers for SPARC NA

Carriers	Cultural-Cognitive
Symbolic System	<p style="text-align: center;"><u>Categories, typifications, schema</u></p> <ul style="list-style-type: none"> - Institutional repositories (at member institutions) - SPARC 2002 White Paper
Relational systems	<p style="text-align: center;"><u>Structural Isomorphism, Identities Structural isomorphism:</u></p> <p style="text-align: center;"><u>Identities: Social identities.</u></p> <ul style="list-style-type: none"> -Relationship with Library organizations -Relationships with SPARC affiliates and coalition partners
Routines	<p style="text-align: center;"><u>Scripts</u></p> <ul style="list-style-type: none"> -Program Advocacy -Education and Training
Artifacts	<p style="text-align: center;"><u>Objects possessing symbolic value</u></p> <ul style="list-style-type: none"> -Branding -Awards and Recognition

Source: Data Analyzed by Jennifer Beamer and Framework Adapted from Scott, 2001; pp. 55-85.

5.4.1.3.2 Cultural-Cognitive Relational Systems

Cultural-cognitive relational systems consist of structural isomorphism and identities that make actors in the group similar to each other (DiMaggio and Powell, 1983). Cultural-cognitive relational systems can be described as those forces creating isomorphic structures and identities that tend to make organizations similar from one to another (Scott, 2014, p. 216). Cultural-cognitive relational systems assist in the establishment of the organizational identity of SPARC NA. In other words, with the cultural-cognitive relational system, SPARC NA organization seeks

to define their identity, how they distinguish their roles and authority, and how they perform in the context of their responsibilities.

SPARC NA's historical ties to the library community and its initial role as a project of the Association of Research Libraries has defined its identity with the library community. This role was also reinforced by the fact that in the early 2000s, many North American university and college libraries began coordinating and/or administering IRs systems as an extension of the libraries-digital library role.

Presently in North America, IRs are typically managed via each university or institution – possibly even within an individual institution's research office, academic affairs office, or graduate school. Historically, “libraries, by nature of their experience manage informational resources, and the ‘scholarly publication process’—scholarly journals, database subscriptions, took the lead in coordinating the establishment, structure, implementation, and maintenance of IRs” (Dubinsky, 2014, p. 4). SPARC NA became instrumental as partners with the libraries (or the librarian serving as the IR administrator), as advocates and educators (promoting open access, promoting the institution's value as a generator of scholarship), and often as facilitators (addressing faculty concerns, faculty participation, copyright, publisher pushback) (Dubinsky, 2014, p. 4). SPARC NA has built their identity around many of the identities of those who work in libraries and IR support.

Additionally, SPARC NA's identity is deeply tied to advocacy as policy and political lobbyists for open access. They also look for opportunities for expanding relationships with its coalition partners-domestically, building on projects that give control back to its memberships and SPARC global affiliates.

5.4.1.3.3 Cultural-Cognitive Routines

Carriers of the cultural-cognitive pillar are categorized as “activities classifications, representations, frames, schemas, prototypes, and scripts used to guide behavior” (Scott, 2014, p. 97). Schank and Ableson (1977, p. 210) assert that “a script is a predetermined, stereotyped sequence of actions that defines a well-known situation”. Furthermore, Barley and Tolbert suggest that institutions are enacted through scripts that are “observable, recurrent activities and patterns of interaction characteristic of a particular setting” (1997, p. 98).

The cultural-cognitive routines characterizing the SPARC NA organization take the shape of “scripts” that an actor might follow in performing a given role. Such scripts exist for SPARC NAs advocacy, i.e., language and behavior that constantly reinforces the need for open access and education. SPARC NA staff provide to its membership scripts that reflect ways of interacting, and behaviors that serve as a cultural and cognitive linking vehicle for those who need to be educated on open access practices.

For example, one recent behavioral routine being habitualized and scripted for members is “negotiating with serials vendors”. A community of practice has been formed around the behaviors of negotiating. SPARC NA staff are known to be good negotiators in dealing with legislative policy, and thus facilitating practice among members, providing other members as examples who have engaged in this behavior, and providing documentation on how to negotiate. These scripts are then shared among the membership community.

5.4.1.3.4 Cultural-Cognitive Artifacts

Scott (2014, p. 47) defines cultural-cognitive artifacts as “objects possessing symbolic value.” For SPARC NA, the most obvious artifact is their logo as a cultural-cognitive artifact. As a membership benefit, SPARC NA allows members to display the logo shown in Figure 5.7 in concert with their institutional affiliation.

Figure 5.7 SPARC NA Logo as of 2016



Source: SPARC NA Logo. Retrieved December 2020 from, <https://sparcopen.org/>

Second, SPARC NA regularly publicly awards the “SPARC Innovator Award”. The award can be for an individual, a group of people, an institution, or another group that has been active in the areas that SPARC NA is committed to. According to SPARC NA

“their actions may be broadly defined and may include online activity (i.e., postings on listservs and Web sites); on-campus programs and conferences; writing and editing (i.e., articles and books); promoting awareness and activism among others; and creating technologies and/or programs.”¹⁵⁶

While there is no monetary recognition, SPARC NA feels that the public recognition is of symbolic value to the community at large.

Finally, there are numerous digital tangible artifacts that SPARC NA has created and shared, as guides that are characteristic to SPARC NA, which over time have accumulated value particularly during 2020’s pandemic budget cuts. Three guides used to change the behavior of memberships spending and negotiating are:

¹⁵⁶ SPARC Innovator Award. Retrieved December 2020, from <https://sparcopen.org/our-work/innovator/>

1. SPARC NA Big Deal Knowledge Base—a database “which puts libraries on a more level playing field with vendors by detailing what thousands of peer institutions have paid for journal subscription packages.”¹⁵⁷

2. OER State Policy Tracker—a document which “catalogs existing policies and ongoing developments state-by-state and will be updated weekly throughout the year.”¹⁵⁸

3. SPARC Roadmap for Action—to inform discussions on ensuring academic institutions control their data and data infrastructure.¹⁵⁹

5.4.2 Organizational Characteristics and Influences of SPARC JP

In this section, data collected and analyzed via the lens of Scott’s Institutional Theory is presented. Table 5.19 depicts the main findings within an institutional analytic framework when SPARC JP was examined. For each pillar and institutional carrier, the characteristics of the organization are listed and will be further described in the narratives presented in the rest of the section.

5.4.2.1 SPARC JP: Regulative pillar

The Regulative pillar includes rules, laws, regulations, governance systems, surveillance, conformity, sanctioning, rewards and punishments that constrain and regularize behaviors (Scott, 2014, p. 96). Table 5.20 summarizes the regulative element as situated within the four types of carriers “symbolic systems, relational systems, routines, and artifacts” (Scott, 2001, p. 70). After the table the findings of the carriers are explained in more detail.

¹⁵⁷ SPARC NA Big Deal Knowledge Base Retrieved December 2020 from, <https://sparcopen.org/our-work/big-deal-knowledge-base/>

¹⁵⁸ OER State Policy Tracker. Retrieved December 2020, from, <https://sparcopen.org/our-work/state-policy-tracking/>

¹⁵⁹ SPARC Roadmap for Action. Retrieved December 2020, from, <https://infrastructure.sparcopen.org/roadmap-for-action>

Table 5.19 SPARC JP Main Findings of the Institutional Theory Framework Applied.

	Pillars		
Carriers	Regulative	Normative	Cultural-Cognitive
Symbolic Systems	<u>Rules, Laws</u> - Mission and Goals -2000 eJapan Law	<u>Values, expectations</u> -Leadership - Social/Technical expertise	<u>Categories, typifications, schema</u> -Japan Dublin Core Schema
Relation Systems	<u>Governance and Power Systems</u> -NII and government hierarchy -Steering committee boards, members, advisors -Relationships with stakeholders, JPCOAR, MEXT, JSPS, JST and mandated deposits	<u>Regimes, authority systems</u> -Working Groups and Task Forces -Core Group relationships	<u>Structural Isomorphism Identities</u> -SPARC affiliate - Aspiration to Participate in international activities
Routines	<u>Protocols, SOPs</u> -Justifying technical requirements	<u>Jobs, roles, obedience to duty</u> - Trainings and Seminars and Communications - Archive and International Reporting	<u>Scripts</u> -Education -Advocacy
Artifacts	<u>Objects conforming to mandated specifications</u> -JAIRO Cloud/WEKO IR Platform	<u>Objects meeting conventions, standards</u> n/a	<u>Objects possessing symbolic value</u> -Branding-logo - JPCOAR membership

Source: Data Analyzed by Jennifer Beamer and Framework Adapted from Scott, 2001; pp. 55-85.

Table 5.20 SPARC JP Regulative Pillar and Carriers

Carriers	Regulative
Symbolic Systems	<p style="text-align: center;"><u>Rules, Laws</u></p> <ul style="list-style-type: none"> -Mission and Goals -Yearly Program Plans -Law of 2000 eJapan
Relational Systems	<p style="text-align: center;"><u>Governance and Power Systems</u></p> <ul style="list-style-type: none"> -NII and government hierarchy -Steering committee boards, members, Advisors -Relationships with SPARC NA stakeholders, JPCOAR, MEXT, JSPS, JST and mandated deposits
Routines	<p style="text-align: center;"><u>Protocols, SOPs</u></p> <ul style="list-style-type: none"> -Justifying technical requirements - Planned University Seminars and Trainings
Artifacts	<p style="text-align: center;"><u>Objects conforming to mandated specifications</u></p> <ul style="list-style-type: none"> -WEKO IR

Source: Data Analyzed by Jennifer Beamer and Framework Adapted from Scott, 2001; pp. 55-85.

5.4.2.2 Regulative Symbolic Systems

Regulative symbolic systems include “rules and regulations, the group rules, the purpose of the group, ownership of the group, and protocols” (Scott, 2008, p. 261). These rules and regulations are considered the “legitimate” regulative pillar of the groups, and as such are officially sanctioned regulative symbolic systems which may provide legitimacy to the

organization (p.261). For SPARC JP symbolic systems present in the regulative pillar were found in documents such as their Mission and Goals, Yearly Program Plans, and eJapan 2000 Law.

SPARC JP is part of the Japanese government organization NII that is hierarchical in nature, led by a designated director with compensated employees. SPARC JP is connected to many group interactors, including other government agencies, and staff at Japanese universities and research institutions that it serves. SPARC JP claims they have large base of people from those universities and institutions who participate in the activities of SPARC JP, and those are related to the other organizations under the umbrella of the NII.

Analysis of the data showed that some examples of regulative symbolic systems of SPARC JP (particularly the Scholarly and Academic Information Division, under the Cyber Science Infrastructure Development Department of NII) include having a mission statement and goals, yearly program plans, and multiple written advocacy and policy actions via government legislative interactions. For SPARC JP, legislative interactions are powerful contributors to its regulative pillar, as they provide the legally sanctioned basis for legitimacy for stakeholder groups and their interactors. According to the SPARC JP staff, the organization is generally recognized as the lead organizational entity directing education and overseeing specific program outcomes around open access (Koh Sugawara, personal communication, May 23, 2019). SPARC JP is responsible for both domestic information on practices and advancements, and for providing information on international open access initiatives.

An interesting characteristic that gives legitimacy to SPARC JP was mentioned in several conversations and seminars I observed, and also mentioned in several reports in the early

conceptions of the NII as supporting academic infrastructure: That was the role of the “eJapan 2000 Strategy” and subsequent Law.

In the 1990s, Japan had a national policy that aimed to prioritize transforming Japan into an information-intensive society. Japan had lagged behind other nations, with an underdeveloped PC and internet infrastructure. This became an architectural choice point (as discussed in Section 5.3.2.7) to use regulative rules and laws to embrace an IT infrastructure change in all aspects of computer and communications technologies (IT Strategy Headquarters 2001a, Sec. 1.1).

According to one SPARC JP staff, the e-Japan Strategy is reminiscent of traditional Industrial Policy, where the government designates resources to target strategic industrial sectors, which has happened frequently in Japanese political economic institutions.

5.4.2.1.1 Regulative Relational Systems

Regulative Relational systems are governance systems that consist of either authority or power (Scott, 2001). “Such governance systems are viewed as creating and enforcing codes, norms, and rules, and as monitoring and sanctioning the activities of participants” (Scott, 2008, p. 82).

One of the main points of legitimacy of the SPARC JP organization originates from its regulative relation system, with SPARC JP as a government-initiated project with government funding. SPARC JP’s legitimacy in terms of education and advocacy work is also strengthened by its position within NII, and its relation to other key government agencies, such as CITI, JPCOAR, JUSTICE, RCOS, and the larger governmental MEXT, JSPS, and JST. Governance and power in the regulative pillar is revealed by the contributions of the SPARC JP’s Steering Committee and its advisors, who create the program plans, and whose members are researchers and academics from universities in Japan. It is also clear from SPARC JP staff interviews, and in

their practices of documenting and archiving all of their historical activities in reports in both English and Japanese, that they wish to build legitimacy both domestically and internationally.

Finally, SPARC JP's relationships with its government stakeholders create many of the enforcing codes, norms, and rules. SPARC JP provides education and training around many of the stakeholders' rules, e.g., JST mandates on the deposit of funded research on open access platforms like JSTAGE; SPARC JP runs trainings and seminars on the practices around this.

5.4.2.1.2 Regulative Routines

For the regulative pillar, regulative routines and activities are those protocols and standard operating procedures (SOPs) that have become so entrenched in the daily operations of the organization that they can impart regulative legitimacy to the institutional actor (Scott, 2004 p. 213). For SPARC JP, regulative routines include “providing education and support for the development of IRs and collaboration among individual universities via the JPCOAR membership.¹⁶⁰ While initially SPARC JP promoted the use of IRs, now in partnership with JPCOAR it “promotes and educates on various aspects of technical and systemic problems relating to the creation and operation of IRs, aiming to procure practical outcomes oriented to the resolution of these problems.”¹⁶¹

According to the SPARC JP staff, SPARC JP in collaboration with the NII has provided “universities in Japan with valuable information, guidance and training for on IR plans. This includes manuals and reports on all repositories operating in Japan, as well as Japanese-language

¹⁶⁰ SPARC JP Annual report 2017. Retrieved December 2020 from, https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2017-E.pdf

¹⁶¹ SPARC JP Annual report 2017. Retrieved December 2020 from, https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2017-E.pdf

translations of IR materials published by SPARC JP and various international organizations and institutions.”¹⁶²

5.4.2.1.3 Regulative Artifacts

Regulative artifacts are material objects that are discrete and created by people under physical/cultural influences (Suchman, 2003). Artifacts that carry the regulative pillar of institutionalization include objects that comply with legal/regulatory requirements, such as policy documents and displayed certifications conforming to legal constraints (Scott 2008, p. 213). Scott (2004) defines regulative artifacts as objects complying with mandated specifications.

I propose that the JAIRO Cloud/WEKO IR platforms are regulative artifacts for SPARC JP, as the IR platform is an actual technical infrastructure, i.e., a technical artifact that has been funded by law, and complies with technical standards of IRs set by the NII. According to SPARC JP the contents of Japanese IRs have grown significantly (Akira Niitsuma, personal communication, May 23, 2019). Statistics on the number of items in the NII funded repository are freely available to access¹⁶³ and the types of materials and numbers of contents in the NII JAIRO Cloud are listed in Table 5.21.

¹⁶² NII Graduate Program. Retrieved December 2020 from <https://www.nii.ac.jp/graduate/en/curriculum/>

¹⁶³ IR Contents National Institute for Informatics may be accessed here. Retrieved January 2021 from <https://dev.irdb.nii.ac.jp/en/statistics/all?year=2019andmonth=All>

Table 5.21 Contents of Japanese IRs as of 2021.

Item Numbers by Type of Material with (number of contents)

- departmental bulletins paper- Kiyō (1,450,518)
- journal articles (554,361)
- other (377,165)
- theses (212,056)
- conference papers (181,413)
- articles (89,601)
- research reports (89,178)
- doctoral theses (74,808)
- conference objects (67,793)
- datasets (64,295)

Source: National Institute for Informatics.

<https://dev.irdb.nii.ac.jp/en/statistics/all?year=2019andmonth=All>, Accessed January 2021.

Interestingly, *Kiyō* (departmental bulletins) are still the top content in JAIRO Cloud. Journal articles which were the focus of SPARC JP, with a goal of international open access distribution still lag behind.

5.4.2.2 SPARC JP: Normative pillar

The normative pillar includes values, expectations, taboos, roles, conventions, practices, protocols, and traditions (Scott, 2004). Table 5.22 summarizes the normative element as situated within the four types of carriers “symbolic systems, relational systems, routines, and artifacts” (Scott, 2001, p. 70).

Table 5.22 Scott's (2008) Normative Pillar and Carriers for SPARC JP

Carriers	Normative
	<u>Values, Norms, Expectations</u>
Symbolic Systems	<ul style="list-style-type: none"> - Leadership - Social-Technical expertise
	<u>Regimes, authority systems</u>
Relational Systems	<ul style="list-style-type: none"> -Working Groups and Task Forces -Core Group Relationships
	<u>Jobs, roles, obedience to duty</u>
Routines	<ul style="list-style-type: none"> - Trainings, Seminars, and Communications - Archive and International Reporting

Source: Data Analyzed by Jennifer Beamer and Framework Adapted from Scott, 2001; pp. 55-85.

5.4.2.2.1 Normative Symbolic Systems

The normative symbolic system reveals the values and expectations of actors involved in the SPARC JP organization (Scott, 2004 p. 97). The elements, i.e., norms and roles, are also relevant to social order (Scott, 2004).

For SPARC JP the normative symbolic system is prevalent in SPARC JP's values and expectations, which center on their leadership role in planning and facilitating open access activities in Japan. Additionally, SPARC JP is engaged in the communication of domestic Japan activities to the international community. They state that they do this "in alliance with US SPARC" (SPARC JP). SPARC JP staff made clear in interviews that SPARC JP is the main

leader of advocacy activities to encourage participation in the development of open access, as well as the larger system of scholarly publishing and communication (Akira Niitsuma, personal communication, May 23, 2019).

Second, SPARC JP staff consider themselves to be the socio-technical experts¹⁶⁴ in the coordination of open access education, and they do this by coordinating both the technical and social groups, like JPCOAR and JUSTICE, under the Cooperation Promotion Council, which links the NII with university libraries.¹⁶⁵

5.4.2.2 Normative Relational Systems

For the normative pillar, relational systems act as carriers that include: “the institution’s authority structure; the way authority-based relationships work to ensure compliance to norms; the legitimacy of the power of those within that structure; and the institution’s accountability structure” (Scott, 2001, p. 70). For SPARC JP, norms are not necessarily enforceable; conformance to norms depends on the professional standards of the SPARC JP audience and a sense of professional obligation.

One of the ways in which normative relational systems were visible is in the working groups and task forces that are coordinated by SPARC JP, but they tend to emphasize the collaboration with JPCOAR and the practice of depositing in JAIRO Cloud. For example, both the working groups and the task forces are created by NII (the regime), as evidenced in their minutes of NII meetings and yearly reports.¹⁶⁶ The members of the working groups and task

¹⁶⁴ I use “socio-technical experts” here in the way my interviewees did, as they themselves emphasized they were experts with a deep knowledge of the technology needed by their “community”.

¹⁶⁵ SPARC JP Annual report 2017. Retrieved December 2020 from, https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2017-E.pdf

¹⁶⁶ SPARC JP Annual report 2017. Retrieved December 2020 from, https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2017-E.pdf

forces are university employees and leaders in research (authoritative members). It should be noted that within those groups several of the members are also NII and SPARC JP staff.

Therefore, the groups are not autonomous; they are guided by NII's authority.

Additionally, the majority of the indirect core interactor groups that SPARC JP and the NII work and collaborate with are other governmental agencies, which have similar authority structures and legitimacy based in the Japanese government. As presented in section 5.3.2.2 (H2 Core Interactor Groups), the direct core interactor groups have been formed when a need was seen to advance the goals of SPARC JP.

5.4.2.2.3 Normative Routines

Normative routines at SPARC JP are the daily activities that are a direct result of the professional roles, duties, and responsibilities held among the leadership and staff (Scott, 2004). A sense of duty is apparent in the trainings, seminars, and communications activities that SPARC JP organizes. SPARC JP staff indicated in interviews that they are committed to providing trainings, seminars, and regular communications to their stakeholders. Koh Sugawara (the head of SPARC JP) stated during an interview that one of the most important roles of SPARC JP was providing training via the two or three highly organized seminars that SPARC JP hosted each year (personal communication, May 23, 2019). He said that the SPARC JP Seminar Planning Working Group (WG) throughout the year was assigned to plan the annual theme and each seminar.¹⁶⁷ Some of the WG members took charge of and implemented each seminar.

Additionally, all the materials, outlines of the seminars and trainings, newsletters, and videos are

¹⁶⁷ SPARC JP Annual report 2017. Retrieved December 2020 from, https://www.nii.ac.jp/sparc/en/publications/pdf/sparc_annual_2017-E.pdf

translated into English, and then are archived in both Japanese and English, on the SPARC JP website as a report of the events (Koh Sugawara, personal communication, May 23, 2019).

5.4.2.3 SPARC JP: Cultural-Cognitive Pillar

The cultural-cognitive pillar includes shared convictions and frames that give a perception about the world and its meaning (Scott, 2004, p. 109). It includes beliefs, mental models, categories, identities, schemas, and scripts. Table 5.23 summarizes the Cultural-Cognitive elements are present within the data collected and situated within the four types of carriers: “symbolic systems, relational systems, routines, and artifacts” (Scott, 2001, p. 70). After the table the findings of the carriers are explained in more detail.

5.4.2.3.1 Cultural-Cognitive Symbolic Systems

Carriers of the cultural-cognitive pillar are concerned with shared conceptions of the nature of reality and common sense-making; are symbolic in nature; and relate to classifications, groupings, frameworks and models (Scott, 2004, p. 75). For SPARC JP, JAIRO Cloud IR is a cultural-cognitive symbolic system. One example of this is the category/schema that JPCOAR and SPARC JP have created within a working group that addresses the “special nature” of metadata in repositories for Japan. The task of the working group is to create established standard metadata sets. In terms of bringing together other stakeholders, a total of 11 museums and archives have cooperated in the program, creating and experimenting with five sets of metadata: retrieval metadata, metadata for animated scenes, distribution control metadata, copyright metadata, and transaction metadata. The focus of the metadata sets is supposed to be integrated on JAIRO cloud with Dublin Core, a standard for global IRs.

Table 5.23 Scott's (2008) Cultural-Cognitive Pillar and Carriers

Carriers	Cultural-Cognitive
Symbolic System	<p><u>Categories, typifications, schema</u></p> <p>- Japan Dublin Core Schema</p>
Relational systems	<p><u>Structural Isomorphism, Identities Structural isomorphism:</u></p> <p><u>Identities: Social identities.</u></p> <p>- SPARC affiliates- SPARC NA</p> <p>- Participation in International Activities</p> <p>- SPARC NA in the NII organization</p>
Routines	<p><u>Scripts</u></p> <p>-Education and Advocacy</p>
Artifacts	<p><u>Objects possessing symbolic value</u></p> <p>-Branding</p> <p>- Archive</p>

Source: Data Analyzed by Jennifer Beamer and Framework Adapted from Scott, 2001; pp. 55-85.

The focus on this schema is because the current Japanese bibliographic data system is not consolidated efficiently. For example, Japan MARC, which was established by the National Diet Library, is a complicated system and is difficult for international use. On the other hand, WebCat, which is provided by NII, has a different system for its database, and most Japanese academic institutions have participated in it. Analysis of my data indicated the need to harmonize these currently incompatible bibliographic data systems before attempting to develop a standard metadata for working with digital archives. Many of the interviews I conducted, and the documents analyzed mentioned the Japan Dublin Core Schema working groups, and the need to

reflect global standards for IRs.

5.4.2.3.2 Cultural-Cognitive Relational Systems

Cultural-cognitive relational systems consist of structural isomorphism and the identities that make actors in the group similar to each other (DiMaggio and Powell, 1983). Cultural-cognitive relational systems can be described as those forces creating isomorphic structures and identities that tend to make organizations similar from one to another (Scott, 2004). Cultural-cognitive relational systems help establish the organizational identity of the SPARC JP organization.

SPARC Affiliates: is there Structural Isomorphism?

According to SPARC JP, in 2003, SPARC JP was founded, and after meeting with the now affiliate SPARC NA, SPARC JP as a project of the NII was developed. Structural isomorphism is a concept in Institutional Theory which is defined as the “similarity of the processes or structure of one organization to those of another, be it the result of imitation or independent development under similar constraints” (Scott, 2004, p. 99). It is the case that many of the initial documents of SPARC NA relay the same objectives as SPARC NA, when they both started in the late 1990s/early 2000s.

Initially, SPARC JP had most of the same goals of SPARC NA, that is “to keep in the hands of Japanese researchers the outstanding research results that they currently published abroad,”¹⁶⁸ to combat the rising cost of serials. Twenty years later, SPARC NA refers numerous times in its communications and reports to its affiliate SPARC NA. However, when I asked about the working relationship of SPARC NA and SPARC JP, I was told it was limited—that

¹⁶⁸ SPARC JP About US. Retrieved August 2020, from <https://www.nii.ac.jp/sparc/en/about/>

there are some challenges and fear around language barriers. Nevertheless, it was apparent that this is only in some interactions, as several times Heather Joseph, the director of SPARC NA, has visited the NII and participated in seminars.

Noted in the SPARC JP yearly reports and in interviews and documents of SPARC JP, it was clear that SPARC JP staff attend and present at North American and international conferences. For example, over the past 5 years staff at SPARC JP have attended more than 45 international conferences (8-10 per year) to present the work of SPARC JP, and to gather information from other presenters.

Structural Isomorphism within SPARC JP

Another interesting example of Structural Isomorphism within SPARC JP is that many of the direct core interactors are composed in similar ways for example JPCOAR is comprised of three main stakeholders:

- a. The Cooperation Promotion Council, which has the purpose of ensuring proper collection and greater dissemination of academic information.¹⁶⁹
- b. The Steering Committee, which is responsible for establishing basic policies for the operation of JPCOAR.¹⁷⁰
- c. The Japanese Coordinating Committee for University Libraries and the National Institute of Informatics (NII), which have the aim of enhancing coordination and cooperation in the Japanese university library community.¹⁷¹

These three same major stakeholders comprise JUSTICE as well.¹⁷² JUSTICE is placed under the Cooperation Promotion Council, a joint forum established by the Japanese Coordinating Committee for University Libraries and the NII. JUSTICE is composed of the Steering Committee, Working Groups, and the Secretariat, which is under the control of the Library

¹⁶⁹ About JUSTICE. Retrieved November 2019 from https://www.nii.ac.jp/content/justice_en/

¹⁷⁰ About JUSTICE. Retrieved November 2019 from https://www.nii.ac.jp/content/justice_en/

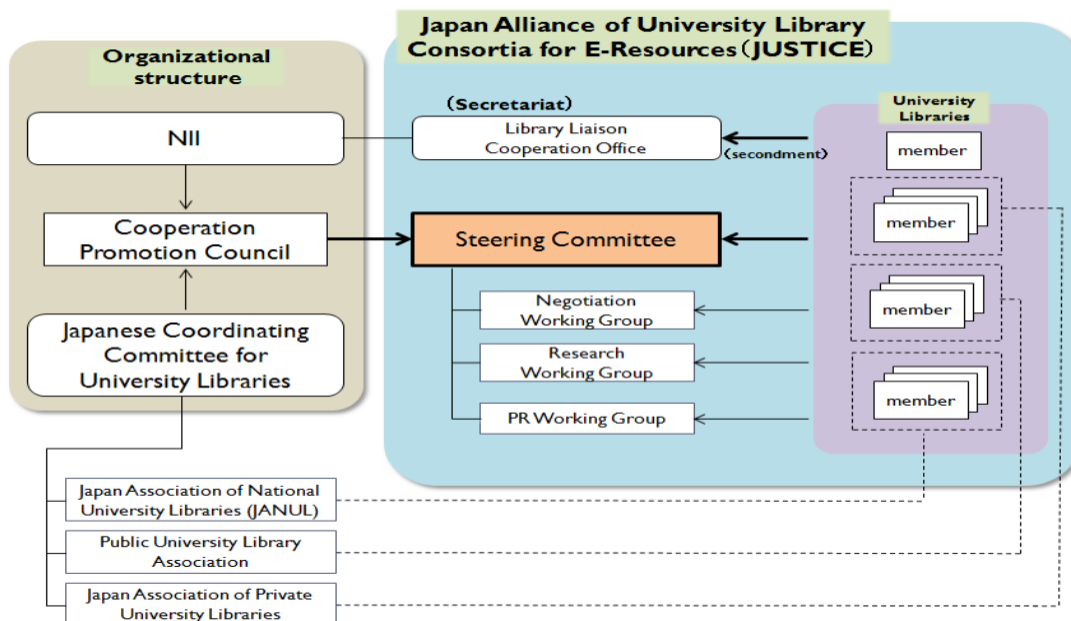
¹⁷¹ About JUSTICE. Retrieved November 2019 from https://www.nii.ac.jp/content/justice_en/

¹⁷² About JUSTICE. Retrieved November 2019 from https://www.nii.ac.jp/content/justice_en/

Liaison Cooperation Office of NII's Cyber Science Infrastructure Development Department.¹⁷³ I

believe these similarities exist because these organizations are all outgrowths of the NII. An example of each of the structures visually and their similarities is shown in Figures 5.8. and 5.9

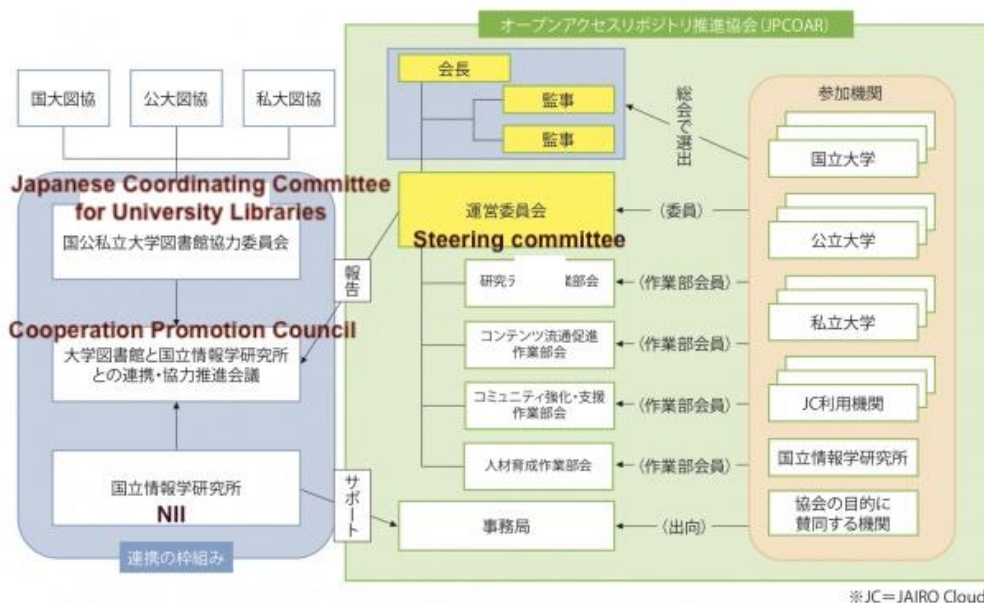
Figure 5.8 JUSTICE Organizational Structure



Source: Retrieved January 2021 from https://www.nii.ac.jp/content/justice_en/org/

¹⁷³ About JUSTICE. Retrieved November 2019 from https://www.nii.ac.jp/content/justice_en/

Figure 5.9 JPCOAR Organizational Structure



Source: Retrieved January 2021 from <https://jpcoar.repo.nii.ac.jp/page/39> and translated by Jennifer Beamer

5.4.2.3.3 Cultural-Cognitive Routines

Carriers of the cultural-cognitive pillar are categorized as activities relating to tendencies, inclinations and dominant modes, logics and discourse (Scott, 2004, p. 190). Schank and Ableson (1977, p. 210) argue that “a script is a predetermined, stereotyped sequence of actions that defines a well-known situation.” Cultural-cognitive routines characterizing the SPARC JP organization also at times take the form of “scripts” that an actor might follow in acting out a given role. Such scripts exist for the tools of open access advocacy, i.e., language and behavior, which constantly reinforce the need for open access and education.

SPARC JP staff provide scripts to its direct core group interactors that reflect ways of interacting and behaviors. These trainings and materials serve as a cultural and cognitive linking medium for those who need to be educated on open access. One example of the materials that SPARC JP creates is educational brochures that speak to a variety of audiences. An example of a

brochure is shown in Figure 5.10.

Figure 5.10 SPARC JP Brochure

International Scholarly Communication Initiative

The International Scholarly Communication Initiative (SPARC Japan) is a project to strengthen the electronic journals of the scholarly publications of Japan's academic societies, with a view to keeping in the hands of Japanese researchers the outstanding research results that are currently published abroad, and to further promote the international dissemination of research results. Progress in the digitization of scholarly journals has stimulated rapid change in the configuration of the distribution of research results; however, scholarly journals in Japan had not kept pace with this trend toward the digitization and international distribution.

Meanwhile, the project, which was launched in 2003 through support by the Ministry of Education, Culture, Sports, Science and Technology, has encouraged the digitization of scholarly journals, especially English language journals published in Japan, with SPARC Japan Publishing Partners. The aim of this project is to create a self-sustaining cost-recovery model that will enable the stable transmission of Japanese scholarly journals and improve their name recognition overseas.

The next three years beginning in 2006 is positioned as the 2nd term following the project of 2003-5. In this term, we will promote solutions to issues unresolved in the first term; implementing overarching support activities transcending academic societies; developing an environment that will foster independent scholarly journal publishing activities.

Goals of the International Scholarly Communication Initiative
During the 2nd term, we will develop operations based primarily on the following goals.

- Development of self-sustaining cost-recovery model**
We will encourage a shift away from conventional Japanese style publication to international publication including the promotion of site license contracts at university libraries and promote the independence of SPARC Japan Publishing Partners.
- Promotion of international collaboration**
With the encouragement of the conclusion of the MOU with SPARC, we will call attention to our activities on a global scale and provide support to expand sales channels worldwide with the aim of increasing and establishing the name recognition of Japanese scholarly journals.
- Development of advocacy activities**
We will provide opportunities to disseminate and share information through human resources training including continuous seminars for persons involved in scholarly journals. In addition, in regard to support for the development of a self-sustaining cost-recovery model, since the realization of site license contracts between libraries and academic societies requires the enhancement of the awareness of researchers who use the electronic journals, we will also promote the dissemination of public information and enlightenment activities for that purpose.

ACHIEVEMENT OBJECTIVES

- Independence and expansion of academic society publishing activities through the establishment of a self-sustaining cost-recovery model
- Expansion of global sales channels based on the promotion of journal digitization and international collaboration
- International transmission of academic research results and the establishment of a greater awareness of Japan's intellectual contributions

ACTIVITY ACHIEVEMENTS

- Launch of the biological journal package "Ushio Press"
- Collaboration with Project Euclid in a mathematical journal
- Support for launch of electronic version of English language journal in medical and electric engineering
- Promotion of electronic journal contracts with university libraries
- Development of advocacy activities for university libraries and academic societies

PROJECT ACTIVITIES

- Support for digitization and internationalization**
 - Creation of metadata
 - Development and introduction of an e-catalog and open access system
 - Provision of information regarding digitization, internationalization, etc.
- Continuous SPARC Japan seminars**
 - Collaboration of academic society executive office human resources
 - Exchange between SPARC Japan Publishing Partners
- Support for self-sustaining cost-recovery model development**
 - Electronic journal packages
 - Site license contracts with university libraries, etc.
 - Expansion of sales channels through collaboration with institutions overseas
- Dissemination of alternative and publicly targeted research and university libraries**
 - Collaboration with library committees
 - Survey of the most recent trends in scholarly communication and enlightenment activities
 - Collaboration with media/related organizations

Overseas

Initiatives have been developed in North America, Europe, etc., for the creation of competitive markets to revolve the problem of surging prices through support for the digitization of scholarly journals by researchers at the urging of university library organizations.

As a result, SPARC (Scholarly Publishing and Academic Resources Coalition) are being developed in the U.S. and SPARC Europe activities likewise in Europe. In addition, the open access movement, which seeks to provide unobstructed access to research results is also being developed centered in the U.S. and Europe, and activities involving government agencies, research assistance organizations and others are becoming more vigorous.

Related organization websites

- SPARC (U.S.) www.arl.org/sparc
- SPARC Europe www.sparceurope.org
- Project Euclid www.projecteuclid.org
- BioOne www.bioone.org
- Japan Association of National University Libraries (JANUL) www.soc.nii.ac.jp/janul
- Japan Association of Private University Libraries (JASPU) www.jaspul.org
- Japan Science and Technology Agency (JST) www.jst.go.jp

Source: SPARC JP website. Retrieved January 2020 from <https://www.nii.ac.jp/sparc/en/publications/pdf/April2008English.pdf>

5.4.2.3.4 Cultural-Cognitive Artifacts

Scott (2014) defines “cultural-cognitive artifacts as objects possessing symbolic value” (p. 104). For SPARC JP the most obvious artifacts are their logo as a cultural-cognitive artifact seen in Figure 5.11 Note that in concert with their institutional affiliation, SPARC JP’s logo is very similar to SPARC NA’s.

Figure 5.11 SPARC JP Logo as of 2018



Source: SPARC JP Logo. Retrieved December 2020 from, <https://www.nii.ac.jp/sparc/en/>

Finally, there are numerous artifacts of past communications, seminars, reports and trainings that SPARC JP has archived. Three examples which highlight valuable information used to change the behavior of memberships' spending and negotiating are the contents of the seminar, including videos; presentations; and all documents, which can be found on their events page.¹⁷⁴

5.5 Summary of Findings

This research argued that the support and use of IRs could not be fully understood without understanding the cultural, institutional, and social contexts in which they evolved, and in the social contexts in which they have been deployed and used (cf. Kling et al., 2005). This is especially clear when similar organizations between the United States and Japan are compared.

The results of this research show that SPARC NA and SPARC JP have complex socio-technical interaction networks. Furthermore, in examining the institutional pillars and carriers within the two organizations it was revealed that relationships highlighted the variances in influences, characteristics, and choices made by the organizations. The next chapter will discuss the findings and reveal the key concepts and themes as they relate to the literature.

¹⁷⁴ SPARC JP Events. Retrieved January 2020 from <https://www.nii.ac.jp/sparc/en/event/>

Chapter 6: Discussion and Results

6.1 Overview

In the previous chapter, the research findings were presented, key themes and concepts that emerged from using the STIN strategy were developed, and an institutional framework as a lens for the analysis of the data in this research were communicated.

Those findings as they relate to the socio-technical and institutional literature will be discussed in this chapter. The overarching goal of this research was to examine the socio-technical influences and characteristics of organizations and relationship to IRs to understand the cultural, institutional and social contexts in which they evolved, and “the social contexts in which they have been deployed and used” (Kling, Rosenbaum and Sawyer, 2005, p. 113). The two organizations that were investigated by this research were treated as case studies: SPARC NA and SPARC JP.

The goal of this research was to examine the ways in which information infrastructures consist of an assemblage of technical infrastructure, social norms, and organizational practices (Edwards et al., 2007). The main research questions of this dissertation were:

- R1. What socio-technical influences have contributed to variances in institutional repository infrastructure?
- R2. What organizational characteristics influence choices and uses of institutional repositories?
- R3. How do the variances illuminate the progression of IRs in organizations in Japan compared to similar organizations in the United States?

6.2.1 Socio-Technical Influences and Variances

Information infrastructure consists of an assemblage of technical infrastructure, social norms, and organizational practices (Edwards et al., 2007). When exploring the socio-technical environments of the two SPARC organizations, this research was successful in that it was able to explore and find evidence of both social and technical influences that highlighted the similarities and variances in the two organizations' institutional characteristics.

Using data from interviews and observations, content analyses of websites, and documents and textual materials gathered during fieldwork this research confirmed that SPARC NA and SPARC JP are key players in the organizational field of supporting, maintaining, and promoting open access information infrastructure.

Furthermore, both organizations have had distinctive socio-technical influences that led to variances in the way of providing support to institutional repository infrastructure. These influences have been heterogeneous for each organization. They have occurred over a long period of time, and the trajectories for their organizational characteristics, practices, activities, and choices have been made by the actors (humans) and actants (non-humans) participating in each of the organizational systems.

The STIN strategy revealed the mixed socio-technical elements and showed how their relationships had been brought together into SPARCs' complex networks. Even though at different times in the historical paths of the two organizations there was an emphasis on either the social or the technical, the results of this research "cannot be reduced either to technological determinism or to social determinism" (Kling et al, 2003, p. 66). The socio-technical variances were intertwined.

The results of the STIN analysis presented a useful lens with which to see the social relationships and the technical systems in which they were connected. The results of this research reveal that there were differences in the socio-technical influences for each organization that have led to variance in the ways they support open access repository infrastructure. The results suggest the following.

Complex organizational relationships: The findings of this research reveal that both SPARC NA and SPARC JP are not isolated organizations. In fact, their work is complex, dependent, and interconnected with many other organizations. The other core system interactor/organizations often have had both social and technical influences and an effect on the choices and trajectory of the SPARCs. In some cases, these other system and core group interactors have shared organizations with regulative, normative, and cognitive characteristics similar to the primary SPARC organization.

It was also found that many systems and core group interactors within the SPARCs that had often emerged as a project (or an offshoot of the organization) and were created by the main SPARC organizations when they saw a need. For example, in the case of SPARC NA (Coalition Partners), several were begun as projects that were at first “projects” initiated by SPARC NA. Additionally a number of the organizations and groups were also linked closely or had the same organizations as interactors with SPARC JP/NII (for example: JUSTICE, JAIRO).

Finally, many of the activities, meetings and working groups depend also on the labor of members (and in some cases non-members) who volunteer their time and skills contributing to projects and information resources. SPARC NA encourages other people to become involved, and members use their member resources to purchase value in the organization. Thus, SPARCs reputation as a source of good information is what Eschenfelder and Chase (2002) would refer to

as account-taking dependency; dependencies which “concern links or interactions based upon some kind of social rating” (p. 102). Kling et al. (2003) and Eschenfelder and Chase (2002) would consider membership funding as a “resource dependency based on interactions which need funding, for SPARC NA’s knowledge, skills, prestige and trust” (p. 102).

Who’s in and Who’s out: For each SPARC, there appeared to a number of people who were included or excluded in their activities. For SPARC NA, education, communication, and information about open access repository practices were provided based on a membership fee. However, at some point SPARC NA decided that the materials were meant to be shared with everyone. For SPARC JP, there was no member fee for education, communication, and information around open access repositories. However, if a university intended to participate in the NII repository JAIRO Cloud, then a fee was necessary, and several seminars and trainings then followed.

For SPARC JP it appeared that exclusions were rare. In fact, there appeared to be positive working relationships with many of the publishing vendors (for example Elsevier), for which SPARC JP was initially started, to address the rise in serials pricing. I expect that this may be because of the initial relationship of SPARC JP to its Japan Publishing Partners; many of those journals are society journals that have traditionally been hosted by such vendors.

For SPARC NA it was very clear in my observations that vendors/publishers were not permitted to participate. Over the past several years as many publishers began to purchase open access infrastructure, SPARC NA hired an industry analyst to understand better the impact of those purchases. SPARC NA also began to adjust its choices and strategies based on those publisher actions.

Embedded in multiple, overlapping, and non-technologically mediated social relationships (Kling et al., 2003, p. 57): The examination of both SPARC organizations revealed that the organizations and their interactors were “embedded in multiple, overlapping, and non-technologically mediated social relationships, and therefore may have multiple, often conflicting, commitments” (Kling et al., 2003, p. 57). STIN is a strategy that reveals networks that include people (including organizations), equipment, data, diverse resources (money, skill, status), documents and messages, legal arrangements and enforcement mechanisms, and resource flows (Kling et al., 2003, p. 48). SPARC JP appears to have the most multiple and overlapping interactors.

At times during the research, it was difficult to understand the relationship of SPARC JP to its other core organizations. Did they play a main role in many different agencies—as a disseminator of open access information? Or did they have influence over the open access repository by the nature of their location in the larger organization of NII? Further investigation showed in many cases that the trajectory of SPARC JP and its relationship to its core group interactors were often chosen for SPARC JP. These choices were embedded in historical choices on government directed economic activities, and then merged or changed later. Many of the technical systems required to support JAIRO cloud and the mandates, and education surrounding them were implemented by the Japanese government in the 1970s and 1980s.

SPARC NA appeared to have the most autonomy in deciding who it would interact with, and with how its strategies and choice were made. Based on a system of yearly program planning, there was a strategy of “pivoting” when events in the open access field changed. SPARC NA prides themselves on being able to adapt and assist their membership.

Origins of Infrastructure: SPARC NA's work was initiated in response to the academic publishing industry's serials high prices. The work of SPARC NA has until recently focused on collective action for its members. For SPARC NA, while there is no formal supported technical infrastructure for open access repositories (it is locally hosted at individual universities), SPARC NA indirectly supports technical *Infrastructure*, as SPARC NA education and advocacy activities rely on encouraging academics to practice open values by putting their work on someone's open infrastructure so that it might be made openly accessible.

Because SPARC JP resides under the umbrella of the larger NII, this allows for the direct support of the already existing academic cyber-infrastructure. Historically much of that infrastructure had been established through formal government agencies, both by edict and authority of the government of Japan.

In conclusion, as Kling et al. (2003) suggested, "a socio-technical network brings together people and equipment in ways that are not meaningfully separable for understanding 'how collaboratories work'." (p. 49). The use of the STIN strategy assisted in revealing within the two case studies the socio-technical relationships present within each organization. The STIN framework for analysis made it clear that the organizations, however formally or informally positioned, are both socio-technical arrangements. Therefore, the STIN strategy provided a structured image of how the two organizations supported IRs, and what social or technical influences contributed to the support of IR information infrastructure

This addressed the first research question. The dominant socio-technical influences that highlight the variances in IR support for the two SPARCs are summarized in Table 6.1.

Table 6.1 Summary STIN Findings for SPARC NA and SPARC JP

SPARC NA	SPARC JP
H1. Identify a relevant population of system interactors	
<ul style="list-style-type: none"> • SPARC NA Employees • Steering Committee • Member Advisory Groups • 200+ Members (universities, colleges, research institutions) 	<ul style="list-style-type: none"> • SPARC JP Employees (NII employees) • Steering Committee • Member Advisory Groups • 600+ Members (Japanese JPCOAR members universities, colleges, research institutions)
H2. Identify core groups	
<ul style="list-style-type: none"> • Coalition Partners • SPARC International Affiliates • Professional Associations- Association of Research Libraries • Government groups 	<ul style="list-style-type: none"> • Direct <ul style="list-style-type: none"> ○ The Japan Consortium for Open Access Repository ○ The JAIRO Cloud Community ○ Japan Alliance of University Library Consortia for E-Resources (JUSTICE) ○ NII Open Science Infrastructure Research Center (RCOS) • Indirect <ul style="list-style-type: none"> ○ The Council for Science, Technology and Innovation (CSTI) ○ The Ministry of Education, Culture, Sports, Science and Technology (MEXT) ○ The Japan Science and Technology Agency (JST) ○ The Japan Society for the Promotion of Science (JSPS)
H3. Identify incentives	
<ul style="list-style-type: none"> • Leadership • Training • Education • Communication • Legislative Action and Advocacy 	<ul style="list-style-type: none"> • Information regarding the distribution of scholarly information and academic resources. • Collaboration • Exposure to international open access initiatives

Table 6.1 Summary STIN Findings for SPARC NA and SPARC JP (continued)

H4. Identify excluded actors and undesired interactions	
<ul style="list-style-type: none"> • Non-members (some events, and information) • Those who do not practice open – especially large corporations – recently private reports for members only 	<ul style="list-style-type: none"> • No one appears to be excluded, unless repository needed (JPCOAR fee) • Publishers can participate
H5. Identify existing communication forums	
<ul style="list-style-type: none"> • Groups and networks • Meetings and in-person gatherings • Media (email, newsletters, reports, educational materials) • Online spaces • Events 	<ul style="list-style-type: none"> • Groups and networks • Media (email, newsletters, reports, educational materials) <ul style="list-style-type: none"> • Expansive online archive • Meetings and face-to-face gatherings <ul style="list-style-type: none"> • 3 x per year trainings and seminars activities
H6. Identify resource flows	
<ul style="list-style-type: none"> • space and operations <ul style="list-style-type: none"> ○ work from anywhere ○ work in congress, senate • staffing and expertise <ul style="list-style-type: none"> ○ Leadership in the field ○ Experts with knowledge of lobbying and Open 	<ul style="list-style-type: none"> • space and operations <ul style="list-style-type: none"> ○ government building Tokyo • Staffing and Expertise <ul style="list-style-type: none"> ○ Government, researchers, graduate students
H7. Identify system architectural choice points	
<ul style="list-style-type: none"> • Collective action: Librarians gathering formation of SPARC NA Organization 1997 • Focused Education and Lobby for Policy and legislation 2000 • Change in SPARC NA operations model 2014-2016 • Securing community-controlled infrastructure 2017 	<ul style="list-style-type: none"> • “Japan 2000 Strategy” and subsequent Law • 2000 reformation of NII • 2002 MEXT report and SPARC JP Project • JAIRO Cloud 2012 • Government Mandated PhD OA policy 2013
H8. Map architectural choice points to socio-technical characteristics	
<ul style="list-style-type: none"> • National OA policy • Building Community through infrastructure 	<ul style="list-style-type: none"> • No alternatives currently • More international exposure

6.2.2 Organizational Characteristics and Choices: The Pillars

The dominant institutional characteristics that emerged from the institutional analyses have been summarized in two 3 x 4 matrices, Tables 6.2 and 6.3. The matrices show the dominant characteristics of the organizations based on data collected and analyzed from content analysis, case studies, interviews, and observations.

6.2.2.1 Characteristics and Choices: The Pillars

For this research, Institutional Theory was used as a framework to provide insights into how social actors are influenced by institutional pressures from their institutional environment (Scott, 2001). Also, Scott's Institutional Theory framework provided insights as to how the two SPARC organizations have built legitimacy through the choices they have made, and how they secure resources and social support (DiMaggio et al. 1983; Tolbert 1985).

The institutional framework for analysis allowed for the data to be organized into categories of pillars and carriers, which then revealed the "rules, activities and routines" that provide stability to the SPARC organizations by guiding their perceptions and actions (Scott, 2008, p. 82).

Regulative and formal rules: according to Scott (2008) organizations may be stabilized by legally binding contracts. Additionally, Geels (2004) would state that stabilizing formal rules may be technical standards, or rules which favor existing technologies. For both organizations, regulative relational systems are where the dominant governance systems appeared to provide their authority or power over their members via formalized rules (Scott, 2001). Examples of these governance systems for SPARC NA included the deep connections to their members, their relationships with librarians and institutions of higher education, the members on the SPARC NA steering committee and advisory boards, and their relationships and influence over

government legislation. Such governance systems are viewed as creating and enforcing codes, norms, and rules, and as monitoring and sanctioning the activities of participants” (Scott, 2008, p. 82). For SPARC NA, the rules and routines can change each year as differing and pressing priorities emerge or there are changes in legislative priorities. Additionally, for SPARC NA, an executive order from the President of the United States in 2018 was also an important regulative and formal rule for the organization, which favored the use of institutional repositories, and allowed for SPARC NA to continue their advocacy work under a legislative agenda.

The SPARC JP organization also has regulative and formal rules, which appear to be guided both historically and currently by a form of Japanese “Industrial Policy”. As such, the actions of government officials that relate to the country’s larger economic outlook are known as “Industrial policies” and they are delivered both through unofficial and official channels such as “administrative guidance” (*gyōsei shidō*) (Johnson, 1982, p. 265). SPARC JP regulative relational systems are deeply embedded in government plans, executed through the NII, then enforced or mandated by the interrelated systems of relationships with other Japanese government agencies.

For SPARC JP the eJapan Law of 2000 was an important formal rule that has led to the long-term development of academic infrastructure. Additionally, the 2013 MEXT mandate that legislated all PhD theses must be hosted in a university repository ensured that the NII cyber-infrastructure plans were now fixed in law.

Normative rules: The social and organizational networks are stabilized by “mutual role perceptions and expectations of proper behavior” (Scott, 2008, p. 53). Furthermore, the normative pillar is characterized by “systems of values and norms leading to social obligations, expectations, roles, duty, professionalism, and moral responsibility” (March and Olsen, 1984, p.

741). The goals of both SPARCs are to encourage the others to engage in the practices and embrace the values of openly sharing scholarship, and they use education and their leadership in the library profession as the main aspect of the normative pillar. For both organizations, leadership in education, building communities focused on open access, and working with higher education libraries, associations, and partners, are the focus.

Table 6.2 Summary of Institutional Analytic Framework Findings SPARC North America

Pillars		
Regulative	Normative	Cultural-Cognitive
Prominent regulative symbolic systems: Laws: Legislative interactions	Prominent normative symbolic systems Values and expectations: Achieving results with policy, collective action oriented	Prominent cultural-cognitive symbolic systems: Practices: IRs (at member institutions)
Prominent regulative relational systems: Power Systems: Governance Docs Relationships with, members, Advisors	Prominent normative relational systems: Authority systems: Communities of practice, Industry, associations and relationships	Prominent cultural-cognitive relational systems: Structural Isomorphism, Identities Relationships with other SPARCS Library organizations, coalition partners
Prominent regulative routines: Protocols: Regular Groups Meetings -Regularly Timed Communications	Prominent normative routines: Roles:-Oversight of the field	Prominent cultural-cognitive routines: Scripts: Program Advocacy, Education and Training
		Prominent cultural-cognitive artifacts: -Objects possessing symbolic value: Branding-membership logo Awards and Recognition

Table 6.3 Summary of Institutional Analytic Framework Findings SPARC Japan

Pillars		
Regulative	Normative	Cultural-Cognitive
Prominent regulative symbolic systems: Laws: Mission and Goals -2000 eJapan Law	Prominent normative symbolic systems: Values and expectations: Leadership Social/Technical expertise	Prominent cultural-cognitive symbolic systems: schema: Japan Dublin Core Schema
Prominent regulative relational systems: Power systems: NII and government hierarchy, JPCOAR, MEXT, JSPS, JST and mandated deposits	Prominent normative relational systems: Working Groups and Task Forces, Core Group relationships	Prominent cultural-cognitive relational systems: Structural isomorphisms: SPARC affiliate, outgrowth organizations
Prominent regulative routines: Protocols: Justifying technical requirements	Prominent normative routines: Roles: Trainings and Seminars and Communications, Archive, and International Reporting	Prominent cultural-cognitive routines: Scripts: Education -Advocacy
Prominent regulative artifacts: JAIRO Cloud/WEKO IR Platform		Prominent cultural-cognitive artifacts: Branding-logo, JPCOAR membership

Leadership in open access education and policy: SPARC NA is highly influenced by the needs and requests of its membership, many of whom are librarians working in the field of higher education. Additionally, SPARC NA meets with and communicates to those members at their professional association meetings, e.g., the Association of College and Research Libraries. SPARC NA believes that they are leaders in the open access community on both a global and national level, recently even advising the United Nations on its UN 2030 Sustainable Development Agenda (Heather Joseph, personal communication, October 15, 2019). Much of

the member activities of SPARC NA include the education and policy advocacy for open access practices. Many of the activities of SPARC NA are generated when an outside event occurs (for example, the collection of information on publisher's big deals costs), signaling a need in the community, requested by members, to enable them to negotiate effectively. Moreover, SPARC NA facilitates the spaces where members can gather to work on projects or provide and participate in feedback on the directions of where SPARC NA should focus.

SPARC JP also considers itself a leader in the open access community especially in Japan. SPARC JP's leadership role is built into the activities of SPARC JP and the NII. While SPARC JP's focus is also on education and the advocacy of open access, they do not need to lobby for policies within the Japanese Government, as the policy typically has already been created and communicated to them. SPARC JP builds communities of practice by hosting activities that encourage sharing, learning, and training around open practices, and also supports training on how to run an IR. Many of their activities are determined in response to a community need.

Cognitive rules: These are the shared belief systems and expectations “which orient perceptions of the future and hence steer actions in the present” (Geels, 2004, p. 910). The *cultural-cognitive* pillar is also “characterized by the construction of individual and group identities and sense-making of participants working within a given environment” (Scott, 2003, p. 881). These institutional pillars, along with their carriers of *symbolic systems*, *relational systems*, *routines*, and *artifacts*, are the principal elements of Scott's (2003, p. 881) framework. They are also characterized by sense-making of day-to-day routines and scripts of the individual participants in the organization, which appears to help them to establish identities and create value and legitimacy.

Both SPARCs provide sense-making routines for their participants through the education and open access advocacy they provide. Using routine scripts, communications, and regular events, the SPARCs are known for their open access work. Additionally, as SPARC JP has branded itself in much the same way as SPARC NA, the perception of collaboration among the two SPARCs exists.

Identities: For both SPARCs identities matter. Their identities are connected to their relationships with their systems and core interactors, which for both organizations are the relationships to universities, and the subsequent library and higher-education organizations to which they were originally connected. Both SPARCs shared similar connections to the government and policy-making institutions and organizations. In some cases, it was noted that some of the collation partners and core interactors looked similar to the original SPARC NA or SPARCJP/NII organization. This may be explained by the concept of institutional isomorphism. DiMaggio and Powell (1983) examined how institutional processes (“structuration”) and coercive, mimetic, and normative forces can result in isomorphism among organizations, explaining why there is such “startling homogeneity of organizational forms and practices” (p.148).

While institutional isomorphism occurred within both SPARCs, it does not seem apparent across the two SPARCs. At the start of this research, I had chosen the two SPARC organizations to examine if they were perceived to be engaged in similar activities and part of the same “organizational field”. The perception was that the work of the two organizations was similar in nature (and possibly even connected) as the names of the organizations were the same. Additionally, there was documented evidence in an Association of Research Libraries report in 2002, that SPARC JP had formed after attending a SPARC NA meeting (Matz, 2002 p. 12).

Scott (2008) regularly emphasized the importance of what he referred to as an “organizational field”, and that the organizational field was also considered a level of analysis in institutional research. Instead of a single organization (defined by a legal charter or formal structures), an organizational field consists of a population of organizations that is “bounded by the presence of shared cultural-cognitive or normative frameworks or a common regulatory system so as to constitute a recognized area of institutional life” (Scott, 2008, p. 86).

Based on an initial analysis of the SPARC JP webpage and reports, I had originally thought SPARC JP was a subset of SPARC NA, and thus part of the same “organizational field”. Moreover, there were other affiliates of SPARC NA as well in Europe and Africa that lead me to believe that all of the organizations were interconnected in deep ways. However, as this research progressed, I learned that there was little interaction or connections between SPARC JP and SPARC NA, aside from in name. For example, even though SPARC JP staff attend the same international conferences and events as SPARC NA, there was little to no collaboration in coordinated routines or activities. One SPARC JP staff told me that there was some hesitation in participating fully with SPARC NA due to language barriers (Akira Niitsuma, personal communication, May 23, 2019). That said, there are sometimes, however, activities where a member of SPARC NA is invited to participate in the activities of SPARC JP. Recorded on the SPARC JP website there are several times when SPARC NA has come to Japan to participate in meetings trainings and seminars.¹⁷⁵

There were, however, some similarities. For example, both SPARCs began as “projects” of two large organizations, SPARC NA as a project of the Association of Research Libraries, and SPARC JP as a project the National Institute of Informatics – notably both directly related to

¹⁷⁵ The 3rd SPARC JP Seminar 2017. Heather Joseph Special Speaker. Retrieved May 2019 from <https://www.nii.ac.jp/sparc/en/event/2017/>

libraries, and then established legitimacy within their organizational fields. Furthermore, both SPARCs have stayed connected to these formal structures that provide legitimacy to their work.

6.2.2.2 Organizational Legitimacy

In this research, many of the characteristics and components of the pillars and carriers contributed to and supported the two SPARC organizations' legitimacy. While the concept of legitimacy was not the main focus of this study, it was perhaps the simplest to identify in the data analysis. Organizational legitimacy corresponds to the "generalized perception or assumption that the actions of the organization are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995, p. 574).

Organizational Legitimacy: Organizations can pursue legitimacy in various ways (Ashford and Gibbs, 1990; Oliver, 1991; Suchman, 1995). As proposed by Scott, the pursuit of legitimacy happens as "institutions are comprised of regulative, normative and cultural-cognitive elements, which provide legitimacy and social conformity" (2001; p. 51). In conducting this research, I proposed that both SPARC organizations' legitimacy originates from the regulative pillars and the organizational systems. For SPARC JP, the organization has its origins in the science and technology plans of the Japanese government. On the other hand, SPARC NA has used its expertise and leadership to lobby the United States government more from the outside, for open access policy that then becomes embedded as law.

Both organizations and their activities and routines have been institutionalized within their respective communities. For SPARC NA, they have become legitimized within the global open access movement as its mission, strategies, and activities, and have been adopted and modeled by the other organizations (SPARC Europe, SPARC Africa, and SPARC JP).

For SPARC NA, legitimacy is focused on forwarding legislative policy, education, and building community. However, for SPARC JP legitimacy included designing and building cyber-infrastructure, and providing governance and education. Thus, the means for achieving legitimacy may be different, but the “process of legitimization is essential for organizations to gain support and resources from multiple stakeholders” (Ashforth and Gibbs, 1990).

In reflecting on the findings of this research, I view the SPARC organizations legitimization processes as much more than an assemblage of the pillar and carrier elements. Instead, both organizations are legitimized by their “practice”, i.e., “the fine details of how people use the resources available to them to accomplish intelligent actions, and how they give those actions sense and meaning” (De Vaujany, Varlander and Vaast, 2019).

Furthermore, many of the activities, meetings and working groups depend also on the labor of members and in some cases non-members, who volunteer time and skills contributing to projects and information resources. The SPARC institutions are given meaning by organizational members, which will guide the behavior of the organization (DiMaggio and Powell, 1983). Both SPARCs encourage other people to become involved, and those who are their members listen to them using their member resources to “purchase value” in their organization. Thus, both SPARCs’ reputation as a source of good information is what Eschenfelder and Chase (2002, p. 102) would refer to as account-taking dependency, i.e., dependencies which “concern links or interactions based upon some kind of social rating”.

6.2.2.3 The Progression of IRs

How do the variances illuminate the progression of IRs in organizations in Japan compared to similar organizations in the United States? The two variances of the two SPARC organizations can be differentiated and potentially addressed as follows.

For the SPARC NA organization their activities and practices were predominantly characterized by:

- Global and National Leadership in Education, Policy Advocacy leading to Legislative Actions
- Building and Maintaining Relationships with a network of members and partners whose goals and values conform with their own
- Building communities of practice (within established members) that further the goals of open practices

It was conceived that a form of collective action was necessary for faculty hoping that open access would come to fruition. To achieve this required a collective group to navigate against publishers, which ultimately led to advocacy from a group of academic libraries (who held the funds to pay for access) and eventually led to the formation of the SPARC NA organization. Academic Steven Harnad, an early advocate of OA, had made a motivated argument for the ultimate effectiveness of OA mandates (2010). Harnad stated that for OA to succeed, “the vast majority of research institutions will have to have simultaneous OA mandates that require immediate deposit in a repository as soon as an article is published” (Wenzler, 2017, p.193). These OA mandates were thought to be enforceable only if they were built into the academic system, for example by an organization such as SPARC NA, or at the university, or governmental funding level, with the power to push back against publishers in North America.

For the SPARC JP organization their activities and practices were predominantly characterized by:

- Using the legal authority of the government to develop academic cyber-infrastructure and make its use mandatory in these two ways:
 - The embedding of the IR in a historically-based management of information systems, which are interoperable and established in academic technical processes
 - The publishing of PhDs via national deposit mandate, which requires that every doctoral institution in Japan must have an institutional repository
- Developing and Maintaining Relationships via Education Activities, with academic and research institutions a network of partnerships with journal publishing societies
- Creating and maintaining cloud-based top-down government-mandated technical systems/infrastructure, and tying it to specific standards

In Japan legal mandates have long been identified as an influence in promoting technology and its adoption with the national government seen as having a key role to play in the enacting of regulations, including impartial contract enforcement (Oxley and Yeung, 2001) that would accelerate adoption (Niegel, 2018). Government policies act as a principal force of isomorphism within organizational fields (Hu, Hart and Cooke, 2007).

Additionally, Japan's government-led "technology catching-up policy", which has been used since the Meiji Period (1868-1912), is part of a contemporary government-led strategy to further the IT revolution. In this research, the progression of IRs in Japan has seen a dramatic

growth in the number of open access repositories within its universities and research organizations, for several reasons:

- The government established NII, and the history of platforms and technical developments have allowed for growth and sustainability of IRs.
- There have been partnerships with scientific societies, for which SPARC JP has continued to maintain a relationship with scientific journals. This has created specific interactions towards the corresponding publishing sector.
- *Kiyō* department journals (Japanese university-specific departmental bulletins) represent more than half the content of Japanese IRs.
- PhD theses are important for IR sustainability, thanks to the national deposit mandate.

Finally, SPARC JP under the NII has been tasked with building and running essential research and education information infrastructures for Japan's academic community. In addition, NII develops and advances operations that provide academic content and online service platforms. The support of the various Japanese government agencies has accelerated the progression of IRs compared to that of IRs in the United States.

6.3 Discussion of the Theoretical Approaches: Findings on Practice for This Research

This section discusses and reflects upon the theoretical approaches to the research. Specifically, the usefulness of the application of the STIN strategy and an Institutional Theory framework to the research.

6.3.1 Assessing the STIN framework

For this research, the STIN framework was used as a strategy for analyzing socio-technical assemblages for two organizations. In doing so, it allowed for the description of aspects

of the two organizations and their practices and socio-technical relationships. This enabled me to at times see how aspects of the social and the technical (and/or the configurations of groups involved in the social and technical, including people) became complex bounded phenomena.

However, in this research, labeling the “whole of the organization” as a socio-technical interaction network was perhaps more just helpful than useful. The classification at times was awkward. As its application was to the whole of the organization rather than to specific systems (as had been used in other research; for example, in Kling et al.’s, [2003] work in the use of e-scholarship forums). This made it difficult to narrow in on specific systems that were perhaps of importance to the organizations. The STIN concept was essentially an analytical structure or metaphor, and it was appropriate in general for investigating the whole of the parts. I believe it was a helpful way to organize the data gathered about each heuristic, and to assist in the comparison across organizations of their similarities and differences.

One of the main challenges in STIN research, as Kling et al. (2003) suggest, is that “there can be significant problems faced by socio-technical analysts of how to figure out what belongs in the network and what does not” (p. 54). According to Kling et al. (2003), the STIN model identifies “the different classes of social interactions as resource dependency (or direct relationships) and account taking (or indirect relationships); resource dependencies create networks of funders and grantees, employers and employees, and journal publishers and authors” (p. 54).

Using the STIN strategy was helpful for this research in that it supported a socio-technical understanding of the case-studies and their activities, leading to the findings identified in the preceding chapter, and bringing this study in line with other social informatics research. I found that understanding the concepts of social informatics was necessary to use the STIN

strategy. Several other doctoral research studies that were useful as models in scale, were Meyer's (2007) and Suri's (2013) research. Both scholars attempted to use STIN heuristics to guide data collection, as well as to support analysis combined with other approaches. However, it should be noted that in this study the framework was applied during the analysis phase: as post-hoc as Meyer would say (2007, p. 273).

In examining the two case studies of SPARC NA and SPARC JP together, it became clear that the STIN approach was a useful checklist or structural framework for the research project. Nevertheless, I would propose that in my future work with the STIN heuristics, I need to develop more explanatory materials. I agree with Meyer when he states, "to more clearly articulate the methods and tools one would use to undertake a study using the STIN strategy" (2006, p. 45). As Kling sadly suffered an untimely death, it is possible that his work would have evolved more to provide guidelines that researchers from other fields could adopt This is discussed further in Section 7.6. Further, the STIN heuristics aided me in the examination of several historical elements and current trajectories, leading to a more holistic understanding of the cases. However, it was at times challenging to re-produce and understand the STIN heuristics according to the criteria created by Kling et al. (2003). In summary, the STIN framework supported my analysis of the cases by providing a consistent structure. Additionally, given the volume and diversity of data collected, the STIN strategy served the purpose of structuring data to share it with other people.

6.3.2 Using Institutional Theory

Scott (2008) probably did not plan that the Institutional Theory framework be used as an applied practical tool for organizational analysis, even though his framework has been adopted by researchers across disciplines. However, based on the sheer number of works that have used

the pillars as a practical tool, the assumption that the potential for the use of the institutional theory framework in applied organizational analysis is significant.

However, Scott (2003, p. 890) noted that considerable work is needed to establish the connections of the carriers within the different institutional pillars and the probable combination of carriers. The lack of clarity in the definitions for many of the pillars and carriers concepts was a significant challenge I faced in this research. During data analysis, I reflected many times on Scott's (somewhat subjective) descriptions of the carriers as means to convey institutional concepts and offer an alternative and/or different perspective on characteristic elements of the regulative, normative, and cultural cognitive pillars (Scott, 2003, p. 882). I necessarily had to return to my coding several times to clarify why one characteristic was in one pillar or another. As the carriers were symbolic systems, relational systems, routines, and artifacts, I often asked myself during analysis, "Could systems conveying authority be categorized as symbolic systems or relational systems?" Or similarly, "Could routines and artifacts be a means of transferring institutional elements?" Thus, it was often not easy to place an aspect to the organization neatly in one of the carriers or pillars.

Additionally, this study suggests that in combination the three pillars function together as equally supporting forces to sustain an organization's institutional characteristics. This supposes that the three posts are all of equal importance in defining the institutional characteristics of an organization. However, one of the problems in applying Scott's frameworks is the somewhat obscure terminology of some of the pillars and carriers' elements. While laws, regulations, and standard operating procedures are relatively straightforward, others such as "categories" and "typifications" are less clear. A specific challenge is that Scott does not clearly define all the

meanings. Thus, the differences between “objects complying with mandated specifications” and “objects meeting conventions and standards” were at times difficult to distinguish.

Finally, in some cases, artifact elements might be viewed as a routine (such as a standard operating procedure), or a law (especially if examining different countries), and so on. Thus, not all of the characteristic elements in Scott’s framework could be identified and were not presented in the analysis. In Chapter 5, in the presentation of the findings from the analysis, the frameworks were duplicated for each organizational participant, and elements and characteristic items were identified for each.

6.5 Summary

This chapter presented a discussion interpretation of the findings. The next Chapter 7 will provide a summary of the research, and contributions and implications for the future.

Chapter 7: Summary

7.1 Overview

This chapter serves as a final discussion of the research. Specifically, it discusses the contributions of the research to understanding institutional repositories and the influences and characteristics of the organizations that support, maintain, and promote them. In addition, it highlights contributions to the field of STIN, social informatics, and Institutional Theory, then outlines the future of the research.

7.2 Addressing the Research Questions

This research explored how two similar organizations, one in the United States and the other in Japan, supported open access infrastructure in an effort to understand the socio-technical and institutional contexts. Furthermore, this research examined two organizations as case studies, SPARC North America and SPARC Japan, focusing on how the socio-technical influences and organizational characteristics have contributed to the variances and uses of IRs. Institutional research has also contributed to the development of the field of social informatics and has at times informed the STIN strategy. Much of the past research has attempted to understand the practices involved in organizational work, and the relationship to technology within the organization (e.g., Kling and Scacci, 1982; Yates and Orlikowski, 2002).

The application of the STIN framework in this research informed the data collection, and both the STIN strategy and Institutional Theory were used as frameworks to help recognize how the organizational structures, rules, norms, and routines became established as a lens for examining the two organizations (Scott, 2008). The activities, characteristics, and influences of the organizations in this research were examined through informed data collection. Data was collected from various sources, including organizational websites, related documents, interviews,

and participant observation. The two organizations' activities took place across several different locations and infrastructures, including geographical locations, websites, blogs, social media, email, and in person. The organizations were first analyzed as Socio-Technical Interaction Networks (STIN), using a framework based on Kling, McKim and King's heuristics (2003). Then, this research utilized Institutional theory using data gathered through documents, interviewing individuals in the organizations, and observing group activities.

The identification, investigation, and analysis of the two SPARC organizations, their contexts, and characteristics may help to understand the ways in which information infrastructures consist of an assemblage of technical infrastructure, social norms, and organizational practices (Edwards et al., 2007). In doing so, the identification, investigation, and analysis of the organizations explored these three research questions:

R1. What socio-technical influences have contributed to variances in institutional repository infrastructure?

R2. What organizational characteristics influence choices and uses of institutional repositories?

R3. How do the variances illuminate the progression of IRs in organizations in Japan compared to similar organizations in the United States?

Insights from this research on the relationship between socio-technical influences, characteristics and contexts of the support and promotion for IRs are the findings of this work, understood in socio-technical terms, and summarized in the following section.

7.3 Contributions to STIN and Institutional Theory

This research attempted to reveal the networks of the two SPARC organizations based on resource dependencies (or direct relationships), and to highlight several important themes while

examining the “socio” that arises in the networks when groups and people communicate (Kling et al., 2003, p. 49).

Institutional theorists would most likely say that “institutions matter”. Institutions are studied as the “mechanisms of organizational governance that structure political, economic, and social interactions” (Williamson, 1996; p. 3). In attempting to understand the socio-technical influences, variances, and organizational characteristics of the two organizations, and the socio-technical relationships with infrastructure, this research attempted to understand the importance of institutional concepts and the relationship of organizational participants. As such, this dissertation contributes to the canon by providing a picture of information infrastructure, and by describing the reciprocal relationship between technology and social contexts in the case-study organizations. These choices were made by the organizations and their interactors, and can be understood terms of governance, education, access, ownership, and resources. Using the social informatics models conceived by Kling and Scacchi (1982) and Socio-Technical Interaction Networks by Kling, McKim and King (2003), this research contributes evidence and procedure to identify the work of organizations and their interactors, and of members working to promote their open access information infrastructure.

Although this research was meant to examine the socio-technical systems and organizations that support open access information infrastructure, the issues surrounding access to scholarly research and the information infrastructures that contribute to knowledge (or lack thereof) are widely known within the field. These issues are extremely important to the organizations studied in this research. Thus, this research makes the following contributions.

First, it raises awareness about the general issues of open access to scholarly information. Second, it helps contribute to general discussions of issues about who is responsible for

encouraging scholars and those in higher education to provide support for open access and related infrastructure; and how they should proceed. Third, it adds new topics for discussion on organizations' socio-technical influences and choices for open repository support. Fourth, it has the potential to contribute to the field of social informatics, in the use of the STIN strategy, and institutional frameworks. Fifth, it contributes to the literature on open access and perceptions of information, technology and people. If the work can impact any or all these communities as discussed above, then it can be useful. Finally, there are many lessons learned from this work that have contributed to my own development as a researcher. These lessons will be addressed in the next section.

7.4 Research Reflection: Lessons Learned while Conducting Research

During the dissertation process, I realized that the main goal of the dissertation, in addition to arriving at the findings, was also to learn how to undertake a major research project. I realized that I was supposed to be learning about the process of research to connect the different pieces of the Ph.D. process. I learned how to connect the concepts and language of my coursework phase with the research process in the dissertation phase. Finally, I attempted to link the lessons learned while conducting the research back to the specific details of this research project. Each of the lessons learned is discussed in detail below.

Nonlinear process: When I wrote the proposal for this research, I envisioned the different phases as happening in a fairly linear process. However, due to the nature of fieldwork and finding times to meet with the interviewees, as well as the timing of the observations, I conducted some of the interviews before and some after the start of the participant observation and further interviews. In retrospect, the non-linear nature helped me because the participant observation and first interviews helped me frame the questions for the remaining interviews.

Similar activities unfolded in other phases of the research process. For example, I assumed that all data analysis would happen after all the data was collected. However, data analysis began after the first interview. This is because information learned in each interview or document received had an impact on the rest of the process. The constant interrogation of my data collection to ensure I was keeping to the original objectives of the research helped me incorporate unexpected and new information. One example of this was, while listening to presentations at the Japan Open Science Summit, I began to think that my definition of a repository and information system might be too narrow. My view of an institutional repository as an information system from academic studies collided with my view from work as a practitioner. Thus, when speaking to the SPARC JP Cyber-Infrastructure Team, I felt the need to broaden some of the interview questions. Furthermore, because the SPARC NA organization had relatively little to do with the actual IRs, my view of information systems became more about humans than technology. Fundamentally, as I moved forward in the research process, I was always learning something unexpected that caused me to reflect and rethink my work.

However, I believe experiencing this was the iterative nature of research, and extremely useful rather than problematic. Discovering previously unknown information was an exciting part of the research and following the new information down new paths of discovery enhanced the work beyond that which had been originally proposed.

Research management: One of the anticipated challenges throughout the research process was an inconsistent use of time, due to the research being conducted while I was working a full-time professional job. At times the research process could take as many hours a week as I chose to work, while at other times I had a significant amount of time for other projects and full-time work. Some other issues with management of time have to do with the research

process itself, including an unexpected pandemic that created a lot of extra work in my professional life. I was very fortunate that all my data collection and interviews were immediately granted and mostly complete.

Dynamic Research Process: The biggest lesson learned during the research was “accomplishing the research process”, which proved to be very rewarding but also challenging at times. In the proposal phase of the work, I assumed that certain parts of the proposal would be held relatively constant during the research phase. This assumption was completely false. For example, my understanding of STIN as a theory and strategy, using Institutional Theory as a framework, conducting interviews and observation for data collection, and using coding as an analysis method all changed throughout the process. The entire process was very dynamic.

Some of the issues faced were due to my former experiences (or lack thereof) as a researcher. For example, my understanding of methods has improved greatly, and I will make different choices in future research projects. Other issues seem to be part of the research process itself. As I continue to grow as a researcher in this field, I would like to know how other researchers use STIN in practice. My assumption is that its use is weighted differently in other research projects. However, in the future using the same theory in different settings may certainly change how the theory is used.

Ultimately, the nature of this research caused the research process to be iterative. As my understanding of each of the pieces of the research developed, I had to revisit portions of the proposal, interview questions, and foundational papers throughout the process. Essentially, the entire research process was dynamic, and as such this dissertation could continue indefinitely.

7.5 Limitations of the Study

In using STIN and Institutional Theory as a way to understand the variances, choices and uses of institutional repositories, the research had several methodological limitations common to both qualitative and organizational research. According to Stablein (2006), it is not uncommon for qualitative inquiries into organizational phenomena to use an inductive holistic approach. However, their use in organization studies is sometimes subject to criticism by researchers more accustomed to positivist inquiries of a deductive nature (Stablein, 2006).

This research attempted to employ a holistic approach. This attempt was made by using multiple sources of data to view the organizations as occurring “in a net of fragmented multiple contexts through multitudes of kaleidoscopic movements” (Czarniawska, 2012, p. 120); as such this research has a place in organization research. The STIN strategy provided the core perspective within which this research was conducted. Meanwhile, Institutional Theory provided a framework to understand the linkages between the organizations via their pillars and carriers.

It is also important to recognize the limitations of this research, methodological and otherwise. First, the scope of the research was limited to only two organizations, one in the United States and one in Japan. The limited number of organizations makes the results non-generalizable. There are two other SPARC organizations, one in Europe and one in Africa, and it is conceivable that, later, those could be added to a research agenda.

Second, the study’s qualitative methodology, employed the triangulation of multiple data sources and techniques, and therefore may have sacrificed some depth in order to explore broader foundational concepts and to better support the summary of findings. For example, the data collection was principally limited to evidence contained on public-facing websites and other openly available published documents, which was a key factor for the data selection. In some

cases, they were large documents with a substantial amount of information available from public sources. All of the interview participants were directly associated with the cases. Both cases also involved direct observation of various activities. As such, the review of the two cases might not have met the standards of depth of case studies as described by Yin (2008) and others. However, the purpose of the multiple case reviews was to establish the organizational context to the SPARC organizations, not to conduct an in-depth ethnography for each case.

Third, the objective of this research was to investigate socio-technical network members' interactions based on interactions within the network; however, it is clear also that a considerable number of them also interact outside the network. Using the STIN methodology to collect data around those outside additional interactions may have revealed that they compliment and extend the roles members play in the network and would additionally shed light on the motivations and rationale for members' actions and interactions within the network context.

It should also be noted that there were two significant differences between the use of STIN in this study and how Kling et al. (2003) may have originally intended STIN's potential use. First, Kling et al. (2003) stated that STIN models helped to understand the progression of technical change and its impact on social, cultural, economic, political, and personal lives. I believe that Kling et al.'s statement is related to studying impacts associated with technical change. For this research, the emphasis was not specifically focused on technical change but rather was equally about social context and different conceptualizations of how information infrastructure might be supported.

Lastly, in applying the two frameworks, the study does not attempt to establish causes or to test explicit correlations between dependent and independent variables, while this is concern for some institutional scholars (e.g., Kelman, 2000; Perrow 1982), this may not be a concern of

for others (e.g., Czarniawska, 2008). Attempting to establish such causality, between institutional differences and the activities coordinated by them would have been too large a task for this specific research. However, I believe that I have provided a foundation for my own future research by a) validating the usefulness of STIN and institutional frameworks of analysis in institutional repository research, and b) identifying applications for future work as well as c) gained an understanding of the limitations of the frameworks. I believe this is a completely sound goal of this study. Future research will be addressed in the next section.

7.6 Future Research

The research conducted for this dissertation could be continued in multiple ways. First, this study was done using STIN strategy. In future this work could be advanced in several different directions. Using two cases/organizations in the research had its advantages and disadvantages. The main advantage was to understand the work of the two SPARCs. The main disadvantage was the quantity of interactors and interactions in two case studies, as well as the short time spent with each organization. If the research had focused on only on one SPARC, then more detail could have been obtained about their specific relationships and in particular about the current implementation of their information system. Additionally, I may have been able to collect “outsiders” perceptions of the organization. Therefore, in future research I could choose a different level of analysis for the work. For example, a focus on the different methods may reveal an understanding of why individuals choose to work in this type of organization and would still provide data for the STIN strategy approach.

A second direction for future research could be to address the issue of social change in the members/participants of one or both SPARC organizations. It was assumed at the beginning of the research that cultural differences would be revealed as a product of the work of the

organizations. However, I was unable to investigate the cultural outcomes of the work of the two SPARCs in a meaningful way. Future research could include work specifically about that.

A third area of future work could study the members of SPARC NA and SPARC JP. A larger set of actors could be included and studied in more detail. As Meyer (2007) suggests, this research could be done as an ethnography rather than as a set of case studies. More time could be spent in the field with the members. Ethnography would allow me to expand the social network of those SPARC members. Because of the geographic and time constraints, the size of the social network of people at organization sites was small.

A different approach to the research could be to study the changes in SPARC membership over time. A longitudinal study could provide detail not found in a single snapshot of time. Since both SPARCs have experienced many changes over time, a longitudinal study would be appropriate to study the transformation of the SPARCs. The findings of this research highlight opportunities for additional research within many areas, including, but not limited to, the suggestions below.

In summary, over the course of this study, there were many times I was able to see new research emerging that employed Institutional Theory to study organizational phenomena, and this was extremely encouraging. It helped in the validation in terms of the relevance and applicability of Kling et al.'s (2003) STIN strategy, and Scott's (2008) Institutional Theory, as analytic frameworks to understand the sometimes complex problems of organizations. While it was suggested that Scott may question the use of an Institutional Theory framework as an applied tool, the ever-growing body of literature clearly supports the utility of the framework within organizational research.

During the research I continued my employment as a scholarly communications librarian at an academic library. I observed, on a regular daily basis, how regulative, normative, and cultural-cognitive institutional factors appeared to influence organizational behaviors. Similarly, I saw evidence that reinforced Kling et al.'s (2003) premise that the relationships among "people (including organizations), equipment, data, diverse resources (money, skill, status), documents and messages, legal arrangements and enforcement mechanisms, and resource flows, were intertwined" (p. 48).

I was also daily engaged in trying to understand my own support of our IR at our organization. Usually, I would try to answer, "What was going on from an Institutional Theory perspective or a socio-technical framework?" This kept me motivated to complete the study, and it is clear that much more can be done to explore this line of research. Having argued that Scott's frameworks are maybe not a useful tool, my future research might engage in similar directions by applying the frameworks in a more focused manner towards understanding different problems. For example, studies might focus more on a particular pillar or carrier, using field ethnographies on a single case study to more fully uncover deeply imbedded institutional characteristics.

7.7 Closing

In closing, I believe that the use of STIN analysis paired with Institutional Theory, as a lens through which we might examine organizational characteristics and socio-technical influences, holds research potential for further study in examining the field of organizations and information infrastructures, specifically as they relate to IRs.

This research explored how organizations support IRs in an effort to understand the cultural, institutional and social contexts in which they evolved, and the social contexts in which

they have been deployed and used (Kling, Rosenbaum and Sawyer, 2005), by examining similar organizations in the United States and Japan. This research examined two organizations as case studies, SPARC North America and SPARC Japan, focusing on how the social and technical influences and each organization's characteristics have contributed to the variances and uses of IRs.

While this study looked at only a limited portion of support and promotion of open access information infrastructure, many other similar problems are emerging that may challenge the field. The research to date in the field of STIN and organization studies is still (and historically has been) heavily influenced by individual or computer studies that remain from classical models of Organizational Theory. STIN and Institutional Theory may complement each other, perhaps more so than other classic theories of organization. These two frameworks may be able to address the unique social phenomena underlying and shaping new forms of organization and technology, including the development of IRs worldwide.

Appendix A: Informed Consent in English and Japanese

Informed Consent in both English (first) and Japanese (second)

Informed Consent

My name is Jennifer Beamer you are invited to take part in a research study. I am a doctoral student at the University of Hawai'i at Mānoa in Communication and Information Science. As part of the requirements for earning my doctoral degree, I am doing research for my dissertation.

What am I being asked to do?

If you participate in this project, I will meet with you for an interview at a location and time convenient for you.

Taking part in this study is your choice.

Your participation in this project is completely voluntary. You may stop participating at any time. If you stop being in the study, there will be no penalty or loss to you.

What is the Purpose of the Study?

You are being asked to participate in a research study. The purpose of this study is to understand how organizations support and maintain institutional repositories (IRs) and their infrastructure. This study is being conducted as a component of a dissertation for a doctoral degree.

What are the Procedures?

Participation in this project will consist of taking part in an interview and/or being observed in a meeting. Interview questions will focus on participants' views of how the IR at an institution developed and who was involved, the resources, and networks. Each interview will last about one hour. Interviews will be audio recorded for the purpose of transcription and later analysis. The interviewer will observe the meeting and take notes.

What are the risks and benefits of this Study?

The researcher anticipates no known risks for participation in this study. There will be no direct or monetary benefits for your participation in this study. However, the research anticipates indirect benefits as a clearly articulated knowledge of how participants develop an IR, who is involved, and what policies are needed. The research will be used to identify models for IR development. You may become stressed or uncomfortable answering any of the interview questions or discussing topics with me during the interview. If you do become stressed or uncomfortable, you can skip the question or take a break. You can also stop the interview, or you can withdraw from the project altogether.

Privacy and Confidentiality:

I will keep all study data secure in a locked filing cabinet in a locked office/encrypted on a password protected computer. Only my University of Hawai'i advisor and I will have access to the information. Other agencies that have legal permission have the right to review research records. The University of Hawai'i Human Studies Program has the right to review research records for this study. After I write a copy of the interviews, I will erase or destroy the audio-recordings. When I report the results of my research project, I will not use your name. I will not

use any other personal identifying information that can identify you. I will use pseudonyms (fake names) and report my findings in a way that protects your privacy and confidentiality to the extent allowed by law.

Future Research Studies:

Identifiers will be removed from your identifiable private information and after removal of identifiers the data may be used for future research studies related to the dissemination of my doctoral research.

More Questions?

If you have any questions regarding this study, please contact the researcher, Jennifer Beamer, by email jbeamer@hawaii.edu. You may also contact the advisor for this study, Dr. Rich Gazan, at 1-808-956-5094, or by email at gazan@hawaii.edu

Additionally, you may contact the UH Human Studies Program at +1 808.956.5007 or uhirb@hawaii.edu. to discuss problems, concerns and questions; obtain information; or offer input with an informed individual who is unaffiliated with the specific research protocol. Please visit <http://go.hawaii.edu/jRd> for more information on your rights as a research participant.

If you agree to participate in this project, please sign and date this signature page and return it to: Jennifer Beamer at jbeamer@hawaii.edu

Keep a copy of the informed consent for your records and reference.

Signature(s) for Consent:

I give permission to join the research project entitled, *“Examining Open Access Information Infrastructures: A SocioTechnical Exploration of Institutional Repository Models in Japan and the United States.”*

Please initial next to either “Yes” or “No” to the following:

_____ Yes _____ No I consent to be audio-recorded for the interview portion of this research.

Name of Participant (Print): _____

Participant’s Signature: _____

Signature of the Person Obtaining Consent: _____

Date: _____

Informed Consent in Japanese:

私はビーマー・ジェニファーと申しまして、ハワイ大学マノア校 交流と情報学の博士号志願者です。博士号を取得するために、博士論文の研修を行なっております。この研修の参加にご招待致したいと存じます。

研修の「参加」は何ですか。

この研修にご参加いただければ、私はご都合のいい時と場所に貴方とインタビューを行います。

この研修に参加するのは任意ですか。

全く任意です。いつでも参加を中絶しても構いません。

研究の目的は何ですか？

この度、調査研究にご参加をお願い申し上げます。本調査では、多機関のリポジトリ（IR）及びそれぞれのインフラストラクチャのサポート・維持組織について研究することを目的としております。なお、本研究は博士論文の一部として行われております。

拒否または撤回する権利：

このプロジェクトへのご参加は完全に任意です。いつでも不利益を受けることなく撤回することができます。

研究方法は何ですか？

このプロジェクトの方法は、主に口頭質問にご回答頂くことですが、可能であれば、研修ゼミナール、社員同士の相互作用などの観察も行われます。質問の焦点は、貴機関の IR がどのように開発され、誰が関わったのかなど、参加者のご意見・ご感想を伺います。各インタビューは約1時間かかります。インタビュー（および観察）はデータ保存・分析のために録音されます。

この研究のリスクと利点は何ですか？

研究者は、本研究にご参加いただくことによってリスクはないと考えております。本研究にご参加いただいても金銭的な利益もありませんが、IR 設立・開発の在り方およびより有利な進め方に関する知識が深まることを期待しております。本研究は IR 開発のためのモデルを識別するために使用されます。面接中に面接の質問に答えたり、私と話題を話し合ったりすると不快になるかもしれません。気分が悪くなった場合は、質問をスキップするか休憩を取ってください。面接を中止することも、プロジェクトから完全に撤退することもできます。

プライバシーと機密保持：

すべての研究データを鍵のかかったオフィスにある金庫、またはパスワードで保護されたコンピューターで保管されています。ハワイ大学教授である主査と私本人だけがこの情報にアクセスすることができます。（但し、データの精度・正確性の確認の為、ハワイ大学人間学研究プログラムの責任者が研究記録などをレビューする権利を有します）

各録音を書き写した後、全てを破棄します。又、研究プロジェクトの結果発表の際、参加者のお名前を一切使いません。個人識別情報も一切利用しません。

今後の研究研究：

識別情報はあなたの識別可能な個人情報から削除され、識別情報の削除後、そのデータは私の博士研究の普及に関連する将来の研究研究に使用される可能性があります。

ご不明な点等がございましたら？

本研究に関して質問がある場合は、電子メール jbeamer@hawaii.edu にてジェニファービーマー宛に連絡してください。また、本研究の主査である Rich Gazan 博士の連絡先は（1-808-956-5094）または電子メール（gazan@hawaii.edu）です。さらに、UH 人間研究プログラムにご連絡いただく際、+1808.956.5007（直通電話）および uhirb@hawaii.edu をご利用いただけます。最後に、研究参加者としてのご権利の詳細については、<http://go.hawaii.edu/jRd> をご覧ください。

本研究にご参加いただける場合、以下に日付とご署名の上、次のメールアドレスにて送付してください： jbeamer@hawaii.edu（同意書のコピーを保管してください。）

同意書

私は”*Examining Open Access Information Infrastructures: A Socio-Technical Exploration of Institutional Repository Models in Japan And the United States*”と題する研究プロジェクトに参加することに同意します。

以下の「同意します」または「同意しません」のどちらかの隣にイニシャルを入れてください。

インタビューの音声録音することに
_____同意します

_____同意しません

参加者名（プリント）： _____

参加者の署名： _____

同意を得た人の署名： _____

日付： _____

Appendix B: STIN Coding Hierarchy and Question/Strategy

Coding Hierarchy and Question/Strategy to Model documents, materials, activities, groups, organizations as STINs

Research Questions: R1 and R2

The following interview guide was used for analyzing documents and semi-structured interviews. The schedule of questions was not be followed verbatim, rather it was generally followed, as the flow of the conversation permitted, dictated (i.e., skipping back and forth to sections pertinent to comments made during the session). Sections not pertinent to the interviewee in question were skipped.

For the interviews conducted in Japan a Japanese equivalent was formed for interviews with the Japanese subjects. However the Japanese interviewees were also found to be quite fluent in English and interviews were often conducted in a mix of English and Japanese.

1. Basic Questions to ask of documents, materials, activities, groups, organizations as STINs

Kling et al's heuristics	Institutional Repository Model Questions
H1. Identify a relevant population of system interactors	1.1. Who participates in the organization, activity? 1.2. What roles do people play in terms of the org? 1.3. Who is in the org to work on the group's agenda? 1.4. Who accesses info from the org 2nd or 3rd hand? 1.5. Who created the organization? 1.6. Who/ What supports the org?
H2. Identify core interactor groups	2.1. What groups interact with the org? 2.2. What group orgs intersect with the org?
H3. Identify incentives	3.1. Why are people accessing the org? 3.2. Who becomes involved primarily because of this org? 3.3. Why do other people want them to access the org?
H4. Identify excluded actors and undesired interactions	4.1. Who is excluded from the org and why? 4.2. Why don't people access the org? (Impediments) 4.3. What unwelcome interactions are experienced, feared or avoided?
H5. Identify existing communication forums	5.1. What communication networks are used by the group? 5.2. What forums/networks have been used in the past?

H6. Identify resource flows	6.1. What costs are/have been associated with the org? 6.2. Who pays? 6.3. To whom? 6.4. Raising money through the org: who, for whom, how? 6.5. Who else benefits from the org (in terms of money or other resources)?
H7. Identify system architectural choice points	7.1. What is the group's history with this org (specific choices about the org)? 7.2. Identify specific technologies (devices?) associated with the org, including ownership and changes over time. 7.3. How does their use influence use of the org? 7.4. Identify links between org – especially those created or increased by use of this org.
H8. Map architectural choice points to socio-technical characteristics	8.1 Explore the org as an assemblage of technologies? 8.2 What hopes and values are most relevant to this org? 8.3 Note trajectories

2. More Detailed Questions to ask of documents, materials, activities, groups, organizations as STINs (Mapped to the Research Questions and STIN)

The box at the right [RQx] denotes the research question number(s) that the question was designed to contribute information to answering. The box next to each question [STINx] relates to the heuristic or surface characteristic intended to be explored. Adapted from Meyer (2007).

1. Background information

1. a. How did you first become interested working for SPARC?
 Probes:
 - i. When did you first have experiences with?
 - ii. What do you hope to achieve with working at SPARC?
 - iii. Work history?
- b. How long have you been in your current position?
- c. Education
- d. Do you feel your education training is related to this position?

2. Work processes [RQ1]

2. a) Description of work [STINH1]
 1. a. Could you walk me through what you actually do when on a typical day?
 Probes:
 - i. Describe what you do daily?
 - ii. What sort of equipment do you use if any?

- iii. How do you decide what to do?
- iv. How do you document what you do?
- v. Does this work change on a seasonal /weekly/ monthly basis?
- vi. Do you work with any technology?

3. Organizational Information [RQ1] [RQ2]

- a. What is your current position in this institution?
- b. How many people work for the organization? [STINH2]
- c. What individuals, organizations or resources played key roles in the founding of the organization? What are their roles? [STINH2]
- d. How are decisions, plans, strategies made? [STINH2][STINH4]
- e. Can the process be improved? [STINH2][STINH4]
- f. What obstacles are encountered by your organization? [STINH2][STINH4]
- g. Does SPARC work with other organizations? Who or who not? [STINH2][STINH4]
- h. Has this changed over time – are there organizations you no longer work with that you wish you did?

4. Funding – Resource Flows [RQ1] [RQ2]

- a. Where does funding come from? [STINH6]
- b. How does that funding work?
- c. What sort of equipment does SPARC need? [STINH6]
- d. What/How does SPARC support technology? [STINH6]
- e. What/How does SPARC support infrastructure? [STINH6]

5. Policy and Procedures [RQ1] [RQ2]

- a. How much of your time is spent working on Policies and Procedures? [STINH3][STINH4]
- b. Have you created any written policies? [STINH3]
- c. Are there benefits to policies in your opinion? [STINH3][STINH4]
- d. Are there any particular frustrations for you in working with policies?
- e. Do they adhere to norms in the field?
- f. Are the policies or procedures formalized?

6. Repository Infrastructure [RQ1] [RQ2] [RQ3]

- a. How would you describe the current infrastructure to support institutional repositories is there any?
- b. How would you characterize the level of support for IRs or IR technology? [STINH7]
- c. How are scholars adapting to the IR environment? [STINH7]
- d. Do you think your SPARC (JP or US) is technologically advanced compared to others in your field, technologically behind, or about average? Why? [STINH7]
- e. How do you learn about other new technologies specifically related to IRs [STINH7]
- f. Are there changes you could imagine, not limited to currently IR technology, that would make your work better or easier or more efficient?
- g. How do you think these problems could be overcome?
- h. Why do you think these solutions may work?

7. Coordination of Activities and Events [RQ1] [RQ2] [RQ3]

- a. Affiliations [STINH5]
 - i. What do you consider to be your most important professional affiliations?
- b. Networking [STINH5]
 - i. Who else do you share information with?
 - ii. How do you share information?
- c. Has this changed? How?
- d. How do you decide on what projects to take on? Are they assigned, based on grants, based on contracts, self-initiated?
- e. Do you share do you share with groups outside Japan/USA?(such as on a website, universities, conferences, or in popular publications)? [STINH5]

8. Other topics

- a. Are there other aspects of your work that you think I've missed?

Appendix C: Institutional Framework Coding Hierarchy and Question/Strategy

Coding Hierarchy and Question/Strategy to Model documents, materials, activities, groups, organizations in an Institutional Framework

Research Questions: R2 and R3

The following shows the coding tree hierarchy used as the base coding scheme in NVivo. Additional categories were added inductively from the data, but these represent the categories specifically designed to help answer the research questions for this project.

a. Pillars

1. Regulative pillar

In the forms: formal or informal, may use folkways (such as shaming and shunning) and mores as more informal mechanisms for normalizing behavior

- **rules** (models for behavior) and or constitutive rules as background conditions
- **laws (or law enforcement)**, usually the State, via its legislative or coercive power, places constraints on the behaviors of actors in civilian society
- **regulations**, could be formal or informal accepted laws or rules within a society
- **governance systems**, Governance can be defined as: “The system by which entities are directed and controlled. It is concerned with structure and processes for decision making, accountability, control and behavior at the top of an entity.
- **surveillance** monitoring usually of others or abstract situations
- **conformity** usually an employing power from above, or at peer
- **sanctioning** many studies in the operation of power in informal groups and, in particular, the emergence of power differences in previously undifferentiated task groups
- **rewards and punishments** that constrain and regularize behaviors
- **kinds of structural arrangements** or procedures are associated with specified behaviors, such as improved productivity or the passage of legislation
- **changes in property or political rights**

Literature shows:

- Individuals craft laws and rules that they believe will advance their interests, and individuals conform to laws and rules because they seek the attendant rewards or wish to avoid sanctions.
- rational choice scholars gather in this pillar,
- evidence of the expansion of constitutions, laws, codes, rules, directives, regulations, and formal structures of control.
- For example, Tolbert and Zucker (1983) determine whether municipalities are mandated by state law to adopt civil service reforms, and Singh, Tucker, and House (1986) and Baum and Oliver (1992) ascertain whether voluntary service organizations are registered by oversight agencies. Dobbin and Sutton (1998) examine financial allocations to enforcement agencies as an indicator of regulatory enforcement.

2. Normative pillar

“emphasizes appropriate standards of behaviors and stipulates how behaviors may exist within the existing structures” p. 64

- values (Values are conceptions of the preferred or the desirable together with the construction of standards to which existing structures or behaviors can be compared and assessed)
- norms, Norms specify how things should be done; they define legitimate means to pursue valued ends.
- expectations
- taboos
- roles
- conventions
- Regimes a system or planned way of doing things, especially one imposed from above,
- authority systems Scott refers to Weber’s traditional, charismatic, and bureaucratic systems, each of which justifies and regulates an existing structure of power on a different basis.
- practices
- protocols
- traditions
- specific roles become identified with certain actors
- constrain on social behavior as well as empower and enable social action confer rights as well as responsibilities
- privileges as well as duties,
- licenses as well as mandates

Literature shows:

- Normative systems define goals or objectives (e.g., winning the game, making a profit) but also designate appropriate ways to pursue them (e.g., rules specifying how the game is to be played, conceptions of fair business practices)
- (Blake and Davis 1964). Normative systems are typically viewed as imposing constraints on social behavior, and so they do. But at the same time, they empower and enable social action. They confer rights as well as responsibilities, privileges as well as duties, licenses as well as mandates.

3. Cultural-cognitive pillar

“shared convictions and frames that give a perception about the world and its meaning” (Scott, 2001, p. 67). “the beliefs are ‘cultural’ because they are socially constructed symbolic representations; they are ‘cognitive’ because they provide vital templates for framing individual perceptions and decisions” (p. 67). Therefore “meanings arise in interaction and are maintained and transformed as they are employed to make sense of the ongoing stream of happenings” (Scott, 2001, p.67).

- beliefs** shared cultural beliefs
- mental models** Hofstede’s (1991: 4) graphic metaphor, culture provides patterns of thinking, feeling, and acting: mental programs, or the “software of the mind.”
- categories**

- **identities,**
- **schemas,** (described as a mental structure of preconceived ideas, a framework representing some aspect of the world, or a system of organizing and perceiving new information)
- **typification** is a process of creating standard (typical) social construction based on standard assumptions
- **scripts**(a structure that describes appropriate sequences of actions in a well-known situation)

Literature shows:

*Meyer, Powell, and Scott stress the centrality of cultural-cognitive elements of institutions: the shared conceptions that constitute the nature of social reality and create the frames through which meaning is made.

- Neo- institutionalism the new cultural perspective focuses on the semiotic facets of culture, treating them not simply as subjective beliefs but also as symbolic systems viewed as objective and external to individual actors. Berger and Kellner (1981: 31) summarize: “Every human institution is, as it were, a sedimentation of meanings or, to vary the image, a crystallization of meanings in objective form.”
- . As Douglas (1982: 12) proposes, we should “treat cultural categories as the cognitive containers in which social interests are defined and classified, argued, negotiated, and fought out.”
- Or in Hofstede’s (1991: 4) graphic metaphor, culture provides patterns of thinking, feeling, and acting: mental programs, or the “software of the mind.”

Carriers: Institutions as being influenced by institutional carriers institutional ideas and knowledge can be said to be embedded in and carried by four types of vehicles or carriers (Bjork, 2004; Scott, 2001, 2003).

1. Symbolic Carriers carry institutional knowledge through culture, culture defined as shared convictions and frames that give a perception about the world and its meaning, vary in the extent to which they promote consistency of action, stability, uniformity and order (Scott, 2001). vary in terms of the realm over which they have influence. For instance, symbolic systems may exist at the world system level, the societal level, within a specific organization, or in a particular. “Symbols are transportable, versatile, and malleable” (Scott, 2014; p. 98).

- **notions of rules,** (ranging in nature from customary mores to legally defined constitutions or rule systems)
- **values,** how specified actors are supposed to behave. developed to guide behavior. Because organizations are social systems, goals or procedures tend to achieve an established, value-impregnated status. We say that they become institutionalized” (Selznick 1949: 256–257)
- **classifications,** be described as a mental structure of preconceived ideas, a framework representing some aspect of the world, or a system of organizing and perceiving new information)
- **representations and logics** A mechanism by which institutional logics exert their effects on individuals and organizations is when they identify with the collective

identities of an institutionalized group, organization, profession, industry or population (Tajfel and Turner, 1979; March and Olsen, 1989). A collective identity is the cognitive, normative, and emotional connection experienced by members of a social group because of their perceived common status with other members of the social group (Polleta and Jasper, 2001).

•**cognitive frames and beliefs of actors** mental template that individuals impose on an information environment. to give it form and meaning” (Walsh, 1995: 281). These frames are produced and reproduced. by individuals through labeling objects and situations according to observed attributes.

•**categories**- a class or division of people or things regarded as having particular shared characteristics

•**distinctions** recognizing or noting difference

•**schemas** (be described as a mental structure of preconceived ideas, a framework representing some aspect of the world, or a system of organizing and perceiving new information) Schemas are “transposable”: “They can be applied to a wide and not fully predictable range of cases outside the context in which they are initially learned” (Sewell 1992: 17).

•**typifications** (typification is a process of creating standard (typical) social construction based on standard assumptions), often coded into organizational structures as differentiated departments and roles.

2. Relational Carriers carry institutional knowledge through both interpersonal and inter-organizational links and relationships

- **patterns of expected behaviors**
- **relationships found in networks of organizational positions.** (these relationships are embedded in a broader set of socio-cultural forces that influence how groups interact, how individuals act within an organization)
- **boundaries of organizational opportunities and constraints** (Dacin, Ventresca and Beal, 1999).
- **Rules that guide behaviors dictate the nature of the social roles and positions**
- **expected patterns of behavior** within the conflict and these patterns influenced their range of potential behaviors as well as reactions to others’ behaviors
- **some relational systems are widely shared across many organizations,** leading to structural isomorphism (similarities within organizational forms).
- other times, the **relational systems may be distinctive to a particular organization** leading to localized identities and behaviors, ultimately resulting in organizational uniqueness.
- **cognitive typifications** lead to differentiated departments and roles within organizations

3. Routines carry institutions through *habitualized behavior and the patterns of action* (activities) that reflect taken for granted tacit knowledge held by the actors enacting them (Scott, 2001, 2003).

•**Routines** patterned sequences of learned behavior involving multiple actors who are linked by relations of communication and / or authority” (Cohen and Bacdayan, 1994, p. 55).

- **action is repeated to the point of eliminating individual thought** in the enactment of the action
- **patterns of action and habitualized behaviors** carry tacit knowledge that is rooted in “deeply ingrained habits and procedures based on in-articulated knowledge and beliefs”
Viewing routines as the “genes” of organizations, Winter (1990: 274–275)
 - “hard”—activities encoded into technologies
 - “soft”—organizational routines such as airplane inspection or fast-food procedures
- **Organizational stability and success** depend on the appropriate use and transfer of these routines in that they provide a consistent framework of responses to familiar and unfamiliar environmental stimuli.
- **routines can have a detrimental effect on organizational behavior** when routines are inappropriately applied (e.g., when pilots lose vigilance after repeated successful safety checks).
- **distinguished from standard operating procedures (SoPs) in that SoPs are explicitly** formulated and have normative standing, whereas
- **routines are *emergent established* patterns of operating** that are often distinct from prescribed operations in other words, routines reflect the way the work is really done (Cohen and Bacdayan, 1994).
- **Routines are typically learned within, learned in and sustained by a community** means that routines are not readily transportable to new and different settings involving new actors and relationships and sustained and renewed by, relational systems.

4. Artifacts carry institutional knowledge through the material culture that is created by actors to assist in the performance of tasks (Scott, 2001,2003). Suchman’s (2003: 98) definition: “An artifact is a discrete material object, consciously produced or transformed by human activity, under the influence of the physical and/or cultural environment.”

- **embody and represent institutional knowledge** that can be viewed as elements of material culture.
- Modern organizational material culture is often conceived of as the **technologies that are embodied in both hardware and software** (Many organizational actors are dependent on such technology to facilitate or even perform their daily tasks)
- **examined in terms of “the socially constructed nature of the technology and the extent** to which its effects are mediated by situational factors and interpretive processes” (Scott, 2001, p. 81).
- **Artifacts, like the other types of carriers, are affected by each of the three pillars.**
- **Some artifacts are designed by regulative bodies**, such as the inclusion of airbags in all new vehicles.
- **Normative processes, such as the development of mechanical and technical standards across industries, help to ensure compatibility of industrial artifacts.**
- **can also carry far greater cultural significance than the value of the object would suggest.** For instance, the Stanley cup carries far greater symbolic significance and value for the winning team than the actual monetary value of the cup would suggest

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