

NAVIGATING THE STREAMS AND CURRENTS OF AN EMERGING INSTITUTIONAL
FORM: THE CAUSES AND EFFECTS OF A COMMUNITY COLLEGE S.T.E.M.
COALITION

by

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ABSTRACT

Increasingly, colleges and universities are partnering with private, non-profit, and government organizations in order to generate revenue, develop academic programs, transfer research to market, and gain legitimacy (Anderson, 2001; Etzkowitz & Lvdendorff, 1997; Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004). While research exploring this phenomenon in universities has produced several important works, fewer studies have examined partnerships centered on the community college. Instead, the bulk of articles written about community college partnerships merely serve as how-to guides for college leaders, providing the benefits of and lessons learned from specific partnerships between colleges and industry (Erwin, 2005; Sundberg, 2002). The purpose of this case study is to provide an in-depth, critical analysis of a complex partnership involving many organizations in a unique geographic setting. The study focuses on the community college at the center of a regional STEM education coalition, exploring why the college entered into the partnership and how it was affected.

Findings demonstrate that several factors at the state and national level, or “streams,” combined to form a powerful “current” of influence uniquely tailored to the community in which the college was located. Further, the loose and informal structure of the coalition, coupled with a myopic and hegemonic institutional narrative, allowed individuals outside the college to guide and direct the activities of the institution with relatively little dissent. Because of the lack of orchestrated inter-organizational coordination and agreement, the objective of the coalition, to develop a pipeline of STEM education programs from high school through the university, suffered from challenges

and breakdowns at every level. The study concludes by discussing implications for college leaders regarding building relationships with external organizations, effectively serving the local citizenry, and responding to constituents and incentives of various kinds.

CHAPTER 1: INTRODUCTION

Somewhere in the United States, against the backdrop of a crystal clear afternoon sky, an unmanned aerial vehicle, or “drone,” shoots quietly toward its destination. The unmanned aircraft’s literal destination is the airstrip located on the Green Valley Community College campus, an important fact in the context of this study. But the vehicle’s figurative destination—the future—is also significant. The future of unmanned aerial systems (UAS), the control systems for UAVs, is as bright as the cloudless Green Valley sky. The UAS is scheduled by the FAA for integration from its current, purely military applications to the civilian, commercial market in 2015. With this dramatic expansion to the market, forecasts say the UAS industry will have an economic impact in the U.S. of \$82.1 billion over the next ten years, creating over 100,000 high-paying jobs, between the years 2015 and 2025 (Dillow, 2013). As one of the top locations for UAS activity in the country, Green Valley stands poised to embrace its cut of that economic impact. The small community houses a major military base, which specializes in the testing of UAS. Connected to the base is a series of private companies in the defense industry, mostly small branches of large global corporations with gross revenues in the billions. Take away the base and its contractors and you eliminate most of the jobs in Green Valley. For the little community, miles away from any city of significant size, UAS is the future.

Tucked away in the corner of Green Valley opposite the base sits Green Valley Community College. The college has been in operation for decades and has considered the military base and its occupants essential clientele for that same length of time. As

with most organizations in Green Valley, GVCC hopes to capture some of the benefits of the UAS market by developing high-enrolled programs for UAS pilots, engineers, and technicians—a portion of the 100,000 UAS jobs projected in the next decade. But to succeed in such an ambitious endeavor, the college will need partners, a coalition of organizations from the education, private, government, and non-profit sectors to develop students and employees in science, technology, engineering, and mathematics (STEM) subjects. The purpose of this study is to explore the dynamics of this educational coalition centered on the community college—its causes, the form it takes, and its effects.

Colleges and universities are increasingly engaging in complex partnerships with many types of outside organizations (Anderson, 2001). Government, non-profit, and private organizations interact with and influence institutions of higher education as part of everyday practice, affecting everything from research projects to curriculum development to campus bookstores (Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004). Over time, the influence of outside organizations is fundamentally changing how higher education functions and its role in society (Etzkowitz & Lvdendorff, 1997; Geiger, 2004).

On one hand, these partnerships often allow institutions of higher education to offer programs and services to their students that they would not otherwise be able to offer, especially given the recent declines in government funding. During the recent economic recession, between 2007 and 2012, state support for higher education dropped 3.8% on average and as much as 32.8% in individual states (Grapevine, 2012). At a time when revenue dollars are hard to come by, finding alternate sources of income serves as a

survival mechanism for colleges and universities (Kisker & Carducci, 2003). On the other hand, partnerships with external organizations can affect the institution's mission. For example, the role of private grants on research production has led institutions to pursue research outputs based more on marketability and revenue generation than the public interest (Slaughter & Leslie, 1997).

For better and for worse, partnerships between institutions of higher education and organizations from other industries are likely to be a permanent fixture. The past decades demonstrate that economic sectors of all kinds are increasingly interdependent and their comingling promises to only increase as time goes on (Orr, 2001). For this reason, higher education leaders and policymakers must seek to understand and positively influence the ways in which outside organizations interface with colleges and universities.

While the relationship between research universities and private organizations has received reasonable attention in the literature, less well documented is the relationship between the community college and outside organizations. With over one thousand community colleges enrolling almost half of incoming college freshmen in the U.S. (Mullin, 2010), two-year institutions are a significant contribution to this country's higher education sector. As accredited institutions of higher education, community colleges are able to grant degrees and certificates in a wide variety of subjects, serving as a tool for individual prosperity and economic development. Because of their ability to train and educate the workforce, community colleges have increasingly been seen as an important partner for government and private agencies of all kinds.

Over the past two decades, community colleges have significantly increased partnerships with outside organizations to provide credit and non-credit courses to train workers in high-demand fields (Bailey & Morest, 2004; Dougherty & Bakia, 2000; Kasper, 2003; Levin, 2001; Orr, 2001). While often these endeavors are a simple one-to-one relationship wherein the college offers customized, contractual training to an organization's employees, there are instances in which these partnerships involve multiple organizations within and outside of the educational sector in an effort to build an educational pipeline from K12 through graduate programs in order to serve a perceived local economic need. These "coalitions" often involve complex relationships between the organizations involved in regards to resource allocation and sharing, curriculum development, personal politics, and power dynamics. These factors have an effect on the mission and operations of the college, and in turn on the institution's ability to serve as a vehicle for individual mobility and economic prosperity.

The community college's significance to the higher education sector, its increasing tendency to form partnerships, and the effect those partnerships can have on the college's mission and operations warrant a close examination of why and how these complex partnerships are formed and how they function. A qualitative study exploring the full depth of this kind of an undertaking will help practitioners and policymakers better understand the various elements of this emerging form of educational partnership, informing decision making and allowing stakeholders to positively influence the intersecting of the community college and external organizations.

This case study is an examination of a partnership between a diverse group of organizations to promote science, technology, engineering, and mathematics (STEM) education in a unique community in the United States. Engineering education, above the other forms of STEM, is a particular focus of the coalition being examined. The term "coalition" is employed to represent the multi-organizational partnership being studied, which involves educational, governmental, private, and non-profit organizations all located within the same state, with most of the organizations being located in the same community. Throughout the study the words "coalition" and "partnership" are used interchangeably to represent the program being examined.

While various organizations play a role in the coalition, many of the efforts are centered on the community college, which houses most of the programs and services of interest to the partners involved. The college is seen as the nexus of an education pipeline, connecting K12 education to advanced degrees. In addition, the university does not have a strong presence in the community, only maintaining a small satellite campus there, which requires the community college to play a leadership role in higher education. For these reasons, the study focuses primarily on the community college and its pivotal role in the endeavor. However, throughout the study, individuals and organizations are examined to the extent such examination contributes to the overall understanding of the partnership.

This study focuses on two different aspects of the STEM coalition. First, the study provides a close examination of the economic, social, and political forces encouraging the coalition. Understanding why organizations are involved helps to

explain organizational actions within the coalition, in addition to communicating organizational priorities, strategic directions, and reward structures—all important in gaining a full understanding of the coalition. Second, the study explores the form the coalition takes and the effects of the coalition on the institutions involved, with particular focus on the community college at the center. Each organization contributes unique and varying resources to the partnership, and partners are connected to the endeavor in different ways. These resources and connections affect organizational functioning in various ways, including political and social dynamics, intra and inter-organizational narratives, and resource allocation. Ultimately, this involvement has an effect on students and staff at the institution, as well as the community at large and each organization's respective constituencies. Another way to phrase the purpose of this study is as an examination of the *causes, form, and effects* of the collaborative, with causes comprising one chapter of findings and form and effects, because of the interrelated nature of these two subjects, comprising another chapter.

Background

Some scholars argue that partnerships formed between community colleges and outside organizations are a result of the college becoming more intricately linked with free-market forces and the new global economy (Ayers, 2005; Levin, 2001). In order to better understand the context of such partnerships, it is important to assess the economic context within which they are forming. The change in the global economic perspective over the past three decades has been well researched and documented (Harvey, 2005; Saunders, 2010). The emergence of a new global economy based on a stronger commitment to free market forces has had significant effects on nations' economic infrastructures, as well as individual sectors. This perspective is commonly known as neoliberalism (defined in more detail below) (Harvey, 2005). The U.S. economy has experienced dramatic changes due to this shift, and the higher education sector—its funding, management, and effect on society—has been a part of these changes. The three subsections below help to develop a general understanding of the concept of neoliberalism, how higher education has been affected by a stronger global commitment to neoliberalism, and how community colleges specifically have been affected.

Neoliberalism and the Global Economy

Neoliberalism refers to an economic system wherein the market is intended to function openly and without restriction. This philosophy is comprised of three basic tenets (Harvey, 2005; Saunders, 2010). First, that the cultivation of free-market forces is superior to a regulated environment in creating prosperity. Second, that government intervention at the local or national level will inhibit economic prosperity by overtaxing

citizens and companies in order to support welfare programs. Finally, neoliberal principles assert that the individual, given the ability to act freely, will make rational choices that will, in the aggregate, lead to general economic prosperity. In a neoliberal economy, the purpose of government is to minimize regulations on the market and on businesses, to lower taxes, to allow free and independent action among individuals, to encourage open trade agreements, and to generally foster a system where private enterprise can thrive in as hands-off an environment as possible (Harvey, 2005). The determination to allow the demands of the market to govern economic systems without restriction is known as *market fundamentalism* (Somers & Block, 2005). Though the tenets of market fundamentalism do not accurately describe the mix of economic policies and practices of any existing government, the concept of allowing the market to dictate success or failure, free of the intervention of government, serves as a fundamental principle of neoliberalism.

The argument supporting neoliberal principles is based on the concept that a stronger private industry will lead to greater general prosperity. The financial success of businesses will “trickle down” from the executive level to each individual employee, as well as to the economy in general (Saunders, 2010). Following this logic, any restrictions put on businesses will inhibit the financial prosperity of the general population. Government’s role is to clear the field of any regulation, taxation, or other roadblock that would inhibit the growth of private industry (Friedman, 1962).

One of the primary arguments against neoliberal principles is that, in removing the regulation of industry, unjust advantage is given to the wealthy. This, in turn, creates a

powerful wealthy class at the top of the economic hierarchy and increases poverty and disadvantage among other citizens (Harvey, 2005). This effect stands directly opposed to the “trickle down” logic supported by proponents of neoliberalism. As power has shifted to large corporations and away from government entities, corporations have gained tremendous power and wealth, while the individual, especially the individual on the lower rungs of the economic ladder, has not prospered.

So prevalent is the acceptance of neoliberal principles as a global ideology that many individuals accept neoliberalism without question, without even knowing it by name (Saunders, 2010). This has given those supporting this set of economic principle extreme power in determining the direction of governments and systems. The acceptance of uninhibited market forces as a superior economic philosophy is so extensive that many citizens of nations think it is the only plausible set of beliefs and actions (Saunders, 2010). For this reason, neoliberalism has been termed the dominant hegemony in global economic thought (Ayers, 2005; Harvey, 2005; Saunders, 2010). A hegemony is a system of commonly accepted thoughts and beliefs that gives power to an individual or individuals. The establishment of a hegemony grants power to its supporting groups to govern and direct, as it extinguishes resistance and would-be resisters. Thus, perhaps the most damaging effect of a neoliberal hegemony is the ability of individual actors in society to enact change through the democratic process and the passing of that power to the organizations that have the most power to create wealth (Ayers, 2005).

The Marketization of Higher Education

As a more global economic engine—one driven by principles of neoliberalism—has formed, systems of higher education throughout the world have been penetrated and permeated by forces of the liberal market (Slaughter & Leslie, 1997). It is important to recognize that institutions of higher education have been engaged with the market since their inception (Anderson, 2001). Colleges and universities have always been expected to contribute to their local and national economies in a number of ways, from generating research that would benefit the economy to preparing students for jobs. The changes of the last three decades do not represent a completely new phenomenon but a paradigm shift toward supporting market behaviors among colleges and universities (Saunders, 2010).

Now under the neoliberal framework, the value of organizations is determined by their ability to create perceptible economic impact. In this light, the neoliberal hegemony emphasizes the ability of colleges and universities to generate marketable research; produce human capital specific to industries critical to strong economic performance; create profit for their local and national economies; and function in rational and predictable ways (Ayers, 2005; Geiger, 2004; Slaughter & Rhoades, 2004). Because neoliberal principles discourage government intervention in the form of collecting taxes and allocating to public institutions, colleges and universities are increasingly funded through private revenues, including grants from the private sector, student tuition, and auxiliary services (Mullin, 2010; Slaughter & Rhoades, 2004). State funding for higher education institutions has declined precipitously in recent years (Grapevine, 2012;

Pattison & Eckl, 2010; Roessler, Katsinas, & Hardy, 2006). These changes have been fueled by a change in public perception that higher education is a private good rather than a public good. As government funding for higher education has decreased, institutions of higher education have engaged at increasing rates in market-driven behaviors in order to capture revenue (Slaughter & Leslie, 1997). These activities are transforming the ways institutions function and causing them to increasingly serve private interests, including the interests of organizations outside of colleges and universities (Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004).

Just as colleges and universities have experienced increasing connectivity with outside organizations, research demonstrates the institutions of higher education are increasingly reacting to market pressures in creating academic programs (Ayers, 2005; Kraatz & Zajac, 1996; Pusser & Doane, 2001). While creating programs that respond to demands in the job market may increase enrollment and, in turn, generate more revenue for an institution, they may also diminish an institution's ability to fulfill its mission and purpose in society, such as preparing students to become well-rounded citizens and leading society to new areas of scholarship rather than giving students what they want (Slaughter & Leslie, 1997). Further, colleges and universities increasingly tend to view current and prospective students like customers in an open market (Slaughter & Rhoades, 2004). This reflects the neoliberal focus on consumers acting as independent agents to determine the fate of organizations. In addition, graduates are treated as products to offer to the market, reflecting the focus on market exchanges and forms of capital so prevalent in neoliberal ideology.

The Emergence of Partnerships

As the interconnectedness between economic sectors has accelerated over the past three decades, community colleges have increasingly developed partnerships with outside organizations. These partnerships exist in a variety of forms, but they often center around the organizations working together to create and deliver credit and non-credit programs geared toward training workers in high-demand fields (Bailey & Morest, 2004; Dougherty & Bakia, 2000; Kasper, 2003; Levin, 2001; Orr, 2001). Because a community college plays a central role in this study, it is important to understand the history and context of community college collaborations, as well as the research related to their causes and effects. Despite a wealth of articles and single case studies on specific community college partnerships, much of the literature consists of writings intended to demonstrate the success of particular partnerships rather than to explore them through deeper qualitative methodologies.

Background and Context

Community colleges are increasingly interconnected with government organizations, private companies, and educational institutions (Orr, 2001). Partnerships between these organizations can be as simple as a college providing training, by contract, to the employees of a local company so the company does not have to provide that training themselves, or extremely complex coalitions that involve educational, governmental, and private organizations throughout entire regions working together to develop the workforce of a particular industry (Orr, 2001).

While partnerships with the private industry are a newer phenomenon (Kisker & Carducci, 2003), appearing mostly in the past few decades, community colleges have a more extensive history with government organizations. Throughout the twentieth century, community colleges cultivated partnerships with federal, state, and local governments, receiving critical operating funds from each. Local governments often control the tax levies that provide a major source of funding. In most states, colleges receive an annual allocation of funds from the state government. At the federal level, funding comes in the form of financial aid dollars granted or loaned to students to cover tuition and other college-related expenses. Another source of funds comes through state and federal grants. Colleges often apply for and receive government grants designated for specific purposes such as developing certain academic program, increasing student support, and so on. Grants can add millions of dollars to a college's revenue stream. Community college relationships with local, state, and federal governments extend back to the development of community colleges from state junior colleges in the early to mid-twentieth century (Brint & Karabel, 1989).

Partnerships between community colleges and private organizations can be manifest in a number of ways. Contract training describes the community colleges efforts to provide specific content to suit the needs of local employers. This form of education is typically contracted by businesses and the college for the sake of improving specific competencies of employees, hence the term contract training. In most cases, contract training does not grant academic credit. Contract training serves an important role in supporting the needs of local businesses, especially in rural communities and with

small businesses, circumstances where adequate resources to provide training are lacking (Kasper, 2003). In 1990, less than half of community colleges offered training programs in conjunction with local industry. By the mid-1990s, that proportion had jumped to 90% (Stamps, 1995). It is important to note that while contract training has dramatically increased in popularity over the past two decades, income from this source still often makes up below 5% of a college's total revenue stream (Bailey & Morest, 2004).

Another prominent form of collaboration occurs when the college works with local businesses to develop new academic programs that do grant academic credit to students and may or may not be targeted to employees of a specific business. While contract training is often administered in a department separate from the college's academic departments (Bailey & Morest, 2004), efforts to serve local industry by providing pertinent vocational programs have permeated the institution (Ayers, 2005; Bragg, 2001). These partnerships may result in a deeper and more complex relationship forming between the college and outside organization, in part because an academic program often requires many more hours of instruction than does a training session. The curriculum development, instruction, and facilities used in such a program may require extensive resources.

In addition to the development of credit and non-credit programs, partnerships between community colleges and private industry may focus on organizations providing resources in general to the college in an attempt to support local economic development. A few examples of these resources are direct monetary gifts, scholarships for students, and space or facilities being loaned or gifted to the college (Jackson & Glass, 2000).

Benefits of Industry Partnerships

Partnering with the private sector can provide a variety of benefits to the community college, its partners, and the economy as a whole. Incentives must be strong in order to attract industry partners to the community college. Partnerships not providing significant benefit to both the community college and its partner are likely to fail (Erwin, 2005; Orr, 2001).

The local economy benefits from the joint efforts of the community college and local industry. By increasing the general level of education, training, and opportunity, these efforts increase the productivity and modernization of the local workforce. They also attract new businesses and retain existing businesses (Kisker & Carducci, 2003). Organizations that partner with community colleges increase the skills of their employees and gain valuable knowledge by contributing to curricular innovation that combines classroom and hands-on education (Kisker & Carducci, 2003; Spangler, 2002).

Community colleges derive several benefits from industry partners. They gain revenue in the form of student tuition for credit and non-credit programs built in association with private organizations. At times private organizations may make donations to the community college, often in the form of a monetary gift or scholarships for students (Erwin, 2005; Jackson & Glass, 2000). The use of facilities is another benefit gained by community colleges. Wealthy businesses may build state-of-the-art facilities on community college campuses to be used for the training of their employees, or colleges may be allowed to use the off-campus facilities of private organizations to teach classes pertinent to those organizations (Kisker & Carducci, 2003). Community

college students benefit from internships and mentorships set up with partner organizations. Additionally, the entrepreneurial know-how provided by industry partners can benefit community college curriculum developers, as colleges strive to develop programs relevant to the private sector (Kisker & Carducci, 2003).

Drawbacks of Industry Partnerships

Though there are definite incentives for community colleges to build partnerships with local businesses, some scholars argue that community colleges' ties to industry have led to "mission creep," weakening their commitment to liberal arts and transfer education in pursuit of short-term economic prosperity (Ayers, 2005; Brint & Karabel, 1989; Levin, 2001, 2005). By focusing on preparing students for very specific roles in industry through academic programs customized to a job rather than providing a solid educational foundation, the community college may stunt long-term opportunity for students. The community college's shift to better serve the market may make it less able to promote the general knowledge and social mobility of the students and communities it serves (Levin, 2001, 2005). Combine those dynamics with the fact that community colleges receive a disproportionate share of low-income and racial minority students and the institution becomes a tool for the perpetuation of inequality (Ayers, 2005; Dougherty, 1994). While community college administrators may think they are making decisions that will enhance their own institutions and their local economies (a win-win scenario), they may overlook the damaging long-term effects such decisions may have on individual well-being.

Community colleges' efforts to develop the local economy through industry partnerships could damage the local economy in certain conditions. For example, if

businesses fail or leave the community, the human capital built up through the community college's training efforts may be wasted. Such occurrences cause trainees to either have to leave the community in search of jobs in the areas in which they are qualified, to return to the community college to be retrained in an area relevant to the local economy, or enter into unemployment. In any of these scenarios, the pursuit of short-term profitability hinders long-term prosperity for the community and many of its individual citizens (Mars, 2012).

Theoretical Frameworks

This study applies three theories to explore the causes and effects of the STEM coalition. Resource dependence theory, or RDT, suggests that organizations employ the behaviors that will help them gain maximum control over the resources critical to their survival (Pfeffer & Salancik, 1978). An aggressive and often effective strategy utilized by organizations is to acquire or overtake an organization that possesses important resources. When this strategy is impossible or inappropriate, as in the case of educational institutions, coordinating strategies are often employed. Coordinating strategies are attempts by an organization to gain greater involvement and interdependence with resource providers. By positioning individuals in the decision-making process of the resource provider, the organization optimizes its influence and control over resources. In addition to coordinating strategies, organizations often attempt to diversify their resource streams in order to depend less on any one or set of resource providers. This often involves organizations developing new partnerships, products, or services in order to capture new segments of the market or new sources of funds. RDT provides a useful

framework for this study, as it focuses on partnering behaviors and the resource decisions that drive those behaviors.

Academic capitalism, which draws upon RDT, applies the concepts of resource dependence, market behaviorism, and neoliberalism to the higher education sector (Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004). The theory suggests that institutions of higher education, in an effort to acquire the financial resources necessary to survive and thrive, are increasingly adopting behaviors to optimize their market positioning. As colleges and universities have developed these behaviors, they have redefined their relationships with their students and employees, as well as external organizations. All these groups are increasingly evaluated in terms of their ability to maximize the institution's resources. Much of the work on academic capitalism has been focused on research universities. However, there has been some application at the community college (Levin, 2001; Slaughter & Rhoades, 2004). Academic capitalism has particular value as a lens through which to explore the shifting mindset of the higher education institution. As such, it is relevant in examining both the forces motivating the STEM coalition and the effects the coalition has on the institutions involved.

Neo-institutional theory, a third framework, adds a new element to the other two theories. In contrast to the focus on maximizing institutional resources contained in RDT and academic capitalism, this theory asserts that organizations respond to social and political pressures to conform to acceptable organizational forms (Meyer & Rowan, 1977). By demonstrating behaviors that fit societal expectations, organizations gain legitimacy in the eyes of their constituencies. Whether through coercion or by modeling

the behavior of legitimate organizations in their fields, organizations become increasingly more like one another, a phenomenon known as isomorphism (DiMaggio & Powell, 1983). Its emphasis on conforming to rules, regulations, and norms, rather than the acquisition of resources, makes the perspective of neo-institutional theory unique in this study. This perspective helps to explain institutional behaviors based more on social and political factors than on the economic factors of the other two theories.

Drawing from resource dependence theory, academic capitalism, and neo-institutional theory throughout the study allows me to explore the causes and effects of the STEM coalition from differing, but complementary, angles. None of the theories alone is able to create as rich a description of the coalition as the three theories used in concert. Together the three theories enable me to apply multiple perspectives to explain the social, economic, and political forces driving the STEM coalition and to interpret the behaviors organizations demonstrate in association with the endeavor.

Research Questions

Research questions guiding the study were divided into two broad categories, corresponding with the topics of causes and effects, accordingly. These questions were used to create interview protocol, and findings chapters correspond with the two categories, with a chapter for each.

1. What social, political, and economic forces motivate organizations to participate in an education coalition?

- a. To what extent are organization's involved as a way to develop new or alternate resource relationships?
 - b. To what extent are organizations attempting to gain greater control of other organizations providing crucial resources?
 - c. How is the community college's involvement influenced by other organizations, state or local government, or other constituencies?
 - d. To what extent are the organizations modeling the behavior of other organizations and partnerships?
 - e. What role do market forces, such as generating revenue and meeting specific workforce needs, play in motivating organizational involvement?
2. How does the coalition affect the behaviors, narratives, and outcomes of the organizations involved, particularly the community college?
- a. What strategic behaviors are employed by organizations involved in the partnership in an effort to manage relationships with the other organizations?
 - b. How does the coalition affect an organization's interdependence with and influence over partner organizations?
 - c. How does these relationships influence the way the community college allocates resources and power toward or away from certain individuals, departments, or programs?
 - d. How does the coalition affect individual opportunity for students?

Significance of the Study

This study contributes to the overall research on educational partnerships by using case study methodology to explore the complex social, political, fiscal, and interpersonal dynamics involved in a collaborative involving many organizations and organization types in a unique setting. The study will benefit administrators and decision-makers at the institutional level by providing a deep look at a phenomenon increasingly common as institutions seek to partner with other organizations to accomplish their purposes and to gain important resources. While institutional leaders may already benefit by studies involving institutional partnerships, this study provides greater depth and critical perspective, far beyond a list of do's and don'ts or lessons learned from a particular endeavor. This study goes deeper by exploring the potential effects of partnerships on an institution's mission and operations, something that administrators and policymakers should consider with the increasingly-popular practice of forming alliances with external organizations. In addition, I address potential effects on institutional outcomes, particularly outcomes such as student opportunity and economic development. Because the community college plays such a vital role in granting access to higher education, the coalition's effect on student access and other outcomes is an important area of concentration.

Further, this study will benefit researchers of higher education by pulling out new phenomena through in-depth study of a partnership that is unique because of its geographic setting and because of the diversity of organizations involved. The findings may induce further exploration of the role of institutional setting in providing

opportunities to partner. From a standpoint of prompting future research, the most significant outcome of this study may be in demonstrating the need for deeper, critical study of the relationships between institutions of higher education and organizations in other sectors. These relationships are not without consequences, and the literature to date often fails to acknowledge the deeper organizational effects, both positive and negative, that occur when institutions develop new relationships with outside entities.

Finally, it is a personal hope that this study benefits the broader public who may or may not be familiar with these critical topics but who will invest personally and monetarily in institutions of higher education throughout life. Though it often seems like the direction of an organization is inevitable and unalterable, we should not accept that to be the case. Those investing in colleges and universities, either through direct or indirect funding, should consider themselves stakeholders in the future of these institutions. How the local community college and other public educational institutions function, for better or for worse, is all our business.

CHAPTER 2: LITERATURE REVIEW

The research on partnerships involving institutions of higher education demonstrates a marked increase in the quantity of this type of partnership over the past three decades (Etzkowitz & Leydesdorff, 1997; Feldman, 2003; Saunders, 2010; Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004). Partnerships are formed for varying reasons and take a variety of forms. This chapter explores literature addressing two aspects of these partnerships—first the causes and motivations of partnerships, then their forms and effects. Within each of these sections, I differentiate between two-year and four-year institutions, as the purpose and nature of partnerships varies significantly between these two types of institutions.

Causes and Justifications for Partnerships

Colleges and universities often pursue partnerships with outside organizations as a way of seeking benefits they could not produce on their own (Haire & Dodson-Pennington, 2002). The institution's motivation is often to obtain resources of various kinds, whether that be a direct monetary exchange—as with donations or training fees—or whether it be in-kind contribution, such as equipment or even physical facilities donated by an outside organization (Spangler, 2002). However, perceived social benefits, such as legitimacy or fulfillment of mission, may also drive organizations to establish partnerships (Dougherty & Bakia, 2000).

Four-Year Institutions

Research addressing the growth of partnerships between four-year institutions, including research universities, and external organizations charts the increased intersecting and interdependence of sectors (Etzkowitz & Leydesdorff, 1997; Feldman, 2003; Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004). In introducing the concept of academic capitalism, Slaughter and Leslie (1997) conducted various studies exploring how universities in several countries increased their pursuit of targeted contracts and grants in lieu of the traditional government allocations during the 1980s. As government block grants declined for public research universities, universities more aggressively pursued private and targeted grants coming from the private sector and government agencies. Government organizations, such as the National Science Foundation (NSF) provided an important alternate funding source for universities, which had become dependent on a certain level of revenue to grow and prosper. Securing these new forms of funds entailed increasing relations with external private, government, and non-profit organizations. Although not all universities in their study pursued academic capitalism at the same rate, two of the four institutions examined garnered a significant portion of their revenues, 10 and 12 percent, from various forms of academic capitalism. However, Feldman and Desrochers (2003) observed that few universities successfully transferred research to the market. Many were simply unsuccessful in doing so, but some, such as MIT, believed it was potentially harmful to the university to allow research interests to be driven by market forces, an idea echoed in the academic capitalism literature (Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004).

Etzkowitz (1983) coined the phrase “entrepreneurial university” to describe the research university’s emerging tendency to pursue applied research that could be transferred to the private sector. Etzkowitz and Leydesdorff (1997) introduced a “triple-helix” model of university-government-industry relations, asserting that the integration of these three sectors altered the behaviors of each sector to create an environment wherein innovation could thrive. While historically the government worked directly with the private sector to spur innovation, the university has increasingly become a key partner in that relationship. Several empirical studies emerged to explore this new role played by higher education institutions around the world (Etzkowitz, Mello, & Almeida, 2005; Feldman & Desrochers, 2003; Geuna & Nesta, 2006). Perhaps most relevant to this study, the triple-helix concept underscores a multi-organizational, or coalition, model for pursuing economic development and innovation. In this model the private, government, and educational sectors work together to introduce innovations into the economy. Etzkowitz (1988) demonstrated how the military and defense industry had grown to be part of that relationship. Feldman (2003) and Saxenian (1996) explored how regions of connected networks of collaborating organizations, including universities, developed local economies through innovation.

In addition to sustaining a dependent base of operating revenue, other factors motivate universities to build partnerships. These factors are often more compelling than the direct, monetary benefits derived from partnerships (Slaughter & Leslie, 1997). One of these factors is the legitimacy gained by the college or university when they are associated with organizations perceived as powerful economically or socially. Slaughter

and Leslie found that the relationship developed with external organizations, enhancing the university “credibility as a ‘relevant’ social actor” (p. 122), was as powerful an incentive in the eyes of university faculty and administrators as the revenues themselves. Generating revenue and establishing credibility work hand-in-hand. As institutions more actively pursue outside relationships with increased funding potential, a well-connected institution becomes the accepted model for a successful organization, granting legitimacy to institutions who replicate the model.

Two-Year Institutions

While universities have developed more extensive collaborative relationships with outside organizations as a way to secure revenues and generate credibility, community colleges have taken their own routes to achieve these ends through partnerships. For example, research has demonstrated a dramatic increase in colleges’ pursuit of contracts to train outside organizations as a way to generate additional revenues (Bailey & Morest, 2004; Jacobs & Dougherty, 2006; Kisker & Carducci, 2003; Spangler, 2002; Stamps, 1995). In 1990, less than half of community colleges offered training programs in partnership with local industry. By the mid-1990s, that proportion had jumped to 90% (Stamps, 1995). The training contracted can produce significant funding for the college, depending on the scope of the project. The reward for the organization being trained is that colleges, because they are publicly subsidized, can train employees at a much lower cost than the organization itself could. Raley (2000) found that not only did a company save \$16,000 per employee trained by the community college rather than its own organization, but training through the partnership took only 44 days instead of the usual

120, realizing a savings of both cost and time. Both Raley (2000) and Dougherty and Bakia (2000) found that in addition to the direct revenues generated by contract training, colleges sought added revenue in the form of state and federal government grants awarded as a way to incentivize contract training partnerships between colleges and the private sector. The limitation of these two studies is that they focus exclusively on one form of partnership, contract training, and in doing so also limit the type of partnership to a one-to-one relationship rather than a multi-organizational arrangement.

The concept of government grants as a form of incentive extends beyond just contract training. Just as universities increased their pursuit of government research grants, community colleges have increased their pursuit of state and federal grants by engaging in partnerships and coalitions to develop certain educational programs deemed in-demand. In their case study of a partnership involving three universities, Duffield, Olson, and Kerzman (2013) found that government grants motivated institutions that had previously considered themselves competitors to establish a partnership that served as a teacher training pipeline from one institution to the next. Zinser and Lawrenz (2004) explored a partnership that involved several educational as well as private organizations funded by 38 million dollars in grant funding from the National Science Foundation. Haire and Dodson-Pennington (2002) analyzed one college's efforts to develop a grant-writing team to more aggressively pursue grant funding. Mirroring the university's efforts to secure grants as a way of replacing declining government allocations directly to institutions (Slaughter & Leslie, 1997), community colleges also seek other forms of

funding more aggressively when state and local allocations ebb (Daugherty & Bakia, 2000).

Beyond direct revenues through contract training and government grants, studies identify other resources gained through partnerships. Both Erwin (2005) and Sundberg (2002) found that partnerships resulted in new facilities and equipment for colleges. Caterpillar, Inc. built a multi-million dollar training facility on the campus of Illinois Central College for the purpose of training Caterpillar employees (Erwin, 2005). The partnership also resulted in millions of dollars of donated equipment to the college. When Maytag built a two million dollar training facility on the campus of Carl Sundberg College, it allowed the college to use the facility for education programs beyond those provided to the company (Sundberg, 2002), thus providing a general incentive to the college outside of the partnership. Whether it be building new facilities on college campuses, or perhaps more common, allowing colleges to teach classes using an outside organization's existing facilities off campus, community colleges benefit by utilizing physical facilities provided by partners, saving them costs on building, maintaining, and upgrading their own facilities. The Erwin and Sundberg studies, along with other found in Spangler (2002) focus mostly on the benefits of these types of arrangements, as well as the logistics of establishing partnerships to train workers.

Dougherty and Bakia (2000) found that by coupling with powerful and prominent organizations in their communities and regions, community colleges were perceived as important contributors to the success of their economies. These perceptions extend across stakeholder groups. In addition to businesses, state and local governments often

support and incentivize community college partnerships with industry in various ways. Colleges reaching out to partner with organizations in their surrounding community can be perceived as progressive contributors to their economies and successful in fulfilling their institutional mission.

The community colleges in the Dougherty and Bakia study often cited their mission to serve the local community as a reason for engaging in partnerships. However, according to the authors, this may have represented a distorted and potentially misguided perception of community stakeholders. They said, “Community colleges tend to define community in a way that makes employers the central constituents of the ‘community.’ There is little to no consideration of the possibility that on occasion the interests of the community and of employers might actually be opposed” (p. 221). This observation aligns with other research that community colleges’ ties to industry have led to “mission creep,” weakening their commitment to liberal arts and transfer education in pursuit of short-term economic prosperity (Ayers, 2005; Brint & Karabel, 1989; Levin, 2001, 2005).

Several studies note a related concept of shared mission or goals as a motivator for establishing partnerships (Duffield, Olson, and Kerzman, 2013; Haire and Dodson-Pennington, 2002; Spangler, 2002). Often this shared goal is the preparation of skilled workers—an arrangement wherein the college is seen as a conduit or pipeline for important human capital required by the specific organization, as in the studies in Spangler (2002), or the economy in general (Duffield, Olson, and Kerzman, 2013; Zinser & Lawrenz, 2004).

An additional component of the discussion is the role an institution's unique setting plays in the context of partnership development. More specifically, this study responds to a call by Stephen Katsinas (1996) for more research on how a community college's unique setting can motivate its partnerships with outside organizations. In each of the partnerships described above, the community college responded to opportunities to partner based on available businesses and local economic forces. This highlights the importance of a college's setting in determining its opportunities for partnership as well as the types of partnerships in which it will engage. A college's size, resources, and other characteristics also play into this equation.

Studies have found important differences among community colleges in different geographical settings (Castañeda, 2002; Kennamer, et. al., 2009). Sink and Jackson (2002) studied how one rural community college in North Carolina developed partnerships with nonprofit and government organizations in its region. Though this study, as with many studies previously mentioned, is approached as a guide for community colleges seeking to develop partnerships, it is unique in its emphasis on a college's unique rural setting. Write the authors, "Although a great deal has been written about best practices in community college partnerships, comparatively little research has focused on factors contributing to the success of campus-based partnerships. Even less has been written about small rural community colleges working with nonprofit agencies or organizations" (p. 36). That statement is important in highlighting the need for research focused on the role a community college's unique setting plays in the partnerships it develops. To this point, Katsinas (1996) wrote, "Do rural, suburban, and

urban community colleges differ in terms of their involvement with business and industry, and in their focus regarding economic development and workforce training? Logic would suggest so, but this hypothesis has not been empirically tested” (p. 22-23). The unique characteristics of the regional economic, political, and social environment play a significant role in a geographically concentrated educational initiative such as the one explored in this study.

In studies focused on community college partnerships, justifications for participation are addressed very briefly if at all. Exploring the reasoning and impetus for partnering is not the focus of these studies. Where justifications are addressed, they commonly center on financial benefits to the institution, and the economic goals pursued by the partnership are taken for granted. But this should not be the case. Deeper study of organizational incentives, particularly those of the college at the center of the partnership, is needed. As Amey, Eddy, and Ozaki (2007) observed in their call for this kind of deeper study, “Despite perceived initial benefits, many partnerships fail to obtain the desired results, cannot be sustained, or cease to benefit both parties” (p. 8). In this study, I explore in depth the justifications for organizations involved in a multi-organizational partnership. It is important to not assume that organizations share a common goal and to address the incentives for each organization’s involvement. As Amey, Eddy, and Ozaki put it, “Partners may bring to the relationship varying levels of power or rationales for being involved” (p. 10).

Form and Effects of Partnerships

The literature on educational partnerships addresses how these relationships function—the forms they take—as well as the effects they have on the institutions involved. However, research on partnerships nearly always focuses either on the context and driving forces of the partnership, as addressed above, or presents a cursory exploration of the partnership's functioning and effects. Below I assess the current state of this literature, again from the standpoint of four-year and two-year institutions.

Four-Year Institutions

The literature on academic capitalism, particularly the work of Slaughter and Rhoades (2004), presents an extensive view of how the increasing connection between universities and outside organizations affects the institution. A key finding of Slaughter and Leslie (1997) was that academic departments within universities experienced dramatically different levels of funding from sources external to the university. As a revenue generator, academic capitalism clearly benefitted departments that were positioned to transfer applied research to the market. This put departments such as the humanities and social sciences at a disadvantage, not only in terms of external funding, but also when it came to funds being dispersed within the institutions. Universities allocated operating funds differentially based on a department's ability to attract funds from partners.

In addition, academic capitalism introduced greater external influence into the institution. In their study of interlocks among boards of trustees, Slaughter and Rhoades (2004) found that the involvement of top corporations on university boards may affect

decisions such as executive compensation and presidents holding equity in private organizations. Expressed in resource dependence theory (Pfeffer & Salancik, 1974) and the theory of academic capitalism (Slaughter & Leslie, 1997), the idea of how individual members of outside organizations join boards, advisory groups, and other decision-making bodies can be extended to the community college in addition to the university. The rationale for creating this form of interface, whether it is initiated by the college or the organization, and what effect these individuals have on the organization are important concepts to this study.

Slaughter and Rhoades (2004) found that as universities more aggressively pursued patents and engaged in online learning, they partnered more frequently with external organizations specializing in those activities. This gave external entities a louder voice in the government of the institution. Further, institutions increasingly developed professional masters degrees in greater numbers. The purpose of these degrees was to make graduates more marketable in a variety of high-demand job fields rather than the path of research and teaching historically the focus of graduate schools.

Two-Year Institutions

The literature on community college partnerships contains a series of case studies exploring specific partnerships between colleges and other industries, usually the private sector. Duffield, Olson, and Kerzman (2013) found that creating a highly coordinated core leadership group, with clearly defined policies and procedures, was crucial to the success of an education partnership involving three universities. Haire and Dodson-Pennington (2002) similarly found that building from mutual goals, establishing clear

roles and ground rules, and extensive dialogue between organizations were all important to the success of multiple partnerships. Amey, Eddy, and Ozaki (2007) expressed the importance of studying the instigator of the partnership. Examining individual roles among those involved in the partnership will create a better understanding of the power dynamics at play and which individuals and organizations are exerting influence over others.

Related to this concept is the research on partnership champions. A champion is an individual situated somewhere in the partnership who makes efforts to promote, develop, and sustain the partnership (Amey, Eddy, and Ozaki, 2007). Duffield, Olson, and Kerzman (2013) found that the success of their multi-organizational collaborative required a champion at each institution. According to Amey, Eddy, and Ozaki, the champion garners support through expertise, character traits, and organizational positioning and has great influence over the direction and sustainability of the partnership. Examining the role of champions is an important component in this study, including exploration of how they are selected, their various functions, and especially how they influence the partnership and organizations involved.

Conversely, Duffield, Olson, and Kerzman (2013) discovered pockets of resistance among faculty members at the three universities involved in a partnership. The authors attributed this resistance to a lack of involvement in core decision making and a lack of awareness. Resistance to the partnership was a very uncommon element in the literature specifically addressing community college partnerships. This is likely due to the fact that most studies took for granted the innate positive value of partnerships. A

deeper understanding of partnerships warrants exploration of all sides and levels of participation at the institution and not just those working to make the partnership succeed. Looking at how individuals in various positions view the partnership and the roles they play in supporting or opposing the partnership will generate a more complete comprehension of organizational dynamics.

The internal allocation of resources and influence associated with the partnership is an important part of this study. Haire and Dodson-Pennington (2002) found that one community college strategically developed a new department to pursue external partnerships through grant opportunities. They state, “Through collaborative partnerships the college positioned itself as a viable investment for both private and federal funders...The college identified prospects and submitted proposals designed to appeal to the funder’s investment interests” (p. 66). The use of the phrases “the college positioned itself,” “identified prospects,” and “designed to appeal,” demonstrate the college’s efforts to strategically position itself for this type of activity. This kind of retooling the institution to pursue external relationships and resources is reflected in the literatures on academic capitalism and resource dependence theory (Pfeffer & Salancik, 1974; Slaughter & Rhoades, 2004). These efforts often represent a new type of pursuit for the institution and at times a significant change in direction. Lacking in these studies is detail surrounding the interpersonal, social, and fiscal dynamics occurring within and between institutions as they pursue these joint ventures.

Throughout his work, Levin refers to the “globalization” of the community college to define the college’s reaction to global economic and social forces, often

through electronic means and technologies (2001). He states, “Conceptually, globalization suggests the drawing together of disparate locations and the compression of time. As a process, globalization intensifies social and political relationships and heightens economic competition (x).” Levin’s globalized institutions are open systems (Birnbaum, 1991), where institutional resources, decision-making, and power structures are influenced by external organizations and forces. In drawing parallels between the concept of globalization and earlier works on neoliberalism and the marketization of higher education, Levin is careful to point out the differences between community colleges and other institutions of higher education, particularly the research university. He notes that such comparisons often undervalue the role of the community college as a social and cultural community center, an engine of social mobility for students with limited higher education options due to geographic and academic immobility, and a the access point of a significant portion of college-goers in the U.S. (Levin, 2001). Levin’s assessment of the community college, its uniqueness in the higher education sector, and its connection to external forces, such as neoliberalism, provide important context for this case study on a community college-centered coalition.

In 1996, Levin conducted a qualitative study of seven community colleges in the U.S. and Canada. Through this study, Levin found evidence that community colleges were increasingly connected to the global economy, particularly to the private sector. These connections were causing the community college to display a decreased focus on learning and a greater emphasis on training and vocational preparation. Levin’s findings support the research of Brint and Karabel (1989), who asserted that community colleges

experienced a significant identity shift in the 1960s from junior colleges, emphasizing liberal learning and the transfer function, to community colleges focused on vocational education and job preparation. Levin's work extended on these findings to define the community college of the 1990s as an institution not only focusing on career education but intimately tied to the demands of industry and the pursuit of student tuition through the creation of marketable academic programs (2000). Levin found that state and local government policy encouraged and incentivized the creation of high-demand vocational programs (2001), and that declining state funding caused community colleges to seek alternate sources of revenues through student tuition and industry connections (2005). Levin further found that community colleges displayed a broader global mindedness in their implementation of technologies and the development of international institutional culture (2002). By adopting a more open system—responding to external, global forces—community colleges absorbed and mirrored neoliberal ideologies, thus formalizing their role in the market-driven hegemony that permeated the globe.

Contribution of This Study

The literature describing partnerships involving community colleges and private, governmental, educational, and nonprofit organizations consists mostly of articles intended to help colleges develop successful relationships. These “practitioner guides” fail to provide a deep and careful examination of the forces motivating colleges to develop relationships with external organizations and the effects these relationships have on the college and its constituents. While this case study involves only one complex partnership, it introduces several elements for future study, such as how a college's

unique environment may have a profound effect on its relationships with other organizations, how forces motivating partnerships combine to produce a more powerful overall effect, and how the influence of individual actors is shaped by the way the partnership functions. But perhaps most importantly, this study demonstrates that while building relationships with outside organizations is an increasingly common practice for community colleges, this practice introduces certain risks and challenges that must be acknowledged and addressed if a college is going to play a positive role in society. Understanding these challenges and complex phenomena requires the type of in-depth study provided here. In a call for this topic of research, Amey, Eddy, and Ozaki (2007) wrote:

Sadly, although these partnerships are growing in popularity, relatively little is known about them. Of the research that exists, most is descriptive, focusing on a single institution or partnership. Of equal concern, most of the research highlights the K12 institution and fails to discuss the perspective of the community college or four-year institution. To fill this gap in the literature and ultimately strengthen these partnerships, it is critical for policy makers and scholars to consider the process involved in establishing these arrangements, how they function, and the factors that help sustain them over time (p. 5).

In addition to providing a more complete exploration of the causes and effects of a partnership, the coalition examined here responds to the calls by Amey, Eddy, and Ozaki, as well as by Orr (2001), for research on partnerships involving multiple organizations

from different sectors. In doing so, it extends beyond the one-to-one partnership to describe the complex nature of this increasingly common organizational form.

In addition, the principles of academic capitalism and the increasing market behaviors of higher education have been applied more extensively to research universities than to community colleges. Exceptions to this include Slaughter and Rhoades (2004) and Levin (2001, 2002, 2005). However, these studies focus on the behaviors of the community college to protect intellectual property, manage enrollment, and become more globally-minded and do not contain in-depth studies of educational partnerships formed with outside institutions. Therefore, this study fills an important gap in literature connecting academic capitalism to the community college. It has been established that the elements of academic capitalism are manifest in the community college. What remains to be explored are the components of academic capitalism are uniquely demonstrated in a coalition centered on the community college.

CHAPTER 3: THEORETICAL FRAMEWORKS

To appropriately contextualize the partnerships involved in this case study, it is necessary to call upon a variety of organizational theories. These theories view the creation, driving forces, and organizational effects of partnerships from different lenses. Three theories pertinent to this study are resource dependence theory, academic capitalism, and neo-institutional theory. In this section, I explain each of these theories individually before applying them collectively to the context of college-industry partnerships.

Resource Dependence Theory

Resource Dependence Theory (RDT), developed by Jeffrey Pfeffer and Gerald Salancik (1978), has been applied to a variety of organizations over the years since its inception. The theory is often applied to research concerning an organization's interactions with its external environment, asserting that in order to understand the behavior of an organization one must analyze the environment in which that organization is located. Contrary to studies that base organizational behavior on independent internal factors, such as employee productivity or the personal attributes of executives, RDT emphasizes the role of external organizations in shaping an organization's behavior.

At the core of RDT is the assertion that the survival of an organization depends on resources acquired from its external environment, and the organization will alter its structure, internal resource allocation, and behaviors toward optimizing control over these entities in an effort to ensure stability and long-term survival. Instead of pursuing growth

or even profits, the organization seeks to manage its resource relationships. Gaining autonomy from or control of crucial resource providers decreases uncertainty in the organization's acquisition of resources, ensuring continued survival.

RDT sees organizations as coalitions of competing interests rather than objective entities in and of themselves. Individuals and groups important to the survival of the organization, both internal and external to the organization, have their own objectives and incentive structures. The existence of the organization rests on the coordination of these varying interests. In this network of competing interests, the individuals and groups with control over the most critical resources obtain the most influence, or power, over the organization (Pfeffer & Salancik, 1978). In an effort to manage resource relationships, the organization responds to its environment in certain ways. These responses affect the way the organization distributes power to various internal subunits. These dynamics are further explored in the following sections.

Mergers and Acquisitions

A central strategy, particularly in the private sector, to gaining control of the resources of another organization is to join with that organization, either by acquiring that organization through purchase or by arranging a merger and forming a new joint organization from the two previous organizations. These strategies represent a most aggressive and effective form of action in terms of resource dependence, as they allow for complete control over resources. While merger and acquisition are common occurrences in the private sector of a free-market economy, they are often not feasible for organizations that are publicly funded and controlled.

Avoiding Dependence Through Diversification

Diversification is a common strategy adopted by organizations to avoid dependence on a limited quantity of resources or resource providers. The diversification strategy entails changing the organization's behavior to establish new resource streams, expanding the organization's overall pool of resources and mitigating the organization's dependence on existing resource providers. Over the past several years, the United States has demonstrated the diversification strategy in the energy sector. In an effort to avoid dependence on a limited set of often unstable countries in the Middle East, the United States has increased its efforts to produce its own oil, while simultaneously directing millions of dollars to research on renewable forms of energy such as solar and wind power. Because fossil fuels, such as oil, are, by nature, nonrenewable, the strategy to invest in renewable energy demonstrates the country's effort to go beyond decreasing dependence on other nations to develop resource streams that cannot be exhausted. Doing so will allow the U.S.—a major consumer of various forms of energy—much greater control of this scarce resource.

Coordinating Strategies

When an organization's dependencies cannot be avoided, the organization may adopt the more subtle strategy of managing, or coordinating, relationships with resource providers. Two important forms of relationship coordination are cooptation and joint ventures. Cooptation describes the strategy of bringing members of outside organizations into the focal organization for the sake of gaining their support, trust, and information. Organizations employ cooptation as a strategy to grow interdependence between

themselves and organizations key to their survival. Often participation from outside constituencies comes in the form of seats on advisory boards or in executive groups. Filling these positions with strategic partners not only helps the organization gain valuable information and open lines of communication, but it has been shown to increase the participating partner's desire for the survival of the organization and their willingness to act in the focal organization's best interest.

Joint ventures are another form of resource coordination. A joint venture occurs when two or more organizations create a new organizational entity for the sake of capitalizing on shared strengths and resources. One example of this was the company Sony Ericsson Mobile Communication, which was a joint venture established in 2001 between two companies, Sony Corporation and Ericsson. Ericsson brought to the partnership its significant experience in the mobile phone market, and Sony, a much larger corporation with almost no share of the mobile phone market, provided important capital and resources at a time when Ericsson was struggling to survive. Sony Ericsson released several new models of cellular phones before Sony acquired Ericsson's share of the venture in 2012, making Sony Mobile the third largest manufacturer of mobile phones in the world. Joint ventures can bring legitimacy to one or more of the organizations involved by demonstrating the organization's relevance to particular markets or stakeholders. Further, joint ventures, just like cooptation, often serve to strengthen the relationship between the organizations beyond the venture itself. As the partnering organizations work together to succeed in the joint venture, communication flows more freely and they are more likely to seek one another's survival and pursue mutual goals.

Pfeffer and Salancik (1978) point out that the gains made through these coordinating strategies do not come without a cost. As relationships are strengthened between the focal organization and its partnering organization, so is the influence of the partner organization on the focal organization. While coordination may improve the focal organization's ability to acquire resources critical to its survival, under the influence of the resource provider it may find itself acting in ways contrary to its original mission.

Internal Power Distribution

Fundamental to RDT is the effect managing resource relationships has on internal power distribution. As stated above, RDT sees organizations as collections of coalitions, both internally and externally. Just as the organization uses various strategies to manage relationships with organizations that control critical resources, influence and resources are shifted within the organization to individuals and groups with the greatest influence over important external resource exchanges. Drawing from strategic contingencies theory, RDT describes shifts in the balance of power between organizational subunits as a result of external dependencies. The complexity of environmental input creates great uncertainty, which the organization attempts to make sense of. Power within the organization is granted to subunits (offices, departments, divisions) with the greatest ability to manage the organization's environment. Subunits whose influence extend beyond the limits of one area of the organization to effect the survival of the organization as a whole are given emphasis and influence in the organization (Pfeffer & Salancik, 1978).

To illustrate power distribution in an organization, Pfeffer and Salancik (1974) explored academic departments in research universities. University departments with the greatest likelihood of attracting external research grants and contracts from government agencies and the private industry receive a disproportionate share of funding from their own institution. Distributing power in favor of entities with the greatest influence over external resource exchange allows the organization to optimize relationships with external organizations and offers the greatest chance of survival.

Resource dependence theory provides insight into the cause, form and the effects of the coalition in this study. The theory supports justifications for involvement that are based specifically on controlling the resources needed for an organization's survival. Because this case study focuses primarily on the community college, resource dependence theory supports the notion that the college entered into the coalition because coalition partners control the resources required for the college to survive and thrive. Narratives focused on resources rather than non-tangibles such as influence or legitimacy as a motivation for involvement fit within the RDT framework. Additionally, regarding form and effects of the coalition on the college, RDT supports decisions made by the institution to position itself in a way that would achieve the greatest control over other members of the coalition, particularly those members possessing resources being pursued by the college. These behaviors include efforts by the college to build close, collaborative relationships with key partners by including them in decision-making and partnering on programmatic elements of the endeavor. Finally, any efforts to shift resources, control, or influence to areas of the college with the closest connection and the

greatest opportunity to garner coalition resources fits within the RDT framework. Because RDT was not developed specifically to explain behaviors employed by institutions of higher education, the theory of academic capitalism helps to apply the principles of RDT specifically to this context.

Academic Capitalism

Academic capitalism describes the increased integration between institutions of higher education and outside organizations as colleges and universities—intentionally and unintentionally—pursue resources by responding to market forces (Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004). According to Slaughter and Leslie, academic capitalism describes the “institutional and professional market or marketlike efforts to secure external funds” (1997, p. 209). These funds come from a variety of external constituencies, including the federal government, private donors, business and industry, and students (Slaughter & Leslie, 1997). Exacerbated by a gradual decline in forms of public funding—particularly from the state—and motivated by the pull to spend increasing amounts on research, facilities, and other expenses associated with institutional competitiveness, institutions increasingly adopt behaviors that will maximize revenue generation.

In their development of the academic capitalism construct, Slaughter and Leslie (1997) relied on resource dependence theory, particularly in describing the university’s motivations for pursuing external resources as the pursuit of alternate resource streams in a time of declining public funding. Because of the interwoven nature of the two theories, many of the principles applying to one theory will apply to the other. Academic

capitalism's contributes to this study is where it extends on RDT to describe the organizational dynamics at play which are specific to institutions of higher education.

While Slaughter and Leslie (1997) focused their work on research universities in the United States and abroad, Slaughter and Rhoades (2004) extended the work in a number of ways. First, they developed a theory of academic capitalism, focusing on certain institutional behaviors that permeated the higher education sector. Second, they applied this theory through a close examination of institutions exclusively within the United States. Third, they extended the work of Slaughter and Leslie to focus on behaviors outside of research universities. In doing this, they joined work like that of John Levin (2001), which highlighted the spreading of market behaviors throughout the higher education sector, including the community college, making it pertinent to this study.

Principles of Academic Capitalism

Slaughter and Rhoades (2004) identified four theoretical constructs connected to academic capitalism. First, academic capitalism has led to the development of new circuits of knowledge. Built upon interconnections between postsecondary institutions, government entities, and private organizations, the creation of knowledge is being directed by audiences beyond the traditional circle of scientists and researchers. In the case of this study, where the partnership centers on a community college, new circuits of knowledge would include the construction of new academic programs by practitioners outside the academic organization. As individuals and organizations external to the institution guide the curriculum toward specific vocational applications, students

receiving that curriculum become a workforce trained for specialized roles as opposed to an informed citizenry able to think critically and adapt to a variety of roles and conditions.

Second, interstitial organizations have been created within postsecondary institutions to maximize their effectiveness in securing market benefits. Tech transfer operations, economic development offices, and fund raising officials are all examples Slaughter and Rhoades (2004) give of these new organizations. In addition, interstitial organizations could include any functional area of the institution focused on securing revenues and resources. While community colleges rarely participate in transferring research to the market, many colleges are increasingly developing offices focused on other forms of revenue generation, including private fundraising, grant development and contract training (Daugherty & Bakia, 2000; Jackson & Glass, 2000). The increasing investment in these efforts signals a shift in the emphasis of college decision-makers toward a position of revenue generation. Further, as increasing resources are allocated to these new operations, areas of the institution supporting the traditional academic subjects and support services may be weakened.

Third, academic capitalism has given rise to intermediating networks that guide the collaboration of higher education, government, and industry. While interstitial organizations are found within colleges and universities, intermediating networks exist outside these institutions and serve the function of guiding research and collaborations on the macro level. These external organizations are increasingly involved in the functioning of the institution, asserting powerful influence over the affairs of colleges and

universities, including research, the curriculum, and resource allocation. Actual or prospective functions of the institution that are supported by intermediating networks may garner significant influence and control, while those functions peripheral to the priorities of these external actors experience diminished institutional support. The concept of intermediating networks is particularly important to this study, as several organizations are involved in the coalition being examined. Of particular focus is the influence these organizations have on the institutions of higher education, particularly the community college at the center of the study, and whether partner organizations encourage increased focus on market behaviors such as revenue generation and institutional competitiveness.

Fourth, academic capitalism has extended managerial capacity, increasing the engagement of researchers and professionals with external markets. New market behaviors have led to a significant increase in the number of non-faculty professionals operating within colleges and universities in areas such as tech transfer, economic development, and fundraising (Rhoades & Sporn, 2002). As interstitial organizations and intermediating networks, staffed by new managerial professionals redesign the institution and create new circuits of knowledge, institutions of higher learning are subtly reconfigured over time to focus primarily on market benefits rather than the transmission of objective knowledge, to serve private interests over the public good, and to promote commercialization over critical thinking.

Academic capitalism and its associated constructs apply to this study in a number of ways. The theory will provide a framework within which to describe organizational

justifications for participation in the coalition as well as effects of the partnership on organizations involved, particularly on the community college at the center of the venture. The fact that the college and university involved in the coalition are interconnected with other partners involved, including a major corporation and a state-level nonprofit, signal the potential for market behaviors. However, of primary importance are the institutional narratives speaking to the reasons for involvement in the coalition. The academic capitalism literature would suggest that the higher education institutions are involved as a way to identify revenue streams, either through direct revenue, like grants, or indirectly, like the potential for increased enrollment the coalition will bring. Regarding effects of the coalition on the institutions involved, academic capitalism helps to describe the shifting of resources occurring internally as a means of exploiting areas of the college or university that can provide the greatest benefit to the coalition, with resources shifting away from areas with less potential. Additionally, academic capitalism helps to describe the emerging of individuals or organizations that exist to develop the partnerships. These individuals may be the kinds of managerial professionals and intermediating organizations described by Slaughter and Rhoades (2004), and the function they serve in the coalition is an important area of focus.

Neo-Institutional Theory

Just like resource dependence theory and academic capitalism, neo-institutional theory explains organizational survival through its interconnectedness with the environment. However, unlike the other two theories, neo-institutional theory asserts that an organization's efforts to respond to its environment may be a façade intended to gain

legitimacy through the mere act of conformity rather than achieving measurable outputs (Davis, 2005).

In neo-institutional theory, organizations adopt the structures and behaviors expected by the broader social context in order to be perceived as legitimate (Meyer & Rowan, 1977). This “formal” and symbolic aspect of the organization is separate from substantive activities that go on inside the technical core of an organization. Thus organizational culture is marked by highly ritualistic and symbolic action from which meaning and purpose are derived, irrespective of any measure of true effectiveness.

Neo-institutional theory suggests that modern societies contain a complex network of interconnected organizations, giving rise to deeply-engrained rules based on rationalized myths of how effective organizations should function (Meyer & Rowan, 1977). These rules allow society to apply a general understanding of organizations without relearning the nuances of each individual organization. For example, the common understanding of the role of president or CEO allows one to immediately gain a sense for the role of a particular organization’s chief officer without knowing the particular details of that individual’s job. The widespread application of such generalized interpretations has led to the institutionalization of society, causing organizations to conform to a common and accepted set of standards in order to be perceived as legitimate. Legitimacy is also a goal of organizations in resource dependence theory, only in RDT the role of legitimacy is to mobilize resources rather than social acceptance (Oliver, 1991).

When organizations reflect compliance with the rationalized myths of an institutionalized society, they are more likely to gain the trust and confidence of constituencies (Meyer & Rowan). This confidence invites the support and backing of key stakeholders. Thus, organizations go to great lengths to reflect the accepted behaviors of their environments, because doing so has an impact on their ability to accrue resources necessary for survival. Neo-institutional theory provides a framework for understanding the justifications behind organizations' involvement in the STEM coalition examined in this study, a framework that is substantively different from the two theories previously described. Instead of attributing institutional motivations to the acquisition of revenues, neo-institutional theory would stress the legitimacy gained through the partnership or the partnership springing from the college's accountability to stakeholders, including the local community, which has an indirect effect on the college's ability to garner resources.

Meyer and Scott (1983) envision a spectrum of organizations. On the one end, there are organizations whose efficiencies and outputs are easily interpreted by their environments. These organizations are often focused on what the authors call "technical activities," which are behaviors linked to measurable outcomes rather than rationalized myths or symbolic meaning. On the other end of the spectrum are organizations, such as schools, that are complex systems whose efficiencies and outcomes cannot be easily measured. Instead of focusing on technical activities to increase efficiency or outcomes, these organizations adopt institutionalized behaviors that are accepted as effective. This concept underscores the importance of analyzing the justifications for institutional behaviors when applying neo-institutional theory. For example, it is significant whether

organizations involved in the STEM coalition are guided by measurable outcomes resulting from correlated inputs or whether participating in the coalition is seen more for its social and political benefits.

Isomorphism

Because the rationalized myths upon which institutionalized rules are established are common throughout society, the original concept of neo-institutionalism suggested that organizations are compelled to become increasingly similar as they develop from simple to complex (Meyer & Rowan, 1977). The phenomenon of converging institutional forms is known as isomorphism. DiMaggio and Powell (1983) identified three basic forms of institutional isomorphism, each form based on the organization's motivation for complying with the rules of organizations in its environment, or field. Important to their study was their differentiating of institutional isomorphism from technical efficiency. While initially organizations adopt behaviors to increase technical efficiency and effectiveness, at a certain point organizations begin to adopt behaviors more for reasons related to symbolic and social acceptance than benefits derived from a technical standpoint. Institutional isomorphism explains an organization's shift toward greater conformity with other organizations in its field irrespective of technical efficiency.

Coercive isomorphism occurs when an organization complies with formal or informal expectations of organizations upon which it relies for resources (DiMaggio & Powell, 1983). Circumstances in which organizations become more alike because they are forced to comply with law or regulation would also fit under the definition of

coercive isomorphism. Coercive isomorphism aligns with RDT in its attribution of organizational homogenization to factors of resource reliance or government or legal oversight (Pfeffer & Salancik, 1978). At the root of coercive isomorphism is the organization's motivation to fit within certain accepted norms to avoid penalties or gain the acceptance of certain organizations in an authoritative role.

Mimetic isomorphism occurs when organizations respond to conditions of uncertainty by modeling other organizations (DiMaggio & Powell, 1983). Conditions of uncertainty are common among organizations with goals, processes, and outcomes that are difficult to define. As mentioned above, when an organization cannot take calculated action to achieve predictable results, it often relies on symbolic gesture to demonstrate value (Meyer & Rowan, 1977). By taking on the form or behavior of legitimate organizations in its environment, an organization gains the perception of success. There is some debate over whether organizations imitate other organizations naturally, as an involuntary and irrational organizational process (Meyer, 2008; Meyer & Rowan, 1977), or whether organizational leaders intentionally imitate institutional forms that have been considered successful as a way to improve stakeholder confidence (Davis, 2005).

Mimetic isomorphism is of particular interest to this study, as it differs significantly from strategies employed by organizations in RDT or academic capitalism. Of particular importance in this study will be to determine whether the college imitates others as an involuntary reaction or as an intentional strategy to please stakeholders (Davis, 2005).

Perceptions focused on the college's responsibility to develop partnerships as a matter of

mission would support the former idea, while comments about satisfying the expectation of state or local governments to develop industry partnerships would support the latter.

According to DiMaggio and Powell (1983), normative isomorphism, a third form of institutional isomorphism, stems mostly from professionalization, or the informal rules created by members of a career field. As individuals in a common occupation strive to create legitimacy for their field, they develop a series of acceptable practices, understandings, and procedures. As these standards disseminate through professional networks, individuals incorporate them into their various organizations, leading organizations to act similarly. And as individuals in a particular field move between organizations by switching jobs, they carry with them the standards of their profession rather than infusing new thought and practice into the receiving organization.

While the original concept of neo-institutionalism asserted that organizations display isomorphic tendencies, and that conforming to acceptable models meant resisting deep and fundamental change, more recent research has attempted to contextualize organizational change through the theory of neo-institutionalism (Davis, Diekmann, & Tinsley, 1994; Greenwood & Hinings, 1996; Jaquette, 2013). Greenwood and Hinings (1996) proposed that radical, aggressive organizational change could occur in organizations experiencing certain internal and external dynamics. These dynamics, such as the relative insulation of an organizational field from other fields, the dissatisfaction of employees in positions of power, and the maturity of an organizational field, have an effect on the scale and speed of change within organizations in that field. According to the authors, when organizations experience the conditions causing change, they consider

alternative “templates,” or organizational forms considered optimal. Because this behavior focuses on the legitimacy of organizational forms, it allows for organizational change—even radical change—while still adhering to the principles of neo-institutional theory. Davis, Diekmann, and Tinsley found that conglomerate firms were deinstitutionalized in the 1980s by responding to market forces, changes in regulations, and other related factors rather than holding to the established industry practice of conglomeration. And Jaquette (2013) found that colleges altered their missions and became universities in response to market forces (the potential for increased enrollments). These studies demonstrate that organizational change has a place in neo-institutional theory and that organizations’ isomorphic tendencies can be superseded by other conditions internal and external to the organization.

While RDT and academic capitalism overlap significantly in their explanation of effects of the partnership, neo-institutional theory represents a substantial departure from the other two theories. Neo-institutional theory sees the college taking action based on other organizations in its field and engaging in symbolic rituals loosely coupled from the technical activities going on in the college. References made by college employees to what other successful colleges are doing or to forces imposed by either the partner or another outside authority support the isomorphism perspective. In addition, references by participants to partnerships they developed in previous positions or being developed by people within their professional fields or organizational types fits within the concept of normative isomorphism. Ultimately, action that is taken to enhance the symbolic image

of the partnership rather than the technical core, focused more on the idea of the partnership rather than the outcomes connects with this framework.

Applying Theoretical Frameworks to This Study

In constructing the research questions guiding this study, I applied the three theoretical frameworks presented above to the two central tenets of the study—the causes and the effects of the STEM coalition. Below I present the research questions in full. In Table 3.1, I apply each of the theoretical frameworks to the research questions in matrix format. Following the table is a narrative explaining how each of the theories applies to each research question.

1. What social, political, and economic forces motivate organizations to participate in an education coalition?
 - a. To what extent are organization's involved as a way to develop new or alternate resource relationships?
 - b. To what extent are organizations attempting to gain greater control of other organizations providing crucial resources?
 - c. How is the community college's involvement influenced by other organizations, state or local government, or other constituencies?
 - d. To what extent are the organizations modeling the behavior of other organizations and partnerships?
 - e. What role do market forces, such as generating revenue and meeting specific workforce needs, play in motivating organizational involvement?

2. How does the coalition affect the behaviors, narratives, and outcomes of the organizations involved, particularly the community college?
 - a. What strategic behaviors are employed by organizations involved in the partnership in an effort to manage relationships with the other organizations?
 - b. How does the coalition affect an organization's interdependence with and influence over partner organizations?
 - c. How does these relationships influence the way the community college allocates resources and power toward or away from certain individuals, departments, or programs?
 - d. How does the coalition affect individual opportunity for students?

Applying Theories to Research Questions

Theory	Research Questions	
	1. What social, political, and economic forces motivate organizations to participate in an education coalition?	2. How does the coalition affect the behaviors, narratives, and outcomes of the organizations involved, particularly the community college?
Resource Dependence Theory Questions: 1a-b 2a-d	A focus on developing new resource relationships, not necessarily revenue A focus on partnering more closely with important resource providers to gain control over critical resources	Cooptation; Joint Ventures; Alterations to internal power distribution A focus on building influence with partner organizations
Neo-institutional theory Questions: 1c-d 2a,c	A focus on accountability to community or other stakeholders A focus on industry best practice A focus on influence of partner organization	Imposed structure/processes by partner; Imitating structure of other college partnerships; Following standards of the field Keep symbolic shell separate from technical core
Academic Capitalism Questions: 1e 2a-d	A focus on revenue generation for the college Rationales at times contradictory to institutional mission A focus on regional economic development and prosperity through strategic means	New circuits of knowledge; Interstitial organizations; Intermediating organizations; Managerial professionals Changing mission/form to align with private industry A focus on effective interface with market forces

Table 3.1

Application of Theory to Research Questions

Resource dependence theory (RDT) suggests that organizations are motivated by a desire to control the flow of scarce resources (RQ 1a and 1b). Organizations may control resource flows by managing their relationships with providers of critical resources (1b) or by developing resource relationships with new organizations or sectors so as to decrease dependence on other organizations or sectors (1a). When unable to decrease its dependence on certain resource providers, an organization will employ strategic behaviors to manage relationships with the organizations providing the resources (2a and 2b). Another key component to RDT is the tendency for organizations to shift resources and power toward units or individuals perceived as critical to the managing of external resource relationships (2c). As a result, individuals or subunits within the organization may lose resources or influence as a result of being perceived as less crucial to coordinating resource relationships (2d). In this particular case study, it will be important to decipher the resource dependencies of each organization involved and to what extent organizations are participating in the partnership as a way to manage those dependencies (1b). Further, the behaviors employed by organizations to achieve greater control over resources through the partnership (2a-d) will help to determine the effect of the partnership on the organization.

Neo-institutional theory asserts that organizations obtain legitimacy among important constituencies by complying with certain imposed or implied norms. Imposed norms, or coercive isomorphism, can come in the form of formal rules and regulations or social pressure created by power imbalances (1c). These power imbalances may come as

a result of one organization's reliance on the resources another provides, as in RDT, or because of the regulatory, social, or legal role of the other organization, such as with government or even non-profit organizations that may apply pressure for the organization to respond to certain social norms. Organizations may also seek to imitate other organizations or adopt the norms of professional associations (mimetic and normative isomorphism), especially in time of uncertainty (1d). Organizations may imitate others consciously, intentionally, and strategically, or they may follow along unintentionally, adopting norms without deliberate action. Because the driving force behind organizational action is symbolic gesture, organizations adopt behaviors that maintain symbolic compliance without disrupting the technical core of the organization (2a and 2c). In ascertaining the motivating force behind an organization's involvement in the partnership in this case study, it is important to determine to what extent each organization is seeking to comply with these forms of formal and informal influence coming from other organizations, both inside and outside the partnership. This influence may be compliance with standards imposed by the state or pressures placed by partner organizations or by the expectations of constituencies such as community members or students (1c). Influence may also come as a result of the organization looking to other such partnerships forming among peer organizations (or even in other branches of the same organization) as an example of what effective organizations do (1d). Organizations may also be deriving norms from professional associations or organizations with which they interact or by hiring certain professionals who come into their organization with norms established at other organizations (1d). An important distinction in the case will

be whether the organizations involved in the partnership are involved deliberately and through strategic action or whether they are complying with perceived norms as an automatic reaction. This distinction will provide important context for the partnership. In either case, the organization will respond through symbolic compliance while maintaining the same rational/technical core within, executing strategies and committing resources only in form but not in function (2a and 2c).

Finally, academic capitalism describes the motivations and behaviors of colleges and universities in terms of capitalistic modes of production observed more commonly in for-profit organizations. According to this theory, partnerships between postsecondary institutions, government, and the private sector develop as a result of efforts to generate revenue and meet targeted workforce needs (1e). To this end, colleges and universities develop ways of structuring and functioning that will create the maximum economic effect (2a). These changes often lead to changes in power-relationships, both externally among other organizations and sectors (2b) and internally among various units (2c). Academic capitalism can also negatively influence certain student and employee populations (2d). As colleges and universities adopt behaviors to maximize revenues and integrate with the needs of the private sector, they take on the priorities and forms of these partners. These priorities may neglect certain student groups and subunits of the organization, sacrificing the institution's mission to serve the public in general for the sake of serving those populations (businesses, applied researchers, high-income students) with the ability to generate revenue. In this study, it will be important to explore the effect revenue generation and workforce development have as motivators for

organizational participation (1e), especially among postsecondary institutions (as that is the focus of the theory). Just as with RDT, examining the effect the partnership has on organizations' relationships with partners (2a and 2b) and internal resource allocation (2c) will provide important information about the effect of the partnership on the colleges and universities involved. In addition, the theory of academic capitalism suggests some important implications market-driven behavior has on postsecondary institutions, students, and departments, which will be an important part of this study (2d).

Likely each of the above theories will have a role in explaining the motivations and behaviors of organizations involved in this complex partnership. In sum, research question 1 addresses the causes of the STEM coalition, particularly organizations' motivations for being involved in the partnership. RDT takes the perspective that organizations justify their involvement in the partnership by focusing on the increase control of resource dependencies and relationships facilitated by the partnership. Neo-institutional theory would support the organization's involvement as a result of compliance with pressures from other organizations. While both RDT and neo-institutional theory highlight an organization's tendency to comply with other organizations, their rationale for doing so is distinct. RDT suggests that organizations comply with resource providers in order to gain crucial resources necessary for survival. In neo-institutional theory, organizations comply out of social and political pressure—they comply because they are required to by law, regulation, or social or political pressure. Another form of compliance in neo-institutional theory (but not RDT) comes from an organization's tendency to imitate other such partnerships occurring elsewhere,

either through deliberate, strategic action or automatic, unconscious reaction to perceived norms. Academic capitalism would suggest that the college and university involved in the partnership participate to generate revenues or make the institution more competitive in the market. Benefits may come in the form of revenue generation from enrollment in credit or non-credit programs built as a result of the partnership or from grants, donations, or gifts that come from partner organizations or others who support the partnership.

Research question 2 addresses the effects of the partnership on organizational behavior. RDT would explain institutions' efforts to partner with other organizations that provide or may provide key resources and shifting resources internally to those areas perceived to have the greatest ability to leverage the partnerships. This resource shift may change or disrupt resource flows and power dynamics in the organization, resulting in the weakening of certain organizational subunits and the altering of the organization's mission. Neo-institutional theory will support symbolic strategy and resource allocation that does not disrupt the technical core. Under this theory, we could expect to see organizational executives making statements and strategic documents, but little corresponding change within the organization. Academic capitalism will explain behaviors to align the organization more tightly with the market, even at the expense of individual student opportunity. The theory also creates a framework to describe changes occurring in the institution's culture, manifest in the institutional narrative, away from a culture supportive of broad and diverse interests toward a more powerful STEM-specific narrative.

Throughout Chapters 5 and 6, the presentation of findings, as well as Chapter 7, the discussion, the three theoretical frameworks are employed to help describe and explain various phenomena. No single theory fully describes the complex sets of motivators and behaviors at play in the coalition. Therefore, the three theoretical frameworks will be woven together throughout the narrative whenever they help to describe findings or frame the discussion.

CHAPTER 4: METHODOLOGY

This case study consisted of interviews and the analysis of supportive documentation, conducted over the course of four months in the spring and summer of 2013. The unit of analysis was a group of organizations—a coalition—involved in a collective effort to strengthen STEM (Science, Technology, Engineering, and Math) education in a particular, unique region of the United States. Because findings have both positive and negative implications, I seek to maintain anonymity by using pseudonyms for individuals, organizations, places and the name of the initiative itself. The coalition, which I will call the Tech Futures Initiative, was formally launched in May of 2011. However, many components of the coalition—STEM programs and activities, as well as relationships among coalition members—began before, in some cases long before, the official launching of the initiative.

The case study is a common approach for studying a program or process in depth (Creswell, 2009) and has proven useful in examining educational innovations, evaluating programs, and informing policy (Merriam, 2009)—all of which are pertinent to the topic of this study. Case studies often produce new ideas and understandings about a phenomenon that prompts further study or the reframing of prior beliefs about a concept (Merriam, 2009). This study attempts to explore the intricacies of a partnership that extends beyond the boundaries of the community college and the large corporation that are at its center. Several other organizations play important roles, including the local K12 school district, a university branch campus, the Engineering College of a large research university, and a nonprofit organization focused on STEM education.

A central aspect of case study methodology is that the unit of analysis be a bounded system, unit, or object (Dyson & Genishi, 2005; Merriam 2009). The term “bounded” is used to describe something that can be clearly defined and distinguished, such as a program or a process that is distinct from other programs or processes. While the organizations involved in the Tech Futures Initiative are loosely coupled at best from day-to-day, they come together under a bounded program for this particular endeavor. Taking Tech Futures as the bounded unit of analysis allows for the exploration of multiple organizations and players in one system. Comparing the perspectives and decisions of those involved in the partnership to a variety of organizational theories will help to contextualize and bring greater understanding about the coalition. Conducting a case study of a single complex partnership will provide the depth necessary to fully explore distinct elements of the partnership. Therefore, the case method, with its focus on rich descriptions of programmatic components and individual perspectives, is the appropriate method for this study.

The Case

The coalition of organizations supporting the Tech Futures Initiative is centered on a community I will call Green Valley. Most of the organizations involved in the initiative are located in Green Valley, with just two exceptions. The university is located approximately 75 miles from Green Valley. And the nonprofit organization I call State Science Network is located a few hours from Green Valley, in the state capital. The names and brief profiles of organizations involved in Tech Futures are included in Table 4.1 below.

Tech Futures Organizations

Organization Pseudonym	Organization Description
Aerotron Global	Green Valley branch of a global security company focused on unmanned systems, cybertechnology, and systems.
East Hills University – Green Valley Branch Campus	Small local branch campus of a major research university.
East Hills University – College of Engineering	Nationally renowned college within a major research university, offering 13 different engineering degrees to approximately 2,500 students.
Fort Kenton – U.S. Military	Home of the U.S. Army Intelligence Center, and by far Green Valley’s largest single employer with over 9,000 employees.
Green Valley Community College	Two-campus community college, with the largest enrollment in Green Valley and an aviation/unmanned systems program at the south campus.
Green Valley Economic Development Foundation	Small economic development foundation located in Green Valley with the mission of fostering economic growth in the county.
Green Valley High School	Large public high school with over 2,000 students, the only high school in Green Valley. Houses a Career and Technical Education (CTE) program with 15 concentrations.
State Science Network	Non-profit public-private organization developed to strengthen STEM education and research. Began in 2006 with 50% funding from state government and 50% from private donation.

Table 4.1

Tech Futures began with a lunch meeting shared by executives from Green Valley Community College and Aerotron. Because of the community college’s role in education STEM students and future employees in Green Valley, GVCC became the focal point of the Tech Futures Initiative. Growing from this initial lunch meeting, Tech Futures grew

to include several organizations in and outside of Green Valley. All of the organizations in the table were involved, to one degree or another, in the initiative.

According to the U.S. Census Bureau, approximately 43,000 people resided in the city of Green Valley at the time this study was conducted. Green Valley was the most populated city in a county with a population of 130,000. The center for economic research in Green Valley reported that the city served a commercial market of more than 110,000 people. . Green Valley is a unique community in demographic terms. The region's population is unusually dichotomous. On the one hand, the community is home to thousands of military servicemen and women and their families. The city of Green Valley itself was incorporated relatively recently in 1956 as Fort Kenton grew to become a major military installation. This very transient military demographic represents the majority of the city's population. A strong rental market in the city demonstrates a relatively transient population, as servicepeople come and go on military assignment. On the other hand, communities surrounding Green Valley, still within the county, are some of the oldest communities in the state. The population in these relatively small communities (the largest has a population of about 17,000) are more established and diverse. For example, according to the U.S. Census Bureau, in Green Valley the population is 75 percent white, has a median household income of about \$60,000, and 71 percent of people over the age of 25 have attended at least some college. The next largest community in the county is 82 percent Hispanic, has a median household income of \$28,000, and just 43 percent of people over 25 have attended at least some college. These dramatic differences demonstrate the demographic dichotomy of the region, which

has important implications for organizations like Green Valley Community College, which is charged with serving a county that includes these two distinctly different populations. Because GVCC's most populated campus is in Green Valley, where the population is much wealthier and has a stronger tradition of college attendance, the college runs the risk of marginalizing the populations in the outlying communities, a concept pertinent to this study.

Below is a description of each organization involved in the Tech Futures initiative.

Aerotron Global

Aerotron is a global security company, with 30 regional development centers in Europe, Asia, and the Middle East. Inside the U.S., Aerotron has operations in all 50 states, some states housing several Aerotron facilities. The company employs approximately 70,000 individuals worldwide. Within the global security field, Aerotron specializes in unmanned systems (also known as drones), cybersecurity, communications, intelligence, and logistics. The company's business sectors are divided into aerospace systems, electronic systems, and information systems. In 2013, no individual product accounted for more than 10 percent of the company's revenue. According to its 2012 annual report, the Aerotron Corporation, formed in 1939, conducted most of its business with the U.S. Government, particularly with the Department of Defense and the intelligence community. Revenue from the U.S. government accounted for 90 percent of total revenues. In 2011, Aerotron posted over \$26 billion in sales. With 237,127,000

outstanding shares of stock at the time of this study, Aerotron's market capitalization was over 16 billion dollars.

According to the company's website, Aerotron has a long history of working with universities, small companies, and other organizations in the development of products and programs. In 2013, Aerotron was funding research at over 25 universities and was actively seeking new university partnerships. Proposals for research funding can be submitted on the Aerotron website. In addition to research partnerships with universities, Aerotron developed a corporation-wide STEM education strategy. In the strategic plan for this program, three of the four strategies have to do with preparing the Aerotron workforce. The executive summary phrases it this way:

Finding the talent we need to continue our heritage of outstanding performance, innovation and discovery is becoming increasingly more difficult for us as a company and for our industry. To address this concern, Aerotron has been focusing on education efforts that will help to ensure a pipeline of diverse talent needed for our future work force and the next generation of scientists, engineers and technicians. While the collective education efforts have been extensive, a more coordinated effort among stakeholders is necessary (AerotronSTEMEducationStrategy,2011).

The strategic document explains that Aerotron will accomplish this initiative by building a diversity of educational partnerships in an effort to strengthen the STEM pipeline from K12 through postsecondary education.

In 2013, the Aerotron operations in Green Valley employed over 400 individuals and were the seventh largest employer in the community. Operations in Green Valley focus mostly on unmanned aerial systems. In Green Valley, Aerotron employees test and provide technical support for Aerotron's aerial systems, which are used by the military for various purposes.

East Hills University

East Hills University's main campus is located about 75 miles north of Green Valley. The two university entities involved in the Tech Futures Initiative are the College of Engineering on the main campus and the university's branch campus in Green Valley. The branch campus is a transfer institution, only offering 300 and 400 level coursework (the second half of a baccalaureate degree). The branch campus is a relatively small operation, with under 50 full-time employees and three relatively small buildings located adjacent to GVCC. The campus offers a small suite of about 20 undergraduate degree programs and two graduate degree programs. Most degree programs are in traditional academic areas, such as History and English, with three programs offered in STEM subjects—Computer Science, Informatics, and Mathematics. Of significance to this study, the branch campus does not offer a degree program in any Engineering subject. In 2012, slightly more than half of the universities approximately 500 full-time-equivalent enrollment came online. Much of the remaining enrollment came through classes offered on campus in the evening.

East Hills University enrolls approximately 30,000 students per year on its main campus about an hour's drive from Green Valley. The College of Engineering enrolled

about 2,500 students in 2013. Offering 13 different Engineering degree programs, ranging from Biomedical to Industrial to Engineering Management, the college boasts 125 tenure-track faculty and over \$25 million in annual research expenditures. The college had partnered with Aerotron and State Science Network in the past to transfer research findings to private companies for product development.

Fort Kenton

The history of Green Valley is indelibly intertwined with that of neighboring Fort Kenton, a major U.S. Army base. While the city is relatively young, the base, established in 1877 as a military camp, has a long history. At the time of this study, the base covered over 100,000 acres and hosted the Army's Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR) Center of Excellence. One of the primary missions of Fort Kenton, and related to this study, was unmanned aircraft systems (UAS). The base operated the Army's sixth busiest airfield in the continental U.S., running more than 159,000 manned and unmanned air operations in 2010. Green Valley officially annexed Fort Kenton in 1971, so the base's population was included in the Green Valley population statistics. As of 2011, 7,084 military personnel and family members resided on the base, with many more living in the Green Valley community. Fort Kenton was the top employer in the county, with 9,039 employees in 2011. At that time, Fort Kenton employed more than ten times as many individuals than the next highest employer in Green Valley. Aside from Fort Kenton, five of the top ten employers in the community were private organizations contracting with the military. The four remaining employers were the school district, the hospital, the city, and one

private organization. Considering the above figures, it was evident that Fort Kenton had been the driving force behind the population and economic growth of the Green Valley community.

Green Valley Community College

Green Valley Community College is a multi-campus community college, with campuses and centers located throughout the county. GVCC opened its first location in 1964. In 2013, the rapid growth of the Green Valley campus, opened in 1978, had surpassed enrollment at the original south campus many years before and remained at roughly double the enrollment of the south campus at the time of this study. The college, classified by the Carnegie Foundation as a large, rural-serving institution, enrolled approximately 4,709 full-time equivalent students at all of its campuses in Fall 2012. As a comprehensive community college, GVCC offers a full array of credit and non-credit programs. High school students can take dual-enrollment courses that count toward high school graduation and also grant college credit. Though the college offers many vocationally oriented programs, particularly under the associate of applied science (AAS) category, many general education, liberal arts, and transfer courses and programs are also offered.

According to the GVCC 2012 Comprehensive Annual Financial Report, the college's roughly 48 million dollar annual revenue consisted of three major sources. Local property taxes accounted for 36 percent of total revenues. Local funding comes from property taxes through the Green Valley Community College District, led by five elected representatives from the community. The portion of local taxes designated for the

college cannot increase by more than approximately one percent per year, a rate that is negotiated by the district board and GVCC. State appropriations made up 28 percent of GVCC revenues in 2012. The third major source of funding, tuition, was more difficult to decipher in the college's financial report. Tuition and fees, excluding scholarships and Pell grants, accounted for 12 percent of the total budget. Government grants and contracts, which included Pell grants, accounted for 18 percent of the budget. Without a closer look at Pell grant funds, it is safe to say that between Pell grant revenue, scholarships, and other forms of tuition payment, tuition was the third major source of revenue for the college. Local taxes, state appropriations, and tuition made up the vast majority, more than 80 percent, of the college's annual revenue.

GVCC has a long history of partnering with Fort Kenton. As a member of the Servicemembers Opportunity Colleges network, the college offers academic credit for military training and experience. Roughly half of a student's associate's degree can be made up of credit earned through military experience. In 2013, GVCC employed a team of academic advisors at Fort Kenton and offered several classes on the base. In addition, the college had developed certain associate degree programs specifically for military personnel. The Associate of Applied Science degree in Intelligence Operations Studies (IOS), a program located on the base, enrolled more students than any other GVCC program other than general studies. Military personnel could receive credit from a variety of military training specialties toward the IOS degree, and the program was being offered online, making it a very flexible degree for the many military personnel who were in person at Fort Kenton for only a few months for intelligence training. The few years

prior to this study, GVCC developed two AAS degrees specific to unmanned aerial systems (UAS)—UAS Operator and UAS Technician. These degrees, anticipating the future transition of UAS to a variety of civilian applications, were created with consultation from employees of Aerotron.

Green Valley High School

Green Valley High School, the only high school in Green Valley, is located within a couple blocks of GVCC and East Hills University – Green Valley (East Hills University’s branch campus). In 2012, Green Valley High School enrolled 2,223 students. The school’s Career and Technical Education department offers an engineering program through Project Lead the Way. This program is among several (approximately 15) offered in that department. Other CTE programs include culinary arts, marketing, automotive, and a variety of other subjects. All Green Valley High students are required to take a career exploration course early on in their high school experience, and many select a CTE concentration based on that course. CTE at Green Valley High does not carry many of the same stigmas or restrictions that high school vocational program are known for. At Green Valley High, students can take a CTE track and still complete a college preparation curriculum. Perhaps for this reason, the CTE programs are a popular option, enrolling hundreds of students any given year.

Green Valley Economic Development Foundation

The Green Valley Economic Development Foundation, consisting of one full-time administrator in 2013, helps build the local economic infrastructure by attracting new businesses to Green Valley and by supporting existing businesses. This support can

range from providing low-cost space for new businesses to temporarily use, offering market research to businesses seeking to open operations in town, or helping local businesses to market effectively to the community. The foundation supported Tech Futures primarily by assisting efforts to make Green Valley a center of excellence for UAS. The importance of UAS to the foundation is manifest by the large picture of an unmanned aerial aircraft on the front page of the organization's website. The foundation is directed by an individual who is a former employee of GVCC and who has a rich history of involvement with the economic development efforts of Green Valley.

State Science Network

State Science Network (SSN) is a non-profit organization formed in 2006 through combined public and private funding, with half coming from the state government and the other half from donations made by private companies with a major presence in the state. The organization, with its approximately 20 full-time employees, is located in the state capital, about 200 miles from Green Valley. The mission of SSN is to promote STEM education and research throughout the state in an effort to build the state economy. As stated on the organization's website, "[SSN's] mission is to diversify [the state] economy by linking industry needs with university research and ensuring the education system creates a 21st century workforce." The organization accomplishes these goals by providing millions of dollars in research grants and fellowships and by donating funds to K12 institutions, colleges, and universities to promote STEM education in the form of workshops, academic programs, and support services. Also from the organization's website:

[SSN] has awarded more than 150 individual grants totaling over \$110M since 2007, which has led to 1,865 direct jobs, 207 patents filed and/or issued, 24 technology companies formed in [the state] and 23 technology licenses in place. Our research grants are highly leveraged, and generate at least \$4 for every \$1 of state funds invested. Additionally, [SSN's] STEM initiatives have impacted more than 385,000 students and more than 10,656 teachers.

SSN's staff includes individuals specializing in working with university researchers and tech transfer officers, as well as individuals designated to work with the state's high schools and community colleges to create academic programs and services to support STEM education. The central effort in SSN's promotion of STEM education is the creation of a statewide network of educational institutions to share resources, information, and support of STEM education. SSN officials were actively involved with the Tech Futures Initiative, donating time and money to the development of the STEM pipeline in Green Valley.

Overview of the Tech Futures Initiative

Tech Futures officially launched in May of 2011 at an event involving representatives from the above organizations, local news agencies, and community members. The coalition developed around the Tech Futures Initiative had two core functions. First, the organizations involved sought to promote and strengthen education in STEM fields, specifically in engineering. As will be discussed in later chapters, STEM education is seen as an important initiative nationally, as the U.S. has fallen

behind other developed countries in its performance in these areas. The Tech Futures Initiative involved three kinds of organizations—educational organizations able to provide academic training and credentials in STEM fields, employers seeking trained and credentialed STEM graduates, and support organizations making efforts in a sort of entrepreneurial capacity to strengthen STEM at the state or local level. The Tech Futures coalition is divided by organizational type in Table 4.2.

Organizations by Type

Organization Type	Organization Pseudonym
Educational Institutions	East Hills University – Green Valley Branch Campus
	East Hills University – College of Engineering
	Green Valley Community College
	Green Valley High School
Employers	Aerotron Global
	Fort Kenton – U.S. Military
Support Organizations	Green Valley Economic Development Foundation
	State Science Network

Table 4.2

Tech Futures coalition partners sought to develop a strong engineering education pipeline facilitating students' transition from high school to community college to

university engineering programs. There were five major components of the initiative, outlined in Table 4.3. Each component played a role in supporting the STEM pipeline.

Programmatic Components of the Tech Futures Initiative

Program Component	Purpose
High School Engineering CTE Program	Provide coursework preparing students for postsecondary engineering programs
Community College STEM Dual Enrollment Program (Bridge Program)	Provide high school juniors and seniors early college level coursework in engineering
Community College Engineering Associate's Degree	Offer a two-year associate's degree program that can be transferred to a university
University Systems Engineering Program	Offer a four-year engineering program in Green Valley to reduce student attrition

Table 4.3

The second core purpose of Tech Futures was to encourage economic development by making the region a “center of excellence” as classified by the Federal Aviation Association (FAA) for the development civilian applications of UAS. Green Valley is home to Fort Kenton, a major military intelligence base, where UAS is developed and tested. This has led several military contractors specializing in UAS to the area. In addition, the air space around the region is relatively empty, and the weather is predictable and good for aviation. The combination of a military intelligence presence, major defense contractors, and exceptional airspace gave the region a competitive advantage for becoming one of the nation’s hotspots for the development of UAS. At the same time, there was an anticipated shift in FAA regulation that would allow for increased civilian and commercial applications of unmanned aerial systems. Developers of these systems anticipated that everything from border security to mail transport to

search and rescue operations would be dominated by UAS. Some of the partners involved in Tech Futures were eagerly engaged in a local and statewide effort to make Green Valley a UAS Center of Excellence. To them, it stood to dramatically increase regional economic development and lead to widespread prosperity. GVCC administrators saw the college as a potential training ground for UAS, the next major innovation in many industries. Through the Tech Futures partnership, the college engaged UAS specialists from Aerotron in building the curriculum for two UAS programs, one for UAS pilots and the other for technicians. Because of their connection to the STEM coalition, the concepts of unmanned aerial systems and engineering education had become dual, intertwined purposes of the Tech Futures Initiative.

Data Collection

In order to explore the causes and effects of the STEM coalition in Green Valley, I conducted 37 face-to-face, semi-structured interviews with individuals employed by or enrolled in programs at the organizations laid out in the previous section. I also conducted unstructured document analysis by reviewing documents associated with the initiative whenever they were referred to by interviewees or accessible in my research of the organizations involved. I found these methods acceptable for this study, as the case study is open to a variety of methods of data collection (Merriam, 2009).

I used the snowball sampling method, asking each interviewee to refer me to other individuals who were involved in the partnership or who were able to provide unique insights about Tech Futures or the STEM efforts in Green Valley. I also formulated my own thoughts and ideas about interviewees to add as I assessed interview feedback and

conducted document analysis. One example of this method was when I decided to interview students from the community college bridge program and the UAS program. I was not directly referred to these students by interviewees, but thought the students would add an important element in better understanding these components of the initiative. Since I found that GVCC and Aerotron were at the core of Tech Futures, I conducted several interviews with employees from each of these two organizations. My interviews focused primarily on executives and administrators of organizations, though I conducted interviews at all levels within GVCC, only because I found that individuals at all levels were involved in the initiative. In addition, I interviewed administrators and faculty at Green Valley High School and at the school district who had been involved in CTE and STEM programs. Interview protocols, separated by organization and position type, are located in Appendix A.

I used document analysis to develop my conceptual understanding of the initiative and of the organizations involved. Documents provided important data about institutional context, such as financial and budget data, enrollment, strategic planning, news stories, and public statements made by executives of organizations. I collected documents in three ways. First, I conducted a thorough search of the websites of each organization involved to gather mission statements, strategic plans, news stories, and public addresses. For the sake of creating a consistent context for the study, I collected documents from May 2009 to spring 2013. Going back two years before the Tech Futures Initiative was officially launched provided sufficient background information. Second, I searched the websites of local, regional, and national news agencies for use of

the name of the initiative. Finally, I asked interviewees for any documentation they had about the Tech Futures Initiative. This included planning documents, publicity materials, meeting minutes, or any other description of the program. I conducted the document analysis before and throughout the interviewing process, using documents to help shape interview questions and to validate interviewee responses.

Data Analysis

I audio recorded each interview. Interviews lasted an average of about 45 minutes, with some student interviews as short as 10 to 15 minutes and the interviews of central players in the initiative lasting up to 90 minutes. Each interview was fully transcribed. Throughout the course of conducting interviews, I kept field notes and modified interview protocol according to emerging themes and ideas. Once interviews were completed, I coded all interview transcripts, looking for prominent themes. Themes were based primarily on the research questions (Merriam, 2009) but also included any subject that emerged. My research questions were tightly aligned with the three theoretical frameworks. Thus, emerging themes spoke directly to the application of the three theories. In addition to codes corresponding with theory, I looked for important conceptual components of the partnership, which were not always linked to ideas emerging from previous research. A key potential contribution of this study is the depth at which it analyzes this unique and emerging type of partnership. Beyond explaining the partnership through the use of theory, I extrapolated unique components of the structure, relationships, or dynamics of the partnership that may be important to organizational

leaders or policy makers wanting to know more about the functioning of this type of partnership.

Because a key factor in the process of coding and identifying key themes is to group the data logically (Merriam, 2009), I grouped transcriptions by organization. This helped me to differentiate findings into particular organizational perspectives and narratives. This method also lent itself to cross comparison between organizations. My codes began as a list of individual words or phrases. I then grouped codes into related concepts, from which I created the categories presented in my findings chapters below.

Protecting Privacy and Reputations

Due to the sensitive nature of this study, it was critical to maintain the privacy and anonymity of individuals and organizations. Results of the study, made public in the dissertation, could disrupt or damage the partnership by tarnishing the reputations of the individuals and institutions involved or by diminishing levels of trust between partners. In addition to protecting identities and reputations from the world outside of the partnership, it is perhaps even more important to protect participants from others involved in the partnership. Information or commentary shared may damage an individual's or organization's ability to function effectively in the partnership. The following measures were taken to mitigate these risks.

First, confidentiality was maintained throughout the interview phase. Information gathered from one interview was not referred to or shared in other interviews. Interviews were kept confidential and were not discussed outside of the primary investigator and the dissertation committee. Because of the snowball sampling method I used, it is impossible

to prevent some interviewees from knowing that certain individuals were interviewed as part of the study. However, once an interview was completed and an interviewee referred certain individuals for interview, I did not communicate back to the referring interviewee about successive interviews (or preceding interviews for that matter). Also, I did not share with any interviewee the name of the individual who recommended him or her for interview. This minimized each interviewee's knowledge of the other individuals being interviewed.

Second, I preserved anonymity. Pseudonyms are used throughout the study for all organizations involved, and, whenever possible, neither the names nor the titles, nor even pseudonyms, are used for individual interviewees. Instead, I refer to individual interviewees in general terms, such as Aerotech executive or GVCC administrator. These references are only made to the level of specificity required to understand the context of the information provided. Even when it would have been helpful for the context of a particular topic, reference to a particular individual is never more specific than the broad employment classification of the individual. Only a couple exceptions to this rule were required. One particular exception was in the establishment of pseudonyms for specific individuals playing prominent roles in the coalition. In order to analyze and discuss the behaviors of these specific individuals, it was necessary to identify each of them by a specific pseudonym and attribute specific statements and behaviors to them individually. In addition to the above efforts to maintain anonymity, special precautions are made to preserve the identity of any individual providing comments that could be perceived as negative or sensitive.

Finally, just as it is important to preserve the identity of individuals involved in the study, achieving a tone that is balanced and fair regarding the intentions of program participants and the spirit of the partnership is key. It must be acknowledged that the individuals and organizations participating in this study sincerely believe the STEM initiative will have an overall positive effect on individuals and the community. It must be noted that in cases where I present potentially negative consequences of the initiative and perceptions of program participants, these effects should not imply that intentions of those involved in the initiative are to degrade or diminish their respective organizations or the individuals they serve. I sought to strike a balanced tone in my presentation of the findings to both protect reputations and increase the likelihood that the final product will be seriously considered by those involved and by the general public.

CHAPTER 5: FINDINGS - CAUSES

On a sunny weekday morning, inside a conference room located in the facilities of Aerotron Global's Green Valley branch, men and women representing various organizations across the region and state gather to motivate and collaborate around a shared purpose they call the Tech Futures Initiative. A local news reporter has been summoned to capture the sights and sounds of the occasion. The meeting begins with a motivational speech given by an individual who has become the face of the partnership, its unofficial leader—Gerald Simms. Gerald, charismatic and upbeat, is a retired employee of Aerotron who has been brought back by the company as a consultant charged with exploring and developing the Tech Futures concept. After Gerald speaks, leaders of the local and regional higher education institutions stand and give a few words demonstrating their support and excitement for the initiative. The local high school is also represented at the meeting. An engineering instructor who plays a primary role in the engineering education program at the school is present at the meeting but does not share a message. The first to speak is the President of Green Valley Community College, then the Dean of the School of Engineering at East Hills University, a major public university located an hour's drive from Green Valley. Finally, the Dean of the Green Valley campus of East Hills University, a branch campus of the university, addresses the group. After the higher education leaders speak, the two local heads of Aerotron Global share words of motivation for the group. Then the chief civilian officer of nearby Fort Kenton gives a short speech. Following this series of brief but rousing orations from some of the most recognized leaders in the city and region, two individuals stand and

give a 30 minute multimedia presentation about the importance of STEM (Science, Technology, Engineering and Math) education in developing economies and granting career mobility to individual students. The two are representatives of the State Science Network, a public-private nonprofit organization housed in the state capital a few hours from Green Valley.

Though more symbolic than operational, this event is seen as very important to those in attendance. As they sit around the big conference room table, eating sandwiches at the close of the meeting, attendees talk excitedly about the value and future of the initiative. But looking more closely, the meeting, and the initiative itself, means different things to the different players involved. Reasons for involvement in the coalition supporting the initiative are as varied as the organizations involved. And even the list of organizations involved—who is on the list and who is not—is significant. Understanding the context of and driving forces for the Tech Futures Initiative will help us gain a greater awareness of the increasingly common phenomenon of this relatively new and complex form of multi-organizational partnerships involving the higher education sector.

In the following chapter, I explore the causes of the Tech Futures coalition. Because the initiative and this study are centered on the community college, that institution will be the focus of my examination, with the other organizations being explored as a way of providing important context and richness to the study. I begin by exploring the initiation of the partnership. Knowing who was involved with the conception of the initiative and their various motivations will help us to understand the context of the coalition and the foundation from which various organizations became

involved. Next, I will explore the coalition's expansion and development from an initial small group of informal players to a mix of organizations across industries. I will explore why organizations became involved in Tech Futures and what comprised their incentive structures. Finally, I will explore the varying, sometimes conflicted, nature of organizations' involvement. Much of the literature on partnerships paints a picture of harmonious and streamlined organizational interplay, neglecting the complex sets of motivations and contexts that come together when such a diversity of organizations and individuals meet. This study seeks to unpack these complex dynamics by exploring the full breadth of positive and negative organizational motivations for involvement in the coalition.

Conception of the Coalition

The Tech Futures Initiative began with four individuals sitting around a table at lunch. Of significance were the roles of those four individuals and the organizations they represented. Two were employees of Aerotron Global, a multi-billion dollar corporation in the defense industry. One of those individuals was head of operations at the Aerotron facility in Green Valley. The other was his chief business manager. A third person at the table was a former Aerotron employee, Gerald Simmons. The last was the President of Green Valley Community College. This lunch was a meeting that had been scheduled for the purpose of discussing the idea of deepening the partnership between the two organizations represented. Aerotron and GVCC had a long history, mostly consisting of the space they shared on GVCC's south campus where Aerotron owned a facility on the campus and shared the runways with the GVCC aviation programs. Though Aerotron

staff and GVCC faculty did not collaborate in any formal way, the two organizations had a longtime relationship if only by nature of the shared space. The lunch meeting was an effort to expand on that relationship.

Beyond the relationship between the two organizations in general, the President of GVCC and the head of Aerotron in Green Valley had a personal friendship. This friendship facilitated the lunch meeting. The head of Aerotron explained:

What we did, we had a discussion with [Gerald] and of course I told him that I had a personal relationship with [GVCC President] and he said, “Well let’s just get together for lunch.” It was his suggestion. So we invited [GVCC President] to lunch with [the three Aerotron employees] and we went out to [restaurant] and just sat down with a napkin and just started talking and saying, “We would like to work closer with [GVCC].” And of course he responded in turn, saying, “Yeah, I’d would love to work with you guys. What can we do together?” Really, that was the genesis out of that lunch conversation, again, pulling out a napkin and kind of drawing some things. It was just a matter of taking the time to sit down and go through that.

Amey, Eddy, and Ozaki (2007) noted the importance of examining the role of personal connections in the establishment of partnerships. Though they did not explore the concept in any depth, they indicated that personal relationships may be a driver for the development of certain partnerships. The friendship between the GVCC President and the head of Aerotron made the formation of a link between the two organizations

comfortable and natural. The two met at church when the GVCC President moved into town in 2009. Both individuals served in volunteer leadership positions for their local congregation. As the GVCC President explained it, their ecclesiastical conversations, over time, began to incorporate elements of their respective occupations and eventually how the two organizations might work together. The head of Aerotron in Green Valley explained how the friendship expanded to include the other Aerotron employees who attended the lunch.

So we were looking for a partnership with the college and he [the President] was totally on board. It was a great conversation. A lot of this was relations, too. We came together in that lunch meeting and I think forged an outstanding working relationship with one another that there's a great comfort in working together and trying to accomplish this goal. These are the kinds of people I'd like to work with. I think everybody at the table felt that, looking at the other three saying, "What a great group of people." It certainly is a lot easier to get things done when you're working with friends...

In each of their interviews, the four individuals at the lunch table shared this sentiment in one form or another, remarking on the sense of friendship and goodwill present among the small group. This informal beginning, scrawling notes on a napkin, distinguished the Tech Futures Initiative from some other partnerships. The Advanced Technological Education (ATE) collaborative described by Zinser and Lawrenz (2004) was initiated by the National Science Foundation (NSF) as an effort to produce workers

in specific technological fields. Partners were solicited and funded by the NSF. Tech Futures started off not as a response to incentives provided by a government entity but as an informal arrangement between leaders of the two organizations that would eventually stand in the center of the coalition. Not only was the partnership not originally motivated by an external entity, but motivations came from the originators themselves rather than through discussions or directives within their organizations. Outreach was not carefully planned or strategic, but organic and informal. Further evidence of the goodwill and friendship driving the partnership is found in the fact that the group decided to partner together before they decided what the partnership would focus on. As stated by Gerald Simmons, the retired Aerotron employee brought in for the discussion:

Well, if you go back three years ago, [the general manager for Aerotron] here locally, and [the President of GVCC] had evidently been talking about can we do something together and obviously because of what [GVCC] is, education institution, and what [Aerotron] is, they hire students that graduate from educational institutions, it has to be something in this general arena. STEM is the buzz word. So you hang your hat on STEM. So we had just a discussion meeting, what could we do together.

The motivation to “do something together” came before the idea of what to do together. The highly-technical nature of Aerotron and the legitimacy of STEM education would eventually converge in the minds of those at the table, propelling both organizations toward each other, but initially the idea was more a more generic partnership. This finding underscores the significance of the friendship as an impetus for the partnership.

Not only did the organizations not have a pre-formulated strategy for engaging in the partnership, the individuals involved did not begin with a purpose for the partnership. They only knew they wanted to partner together.

Despite the importance of personal connections in initiating the partnership, friendship alone was probably insufficient to bring the two partners together. After all, the GM of Aerotron likely had many friends and he chose to invite the President of GVCC to lunch. Likewise, the GVCC President felt compelled to have lunch with Aerotron executives. Leaders of each organization clearly sensed an opportunity to benefit from a partnership with the other organization. It is significant that the lunch meeting was called by Aerotron rather than the community college. Though the meeting was informal, it involved enough planning for the General Manager of Aerotron in Green Valley to bring in a former employee of the company who had years of experience building partnerships with higher education, Gerald Simmons. In calling the lunch meeting, Aerotron had two ideas. One, economic development in the community. And two, production of more trained Aerotron employees. These two motivations were expressed by the Aerotron GM:

First of all, we've been in the community for some years. In fact, I'm now 20 years here in [Green Valley], since I relocated with the company out of [another state]. And the community has been very good to us and we've had some prosperity here business-wise. The business has grown significantly. So one of the thoughts was, I guess, as a big fish in a small pond here, [Aerotron] has the ability to maybe make a difference in

STEM. The other thing that we saw was our engineering department was always short on people so there is some business need there where you say, “Gosh, we’re not meeting supply with demand in our engineering discipline.” So other areas we have much more success in hiring. With the engineers we just have a hard time and there are probably multiple factors involved and one of them certainly is people getting an education in a technical field and engineering field.

Aerotron’s early motivations are consistent with resource dependence theory.

The supply of trained engineers served as an important resource for the company. Seeking out a partnership to affect the flow of trained and credentialed workers—since Aerotron could not credential its own workers—served as a coordinating strategy consistent with the theory.

On the part of the community college, neo-institutional theory may give clues as to why the GVCC President decided to engage Aerotron. Neo-institutional theory suggests that by conforming to the rules, norms, and expectations of their social systems, organizations gain legitimacy and support. From the perspective of the community college, partnering with a major local employer would signal progress and the fulfillment of institutional mission, particularly to local stakeholders such as the college’s Board of Trustees and other leaders throughout the community and the state. The President of GVCC supported this idea, when asked why he participated in the partnership, by saying:

I think good neighbor or kind of our economic development arm that, you know, we need to help provide that. Clearly, we have a mission statement

that has a threefold thing: constructive citizenship, meaningful careers, in [Green Valley] most of your meaningful careers are going to be directly linked to, at least on the technical side, to [Fort Kenton] in some way or another.

Working with Aerotron spoke to GVCC's mission to work with employers to create jobs, thus communicating to local and state constituencies that the college was engaged in meaningful pursuits worthy of support. And while engaging with Aerotron represented an important and responsible pursuit to the President, it must be noted that such a mindset was driven by his own interpretations within what has been called a neoliberal hegemony (Ayers, 2005). In other words, to the President establishing "meaningful careers," as stated above, meant engaging with a specific employer to begin to develop programs and services in a specific subject. That action represented the President's interpretation of what meaningful careers would be for the Green Valley citizenry, careers connected with the military and defense industry. The forces driving this mindset will be explored in the next section.

A potential key to the perceived benefit of the partnership is found in the quote by Simmon's above. He noted that GVCC was an education institution and Aerotron hired students that graduated from educational institutions. The primary motivation for the partnership emerging from that lunch meeting, by nature of the organizations involved, was to educate future Aerotron employees at GVCC. Resource dependence theory sheds light on this phenomenon. Aerotron depended on GVCC for an important resource—trained and credentialed workers. Engaging in the partnership served as a coordinating

strategy for Aerotron. Since the corporation could not formally merge with or take over the college, the next best form of control would be to partner with them to ensure an adequate supply of trained and credentialed workers coming down the pipeline to the organization. This is similar to a steel manufacturing plant developing a partnership with a company that mines iron in order to ensure an adequate supply of a crucial resource. The GVCC President described the college's role in supplying workers for Aerotron.

We start with some general concepts of things we want to do together. I think there was a recognition [Aerotron] had hired a lot of our, we take students on the tour through [Aerotron] and I don't know what percentage of their technical staff had taken our coursework at GVCC, so we had this relationship in there and so we said we needed to do more. One year they started some new initiative and hired three of our faculty away from us to go into this field which told us, man we must be onto the right kind of thing. So this was around that UAV [Unmanned Aerial Vehicles] and kind of how all that stuff was going to work in there together. We recognized we've got to get more students interested in STEM and then we've got to have the programming that leads to instant employment there and at Fort Kenton.

In that statement, the GVCC President highlighted what was to become the objective of the coalition and the need for multiple organizations to be involved—the creation of a STEM education pipeline extending from the K12 system to the community college to employment. The initiative would not be as simple as attracting GVCC graduates to the

company, but the scarcity of trained and credentialed engineers and other technical roles would require the development of an effective pipeline through the entire educational system. Broadly speaking, the partnership would prepare students for technical and engineering careers, as expressed by the Aerotron business manager:

It's a collaboration of industry and local and state education institutions to try and create an avenue for young people to get into STEM based education. To help facilitate it. We recognize that in our area it was sometimes harder for harder for the children to be exposed to STEM, so we tried to come up with a way to expose them and give them an avenue if they show interest to follow that into an educational experience.

While the partnership formed around providing educational pathways in general, many of the original participants connected the initiative to supplying educated workers to fill specific local needs at Aerotron and Fort Kenton.

Yet we look around and see high unemployment rates and say that's a tragic thing see. To say, "I've got high-paying jobs here that go unfilled." Then meanwhile, people are unemployed and the only thing that would separate them from that high-paying job is education. So there's probably some business aspect to it, I guess, in that regard. (General Manager, Aerotron Green Valley)

So the idea is to grow your own so that you can maintain the workforce that you need to have in the local community. I don't think it has changed too much from that goal. (Gerald Simmons, Retired Aerotron Employee)

[Tech Futures] is an initiative originally between [GVCC] and [Aerotron], really trying to address the increasing needs for students interested in the STEM fields. It probably starts even a little bit earlier than that in some discussions that [GVCC] had with [Fort Kenton] that at the time was continually talked about that there were 400 open jobs at [Fort Kenton] for people with STEM related fields. And they couldn't find anybody to take them because the Department of Defense can't use international people and all of that stuff in there. So we kind of started out a discussion of what was truly needed. (President of GVCC)

While the personal connection and desire to work together originally brought together the President of the community college and local leaders of a global defense corporation, the group quickly defined the role of the partnership in educating a technical workforce to meet the needs of local employers. The focus on training students for local employment rather than educating them for broader career application has important consequences. It may lead a community college to provide a narrower skillset that is tailored to a limited set of proficiencies. Students trained for specific jobs in the local economy are more dependent on the availability of those jobs. Changes in the local economy or the financial status of individual companies can lead to downsizing certain

jobs, causing narrowly trained employees to find themselves without employable skills (Mars, 2012). I will discuss this concept in greater detail in the next section.

As the partnership began to grow, it took on the name of the Tech Futures Initiative. Because the initiative's goal intersected with many other efforts, particularly at the college, to develop an effective STEM educational pipeline, the partnership quickly expanded to include many individuals and organizations already engaged. It served as a collection point to tie in these previously loosely connected activities. This idea was articulated by the GVCC President:

The important part to realize is The Tech Futures Initiative and then if you go out and look on our website, and you look at the whole STEM initiative, you'll see that a whole bunch of things came together that the College already had going in some different ways. I will say what The Tech Futures Initiative kind of pulled it all together. Not that The Tech Futures Initiative did it all, it just realized I think just realized, we're doing this, this, this.

Consistent with neo-institutional theory, which highlights the value of symbolic action at the institutional level in legitimizing the institution, one role served by the developing partnership was to provide a symbolic framework to house and communicate related efforts being pursued throughout Green Valley Community College. These dynamics will be further explored in the next chapter and are only mentioned here to demonstrate that the Tech Futures Initiative, though new by name, quickly attached to preexisting organizational motivations and relationships. The Tech Futures Initiative and STEM

education became somewhat synonymous in the minds of those involved in these efforts. The budding partnership between GVCC and Aerotron represented a type of activity—STEM education—that various organizations joined for various reasons. Organizations had reasons and incentives for participating in these endeavors. Some of these reasons were shared between organizations and combined to create powerful incentives for participation. Other reasons for involvement were unique to a particular organization, sometimes leading to conflict and struggle within that organization. In the following section, I explore these justifications for organizations’ involvement in the Tech Futures Initiative and in efforts to develop a STEM education pipeline.

Coalition Incentives

As the partnership between Aerotron Global and Green Valley Community College expanded to include other organizations involved in efforts to strengthen STEM education from K12 through the university, individual organizations responded to perceived incentives for participating in the coalition. In this section I explore some of the prevailing rationales for involvement and the broader overall context within which the coalition emerged.

Responding to the STEM Current

The rise of the Tech Futures Initiative in Green Valley resonated with many organizations that were already involved in a national, state, and local push to strengthen STEM education. This simultaneous push from many different levels and economic sectors formed a powerful and influential “current” driving STEM education, as demonstrated in Illustration 5.1. The unique economic and geographic setting of Green

Valley made it a place where the STEM current gathered with particular strength, a sort of basin within which organizations involved in the Tech Futures Initiative and other STEM education efforts perceived powerful incentives to join these initiatives.

The organizational theories employed in this study shed light on the factors motivating the different organizations in Green Valley, and particularly the community college.

Some of these factors related to finite resources, such as grant funding, and can thus be explained by resource dependence theory and academic capitalism. However, perhaps the greatest incentive came in the form of legitimacy granted to the organization for playing a role in national and state calls for strengthening STEM education. Consistent with neo-institutional theory, by being a key player in the broader STEM initiative, organizations in Green Valley, particularly GVCC, stood to gain credibility among stakeholders at multiple levels. Because STEM education was taken for granted by GVCC administrators as a legitimate pursuit, they often accepted without question the direction being given at the national and state levels. The fact that local employers were simultaneously echoing the broader narrative by decrying the vast quantities of unfilled or potential local jobs in STEM fields converged with the broader STEM narrative and further incentivized the college's pursuit of STEM activities.

The STEM Current

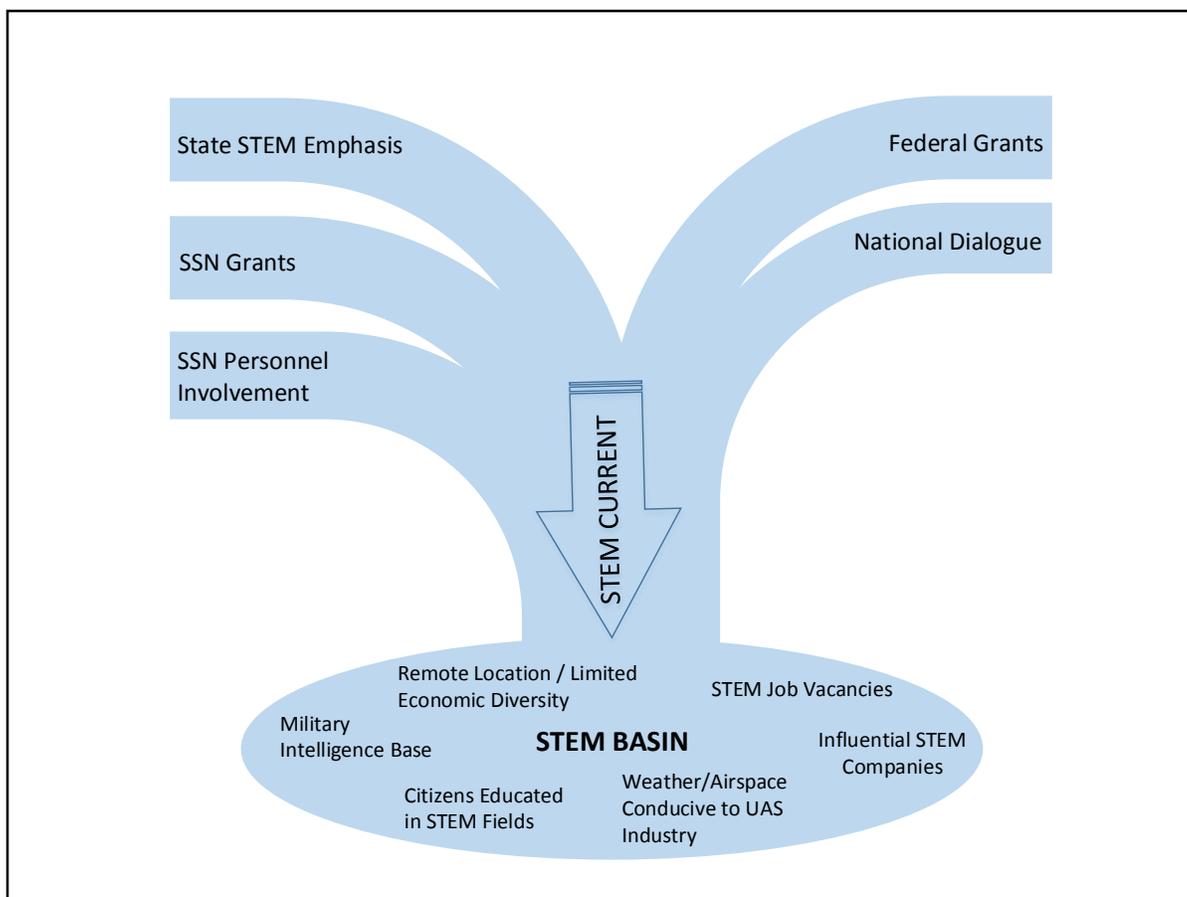


Figure 5.1

National STEM Stream

Over the past decade, the U.S. government has increased its focus on strengthening educational efforts in the STEM areas—science, technology, engineering, and math. These efforts were exemplified by the release of a national report on the subject, entitled, “Rising Above the Gathering Storm,” in 2005 (Augustine, 2005). This report—developed under the aegis of the National Academies Committee on Science, Engineering, and Public Policy—was a response to the perceived threats to the U.S. economy brought about by globalization of the economy, particularly the science and technology sectors. As the report reads:

Today, Americans are feeling the gradual and subtle effects of globalization that challenge the economic and strategic leadership that the United States has enjoyed since World War II. A substantial portion of our workforce finds itself in direct competition for jobs with lower-wage workers around the globe, and leading-edge scientific and engineering work is being accomplished in many parts of the world (p. 3).

The report provides four recommendations to strengthen the U.S. science and technology sectors. Two of the four recommendations focus on improving STEM education in the K12 and higher education sectors. The report recommends providing federal grants for a variety of initiatives related to STEM education. Educators and administrators have looked to “Rising Above the Gathering Storm” (Augustine, 2005) for direction over the past decade. A Green Valley Community College administrator said this about the report, “It is really what started this new push for STEM. Honestly, it is as fundamental

to modern education as ‘A Nation at Risk’ was back in the late 70s or late 80s.” Beyond encouraging the federal government to provide more funding to STEM initiatives, the report started a national dialogue centered on STEM education. The same Green Valley administrator described a conference he attended shortly after the report was released:

Look, when the defense industry spoke, everybody listened. I remember going back to 2005, my dean and I went to a conference in El Paso. It was a White House initiative thing. Basically, you had your [defense industry corporations] and things like that. The major defense players were seated at the table along with university reps and community colleges reps. I think what industry kind of said is we need more people in here and higher education and you really have to do something in order to get this. That’s when we came back here to [GVCC] and kind of said, “What can we do?” Recognizing our location, our mission, and what our resources were and so we just started building a program.

As noted by this administrator, the national dialogue pertained to not only government and educational entities but to the private sector as well. The committee charged with producing “Rising Above the Gathering Storm” (Augustine, 2005) was made up of not only distinguished scientists, educational administrators, and government officials, but also included current or retired board members of corporations such as Intel, Lockheed Martin, Merck & Co., and Exxon Mobil. These combined voices communicated a powerful message to educators nationwide. Several individuals interviewed for this study mentioned the national shortfall of STEM students as a reason for the Tech Futures

Initiative and STEM education push in Green Valley. This perspective was voiced not only by educators but by other sectors as well as demonstrated here:

We know that in the United States we aren't producing enough people that can think mathematically and use technology and engineering math to be creative and keep the US where it should be or get us where we should be and so I just think it's vitally important and I think we're doing a good job of becoming a well-rounded STEM area. (K12 Administrator)

Basically, the way the story goes is that the defense department looked at the number of Americans, I shouldn't use the word Americans, people who can get clearances and they looked at the number of people who can get clearances who are enrolling in STEM-like activity and they were terrified to learn it was only 3%. A whole bunch of other people, but they're from Eastern Europeans, Indians, Chinese, really smart people that are taking our technology away, but we don't have enough people that can get clearances, and so the defense department said, "Who's going to run our systems? Who's going to design our next types of defense systems?" So they turned around to their National Science Foundation and said, "Fix this." (GVCC Administrator)

And again, there's a looming cliff of engineers. The last of the baby-boomer engineers who bought into the space-race and went off and got

their degrees and became engineers and are coming to the end of their 25 or 30 year career and they're just about ready to step of the cliff and we need to backfill that.

(Aerotron Administrator)

I see this as a national program and we're pulling levers on areas that we can pull levers on. I can complain about all the lack of engineers in Kansas City, but I've got no lever to pull there. I can pull levers here. I can wave flags here and support here. So, the best I can tell, I'm doing my part in my little corner of the world here with what tools that I have. (Fort

Kenton Administrator)

The national push to strengthen STEM education has generated a compelling narrative. STEM education has been a recurring theme in the U.S. President's State of the Union addresses over the past decade. The President's proposed 2015 budget includes \$110 million to strengthen high school STEM innovation networks, which includes connecting high schools more closely with colleges to prepare students for postsecondary study in STEM fields. These messages were echoed by many of those involved in Green Valley's Tech Futures Initiative and STEM education coalition.

The national STEM narrative is supported by millions of dollars in federal grants flowing into educational institutions around the country. While the perceived need to strengthen STEM education at the national level seemed to have resonated with those in Green Valley, it is difficult to say whether that message alone, unaccompanied by

financial incentives, would have produced action or whether it served only as a common set of talking points for participants in the coalition.

Green Valley Community College has actively pursued federal grant opportunities resulting from the national emphasis on strengthening STEM education. These grants have been an important incentive for the college to participate in certain activities it may have not otherwise supported, such as the Tech Futures Initiative. One GVCC administrator, speaking of the decision of college executives to pursue STEM grants, said, “Sometimes I think our upper administration recognizes and our faculty recognizes that resources are being devoted to STEM.” This administrator went on to say, “I think they recognize and I recognize that funding from the federal government and from foundations is going to STEM right now.” Another GVCC administrator put it this way:

There was kind of a convergence that was just perfect timing. I don't know, maybe. We were looking at Gate's Foundation. We were looking at [a national grant program offered in two states]. We were looking at [a state grant program]. We were looking at NSF. You know, there's all sorts of things that we were looking at at the time in order to try to fund this stuff. Again, that was the glory days. We really got fortunate because that was when suddenly purse strings opened up for STEM and we were ready to go. So, that's how we kind of jumped in.

These statements highlight the effect the influx of STEM funding at the national level had on GVCC's decision to pursue STEM activities. Much of the literature on partnerships

involving educational institutions mention grant funding is a motivator for the partnership (Duffield, Olson, & Kerzman, 2013; Haire & Dodson-Pennington, 2002; Spangler, 2002; Zinser & Lawrenz, 2004). GVCC acquired two substantial federal STEM grants through their efforts between 2005 and 2012. These funds were awarded based on the college's plans to develop partnerships with the local high school, the university branch campus, and the private sector. I explore the use of these grants in greater detail in the next chapter. For the purpose of this chapter, it is important to note that federal grants played a significant role in motivating STEM activities in Green Valley, at least from the perspective of the community college at the center of the coalition. But the federal grant monies were only a part of the powerful current driving the organizations to build the coalition. Grant funding was part of a larger national directive to strengthen STEM education, a directive to which the organizations in Green Valley responded. In addition to this national stream, state and local streams also added to the STEM current.

State STEM Stream

At the state level, encouragement to develop the Tech Futures Initiative and STEM education pipeline came less from the state government and more from a nonprofit organization called State Science Network (SSN). Headquartered in the state capital, SSN was formed as a public-private partnership, with roughly half their start-up funding coming from a state government allocation and the other half coming from large, private companies located in the state. These companies had a vested interest in the success of STEM-related activities in the state and in the establishment of science and technology as a cornerstone of the state's economy. The original focus of the

organization was to invest in research activities and graduate education that would have a direct, positive effect on the economy. In this light, SSN played the role of an intermediating network as described in the theory of academic capitalism (Slaughter & Rhoades, 2004). Consistent with the theory, SSN funded university research and graduate student scholarships in an effort to develop innovative products that could be transferred into the private sector and marketed. After SSN had been involved in this type of activity for a few years, they recognized the role undergraduate and K12 STEM education played in economic development. An SSN executive made the connection between the organizations initial efforts to support tech transfer and their merging into the realm of STEM education:

And the intent was for the investments to be made to, in research, so that we could get new innovations and create new companies and diversify our economy. And we're still trying to do that. And in order to support those companies we needed a new, a better, workforce. And so that's where a greater emphasis on STEM education came into place.

Another executive described a shift in role as the organization shifted from a research focus to an education focus:

So, my role changed from something that was attuned to research and education to something that became more education centric—as the organization clearly was required to play, as it should, a much larger role in the education space. The sense of this is that industry and research-based technologies can't succeed without good people. In the beginning,

we were trying to bring good people to the universities from other places in competition with other universities who were competing for the same people. I think over time we began to realize it was equally important to build a pipeline that would bring younger people into this, for want of a better word, sphere that we presently were thinking about.

This connection between tech transfer and workforce development activities highlights an important link between academic capitalism at the university and in other educational sectors. Though community colleges do not focus on research, especially the kind that would produce marketable innovations in science and technology, the college's workforce development function is its contribution to the economy, and, as in the case of the SSN, can attract involvement from external actors through the new circuits and networks described in academic capitalism.

The above quotes also demonstrate the tight connection between the State Science Network organization and the local efforts of the Tech Futures Initiative. The description of the STEM education pipeline given by an SSN executive are very similar to those given by executives from Aerotron and GVCC regarding the conception of Tech Futures. This is due, as I will explain throughout this study, in no small part to the tight interpersonal connections between SSN and those involved in the STEM coalition in Green Valley. This connection was not unique to Green Valley but was a practice SSN hoped to accomplish statewide. SSN positioned itself to be a vehicle for strengthening STEM education across the state. As described by an SSN executive:

Our goal is to identify best practices in the state and elevate them and connect them to opportunities so we can replicate and scale best practices, changing the culture of STEM education in K12 schools. And my role in particular is to look at community colleges and how they serve as the center point, the conduit, for good STEM education.

The goals of SSN were vast and aggressive. In order to have real economic impact, the educational system would require a substantial shift toward more effective STEM education and greater integration with workforce demands. In the words of an SSN executive:

So, we have to change a culture of how you deliver education, and we have to change a culture by integrating industry a lot more often with education so that the changes in industry are reflected in education and education stays up to speed. This is my philosophy, you have to have an education system that is flexible, responsive to what industry needs.

Just as the federal focus was to integrate educational institutions with the needs of industry, particularly the forms of industry focused on science and technology innovation, the State Science Network functioned at the state level to convert educational institutions to the new way of thinking. In its own eyes, SSN was a complement to, or even an extension of, the national STEM effort. One SSN executive described the shortfall in STEM educated students the country faced today, citing “Rise Above the Gathering Storm” and said, “We emerged as a possible new way of addressing the problem.” This interviewee saw the State Science Network as a state application of the

federal push for STEM education, going on to describe the role SSN would play as a model for other states to accomplish what was laid out at the federal level:

So, the idea, I think, is to build a model in [this state] where it seemed interesting and possible and there was support from the governor to look at the role of industry and the universities together on the same platform and recognize how the needs are more local, regional and therefore more compelling for support and that model might be transformational.

Not only did SSN executives see their work as a response to the national promotion of STEM education, but there were important personal connections between SSN and the federal government. The CEO of SSN was a former executive at the National Science Foundation (NSF), and before that he was head of a similar foundation in Ireland. According to one SSN executive, “When [governor of the state] decided to invest in science and technology, the model that [the governor] looked at was an organization called Science Foundation Ireland.” When SSN was formed through that investigative process, the previous head of Science Foundation Ireland was chosen to be its CEO. And the CEO brought in other employees he had previously associated with in his time at the NSF. This practice is consistent with the theory of normative isomorphism, where organizations take on similar forms with others in their fields due to the sharing of employees across organizations and the intermingling of employees in professional associations. The connections between the State Science Network and both the NSF caused SSN to replicate and build on NSF efforts, serving as both a product of and a model for the national current of STEM education initiatives. This multiplying

effect created powerful momentum in support of SSN's cause, which was the strengthening of STEM education statewide.

As described by the SSN executive above, the mission of organizations like SSN was to "transform" education at the state and local level in a way that could not be done at the federal level. Where the federal government could create a compelling national dialogue and incentivization through grants, SSN could reach into communities and affect transformation through more specific involvement. An SSN executive described the reach of the SSN effort:

[It] is an initiative that evolved out of a year-long study across the state where we went and visited [every county in the state], talked to their communities, school superintendents, industry, the whole thing, and basically came up with a set of critical needs that these communities had around education, and devised a plan.

The plan mentioned by this executive would "integrate STEM into schools and districts." Its ability to engage with every county in the state would allow SSN to influence STEM education on a level not possible for the federal government. An SSN executive described operations at this level of depth:

They had to have all the teachers engaged, industry in their community engaged, and have a full-blown community partnership before...because you can't make those kinds of cultural shifts without everybody's support.

Through the personal involvement of SSN staff, SSN would guide school districts, community colleges, and industry to strengthen STEM education. And these

communities would connect with each other in a broader, statewide network to develop and sustain practices that would foster STEM education. A sample of those practices was mentioned by this SSN executive:

We're also developing our goal to kind of create networks of everything we're doing. We have a network of STEM clubs for after school environment, trying to get these clubs to connect with each other. And I'm working on a network of the rural community colleges, so that they can reach out to those K12 schools and bring them into their campuses and that they have the kind of programs and curriculum that meet industry needs.

Extracurricular offerings, high school and college curricula, bridge programs offering college courses to high school students, and community STEM events were all activities SSN promoted to strengthen STEM education in communities throughout the state. In addition to creating networks of STEM activity through personal involvement, SSN provided millions of dollars in grants to bolster STEM programming. Joining the grants provided by the NSF, these SSN grants would further incentivize and make possible STEM activities throughout the state. Green Valley Community College was awarded an SSN grant to build a bridge program between the local high school and GVCC. This program would enable high school juniors and seniors to take general education science and math courses to transfer to a college engineering program upon graduation from high school. Speaking of the programs funded by SSN, one GVCC administrator said:

None of this happened without [SSN]. [The bridge program] didn't happen. Our STEM expo didn't. Math, science, none of that happened without [SSN]. And it's been a really good relationship with [SSN] since we began this thing. So because of them, we're in it and the big part about that, we got one kind of little seed grant from [SSN] in the beginning and then the next year we got a fairly substantive grant. Part of that grant was also a . . . we had to match an endowment so I have an account of five hundred grand sitting there. We draw interest off of it. I can pay students' tuition. So, it's important and any time we do anything with high school, we have to remember that tuition costs will eliminate a lot of the kids that you want in those programs because we want to get out into non-traditionals and do that. Ok, fine, they can't afford it. And, by the way, they don't qualify for financial aid because they haven't graduated high school yet. So having that funding is just so important.

Not only did this administrator credit SSN with making many programs possible, but the vast majority of students in the GVCC bridge program funded by SSN said they would not have signed up for the program and taken the courses if they were not offered for free. Free college credits were a compelling incentive for high school students and their families. Without that funding, programs like the STEM bridge program would not exist, as stated by the program's director. Drawing on resource dependence theory, the grant funding provided by SSN incentivized the college to form an alliance with the state organization in order to ensure the acquisition and continuation of funds. But as will be

explored later in this study, partnership with SSN entailed more than just receiving funding but responding to the organization's mission to center educational institutions on STEM.

Joining the national push for STEM education, SSN provided a powerful state-level push that multiplied the overall effort. Both of these levels served as streams building the overall current. The current consisted of calls to strengthen STEM education at the national level, personal network-building at the state level, and grant funding at both state and national levels. The streams did not run independently—the national stream had a direct influence on the state stream, as the SSN believed it was a model for implementation of the national STEM initiative. Further, SSN executives were tightly connected with the NSF and other such entities, including a similar organization in Ireland. In the next section, I explore how the current fueled by these national and state influences, or streams, joined with the unique economic and geographic setting of Green Valley to create a “basin” of influence that would compel individuals and organizations to participate in the local Tech Futures Initiative and associated STEM education activities.

Local STEM Basin

The many influences, or streams, at the national and state levels formed a powerful current, motivating and incentivizing efforts to strengthen STEM education at the local level in Green Valley. The town and region of Green Valley served as a sort of basin where all these streams of influence flowed and settled. In this respect, Green Valley was not an ordinary town. Though STEM state and national STEM influences likely had an effect across the U.S. and throughout this particular state, certain factors

unique to Green Valley made this town particularly prone to the STEM focus—a particularly eligible basin into which STEM streams could easily flow. The combination of these elements granted added legitimacy to organizations participating in STEM education efforts, in addition to exerting social pressures and power dynamics to motivate organizations to support STEM. This finding is in line with studies by Stephen Katsinas (2003) and others (Castañeda, 2002; Kennamer et. al., 2009), which have focused on how the unique settings of community colleges influence their missions and outcomes. In supporting the Tech Futures Initiative and the STEM education pipeline, organizations in Green Valley were not only responding to the same state and national forces influencing other cities, but these organizations were responding to powerful local influences that further motivated and incentivized these programs. And being the only provider of two-year degrees and certificates within 75 miles gave GVCC added influence, added legitimacy, in the partnership.

Though individuals involved in the Tech Futures Initiative often described state and national efforts to promote STEM education, many cited local employment shortfalls as the primary purpose for the initiative. STEM-related jobs, particularly engineering, at Fort Kenton and the many companies contracting with the military in STEM fields were repeatedly cited as justifications for the Green Valley STEM initiatives. In the following statement, one K12 administrator encapsulated the concept of national forces and local workforce needs working together to incentivize many different STEM education practices:

I think it's vitally important that we do everything we can to promote STEM education in [Green Valley]. We have a very transient community. Our kids don't normally stay here and if they do stay here, they're going to be working in technical fields up on [Fort Kenton] or other things. We need the STEM education to be here so that kids don't have to leave and not come back if that's their interest level. We're the hub of [the region]. [A nearby bigger city] is our closest, but I think we have the potential to really grow a lot of our own and we know that in the United States we aren't producing enough people that can think mathematically and use technology and engineering math to be creative and keep the U.S. where it should be or get us where we should be, and so I just think it's vitally important, and I think we're doing a good job of becoming a well-rounded STEM area. We don't just have all our eggs in one basket with the engineering program. We've got the Cyber Patriots program through ROTC. We've got the Lego-Robotics in our elementary schools. We've got the Robotics program at the high school which is a club, but it also becomes a curriculum and we've had national champion robotics teams, so I think we're going in lots of different directions but they all feed towards preparing our kids in STEM fields.

The military base and local contractors were by far the top employers in Green Valley in terms of numbers of employees. The sheer number of technology-related jobs made STEM education and training compelling to local educators. However, an employment

shortfall had developed in Green Valley due to two compounding factors: A disproportionately large technology industry and the fact that Green Valley's remote, and relatively unpopulated, location made recruitment difficult. Several organizational leaders explained this phenomenon as a problem addressed by the Tech Futures Initiative. One Aerotron administrator put it as follows:

It's hard to recruit into [Green Valley] for a variety reasons. People tend to like to stay where they're at. We also find with the housing crisis that people just are sort of less inclined to relocate. They say, 'I'd love to go to work for you, but I'm underwater on my home and can't get out of it, so if you'll let me work from home or out-of-state, something like that, then ok, but otherwise, we can't come.' So there's some other factors going on here, whereas we find our ideal, in fact, we saw this 20 years ago saying, 'Here's a company where someone can be raised in [Green Valley] and come to work here locally.' Because in the past, there was a real high propensity if someone were well-educated, well you better go leave the area to go find work. With some exceptions, [Fort Kenton] would have some jobs up there, but we thought here's an industry we can bring to [Green Valley] and allow people to grow up in the community, maybe go to a [East Hills University] or something like that, get a good technical education and they like the area, come back and live here. We find the kids that grew up in the area will talk about boring [Green Valley], but

when they become parents, they're anxious to come back to a boring place. All these factors coming together and saying we can do more.

Resource dependence theory would describe Green Valley as an environment wherein organizations were starved for a key resource—employees trained and credentialed in STEM subjects. With so relatively few educational institutions in Green Valley, this resource dependence would simultaneously exert pressure on the institutions and grant them special influence as the only provider of the scarce resource. From the perspective of RDT, Aerotron was a pioneer in its efforts to partner with GVCC to acquire needed employees. Other companies may follow suit, especially if the situation with job vacancies does not improve over time. An administrator at Fort Kenton described the military base's failure to recruit sufficient employees to fill the hundreds of vacancies in Green Valley.

I have the personnel office that hires that folks come see me once a month and we go through each organization and how many job vacancies there are. Approximately 2003/2004, I forget which, it just got too many that we have hundreds of vacant jobs on [Fort Kenton] and they were technical in nature and we just flat were having a great hard time filling those positions. That means we have a job, you have a slot for someone, you have the sort of pay for them, you have the want ads electronically out there looking for people, and you just can't find qualified people to fill those....Ok, if you live on the east coast and you're surrounded by shopping malls and great restaurants and you go home and talk to the wife

and say, ‘Hey, let’s move to [Green Valley].’ The wife instantly flashes to Russell Crowe out in the middle of nowhere getting shot at or they think of *No Country for Old Men* or something like that and say, ‘Are you kidding me? Have a good time. I’m staying here.’ It’s hard to bring people out, too, because of some overriding appendages. Then it’s hard to get young people here to [Green Valley]. You’re here and married, it’s a great life. If you’re here and single, it’s like, ‘Ok, another weekend in [nearby larger city].’ Enough said.

For Aerotron and other companies, as well as for Fort Kenton, developing a STEM education pipeline as a way to increase the number of credentialed workers clearly made sense. “Growing their own,” by training Green Valley citizens with the skills and proficiencies to fill the many vacant jobs was a preferable alternative to trying to meet workforce demands by recruiting from out of town.

Through the lens of the Green Valley Community College, meeting workforce demands would not only respond to national and state calls to strengthen STEM education but would respond to a critical need locally by preparing students to fill vacant positions in the community. Preparing community members for employment was seen as a core mission of the college, as stated by one GVCC executive.

Yeah, we want to be known as a great innovative, excellent community college, but in the end if our citizens aren’t being paid. I mean, today, fifty percent of our revenue to operate the college comes on the backs of

the local taxpayers. So they need to have jobs. They need to be employed and we think we play a role in that.

In the minds of GVCC administrators, creating academic programs to satisfy local employment needs was an important part of the college's mission, mentioned more often than revenue as a motivator for participation in the initiative. In the eyes of GVCC administrators, such as the one quoted above, satisfying local taxpayers meant responding to local employment needs by creating employees ready to move into local jobs. This perspective is supported by the theory of academic capitalism in that it demonstrates the college's focus on market forces—in this instance the job market. Students serve as a product in that market and the college's key role is seen as producer of a marketable good. To the extent the college succeeds in that market, it is seen as a worthy investment for taxpayers. This concept intertwines with neo-institutional theory in that local taxpayer support is likely based on perceptions of the institution as an able producer of employees, a concept popularly accepted as a key role of a community college. One GVCC executive connected the college's mission to produce trained workers to the quality and quantity of technical jobs in Green Valley.

Clearly, we have a mission statement that has a threefold thing: constructive citizenship, meaningful careers, in [Green Valley] most of your meaningful careers are going to be directly linked to, at least on the technical side, to [Fort Kenton] in some way or another.

By preparing more students in local high-demand fields, the college was fulfilling its mission to make its citizens employable. Consistent with neo-institutional theory,

addressing its mission to develop the workforce would signal quality and success for the college—the institution would be accomplishing what it should have. This would enhance the legitimacy of the college in the eyes of taxpayers and community leaders. Symbolically, the college would be engaged in the right pursuits by playing a central role in the STEM initiatives. This served as a significant motivator for the institution's involvement. However, at the technical level, there was an irony that was not addressed by any interviewee. According to comments cited above, many of the youth of Green Valley, who were the students of the educational institutions, left the community after high school or college to pursue education and life in other places. This phenomenon presented a hidden dilemma for the educational institutions in Green Valley, particularly for the community college and university branch campus, who had greater autonomy over their own curricula. The demands of the workforce were not necessarily aligned with the demands of the citizenry. The major local employers needed STEM-trained employees, but students planning on leaving the community for other locations with more diverse career options than the community could provide, were not necessarily interested in STEM-related career fields. Therefore, while the Tech Futures Initiative sought to address the demands of the local workforce, it did not necessarily address the demands of community residents. Thus, in saying the Tech Futures Initiative addressed the demands of the citizenry, the college was defining the needs of “the community” as the needs of major employers of the community and not necessarily the citizens of the community. Daugherty and Bakia (2000) noted this tendency in colleges when they said, “Community colleges tend to define community in a way that makes employers the central constituents

of the ‘community.’ There is little to no consideration of the possibility that on occasion the interests of the community and of employers might actually be opposed” (p. 221). To GVCC administrators, it was a given that participation in the STEM coalition would meet the career preparation demands of the citizenry, when that was not necessarily so. In the next chapter I will explore this phenomenon in greater depth, particularly in terms of how it affected the workings of the college and the coalition.

An interest in meeting its mission of local workforce development was one reason GVCC engaged in the Tech Futures Initiative. Another significant motivator was the potential for revenues, market position, and other financial and resource-driven advantages the college saw in participating. The college perceived two distinct paths to achieving the economic benefits of the partnership—engineering education and the emerging field of unmanned aerial systems, or UAS. By partnering with the local high school and the university branch campus—both organizations located within a stone’s throw from the GVCC campus—the college would serve as the middle segment of an engineering education pipeline that began as a technical education emphasis in high school and culminated in a bachelor’s degree in engineering from East Hills University.

The role played by GVCC in the pipeline would be to develop a bridge program for high school juniors and seniors, which would lead to an engineering associate’s degree program at the college. Upon completion of that program, students would be prepared to transfer to the main campus or local branch campus of East Hills University to complete a bachelor’s degree in engineering. From the perspective of resource dependence theory, students were an important resource to GVCC. A successful

partnership with the local high school served as a coordinating strategy for the college, ensuring the flow of students into the institution. Just as local employers depended on these students to emerge from GVCC as trained employees, GVCC depended on the high school to prepare these students for enrollment at the community college. In a sequential pattern, this vertical integration of resources would benefit all organizations involved in the coalition.

This approach had two potential financial benefits for the college, in addition to supplying the local workforce with more engineers. First, the college hoped to garner federal and state-level grants to help build these programs. In this regard, the college had achieved some success by being awarded a multi-million dollar NSA grant to bolster the engineering education pipeline and a grant through the State Science Network to develop the high school bridge program. The other economic benefit to the college would be increased tuition revenue from those enrolling in what they hoped would be a high-demand engineering program that would retain local youth who would otherwise have left the community to pursue jobs and education elsewhere. This revenue would help to replace state allocations that had been declining for five years. As one GVCC executive explained:

We've lost five million dollars of annual operating funds out of the state over the last . . . in the last five years. We've lost thirty-two percent of our state funding. So, I would say on one side it's made it difficult, but on the other side, maybe that's what's allowed us and made us to go look at

things like [the Tech Futures Initiative] and try to find those resources and leverage things despite the state.

This idea has two important theoretical connections. First, in pursuing alternate resource streams, the college was demonstrating a form of diversification as described in resource dependence theory (Pfeffer & Salancik, 1978). As the theory asserts, in order to avoid being overly dependent on a single resource provider, an organization will develop alternative resource streams. In the case of GVCC, resources resulting from the STEM initiatives served as an alternative to declining, and unreliable, state funding. The theory of academic capitalism applies this concept to higher education by specifically charting the decline of state funding with the correlated increase in government and private grant revenue (Slaughter & Leslie, 1997). Though Slaughter and Leslie's study focused on research universities, here we see a community college application of the same principle. As state allocations, or block grants, declined, GVCC looked to public and private grants, as well as new streams of tuition revenue, made possible by the Tech Futures Initiative.

In addition to tuition and grant revenue made possible by the new STEM initiatives, many of the organizations involved saw a more indirect, though potentially much bigger, incentive for participating. The desire to make unmanned aerial systems (UAS)—sometimes called unmanned aerial vehicles, or UAVs—a major commercial industry in the Green Valley region was a concept intricately woven into the STEM narrative. As an emerging commercial industry, UAS had the potential to transform the economic prospects of the region. Throughout the course of this study, many individuals and organizations involved in the coalition anxiously awaited a decision by the Federal

Aviation Administration (FAA) to select six test sites from around the country at which commercial applications of UAS would be approved for testing. Green Valley hoped to be one of those locations, which would be called UAS Centers of Excellence. A GVCC administrator explained the importance of commercial application of the UAS.

UAS is the future. I've got articles where in UK they're already flying commercial planes, remote control. They don't put any passengers on them, but there was a twenty-one passenger airplane flew five hundred miles. You've got UPS and all those, think of what they can do when they can start remote-controlling 747s flying around the world, different things, and not have to worry about pilots and all that stuff controlling it. It's a way of the future. So, forget the war part of it, just in the regular world, I mean, you have to have to so many pilots, you have to have so much rest, and everything. We just see it as the future of helping everything. Power lines, [local company], I mean, I see helicopters and stuff going up to power lines out in the desert all the time. Now, you can do it with UAVs and UASs with cameras and everything and you can do the same thing.

An economic development executive for the region explained the great impact UAS could have on Green Valley.

It diversifies our entire economy, is what it does. What we're looking at again, when people hear that, they think that so much of it is tied to the military, and it isn't. This is specifically commercial. This is to help border patrol. This to help fire fighters. This is to help agriculture. We're

looking at ways that we can use it in the mines. So, it's a whole different way of looking at unmanned aircraft systems versus military use. Of what people perceive on that it's spying. That it's used for missions overseas. We're moving to the commercial side in the usage to include the way UPS may change shipping. I mean, it's just, it revolutionizes a lot of the ways that we've been doing business. It creates a whole new industry for our region. It creates opportunities.

Several economic and environmental conditions in Green Valley made it a prime location for development of the UAS industry. Fort Kenton is the largest UAS training facility in the world. Several Green Valley companies contracting with Fort Kenton specialize in building, repairing, and piloting the systems. GVCC had an existing aviation program at their south campus, on an airstrip shared with Aerotron. And the airspace above Green Valley, because of its geographic location, is some of the least congested and most moderate airspace in the country. For these reasons, Green Valley economic development and industry representatives saw Green Valley as a competitor for UAS Center of Excellence status. An Aerotron administrator explained this synergy of organizations and the stake each had in the endeavor.

The basic premise was that because of what all the army folks that fly UAVs train at [Fort Kenton]. So there is that aspect of it. The fact that [GVCC] had an aviation technology program that you could now embellish it and turn it into a UAS Center of Excellence Program, which they've done. They remodeled the building and everything else new,

repaved the runways, little things like that. The fact that [Aerotron] is one of our largest businesses worldwide in UAS. So it fits in the [Aerotron] scheme of things. It may not fit as closely in the [other local company's] scheme of things. But for [Aerotron] specifically, this is where it's at. It's the new thing. It's not the space-race. It's a little bit different. But on the other hand, it's up and coming. There will be plenty of jobs and they'll be decent jobs.

GVCC's role in the UAS partnership would be to develop training programs for students to receive an associate's degree in UAS repair or piloting. One GVCC UAS instructor explained the impetus for establishing a UAS program.

Every university and college is starting to look at how could they get a UAV program, because there's been figures released that as soon as the FAA opens the airspace and integrates the UAS into national airspace, it's going to create 86,000 jobs within the first year, which is a 13.6 billion dollar industry, just within the first year. By 2015, they estimate there's going to be over 103,000. Now that's manufacturing, engineering, doing, those types of things with a much higher revenue and income.

Just like the high school bridge program and the engineering associate's degree program, the two UAS programs would bring new enrollment revenue to the college. Perhaps even more importantly, the establishing the region as a UAS Center of Excellence, a major hotspot for commercial applications of UAS, would give GVCC a major advantage among the relatively few UAS training centers in the country.

The UAS Center of Excellence concept became intertwined with the Tech Futures Initiative for a couple reasons. First, GVCC utilized its relationship with Aerotron to develop the curriculum for its UAS programs. As experts in the field, Aerotron employees were positioned to develop a curriculum based on industry demands, or at least the demands as ascertained by Aerotron. GVCC was unequipped to develop the UAS technician and pilot curricula without help from outside experts. The Tech Futures Initiative refocused and enhanced the relationship between GVCC and Aerotron, making it possible to collaborate on the curriculum development for the UAS programs. One Green Valley administrator described the role of the Tech Futures partnership in enabling the UAS program's development.

I think [Tech Futures] was really one of the things that started it, they started to look more intent, more contacts that they could get those ends of things. Additionally, it opened up another door, which was the arrival of the UAV program and the college is kind of run with that on the [south campus]. They've got their UAV program set up down there. Because of [Tech Futures], [Aerotron] was involved in writing the curriculum for the UAV program and it was pretty heavy involvement in putting that thing together.... It's allowed us to expand some things out. That's always nice. Like I said, the UAV program is completely because of [Tech Futures]. Again, I think what we were doing bought us a sense of legitimacy and it forced me to take it seriously. Until then we were [GVCC]. What were we doing?

While participants in the Tech Futures Initiative all pointed to the engineering education pipeline as the primary focus of the coalition, many also mentioned the UAS programs as a product of the initiative.

Another link between the UAS Center of Excellence and the Tech Futures Initiative was the shared focus on jobs and economic development. The UAS programs at GVCC would prepare community members for jobs—not only those available at the time through Fort Kenton and its affiliated contractors, but also those the Center of Excellence would bring in commercial applications of UAS. Unmanned aerial systems would require both master’s-degree-wielding engineers as well as associate’s-degree-trained pilots and technicians. Both of those options were viable outcomes in the Tech Futures pipeline.

The efforts to make Green Valley a UAS Center of Excellence, recognized by the FAA as a hotspot for the development of commercial applications of UAS joined with other components of the Tech Futures Initiative to further strengthen the local forces encouraging the coalition. One GVCC executive explained the importance of the FAA decision on the impact the Tech Futures Initiative would have on the region. He said, “For me, the biggest things we’re kind of waiting to see is what happens in this whole UAV area. For me, that’s the one that really set [the Tech Futures Initiative].” The regional push for the establishment of a broader UAS economy incentivized GVCC and other organizations to partner together for the Tech Futures Initiative.

The unique local conditions created by the UAS Center of Excellence and the wealth of unfilled STEM jobs in this relatively remote location combined with state and

national forces to create a pool of incentives for participating in the Tech Futures coalition. By joining the movement, organizations gained the legitimacy awarded to those supporting economic growth, not only in the region, but in the state and the nation. This finding was consistent with how neo-institutional theory sees organizational motivation. The promise of important and sometimes substantial financial rewards, in the form of grants, enrollment, and trained employees also motivated the partnership. Thus, resource dependence theory and academic capitalism also helped to explain some forms of organizational motivation. The unique economic, geographic, and environmental conditions of Green Valley made it a STEM basin, into which federal and state streams flowed and settled, encouraging organizations to join the STEM coalition. However, not all organizations were equally immersed in the STEM basin. Some organizations and individuals, though involved in the coalition symbolically, seemed to struggle to justify participation in the partnership on a technical level. The next section addresses these viewpoints.

Disparate Perceptions

In the previous section I described the STEM “current” pushing from the national and state levels into Green Valley and incentivizing involvement in the STEM coalition. While some individuals and organizations involved in the coalition saw advantages to being part of the coalition by participating in meetings and events related to the Tech Futures Initiative, many also struggled to justify participation in the coalition on a technical level through the dedication of resources beyond their time and energy spent on outward support of the program.

The STEM pipeline began at Green Valley High School, where students pursuing a technical education track in engineering would have their first curricular involvement with the pipeline. While administrators at the high school and district levels voiced their wholehearted support for the Tech Futures Initiative, budget cuts and competing priorities had left the engineering program underfunded and, in the words of one administrator, neglected. That individual said the following:

The district will say that they support STEM. They support STEM in speech. They're proud of the program. They're proud of the results, but if you take a look at the district's financial support of the program, then it rings hollow. When I point that out, then I usually get thrown under the bus and told to 'shut-up.'

Though the Green Valley High School engineering program had been developed through cooperative funding from several state and federal grants, involvement from the district level consisted of little more than symbolic signs of support. Neo-institutional theory differentiates organizational action at the technical core from symbolic action taken by organizational leaders (Meyer & Rowan, 1977). In some organizations, particularly the high school, leaders voiced support of STEM education, while those teaching and directing STEM programs in the high school indicated a lack of support. One administrator talked about the failure of the district to fund the program when grant funding ran out:

With that money, then we purchased the initial equipment to get the labs stocked and I was paid the first two years to go to training. The second

two years there was no grant money. It had been spent down. I think there was a sunset, too. You had to spend it down within two years. This is kind of what I think it went. So, I went to training and I was not paid, which still leaves kind of a bone in my craw because they say, ‘Well, we support you.’ Well, if you support teachers, then you’ve got to support teachers. That’s a discussion that gets me in trouble, but . . . That’s why there’s hard feelings, I think, between me and them because a lot of the stuff that’s been done has been kind of good will. It’s been the will, and I should backtrack and make that a little bit clearer. The business and industry partners that we have on the Business and Industry Advisory Board paid for this school. They did not pay for my salary. I think that as a district employee I should get paid to do the work that the district wants me to do.

Though the high school had developed and begun enrolling students in an engineering program, some high school and district administrators did not see engineering, and STEM in general, as the same kind of special opportunity that the central members of the coalition perceived. One high school administrator walked me through all of the career and technical education programs, expressing that they were all important to the school and pushed with equal emphasis.

The difference in the high school and community college’s perception of engineering education may have been a result of differences in how the two organizations perceived potential benefits offered by the STEM endeavor. While the community

college pursued multi-million-dollar grants associated with STEM education, grant funding from the state to the high school was based on student enrollment in all career and technical education courses, rather than just in engineering. Students studying culinary arts at the high school brought the same level of funding as students studying engineering. Perhaps because of the differences in the potential for external funding, decision-makers at the high school did not see the engineering program as the kind of unique opportunity that the college saw in its STEM programs. The incentive, in terms of grant funding, for the high school was to enroll students in whatever subject they were interested in. This may explain why career and technical education administrators described efforts to recruit students to any program of interest without emphasizing particular programs. Additionally, career and technical education programs were built based purely on student demand. One administrator described the creation of an aviation program in the high school and its cancellation a few years later due to lack of student enrollment. In their introduction of academic capitalism, Slaughter and Leslie (1997) described the diminishment of state block grants and forms of general funding not tied to specific university endeavors. The authors argued that forms of funding targeted at particular areas or outcomes cause the institution to change its behavior in order to acquire those funds. This finding may shed light on the behavior of Green Valley High School. As funding to support the engineering program, and really the Tech Futures Initiative in general, was relatively small, the high school changed its behavior little or not at all. Whereas, funding and other incentives were greater at the community college level, the community college changed its behavior more substantively to pursue those

incentives. The community college and the high school were both experiencing declining funding from the state. However, the high school had a less significant financial incentive to pursue STEM education and, therefore, did not attempt to diversify resource streams by putting funding toward the engineering program as the community college did, because there was not a perceived resource stream available through the engineering program.

It is significant, however, that high school and district administrators did engage with and voice adamant support for the Tech Futures Initiative. Doing so would demonstrate the high school's relevance to influential local organizations and to the community in general, consistent with neo-institutional theory. The high school's conflicted role in the partnership also demonstrated the relatively meager level of power and influence the organization had as a member of the coalition. The high school's lack of strong commitment for and pursuit of STEM activities did not seem to negatively influence the overall tone or operations of the broader coalition. Other factors that contributed to this disconnect are discussed in the next chapter.

The Green Valley School District was not the only organization that supported the Tech Futures Initiative outwardly but demonstrated conflicting support inwardly. The university, both the main campus and the local branch campus in Green Valley, demonstrated this behavior as well. An administrator in the College of Engineering at East Hills University described their involvement in the Tech Futures Initiative by saying, "I don't really think, we've been to a meeting or two, but I don't think we're

really what I'd say 'involved.'" This administrator went on to describe the value of demonstrating his symbolic support for the initiative at the initiative's kickoff meeting.

Remember, part of my job is visibility in the community and [the university president] was there, if I remember right, and there were probably going to be some people there that I thought were interesting to talk to and get a chance to chat with. We like [Gerald Simmons with Aerotron]. So, if [Gerald] says, "I'd like you to come here. You could help me support this and it'll be good for you and looks good, as well," then I'm usually there. I'm ok with that. That's part of my job.

An executive of the branch campus voiced a similar sentiment in describing the positive perceptions and relationships that could develop through support of the initiative.

The real, for me I think, if we can find a way to cooperate with that, it helps us not only get into certain circles, but shows us a willing a flexible participant in these kind of community based projects.... If we can work with various organizations: the Chamber, the economic development folks, the City Council, the Mayor, in a partnership way, that will just open the door and thinking about us, next time they have an idea, instead of creating the idea and then three years later saying, 'Can you play in that?' 'Can you fit in with us?' So, I think working with somebody like [Aerotron] and developing something shows that we can be part of that kind of a discussion.

While these two organizations saw value in being involved with the coalition for the relationships it could foster, each organization had its own conflicts with being involved from a day-to-day standpoint. The main campus saw little to no value in the coalition in terms of potential enrollment revenue, nor in fulfillment of its mission. In fact, the College of Engineering saw many of the technical education components regarding UAS as conflicting with the college's mission. Describing their disinterest in developing a four-year program in UAS, one administrator said of the coalition:

I didn't pay a huge amount of attention once I see it's focused around things that I just don't think we're ever going to super excited about in a big way. Again, in a peripheral way, we can put two or three courses together and pipe them down there. We'd be happy to support like that. I'm not going to ever do an [East Hills] degree program in this [meaning UAS]. It's not a part of the College of Engineering mission.

This administrator went on to say:

Yeah, we see that as more interesting educational process for us doing advanced degrees or master's degrees in systems engineering or electrical computer engineering with the [Fort Kenton] staff. That's more in my mission statement rather than training technicians.

It is worth noting that the East Hills College of Engineering defined the Tech Futures coalition as an effort to develop technical degrees and not general engineering bachelor's or master's degrees. When asked about their interest in the region becoming a UAS Center of Excellence, an administrator voiced his support for that endeavor because of its

potential to attract research opportunities, though he did not connect it to the Tech Futures coalition. This disconnect between perceived purposes and outcomes of the coalition is explored in the next chapter. Its purpose here is to demonstrate the disparity between the university's surface level support and involvement in the coalition and the conflicted nature of actually supporting the initiative with day-to-day effort and resources.

The branch campus in Green Valley, though positioned physically to support the initiative, faced perceived challenges from a curricular standpoint. The academic programs at the branch campus focused mostly on liberal arts and general education subjects, such as psychology, English, and history. Developing a STEM, or more specifically an engineering degree would require resources the branch campus did not have. In the words of one executive:

STEM is not the cheapest way to go. It's much easier, even just yesterday, a computer science faculty member from main campus said, "It's a lot cheaper to have a computer science program than it is to have computer engineering." Although, computer engineers are in heavy demand, you have a lot of infrastructure you have to build up when talking about higher level STEM. It's expensive to do. Are there ways we can envision what our future role in STEM might be, parallel to what [GVCC] has. So maybe we end up with a physics program down the road. Maybe we end up with biology or chemistry or on-site engineering. We can't just

say, 'Let's go build an engineering program. Give us twenty million dollars, we'll build an engineering lab over there.'

The university's branch campus in Green Valley existed to meet local needs, but when it came to developing academic programs to support the STEM pipeline, the branch campus struggled to defend the value proposition. It was easier to support the endeavor symbolically than it was to develop STEM programs. Executives explained that the cost for running such a program would be very high and the enrollment potentially low, failing to justify the program from a revenue standpoint. Costs were not the only concern for branch campus administrators. With university faculty having greater control over the curriculum, some opposed the establishment of technical degrees that served specific workforce development functions. Doing so would conflict with the university's mission to provide general career preparation. One academic administrator expounded on this thought.

Many people like me don't think that's the job of a high school, is to prepare workers for open positions in local jobs. You know that I don't really think that's the job of a university. I think there's a role for education that is beyond preparing workers. So, there is a belief, and whether or not it's true nobody knows, there's a belief that that's where the jobs are going to be, so that's what the schools need to focus on.

This individual went on to express a conflict regarding the specific aim of the coalition to educate future engineers for jobs in Green Valley.

Well, let's just take locally, whether there's going to be this huge need for engineers locally, I think is an open question. You know, kids coming out of The high school are not getting engineering jobs. You need a college degree for an engineering job, so how many engineering jobs there's going to be over the next ten years, I don't know. Certainly, [local engineering company] makes projections. I've heard all of those projections, it's just I'm not one who believes them, necessarily. And I'm also not one that believes that the economic interests of [that company] should drive educational policy making. I think here in some ways, it does.

The comments made by this administrator align with writings on academic capitalism and neoliberalism in colleges and universities (Ayers, 2005; Slaughter and Leslie, 1997; Slaughter & Rhoades, 2004). In particular, the above statement questions the practice of expending resources to meet specific local workforce needs as a function of the institution's mission. This administrator went on to question GVCC's motivations for pursuing STEM education.

When I think about [GVCC], I more think about like [administrator's names] and I think in some ways everybody in education is kind of pressured by the same political agenda. I think for [GVCC] getting grants in and doing stuff in the community makes them look good.

Ironically, the East Hills branch campus had recently received a multi-million dollar grant to create a master's degree program to prepare STEM teachers for area high schools, which seems to contradict the above statements. Or, perhaps this administrator's

definition of workforce development only includes employers from certain sectors, such as private industry, instead of teachers. Regardless, this administrator highlights the conflicts experienced by university administrators in engaging in the Green Valley STEM coalition. Questions of potential for revenue and institutional mission diminished their perceived incentives for involvement beyond the symbolic level.

Educational institutions were not the only organizations who found motivations for perceived involvement to be more easily supported than operational involvement. The coalition's link to Fort Kenton, an administrator on the base, expressed what he perceived his role to be in the partnership:

I represent sort of the picture of, 'Hey, I'm the pot of gold at the end of the rainbow.' I'm the guy saying, 'If you get degrees in such and such, there's jobs in this and there's jobs in the future in this arena.' So, to say I get my hands dirty a lot as opposed to an old guy providing opinions and hopefully motivation. That's kind of what I do. [meaning the latter]

This administrator pointed out the value of symbolic support for the partnership as a motivator in itself. However, when asked whether he thought the coalition would have a serious impact on the gap in unfilled jobs at Fort Kenton, he said:

If you want me to be honest, I'll say not so much, but that doesn't matter. I see this as a national program and we're pulling levers on areas that we can pull levers on. I can complain about all the lack of engineers in Kansas City, but I've got no lever to pull there. I can pull levers here. I

can wave flags here and support here. So, the best I can tell, I'm doing my part in my little corner of the world here with what tools that I have.

This statement highlights the conflicted nature of some organizations' involvement in the Tech Futures Initiative. While support for the initiative was widespread, with multiple organizations represented at events such as the one at the beginning of this chapter, deeper commitment to and perceived incentives available in the STEM initiative varied by organization. All partners found value in demonstrating support for the overall initiative of STEM education, at least at a high level. The speeches that marked events such as the one above were genuine demonstrations of that support and strengthened the legitimacy of the organizations involved. However, when it came to engaging in the processes and day-to-day efforts of building and sustaining a STEM education pipeline, motivations were mixed. At the beginning of the pipeline, the school district shuffled its participation off to one individual for whom it failed to provide adequate financial support. The engineering joined the vast group of other career and technical education programs. The community college at the center of the coalition found more substantial reasons for involvement, including federal and state-level grants, as well as the potential to build a competitive advantage out of the upcoming commercial applications of unmanned aerial systems. The university was conflicted in its commitment to the coalition. The College of Engineering on the main campus did not perceive potential for significant revenue or the fulfillment of its mission in the endeavor. The branch campus saw value in supporting the local initiative but, just as the main campus, had concerns about whether revenue generated could justify the expense for a program that would align

with the STEM pipeline. There were also concerns that the branch campus was sacrificing its mission in pursuit of inferior motives. Finally, Fort Kenton, the organization with hundreds of vacant jobs, expressed doubt about whether the initiative could succeed in filling those jobs.

Conclusion

The Tech Futures Initiative, initiated through the personal contact and long-standing partnership of two prominent local organizations—Aerotron and Green Valley Community College—was a response to national, state, and local calls for more workers educated and trained in STEM disciplines, particularly engineering. Incentives provided at each of those levels—in particular the potential to garner grant funding and enrollment revenue, as well as to enhance an organization’s image and legitimacy—created a powerful current of incentives that flowed into Green Valley’s unique economic and geographic setting with particular strength. Organizations were quick to demonstrate willingness to support an initiative that addressed such a pressing need.

The community college’s decision to participate in the initiative had several important implications. First, the way the partnership was initiated demonstrates the significance of relationships developed between colleges and outside entities. The fact that the heads of Aerotron and GVCC were friends, had ongoing dialogue, and so easily folded into a more prescribed relationship demonstrates the power and significance of seemingly innocuous organizational ties. Who the college President associated with clearly did matter in determining the direction of the institution. The fact that this relationship was with a major global defense organization, rather than the high school

principal, the chairperson of a local board for the arts, or the parent of a Hispanic high school student in one of the outlying communities was extremely consequential. A partnership conceived with any of the above individuals likely would have been significantly different than the Tech Futures Initiative in who it served and how. Neo-institutional theory and the concept of the neoliberal hegemony explain why college presidents may lean toward developing relationships with major local employers rather than any of the above—because it has become the accepted course of action for any responsive community college president—but whether doing so is the most effective way to benefit members of the local community should not be a foregone conclusion. The initiation of Tech Futures should give serious consideration to Daugherty and Bakia's (2000) observation that sometimes the needs of the local citizenry and the needs of individual employers may not always be the same. Further, in cases like Green Valley, where groups of citizens are so dichotomous, it is likely that the needs of one group of local citizens does not even represent the needs of another. Whether the demographics served by a college are so different or not, each college likely serves a variety of constituencies in its efforts to be all things to all people, and such diversity should be taken into account in the development of partnerships and programs. The opposing perspectives presented in this chapter demonstrate that there are other points of view, other potential courses of action an institution can take.

Another important implication of these findings is the strength of influence created by compounding incentives and narratives on multiple levels. What may seem to college leaders like an obvious course of action could be the result of a hegemonic

narrative built by individuals and organizations in positions of power. The streams combining to create the STEM current flowing into Green Valley demonstrate a substantial compounding effect certain efforts may have on targeted organizations. Additionally, looking at Green Valley as a STEM basin, a location specifically prone to be influenced by the STEM current, demonstrates the importance that an organization's setting can have on its susceptibility to certain popular narratives. Not only is Green Valley unusually homogenous in terms of the diversity of its economy, but the community is isolated geographically, about an hour and a half from the nearest city, which further limits economic diversity and employment options for local citizens. Because the mission of a community college is to serve the diverse needs of its citizenry, thought must be taken for the pressures these streams, currents, and basins have on colleges to serve certain segments of the population or to serve them by emphasizing only certain programs and services to the detriment of others.

When it came to engaging the day-to-day efforts of the coalition, to committing to the initiative, organizations faced a mix of incentives and conflicts, creating justifications for involvement on the one hand and constraint on the other. Individuals and organizations faced questions and difficult decisions about how to engage in the partnership. In the next chapter, I explore the complex inter-personal and inter-organizational workings of the Tech Futures Initiative and the effects they had on institutions and students involved.

CHAPTER 6: FINDINGS – FORM AND EFFECTS

The dichotomy presents a certain irony. On the fifth floor of a solid, downtown office building in the heart of the state capital, the elevator opens to reveal a newly renovated office suite occupied by the State Science Network organization. The SSN logo neatly etched into the glass entrance of the suite mirrors the crisp professionalism of the entire facility—glass paneling, dark wood desks, and a clean, spacious conference room, where I interview SSN employees, who talk intelligently and dress sharply. One of them is Bridget Halpert, an SSN staff member charged with building a statewide network of community college STEM education programs. The place is quiet, giving one the feeling that thoughtful people are thinking on the premises. This is the heart of SSN operations. Here plans are made, strategies designed to aggressively fulfill the organization’s mission to proliferate STEM education and turn this state into a beacon of STEM industry, an economic powerhouse.

In contrast, I encounter Gerald Simmons in a cluttered storage room on the small, unassuming campus of East Hills University’s Green Valley campus. This is where he squats when he is between visits to partners of the STEM coalition. Surrounded by stacks of colored printer paper and shelves of promotional material, Gerald types away on a refurbished desktop computer sitting on a pieced-together old desk. Gerald is quite likely a wealthy man from his years as an administrator with Aerotron Global, but he dresses modestly and apparently does not own a laptop. It takes a few minutes of dialogue for one to realize that Gerald’s intelligence is more a matter of function than

form. The words and tone he uses are found in everyday conversation, but you realize that the true insight is in what he says and not how he says it.

These are the champions. Bridget Halpert and Gerald Simmons are the fuel behind the Green Valley STEM coalition. Their respective workplaces are a reflection of their personal styles. Bridget is formal, organized, and official—a single piston in the well-oiled engine that is State Science Network. Gerald is casual, humble, and unpretentious. He believes in the genius that can spring out of the natural environment, the good work that can be done in a storage room. Bridget works for an organization with a clear mission and vision related to STEM education. Gerald, now “retired,” works almost completely independently of Aerotron. One gets the sense that he is making things up as he goes, but that would be wrong. It is more accurate to say that building educational partnerships has become second nature. Despite the differences in their work environments and personal styles, Bridget and Gerald were perhaps the most important players in the STEM coalition.

In this chapter, I explore the organizational dynamics and effects of the Green Valley STEM coalition. I demonstrate that rather than a formal, centralized system of programs, the Tech Futures Initiative is an informal and decentralized set of loosely-connected programs. Because the coalition is loosely-connected and informal, individual champions, especially Gerald Simmons, have greater control and influence over the functioning of the initiative. I explore the characteristics and influence of these two champions. I then analyze the effects of the coalition on the organizations involved,

particularly on the community college as the initiative's focal organization, demonstrating the challenges and potential pitfalls of the organizations involved.

The Coalition as an Informal and Decentralized System

One of the most notable features of the STEM coalition in Green Valley was its unusual structure in terms of planning and coordination. Many partnerships in the literature began with or quickly adopted a formal, centralized planning and coordinating group, consisting of key stakeholders and representatives from the organizations involved in the partnership. In their case study of an educational partnership involving three different universities in one region, Duffield, Olson, and Kerzman (2013) listed centralized and frequent planning and coordination as one of the keys to the success of the partnership and a recommended practice for all those considering such an endeavor. The authors pointed out that centralized coordination facilitated frequent communication and buy-in, both crucial components to a partnership's success. Faculty who were not included in the combined leadership group felt uninformed and were more likely to devalue or resist the partnership.

The STEM coalition in Green Valley did not include a centralized coordinating body, nor were the efforts involved in the coalition formally planned as a collective endeavor. After studying the literature on partnerships, one would have expected the coalition to have begun with a formal plan, created by executives of the organizations involved or their delegates. But this never happened. An executive of Green Valley Community College captured this idea when he said, "There hasn't been as much of a deliberate sit around a table and come up with a big picture strategic plan or anything like

that.” The only time all the members of the coalition came together in one room was for the kickoff of the Tech Futures Initiative and the occasional Tech Futures media event, such as the one highlighted in the beginning of Chapter 5. But these meetings functioned as publicity events and not as strategic planning meetings, leading some representatives who only attended these events to consider themselves only loosely involved in the coalition at all. For example, when asked about their involvement in the Tech Futures Initiative, an executive from the College of Engineering at East Hills University said, “I don’t really think, we’ve been to a meeting or two, but I don’t think we’re really what I’d say ‘involved.’” And the executive representing Fort Kenton considered himself more of a promotional figure than a functioning partner.

Whether key stakeholders involved in the coalition deliberately avoided the idea of convening a centralized coordinating group was difficult to tell. Gerald Simmons, a key player from Aerotron in the coalition, as I will discuss in the next section, found avoidance of formalization to be beneficial to the coalition’s functioning.

It’s a very informal process, the way it’s working down here. In a larger [Aerotron] site it’s probably much more formal. In fact, I know it is having worked over in the L.A. area. And I did work at corporate, as well. So I see all the different things that are going on. Depending on the people, it becomes very officious, bureaucratic or it becomes very effective, by contrast. Once it becomes bureaucratic you start to lose traction on what you’re trying to accomplish because you’re worried too much about filling out that hour of timecard that says here’s where I spent

it. Then you have some bean counter look at it” So, the least amount of bureaucratic oversight you have, at this stage certainly, the better off we are.

This statement contradicts the practices and recommendations of the partnerships in the literature and sets the Green Valley coalition apart. Gerald implied that making operations “bureaucratic” and formalizing procedures such as filling out timecards can make the partnership less effective. Other comments made by Gerald, presented throughout this chapter, demonstrate his desire to keep a loose, informal structure in order to allow the partnership to grow naturally and not be forced. Commonly supported models for partnership development consist of a centralized group of representatives collectively determining action to be taken in the partnership (Duffield, Olson, & Kerzman, 2013; Haire & Dodson-Pennington, 2002). Illustration 6.1 demonstrates how Tech Futures would be organized in such a system. A centralized system allows partners to establish a collective understanding of their venture, to be deliberate in their plans for action, and to coordinate and control actions once put into motion. However, this centralized model present in many inter-organizational partnerships did not represent how the Tech Futures Initiative in Green Valley was structured. In contrast to the centralized model, the STEM coalition in Green Valley consisted of a series of subsystems—academic and non-academic programs—operating in relative independence, as demonstrated by Illustration 6.2 below.

Centralized Partnership Model

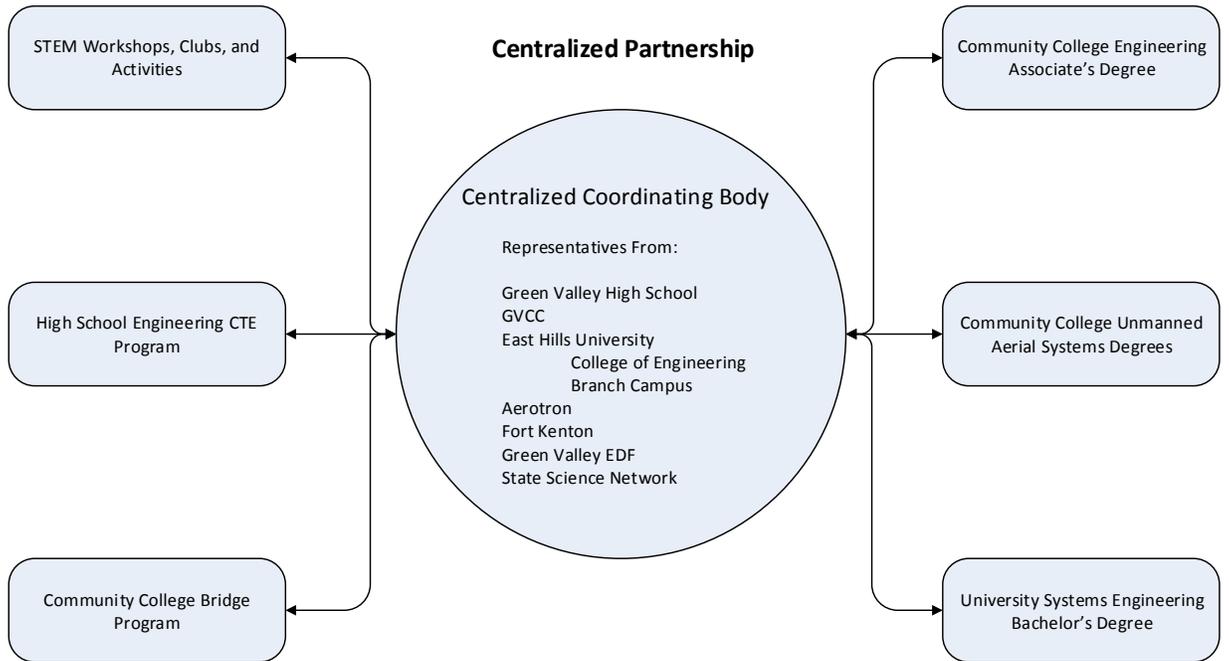


Figure 6.1

Tech Futures Initiative Model

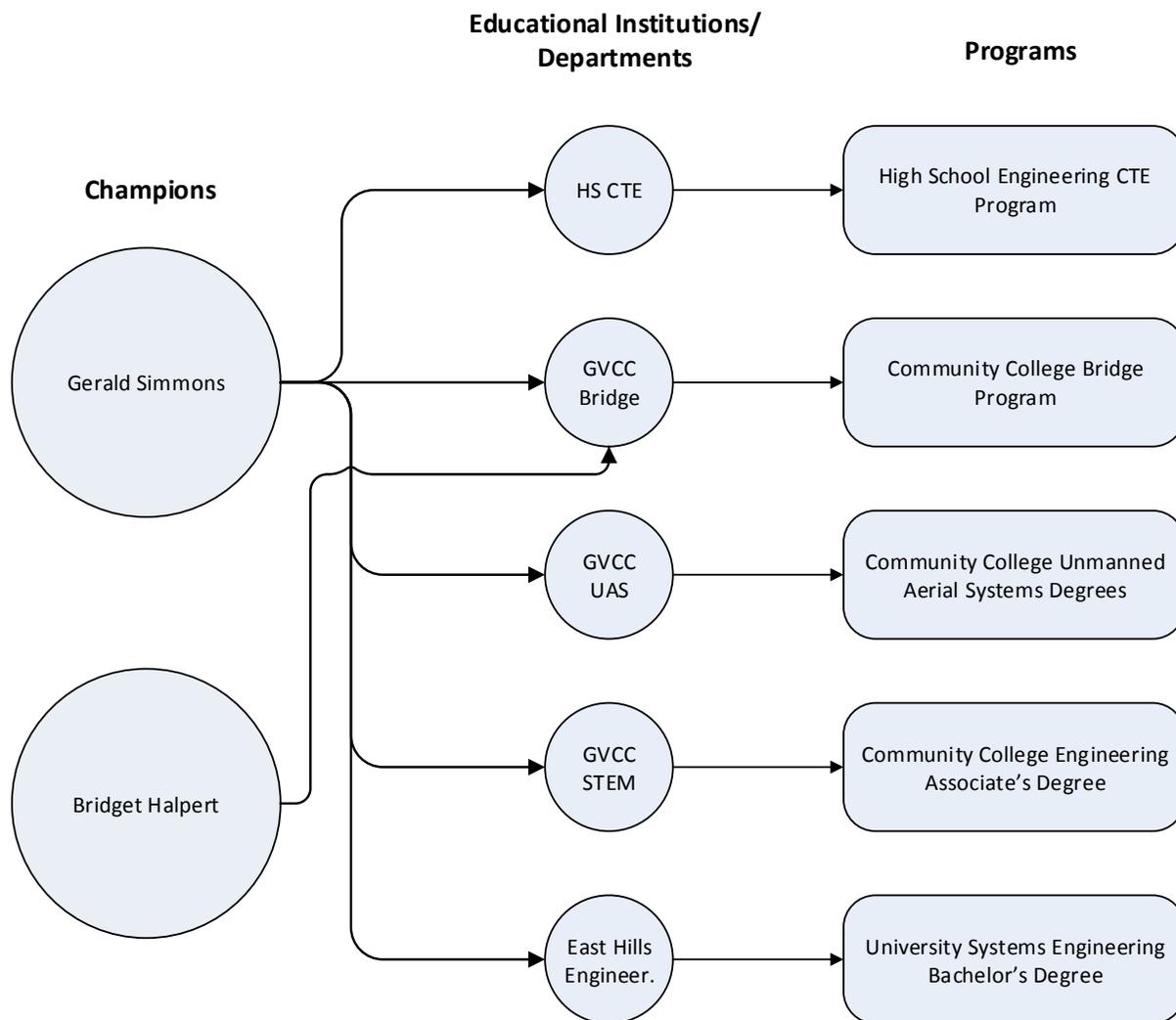


Figure 6.2

Before expounding on the effects the lack of centralized coordination had on the coalition, an exploration of the reasons for this phenomenon will inform the discussion.

There were two apparent explanations for why the STEM coalition consisted of a series

of independent programs instead of a tightly connected system centered on a representative coordinating body. First, many of the STEM activities that came to be associated with the Tech Futures Initiative and the coalition existed before the coalition was formalized. For example, years before leaders from Aerotron met over lunch with the President of GVCC, the State Science Network had helped GVCC to build the STEM bridge program for high school students, an important segment of the STEM pipeline the Tech Futures Initiative later represented. When asked whether the emergence of the Tech Futures Initiative impacted the STEM bridge program, the director of that program said, “No. Candidly, no. I think what we were doing matched what [Tech Futures] wanted and so therefore it was just a nice fit.” Other preexisting components included the high school’s engineering program and the STEM outreach activities intended to promote STEM to younger students throughout the community. Because these programs were already running when the Tech Futures Initiative began its formal efforts to develop the STEM pipeline, Tech Futures stakeholders began to see their initiative as an informal collection of independent efforts, both those already underway and those that would come after, a sort of umbrella for STEM activities. Creating a formal structure would, in many ways, require the repositioning of existing endeavors into a new structure. An informal structure would allow programs to continue functioning the way they were without disrupting operations, but would add legitimacy to those programs by connecting them to the broader initiative on a symbolic and conceptual level. One GVCC executive described this function.

The important part to realize is [Tech Futures] and then if you go out and look on our website, and you look at the whole STEM initiative, you'll see that a whole bunch of things came together that the college already had going in some different ways. I will say that [Tech Futures] kind of pulled it all together. Not that [Tech Futures] did it all, it just realized I think just realized, we're doing this, this, this.

In the eyes of Tech Futures partners, the initiative would provide a common platform for STEM activities. Connecting these activities would strengthen the overall perception and legitimacy of Tech Futures, a concept consistent with neo-institutional theory where the institution of STEM education served as an organizing and legitimizing concept.

Additionally, having such a significant shared purpose would give partner organizations a highly-relevant cause to associate with, thus strengthening the coalition and giving rise to new opportunities. These new opportunities would be folded into the Tech Futures Initiative.

Following this logic, some of the Tech Futures stakeholders saw the initiative as the development or cultivation of an environment that would give rise to STEM programs rather than a program to be tightly planned and coordinated. One stakeholder said, "In fact, we're thinking now of taking it to the next step and calling it the [Tech Futures] Ecosystem because it has got more pieces than are readily apparent." The term "ecosystem" helps to explain partners' focus on creating an environment that would support and sustain STEM activities. One GVCC executive, closely involved with the initiative, described this approach as "organic." He said:

So it's probably a more organic approach. Which means if our connection right now, say with [the high school], isn't where the vision might ultimately have it be, part of that is because we're probably annoyingly going to be at the mercy of the right time and the right thing to appear and something to happen.

The passive stance taken by this executive underscores the focus of Tech Futures stakeholders on creating an environment where STEM activities would naturally come to life rather than a "bureaucratic" program to be planned and executed by a centralized committee.

In her study of the development of technology industries in Silicon Valley and along Route 128 near Boston, Saxenian (1996) found evidence that the decentralized, open network of organizations in Silicon Valley experienced far greater industry growth than the centralized and closed system of Route 128. While Route 128 experienced remarkable economic growth in the technology industry prior to the 1980s, that growth eventually flagged as tech companies migrated to the more prosperous Silicon Valley. Saxenian attributed this phenomenon to the way the two regions functioned. Route 128 consisted of a series of large, bureaucratic organizations that attempted to centralize all key resources in house without connection to or reliance on other regional tech companies. In contrast, Silicon Valley consisted of a series of nimble, up-and-coming tech firms that created an informal network of resources and knowledge upon which each organization could draw. The openness of the Silicon Valley tech ecosystem led to the prosperity of many individual organizations, as well as a thriving tech industry generally.

Intentionally, or probably more likely unintentionally, Tech Futures stood to capture one of the strengths of a decentralized system such as the Silicon Valley model in Saxenian's study. While a centralized coordinating body may have brought greater organization and clarity to the initiative, decentralization allowed the programs to adapt to their individual circumstances and serve their specific purposes without constraint from the overall initiative. This allowed programs to draw from the collective well of STEM knowledge and resources in Green Valley but still guide their own activities day-to-day. In the minds of some of those overseeing Tech Futures, decentralization would allow new STEM programs and services to crop up naturally as needs and opportunities arose, while still benefitting from the connections and shared purpose of the broader Tech Futures Initiative.

The second reason for the lack of a centralized coordinating body associated with the Tech Futures coalition may have been the lack of perceived ownership or leadership of the broader initiative. The coalition was formed between several organizations operating not only autonomously from each other but each within their own systems. In Green Valley, the high school engineering faculty operated within the career and technical education program, which responded to the high school and was ultimately accountable to the school district. The community college had its own leadership and reported to a local Board of Trustees as well as a community college leadership board at the state level. The university branch campus reported to executives at the main campus. The main campus College of Engineering reported to different executives on the main campus. Aerotron's Green Valley branch operated within a global Aerotron

organization. Fort Kenton executives operated under the command of the U.S. military. Among all these organizations, only the university branch campus and College of Engineering ultimately reported to the same organization, and even then each operated with a great deal of autonomy within that organization. The disconnected nature of the organizations and the variability in perceived incentives, despite a shared goal, made collective coordination a very complex undertaking. Though none of the interviewees voiced a calculated effort to avoid centralized coordination, when faced with such complexity it may have been the natural reaction of those involved in the coalition to refrain from such efforts. While the community college was clearly at the center of the coalition, that fact did not put the college in a position of leadership in relation to the other organizations involved. And because none of the organizations involved attempted to take a lead role and establish a centralized coordinating body, STEM activities associated with the Tech Futures initiative were left to be conducted either autonomously within a single organization or through careful diplomacy and efforts independent to each activity.

The makeup of the Tech Futures Initiative as a set of autonomous STEM activities with no centralized planning or coordination resulted in great variance in the participation of each organization. Communication lines and interdependent relationships between organizations and even within some organizations were subject to confusion, misunderstanding, and frustration. One high school administrator voiced confusion with the relationship between the high school and the community college by saying, “One of the things I’ve been most disappointed with is that there’s been no

philosophy within my district that I have ever seen or had explained to me where an operational relationship would be.” Another high school administrator explained an apparent disconnect in the communication of STEM outreach activities involving high school students and the faculty and administration involved with those students at the high school.

Well, yeah, I think I’ve seen them in the newspaper, ok, that the kids come over. Again, I think that’s the problem. They have these workshops and they’re for our 9 to 12 or K12, but no one comes and talks to us about it, so that we can promote it. It’s just, again, I see it in the newspaper, but no one has come and said, “Listen guys, we need to work together. This is how we should . . .,” because that’s the disconnect in education right now.

In addition to causing confusion and exclusion among some organizations and individuals, the lack of centralized coordination allowed those who were engaged with the Tech Futures initiative to maximize their influence on independent STEM activities. Whereas a centralized coordinating body consisting of representatives from all organizations involved would have tempered the effect any individual had on the initiative and its associated activities, the loose coupling of the STEM activities allowed certain key stakeholders—or champions—to develop independent connections with programs and activities, exerting powerful influence that went unchecked by those involved in the broader initiative. The following section explores this concept in greater depth.

The Influence of Champions

Because the Tech Futures Initiative never brought stakeholders together to formally define, plan, and coordinate the STEM activities it would involve, individuals or groups interested in defining, planning, and coordinating those activities had great influence over the initiative. In terms of organizational interactions in the initiative, it was abundantly clear that organizations were not equally invested and involved in Tech Futures. Some, such as Fort Kenton and Aerotron, for the most part, saw themselves as spokespeople representing the employment needs of industry. The educational institutions—the high school, community college, and university—were each involved in their respective segment of the STEM pipeline but rarely involved in other segments. This stratification was a distinct feature of the initiative. Nearly all individuals and organizations involved focused exclusively on their domain without crossing over into other domains. A centralized coordinating body would have enabled stakeholders to invest in the STEM pipeline as a cohesive whole rather than in individual pieces. As I discuss in the next section, this segmentation introduced many dynamics into the initiative. But, despite the fact that the initiative consisted of a series of loosely connected programs, there were two entities that operated as champions for the initiative as a whole. Gerald Simmons, the retired Aerotron employee brought on by Aerotron executives in Green Valley to support Tech Futures, was one of those champions. The other was the State Science Network—more particularly, three staff members of that organization. The Tech Futures champions each had unique reasons for being involved,

as well as unique ways of functioning within the initiative. Below I explore the role of these two champions, the reason for their influence, and their connection with each other.

Gerald Simmons – Instigator and Intermediary

For the majority of those interviewed for this study, Gerald Simmons was at the heart of the Tech Futures Initiative. He was there from the beginning. As soon as Aerotron executives knew they wanted to work with the community college in some capacity, they called Gerald. He was the one taking notes on a napkin at the lunch meeting between Aerotron and GVCC where Tech Futures was conceptualized. And after that meeting Gerald moved into a position of instigator and intermediary. Interviewees called him “the introducer,” “the initiator,” “the glue,” and “the spark plug.” As a representative of Fort Kenton said, “Of course, I can’t give enough credit to [Gerald] because let’s face it, he’s the spark plug to this engine. I’m just one of the valves in there popping up and down.” This was a very common sentiment expressed by Tech Futures stakeholders at all levels. Gerald was given almost complete autonomy in how he functioned and the direction Tech Futures took. Many considered it Gerald’s initiative rather than a coalition of equal partners. For example, when asked to define Tech Futures, one administrator at the university said, “It was [Gerald Simmons’] idea to do some education programs down in Green Valley.” As the instigator and intermediary, Gerald set the pace for the initiative. One GVCC executive explained Gerald’s role as a sort of entrepreneur for the initiative in the absence of coordination between the organizations.

I think that [Tech Futures], as I view it, has a number of aspects that are complex, and the way that [Aerotron] and specifically [Gerald Simmons], for instance, the way that he functions, he didn't get us all together, sit us down in a room, pull in [grant writer from GVCC] or get out the grant-getter whip and spend four days with us developing the [Tech Futures] vision. He'll come in and he'll see an opportunity. He'll plant some seeds and he'll allow some of these things to grow.

This senior executive from GVCC described the control Gerald had over how the initiative functioned, even attributing the form of the initiative as a collection of loosely-coupled programs to Gerald's way of operating. The phrase, "he didn't get us all together," implies that this administrator saw Gerald as the leader of the Tech Futures Initiative. This was a common sentiment.

Intermediary

The fact that Gerald lived in an adjacent state and commuted to Green Valley every couple weeks was ironic, considering that Tech Futures was a local initiative. From the initiative's inception, Gerald was paid by Aerotron to come to Green Valley on a regular basis and continuously develop Tech Futures. Aerotron put no parameters on how Gerald functioned. His only requirement seemed to be to keep Aerotron executives updated on his activities, something he did on a regular basis. Gerald's approach to growing the initiative was to travel to Green Valley every couple weeks and to keep continuous contact with every organization represented in Tech Futures. While organizations had surprisingly little contact with each other, Gerald had complete contact

with nearly everyone interviewed as part of this study, from top executives to faculty to mid-level managers. Gerald explained his somewhat informal method for keeping connected with Tech Futures stakeholders.

Every couple of weeks I'm here two or three days, and for the most part I usually try to touch base with [GVCC executives], at that level. A lot of times I'll take a day and drive down to [GVCC south] campus and talk to [UAS faculty] and see how they're doing. They've had their first cohort of nine students in the UAS program, as we speak. What's the attrition rate going to be? You want to keep them interested. Part of the, which I haven't done yet, is to make a point to talk to the students a little bit, either as a class or one on one, or something. Then, I'll talk to [GVCC STEM faculty member] periodically. And I'll talk to [GVCC STEM academic administrator], same people you're talking to. Because of the way the funding flows, I'll talk to [GVCC grant writer], whatever her new name is, because she is the interaction there. [GVCC bridge program administrator] and his folks. [GVCC employee]. People over there in the trailer [at GVCC] that are doing things that are STEM related. The science fair, you know, [GVCC employee] thing. It varies. Usually I'll try to go by the high schools and spend some time. Probably, every other time I'll try to arrange a meeting up at [Fort Kenton] and talk to [Fort Kenton executive], who is the [his position]. He likes this idea. He can

see the future, I think, and what it's going to mean. A lot of times we'll go around and we'll talk to other people on base.

Tech Futures stakeholders verified Gerald's efforts to stay in continual contact. The following statements express Gerald's prominent role as the common connecting point for the initiative:

[Gerald] is really the introducer. He makes sure the right people get talking to one another to help develop the programs. Because of his connections he knows the people. So he makes sure that we're not bogged down wasting time talking to people and knocking on doors that aren't going to produce the outcome that everybody really wants. (GVCC faculty)

Certainly, [Gerald] is a master instigator in that he doesn't come in with any authority, but he's able to come in and again develop relationships with the people that need to be connected with and encourage our involvement in some particular effort and that's I think very critical. (GVCC executive)

But [Gerald], again, has been the glue that has pulled everybody together and bonded us together, and he has really created that so we can work with [the university] and [GVCC] and [the high school], and work with these

institutions in a pretty fluid way and we're all nicely connected. (Aerotron executive)

You ask the question, are there any other entities or organizations in [Tech Futures][that this individual interacts with]? The answer to that point, I think, still has to be, "No." It is [Gerald] and it will be [Gerald] until we have proven to our local business partners or even some that aren't partners yet that this is a source of talent for your function that you don't necessarily don't have to go and recruit, except to like show up every once in a while and make a speech and let me know. (high school administrator)

He is my principle contact. I think our upper-administration I think he kind of plays with our upper-administration a little bit more, but when it comes to getting in there, for me, it's [Gerald]. (GVCC administrator)

For many Tech Futures stakeholders, Gerald was not only a common point of contact but the only point of contact they had with the initiative outside of the few media events that had been held, which were often planned and coordinated by Gerald. Having Gerald as such a rare and continuous form of contact meant that many Tech Futures stakeholders knew and understood the initiative as interpreted to them by Gerald. This gave Gerald influence not only over what parts of the initiative were developed but over the initiative's narrative itself. Many Tech Futures stakeholders had similar conceptions of

the initiative, even using similar words to describe, for example, the STEM pipeline or the national shortage of engineers. These similarities may have been a result of Gerald's ongoing and frequent interactions with a wide variety of stakeholders.

Gerald's efforts were spent almost exclusively on developing the STEM education pipeline, particularly on a pipeline to create more engineers in Green Valley. This was the primary objective of the Tech Futures Initiative, as stated by all the stakeholders involved with the initiative. Gerald met regularly with individuals representing the different segments of the pipeline, from the high school to the employers, working on strengthening each segment and making it more cohesive with the other segments. An executive at the university's branch campus in Green Valley described Gerald's way of viewing the pipeline as a series of handoffs from one phase to the next.

I don't envision the pipeline as pieces. I try to envision it as one organic whole where the parts work with one another. [Gerald] has the more traditional viewpoint of the hand off system. High school produces somebody that they hand off to the community college for two years. They hand off to the one to the one. Those linkages can be break points, as well things that get handed off appropriately. It's an opportunity and a curse at the same time.

This description of Gerald's perspective on the STEM pipeline explains how Gerald saw the initiative as connecting distinct educational phases rather than a unified whole. In light of the statement above about Gerald "planting seeds," it is feasible that the loose

coupling of initiative parts may be attributable to Gerald. As the one coordinating and interpreting the initiative, Gerald was in the position to design how coalition partners interfaced with each other and with him. Gerald's approach was to personally serve as the common connecting point, to have frequent, informal discussions with individuals connected to Tech Futures, and to bring together stakeholders for events, rather than meetings, as a way of cultivating an environment where partners would organically initiate STEM activities.

Filling a Void

A common justification for Gerald's prominent role in the program, at least in the eyes of executives from Aerotron and GVCC, had to do with the time and effort he could dedicate to the program. While Tech Futures was just one of many items in the workload of an executive, it was Gerald's sole focus. One Aerotron executive explained how Gerald picked up the new initiative that would have been difficult for others to find time to manage.

It made a huge difference because we had the will to do more but didn't necessarily have the way. Plus, we tend to get distracted with our day-to-day jobs here. So [Gerald] came in and became really the spark plug to pull all of this together and really developed this [Tech Futures] concept.

Another Aerotron administrator said:

So we're very busy from a work standpoint and there are times when we want to do something that we can't and [Gerald] fills that void perfectly.

It's not a full-time job, but it's a job that someone has to be available to respond quickly and that's what [Gerald] fills.

It made sense to Aerotron executives that the best way to ensure the new initiative was getting the attention it would need was to contract with Gerald rather than tasking an existing employee. But Aerotron executives were not the only ones who attributed Gerald's leadership role with his ability to focus exclusively on the initiative. GVCC executives also expressed this idea. A GVCC executive who was organizationally in a position to coordinate efforts but who had trouble finding the time said:

Part of what we're doing is we're working on this model, and part of what is probably frustrating to me is that I haven't have a chance to do what I've been talking about for a year and a half, or something. That is sitting down and describing it in absolute full detail. I've got a relatively good amount of detail just I have to go on show and tell sessions with [SSN employee] to conferences, but trying to put together the whole STEM thing at [GVCC]. Not just the whole thing as it exists, but what else would I envision if we were able to get the next chunk of grant money. If I had the next chunk of money that came down the pike, what else would I want to put into that whole path? That I haven't been able to do yet, and it's a little bit frustrating, but if I were able catch up to that piece, I'd be able to do a much better job of linking some of the instigator efforts of [Gerald], some of the efforts of [SSN employee], and figure out, as well, what we have to look like over the long term.

The sentiment was expressed by some of the key stakeholders of the initiative. In their minds, they would and should have been more involved in defining and coordinating the initiative, but because of constraints on their time and energy, they were pleased to involve Gerald, who could focus exclusively on the growth and development of Tech Futures.

Characteristics of a Champion

Gerald was not given such control over the Tech Futures initiative and the organizations involved just because he had the time to do so. He embodied a unique combination of factors that maximized his influence over stakeholder. Amey, Eddy, and Ozaki (2007) highlighted the power granted to champions because of factors such as reputation, resources, political influence, and expertise. Gerald Simmons possessed a unique combination of personal charisma, experience, and industry connections that gave him immense credibility among Tech Futures partners, allowing him to be freely granted the lead role in the initiative.

Gerald was a retired Aerotron employee. During his long career with the organization, he had served as a liaison to universities, facilitating the transfer of university research into the Aerotron organization. Gerald described his efforts to facilitate tech transfer as follows:

We were trying to get faculty to focus their research in an area that we as [Aerotron] had an interest to help us develop new products and services for our customers, which were all DOD, you know, all branches of the service plus other agencies, let's say CIA, what have you. So we would

find a faculty member that was doing something related and we'd go sit down with them. "Would you focus a little bit?" You walk a thin line because you want to give them the money on an unrestricted basis, for the most part. Because if it is restricted you then incur the overhead that the institution wants to attach. At MIT the overhead is 60 percent. So if you had \$100,000, the faculty only got 40. For \$40,000 at MIT you don't get much. So we tried to focus more on schools that. . . Cal Poly is a good example. We obviously went to the gorilla schools like Stanford, USC, Cal Tech., MIT. We continued to fund things at MIT, but we wanted to go schools where, I don't want to say they were undiscovered, but sometimes there were fresh faculty that you could kind of steer them in the direction you wanted them to go. In some of them were very successful in doing what we asked them to.

He went on to explain how he attempted to garner influence among senior executives.

So we tried to establish very good people-to-people relationships in a university environment. So the theory was that if you had, you were dealing with such and such a school, you would identify a senior executive, hopefully VP level, who would become that champion for that school. Obviously it is usually an alum that is interested in doing that. Sometimes it's not. So part of my job was to manage the alignments of our vice presidents to the deans, to the faculty, what have you. Usually dean's advisory report levels. Sometimes the president's advisory report,

whatever it may take. Every school is different so you're constantly trying to make things keep happening that you will hope that will happen.

Gerald's decades of work as a university liaison had given him a wealth of contacts, in education as well as the private sector. Looking at Gerald's experience from the lens of academic capitalism, he had spent a lifetime becoming an adept intermediary between educational institutions and Aerotron. Helping Aerotron harness university research by providing financial incentives for researchers to "focus" their research on marketable areas, Gerald was an important player for Aerotron in creating new circuits of knowledge between the corporation and various universities (Slaughter & Rhoades, 2004). In addition to being involved in university research, Gerald mentioned he also worked with the universities to develop graduate programs in specific forms of engineering that would produce a workforce to meet the needs of Aerotron and other companies in the industry. This form of experience—creating educational pipelines between universities and Aerotron—had a direct relation to the work Gerald would do in Green Valley on the Tech Futures Initiative. As Gerald moved around Green Valley building relationships, he drew upon extensive past experience doing the same thing with a variety of universities. Gerald's experience as an influencer of both university research and educational programs demonstrates the connection between a prominent form of academic capitalism—the transfer of university research to the market—to another form of academic capitalism not as prominent in the literature—the development of academic programs by intermediaries from the private sector. The latter was a key feature of the Tech Futures Initiative. Just as Gerald attempted to modify university research pursuits

to fit the needs of Aerotron, he attempted to modify curricular offerings to fit the needs of the organization—another form of creating new circuits of knowledge. Thus, Gerald embodied an important theoretical connection between Tech Futures and the concept of academic capitalism.

When approached about working on the Tech Futures Initiative, Gerald was eager to participate on a project for which he possessed vast expertise and connections. In addition, Gerald grew up in the Green Valley region and had a personal interest in developing the region's economy. Payment was not a motivator for Gerald, demonstrated by his converting the consulting fees paid him by Aerotron to a Tech Futures scholarship for Green Valley students. When asked why he chose to participate in Tech Futures while in retirement, Gerald expressed his tie to the local area and that he thought the project would be “interesting,” and “fun.”

Not only was Gerald perhaps the most experienced and connected employee in all of Aerotron Global in regards to connecting education and industry, but he possessed such a deep level of personal charisma and charm that many Tech Futures stakeholders considered him a personal friend, even after only a few interactions. This sentiment was encapsulated by one GVCC administrator.

He and I have grown to be pretty decent friends. He went to [neighboring high school]. I graduated from [rival high school], so we always give each other a hard time about that. He was going to his class reunion, I bought him a [rival high school] t-shirt and said, “Here, you have something to wear.” [Gerald] is a good guy. He does care about what is going on. Like

I said, he was doing some stuff in [another state] and similarities between the two, he recognized.

Gerald's ability to connect with administrators was likely a product of both natural charm and years of experience making those kinds of connection.

Respect for and adherence to Gerald Simmons was universal within the Green Valley coalition. Most interviewees' comments blended factors of experience, industry connections, and personal attributes when referencing Gerald.

Number one, he's a sharp guy. Number two, he sits on boards that put deans of engineering in their chairs in the state. There's a lot about [Gerald] I don't know. The parts I do know, I love. The guy is just a good guy. But because he puts deans in chairs of universities, he can get deans to listen to him and make time to talk to him, and because of his long service to [Aerotron]. I don't know what [Gerald's] job with [Aerotron] is. I don't, but I watch him walk around there and people listen to him there, too. (high school administrator)

If you had to say who can pull any string, it's [Gerald]. Then myself and everybody has kind of got a wacky role. [Gerald] can find anything in the corporation or in industry. He's familiar with how universities work so he can tell when the right person is talking to us or find the right person just from his understanding of how universities from a business and political

stand point work. He can do the same with [Aerotron] as we have an understanding of that. (Aerotron administrator)

[Gerald] was the one who brought [Tech Futures] down to me. He brought a brochure in here and said, “Hey, take a look at this thing and we’re going to put the [high school] logo right here.” Immediately, I said, “This is a good thing,” not only because [Gerald] is a high-quality standup guy, but it lends immediate credibility when you say here’s our industry partner and here’s kind of how this thing lines up. (high school administrator)

He’s a man after my own heart, because he likes to get things done.
(GVCC STEM faculty)

Gerald Simmons possessed a unique combination of personal charisma, industry connections, and years of experience doing work similar to the Tech Futures Initiative. This combination of factors gave Gerald an unusual amount of influence in working with Tech Futures stakeholders. Gerald’s familiarity and connections with similar endeavors in other areas of the country gave him additional legitimacy among initiative partners. This concept of modeling Tech Futures after other programs Gerald was familiar with was of interest to the organizations in Green Valley. Several interviewees were aware that Gerald was pulling from other models to help develop Tech Futures and saw that as an additional sign of Gerald’s legitimacy. An administrator at Aerotron mentioned

Gerald's connection to a program in another state in the context of other factors qualifying Gerald to lead the initiative in Green Valley.

He had an integral role with a similar concept in [neighboring state]. So, we brought him on because of his experience with the academic system, the politics involved, also he crosses over into the engineering side. So he understands the need of the industry and he also has the relationship with the professional engineering associations. So, he was kind of the fits-all-needs person.

Gerald explained how he saw Tech Futures being part of a network of similar initiatives across the country—initiatives to which he was personally connected.

[Neighboring state high school], which is probably the model that we used for the [Tech Futures Initiative], to a certain extent. We are in a process of doing the same thing with the University of North Dakota in a community college over in Minnesota, same thing, with the Grand Forks Air Force Base. So that's with the Air Force up there. We're trying to all learn together. So what we are trying to do is to have not only the companies and the service of the DOD members be able share and understand, but also to provide each other with resources. I know that [GVCC UAS faculty member] wants a program in [GVCC south campus] on engine repair. Well it turns that Northland College up in Minnesota has a program on engine repair that [Aerotron] funded. So we've got the two of them talking to each other so [GVCC faculty member] can share her UAS

program curriculum. They can share their curriculum so neither of them has to spend days, weeks, months, years putting together curriculum. So we're trying to make it a very open, almost like an open source, open software type environment so that people can pick up the phone and say, "Hey, can you help me out with this?" So far it seems to be working—so far. At least they're talking, let me put it that way.

Gerald's involvement in Tech Futures had an important connection to neo-institutional theory. In their concept of normative isomorphism, DiMaggio and Powell (1983) explained that organizations are influenced by individuals who introduce the standards and practices of other organizations in their field. By connecting the organization to a network of individuals and organizations in the wider industry, these individuals gain credibility and their influence on the organization serves a norming function by making the organization more similar to other organizations in its field. Gerald served this function in Tech Futures. Bringing a wealth of previous experiences developing educational pipelines gave Gerald great credibility among Tech Futures partners. This credibility enhanced Gerald's influence on the coalition, and as concepts introduced by Gerald were accepted, the institutions involved in Tech Futures subtly shifted to become more like other institutions adopting similar practices in their respective fields.

Gerald Simmons was the central figure of the Tech Futures Initiative. His likeability, vast experience connecting industry with education, and extensive personal connections made him the kind of "fits-all-needs person" Aerotron sought to coordinate

the initiative. Where administrators and executives of various organizations lacked the time and attention to give to the new initiative, Gerald stepped in to lead the effort through continual contact with stakeholders across all organizations and at all levels. Doing so allowed Gerald significant influence over the STEM activities associated with the initiative. But Gerald was not the only individual seeking to influence the STEM education pipeline in Green Valley. State Science Network had a similar objective.

State Science Network – Building the STEM Culture

Most members of the STEM education coalition in Green Valley took a passive role. Few connected with any regularity, and relationships were sparse to nonexistent between organizations and sometimes even within organizations. Gerald Simmons was a big exception to that rule. The State Science Network (SSN), and in particular one employee, Bridget Halpert, were another exception. The SSN is a non-profit, public-private organization established in 2006 by the state government and funded by both the state and private donors, mostly big technology businesses with a prominent presence in the state. On the list of funders are Boeing, IBM, Google, and Intel. The formal mission of the organization is to “diversify the state’s economy by linking industry needs with university research and ensuring the education system creates a 21st century workforce.” The organization began by funding STEM research through the state’s universities and supporting the transfer of that research into the market. It was only later, in the year before this study was conducted, that SSN ventured into the educational realm and established the second half of their mission to “create a 21st century workforce.” In this endeavor, SSN claims to have impacted more than 385,000 students and more than

10,656 teachers by developing a statewide network of schools to strengthen STEM teaching and learning.

SSN attempts to influence STEM education across the state in two ways. First, the organization awards grants through a competitive RFP (request for proposals) process. Often with SSN's guidance, K12 schools, community colleges, and universities submit proposals to SSN detailing how they will use funding to strengthen STEM education at their institutions. To date, SSN has generated \$149,000,000 in revenues and awarded more than 150 individual grants, totaling over \$110,000,000. Approximately \$41,000,000 of those funds have been directed toward enhancing STEM education. The second way SSN influences STEM education is through direct involvement. An SSN employee described SSN's shift to becoming more personally involved with grant recipients in order to ensure that the grants lead to self-sustaining STEM programs.

We're running programs in ways we never thought we would. By that I mean, we used to give money to others who told us the programs they wanted to run and we decided those programs were worthwhile running. Now, we're more hands-on as we try to bring partnerships together and collaborations together and people who do have resources who kind of glue all the pieces together. We're more programmatic. We're hands-on. I guess, one way of looking at this is you can't afford a laissez-faire attitude. Here's the money, sounds like a good program, go and do it. The problem with that is that's what we did with NSF and the lesson we learned with NSF was as long as the money was pumped into a program,

the program was sustained. As soon as the money disappeared, the programs tended to disappear. It's an unusual program that became self-sustaining. Now, we see our role as ensuring that programs that are judged of value become self-sustaining.

Though both State Science Network and Gerald Simmons for Aerotron both became personally involved in championing the Tech Futures Initiative in Green Valley, their mode of operation was significantly different. Aside from a small amount of scholarship money donated by Aerotron, Gerald had no real financial resource to offer to the coalition. In contrast, SSN had millions of dollars of grant funding at their disposal. And while Gerald's goal was to help construct the specifics of STEM pipeline that ran from high school through the university and to local jobs, SSN had a deeper and more widespread objective—they wanted to establish a new STEM culture in education across the state.

Changing the Culture

In pursuit of its mission to build a 21st century workforce, State Science Network aimed to transform schools and systems into STEM education centers. They would do this by building communication networks to enable teachers to share best practices, teaching tools, and timely information. They would facilitate after-school STEM programs. They would train teachers to be more effective in transmitting the STEM curriculum. And they would equip classrooms with the latest materials in the STEM subjects. Ultimately, SSN would transform the culture of institutions to center all

learning on science and technology and to provide specific training and resources to prepare students for jobs in the new economy.

One SSN employee described how this transformation would work.

We have what we call a STEM immersion guide. So schools can test to see where they fit along that spectrum, and they can be at a level of where they're just exploring STEM, where they can go into an after school STEM club, or they can do an introductory level, where they want to bring all their fifth graders, can change a culture, the fifth grade program. Or they are a partial immersion or a full immersion school. And the full-immersion school examples that we have is there's a [high school in the state] is one that has effectively changed its culture, created itself with a culture that we would like to emulate in other schools.

Not only did SSN want to facilitate clubs and programs to strengthen STEM education, they wanted to center the curriculum on STEM so that all subjects were taught in relation to science and technology. Another SSN employee explained this process.

We are developing programs like this. [Another SSN employee] will tell you about the [high school transformation program], which is designed to take whole schools, not just one teacher, and produce an increased awareness of how to make it a STEM school so that there's an integrated approach to STEM in learning. In other words, what we would arrogantly say is, "You want to educate a kid to read and write better, do it through engineering and science." It's not that you just kill two birds with one

stone, but you read differently. You write differently. You communicate differently. My personal conviction is scientists and engineers are better off than artists and humanists and the reason is I can go to a concert and enjoy their music, but they can't come and listen to me talk about my science as easily as I can listen to their music and that's the dilemma that we all face.

SSN considered their work critical in preparing individuals for the future. Changing the culture of state schools to be more STEM-centric was not only essential in preparing students for jobs in the 21st century but in making them happy and productive citizens. And SSN intended to go beyond immersing individual schools to change policy and practice statewide, as one SSN employee stated.

You see a growth in understanding the need to reach out and get beyond just the immediate beneficiaries of a program, to the larger population of tax payers who are funding it so they will understand that they did the right thing by funding it and that they need to do more of this kind of thing. I guess you could say that we're more closely aligned to the need to get into the policy game. How do you influence policy and practice?

By incentivizing STEM immersion through grant funding and by personally helping to link schools and communities into a statewide STEM network, SSN would change the culture of education in the state. The new culture would put sciences and technologies at the center of the curriculum, teaching other subjects through this lens and preparing students for jobs in the 21st century economy. This aggressive approach to building a

STEM education culture statewide came into play in the Tech Futures Initiative in Green Valley. Looking closer at SSN's involvement in Green Valley illuminate's how the organization approached organizations and communities throughout the state.

The Role of State Science Network in Green Valley

For SSN, the efforts to strengthen STEM education in Green Valley represented just one microcosm of many across the state. However, SSN had invested significant time and money into the STEM coalition in Green Valley, demonstrating their mission to work closely with individual organizations and communities and then link them together in one great network. SSN saw the potential of the Tech Futures Initiative, initiated by Aerotron and GVCC, as something that could help strengthen STEM education locally and serve as a model in other communities, as voiced by one SSN employee.

Well, like I said at the beginning, we're a public-private non-profit organization, and we have made investments in that community, and I think our role is to understand what's working within [the Tech Futures Initiative]. I'd like to see what they're doing, how to quantify it, how to help strengthen it, whether it's helping engage more industry. And then, ideally, I'd like to see it replicated in other parts of the state.

In contrast to Gerald Simmons, SSN did not interact as frequently with members of the STEM coalition in Green Valley, nor did they connect with as wide and diverse a population of stakeholders as Gerald. SSN's primary focus was on the community college. Green Valley High School had not attempted to become a STEM-immersed school by pursuing an SSN grant. SSN's interactions with the high school were sparse,

consisting only of both organizations' involvement in the occasional Tech Futures event. SSN's interactions with the university branch campus in Green Valley were similar. Their connection to the university's College of Engineering on the main campus was deeper. SSN employees served on an advisory committee for the College of Engineering, and SSN had funded research and educational endeavors through the college. However, SSN did not partner with the College of Engineering on anything regarding Green Valley.

The community college was the one organization in Green Valley that had frequent interactions with SSN. Bridget Halpert, an SSN employee focused on community college relations, served as SSN's point person in Green Valley. Though SSN's involvement focused predominantly on the community college, their involvement with the college was frequent and carried significant weight. One GVCC executive described this involvement, saying, "We probably have them here all the time. [Other GVCC executive] laughs and jokes about it. He gets another assignment or call from his boss and when he says that it's the grant manager for [SSN]." This statement underscores the influence of SSN at GVCC. Another executive described SSN's attempts to establish connections at the executive level rather than further down in the organization, in an effort to maximize their influence.

[SSN] was kind of interested in having it be higher up in the organization that it would have a stronger support. I didn't want it to just be assigned further down the line. So, in moments of weakness, I ended up being that person that sucked in as the primary and eventually I got sucked in to take over the role of principle investigator on the particular grant. I do have a

background in the STEM area with Car Production Physiology. It's not exactly the electronics, the engineering or a lot of those things that are more specifically applied here, but I do have that background. But again, I think because of my position within the college and within the academic side of things right now that it's probably been both a blessing and a curse to the players because they've got somebody with the authority to make just about anything happen. At the same time, I don't have as much time to try and make everything happen.

In addition to demonstrating SSN's approach to connecting with decision-makers at the college, both of the above statements highlight an important incentive for the college's involvement with SSN—grant funding. SSN had funded the STEM bridge program at the high school several years before, and just a year before this study, SSN had partnered with GVCC to pursue a multi-million-dollar grant through the National Science Foundation (NSF). This grant would focus specifically on strengthening the STEM pipeline from high school through the college and into jobs. Though SSN helped to facilitate the acquisition of the NSF grant, it was this GVCC executive who had been thrust into the driver's seat as the primary investigator of the grant. SSN would also benefit by receiving a portion of the funds to cover overhead costs, an important incentive for SSN, since they operated completely on donations and grants.

Because of the connection to grant funding, GVCC's relationship with SSN was significantly different than its relationship with Gerald Simmons. While Gerald garnered influence with a wide set of coalition members because of his experience, industry

connections, and personal charisma, none of those things was ever mentioned by coalition members in terms of their relationship with SSN. Instead, SSN seemed to have influence because of the potential for grant funding and the organization's influence across the state. One GVCC executive explained why the college was interested in a partnership with SSN.

But when somebody who is legitimate, who does represent a major industry, who is key to the local economy, comes forward, you try to figure out how to do something that will be collaborative and help promote their interest in the community and student employment opportunities and all the above. Any day somebody who really truly has the right type of interests, we'll take those any day.

Seeing economic development as an important mission of the college, GVCC gladly accepted Bridget Halpert's involvement. Indeed, the college looked to SSN for guidance on the academic programs it offered, as voiced by one GVCC executive.

The other part is [SSN] would like to see us do more things in mining. So much of the technology is now being utilized in so many different fields. How can we carry that stuff across? Part of that is a desire by [SSN] to be recognized as leader in science and technology and a place for innovation.

The responsiveness of this executive to direction given by SSN regarding academic programs the organization believed would promote the economy demonstrates the role SSN had in advising the college. By garnering influence with top executives and wielding grant funds—both its own and the possibility of federal funds—SSN became an

important champion for STEM initiatives in Green Valley. Though Bridget's influence was based on different factors than Gerald's, they both played a championing role in motivating and facilitating the STEM pipeline at the heart of the Tech Futures Initiative. Just as a partnership with SSN meant potential grant funding for GVCC, the same was true for SSN. Only by partnering with GVCC and other educational institutions could the organization qualify for the federal, state, and private funding important to running its operation. This made the two organizations mutually dependent. Their partnership was sealed by direct financial interests in a way that the partnership between GVCC and Aerotron was not. However, both Gerald Simmons of Aerotron and Bridget Halpert of SSN played on the same field, championing the STEM initiatives in Green Valley, with the college as their primary contact. A GVCC executive explained the differences in immediate benefits derived by SSN and Aerotron's, while comparing Bridget to Gerald in terms of "instigating" activities in order to achieve their goals.

[SSN] isn't looking for employees [like Aerotron], but their biggest driver is they were started with some state funding. Right now they have a claw for any endowment they have by either getting somebody to donate it or by writing a grant. So for instance, the NSF Grant that I'm involved in, they kind of wrote it, they kind of run it. So they're able to get some overhead or some portion of that grant. In theory, would they necessarily need to be involved? No. But because of what they need and the things they're trying to get done, for them to step in again and be a little bit of a [Gerald Simmons] in terms of right now they have written a grant trying to

tie the eight rural community colleges together in kind of a STEM consortium to try to promote sharing of best practices and working together on certain things related to STEM. They are also trying to be an instigator, I think that's what [Gerald] has decided his new title is, instigator, and they also are obviously doing because if they don't get grants, that's one of their sources of money. [Bridget] won't have a job if she's not involved in some of those things.

While both Gerald and Bridget served as the primary “instigators” or champions of the STEM initiatives in Green Valley, they had different reasons for doing so. Gerald was driven by Aerotron's need for local employees that would come by building a strong engineering education pipeline from the high school through the university. Bridget represented SSN's mission to build a vast STEM network across the state, as well as the organization's need for grant funding in order to continue to operate. Both Gerald and Bridget wielded significant influence over the STEM coalition, particularly at the community college, albeit for different reasons. Both individuals found themselves playing on the same field in Green Valley, leading them to become interdependent and to form an alliance.

Because they ultimately served the interests of private industry, both Gerald and Bridget represented the concept of intermediating networks found in the theory of academic capitalism (Slaughter & Rhoades, 2004). State Science Network, funded by state appropriations and donations from influential individuals and corporations in the state, existed to push STEM education efforts into K12 and postsecondary institutions.

By strengthening connections between institutions open to becoming STEM schools, STEM would gain prominence and become the accepted norm throughout the state. As evidenced by the individuals quoted above, SSN was interested in nothing less than creating an educational system focused on STEM subjects, in which even the arts and humanities were taught through the lens of science and technology. Doing so would create powerful new circuits of knowledge (Slaughter & Rhoades, 2004), wherein the demands of STEM-related forms of private industry directed the way teachers would teach and students would learn.

Champion Alliance

While Gerald and Bridget seemed to operate with relative independence in establishing relationships within Green Valley day-to-day, they became associated through the Tech Futures Initiative and linked in other ways. As the two champions of the STEM initiative, those who were facilitating and driving STEM programming on a regular basis, the connection between Gerald and Bridget was significant. Both of these individuals represented organizations outside of education but hoped to help educational institutions develop programs and resources to produce more graduates in STEM programs that would fill jobs in STEM fields. Their connection represented a combining of resources and interests. Instead of two separate and independent entities being represented in the coalition, those entities would begin to function in relation to one another. Greater interaction would allow Gerald and Bridget to develop shared beliefs and perspectives, in addition to combining efforts toward one goal. On one hand, this could strengthen the influence both champions had on the coalition. On the other hand,

their alliance would lessen the diversity of perspectives represented among the coalition champions, leading to the compromising of initial objectives and outcomes incongruent with the goals of the organizations they represented or the coalition in general.

As organizations began joining the coalition in Green Valley, Gerald and Bridget became acquainted. Because of the facilitating role both Gerald and Bridget saw each other playing in Green Valley, Bridget soon invited Gerald and another executive to the SSN headquarters in another part of the state. As she explained it:

So we invited [Gerald] and [Aerotron executive] to come here. We met with them, and then they really wanted to incorporate what we're doing, because we're already down there. We want to incorporate what they're doing. We just really want to understand and leverage each other's activities, really.

She went on to say:

I invited them to be on an advisory that we've pulled together with all the deans from all the universities, engineering, science deans. And industry, I have about half a dozen industry. [Aerotron executive] and [Gerald] representing [Aerotron] for one. To be on what we're calling a STEM Diploma Advisory.

The connection established between Gerald and Bridget, with Gerald being invited to serve on an SSN advisory board and both agreeing to combine efforts in their approach to STEM in Green Valley, demonstrates a phenomenon described as interlocks in the theory of academic capitalism (Slaughter & Leslie, 1997). As in Slaughter and Leslie's study of

board interlocks, the increasing connectedness between Gerald and Bridget, or Aerotron and SSN, stood to strengthen the shared interests of both individuals and their respective organizations, as well as the effect of Gerald and Bridget on the operations of the Green Valley coalition. In addition to the above connections, Gerald served on an advisory board through the College of Engineering at East Hills University, a board SSN representatives also sat on. On the one hand, these connections could allow Gerald and Bridget to enhance their efforts in Green Valley and increase their likelihood of achieving the goals of the initiative. On the other hand, strengthening the relationship between the two champions of the initiative may lead to greater combined pressures on the educational organizations involved, pressures from outside organizations that may not necessarily align with organizational goals. Because the creation of networks and connections between organizations is a key component of this study, the result of such connections is important to consider. Creating networks and alliances throughout the community and the state, as SSN has done, strengthens the influence of the organizations involved, particularly of the organizations or individuals who serve as champions in the endeavor. In this case, their alliance stood to allow Bridget and Gerald to strengthen their influence on the Green Valley organizations, particularly on the community college, which was the focus of their efforts. Because GVCC executives welcomed the involvement of Gerald and Bridget, and because they often lacked the time and attention to dedicate to the STEM initiative, GVCC allowed Gerald and Bridget great influence and autonomy over the direction of college operations. Inasmuch as such influence allowed the college to achieve its intended aims, the college stood to gain from the

involvement of these champions. However, by the same accord, the champions introduced certain potential pitfalls. Programs and services deemphasized or dismissed by the champions, such as non-STEM curriculum, stood to be negatively impacted by a strengthening of the champions' influence over the college. In the next section, I explore these dynamics further, by focusing on individual components of the STEM pipeline and the relationships, both intraorganizational and interorganizational, each of these components entailed.

The Dynamics of the STEM Pipeline

In this section, I explore in greater detail how these individual programs and services under the Tech Futures Initiative functioned together. Despite being made up of loosely-connected programs and activities, the Tech Futures Initiative was an effort to increase student interest in STEM subjects while they were in middle school and high school and then build academic programs and services to move STEM students from high school to the community college to the university and into STEM-related jobs in Green Valley. This section explores how Tech Futures as a concept introduced certain opportunities to coalition partners and how those opportunities carried potential drawbacks to the institutions. In addition, I explore the challenges in coordinating each phase of the STEM education pipeline, demonstrating how Tech Futures was relatively simple and altruistic in concept but complex and challenging in practice.

The Benefits and Drawbacks to Tech Futures as Relationship-Builder and Facilitator

The Tech Futures Initiative enabled certain activities that brought perceived benefits and drawbacks to the organizations involved. The initiative helped to increase contact between the organizations involved. Prior to Tech Futures, most of the organizations involved communicated very seldom or not at all. The STEM coalition had allowed for contact and discussions between organizations that did not exist before. In addition, Tech Futures introduced new forms of funding to the organizations, particularly the community college. These grants funds were designated for certain activities, allowing the college to focus in areas it could not have done without the funding. As a relationship builder and a facilitator of STEM activities, Tech Futures moved Green Valley educational institutions in new directions. But some interviewees perceived certain drawbacks in these directions. To them, increasing responsiveness to industry needs and dedicating resources to STEM meant less focus on other academic areas, which could weaken the institution's ability to achieve its overall academic mission and serve the community in general.

Linking Organizations

The Tech Futures Initiative was, in many ways, just a name for a set of loosely connected STEM activities in Green Valley. Some of those activities already existed before Tech Futures was conceptualized. Others were facilitated by relationships that were strengthened as Tech Futures evolved. Regardless, even as a name and a concept, one powerful effect of Tech Futures was that it caused certain organizations in Green

Valley to initiate individual and collective contact that did not occur before. One Aerotron employee captured this concept aptly.

Before [Tech Futures], there might have been a scholarship. There might have been presence at the science fair, but it wasn't an overall effort. It think, maybe if you call it, they'll come. That's a terrible misquote. [Laughs] Just using the terms. Getting the people together. Having everybody associated with it, really does pull people together for a cause.

Tech Futures brought a name and a concrete idea under which STEM activities could fold, allowing partner organizations to rally around a common purpose. Without a unifying concept, there was no need for a coalition. And even though the coalition was more symbolic than functional—with connection facilitated by champions rather than through direct contact between organizations—Tech Futures enabled certain interorganizational contact not present before. A GVCC executive explained how Tech Futures facilitated new relationships with several organizations.

Would I be having any discussions with the Systems Engineering folks [at the university] if it wasn't for the [Tech Futures]? Probably not. I'm sure there are people that our folks were able to talk to at [Aerotron] regarding developing the UAV curriculum. That wouldn't be there if it wasn't for that kind of connection. Once in a while with [the high school] where [Gerald] has said, "Hey come on over." And next thing you know there you are and it's hopefully helping to strengthen some things in some way shape or form.

One particular form of contact that was enhanced by Tech Futures was the link between education and industry. Educational leaders in Green Valley found themselves in greater contact with employers such as Aerotron and Fort Kenton because of the initiative. An executive at the university branch campus explained this benefit.

We probably wouldn't have had a relationship with [Aerotron] had we not had that. That's opened other kinds of doors, opportunities to think about STEM in ways that we haven't before.

The branch campus in this study held a somewhat awkward position in terms of industry connection. While the community college, because of its economic development mission, had always had a connection to local employers, the branch campus did not have such an overt reason in making those connections. In some ways, the branch campus was caught between offering traditional four-year degrees with no specific connection to the employment demands of Green Valley and responding to the needs of the market by creating academic programs not typically found at a university. One example of this was the branch campus's recent creation of the bachelor of applied sciences degree, an academic program that attempted to build off of the associate of applied sciences degrees offered at the community college. The B.A.S. was a terminal, four-year degree that prepared graduates for employment in a specific field, such as Intelligence Studies (military intelligence). The branch campus had recently developed a small set of B.A.S. programs, a degree not offered on the university's main campus. This decision represented the branch's efforts to respond to the needs of local employers while still maintaining status of the university. Though the creation of the B.A.S. was not a direct

result of the Tech Futures Initiative, budding partnerships with Fort Kenton and GVCC did lead to the development of new B.A.S. concentrations, such as Intelligence Studies and Informatics. These concentrations may have not been built without the STEM partnerships developing in Green Valley. Tech Futures helped to further facilitate that connection between the branch campus and Green Valley employers. This sentiment was expressed by an employee of GVCC who was connected to the NSF STEM grant.

That's a big part and that was never there before. It was just sort of this academia ivory tower of this is what everybody seems to be doing and we're just going to produce computer science majors, and that's good.

When the industry is saying, "No, those folks are unemployable."

By enabling relationships with the major Green Valley industries, Tech Futures brought educational institutions a step closer to those organizations, making education more likely and more able to develop academic programs that would meet the needs of local industry. But a step toward one direction is a step away from another. Some interviewees, particularly those involved in areas outside of STEM subjects, such as liberal arts and education, saw a potential drawback to the tightening relationship between education and industry in Tech Futures. One professor at the branch campus voiced this concern.

Many people like me don't think that's the job of a high school, is to prepare workers for open positions in local jobs. You know that I don't really think that's the job of a university. I think there's a role for education that is beyond preparing workers. So, there is a belief, and

whether or not it's true nobody knows, there's a belief that that's where the jobs are going to be, so that's what the schools need to focus on.

When asked to expound, the professor added:

Well, let's just take locally, whether there's going to be this huge need for engineers locally, I think is an open question. You know, kids coming out of [Green Valley High School] are not getting engineering jobs. You need a college degree for an engineering job, so how many engineering jobs there's going to be over the next ten years, I don't know. Certainly, [local engineering company] makes projections. I've heard all of those projections, it's just I'm not one who believes them, necessarily. And I'm also not one that believes that the economic interests of [that company] should drive educational policy making. I think here in some ways, it does.

To this individual, developing degree programs to meet the needs of local industry represented a certain risk. If market forecasts failed to pan out, institutions could spend significant resources building programs for which there was no demand. In addition, this professor believed that the role of an educational institution was “beyond preparing workers” for specific jobs. The literature on academic capitalism and neoliberalism in higher education asserts that tailoring academic programs, university research, and other activities around market demands weakens the ability of community colleges and universities to effectively serve the public (Ayers, 2005; Mars, 2012; Slaughter & Rhoades, 2004). While enhancing relationships between organizations, and particularly

between educational institutions and industry, was seen as an advantage by most interviewees, some were concerned that these new linkages would serve as a red herring for the academic system in Green Valley, sacrificing education overall in an effort to meet the demands of specific markets.

Facilitating New STEM Activities

To local stakeholders, Tech Futures not only increased organizational linkages, it helped organizations pursue activities they otherwise would not have had the resources to do. This concept mostly centered on the two grants GVCC had acquired due to their pursuit of STEM. A GVCC executive explained how these grants enabled the college to initiate certain activities.

For us, they're seed money. They are a way to try something. To explore things. They are ways to do things in areas that are probably not in our core mission. To run science and math experience for fourth graders is probably not our core mission. However, if those resources are brought in to try it, then it has a chance of becoming from outside. I mean, we talk about our technical core in here, this becomes very much periphery, but as you do it over time it begins to morph in. So, for me, if this is our core stuff, so freshman, sophomore educational opportunities, we're seeing more and more of this merge and that seed money allows that to kind of occur. It allows us to run a project. It allows us to try something.

One example of a new activity facilitated by STEM grants was the STEM Learning Council. With grant funding from NSF, GVCC hired a full-time researcher who

convened a committee to explore challenges and inhibitors along the STEM pipeline. In particular, the committee would seek to understand things like the great need for remedial math education at the community college. The committee was comprised of a variety of leaders from K12 and higher education in the region. In a way, the STEM Learning Council served as the only example of a group comprised of representatives from organizations in the STEM coalition in Green Valley. The committee was generally seen as a successful example of interinstitutional collaboration but that perception never led stakeholders to develop a centralized coordinating body to lead the overall STEM initiative. Because the STEM pipeline involved three distinct educational phases—high school, community college, and university—members of the Learning Council were not only in a position to represent the perspectives of their institutions but to implement research findings.

While “seed money” provided by the STEM grants allowed GVCC to initiate new activities, the potential drawback to these activities, as seen by some interviewees, can be drawn from the statement above. The GVCC executive explained how the funds allowed the college “to do things in areas that are probably not in our core mission,” going on to say that, “as you do it over time it begins to morph in.” This process of taking outside funding to initiate an activity that will later be sustained by the institution, is, as described by a staff member of State Science Network in a previous section, the goal of grant funders. Resource dependence theory describes this behavior as the power exerted from a resource provider on a resource-dependent organization. The resource-dependent organization changes the way it functions in order to acquire resources and to establish a

relationship wherein future resources would be easier to acquire (Pfeffer & Salancik, 1978). While the activity begins as an experiment, or something to try, the purpose of the funding is to transition that activity from grant-supported to institution-supported. When grant funds expire, the institution is required to expend the funds, personnel, time, and focus to support the activity. The inherent drawback in this situation is that the institution's resources are not limitless. Adopting one set of activities must mean neglecting or rejecting another. As stated in both RDT and as a principle of academic capitalism, as an organization positions itself to acquire maximum resources, it allocates existing resources to areas that influence the flow of those future resources (Pfeffer & Salancik, 1978; Slaughter & Leslie, 1997). This grants particular power and influence to those areas of the organization that are perceived to bring the greatest benefit in this resource relationship. The perception that pursuing STEM activities could lead to a diminishment of resources spent on other operations of the college was voiced by some interviewees. In fact, an administrator at GVCC suspected investments in STEM had already drawn resources away from the liberal arts.

I think there has to be a shifting of time and resources to supporting STEM projects and I'm ok with that, I just sometimes get frustrated because the liberal arts get ignored somewhat or they don't get the resources that we once received. Although, in some areas we have a wonderful art department, and the institution has been very supportive of things like our Pit Fire Project that we have on the [south] campus every fall, supporting cultural events on both campuses. In the most recent budget cycle, it

wasn't unexpected, but the liberal arts got reduced and other maybe because of the STEM projects and STEM initiatives that are out there.

An administrator at the university branch campus made a similar observation.

But the focus really directs the energy of the institution. Part of that is just that, you only have so much time and you only have so much time to build stuff. If everything is focused on STEM, that's what you're going to spend your time building. When I say everything, I mean when the money that's available, when the content in the schools is getting focused on that. Now, I do think that's the same at [GVCC], to a large extent, so I think in education it's a particular problem because it means that in some very weird way that the focus of the teacher ed classes, STEM just enters into those conversations much more than History and Literature does.

This statement focuses not only a shifting of financial resources but the dedication of time, energy, and curricular focus that occurs when institutions decide to actively pursue STEM activities.

The Tech Futures Initiative gave coalition organizations a concept around which to forge new relationships and activities. Organizations began to communicate and respond to one another in ways they had not done before. And organizations, particularly GVCC with its grant funding, were able to venture into STEM activities they could not otherwise have explored. The potential drawback associated with both of these benefits is that the new relationships and activities facilitated by Tech Futures would require the commitment of time, energy, funding, and focus—all of which had to come from

elsewhere in the organization. Consistent with the theory of academic capitalism, as institutions pulled resources into STEM activities they risked marginalizing areas that were core to their mission and operations, such as liberal arts education.

Breakdowns in the STEM Pipeline

When officials from Aerotron and Green Valley Community College conceptualized the Tech Futures Initiative, they intended to create a pipeline of educational programs and services leading from Green Valley High School through East Hills University and to jobs, specifically in engineering, at Aerotron, Fort Kenton, and several other companies in Green Valley. In this study, I have shown how the pipeline was more a collection of loosely-connected programs and services from the beginning, how the initiative lacked centralized coordination and planning, and how champions operated with relative autonomy in guiding STEM activities. Several organizations joined an informal coalition, rallying around the concept of Tech Futures, because it gave a name and a concrete objective to the variety of STEM activities currently underway or envisioned for the future. However, a more in-depth exploration of the STEM pipeline reveals a set of programs and services that are often disjointed, incompatible, and struggling to materialize. Ultimately, many of the programs and services affiliated with Tech Futures and the Green Valley STEM initiative fail to address the justification given for the program in that they are not positioned to create more local engineers. The mix of motivations, relationships, and incentive structures that make up the Tech Futures Initiative is a demonstration of the truly complex nature of such an undertaking.

Incompatible Academic Programs

It is one thing to envision a program that would integrate high school, community college, and university curricula into one seamless pipeline leading to a bachelor's degree in engineering and another thing to actually design such a program. Though the Tech Futures initiative was only a couple years into its operation at the time of this study, it still faced obstacles at every level in terms of creating a seamless pipeline for engineering education. The lack of compatibility between academic programs at each institution was manifest most clearly in three particular areas—the disparity between the high school engineering program and the community college bridge program, the lack of a substantive engineering program at the community college, and the failure of the university branch campus to provide a local engineering option.

Green Valley High School offers a career and technical education program in engineering in conjunction with Project Lead the Way, a national non-profit organization that provides curriculum and materials to K12 institutions in a variety of STEM subjects. The program had gained popularity in its two-year history leading up to this study, with dozens of students enrolled. The program prepares students for entrance into a college engineering program by providing introductory, high-school-level coursework in basic engineering subjects. As the Green Valley economy is home to many workers in engineering and other technical areas, the interest in STEM subjects among children of Green Valley residents may be unusually high. The Project Lead the Way curriculum would seem like a good introduction to the engineering pipeline Tech Futures hoped to accomplish. However, the first snag in that plan occurred when the community college

was awarded a grant by State Science Network to establish an engineering bridge program that would offer high school juniors and seniors college-level coursework toward a four-year degree in engineering. Causing juniors at Green Valley High to have to choose between the high school program and the community college bridge program quickly created a rift in what had been a budding relationship between the high school and the community college programs. Soon the high school engineering program and the community college bridge program found themselves recruiting competitively for their respective programs. One high school administrator described the breaking down of relations between the two incompatible programs.

So, we started off and [the bridge program administrator] and I would talk and we'd try to get things going. We'd pick at the road, build a little road, pick at the road, build a little road and for a while it was just us building from the bottom. That was the key change between [Tech Futures] and [the bridge administrator] and I building from the bottom, working on the [grant] that we were dealing with. But when [GVCC] broke off the articulation talks, [the bridge administrator] and I basically said, "We're doing our own thing and whatever." The very real things that happen to my mind when we talk about [Green Valley High] and [the bridge program], is that when students leave from the engineering program that I've recruited, I don't begrudge them for doing it. There's a lot of good reasons for doing it, and a lot of good reasons for not doing it, but what it does do is it takes that number of students of high level science classes and

high level math classes, and so then my own faculty at [the high school] says, “You’re hurting me. When you let them do this, that section might not run.” Instead of having three sections of calculus, it might just be two sections of calculus. If it’s two sections of physics AP, it’s one section of physics of AP because those are the kids doing [the bridge program].

There is a faculty affect in my building and after discussions it’s like, “Why do we let [the bridge program] come and recruit?” What ended up happening is that some of the faculty just said, “Well, we just won’t let him into our math classes. We just won’t let him talk to our math kids.”

So, what [the bridge administrator] said is, “Fine, I won’t come to math classes. I’ll recruit out of the history classes because I used to be on the history staff.” He comes in and he recruits out of the history classes for [the bridge program].

Despite the efforts of the high school faculty, the bridge program was a compelling option for students. Two factors were most compelling to students of the bridge program interviewed for this study. First, bridge program student would graduate with college credit, something the high school engineering program did not offer. Second, because grant funds covered the tuition of classes offered through the bridge program, students could gain college credit for math and science tuition-free. The State Science Network funds helped GVCC create a compelling engineering bridge program that allowed many high school students to get free college credit, but that program conflicted with the engineering program the high school was running. Because the requirements of each

program was unique, students could not pursue both the high school and the community college program. They had to choose. Both programs could lead to students graduating high school, but only the bridge program would grant both high school and college credit. And the fact that tuition for the program was covered by the SSN grant made the bridge program a very compelling prospect for students. This uncompromising fact served to sever relationships between the two engineering faculties. At the time of this study, Gerald Simmons was meeting individually with each group, but it was not clear what, if any, progress had been made to mend the relationship or create a compatible program. It was clear that the high school program felt this disconnect with the Tech Futures Initiative in general, feeling that, other than the link with Gerald Simmons, attentions had really been focused on the community college and above.

The high school engineering program was not the only ill-fitting component of the engineering pipeline. GVCC's own newly-created engineering associate's degree program was attracting no more than handful of students and was having trouble getting off the ground. Five years before this study, GVCC began to create an engineering program with the hope it would lead to transfer to a four-year university program. The college hired a full-time faculty member with an extensive background in engineering to oversee the program. Five years later, the program still did not offer any 200-level courses in engineering. The College of Engineering at East Hills University resisted efforts to articulate engineering coursework, meaning graduates of the GVCC program would be no further ahead than anyone who had taken general education coursework at any given college. For this reason, there were only two engineering courses in the GVCC

program, the rest of the program consisting of advanced math and science courses.

Ultimately, the GVCC engineering program struggled to prove its value to any prospective student. One faculty member explained the programs precarious positioning.

They say we have an engineering program, but people aren't buying it.

It's the marketplace that usually determines whether something is successful in this country. They don't know how to market it and they're selling something that people don't want. It doesn't have the look and feel of a real degree.

The recently-hired engineering faculty member described his frustration with the program and what he sees as apathy on the part of the college administration.

I haven't taught an engineering class yet. Three years. So, I'm a little disappointed that they aren't using people effectively. I'm disappointed that in the way they actually do the engineering program. Here they have very little, they haven't had any growth. The engineering program has been going for five years.

He went on to describe how he felt "shunned" by the administration.

It's almost like I've been shunned and I'm not sure why. We have engineering days, they don't say, "Would you please come to our engineering days?" So, I'm like, "What the hell's going on?" If you had somebody that was a retired NASA engineer with 25 years of experience with spaceships and rockets, would you be putting them out front to attract them to your engineering program? It doesn't make any sense. I mean,

I'm willing to put reputation on the line and do all that kind of stuff, because I have a good reputation. I've done national level projects. My projects have gone to the President of the United States for approval. So, it's like they don't want to use that.

Failure to provide two-years of coursework toward a corresponding four-year degree had questioned the role GVCC's engineering program could play in the pipeline. Though it was not stated directly, this may be why GVCC administrators talked very little about the engineering program when interviewed and why the engineering faculty member felt neglected, even "shunned."

While the community college struggled to provide a program to bolster the engineering pipeline concept, the university was still at the drawing board attempting to create a program that would allow Green Valley residents to earn a four-year engineering degree without leaving the community. The branch campus lacked the resources to develop an engineering program. Such a program would require labs, faculty members, and expertise the branch campus did not have. In addition, establishing a standard engineering program would require approval from the main campus. Since the main campus housed a large College of Engineering, it was unlikely they would approve of an engineering program at the branch campus. The only option that remained would be to create a modified engineering program, a program that addressed market needs, could be offered with limited resources, and did not replicate a program offered on the main campus. At the time of this study, branch campus administrators had not conceptualized such a program. The champions of Tech Futures, Gerald Simmons and Bridget Halpert,

had differing roles supporting the branch campus. The role of State Science Network was symbolic only—Bridget, whose role it was to connect specifically with community colleges—had not engaged with the branch campus in any substantive way. Gerald Simmons, on the other hand, moved as freely into the four-year sector as he did into all other organizations involved in Tech Futures. Gerald had identified a program he thought could fill the four-year void, at least to an extent. Systems Engineering was a hybrid program, offered part online and part on the university's main campus. By taking two years at the community college, one year online, and then moving to the main campus for their final year, students could complete a four-year engineering program by leaving the community for only one year. As with other program components, Gerald borrowed this program from a model the university was running elsewhere in the state. While this option would not involve the branch campus, it was one step better than sending students away for a traditional engineering program. However, there was some disagreement that Systems Engineering would provide the skills needed for jobs in Green Valley. An executive of the branch campus voiced this sentiment.

Recently, they latched onto a clear idea that they need something like the [university] engineering program at [other state location], in conjunction with [their local community college]. I don't think they really want that if they look at it really close and I think [Gerald] is starting to get that, but what they want is an engineering program that can be offered locally.

In an effort to get some viable option on the ground, Gerald had found the Systems Engineering model. However, it was yet unproven whether that program was a match for

the local economy, not to mention the fact that students could not complete it without leaving the community.

The academic programs comprising the envisioned STEM education pipeline in Green Valley had serious obstacles to overcome. The high school engineering program and the community college bridge program were in active competition for students, though both programs had healthy enrollments. Neither the community college nor the university branch campus had a viable program to help students acquire engineering education. While the Tech Futures Initiative was only a couple years old at the time of this study, solutions for the problem of academic incompatibility were nowhere in sight.

Student Pathways

In addition to the initiative's struggle to provide viable engineering academic programs, student motivations and enrollment patterns challenged the concept of cultivating a local workforce. Both the high school engineering program and the community college bridge program enrolled, depending on the year, around 75 high school students per year. As part of these programs, students were required to take advanced academic programs, such as Calculus, likely putting most of them in the top third to quarter of students in the high school in terms of academic preparation and capacity. The Tech Futures Initiative hinged on being able to retain these students in the community. In addition to not being able to provide a viable engineering program in the community, the initiative faced the challenge of natural attrition. Top students were unlikely to want to stay locally with such a dearth of educational opportunities. Of the handful of bridge program students interviewed for this study, only one had plans of

staying in the region and only two planned on staying in the state at all. Nearly all of these students seemed to consider staying close to home to be selling themselves short. The same ambition that inspired them to pursue a rigorous bridge program, seizing an opportunity to earn free college credit, also motivated them to pursue challenging majors at far-away universities. Just as the key stakeholders of the Tech Futures Initiatives had surmised, keeping engineering students local would be a challenge.

The unmanned aerial systems (UAS) academic programs developed by GVCC, with help from Aerotron experts, was another educational product of the Tech Futures Initiative. Though UAS graduates did not have the four-year engineering degree stakeholders sought, they would fit well into the local job market, especially if Green Valley became a UAS Center of Excellence. However, there were two problems with the UAS program when it came to cultivating the local workforce. First, among the approximately 15 students in the UAS program, none had come up from the high school pipeline. The UAS students were often older, and many were from various places across the country, from Minnesota to Florida. Many had already earned or were earning their pilot's certificates and planned on combining UAS with aviation as a career. Another avenue for UAS students GVCC hoped to draw was former military servicepeople already familiar with UAS who, after retiring from the military, would earn the UAS degree and move into the civilian UAS space. These were not local students but individuals for whom the UAS program filled a particular, calculated career interest that had developed over time. The second reason why the UAS program failed to cultivate the local workforce was that UAS students did not plan on staying locally to work. As

mentioned, many were from across the country and planned on returning to their home communities after completing the program. Some already had a foot in the UAS industry, either from family connection or previous work. None of the handful of students interviewed voiced an intention to stay locally.

The Tech Futures Initiative faced real challenges when it came to achieving their goal of retaining local students for STEM jobs, specifically engineering jobs. Engineering programs were virtually nonexistent, meaning students could not progress beyond college-level math and science courses. And students who were ambitious enough to pursue those courses while in high school were very likely to transfer to universities elsewhere in the state or in other states. Green Valley did not have the infrastructure to achieve the goal of Tech Futures. Its unique location and limited educational resources made it a place where, ironically, engineers could make a good living but not be created.

Conclusion

Perhaps the most consequential finding presented in this chapter was the informal and uncoordinated nature of the activities associated with the Tech Futures Initiative. The absence of formal coordination and planning, particularly on the part of the community college at the center of the coalition, set the stage for external actors—Gerald and Bridget—to navigate the activities of the institution through individual, day-to-day interaction. When it came to encouraging action, these champions, particularly Gerald, were able to influence organizational decision-making, such as the college's decision to provide the first half of a bachelor's degree in Systems Engineering. However, when it

came to the complex and detailed work of linking educational sectors to form an engineering education pipeline, the champions had not succeeded. Curricula conflicted, academic departments refused to respond, and student enrollment reflected other priorities. Ultimately, Green Valley was no closer to its goal of creating local engineers than before the Tech Futures Initiative had begun. From the angle of neo-institutionalism, the effort looked and sounded good, signaling success at the symbolic outer level, but fundamental problems abounded in the technical core.

One on hand, the absence of shared coordination may have served as a buffer and protection against outside influence. The fact that Gerald and Bridget faced a misaligned system that was slow to respond to their involvement meant their influence was less pronounced than it may have been had activities been more tightly coordinated and rationally executed. On the other hand, failure of institutional leaders to deliberately and collectively engage with the coalition may have thwarted the efforts of those attempting to develop the pipeline. A more concerted effort may have resolved disputes and aligned systems. However, the lack of coordination may have signaled a deeper problem—a failure to plan and act thoughtfully, prudently, and deliberately on the part of community college leaders. If the Tech Futures Initiative was designed to create engineers and UAS pilots out of the local population, the fact that the pre-engineering high school students were transferring out of the community instead of pursuing engineering at the college and UAS students were coming from outside the region rather than from the local population. The problems creating these situations were so fundamental that they were unlikely to be resolved through coordination. This underscores the importance of discussion, thought,

and deliberate action on the part of college administrators. The passive stance of the administration not only allowed outside actors (Gerald and Bridget) to freely influence college activities, it failed to ensure that the programs and services being employed actually served the local population. The one group putting thought, research, and even coordination into how to assist the local population was the STEM Learning Council mentioned above. Ironically, this group was running parallel and in many ways behind the other STEM activities associated with the initiative. Instead of collectively researching and assessing the local population first, the council's research was being collected while the other programs were being built. As it was, despite continual investment and involvement from Gerald Simmons and SSN, programs and services under the Tech Futures Initiative failed to produce the results hoped for by those who initiated the program.

CHAPTER 7: DISCUSSION AND IMPLICATIONS

The purpose of this study was to answer the questions, “Why do organizations, particularly the community college, engage with other organizations in support of educational initiatives,” and “How do those initiatives influence the operations and outcomes of the college?” The findings presented in the previous two chapters suggest that the community college in Green Valley was faced with several different streams of compounding influencers at both the state and national levels, including individuals, organizations, and monetary incentives, all encouraging the college to pursue STEM education programs—particularly programs in Engineering and Unmanned Aerial Systems. These compounding forces resonated with particular strength in the unique environment of Green Valley, where, miles from the nearest city, industries and many of the more powerful constituencies considered engineering and unmanned systems the key to Green Valley’s future. Responding to these factors, college leaders engaged with outside individuals and organizations whose purpose was to create STEM programs and services to produce local workers. But the college’s efforts did not include centralized planning or coordinated action, leaving the true influence to “champions” from other organizations, who moved more deliberately and aggressively to make change within the college. Ultimately, the initiative to produce an education pipeline from the high school through the university suffered challenges and breakdowns at virtually every step. While leaders of organizations involved in the coalition were able to speak a compelling message about the initiative’s role in the future of Green Valley, the day-to-day operations of the initiative failed to produce any of the desired effect.

For administrators at Green Valley Community College, the activities and organizational behaviors associated with the Tech Futures Initiative did not represent a departure from what they considered expected practice. For them, it was business as usual. Partnering with outside organizations, creating academic programs based on employment demands, pursuing grant funds—all of these activities symbolized the kind of work administrators at GVCC were supposed to do. In fact, it represented the kind of work done at other colleges striving to be successful as well. It is because the findings presented in the previous two chapters were based on what would not be considered unusual practice that their implications are so significant.

As voices calling for community colleges to play a more substantial role in preparing the workforce of tomorrow become louder and more insistent, institutional leaders and policymakers will face difficult decisions about how to best serve their constituents and how to position themselves for the future. As state allocations for higher education in general become smaller and smaller, with what money is allocated being tagged for certain specified purposes and outcomes, institutional leaders and policymakers will face pressure to preserve the mission and operation of the college. And as outside organizations, often facing similar economic pressures, come in greater numbers to the doors of the college, looking for trained, credential employees, institutional leaders and policymakers will face new challenges and opportunities regarding the direction of individual institutions and of the community college system collectively. Following are implications of this study for community college leaders.

Riding the Streams and Currents of External Forces

The Tech Futures Initiative represented a wide variety of activities taking place in Green Valley to increase the number of students educated and credentialed in STEM subjects. These activities were motivated and incentivized at the national, state and local levels. The breadth and depth of the STEM education movement are vast, with encouragement and rewards promoting STEM education coming from multiple tiers of society. The STEM activities in Green Valley were encouraged by government, non-profit, and private organizations locally, at the state level, and nationally. At each level, organizations offered a unique set of motivators and rewards, from grant funding to authoritative statements and documents to individuals who became personally involved in the initiative. I compared these different tiers of organizations with their respective drivers to streams combining together to create a powerful, motivating current. My purpose in doing so was to demonstrate that by developing the Tech Futures Initiative organizations in Green Valley were responding to a combined array of forces encouraging STEM activities. This was demonstrated by the tendency of individual interviewees to describe forces at each level influencing the initiative. They talked about the national shortage in STEM-educated employees, the desire for State Science Network to build STEM throughout the state, and the opportunity to establish STEM as a competitive advantage locally. National, state, and local forces exerted powerful pressure to act, and when action was taken it was in response to a current of forces. No single incentive encouraged the STEM initiative but a series of aligned incentives.

Potential and actual revenue generation was an important incentive for the community college. Partnering more tightly with industry and initiating and furthering STEM activity would qualify the institution for grants at the national and state levels. Further, the possibility of becoming a UAS Center of Excellence, as classified by the FAA, motivated the college to partner with Aerotron and create academic programs in unmanned aerial systems. To the college, UAS could become a “competitive advantage.” This demonstration of market behaviors is compatible with the theory of academic capitalism. The theory asserts that as institutions of higher education seek increasing revenues, particularly at a time of diminishing public funding, they adopt behaviors necessary to capture funds from students, the public, and external entities (Slaughter & Rhoades, 2004). STEM and UAS would bring to GVCC more of the revenue necessary for survival.

But the desire for revenues alone did not drive GVCC to pursue STEM. Responding to the chorus of voices at the national, state, and local levels calling for STEM education and STEM employees would demonstrate the college’s legitimacy and justify its economic development mission. Adopting behaviors reflective of societal norms as a way of garnering legitimacy, power, and influence is described by neo-institutional theory (Meyer & Rowan, 1977). In this light, pursuing STEM would demonstrate that GVCC was responding to the local, state, and federal shortage of STEM graduates and employees. The college would be doing what a community college should—preparing workers in high-demand fields. And by so doing, the college stood to be seen as a progressive, relevant organization in the community and in the field of

colleges. The opportunity to boost the college's image by becoming a leader in STEM served as a powerful motivator to engage in the initiative.

The multi-faceted nature of STEM motivators, the many streams combining to form the STEM current, warrants careful consideration regarding its implications for policy and practice. For one, the nation-wide push for STEM education should be seen not only as an opportunity for institutions to move in a certain direction but as an array of pressures on institutions to pursue certain activities that may or may not be core to their functioning. In other words, community colleges should not only see the positive aspects of the movement but the potential drawbacks as well. It was apparent that employees of GVCC saw the forces driving STEM as an opportunity for the college to become a leader in a field that was so relevant to the local community, but few saw the potential drawbacks inherent in pursuing STEM as an institutional priority. Few pointed out the fact that engaging more extensively in STEM would naturally mean dedicating fewer resources to other areas of the college. Establishing an awareness that national education movements are not just opportunities to pursue incentives but outside influences and forces exerting pressure, sometimes layers of compounding pressures, on the college will prepare institutional leaders to make balanced decisions regarding the direction of the institution. Pursuing grants and responding to calls for change should be deliberate decisions made by community colleges rather than automatic responses, because such action shapes the operations and outcomes of the institution.

Policymakers, those determining the mix of grant funds and composing authoritative calls for change should also consider the power of the STEM current in

creating a potential imbalance among institutional priorities. GVCC and East Hills administrators admitted they pursued STEM grants because more STEM grants were available than grants supporting other academic areas. Consistent with academic capitalism, in the absence of balanced incentives, institutions will be compelled to shuffle resources into projects and programs where they perceive the greatest potential for gain. Researchers and policymakers should carefully consider the effect such powerful currents can have on the decision making and direction of individual institutions, ensuring that incentives to support a variety of institutional activities and outcomes are offered. In short, it falls on policymakers—those overseeing the allocation of grant funding and the establishment of governmental priorities—to ensure that education systems refrain from becoming homogenous. It is the nature of private industry to capitalize on market forces. Public entities, such as governments, must protect and preserve aspects of the education system that are prone to being naturally neglected by the private sector and free-market economy. State Science Network’s commentary on converting schools into STEM institutions, where every subject is taught in relation to its relevance to STEM, should concern policymakers, whose role it is to ensure a diverse and complete education system.

The above implications are based on a certain perspective about the relative level of control institutions of higher education have on their own operations. Below, I draw upon opposing perspectives to create two models of institutional control. This is done in an effort to highlight the relative influence external pressures, or currents in my model, have in guiding institutional response, with the Oars and Rudder Model representing

relative control on the part of the institution and the College Adrift Model representing relative control on the part of external forces.

The Oars and Rudder Model

I return to the image of the river, where STEM education consists of a powerful current made up of several streams of influence. Expanding the image, colleges and universities operate under the influence of a variety of currents, each driven by its own associated incentives and influences. In determining a college's responsibility to pursue an appropriate set of programs and services, it is important to establish whether a college has the ability to do so. The Oars and Rudder Model suggests that colleges can take deliberate action to determine their direction—that things like strategic planning, allocation of resources, and relationship management serve as devices (oars and rudder) to effectively control institutional direction.

Though the Tech Futures Initiative did not involve centralized planning and coordination, by attending a lunch meeting with Aerotron employees to establish a partnership, executives demonstrated their belief in taking action to determine institutional direction. Such is the everyday behavior of institutional leaders. In the Oars and Rudder Model, institutions deliberately pursue appropriate grants and respond to outside influences in order to achieve their mission and objectives. Acting on enrollment statistics other data on the performance dashboard, administrators carefully guide the institution on a chartered course. In this model, college executives deliberately maneuvered into the STEM waters, not recognized as a powerful current, because those waters were consistent with the chartered course of the institution. Perhaps the most

appropriate word to describe the Oars and Rudder Model is “control.” In the model, the college believes it has relative control over its operations, direction, and outcomes.

This model is related to Birnbaum’s pool theory (1988), and is present in assessments by Rhoades (2000) and Birnbaum (2000). All of these pieces submit that institutional leaders often believe they have more control over direction and outcomes than they actually do and that this line of thinking can negatively impact the institution by leading it to pursue unfruitful activities.

The College Adrift Model

In contrast to the Oars and Rudder Model, where college leaders guide the institution through deliberate action, the College Adrift Model sees the college as a ship without oars or rudder, riding waves and currents as they arise. In this model, the college pursues the direction of the strongest currents, swishing back and forth across the river as currents ebb and flow. The term “out of control,” as a contrast to the “control” of the other model, probably paints too strong an image to be accurate. A more appropriate descriptor for this model might be “influenced.” Taking a reactionary stance, college leaders respond to incentives and influences exerted on the institution. If lucrative grant opportunities become available or people in positions of power make statements, college leaders take action. Leaders may see this action as pulling out the oars and paddling in a deliberate direction, but the model suggests that it is actually the ship moving naturally under the most forceful current at the time.

In this model, the STEM movement is a powerful current to which college response was inevitable. In the Tech Futures Initiative, as GVCC leaders found they did

not have the time to focus on the initiative, by implementing grants and responding to outside influence, the institution moved in the direction of the STEM current even without the involvement of leadership. The College Adrift Model does not assume institutional planning and coordination do not occur but that these activities do not significantly influence the direction of the institution. Instead, leadership activity only serves to either respond to external currents or demonstrate symbolic action. To this latter point, the College Adrift Model supports the notion in neo-institutional theory that leaders serve a symbolic function in the institution (Meyer & Rowan, 1977). However, a key difference between this model and neo-institutional theory is that in the theory the technical core is preserved from outside influence through the efforts of leaders to buffer day-to-day operations through symbolic action. In contrast, the Adrift Model suggests that the technical core, the operations of the college, are influenced by external forces and leaders' efforts to strategically guide the institution serve the same kind of symbolic function as their efforts to respond to external forces in neo-institutional theory.

In addressing the relative influence of institutional leaders, Rhoades (2000) submitted that the common image of a symphony under the direction of a conductor was ineffective in explaining the operations of a university. A more accurate comparison, according to Rhoades, would be a jam session, with leadership serving only as the manager facilitating the session rather than guiding the direction of the music. The College Adrift Model supports this notion that colleges respond to external influences and incentives, or currents, rather than to deliberate efforts by leaders to steer the institution. As in Birnbaum's perverse black box (1991), leaders' efforts to lead

sometimes result in action consistent with the inevitable current, in which case leaders overestimate the effect of their efforts. And when efforts to lead contradict the current and plans dissipate or lead to failure, leaders excuse the outcome and move on.

Summary

It is likely that neither the Oars and Rudder Model nor the College Adrift Model perfectly and completely represents how colleges function. But the two models demonstrate two very different viewpoints in terms of the role of leaders, the effect of deliberate efforts to guide the institution, and the outcomes of the college in general. In reality, colleges function somewhere in between the models, with institutions and outside influences both having an effect on the institution. My purpose in proposing the two models, and to the image of streams and currents, is to draw attention to the forces that determine the direction and outcomes of the institution. Considering the relative size and strength of the oars and rudder under the power of the current helps one to see that institutions operate under external incentive structures, forces, and pressures with varying levels of influence. Also, efforts to guide and direct the institution do not exist in a vacuum, but, even at best, respond in some respect to outside influence. Developing such a perspective should help institutional leaders and policymakers see opportunities and challenges in their role to ensure the institution moves in directions that are effective and equitable, despite the influence of external currents. In other words, even if the oars and rudder are short and narrow and the current is wide and strong, it behooves leaders to keep their heads up and paddle with all their might.

Champions as Navigators

Utilizing the river analogy, the influence of the STEM current was significant in the decisions made by institutional leaders to develop and participate in the Tech Futures coalition. And while the current wisped coalition partners down certain channels, external actors served as navigators, narrating and guiding the efforts institutions did put forward to make decisions. Gerald Simmons from Aerotron and Bridget Halpert from SSN played significant roles in how institutions perceived STEM education and the decisions they made to develop new programs and services as a result. Gerald Simmons in particular was perhaps the most pronounced feature of this study. Embedded in literally every aspect of the Tech Futures Initiative, from conception to the completion of this study, Gerald served as the quintessential navigator. Personal charisma, a career's worth of experience, connections to Aerotron and a variety of other players, and the time and energy needed to sustain involvement gave Gerald huge influence in Green Valley STEM activity. He was everybody's best friend, a recognized expert and master of the subject matter, and an ever-present force for good, as perceived by coalition partners. Aerotron executives were correct when they said they had brought in the right person for the job of building Tech Futures. And because Gerald was universally seen as the right person, he was given free-reign to explore and develop different components of STEM education as he saw fit—one day introducing high school engineering faculty to Aerotron executives, the next day meeting with college and university administrators to develop the Systems Engineering degree. In addition, Gerald pulled from other models of STEM education collaboratives developing in other parts of the country, often partnerships

between Aerotron and the education sector. Access to and experience with other models gave Gerald extra credibility in the eyes of Tech Futures stakeholders. Pulling from other models also played a norming function for the program. It made Tech Futures more like programs of its kind, in turn making the approach to STEM education in Green Valley similar to other approaches. On one hand, this normative isomorphism made Tech Futures more likely to succeed, because it allowed the initiative to replicate other successful models. On the other hand, replicating other models reduced variety and the ability for the initiative to adapt to circumstances unique to Green Valley.

In addition to being embraced as navigators of STEM education in Green Valley, Gerald and Bridget became connected themselves when Bridget introduced Gerald to SSN and made him an advisory board member. The connection of the champions and navigators of Tech Futures made it more likely their efforts would be strengthened, their effects on the institutions involved magnified. In addition, a closer association would naturally lead the two to establish similar perspectives and approaches. Their outlooks on STEM education, already similar, would become homogenous.

Perhaps the most significant implication regarding Gerald and Bridget was that they represented organizations outside the academe but sought to influence the educational institutions involved in the initiative, especially GVCC. Ironically, the most applicable connection to resource dependence theory in this study may not have been to the educational institutions but to the organizations represented by Gerald and Bridget. RDT suggests that organizations will develop behaviors to maximize their control of external resource providers (Pfeffer & Salancik, 1978). To the private sector represented

by the two navigators, credentialed graduates served as a critical resource and their stated purpose for participating in STEM education initiatives. And neither Aerotron nor the STEM industries represented by SSN had the ability themselves to credential their employees. The private sector is in the precarious position of relying on trained and credentialed employees but having a total inability to produce these employees whenever education credentials are required. Nor is it possible for the private sector to exercise the most effective strategy to control resources and acquire educational organizations through merger or takeover. By utilizing Gerald, Bridget, and SSN, the private sector was taking the next best avenue in accordance with RDT principles by incorporating coordinating strategies. Joining advisory boards, garnering influence over top institutional leaders, and developing working relationships with decision-makers across the institution would help Gerald and Bridget, and in turn the industries they represented, to control the output of credentialed STEM employees.

Because Gerald and Bridget represented the STEM movement to which colleges and university subscribed, and because they, as individuals possessed the characteristics described above, they were often allowed to navigate and give direction to GVCC regarding all things STEM. Even though the two represented outside organizations, the fact that the missions and goals of those organizations might not in every case align with those of GVCC was not mentioned as a concern of the college administration. Instead, college administrators and even executives took direction from Gerald and Bridget when it came to STEM. The two navigators were allowed into the technical core of the institution to guide operations. In fact, executives were glad that there was someone with

the time and energy to move STEM activities forward at a rate faster than would have been possible without them.

Seeing Gerald and Bridget as navigators within the river analogy reveals the important implications these two individuals represent. Many members of the Green Valley STEM coalition admitted that without Gerald's constant involvement, the activities associated with the Tech Futures Initiative would not have been possible. Through a surprising level of influence, Gerald and Bridget helped GVCC ride the STEM current in new ways. They were responsible for the budding network of interpersonal connections surrounding STEM in Green Valley. They both provided personal support and Bridget provided monetary resources to make programs such as the engineering bridge program and the Systems Engineering program a reality. Navigation provided by Gerald and Bridget immersed Green Valley in STEM like it never had been before. But because immersion in STEM had long-term implications for the institutions involved, especially GVCC, institutional leaders should also be aware of the implications of the involvement of figures like Gerald and Bridget. Creating programs and services through personal influence or seed money provided by grants commits GVCC resources to certain activities for the long term. And because the institution has a limited pool of these resources—money, administrative time, and personnel—dedicating resources to one set of activities means not dedicating them to another. In that light, allowing outside influences to direct activities, without the institutions oversight in terms of planning and coordinating those activities, means the institution is putting its resources into the hands of external constituents. And because it can be assumed that external entities are not

always perfectly aligned with the institution's goals and priorities, or what those goals and priorities should be, this implies at least some degree of waste and misdirection—resources leading the college away from optimal functioning.

The way in which external actors approached GVCC with the time, focus and dedication necessary to be involved in ways far beyond even the institution's own administration was able to do has important implications for practitioners and researchers. Practitioners, such as administrators, should consider the influence individuals from outside the institution, or even from within the institution, have on the institution's functions as a result of personal characteristics or because they have the time and resources to do so. An important part of the definition of a champion in literature on partnerships is a person who dedicates time and energy to a particular initiative. In this light, internal and external champions influence an institution's programs and activities every day. The findings of this study should lead a practitioner to more carefully observe whether the commitment of institutional resources occurs more as a result of particular individuals involved or because of intentional institutional decision-making. Special scrutiny should take place when those individuals represent interests outside the institution. This also represents an important area for research. Better understanding the influence of certain individuals over institutional decision-making and the commitment of resources will help administrators keep a balanced and measured perspective. Finally, this study's findings on champions can also serve practitioners in a sort of unconventional or even perverse way. The approach by Gerald and Bridget may suggest that the key to influencing the decision-making and direction of an institution is to

dedicate more time and focus to particular areas than the other person, especially when the areas of focus are seen as positive, progressive, or mission-critical. Being seen as experts on STEM, and consistently driving that one area allowed these champions great influence over institutional programs. This suggests that by becoming a perceived expert and by dedicating time and energy to a particular area of interest, an administrator or an employee may have unusual influence over institutional processes. Taking the administrators involved in this study as an example, leaders may find themselves with the desire but without the time and energy to focus on even important topics, and may therefore be more likely to delegate influence to those who do.

The Collective Narrative of Tech Futures

When the Tech Futures Initiative was officially kicked off approximately two years before this study was conducted, in the minds of coalition members it immediately encapsulated a wide variety of STEM activities in Green Valley. Some of these activities had already existed, even for a number of years, such as the GVCC bridge program for high school students. Other activities were thrust forward as a result of the increased communication and collaboration introduced by the initiative. For example, faculty in the GVCC Aviation Program had begun to work with experts at Aerotron to develop the curriculum for two associate's degrees in unmanned aerial systems. The college had already earned a grant from State Science Network and would earn another grant from the NSF with help from SSN, their application strengthened by their recent efforts to strengthen ties with STEM partners. The Tech Futures Initiative brought past and future STEM activities together into one unified concept. As one Aerotron employee

mentioned, there was value in this integration of STEM. She said, “Just using the terms. Getting the people together. Having everybody associated with it, really does pull people together for a cause.” In addition to the programs and services developed under the Tech Futures Initiative, the concept of Tech Futures had value as a narrative to the organizations involved and created a collective narrative between coalition partners, which brought meaning, purpose, and legitimacy to organizations and strengthened connections between organizations.

Implications Within Institutions

The way in which Tech Futures as a narrative, a story, helped the leadership at GVCC garner support and collaboration among employees demonstrates the symbolic importance of initiatives like STEM education. As previously mentioned, the GVCC administration may have made certain strategic decisions to pursue STEM, such as the decision to pursue an NSF grant, but the administration certainly did not control all the forces pushing them toward greater involvement in STEM. However, by creating a narrative in which the institution deliberately sought to become a recognized leader in STEM fields and unmanned aerial systems, college leaders created the perception of deliberation action and strategy—a perception of control over their future. Writers like Birnbaum (1991) and Bolman and Deal (2003) explained the role of leaders in narrating institutional action, even when they do not control many actions and outcomes. Utilizing my river analogy, as the college rushes down currents and through channels, the successful leader, according to these authors, is one who is able to explain to the crew on board what they are seeing and what it means. In literal terms, the leader’s role is to

create a constructive and compelling narrative from trends and influences affecting the institution. Such leadership inspires willing action on the part of college employees and creates synergy as employees rally around the various components of the narrative.

For GVCC administrators, the Tech Futures Initiative represented an opportunity to consolidate and promote the STEM education narrative. It was evident they had seized that opportunity. Interviewees throughout the college shared a similar narrative about the college's future in STEM. That narrative had been thoroughly disseminated throughout the institution. Components of the narrative included the college's leadership role in helping to solve the national shortage in STEM-educated employees. Further, the college was a key partner in the region's efforts to become a hotspot for the commercial application of UAS. At the local level, the college was a vehicle for filling STEM jobs in the local economy. There were common pieces of an overall STEM narrative that permeated the institution. Despite the loose coupling of STEM activities within the institution and the external forces driving institutional action, the STEM narrative within the college described STEM activities as unified and part of a calculated strategic decision to ensure the survival and prosperity of the institution. Framing STEM activities at GVCC in such a way increased support for and understanding of institutional behaviors.

Implications Between Institutions

Just as Tech Futures gave the community college an opportunity to create an institutional narrative, the initiative did the same for members of the coalition collectively. In the collective narrative, Tech Futures represented the creation of a team

of organizations, working together to achieve a common goal, a goal that would lead to the prosperity of the entire region. Despite the many challenges faced in creating a pipeline for STEM education, interviewees held up Tech Futures as a winning concept. Tech Futures was a concept inextricably connected with Gerald Simmons, who was seen as the founder of the initiative and its leader. This underscores the role Gerald played in transmitting the Tech Futures narrative to coalition members. Because he had regular interaction with the wide variety of individuals involved in the initiative, he had a key role in telling the initiative's story. Many individuals communicated more with Gerald than they did from the leaders of their own organization in regard to STEM education in Green Valley. Because of his role as the common denominator between organizations, Gerald coordinated the collective Tech Futures narrative. For example, this is why high school faculty members, military executives at Fort Kenton, and GVCC executives were all familiar with a STEM high school in another state. Gerald had told each of them about it, and they had folded it into their own Tech Futures narrative. Subscribing to the collective narrative allowed organizations to see themselves as part of a larger effort, drawing organizations closer together. Although relationships between organizations were still strained at times and contact was still infrequent, many coalition members attributed initiated or increased contact between organizations to the Tech Futures Initiative. In Tech Futures, narrative played the role of symbolic action, as described in neo-institutional theory. As the theory suggests, narrative allowed key figures throughout each organization to communicate buy-in and support for the initiative even when those working in the technical core of the initiative, those building the day-to-day programs and

services to bridge institutions, wrestled with challenges. As with the event described at the beginning of Chapter 5, key stakeholders were able to convene to celebrate the concept of STEM education and the efforts taking place in Green Valley, instead of arguing about failure to articulate courses and build academic programs, because they subscribed to a similar narrative at the symbolic level.

The role of narrative in the Tech Futures Initiative demonstrates the value of story in the organizational operations and in partnerships between organizations. Successful leaders are able to contextualize institutional action. They see the direction the institution is headed and the forces determining that direction, and they create a narrative to explain the institution's reaction to those forces. This empowers employees to act and to act in concert, when necessary, in order to maintain the operations of the institution. Building coalitions requires buy-in, trust, and collaboration. Those responsible for building partnerships should understand the value of narrative in developing common goals and building relationships.

When Students Win and When They Lose

The Tech Futures Initiative had implications for the organizations involved, particularly the community college. The initiative meant a greater commitment to STEM education, which meant the dedication of resources to STEM activities. In an environment of scarcity, where resources are limited, dedicating more resources to STEM meant dedicating fewer resources to other areas. Interviewees expounded on the advantages and disadvantages of that prospect. While the Tech Futures allowed GVCC to create new UAS programs, some were concerned funds would be diverted away from

the liberal arts. While the initiative strengthened communication and relationships with industry, some were concerned that industry would play too strong a role in determining institutional action. And while the initiative meant greater funds flowing into the college from State Science Network, that organization desired to change the culture of education to make STEM the center of all academic subjects. Because many of the technical aspects of the initiative were, at the time of this study, still undeveloped, many of the anticipated benefits and drawbacks of the program had not been realized. Many hopes and concerns were still theoretical. Still the initiative represents certain trends in higher education that have real implications for institutions and ultimately for students.

Perhaps the most pertinent issue introduced by the STEM movement in Green Valley is the concept of homogenization of the curriculum. As money, policies, and people flow into institutions to strengthen education in STEM subjects, institutions risk diminishing their effectiveness in other academic areas. The money, time, and attention required to create an academic program in STEM subject is money, time, and attention not spent to create or sustain a program in another subject. Classroom time spent discussion STEM topics is classroom time not spent discussion other topics. If carried to the point of imbalance, allocation of excessive resources to STEM could limit an institution's ability to create well-rounded citizens. In such an equation, subjects least relevant for employment in STEM jobs would likely be most negatively impacted—arts, humanities, music, and other topics that help to transmit culture and diversify perspectives.

As studies on how the U.S. continues to fail to produce its share of individuals educated in STEM subjects, educational institutions will continue to be pressured to dedicate increasing levels of resources toward STEM. Educational leaders, researchers, and policymakers should seek to understand the effects of this movement on other areas of learning. In specific, communities such as Green Valley, where the local economy, workforce, and organizations in positions of power disproportionately lean toward STEM, are an important area of focus. This type of area may stand a greater risk of becoming homogenized and failing to provide opportunities for citizens outside of STEM. While efforts to strengthen STEM education may lead to a stronger economy, we must ask what we lose in the process.

In addition, college leaders must carefully consider the implications of certain actions on their constituencies. While Green Valley is home to a military population, including many individuals working in the STEM fields, it is also home to much older communities consisting of many lower-income, Hispanic families with parents who did not attend college. Many of these families have been in the region for generations. Whether looking at the children of the above STEM employees or these long-established communities, GVCC leaders must carefully consider how a program like Tech Futures will affect the local citizenry. While many coalition partners commented on the future of STEM education and the UAS industry, very few even mentioned the unique demographics, needs, and perspectives of the local population. As stated by Daugherty and Bakia (2000), “Community colleges tend to define community in a way that makes employers the central constituents of the ‘community.’ There is little to no consideration

of the possibility that on occasion the interests of the community and of employers might actually be opposed” (p. 221). Tech Futures represents this danger in a very real sense. In their desire to aggressively build a STEM education pipeline for the workforce needs of the local community, college leaders should have spent more time exploring whether the local low-income, first-generation, Hispanic youth were prepared for and interested in traveling that pipeline. One could argue that it is the primary role of private organizations to find employees and make profits, while it is the role of a public community college to carefully consider how to benefit local citizens through education. Those two roles are not always congruent. Community college leaders should not assume that organizations such as those endorsing “Rise Above the Gathering Storm,” and those funding the State Science Network have the best interests of their local community in mind. It stands to reason that those organizations are pursuing more STEM employees, and they have the political, economic, and social influence to create the kind of powerful current demonstrated in this study. But community colleges have the opportunity to buffer their local citizens from influences that would homogenize educational programs, limiting options for individuals not served by those programs. Resisting such powerful currents will require careful examination, discussion, and planning on the part of college leaders.

Conclusion

The Tech Futures Initiative was a complex educational coalition taking place in a unique setting. The set of incentives, pressures, and influences encouraging a more aggressive pursuit of STEM education programs was multi-faceted and took multiple

theories to explain. While the goal of the initiative was straightforward—to create a pipeline from high school to a four-year engineering degree—the setup was complicated and at times confusing. The coalition was not led by a centralized body of representatives, a group to plan and coordinate the activities of the initiative. Instead, STEM activities were loosely connected and mostly independent from one another in terms of the organizations and individuals involved. This made the coalition susceptible to the influence of individual actors outside the educational organizations involved. Those with the time, focus, and expertise to influence activities were at liberty to do so. At the symbolic level, leaders of organizations supported a common narrative. At the technical level, that narrative tended to break down, as programs and processes failed to coordinate and at times conflicted. The initiative was relatively young at the time of this study. Over time, the technical components of the STEM pipeline may align with the great symbolic support it had from the beginning. But the strengthening of STEM activities has implications for organizations involved and ultimately for students.

This case study stands as one exploration of an increasingly common phenomenon. Partnerships, particularly those between institutions of higher education and outside government, private, and non-profit organizations, are relied upon to pursue common goals regarding workforce development. This study demonstrates the need for further study on the part of researchers and deeper consideration on the part of policymakers and institutional leaders. The need for deeper exploration is particularly pertinent for the community college, an organization at the center of this study and of many of these kinds of partnerships. Espousing a workforce development mission and

facing declining public funding, community college leaders are seeking ways to more efficiently accomplish their objectives while demonstrating that they are more relevant than ever to the economy. As a public institution often funded by taxes at both the local and the state level, the college has an obligation to serve its community and create well-rounded citizens. To fulfill this obligation and not simply turn the oars over to the individuals and organizations with the greatest power, resources, and interest to command the ship, community college leaders must be thoughtful and deliberate in how they act. Instead of riding every powerful current that comes along, for the sake of the local citizenry they serve, it behooves college leaders to row with all their might in the direction that serves their people best. Rowing involves learning about and listening to all constituents, particularly those without the kind of power and influence others may have. It also involves thoughtful, deliberate planning. We learn from Green Valley that in the absence of planning and coordination institutions run the risk of following whatever current is strongest, whatever influence seems to promise the greatest economic, political, or social reward. Finally, rowing involves continually finding a balance between the many constituents the college seeks to serve, recognizing that the desires and objectives of these constituents can conflict. Nearly all of the studies on community college partnerships presented above carry the assumption that creating grand and numerous partnerships with outside organizations is always a good thing for colleges. This should not be assumed. Finding a balance will require college leaders to be deliberative about the relationships they develop with outside organizations. At times, this may require the college to lessen its engagement with some organizations in order to

preserve its limited resources, and at times it may require the college to seek new relationships in areas important to the success of local citizens but not strongly represented by private interests—areas such as liberal arts education and small businesses.

Initiatives like Tech Futures promise to change the way community colleges function in terms of who is involved in decision making and how they serve students. These partnerships are likely to only increase in the coming decades, as the private sector becomes increasingly involved with public educational institutions. As colleges move into this more collaborative future, it behooves them to do so with both eyes open.

APPENDIX A: INTERVIEW QUESTIONS

General Interview Questions

1. What is the Tech Futures Initiative?
2. What is your role in the Tech Futures Initiative and STEM education?
3. What organizations are involved in this program?
4. Describe the events surrounding the creation of the Tech Futures Initiative and the beginning of your organization's involvement in the program.
5. Where have those involved looked for information or a reference on establishing this kind of partnership?
6. What organizations are encouraging the development of the Tech Futures Initiative?
7. How are those organizations encouraging its development?
8. Why is your organization participating in the Tech Futures Initiative?
9. What role does revenue generation play in the Tech Futures Initiative?
10. What individuals and units within your organization are involved in the Tech Futures Initiative and in what capacity?
11. What other organizations do you and your organization interact with as a part of the Tech Futures Initiative?
12. Describe these interactions.
13. In what ways has the partnership changed your involvement with or connection to the organizations involved?
14. What resources does your organization contribute to the program?
15. In what ways has your organization shifted funding or other resources to serve the partnership?
16. What new jobs have been created as a result of the Tech Futures Initiative?
17. In what ways have peoples' jobs changed because of the partnership?
18. What is your organization hoping to achieve or gain from the Tech Futures Initiative?

19. What resources and funding does The Tech Futures Initiative require?
20. What resources or outcomes has the program produced?
21. Who benefits from these outcomes and how do they benefit?

GVCC Administrators

1. What is The Tech Futures Initiative?
2. What is your role in The Tech Futures Initiative and STEM education?
3. What organizations are involved in this program?
4. Describe the events surrounding the creation of The Tech Futures Initiative and the beginning of GVCC's involvement in the program.
5. Where have you looked for information or a reference on establishing this kind of partnership?
6. What organizations are encouraging the development of The Tech Futures Initiative?
7. How are those organizations encouraging its development?
8. Why is GVCC participating in The Tech Futures Initiative?
9. What role does revenue generation play in The Tech Futures Initiative?
10. What individuals and units at GVCC are involved in Tech Futures and in what capacity?
11. What other organizations or individuals do you or others at GVCC interact with as a part of The Tech Futures Initiative?
12. Describe these interactions.
13. In what ways has the partnership changed the college's involvement with or connection to the organizations involved?
14. What resources does GVCC contribute to the program?
15. In what ways has GVCC shifted funding or other resources to serve the partnership?
16. What new jobs have been created as a result of The Tech Futures Initiative?
17. In what ways have peoples' jobs been effected by the partnership?
18. What is GVCC hoping to achieve or gain from The Tech Futures Initiative?

19. What resources and funding does The Tech Futures Initiative require?
20. What resources or outcomes has the program produced?
21. How does GVCC or individual areas of the college benefit from these outcomes?

GVCC Faculty – STEM Areas

1. What do you know about The Tech Futures Initiative?
2. What role, if any, do you play in The Tech Futures Initiative?
3. What changes, if any, have you seen to the emphasis on STEM education at GVCC and throughout the community over the past several years?
4. Why do you think these changes are occurring?
5. What students have these efforts been focused on?
6. What students are not right for STEM education?
7. How have efforts to promote STEM education affected students' attitudes about STEM-related academic and career fields?
8. How have these efforts affected students' attitudes about non-STEM related academic and career fields?
9. How has the emphasis on STEM education through The Tech Futures Initiative and other initiatives affected you and your department?
10. What other organizations do you and your organization interact with as a part of efforts to promote STEM education?
11. Describe these interactions.
12. In what ways have these partnerships to promote STEM education changed your involvement with or connection to the organizations involved?
13. In what ways has GVCC shifted funding or other resources to promote STEM education?
14. In what ways have peoples' jobs changed because of this effort?
15. What resources or outcomes have these efforts produced?
16. Who benefits from these outcomes and how do they benefit?

GVCC Faculty – Unmanned Aerial Systems Programs

1. What do you know about The Tech Futures Initiative?
2. What role, if any, do you play in The Tech Futures Initiative?
3. Describe how the UAS programs began at GVCC.
4. Why were the UAS programs created?
5. Who are the target students for the UAS programs?
6. What students are not right for UAS programs?
7. What are the goals and intended outcomes of the UAS program?
8. What resources—money, personnel, consultation, equipment, facilities—are required to create and run the UAS programs?
9. Where do these resources come from?
10. How has the flow of resources changed over the past several years, if at all?
11. What other organizations did or do you work with to create or run the UAS programs?
12. Describe these interactions.

GVCC Faculty – Non-STEM Areas

1. What do you know about The Tech Futures Initiative?
2. What role, if any, do you play in The Tech Futures Initiative?
3. What changes, if any, have you seen to the emphasis on STEM education at GVCC and throughout the community over the past several years?
4. Why do you think these changes are occurring?
5. Who are the target students for STEM programs?
6. What students are not right for STEM programs?
7. How have efforts to promote STEM education affected students' attitudes about STEM-related academic and career fields?
8. How have these efforts affected students' attitudes about non-STEM related academic and career fields?
9. How has the emphasis on STEM education through The Tech Futures Initiative and other initiatives affected you and your department?

10. What changes, if any, have you experienced to your funding over the past several years?
11. What has caused these changes?
12. What are the primary reasons students enroll in your classes and programs—what are they hoping to achieve?
13. What changes, if any, have you seen to student interest and enrollment in your programs over the past several years?
14. What has caused these changes?
15. What outside organizations do you or your department work with to create or develop your programs?
16. Describe these interactions.

University Administrators

1. What is The Tech Futures Initiative?
2. What is your organization's role in The Tech Futures Initiative and STEM education?
3. Describe the events surrounding the creation of The Tech Futures Initiative and the beginning of your organization's involvement in the program.
4. Where have you looked for information or a reference on establishing this kind of partnership?
5. Why are you participating in The Tech Futures Initiative?
6. What organizations are encouraging the development of The Tech Futures Initiative?
7. How are those organizations encouraging its development?
8. What role does revenue generation play in The Tech Futures Initiative?
9. What individuals and units at the university are involved in Tech Futures and in what capacity?
10. What other organizations or individuals do you or others at the university interact with as a part of The Tech Futures Initiative?
11. Describe these interactions.

12. In what ways has the partnership changed the university's involvement with or connection to the organizations involved?
13. What resources does the university contribute to the program?
14. In what ways has the university shifted funding or other resources to serve the partnership?
15. What new jobs have been created as a result of The Tech Futures Initiative?
16. In what ways have peoples' jobs changed because of the partnership?
17. What is the university hoping to achieve or gain from The Tech Futures Initiative?
18. What resources and funding does The Tech Futures Initiative require?
19. What resources or outcomes has the program produced?
20. How does the university or individual areas of the college benefit from these outcomes?

Students in the UAS Programs

1. When and how did you first learn about the UAS program at GVCC?
2. Why did you choose to enroll in the UAS program?
3. If you had ever considered pursuing a different academic or career path, what caused you to change?
4. How do you feel about the classes you take as part of the program—the general education courses (writing, math, liberal arts) and the core curriculum (UAV/S classes)?
5. What are you hoping to achieve after you graduate from the program?
6. Do you plan on pursuing additional degrees, and if so, which ones?
7. What is the career outlook in unmanned aerial systems?
8. How are tuition and other costs associated with the program being paid for?
9. How did costs and forms of financial aid affect your decision to enroll in the UAS program?
10. Other than your classmates, who do you interact with as part of the program and in what capacity?

STEM High School Faculty

1. What do you know about The Tech Futures Initiative?
2. What role do you play in The Tech Futures Initiative?
3. Describe the events surrounding the beginning of your organization's involvement in the program.
4. What organizations are encouraging the development of The Tech Futures Initiative?
5. How are those organizations encouraging its development?
6. Why did your organization want to participate in The Tech Futures Initiative?
7. What changes, if any, have you seen to the emphasis on STEM education at the high school and throughout the community over the past several years?
8. Why do you think these changes are occurring?
9. Who are the target students for STEM programs?
10. What students are not right for STEM programs?
11. How have efforts to promote STEM education affected students' attitudes about STEM-related academic and career fields?
12. How have these efforts affected students' attitudes about non-STEM related academic and career fields?
13. What other organizations do you and your organization interact with as a part of efforts to promote STEM education?
14. Describe these interactions.
15. In what ways have these partnerships to promote STEM education changed your involvement with or connection to the organizations involved?
16. In what ways has the high school shifted funding or other resources to promote STEM education?
17. What funding or other resources have been contributed to the initiative to promote STEM education, and where did these resources come from?
18. What new jobs have been created as a result of The Tech Futures Initiative?
19. In what ways have peoples' jobs changed because of this effort?

20. What resources or outcomes have these efforts produced?
21. Who benefits from these outcomes and how do they benefit?

Aerotron Employees

1. What is The Tech Futures Initiative?
2. What is your role in The Tech Futures Initiative and STEM education?
3. Describe the events surrounding the creation of The Tech Futures Initiative and the beginning of Aerotron's involvement in the program.
4. What organizations are encouraging the development of The Tech Futures Initiative?
5. How are those organizations encouraging its development?
6. Where have you looked for information or a reference on establishing this kind of partnership?
7. Why did Aerotron want to participate in The Tech Futures Initiative?
8. What individuals and units at Aerotron are involved in Tech Futures and in what capacity?
9. What other organizations do you and your organization interact with as a part of The Tech Futures Initiative?
10. Describe these interactions.
11. In what ways has the partnership changed your involvement with or connection to the organizations involved?
12. What resources does Aerotron contribute to the program?
13. In what ways has Aerotron shifted funding or other resources to serve the partnership?
14. What new jobs have been created as a result of The Tech Futures Initiative?
15. In what ways have peoples' jobs changed because of the partnership?
16. What is Aerotron hoping to achieve or gain from The Tech Futures Initiative?
17. What resources and funding does The Tech Futures Initiative require?
18. What resources or outcomes has the program produced?
19. Who benefits from these outcomes and how do they benefit?

Fort Kenton Administration

1. What is The Tech Futures Initiative?
2. What is your role in The Tech Futures Initiative and STEM education?
3. Describe the events surrounding the creation of The Tech Futures Initiative and the beginning of your organization's involvement in the program.
4. What organizations are encouraging the development of The Tech Futures Initiative?
5. How are those organizations encouraging its development?
6. Where have those involved looked for information or a reference on establishing this kind of partnership?
7. Why did your organization want to participate in The Tech Futures Initiative?
8. What individuals within your organization are involved in Tech Futures and in what capacity?
9. What other organizations do you and your organization interact with as a part of The Tech Futures Initiative?
10. Describe these interactions.
11. In what ways has the partnership changed your involvement with or connection to the organizations involved?
12. What resources does your organization contribute to the program?
13. In what ways has your organization shifted funding or other resources to serve the partnership?
14. What new jobs have been created as a result of The Tech Futures Initiative?
15. In what ways have peoples' jobs changed because of the partnership?
16. What is your organization hoping to achieve or gain from The Tech Futures Initiative?
17. What resources or outcomes has the program produced?
18. Who benefits from these outcomes and how do they benefit?

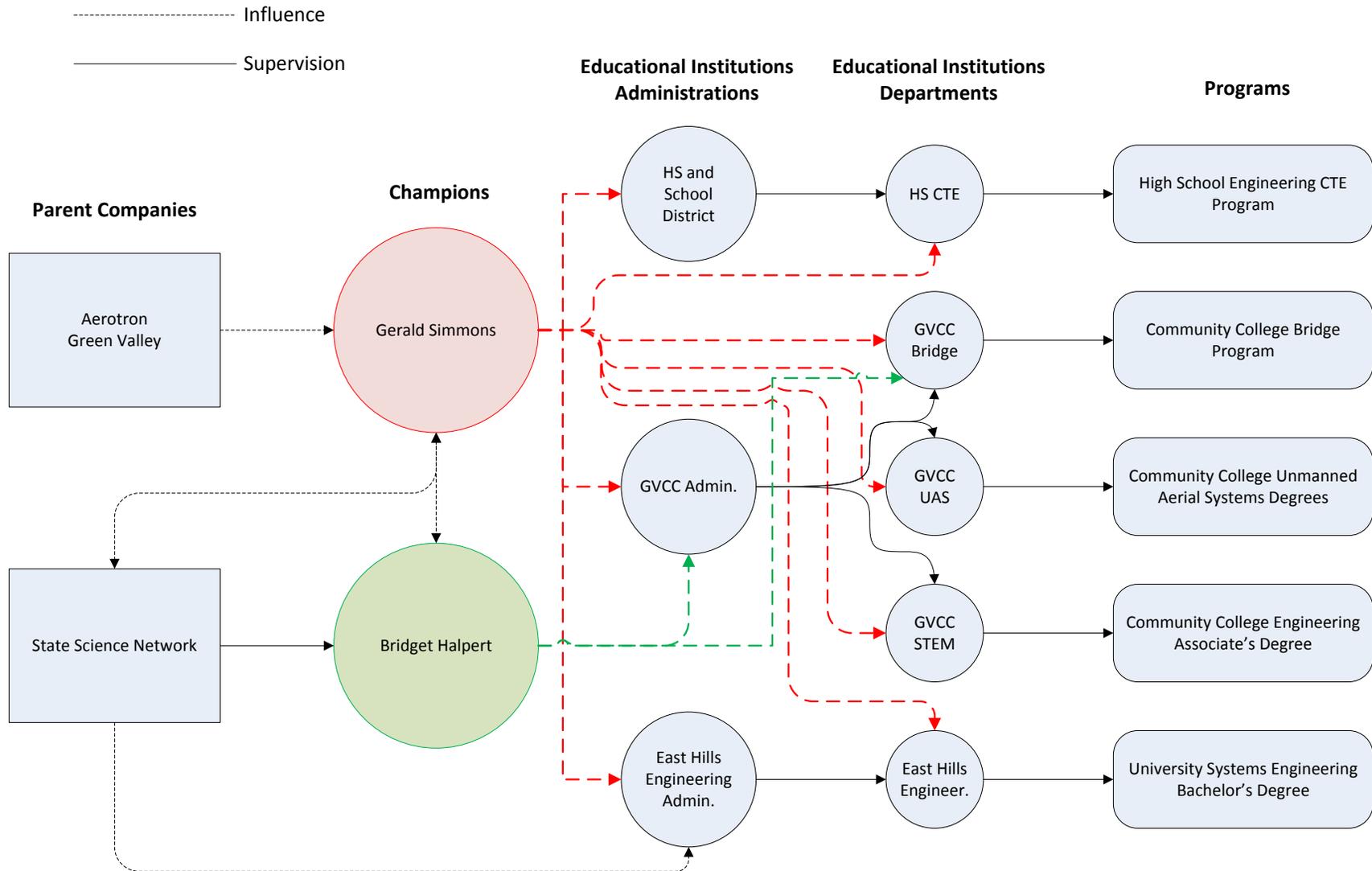
Non-Profit Administrators

1. What is your organization's role in promoting STEM education?

2. In general, how does your organization go about pursuing that objective?
3. How do you measure your success in promoting STEM education?
4. What changes, if any, have you seen to the emphasis on STEM education over the past several years?
5. Why do you think these changes are occurring?
6. How have recent efforts to promote STEM education affected the attitudes of students, faculty, administrators, and others about STEM-related academic and career fields?
7. How have these efforts affected attitudes about non-STEM related academic and career fields?
8. Who are the target students for STEM programs?
9. What students are not right for STEM programs?
10. How would you define The Tech Futures Initiative?
11. What organizations are encouraging the development of The Tech Futures Initiative?
12. How are those organizations encouraging its development?
13. What is your organization's role in The Tech Futures Initiative?
14. What role does The Tech Futures Initiative play in your efforts to promote STEM education?
15. Describe the events surrounding the creation of The Tech Futures Initiative and the beginning of your organization's involvement in the program.
16. Where have those involved looked for information or a reference on establishing this kind of partnership?
17. Why did your organization want to participate in The Tech Futures Initiative?
18. What role does revenue generation play in The Tech Futures Initiative?
19. What individuals within your organization are involved in Tech Futures and in what capacity?
20. What other organizations do you and your organization interact with as a part of The Tech Futures Initiative?

21. Describe these interactions.
22. In what ways has the partnership changed your involvement with or connection to the organizations involved?
23. What resources does your organization contribute to the program?
24. In what ways has your organization shifted funding or other resources to serve the partnership?
25. What is your organization hoping to achieve or gain from The Tech Futures Initiative?
26. What resources or outcomes has the program produced?
27. Who benefits from these outcomes and how do they benefit?

APPENDIX B: DIAGRAM OF THE TECH FUTURES INITIATIVE



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