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Transforming a traditional research organization through public entrepreneurship

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Abstract Public entrepreneurship is much like its private sector counterpart; however, public entrepreneurs face additional challenges due to weaker competitive forces in the public as compared to private sector, with objectives that often are poorly defined and performance that is difficult to measure. Despite the impact on public good, how to enact changes successfully in public sector organizations to be more entrepreneurial is poorly understood. This article summarizes current research on public entrepreneurship and presents a detailed case study of a successful entrepreneurial change in a public sector organization. A five-step change process used to enhance entrepreneurial behaviors was implemented in a public sector organization and the qualitative and quantitative results demonstrated substantial performance improvements over 4 years (i.e., quantitative performance in some areas was more than 10 times greater). We explain key steps that produced successful outcomes and how to avoid common challenges in the implementation of ongoing entrepreneurial behaviors in public sector contexts.

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1. What is public entrepreneurship?

The term public entrepreneurship can invoke images of actions taken by a government organization to promote a common good that transforms community life; simultaneously though, the term can also invoke images of a Sisyphean struggle for the 'freedom to manage' while trying to update stagnant public institutions that have lost relevance and accountability (Edwards, Jones, Lawton, & Llewellyn, 2002). Public entrepreneurship is much like its private sector counterpart, with defining characteristics of opportunity alertness, judgments about investments under uncertainty, and product, process, and/or market innovation (Klein, Mahoney, McGahan, & Pitelis, 2010). However, public entrepreneurs face additional challenges due to weaker competitive forces in the public sector—as compared to the private sector—with objectives that are often poorly defined and performance that is difficult to measure. Specifically, public organizations are often characterized by a focus on mission rather than profitability and a lack of clarity in organizational goals due to numerous competing demands, interdependencies, and interrelationships across multiple stakeholder groups. Indeed, Klein et al. (2010, p. 4) suggested that for outdated institutions, "innovation, both technological and organizational, is required but is difficult to accomplish because of conflict between short-run and long-term performance. Entrenchment is deepened by agency problems and by lack of clarity about the public interest."

Innovation is at the core of entrepreneurial behaviors that result in organizational change and the development of new business models (Kuratko, 2015); innovation is as important to the success of public sector organizations as it is to private for-profit companies (Mack, Green, & Vedlitz, 2008). Indeed, innovation can help transform public sector organizations by increasing their flexibility, responsiveness, and efficiency in serving constituencies (Mack et al., 2008). Furthermore, innovation in public sector organizations does not require the development of a new organization but does involve a new way of organizing, managing, and/or delivering services (Shane, 2003; Walker, 2007).

Entrepreneurship research has broad and valuable implications for public organizations and public policy, but such a focus has received sparse attention in the literature (Hitt, 2005). This deficit has resulted in limited prescriptive advice on entrepreneurial activity for public sector managers. Indeed, we currently do not fully understand how to effectively implement an entrepreneurial change in public sector organizations (Holbrook, 2010). Therefore, to fill this gap in our knowledge, we present a detailed case study of a major change which has led to the successful development of entrepreneurial behaviors in a public sector organization. This case study yields insights on how to apply entrepreneurship models in other public sector settings to maximize the benefit.

We begin by discussing what is unique about public entrepreneurship and providing an overview of the current research on public sector entrepreneurial models. Then, we examine in detail how one team transformed a public institution through a five-step change process to develop entrepreneurial behaviors and show the performance outcomes from the change. Finally, we use the perspectives of both public entrepreneurship and management theory to provide a framework for understanding the key lessons for engaging in public sector entrepreneurship in other contexts.

2. How is public entrepreneurship different?

Public and private organizations share many characteristics such as formalized structures, competing stakeholders, and deeply entrenched cultures and operational procedures that suggest the need to use and perhaps rely on entrepreneurship as a means of improving performance (Morris & Jones, 1999; Zerbinati & Souitaris, 2005). Specifically, entrepreneurial behaviors in both private and public organizations broadly encompass a series of actions undertaken by entrepreneurs in the pursuit of change, either in starting a new organization or transforming some fundamental aspect of an existing organization (Covin & Slevin, 1989; Shane, 2003). Key entrepreneurial behaviors include being more innovative, more proactive, and a willingness to take strategic risks (Covin & Lumpkin, 2011). However, there are meaningful differences between public and private sector organizations that affect the emergence and display of these entrepreneurial behaviors (Ring & Perry, 1985).

An example of one such difference is in desired outcomes. Specifically, the focus on mission rather than profitability calls for different behaviors and foci within private for-profit and public sector organizations (LeRoux, 2005). Another difference is in the clarity of organizational goals (Klein, Mahoney, McGahan, & Pitelis, 2013; Short, Moss, & Lumpkin, 2009); unlike many private for-profit companies, social enterprises and public sector organizations seek to create social, political, economic, and/or cultural value (Miller, Grimes, McMullen, & Vogus, 2012). Indeed, the importance of purpose can be a

strong motivation for individuals working in the public sector (Wright, 2001). Adding complexity to this focus on outcomes benefiting public value is the fact that public value is difficult to define due to the numerous competing demands, interdependencies, and interrelationships across multiple stakeholder groups (Benington & Moore, 2011; McGahan, Zelner, & Barney, 2013).

Despite these differences, public sector organizations have been trying to be more entrepreneurial over the last few decades (Mack et al., 2008; Osborne & Gaebler, 1992). Being entrepreneurial improves their ability to deal more effectively with the rapidly changing conditions they face (Kim, 2010; Osborne & Gaebler, 1992). Yet, it remains challenging for public organizations to do so, as noted previously. For example, fiscal realities also play a role in public sector organizations' decisions. LeRoux (2005, p. 360) noted that:

> The existing evidence seems to suggest that nonprofits do not have a priori motivations for entrepreneurship but rather adopt activities that are associated with entrepreneurship as a coping strategy when financial circumstances threaten to limit the scope of the services they provide.

Thus, agency leaders try to be more entrepreneurial in order to continue their operations. Successfully engaging in more entrepreneurial behaviors in public sector organizations can be challenging because those leading such efforts (i.e., the entrepreneurs) must help others understand how to leverage a unit's strategies and available resources to overcome bureaucratic barriers to risk taking, innovation, and proactive vs. reactive behaviors (Kim, 2010). To date, however, few fully understand how to effectively implement a system of continuous entrepreneurial behaviors in public sector organizations (Holbrook, 2010).

2.1. Taking stock of what we know about public entrepreneurial efforts

Public sector entrepreneurship essentially encompasses what some refer to as entrepreneurial government (Luke & Verreynne, 2006; Luke, Verreynne, & Kearins, 2010). The behaviors associated with public sector entrepreneurship or entrepreneurial government typically are oriented to reduce costs and improve productivity (Osborne & Gaebler, 1992). Simultaneously, these behaviors must be consistent with and supportive of the core values of public administration including accountability, sustainability, equity, responsiveness, and citizen satisfaction (Kim, 2010). Public entrepreneurship can help to improve the efficiency and quality of services public sector organizations provide to citizens (Piening, 2011). But public entrepreneurship can also go beyond improving services to include the design of new and more effective public policies and new services along with their implementation (Bernier, 2014; Osborne & Gaebler, 1992). Several benefits accrue to public sector organizations when they exhibit entrepreneurial behaviors, including increased innovation and productivity, and providing a foundation for creating additional value for societies and their citizens (Luke et al., 2010).

Currently, there are two suggested models for public sector entrepreneurship based on the research. The first model, proposed by Luke et al. (2010), suggested that public sector entrepreneurship includes the following activities:

- Deliberately searching for opportunities to innovate as a basis for bringing about value-creating change;
- Involving citizens to identify paths through which additional revenues can be secured to enhance the quality of services the public sector organization delivers; and
- Determining ways the organization can consistently innovate to enhance its overall efficiency and effectiveness.

Alternatively, Sundin and Tillmar (2008) suggested that public sector entrepreneurship works well when entrepreneurs are able to:

- Identify local needs and propose innovative solutions to them;
- Create the freedom and legitimacy necessary for employees to act more entrepreneurially and for others interested in the organization's welfare to engage in innovative behaviors; and
- Persist until intended outcomes are achieved.

While these models have notable similarities, the differences and generalizations limit the prescriptive ability of both.

3. A detailed case study: Traditional state research unit

3.1. Empirical approach

To help address the issues of generalization and the limited prescriptive ability of the public

entrepreneurship models discussed above, in this section, we describe in detail the entrepreneurial experience of a state research organization attempting to shift its business model in response to declining government funding. We obtained the information and data used in this case study via semi-structured interviews with the outside consultant and internal director, along with written materials produced and used by the internal entrepreneurs during the time period examined to identify the actions taken and their outcomes. We follow the presentation of the case study with a description of the empirical data we gathered and present quantitative outcomes of the change in Section 3.5.

3.2. Background

The subject of this study is an agricultural research center (hereafter, the Center), one of 13 such regional centers that are a part of a state research agency (hereafter, the Agency). Agricultural experiment stations are state-based research organizations that are located in each of the 48 states of the continental U.S. Since 1887, these stations have conducted research to improve food production, agricultural industries, and life sciences. The improvements they developed have typically provided direct benefits to farmers and ranchers, farm suppliers, and food and fiber processors, and also direct and indirect benefits to consumers.

Centers, as parts of the state agricultural research agency, receive their base funding in part from the federal government and in part from state appropriations. While these sources of base funds are necessary for the state research agency, they are generally not sufficient to cover the entire cost of the research; thus, scientists employed by these experiment stations often seek external grants and contracts to round out funding needed to conduct their research. This additional revenue is generally substantial and independent from the base funds provided by federal and state sources. Also, experiment stations generate revenue from the sale of research products through license fees and royalties. Most state agricultural experiment stations and their subsidiary centers have operated since their inception with essentially unchanged administrative structures and are usually managed by former faculty or academic researchers.

3.3. Motivation

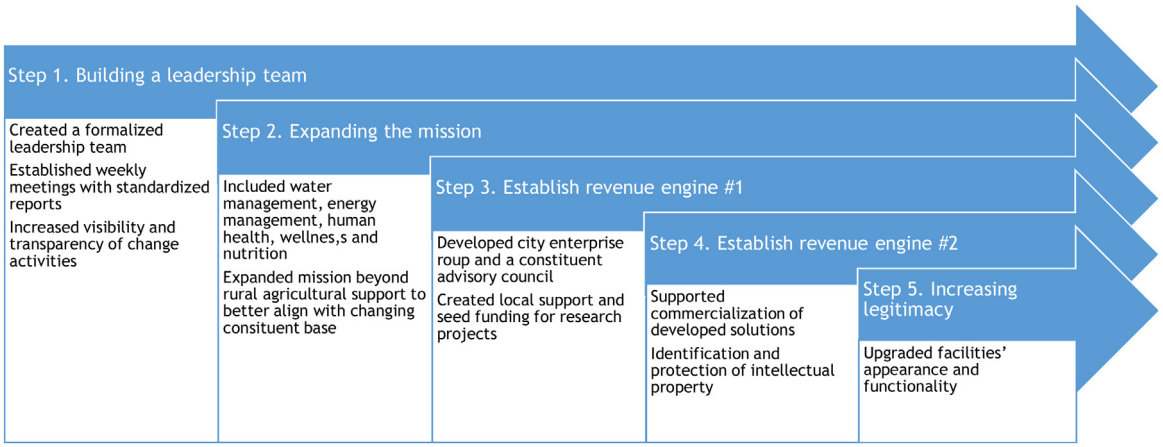
The migration of citizens from rural areas to cities suburbs represented a significant change across the U.S. and has resulted in a new client demographic for agricultural experiment stations. Because of these new demographics, state experiment stations are experiencing significant erosion in their rural support clientele and in traditional legislative appropriations. This erosion of traditional agricultural constituents and of funding for agricultural research agencies and regional centers such as the focal Center has reinforced adoption of a broader research focus. Thus, scientists have been increasingly charged with procuring their own funding and decreasingly called on to collectively address state, regional, or local needs.

These changes have created substantial problems for research agencies and centers throughout the nation. Declining base budgets alter and restrict their ability to serve traditional rural constituents and centers largely have not tried to serve new urban constituents. Without adapting to serve new constituencies, these agricultural research centers are caught in a downward spiral—their perceived lack of relevance by urban and suburban constituencies serves as a basis for reduced funding, which then further inhibits the centers' ability to serve traditional and new clientele. As the research in each of the centers remains broad and less regionally focused, local constituents cease to perceive the value of the services available to them and thus question appropriating funds to support the centers. In light of these challenges, a leading researcher at the focal Center brought in an external entrepreneurial consultant to meet with the Center's director. The researcher and director's common goal was to generate ideas about potential opportunities for the Center to "shift from a rural to an urban-focused agenda."

3.4. The change process

The change process used to develop and support ongoing entrepreneurial behaviors in the Center was developed by business consultants in partnership with the Center's director to address the funding and constituent challenges faced by the regional centers of the Agency. Specifically, the Center leadership sought to change the organization from a traditional academic administrative model for funding research to a constituent funding model that built on Center research to address local issues. The intent was to create an organization that was proactive, innovative, and willing to take measured risks. After obtaining permission from the Agency director as a proof-of-concept model in 2006, the Center implemented the following Agency-approved change process in five steps, which are outlined in Figure 1; more detailed descriptions are provided in Table 1.

Figure 1. Overview of center's change process



3.4.1. Step 1

Created a Center leadership and management team by distinguishing and separating the position of Center director as the chief executive officer (CEO) from other Center leadership positions and creating three other top management team positions.

As the CEO, the Center's local director assumed responsibility for assuring an appropriate financial return on the value of agency assets assigned or allocated to the Center and assuring consistent leadership direction and focus for the Center in achieving externally generated research grants and contracts emphasizing the local urban mission and the Center's commercialization engine (described in Step 4). To accomplish these two priorities, the Center director created and delegated responsibility and authority to four officers each with distinct roles and responsibilities ranging from coordinating grant and proposal writing, managing Center facilities (including scientific equipment), supporting operations by developing improved budget projections, to identifying and managing new constituent relationships, among others.

Beyond creating new roles and delegating responsibilities, new explicit processes were developed to support the officers' actions taken to support and facilitate the change in the Center's business model. As the consultant emphasized: "The ability to proceduralize is often the difference between success and failure," regardless of whether the business is private or public. The use of formal processes helps transform efforts into routines, which in turn lead to outcomes. To be successful, all of these actions must be balanced with flexibility to act in ways that satisfy the organization's changing needs. For example, to ensure that each individual on the Center management team recognized Center priorities and activities in support of the Center's goals, a management team staff meeting was held each week. Each member reported to the entire team using a specific verbal and written format. They also used these reports to identify how and where their personal actions and planning facilitated the success of other team members.

Process-oriented officer and staff meetings such as these held influence in changing the focus of the top management team and in obtaining acceptance and commitment from the employees. As such, this practice was expanded to include researchers and staff throughout the organization. The Center director recalled:

> Having others sit in on these meetings, even if they didn't participate, was important. It increased the visibility of why certain changes were being made and helped facilitate changing the structure and behavior throughout the Center. In hindsight, we should have expanded these meetings to the entire Center far sooner than we did. It would have helped increase our buy-in across the organization.

As such, this particular change helped the organization become more proactive and supportive of entrepreneurial behaviors over time.

The effect of these processes and meetings was not immediate. Buy-in from every employee was necessary as leadership did not have the ability to fire any employees, especially researchers who tended to be resistant to the changes. But, consistent use of the new processes paid off. The consultant observed:

> Over a period of 8 or 9 months, the questions from researchers during meetings changed from scattered and individually focused to being more about the group and how individual work (research) could be used to help the Center achieve its goals.

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Table 1. Overview of change process to develop entrepreneurial behaviors

	Step 1	Step 2	Step 3	Step 4	Step 5
Description	• Created a Center leadership and management team by distinguishing and separating the position of Center director as the chief executive officer (CEO) from other Center leadership positions and creating three other top management team positions	• Expanded the Center mission to include urban priorities and established processes for research collaboration	• Established one of two revenue engines, the city enterprise group (revenue engine #1) which in turn established the constituent advisory council(s) for identifying local constituent issues and challenges (translated into entrepreneurial research opportunities), and creating a basis of ownership and support of the research projects being done locally	• Established the technology enabling and commercialization group (revenue engine #2) to support commercialization of developed solutions with identification and protection of intellectual property	• Focused on improving the functionality and appearance of the science capabilities and buildings at the Center to ensure that the Center was credible to the public as a source of information and new research products
Actions Taken	• Delineated Center director as CEO • Created the positions: Center associate director, Center chief fiscal officer, Center facilities manager, and Center grants and proposals coordinator • Established weekly meetings for all TMT members, with a standardized verbal and written report	• Officially expanded Center mission to include urban issues such as (1) water management and conservation, (2) energy management and conservation, and (3) human health, wellness, and nutrition	• Established the city enterprise group • Established the constituent advisory council • Established shared responsibility for the city enterprise group between the grants and proposals coordinator and the Center associate director	• Developed the technology enabling and commercialization group • Supported the identification and protection of IP generated by the Center • Facilitated the eventual commercialization of Center generated IP	• Center physical facilities were upgraded to current business standards
Outcomes	• Created a top management team with defined objectives for each position • Changed focus of TMT to center priorities and activities each week • Helped increase employee buy-in through visibility and transparency (as meeting was expanded across the organization)	• Helped facilitate awareness of Center's research capabilities by local constituencies	• Constituent advisory council created a bridge between constituents and the Center, increasing the flow of information, local support, and helped identify local research needs and opportunities • City enterprise group supported seed and/or additional funding for research as needed	• Enabled the generation of a second revenue stream for the Center • Provided a single point-of-contact for Agency's commercialization office • Reduced turn-around time on IP to help private sector interests move forward	• Increased legitimacy of the Center among constituents as a place of cutting-edge research

It took time, persistence, and formalized processes to generate acceptance and commitment from all members of the Center and to create the "shared vision, shared accountability, and changing of the mindset" that was necessary. But as commitment was obtained from an increasing number of people, the new entrepreneurial behaviors by employees helped to implement the change in the Center's business model. The employees—especially the researchers—began to search for and identify opportunities to address problems in the community through their research. Some of these opportunities required the researchers to expand their knowledge bases and to apply their research skills in new ways. This required them to take more risks to exploit the opportunities identified.

3.4.2. Step 2

Expanded the Center mission to include urban priorities and established processes for research collaboration.

Step 2 began nearly simultaneously with Step 1 in the fall of 2006. The entrepreneurial actions undertaken caused the Center to expand its horizons while refocusing its then-current science capability on urban issues while incorporating relevant urban constituent concerns regarding (1) water management and conservation, (2) energy management and conservation, and (3) human health, wellness, and nutrition. When the newly designed changes detailed here were initially implemented, the Center was continuing to operate under its and the Agency's old mission: to serve a rural clientele by producing crop production information, technologies, and research. The Center director recalled that "there were already the beginnings of a change in attitude from a rural to urban agenda . . . with some recognizing it as where the future is headed," but there was no understanding of how to go about making this shift in focus and priorities. Because of this, Step 2 was critical for the new Center organization as it became more proactive in identifying opportunities from an expanded definition of its constituents and thus increased and broadened Center research and science programs.

As an example, the Center was already well known for its leadership in education and research dealing with turf and ornamental plants. The turf and ornamentals programs at the Center encompassed strong science production but neither was well connected to the larger concerns that were important to urban consumers. Specifically, private sector and elected leaders needed help to move water-efficient plants, plant products, and information into the marketplace and in managing the public urban environment and natural resources so that both could be sustained with minimal expense. The Center's urban natural resource science included research on urban ponds, wildlife management, and urban parks and recreation. Despite this overlap, the consultant observed that local constituencies were:

> Not even aware that they could work with a local public entity to do research to help solve their problems. Once we opened that door, they literally started barreling down it—we ended up having a major problem of trying to create a filter to identify the most relevant projects for our expertise.

In order to control expenses as part of an increased scope in the Center's mission to support entrepreneurial actions to identify and exploit new funding opportunities for emerging Center research, Step 2 also included the development of processes to help minimize costs. Specifically, the Center wanted to support collaboration and efficiencies in research by sharing resources. The director recalled that three of the Center's scientists all submitted competing proposals for the same funding: "We wanted the researchers to succeed, but we wanted them to see how working together could advance not only their own work but the Center's objectives." Thus, the director brought in a grant and proposals coordinator whose job it was to "work for the faculty," support them in writing the most competitive proposals, and, importantly, to facilitate researchers working together. In doing so, they could more effectively identify research funding opportunities that met the new mission of the Center and combine their resources and capabilities to increase the probability of receiving external funding for the new research.

3.4.3. Step 3

Established one of two revenue engines, the city enterprise group (revenue engine #1) which, in turn, established the constituent advisory council for identifying local constituent issues and challenges and creating a basis of ownership and support of the research projects being done locally.

In response to the high level of interest and opportunities among the local constituencies, Center management began to build the enterprise capability to identify and coordinate fundable research opportunities in urban or other settings. Leadership for the Center enterprise capability was initially assigned to one director but because of the broad scope, the responsibilities were shared by two directors: one was charged with identifying and generating productive new partnerships supported by

the other. Funding for some of the proposals required additional collaborative partnerships (e.g., research universities, private sector companies, cities, counties, school districts). The city enterprise group was established to work with Center faculty and the management team to bring needed partners together and to help with proposal preparation. This step required being proactive. As the consultant described:

> We were the Google search engine. We'd ask local constituents, "What's your problem?" and ask them to let us do the research to provide a solution. We'd then take basic research that's already been done and apply it to their problem. If we were missing a piece of research, we'd get them to fund it to get a solution.

In other words, this revenue engine was established to monetize both existing research and provide funding for new research that was required to satisfy local needs. In essence, the problems identified by local constituents were entrepreneurial opportunities for the Center in which new services could be created to provide new sources of revenue.

The second dimension of Step 3 was for the city enterprise group to organize and convene a constituent advisory council to help identify (1) local research needs and opportunities, (2) relevant grants and contracts, and (3) a local constituent to take ownership for seed funding and positive political support and influence. Center management wanted local constituencies to feel a part of what was happening at the Center and needed a vehicle to bring them together. The majority of the constituent advisory council members were elected officials from the constituent taxing authorities and influential private sector leaders. The council's purpose was to (1) identify and prioritize constituent problems consistent with the Center's and Agency's research capabilities, (2) provide active political support for Center requests for state, federal and other funding to finance research-based solutions, and (3) facilitate the implementation of research-based solutions for partners recruited by the constituent advisory council.

3.4.4. Step 4

Established the technology enabling and commercialization group (revenue engine #2) to support commercialization of developed solutions with identification and protection of intellectual property.

As leadership responsibilities and Center missions were defined in Steps 1 and 2, and research was funded and progressed under the guidance of the city enterprise group and constituent advisory council established in Step 3, some of the research was expected to create new intellectual property (IP). In fact, the emphasis on being more innovative increased the probability of creating new intellectual property. At the time, the Agency review process for IP was handled totally by a state system review committee that dealt primarily with protecting plant materials. Further, the commercialization engine at the Agency was part of a system-wide office which had such a large magnitude of potential IP to evaluate, the timing of which often required was months or even years, not the more rapid response needed by the Center in its close, local working partnerships. Thus, a Center commercialization capability was created to conduct reviews of Center-based science to generally assure that the Center's potential IP had sufficient scientific merit to warrant further efforts for protection and facilitate communication with the Agency's review committee to support faster decisions.

The change in mission was a catalyst for the development of a commercialization capability. As the consultant described it:

> We were saying that the Agency, and specifically this Center, was in the business to help the public solve problems. Previously, we would say that the agency is in a position to do basic research so that somebody else can solve a problem.

These statements represent different mission and this difference created a need for proactively establishing local processes to handle potential Center IP.

3.4.5. Step 5

Focused on improving the functionality and appearance of the science capabilities and buildings at the Center to ensure that the Center was credible to the public as a source of information and new research products.

There was a need for the Center to have legitimacy in the community as a place to create and provide access to the cutting-edge research and technology that it developed as a result of enacting the change process that enhanced the entrepreneurial behavior of the organization. In the consultant's words: "Perceptions matter. It was hard to sell the cities that we were a place of cutting-edge research when they'd walk into buildings that were very dated and in poor repair." The Center, similar to many others across the U.S., reflected declining budget support

from traditional agriculture, increased competition for external grants and contracts, and deferred maintenance. As such, the Center's facilities were in poor condition and some were largely obsolete. The poor facilities limited acceptance and perceived legitimacy of the Center as a place of cutting-edge research in the community. In light of this fact, Center management enlisted help from the Agency director who committed to revitalizing all Center facilities as an investment in this Center's change in business models as a proof of concept. This investment by the Agency brought the facilities up to commercially acceptable business standards and to be on the cutting edge of technologically. Because this step was a Center priority, it was initiated at the start of the change process and remained in progress during the entire time period under evaluation in this study.

3.5. Outcomes

The Center is one of 13 similar organizations within the state. The availability of comparable data from the other 12 organizations allowed the utilization of a "nonequivalent control group" design (Campbell & Stanley, 1963; Cook, Campbell, & Peracchio, 1990) to assess the outcomes of this change across two dimensions: the dollar amount of grants awarded and the number of proposals submitted. The 5-step change process to enhance the entrepreneurial behavior of the Center was approved in June 2006 and was initiated in 2006 and 2007. All actions needed to implement the 5-step organizational change process were fully engaged by 2010.

As shown in Figure 2, the Center averaged $284,194 annually in awarded grants and contracts from 2002—2006. In 2007 when the Center's organizational change process was fully launched, the Center demonstrated growth in grants and contracts over time, obtaining a final number of $5,088,137 in 2010. While it was an upward trend, 2009 exemplifies a negative outlier with only $840,628. Discussions with the Center management suggested that this lower number was likely the result of award dates occurring later than expected, thus carrying over into the 2010 year. Regardless, as the worst performance year, 2009 still represented approximately 300% of the annual performance average prior to the changes. The amount of the proposals submitted from 2004—2010 is depicted in Figure 3. Furthermore, because of the presence of all 13 research centers in these data, we were able to employ a quasi-experimental design by comparing the focal Center's results to the other 12 centers' results over the same time period, thereby increasing the validity of the causal arguments explained herein.

As shown in Figure 2, the focal Center not only shows a strong, positive trend, it is the only unit within the Agency to show such a trend line. While most of the other centers were consistently producing more research proposals than the Center prior to 2006, by 2010 the Center surpassed all others with a figure of $23,560,064.84, compared to the next closest amount of $11,969,326.97 by regional center #9; thus, the focal Center's total was still substantially higher (97%). Over the course of the development of the Center's entrepreneurial behaviors, the Center increased its dollar amount of proposals submitted relative the other 12 Agency centers thereby moving from a rank of 12th among 13 in 2006 to a rank of first in 2010. Thus, the results show that, while the other centers improved their performance and some declined over these same years, no other center exhibited a similar and consistent upward trend in its performance relative to other centers over the same time period.

Figure 2. Grants and contracts for the focal center

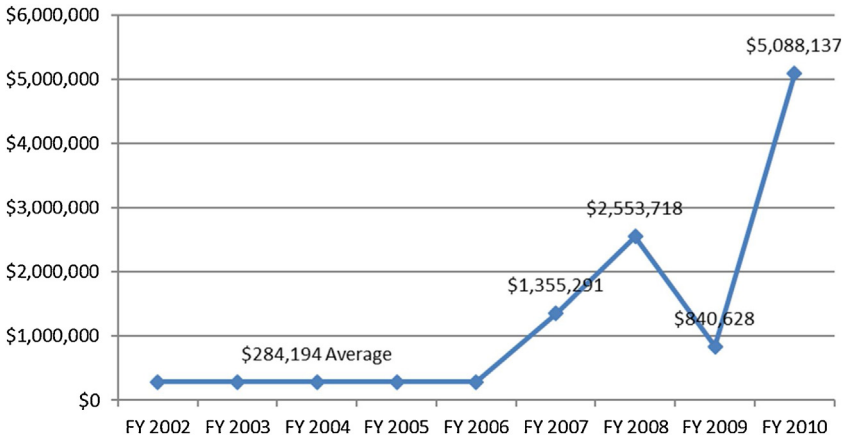
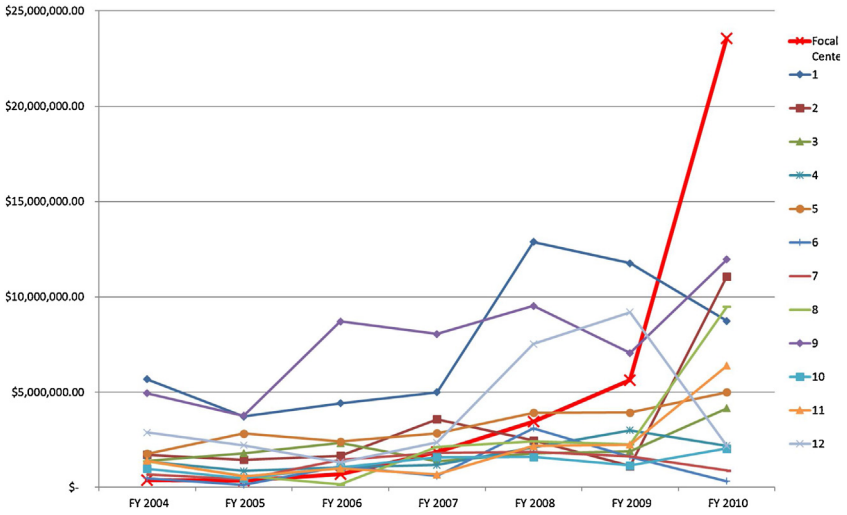


Figure 3. Dollar amount of proposals submitted by all state research centers



Overall, the results from analyzing the two sets of data from internal and external sources support the assertion that the entrepreneurial behaviors described herein substantially improved performance across multiple relevant metrics for the Center. This quantitative evidence aligns with the qualitative evidence of the experiences described by the external consultant and Center director and reported in the case description.

4. Applying public entrepreneurship models

In many ways, the development and integration of entrepreneurial behaviors within the Center resulted in actions that closely resemble the public sector entrepreneurial model proposed by Sundin and Tillmar (2008). Specifically, the change process instituted by the Center focused on identifying the local (constituent) needs (e.g., reduced state funding created a greater need for external funding) and proposed innovative solutions (e.g., the creation of two revenue engines). Explicitly defining leadership roles in Step 1 and expanding the mission while supporting a quality appearance of facilities and equipment in Steps 2 and 5 created the freedom and legitimacy necessary for employees at the Center to engage in behaviors that were unique and innovative compared to the Agency's other 12 centers. And finally, though all steps in the organizational change process used by the Center were instituted in approximately 1 year, it took 4 additional years of continually developing and supporting this initiative for the dramatic increases in the Center's performance metrics to materialize fully. Developing and supporting entrepreneurial behaviors, particularly in a highly bureaucratic public organization, is often not a short-term process; indeed, in this instance, the employees at the Center persisted until intended outcomes were achieved.

However, while the original outcomes closely followed Sundin and Tillmar's (2008) public sector entrepreneurial model, the continual innovation processes developed as a result of the changes that flowed from implementing the five-step change process are more closely aligned with the other model proposed by Luke et al. (2010). For example, the technology enabling and commercialization group (or revenue engine #2) developed in Step 4 created a routine and deliberate search for additional innovation and revenue opportunities from previously developed IP. In addition, the constituent advisory council created in Step 3 serves to involve citizens to identify paths for future revenue along with enhancing the quality and visibility of services that the Center delivers. Finally, the defined leadership roles and shared responsibilities, along with the expanded mission and focus on collaboration in Steps 1 and 2 allowed the Center to consistently innovate for the purpose of additional revenue, even more specifically for enhanced efficiency and effectiveness.

This study suggests that both entrepreneurial models proposed can engender change and innovation in public sector organizations, but the current public entrepreneurship models may better serve different purposes. In this experience, the initial change required the identification of local needs, the freedom and legitimacy to pursue those opportunities, and the persistence to overcome expected and unexpected challenges (i.e., Sundin & Tillmar, 2008). However, the continual innovation and entrepreneurial behaviors inside the Center also required the formalized connection with local citizens,

deliberate searches to identify new opportunities, and a focus on routines and procedures to enhance efficiency and effectiveness (i.e., Luke et al., 2010). The need for balancing different objectives in creating and sustaining entrepreneurial behaviors is reflected in the explorative and exploitative actions observed in the process described herein, which are critical to the ongoing performance of an organization (Hitt, Ireland, Sirmon, & Trahms, 2011). More specifically, based on our analysis of this case study, the theoretical models proposed seem to focus on more explorative behaviors (i.e., Sundin & Tillmar, 2008) or exploitative behaviors (i.e., Luke et al., 2010), but the combination of both is critical for a successful entrepreneurial change.

5. Key lessons going forward

Examining an effective application of public entrepreneurship in light of the current theoretical perspectives suggests some key lessons to help other public sector managers to engage in public entrepreneurship and prevent or avoid common challenges in the process. First, while the focal Center fundamentally changed its business model in order to develop and support entrepreneurial behaviors, it is important to recognize that a new business model does not mean an abandonment of the public organization's original mission. Indeed, the new approach still placed importance on addressing and/or solving critically important social concerns and contributing to the welfare of society and its citizens. In addition to identifying and obtaining external financial support for the research, the new research organization emphasized the importance of commercializing and/or licensing the intellectual property—often collaborating with new partners to do so. Thus, by engaging in both of these behaviors, the new business model was simultaneously explorative and exploitative with the two sources of revenue generation (Osiyevskyy & Dewald, 2015). Managers of public sector organizations interested in pursuing change by designing and implementing a change process to develop and support ongoing entrepreneurial behaviors might consider creating multiple systems, or engines, of revenue that can simultaneously and deliberately search for and create valuable innovations.

Another key lesson that emerged was dealing with differing time frames; specifically, the speed at which the public and private entities moved created challenges that had to be addressed. Working to align different time frame expectations had to occur both internally and externally. For example, within the focal Center, researchers were accustomed to being evaluated annually, or over even longer time periods, and did not want to engage in more frequent discussions regarding work done to accomplish their stated goals. Turning the evaluation process into a negotiation and increasing visibility of actions across the entire Center were necessary to assure employees that the evaluations did not mean losing autonomy, but rather allowed them to create a shared purpose and achieve greater coordination. Another instance of timeframe challenges occurred in obtaining patents for the intellectual property created. Researchers were motivated to publish any new IP rapidly and local constituents wanted access to the solutions they helped fund; but, to support the business model on both sides, patents had to be obtained first. This tension was exacerbated by a distant and slow system-wide office of technology commercialization. A key factor in the revenue engines' success came from addressing these conflicting timeframes by developing a unit within the Center to proactively collaborate and communicate with the Agency's office to enable faster decisions.

Engaging in such a vast business model change required all employees' acceptance of and commitment to the shared goal (i.e., buy-in) to enact and engage in the subsequent processes. While important in both private and public entrepreneurship (Kuratko, 2015), the issue of buy-in is often magnified in the public setting—and specifically this institution—due to structural characteristics that prohibited the Center from terminating employees who did not support the change and even might work to forestall it. Without the ability to remove employees who were inhibiting change, buy-in became critical from everyone involved. This critical need for gaining buy-in to promote public entrepreneurship extended beyond the organization's boundaries. In discussing Center performance, the consultant recalls that the:

> [Agency director] was amazed by our success. But it also riled many others. As we continued to perform better, we were faced with increased push back from other centers and leadership outside of the direct line of reporting. We had to tread carefully.

Though the Center had the Agency director's approval, the layers of administration between the two levels created challenges in the communication and coordination of processes. Overall, in the case of public entrepreneurship and even more so than with entrepreneurial efforts undertaken in private for-profit organizations, "any lack of buy-in, internally or externally, was a major threat to the success of our Center's goals."

A final key lesson overlooked in both of the existing public entrepreneurship models described herein is the importance of quickly formalizing the processes and procedures needed to support entrepreneurial behavior. While flexibility is often paramount in new ventures, in public enterprises the ability to routinize behavior creates a systematic way to communicate, increases visibility across the organization, and creates a shared vision with individual accountability. In other words, developing routines helped the Center balance both explorative and exploitative entrepreneurial behaviors by integrating the entrepreneurial efforts into all employees' regular tasks. This may seem contradictory, but this lesson suggests that the new actions taken to develop and support entrepreneurial behaviors within the organization need to be integrated into routines in order for employees to regularly enact the desired entrepreneurial actions. Using processes to establish goals and evaluation tools was paramount to changing behavior. Our final takeaway highlights the importance of balancing explorative and exploitative entrepreneurial behaviors simultaneously not only in the business model but also in employees' regular tasks.

6. Summary

The changing funding climate described in our case study is not a unique experience for organizations, public or private. Stevenson, Kuratko, and Eutsler (2018) found that the funding climate is changing across the U.S. such that industries and regional areas underserved by venture capital seem to have shifted toward alternative sources such as crowdfunding. Following this shift in the private business climate, public organizations in sectors such as agriculture or in rural geographic regions may also need to seek novel forms and sources of funding as government allocations continue to contract. The case study presented herein highlights one path for seeking alternative funding by engaging the local community both as a source of support and seed funding (i.e., revenue engine #1). However, future research might further explore how public organizations specifically can leverage their communities and constituents for novel forms of funding to help mitigate eroding federal and state allocations. In particular, they may seek funding from some of the newer sources for funding entrepreneurial efforts such as crowdfunding (i.e., Josefy, Dean, Albert, & Fitza, 2017).

In addition, this study focused on the development of entrepreneurial behaviors in a public organization; however, there is an opportunity to expand on this work by focusing on how public organizations might develop and foster an entrepreneurial orientation (Covin & Lumpkin, 2011). Many of the behaviors that are considered to be innovative, proactive, and demonstrate a willingness to accept strategic risks are integrated within an entrepreneurial orientation. An entrepreneurial orientation also includes autonomy and competitive aggressiveness and represents an enduring entrepreneurial culture in an organization. However, recent research highlighted how firms adopt various configurations of these five characteristics in response to their environment (McKenny, Short, Ketchen, Payne, & Moss, 2018). Future research could explore the benefits and challenges of developing an entrepreneurial orientation in public organizations given their unique environment, culture, and mission as compared to private firms.

Thirdly, our case study suggests that the two major models for public entrepreneurship may be inadequate on their own; both explorative and exploitative actions are needed. Future research needs to examine the importance and value of integrating these two models in public organizations. Does integrating the two models when properly implemented always produce a more entrepreneurial organization? Alternatively, are there types of public organizations in which one model is more effective than the other? If so, what are the contingency variables that determine the appropriate model?

Although these research questions flow particularly from the research described herein, there are likely a number of other potentially valuable research questions on public entrepreneurship that could be addressed. Such work could provide valuable contributions to public entrepreneurship research and practice.

While organizational and institutional inertia can be difficult for entrepreneurial change agents to overcome, the performance implications can be significant as noted in our study. A thorough analysis of a successful change process to enhance entrepreneurial behaviors in a public setting using entrepreneurship theory highlighted the applicability of existing public entrepreneurial models depending on organizational goals. Furthermore, integrating our case study with entrepreneurship theory provided some important lessons that can be used in future applications of entrepreneurship in public sector organizations

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