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From the Editor’s Desk

Timothy L. Linker
High Point University

The Journal of Research Administration is committed to broadening and deepening our shared understanding, so that we can successfully manage the global research enterprise and solve our collective challenges. With the complexities of research administration ever growing, there has never been a greater need for more effective management. Fortunately, research administrators are renowned for their willingness to share their successes and failures. It is with this perspective that the Journal contributes to our field.

I am proud to say that, as of this edition, the Journal is an open-access publication. The Journal and its resources are available to every research administrator, at every level, at every institution, throughout the globe. This transition reflects our profession’s willingness to share. If you are a non-SRAI member and wish to have the Journal delivered to you via email, please send a message with your name and institution to journal@srainternational.org. Our progress toward reaching all research administrators would not be possible without the generous support of the Society of Research Administrators International (SRAI), which publishes the Journal and I thank the SRAI members and leadership for their continued support.

The Journal also supports those who seek to share their expertise in our field through our Journal Fellowship Program and SRAI annual conference offerings. The fellowship program, which welcomes its first cohort in January of 2017, will pair seven writing fellows with established authors. This program is designed to guide budding research administration authors through the scholarly writing process. If you are interested in becoming a fellow, calls for future fellowship applications will continue throughout 2017 and will be noted in the Catalyst and on the Journal website (www.journalra.org).

This edition of the Journal is filled with ways to more effectively manage your research enterprise. Abbott and Stacener investigate a systems engineering-based approach to improve the effectiveness of universities’ administrative tools and procedures in Systems Engineering-Based Tool for Identifying Critical Research Systems. In their article Multi-institution Research Centers: Planning and Management Challenges, Spooner and coauthors examine the challenges in planning and managing multi-institution centers of excellence. Phipps and coauthors evaluate knowledge mobilization strategies to more effectively measure future research impact in their article Supporting Knowledge Mobilization and Research Impact Strategies in Grant Applications. In their article Enhancing Faculty Productivity Through a Centralized Communications and Project Management Infrastructure: A Case Study at the University of Kentucky Markey Cancer Center, Vanderford and coauthors put a spotlight onto the University of Kentucky, Markey Cancer Center’s efforts to support faculty with professional grant services designed to enhance faculty productivity. In their article The Grants Office and the RA Generalist: Parallel Life-Cycles and Development at Small PUIs, Chuel-Shuckers and coauthors explore a life-cycle model for
accessing Predominately Undergraduate Institution (PUI) research offices. Finally, Raubenholt
details the use of the sprint model as a problem-solving mechanism at The Research Institute at
the Nationwide Children’s Hospital in her article *An Analysis of Collaborative Problem-Solving
Mechanisms in Sponsored Projects: Applying the 5-Day Sprint Model.*

As always, I want to thank the *Journal’s* Deputy Director, Dr. Nathan Vanderford, and editorial
board for their outstanding efforts. The *Journal* is a team effort and the editorial board is one of
the best teams in research administration.
Systems Engineering-Based Tool For Identifying Critical Research Systems

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Abstract: This study investigates the relationship between the designated research project system independent variables of Labor, Travel, Equipment, and Contract total annual costs and the dependent variables of both the associated matching research project total annual academic publication output and thesis/dissertation number output. The Mahalanobis Taguchi System (MTS) pattern recognition methodology was utilized in the three-year, 3000+ research project case study to identify which research project system variables are responsible in both magnitude and degree for the associated publication & thesis and dissertation research project outputs. The selection of the MTS “abnormal” and “normal” data set boundary was specifically chosen in an attempt to define a “successful” from “unsuccessful” research project metric at the research unit, tenure track versus non-tenure track, and individual research project principal investigator organizational levels. The findings of the study are directly compared against the associated level budget percentages changes over the same time period. Through such concrete research system identification, research administrative personnel have the possibility of directly identifying both the research project system “impactors” as well as the association between likely effects of reduced or affected research system impacts on the research outputs themselves.

Keywords: Faculty Integrated Outputs, Mahalanobis Taguchi System, System of Systems

Introduction

Modern university research projects, even though they are still primarily leadership driven by individual Principal Investigator (PI)/Program Director (PD)-equivalent faculty members, must today utilize and rely on a series of institutional infrastructure systems for their facilities, instrumentation, travel, contracting, labor, and administrative needs to function effectively. Each of these systems has various costs associated with them (Haley, 2009; Haley 2011; Grieb, Horon, Wong, Durkin, & Kunkel, 2014).

This paper addresses the use of systems engineering-based management concepts to respond to and develop an advanced research systems administrative and management information approach prototype in order to allow research universities to improve the effectiveness of their research infrastructure administrative tools and policies.
The International Organization of Standards (ISO) Subcommittee on Software Engineering (SC/7) developed the current measurement standard for software measurement processes. “This International Standard identifies the activities and tasks that are necessary to successfully identify, define, select, apply and improve measurement within an overall project or organizational measurement structure” (ISO, 2007). However, while this standards title (referred to as ISO/IEC 15939) uses the terminology of software engineering, it is explicitly meant to also refer to systems engineering (Frenz, Roedler, Gantzer, & Baxter, 2010). ISO/IEC 15939 is also defined in terms of fields of application. In the context of a university research administrative organization, one of the fields of application, “by a supplier to implement a measurement process to address specific project or organizational information requirements” can be seen as representing the necessary measurement needs of a research university administrative component organization (ISO/IEC 15939, 2007).

Of note, ISO/IEC 15939 is not a library of measurements nor does it provide any recommendation on which measures apply to an individual project or organization. It merely defines a process supporting the construction of defined and tailored measures for an organization’s individual requirements.

From an organizational management perspective, ISO/IEC 15939 also details the steps necessary for an organization to ensure that their measurement processes are optimized to form a set of “requirements” to ensure the maximum utilization of these same measurement processes. Figure 1 depicts this process, including the four fundamental measurement task activities.

Figure 1. ISO/IEC 15939 Measurement Process Model. (From ISO/IEC 15939, 2007)
Institutional Background

Between 2009 and 2012, the Naval Post Graduate School (NPS) experienced an unprecedented growth rate exceeding thirty percent annually in its research funding. From ~$75M in 2009 to over ~$150M in 2012; the breadth and scope of research work done at NPS increased dramatically (NPS, 2014). Such growth was not without its problems, however. Several major new research program investments failed to achieve their intended results and goals. A root cause analysis was conducted at the project level by the Chairs and Dean of the associated schools. Additionally, several internal and external reviews were conducted of both institutional research project acceptance and research project review processes. As a consequence, the top level research management and administrative level organization at NPS, the Research and Sponsored Programs Office (RSPO), began exploring possible additional technical and management processes in order to assist in preventing such similar occurrences from occurring again.

As a result of these technical and management process actions, the RSPO has adopted a multi-pronged institutional approach to managing the acquisition of key information required for support, improvement, and strategic planning for critical research activities. These include: (1) the development, formation, and maintenance of an institutional work acceptance policy and joint academic, research, and leadership committee to monitor and serve as a senior decision body for research program acceptance according to the institutional strategic plan; and (2) the development, formation, and maintenance of an evolving research system, staff, and project research output measurement information construct. This latter element will form the major portion of this paper.

Research Administration Background

Education, research, and services constitute the three major responsibilities of universities (Boyer, 1996). Because of the inherent complexity of optimizing and simultaneously balancing these three different mission areas, the resultant university structure that results from it is one that requires a critical, evolving, and well thought out management process. This would include the specific research management structure employed (Bosch & Taylor, 2011; Pettigrew, Lee, Meek, & Barros, 2013). Furthermore, in selecting the elements necessary in formulating the elements of this research management structure, Mintzberg (1979) lists four generic parameters, including an information based decision making system as being necessary (Haines, 2012).

With respect to this decision making system Kirkland (2008) notes “a system to identify any emerging problems at an early stage” as being critical. Taylor (2006) also supports this concept by stating that research management administration should be seen as “encouraging, supporting and monitoring” project entities.

The general advantages of developing a systematic information based measurements tool basis as a tool for research administration are not new. Haines (2012) has pointed out that their use includes establishing and oversight of research business processes, defining responsibilities, controlling expectations, driving team motivations, assessing research staff performance, as well as upgrading tools for both research decision making and prioritization.
While many research administrative organizations use various information measurement constructs as a key portion of their overall responsibility, as Nguyen, Huong, and Meek (2015) point out, “the need for an effective, evidence-based metric standard that captures the complexity of the (Research Management) field remains unmet.”

As Nguyen et al. (2015) have also pointed out, universities typically use an amalgam of publication information, peer review, or a combination of the two former to quantify research personnel outputs at the individual principal investigator, department, or school levels. This combination, or bibliometrics, includes such elements as impact factors and/or citation rates. While there are both pro arguments (Taylor, 2011) and contra arguments (Adams, 2009) to the use of bibliometrics, the inclusion of specific system derived information directly relevant to the integrated System of System (SoS) research project outputs has, to the best of the authors’ knowledge, not been attempted for inclusion.

**Literature Review**

Cost functions as almost a universal sanctioned means of exchange and value throughout communities (Newlyn, 1978). Investments in a particular quantity, whether it be equipment, labor, project, etc., can all be associated with the appropriate process if there is an accurate accounting system to assign “cost” in dollars to these processes and interactions (Langford, 2012). The system engineering usage of cost constituting the basis for modelling is also well known (Boehm et al., 2000; Blanchard, 1998).

Any performance management information system which has the capability to actively predict performance, must also meet two additional criteria: (1) it must have a program management framework; and (2) it must also have a procedural framework (Folan & Browne, 2005). The numeric basis of cost makes it attractive as many other gauges of systems measurement (Beamon, 1998). Beamon (1998) also concluded, however, that it is improbable that a unitary performance measure like cost will be sufficient, hence a conglomerate of performance measures is demanded for precise assessment.

The need to further classify research university project performance measures as they relate to performance information management is apparent from the fact that effective performance information management involves more than merely quantifying usefulness or benefit as the produced outcome of any organizational undertaking (Macbryde & Mendibil, 2003). Monitoring the processes responsible for those outcomes themselves is equally as important in order to influence the determination of the usefulness or benefit (Busi & Bitici, 2006). The outcome-process difference is also related to a ‘systems’ view of research university organizational functioning, in that the effectiveness or performance of the organizational system in question will itself then be a nascent property of interaction and processes between which and within which all elements that comprise the system as a whole may function (Atkinson, Waterhouse, & Wells, 1997).

Systems engineering (SE) involves the utilization of multiple academic disciplines to integrate various concepts “encompassing a wide range of engineering fields and associated analytical
thought processes” (Kossiakoff & Sweet, 2003). It further defines an overall ‘systems’ thinking to consider the broader perspective that embraces a systems perspective as well as the interaction and integration of individual parts (Cowan, Allen, & Mistree, 2006; Haskins, 2006). Systems Engineering also bears a strong resemblance to an implementation of General Systems Theory in that the “general nature of a complex problem is to find a solution using systems ideas and principles” (von Bertalanffy, 1962).

Gorod, Sauser, and Boardman (2008) suggest that there are eight measures (focus, boundaries, problem, structure, goals, approach, timeframe, and centricity) to compare system versus SoS engineering approaches. If the focus is on an integrated system, boundaries are dynamic in nature, problems tend to be of an emergent nature, structures of the organization are best described as a network, goals are pluralistic, timeframes are continuous, the nerve center of the organization is a network itself, then a SoS SE approach would be considered the better alternative (Gorod, Sauser, & Boardman, 2008).

DeLaurentis and Callaway (2004) define a SoS as “the combination of a set of different systems [that] forms a larger system of systems that performs a function not performable by a single system alone.” In the context of a university research administration application, however, the definition by Jamshidi (2009) as “an integration of a finite number of constituent systems which are independent and operable, and which are networked together for a period of time to achieve a certain higher goal” seems to serve the present application best.

To be considered as a SoS, there are at least five identified traits: “operational independence, managerial independence, emergent behavior, evolutionary development, and geographical distribution” (DeLaurentis, 2007; Boardman, DiMario, Sauser, & Verma, 2006). Maier (1998) interprets operational independence as: “if the SoS is disassembled into its component systems, the component systems must be able to usefully operate independently.” Managerial independence is defined similarly as: “the component systems not only can operate independently, they do operate independently.”

In summary, a SoS executes both tasks and designs that cannot and are not either inhabiting any single constituent system (Engell, 2014). These functions are the nascent constituent elements of the total SoS itself and may not be confined to any single constitutive system. The foremost functions of the SoS emerge and are in turn satisfied by the SoS (Maier, 1998). Hence, SoS are comprised of multiple systems that are each managed and operated independently. At the SoS level, they deliver additional benefits. The enterprises at the systems level are all seen to have managerial and operational independence. Together, however, the individual component systems collaborate to develop and operate the SoS (Maier, 1998).

The current state of NPS research administration operations is seen to be requiring a more developed research output measurement information construct. NPS is not alone in this regard (Nguyen et al., 2015). A systems engineering-based method of analysis offers us one possible way to gain additional perspective into the many complexities observed in managing a research university construct by providing an additional dimension through which to view research conduct.
Method

At NPS, the increased fidelity of individual research project financial data has provided valuable spending pattern accounting information. It was not until 2011, however, that questions arose whether the individual total annual system cost structure items afforded by use of the institutions Kuali Financial System (KFS) (labor, equipment, etc.) may be treated as representative of the individual systems they originate from in order to possibly afford additional insight into NPS RSPO research operations (Kuali, 2014). This further implied that a possible new integrated RSPO planning and control information mechanism could be constructed, utilizing continuous process measurement techniques to track the state(s) of the system(s) variance trends.

The detailing of research project total expenditures as broken down by labor, equipment, travel, contracting, and “indirect” costs is conceived as five operational and managerial independent systems functioning as a SoS. Labor, Equipment, Contracting, Indirect, and Travel are all individually operationally separate and managed organizational entities. This includes their “input personnel, hardware requirements, software requirements, facility spaces, office policies, and in house documents that interact substantially through processes, feedback, and boundaries” (INCOSE, 2006). The outputs from each system, with the exception of Indirect, include “specifically different qualities products, properties, characteristics, functions, behaviors, and performances” (INCOSE, 2006). The individual system elements (Labor, Equipment, Travel, and Contracting) are all “managerial and operationally independent elements” (Boardman et al., 2006). They also possess the traits of “emergent behavior and evolutionary development” (DeLaurentis, 2007). Geographical distribution of elements may be more problematic. The individual system offices are physically co-located within a ½ square mile area, however, the geographical network responsible for the core policies and procedures governing each individual system are nationwide (DeLaurentis, 2007).

Knowing one measure regarding a system presages a degree of comprehension of an alternate measure of the system (Kuhn, 1962). Systems engineering ‘integration’ could be defined as the act of ‘combining two different knowledge representations together’ (Kim & Porter, 2007). The integrative framework that is systems integration serves as a tool to analyze the anatomical basis for an item; the act of integration serving to identify both missing objects, quantities, and processes (Langford, 2007).

The use of academic faculty performance measurement tools has been the subject of the academic literature since 1961 (Gustad, 1961). The evaluation of a researcher’s output is of obvious interest due to the benefits of developing criteria that are not biased or unfair in any way. If such a metric could be devised, it could serve as the basis for research project funding, faculty comparison, promotion, and management of the same (Sidiropoulos, Katsaros, & Manolopoulos, 2007). In an attempt to answer some of the drawbacks of use of such simple indices, researchers have developed a myriad of academic productivity indices based upon aggregation, time, seniority, dynamic properties, multi-dimensional, trend, etc. based metrics in that they combine mathematically other simple indexes into new ones (Garcia-Perez, 2009; Boell & Wilson, 2010).
In terms of evaluation of the various indices outlined above with respect to quantitatively tying results to specific process or outcome factors, there is precious little research, however. An example of such quantitative empirical analysis that could be found in the literature has been used to identify the “input-output” efficiency of Chinese universities (Chen, Shen, & Fang, 2010). The six output indicators for this study were scientific and technical awards value, academic writing, academic theses, national research projects, number of patents granted, and tech transfer income. These factors were correlated against input factors which included numbers of various staff personnel in various categories (by number) (Chen et al., 2010).

In the present case, we are looking for quantities to tie and compare directly against individual research project system costs; we will postulate the existence of a metric: Faculty Integrated Outputs. We will assume that this is composed of the digital sum of all individual research program subject area publications, presentations, reports, and citations on the one hand, and student theses and dissertation numbers for a particular funded research program within two years of the onset of program project funding. The two year figure is based upon the observed local output data. An NPS principal investigator is seen to normally publish at least one scholarly article within a two year time frame commencing after project onset. Similarly, students are seen to normally produce a M.S. degree thesis within two years of project onset. In another research university implementation, either of these two values may be different. We are also specifically including two separate categories of “FIO” in our discussion in order to recognize the dynamic yet dual nature of research administration in the university environment: between the need to publish in whichever form to meet the faculty members academic research performance milestones, and the need to balance those against the need to meet the teaching institution’s requirement for passing along information to the next generation of academics/students via theses & dissertations.

The expression for the FIO variables of “Publications”, and “Dissertation & Thesis” outputs generated are clearly terms for “performance” as, in totality or individually, they are commonly accepted metrics of functionality (Langford, 2012). The measurement of them are also assumed to be “continuous and quantifiable” (Langford, 2012). The individual performance metrics are also seen to be impacted by both temporal changes and events. While they are also each individually discrete, we also will make the assumption that we may manipulate them mathematically as a means of determining a total FIO quotient for each faculty member, department, school, Center, or institute. This approach is common in Academia. Several authors, as stated above, have attempted to identify various mathematical constructs (ex: h-index, m-index, relative value unit, academic readiness level, etc.) (Iyengar, Wang, Chow, & Charney, 2009; Thompson, Callen, and Nahata, 2009; Mezrich & Nagy, 2007). None of these expressions, however, is intended to constitute a single “determinator” in that one citation, publication, or thesis is any more valuable than any other, just that we will make the assumption that they may be manipulated mathematically as a means of quantifying and discovering relationships between FIO and any other research administrative developed metrics.

Before displaying several FIO and other critical example FIO data, a status review will be conducted with respect to the characteristics of the presumed model that has been proposed. A
postulated multiple input (assumed four independent variable-labor, travel, equipment, contract) single output(s) (Faculty Integrated Output-Dissertation & Thesis or Publication) model. What we do not have at the moment is more than a general theoretical idea of how the independent variables should interact in order to produce a predictive trend of how the individual NPS researcher and research groups "products" should evolve. The next question is obviously, why the concern? There are computationally effective methods available to the research administration community that can optimize such "black-box models" with undetermined structurally complex interactions. Neural Networks and genetic algorithms are but two possible examples. In order to narrow down the mathematical analysis approach further, we should consider what exactly are the attributes of the FIO product that we are looking for? The insight developed from the FIO use is meant to motivate deeper involvement in both discovering as well as fixing the issues brought to light through their use. Secondly, given the scope, breadth, and multiple interaction pathways experienced by all research projects at a university, one would like to believe that the widest possible search process done in order to find the best near-optimal solution would seem to be appropriate. As the introduction of a new FIO metric is also expected to be continuous, the solution space for any research group FIO trend data is expected to evolve over time. For example, if the labor system cost solution factor evolves as a more important component of a total FIO data for one research group versus another over time, this in itself provides motivation for determining the reasons why. How the FIO would also be implemented into the day to day operations of the research administrative organization is also important. We are not talking about a requirement to generate instant and complex time sensitive solutions. We are talking about the incorporation of data over long periods of time wherein the individual "optimal FIO solution" from one research entity is combined with other metrics under the watchful eyes of presumably very experienced and trained research administrative personnel before any decisions are made. Lastly, as all system independent variables are tracked as cost components, which individual system components (and combinations thereof) play the largest role in research projects X or research groups Y work should be easily available (i.e., the ability to choose and adapt other functional constraints on the functionality of the problem solution should be easily adaptable) for research administration observation.

Research Questions

In the context of university research administration, the specific research questions are:

1. May a research institution develop a mathematical computational analysis method linking the independent system variables of Labor, Travel, Equipment, and Contracts on the one hand, and the dependent variable of FIO on the other?

2. Provided we are successful in (1.), what increased situational awareness does the analysis of the Systems to FIO data provide research administrators?

Chosen Computational Method

There are several basic computational analysis options available to analyze the above quantitative multi-variate data. The authors have chosen to use the Mahalanobis-Taguchi System (MTS) (Taguchi & Jugulum, 2002) analysis technique for this proof-of-concept trial. In the setting
of research administration operations, MTS has been shown to offer a number of important advantages over other computational analysis methods: (1) it offers the possibility of independent variable reduction; (2) it can identify both “abnormal” and “normal” data sets; (3) the degree of “abnormality” can be measured relatively simply; (4) it requires no assumptions as to the distribution form for the data; (5) the controls governing what is “normal” and what is “abnormal” can be easily changed and the effects viewed; and (6) it is not computationally complex (Kumano, Mikami, & Aoyama, 2011; Holcomb, 2016).

MTS is comprised of four stages. Performing a multivariate analysis utilizing MTS requires the obligatory data. Once the data is obtained, including all variables that can influence any outcomes, the researcher must determine the parameters of “normal” versus “abnormal” data. From these separate identities, a Mahalanobis Space (MS), composed of the differentiated Mahalanobis Distances (MD) for each sample, is calculated. The MD represents a scaled distance of all variables delineating the correlation between each. Two calculation methods are known for determining MD: (1) Inverse Matrix Method; and (2) Gram-Schmidt Orthogonal Process (Taguchi & Jugulum, 2002). The Inverse Matrix Method (IMM) will be used in this work. The IMM is described in Equation 1.

1. \[ MD_j = Z'_{ij} C^{-1} Z_{ij} \]

\( MD_j \) is a squared distance and \( Z_{ij} \), shown in Equation 1, is the standardized vector, \( Z'_{ij} \) is the transpose of the standardized vector, and \( C^{-1} \) is the inverse of the correlation matrix of the data.

2. \[ Z_{ij} = (X_{ij} - m_i)/ s_i \]

\( X_{ij} \) is the data, \( m_i \) is the mean of a specific column, and \( s_i \) is the standard deviation.

In stage two of MTS, the MDs for the abnormal group are calculated and compared to the normal group values. To calculate the abnormal MDs, the standardized vectors must be standardized using the mean and standard deviation from the normal group. Also, the correlation matrix and inverse correlation matrix come from the normal group as well. The abnormal threshold is validated if the MDs for this group have higher values than for the healthy group.

The third step in MTS is to determine all functional variables that influence the outcome using Orthogonal Arrays (OA) and Signal-to-Noise Ratios (SNRs). In MTS, an OA is a survey instrument with two identities; either the variable is present or it is not. For each run specified by the OA, MDs are recalculated. The SNRs attempts to recognize all functional variables compared to variations in the system. SNRs are calculated from the MDs of each run using Equation 3.

3. \[ SNR = \eta_q = -10log\left[\frac{1}{t} \sum_{i=1}^{t} \left(\frac{1}{MD_i}\right)\right] \]

Non-functional variables are removed based on the overall gain of the system. Only functional variables that increase the system’s overall gain are retained. The last stage of MTS is the condition of monitoring the MD scales while applying either suitable conclusions or remedial actions based on the observed values.
In the present situation research administration case, where there are expected to be a large variation in the incidences of correlations because of the diversity of research and principal investigators as well as the individual and group small data sets, as long as we select the proper “normal” and “abnormal” groups correctly, MTS would seem to offer an initial advantage over any other technique because of the prior stated reasons. In this proof-of-concept trial, we have set the initial publication and thesis/dissertation abnormal/normal differentiation data set factor boundary at zero. Thus, if the research unit (e.g., department, Center, or Institute), faculty type (e.g., tenure track versus non-tenure track), or individual principal investigator produces a publication or thesis/dissertation, it is considered “normal.” If they do not, it is considered “abnormal.” In future iterations, where the normal/abnormal data set boundary could be set at a non-zero quantity, as in the case of mandated research project quarterly or monthly reports, we would have to possibly modify the selection criteria to include cluster analysis or publication quantity averaging for determination of the boundary standard.

System Uncertainty Sources

In the desire to link research project system costs to research project outputs of D/T numbers and Publication output, we have assumed that the expressions for system costs are capturing the true costs in total annual labor $, travel $, equipment $, and contract $ as they relate to those same outputs. How valid is this?

From work in the 1980’s concerning production “technical efficiencies” (Schmidt & Sickles, 1984) we know that at least some airline companies’ ability to produce “maximal output” is in the range of seventy to one hundred percent. This would also imply that there are inefficiencies on the order of zero to thirty percent. Such items as “marketing research costs”, testing costs, and administrative costs are all not usually correctly costed in research project accounting (Skaife, Swenson, & Wangerin, 2013). There have also been so-called R&D “intangible” expenses identified (Siegel & Borgia, 2007) to include HW/SW, technical expertise, training programs, and customer service capability that could be left out of any research project total accounting scheme (Johnson, 1964). Hence, we know that there are likely to be sufficient research project uncertainty components that are missing from individual or group research projects depending on whether or if these “costs” are accounted for. In an attempt to quantify the specific NPS case, Langford (2015) has calculated there may be a ~20-25% uncertainty rate in the labor cost accounting alone. To deal computationally with these cost uncertainty “noise” issues, a fifth random variable has been inserted into the MTS calculation along with the other four independent variable system costs. Because of the number of variables and the lack of any known variable interactions, the L8(2⁷) Taguchi Table was chosen as the orthogonal array for use in our MTS calculations (Taguchi & Jugulum, 2002).
Results

Data Sources

Between 2013 and 2015, the authors collected and reduced the 2010-2012 NPS FIO research output and matched them with the correlated system cost data for over three thousand research projects from fourteen different university departments, centers, and institutes in order to establish a possible basis for an additional system research administrative information metric tool. Dissertation and Thesis (D/T) and Publication (Pubs) specific MTS Gain factors were obtained for the fourteen research units as well as the faculty sub-unit type Tenure (TT), Non-Tenure Track (NTT), and individual Principal Investigators (PIs) in some cases.

Data Summary

Table 1. NPS Group MTS Gain Factor Success Percentages.

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>D/T MTS Gain Factor Success Percentage</th>
<th>Pubs MTS Gain Factor Success Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>78.5</td>
<td>78.5</td>
</tr>
<tr>
<td>11</td>
<td>92.8</td>
<td>85.7</td>
</tr>
<tr>
<td>12</td>
<td>71.4</td>
<td>57.1</td>
</tr>
</tbody>
</table>

Table 2. NPS Faculty Type MTS Gain Factor Success Percentages

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>D/T MTS Gain Factor Success Percentage (TT/NTT)</th>
<th>Pubs MTS Gain Factor Success Percentage (TT/NTT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>11</td>
<td>7.1/14.2</td>
<td>14.2/14.2</td>
</tr>
<tr>
<td>12</td>
<td>7.1/7.1</td>
<td>7.1/7.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FY</th>
<th>FY 10 Labor Budget %</th>
<th>FY 10 Travel Budget %</th>
<th>FY 10 Equipment Budget %</th>
<th>Contract Budget %</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.71</td>
<td>0.06</td>
<td>0.04</td>
<td>0.18</td>
</tr>
<tr>
<td>11</td>
<td>0.67</td>
<td>0.06</td>
<td>0.009</td>
<td>0.25</td>
</tr>
<tr>
<td>Individual E</td>
<td>3.5</td>
<td>0.09</td>
<td>0.02</td>
<td>0.53</td>
</tr>
<tr>
<td>Individual B</td>
<td>0.64</td>
<td>0.03</td>
<td>0.001</td>
<td>0.33</td>
</tr>
<tr>
<td>12</td>
<td>0.82</td>
<td>0.06</td>
<td>0.018</td>
<td>0.09</td>
</tr>
<tr>
<td>TT</td>
<td>0.87</td>
<td>0.07</td>
<td>0.017</td>
<td>0.05</td>
</tr>
<tr>
<td>NTT</td>
<td>0.81</td>
<td>0.06</td>
<td>0.018</td>
<td>0.10</td>
</tr>
<tr>
<td>FY D/T</td>
<td>Labor Gain</td>
<td>Travel Gain</td>
<td>Equipment Gain</td>
<td>Contract Gain</td>
</tr>
<tr>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>5.2</td>
<td>4.75</td>
<td>-2.2</td>
<td>-1.6</td>
</tr>
<tr>
<td>Individual E NTT</td>
<td>5.37</td>
<td>11</td>
<td>6.9</td>
<td>3.21</td>
</tr>
<tr>
<td>12</td>
<td>3.68</td>
<td>0.52</td>
<td>2.02</td>
<td>0.58</td>
</tr>
<tr>
<td>NTT</td>
<td>6.27</td>
<td>5.91</td>
<td>4.15</td>
<td>0.85</td>
</tr>
<tr>
<td>FY Pubs</td>
<td>Labor Gain</td>
<td>Travel Gain</td>
<td>Equipment Gain</td>
<td>Contracts Gain</td>
</tr>
<tr>
<td>10</td>
<td>8.48</td>
<td>4.91</td>
<td>-1.23</td>
<td>0.73</td>
</tr>
<tr>
<td>11</td>
<td>3.62</td>
<td>4.24</td>
<td>-2.4</td>
<td>0.63</td>
</tr>
<tr>
<td>Individual B TT</td>
<td>109.9</td>
<td>41</td>
<td>52</td>
<td>43</td>
</tr>
<tr>
<td>12</td>
<td>1.79</td>
<td>0.71</td>
<td>-0.56</td>
<td>0.93</td>
</tr>
<tr>
<td>NTT</td>
<td>4.6</td>
<td>1.84</td>
<td>2.39</td>
<td>2.26</td>
</tr>
</tbody>
</table>

FY 11 D/T Note: FY11 MS Space (MD values: 1.56, 2.36, 2.42, 9.60). Reduced variable MS space (MD values: 1.35, 2.43). Correlation Coefficient=.98
FY10 - 12 Pubs Note: FY10 MS space (MD values: 1.19, 4.2, .71, 3.5). Reduced variable MS space (MD values: 1.31, 4.34, 3.97). Correlation Coefficient=.993; FY11 MS space (MD values: 2.69, 10.08, 1.81, 1.80. Reduced variable MS space (MD values: 1.89, 8.7, 1.3). Correlation Coefficient=.995; FY12 MS space (MD values: 6.93, 3.33, 3.71, 1.71). Reduced variable MS space (MD values: 5.5, 4.1, 1.9). Correlation Coefficient=.941
Table 4. Group 4 Calculated Standard Errors and Signal-to-Noise Ratios for FY10-12 D/T Data.

<table>
<thead>
<tr>
<th>Group 4 DT Data Set</th>
<th>Standard Error(FY10,’11,’12)</th>
<th>S/N Ratio(FY10,’11,’12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>(0.406, 0.266)</td>
<td>(2.24, 3.75)</td>
</tr>
<tr>
<td>Abnormal</td>
<td>(0.180, 0.131)</td>
<td>(0.54, 0.78)</td>
</tr>
<tr>
<td>Improvement</td>
<td>(0.226, 0.135)</td>
<td>(3.09, 3.83)</td>
</tr>
</tbody>
</table>

Table 5. Group 4 Calculated Standard Errors and Signal-to-Noise Ratios for FY10-12 Pubs Data.

<table>
<thead>
<tr>
<th>Group 4 Pubs Data Set</th>
<th>Standard Error(FY10,’11,’12)</th>
<th>S/N Ratio(FY10,’11,’12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0.185, 0.297, 0.200</td>
<td>5.39, 3.35, 4.24</td>
</tr>
<tr>
<td>Abnormal</td>
<td>0.123, 0.119, 0.235</td>
<td>8.124, 8.37, 9.98</td>
</tr>
<tr>
<td>Improvement</td>
<td>0.062, 0.178, 0.035</td>
<td>2.734, 5.02, 0.74</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Group 4 NTT DT 1Ind E</th>
<th>Standard Error</th>
<th>S/N Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>.461</td>
<td>2.16</td>
</tr>
<tr>
<td>Abnormal</td>
<td>.0059</td>
<td>169.18</td>
</tr>
<tr>
<td>Improvement</td>
<td>.46</td>
<td>167.02</td>
</tr>
</tbody>
</table>

Discussion

Aligning Findings to the Research Questions

Research Question 1: System to FIO Analysis Method. The use of the Mahalanobis Taguchi System (MTS) method allows for determination of the specific system variables and their associated degree of contribution to both of the identified Pubs and D/T outputs at the research unit levels. As can be seen in Table 1 the majority of NPS research units (Department, Centers, and Institutes) covered in the fourteen groups researched provided MTS Gain Factors which identify the systems affecting research outputs. At the faculty sub-unit levels, as can be seen in Table 2, the percentages are much lower. This result is not surprising. All groups under MTS evaluation require both a minimum number of acceptable independent variable value sets as well as adherence to compliance rules for determining the validity/usefulness of the derived Mahalanobis Distance. In the case of TT and NTT there are simply less data available. For the specific situation of individual NPS PIs researched, the situation is even worse. Over a three year period, only five individual PIs researched successfully developed MTS Gain Factors for the same reasons. The same MTS Gain Factors were also for individual years and hence, were not available for tracking over a multi-year period. Table 3 is used to display the integrated combined research group, faculty, and principal investigator results for one of the fourteen research groups observed. As can be seen, the differences are indicative of factors impacting research group and sub-elements of those groups.
Between FY10 and FY12, Group 4’s total research budget increased 12%. D/T Gain Factor information was not available for FY10. For FY10, all abnormal D/T MD values were negative, negating any MTS Gain Factor results. Raw thesis and dissertation output numbers more than tripled from FY10 to FY12 for Group 4. In FY11, neither the Equipment nor Contract systems contributed to the generation of this group’s D/T output as the MTS Gain Factors were both negative. Labor was seen as both the largest budget percentage as well as the largest system contributor to the generation of D/T output between FY11 and FY12.

The publication output numbers from this group increased 13% from FY10-FY12. What is interesting here is that the MTS Gain Factor numbers associated with the Equipment system for this group remained negative for the three year period. This means that the Equipment system variable is not seen as contributing to the Pubs outputs. More in-depth analysis of the specific dynamics of this group would have to be done to account for this.

While there were slight differences between TT and NTT budget percentages in FY12, the budget was dominated by the Labor system contribution. NTT personnel were responsible for thirty three percent of the raw dissertation and thesis output in FY12 and fifty percent of the publications raw output. The Labor system was also seen to dominate the contributions to NTT D/T and Pubs contribution outputs. Individual E produced twelve percent of the FY11 group raw dissertation and thesis output. Individual B produced thirty two percent of the FY11 raw publications output. For both individuals, there are substantial MTS Gain Factor system differences between them and the member research group MTS Gain Factors. Unfortunately, there was not enough data to support either a direct TT or NTT comparative analysis for these years. More in depth analysis of the specific dynamics of this group would have to be done to account for this.

Research Question 2: Research Administration Situational Awareness. By providing additional system information insight into the relevant output behaviors for research institutions, we provide an additional system contribution perspective valuable to the execution of research administration. As an example, if we have advance knowledge of macro research system changes (ex: changes to contracting or travel organization/policy execution), we may have advance knowledge of which specific research groups outputs may be vulnerable to those systems in the near term.
Conclusion

Summary

This study addressed the postulated relationship between research system independent variables of Labor, Travel, Equipment, and Contract total annual cost and the dependent variables of total bi-annual publications/thesis & dissertation outputs. The three-year study data captured the identification of which research system variables are responsible for these same outputs by magnitude and degree. The findings of the study also help to identify which critical systems are responsible for research group outputs independent of budget percentage expenditures. At higher levels of research group fidelity, the MTS Gain Factor identification was shown to be problematic due to a combination of acceptable variable value sets as well as MTS compliance rules. Through such concrete research system identification, however, research administrative personnel may have the possibility of directly identifying the association between likely effects of reduced or affected research systems on the research outputs themselves.

Future Research

The authors will continue to develop the system engineering-based FIO construct seen above to include possible extension to a non-research university laboratory data set case. The authors will also review any potential system structural effects that may have been responsible for the NPS results. As MTS has also been used to forecast other physical system multi-variate systems with success (Soylemezoglu, Sarangapani, & Saygin, 2011; Hu, Zhang, & Liang, 2013), we will specifically include this possibility in our future research administration information development construct.
Author’s Note

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References


Multi-institution Research Centers: Planning and Management Challenges

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Abstract: Funding multi-institution centers of research excellence (CREs) has become a common means of supporting collaborative partnerships to address specific research topics. However, there is little guidance for those planning or managing a multi-institution CRE, which faces specific challenges not faced by single-institution research centers. We conducted qualitative research to identify the challenges faced by an Australian program of multi-institution CREs with a view to identifying lessons for the future. This paper describes two of the most significant challenges: administrative complexity and investigator engagement. Administrative tasks (e.g.: establishing partner contracts and recruitment) were significantly more complex and time-consuming in the multi-institution CREs than single-institution research centers. Investigator engagement was hampered by a range of factors, including differing expectations within the investigator team and between the team and the funding body in relation to investigator roles as well as investigator capacity. We conclude with a discussion of key strategies that cut across the challenges: 1) early planning, 2) communication and 3) management capacity.

Keywords: collaboration, multi-institution, university research centers, research collaborations, organizational design, virtual organizations

Introduction

A range of collaborative models is increasingly used in the research field because of the benefits collaboration can provide (Bozeman & Boardman, 2003; Jones, Wuchty, & Uzzi, 2008; van Rijnsoever & Hessels, 2011; Wuchty, Jones, & Uzzi, 2007). The model might include researchers and people or organizations that might use or be affected by the research (e.g. communities, policy makers, health providers). In such cases, collaboration aims to increase the appropriateness
and feasibility of research, and to increase the likelihood that the research will be implemented (Edelstein, 2015). The model might include researchers that differ in some way to each other, for example, in disciplinary background, research experience and/or location. This can provide interdisciplinary perspectives to complex problems, broaden the geographic spread of data collection sites and networks, and increase the range and depth of research experience brought to the project (Bindler, Richardson, Daratha, & Wordell, 2012; Wagner et al., 2011).

A Center of Research Excellence (CRE) is a type of research collaboration that conducts research in a defined area. Not all CREs are the same. The CRE funding scheme objectives, duration and amount of funding, requirements, allowable expenses (e.g. direct research costs, capacity building and knowledge translation and exchange (KTE)) and expected outputs are some of the areas in which the schemes vary. There are multiple funders of CREs focusing on health issues around the world, each with their own funding rules. Examples of funders include the National Institutes of Health in the United States of America, and the British Heart Foundation and Networks of Centers of Excellence of Canada. In Australia, the largest funder of CREs relating to health is the National Health and Medical Research Council (NHMRC). The NHMRC awarded grants for 19 new CREs in 2015 alone (NHMRC, 2015).

As part of the Australian Government’s Primary Health Care Research, Evaluation and Development (PHCRED) Strategy Phase 3 (2010-2014), (Australian Government Department of Health and Ageing, 2010), a specific CRE-funding scheme was established to facilitate research and to build the capacity of the primary health care research sector.

Nine CREs were funded under this scheme, which was administered by the Australian Primary Health Care Research Institute (APHCRI) at the Australian National University (ANU). The APHCRI CREs had to be a collaboration of two or more institutions and could be virtual organizations. Funding was not recurrent and generally limited to four years. One university in the partnership was the administering institution who signed the head agreement with the ANU and received the CRE funding. The administering institution had contracts or agreements with other partner organizations that guided the nature of their relationships including reporting arrangements and disbursement of funds. The distribution of the funds between the partners did not need to be established as part of the head agreement.

Unlike many CRE-funding schemes, substantial funding was provided for direct research costs and for KTE, which was considered a priority. Another distinctive feature of the scheme was that the funding body (APHCRI) established and managed a network of the nine CREs to promote relationships with, and between, the CREs and the key stakeholders (APHCRI Research Advisory Board, Department of Health, Primary Health Care Research and Information Service). The APHCRI CREs are the focus of this paper.

A model of an APHCRI multi-institution CRE with four partners is presented in Figure 1. The number of partner institutions within Australia in these CREs ranged from three to 14. Most of the CREs had international partners who were not expected to be as involved as local institutions.
Multi-institution CREs have certain strengths but they also present particular challenges that need to be effectively managed. For example, differences between partners’ viewpoints and expectations can lead to conflict which can prevent people from working together effectively (Bammer, 2008b) and collaborative research requires substantial transaction costs (Landry & Amara, 1998).

Literature to guide the establishment and management of a multi-institution research center is sparse. Universities often provide their staff with guidance on establishing a single-institution research center and literature exists on managing collaborative partnerships and projects, (Bammer, 2008a; Chung, Song, & Group, 2010) managing virtual (business) teams, (Ale Ebrahim, Ahmed, & Taha, 2009; Hertel, Geister, & Konradt, 2005; Hunsaker & Hunsaker, 2008) and (more generally) project management (Project Management Institute, 2013). However, these sources do not address the confluence of issues of a multi-institution research center.
One resource with this focus was developed by staff of Engineering Research Centers (ERCs) funded by the National Science Foundation in the USA, based upon their experience of multi-institution research centers (Engineering Research Centers, 2012). The ERC resource described administrative challenges they considered unique to multi-institution research centers. These challenges related to the highly complex structure of the institution that comprised a large number of stakeholders, widely diverse research priorities and agendas, different institutional cultures, and institution specific administration processes. The organizational and administrative complexity and the time and effort dedicated to developing consensus and communication between stakeholders required highly sophisticated administrative structures and additional resources to support the work.

Other problems identified by the ERC resource related to the determining of partnership agreements between and among institutions, conflicts involving the scheduling of multi-institution activities due to the demands of different academic calendars, and substantial travel-related costs for Center-wide events. The resource proposed that effective communication is key to achieving multi-institution cohesiveness and focus and that meetings via teleconference or videoconference are critical to operational success. While this resource is useful, it might not be applicable to the APHCRI multi-institution research centers with their different context (Australia) and focus (primary health care). Further, it was informally compiled, so was not representative of all ERC experiences.

This paper presents the key findings of an Australian qualitative study that examined the challenges experienced when establishing and managing APHCRI CREs. The exploration of this issue was triggered when two APHCRI CREs managers (CS and LL) noticed that other APHCRI CRE managers were dealing with similar management problems that seemed to stem from the CRE multi-institutional structure. Managers, however, did not usually discuss these problems or their solutions between themselves. Consequently, CS and LL drafted a record of the challenges faced and the lessons learned in establishing and managing their CREs to guide the development of a resource for investigators and managers involved in establishing other multi-institution CREs. To ensure the data summary table record reflected the experience of all nine multi-institution CREs, a qualitative research study was undertaken.

An organizational partnership model was developed based on other models (Bryson, Crosby, & Middleton, 2006; Grudinschi et al., 2013) to guide data collection and analysis. The model identified aspects that were outside the CRE’s control (context and history), those aspects that could be planned and managed (governance structures, interpersonal processes and administrative processes), the impact of ways of managing a CRE on the type and nature of the collaboration, and the CRE outcomes for which the CRE was responsible (Figure 2).

This paper describes the qualitative study; presents the two key challenges for multi-institution CREs identified by the research, and proposes strategies for addressing the challenges.
The study adopted an insider active research approach. The defining feature of this approach is that a researcher examines a research phenomenon that arises inside his or her own work environment. The ‘insider’ status facilitates researchers’ access to the experiences and insights of work colleagues in a way that subsequently shapes and informs the research. It “offers a unique perspective on

Figure 2. Conceptual model for a multi-institution CRE

Method

Design

The study adopted an insider active research approach. The defining feature of this approach is that a researcher examines a research phenomenon that arises inside his or her own work environment. The ‘insider’ status facilitates researchers’ access to the experiences and insights of work colleagues in a way that subsequently shapes and informs the research. It “offers a unique perspective on
systems, precisely because it is from the inside. Insiders have a deep level understanding of the business context, its dynamics, its evolution and performance” (Coghlan, Shani, Roth, & Sloyan, 2014, p. 994). The research team LL, CS and CM were involved in the establishment and management of multi-institution CREs.

Ethics Clearance

UNSW Australia, Monash University and the Australian National University Human Research Ethics Committees provided ethical approval to conduct the study. Potential study participants received a Participant Information Statement and Consent Form that they read and signed. Their participation was voluntary and could be terminated by the participant at any time without consequence. Data was confidential and de-identified for reporting purposes.

Sampling Strategy

Individuals from the CRE network and associated organizations with detailed knowledge about the APHCRI CRE challenges were identified as potential key study informants. They were invited to participate in the study because they were viewed as “information rich cases” (Patton, 2002, p. 230), who could provide detailed qualitative information about the study phenomenon. Twenty potential key informants were identified. These were the nine multi-institutional CRE directors (one of each from each CRE), seven CRE managers (two CREs did not have a manager) and four “other” key informants representing the Primary Health Care Research Evaluation and Development (PHCREd) organisation and the APHCRI.

The Recruitment Process

Most of the potential study participants attended a CRE Network meeting in Canberra prior to recruitment commencement. The study plan was presented at this meeting and there were opportunities for questions and input. The information session was followed-up by email with a study invitation and a Participant Information Sheet and Consent Form. Non-responders were followed-up with a second email, and (if necessary) a telephone call.

Sample

Six CRE directors, four managers and three “other” invitees agreed to participate in the study. Consistent with the insider research stance, two of the managers and one of the “other” personnel were also the study researchers.

Data Collection Instrument

A semi-structured interview schedule generated discussion around the data summary table and constructs from the multi-institutional CRE model (Figure 2). The questions aimed to determine whether the data summary accurately reflected and encapsulated the problems specific to establishing and managing the APHCRI CREs and whether the proposed strategies for preventing or managing problems were feasible. Questions invited participants to describe any problems or lessons that had not been included in the data summary and to suggest modifications.
Data Collection

Interviews were conducted between February and June in 2015. Participants from the same CRE could elect to be interviewed together or singly.

Nine interviews were completed with 13 interviewees being involved. This occurred because two interviews were conducted concurrently with a CRE program manager and the director. The remaining interviews had one interviewee.

Interviewees were supplied with a copy of the research questions and the current data summary table to facilitate discussion. Most of the interviews were conducted by telephone; two were conducted face to face. All interviews were audio recorded. The interview duration ranged between 11 and 74 minutes. A professional transcriptionist transcribed the audio recordings.

Data Analysis

Qualitative data from 13 interviewees was analyzed using an inductive, iterative approach to identify the breadth of ideas and common themes in the transcriptions and to form a deep understanding of the data. Ideas and themes were explored and discussed by the research team with reference to the study goal and questions and theoretical propositions were generated (Grbich, 2012; Srivastava & Hopwood, 2009). The researchers discussed the transcript information as it became available and incorporated the feedback into the data summary table on an ongoing basis. The most recent version of the data summary table was used for each interview. This process was repeated until all interviews were completed. Researchers clarified information with the interviewer/s during the data review process, where necessary. After the transcription of all interviews, the researchers discussed the entire transcript dataset to form a cohesive, comprehensive understanding of the data and consensus on key themes was obtained. This information guided the development of a document called “Establishment and Management of a Multi-Institutional Center of Research Excellence - Tips for New Players”. The document content was checked and validated by participants (Bazeley, 2013, pp. 408-409; Patton, 2002, p. 560). Feedback was positive and generated no further changes.

An independent, external researcher, Rosslyn Eames-Brown, also coded and analyzed the transcripts (analyst triangulation) to cross check the themes and ideas identified by the three investigators (Patton, 2002). No discrepancies between the researchers’ and the independent researcher’s findings were identified.

Findings

Study findings indicated that the two areas with the greatest challenges were administrative and interpersonal processes. Administrative problems related to the CRE budget (e.g. a failure to include the correct on-costs from each partner institution for staff), contracts (e.g. difficulties in negotiating partner contracts), and recruitment (the lack of any procedure for recruiting positions that could be located within any of the partner institutions). A key challenge for the multi-institution CREs in the interpersonal domain was investigator engagement with the CRE.
Few problems were unique to a multi-institution CRE. Some version of the problem was generally faced in single-institution research centers or collaborative research projects. However, multi-institution CREs experienced these problems to a greater extent due to their administrative complexity and a confluence of barriers to investigator engagement with the CRE. These two themes are discussed below.

**Administrative Complexity**

The research findings indicated that administrative tasks that were simple to execute in single institutions were more difficult and time-consuming in multi-institution CREs. This is because, in contrast to working in a single institution, a multi-institution CRE comprises multiple investigators from multiple institutions, each with their own legal department, grants management office, human resources policies and procedures, scholarship programs, etc. Two examples of administrative complexity, establishing partnerships contracts and cross-CRE recruitment, are provided.

**Partner Contracts**

Legal contracts were required between the administering institution and the partner institutions to ensure each partner institution agreed to commit to the implementation of the multi-institution CRE as per the head agreement. These partner contracts included agreements regarding ‘in-kind’ contributions provided by the partners, intellectual property, and the distribution of the grant to the partner institutions. The process of establishing partnership contracts and distributing funds to partners was complex and time consuming.

A significant source of the problem was reluctance of the legal offices of some partner institutions to sign their partner agreement until certain conditions of the head agreement (the agreement between APHCRI and the administering institution) were changed. As they had not reviewed the head agreement until after it had been executed, changes were not possible.

A second contract problem arose for CREs that opted for funds to be held by the administering institution and to be distributed to partner institutions over the life of the CRE. In this situation the CRE Executive Committee would decide the allocation of funds over time. This arrangement provided for flexibility in the distribution of funds. However, some of the legal departments of partner universities were reluctant to sign agreements that did not stipulate a specific amount of funds for their institution. It also meant that a series of contract variations were required each and every time that a partner institution was allocated funds.

A third problem involved lack of clarity on ‘in-kind’ contributions from each investigator and each institution. This was not always clear from the grant application and some of the legal departments of partner universities were reluctant to sign agreements until this was clarified.

The number of partner contracts to be established, and the short time-frame for the multi-institution CRE to achieve all their outcomes (four years), meant these delays threatened the achievement of outcomes. For example, it was a requirement that all of the multi-institution
CREs provide doctoral scholarships as part of their capacity-building program. The duration of a doctoral program is a minimum of three years. Many students require more than three years to complete, and the scholarships could not be established, advertised or appointed until the partner contracts were complete.

Similarly, no staff could be recruited at partner institutions for research projects until the partner contracts were executed. Consequently, delays in establishing the partner contracts, recruitment of post-doctoral candidates, and other human resource requirements threatened the achievement of outcomes.

The study findings suggest that partner contract problems might have been reduced or preventable if certain steps were taken prior to submission of the grant application. That is, for the administering institution to consult with each institution’s legal office to ensure those offices are satisfied with the head agreement and they are satisfied with draft partner agreements, including the specification of ‘in-kind’ contributions. Each institutions grants management office might assist in identifying ‘in-kind’ contributions.

Recruitment Across the CREs

The multi-institution CREs had funding to employ research staff and to provide student scholarships. Some CREs allowed these positions to be located in any of the partner institutions, depending upon the location and preferences of suitable candidates. For example, funding might be available for three postdoctoral fellows and these could be located in any of the CRE’s institutions. However, there was no agreed process for recruiting across the institutions. Each institution had its own recruitment process that needed to be followed if the position was to be with them. This included creating a position description that adhered to that institution’s policy, advertising the position from that university and culling, interviewing and selecting a candidate. If the CRE undertook a recruitment process and the successful candidate chose Institution X, then Institution X would need to implement their own recruitment processes. Hence, the ‘successful’ candidate would need to go through two processes of selection. Such a process would have delayed appointments and been unfair to the applicant.

APHCRI CREs faced with this problem generally negotiated specific arrangements with the institutions that were to host the successful applicant. This process was time-consuming and delayed the appointment of positions. It is likely that this problem is unique to multi-institution CREs, or rarely encountered elsewhere. Investigators planning to establish multi-institution CREs are advised to consult the Human Resource departments of partner institutions during the grant preparation period, or as soon as the grant is awarded, to develop a streamlined recruitment process that does not delay appointments.

Investigator Engagement

A second highly demanding challenge experienced by the APHCRI CREs related to the level and nature of investigator engagement with the CRE. Indicators of participation included, for example, attendance at project or CRE meetings, responses to requests to comment on
documents, to provide information for reporting, to promote the CRE and to contribute to the CRE-wide knowledge translation and exchange activities.

Indicators of promoting the CRE included: adding the affiliation to the CRE in email signatures and conference and other presentations; and adding the CRE website link to institution websites. The level of investigator engagement in CRE activities varied. As a result of variable investigator engagement, the completion of some planned CRE activities was delayed or prevented, and the workload fell disproportionately on those more deeply engaged with the CRE. This situation was not conducive to the fostering of positive work relationships or a sense of team and furthermore, the full benefit of including all investigators in planning and decision-making was unobtainable.

Study findings suggest several factors might have contributed to a lack of investigator engagement. Investigators, for example, had varied ideas of what involvement with the CRE meant. Some appeared to see it as only being involved in CRE research. The funding body, in contrast, expected investigators to support the CRE as an institution that would produce outcomes beyond their specific academic research. This included contributing to knowledge translation and exchange in relation to crosscutting CRE topic areas, not just in relation to specific CRE research projects. Investigator involvement could encompass engaging in media debates, preparing submissions to government, and advising and supporting primary health care (PHC) organizations. The funding body also expected investigators to raise the profile of the CRE, so that its value was more than the sum of its individual partners. A third expectation was that investigators produce far-reaching outcomes, like new or continued collaboration with other local and international partners, even when the CRE program had finished.

The qualitative research conducted indicated that even if investigators had fully understood the expectations of the funding body, other barriers to engagement remained. These related to investigator capacity for engagement and career priorities which was influenced by funding. Specifically, the APHCRI CRE grant did not include investigator remuneration. Investigators were remunerated by their own institution, and would continue to be paid by their institution after the multi-institution CRE funding had ceased. Investigators’ careers relied upon the production of academic outputs and the development of their profile in affiliation with their institutions, rather than with the CRE. Further, the APHCRI CRE was a short-term project, one among many that investigators were leading. Thus, the investigators had many competing priorities for their time.

Fostering positive work relationships was impeded by investigators being located in geographically different locations. This factor limited opportunities for face-to-face interaction that could have assisted with communication and relationship building. Video or telephone conferencing methods were used for focused discussion. However, these were insufficient for building relationships.

Study findings identified several strategies that might improve the level of investigator engagement and teamwork:

1. Choose partners wisely—investigators reported that they benefited from pre-existing relationships.
2. Ensure the leader is skilled in collaborative leadership.
3. Obtain investigator consensus on the goals for the CRE.
4. Obtain consensus during the grant writing process on the roles of investigators. As investigators’ ideas about this might change over time, for legitimate reasons, a review of these roles should occur after the first and second years of the CRE’s operation.
5. Ensure that the plans for ‘in-kind’ contributions of investigators are clear, realistic and flexible.
6. Organize face-to-face meetings or team-building activities to coincide with team attendance at events such as conferences.
7. Allocate a budget to support building relationships.
8. Use the telephone for one-to-one conversations when possible. An email might be quicker, but a verbal conversation is more personal and helps to develop a relationship.

Discussion

This paper described a qualitative study that explored the challenges of establishing and managing a primary health care multi-institutional CRE in Australia. The research findings identified several highly demanding and unusual challenges in the areas of administrative and interpersonal processes.

Study participants reported a range of challenges, largely in administrative and interpersonal areas with complexity as a common theme. The multiple geographic locations and different institutional policies and procedures meant that administrative processes, such as establishing partnership agreements and recruitment, were resource-intensive and lengthy exercises that delayed the commencement of research activities. The multiple geographic locations, partner-institution demands on investigators, and the time-limited life of the multi-institution CRE, meant that developing a sense of team around a research center (rather than just a research project) was very difficult. The complexity found here is consistent with that reported by the ERCs in the USA, (Engineering Research Centers, 2012) and in the literature relating to virtual teams (Ale Ebrahim et al., 2009).

Specific strategies for preventing or managing each challenge are identified in the “Establishment and Management of a Multi-institutional Center of Research Excellence - Tips for New Players” document that was developed as a result of this research (Lavey, Spooner, & Mukuka, 2015). The key strategies that cut across the challenges related to 1) early planning, 2) communication, and 3) management capacity, are discussed below.

Early Planning

Most of the multi-institution CREs’ problems might have been prevented with early planning and stakeholder consultation—during the development of the grant application and immediately upon being advised of the grant’s success. For example, presenting the head agreement to the legal departments of every partner institution before it was executed could have enabled a smoother roll out of partner agreements. Ensuring the investigators agree upon what involvement in the multi-institution CRE means before they consider joining the consortium would have prevented
misunderstandings during the life of the multi-institution CRE. Talking early with the HR departments of each institution to identify a satisfactory process for recruiting positions across the multi-institution CRE would have facilitated rapid recruitment of students and staff as soon as the funds were available. The recommendation to engage in early planning and troubleshooting with stakeholders is a common project management process (Project Management Institute, 2013).

While early planning is ideal, there are barriers to this approach. In particular, investigators have a very busy work schedule. Planning a multi-institution CRE, including its research projects, capacity-building program and KTE program, is a complex and time consuming process. Developing and agreeing upon high-level partnership principles is also a lengthy process. This is particularly the case when embarking on a project with investigators with whom one has not collaborated before. If the grant is unsuccessful, the work involved might be considered a waste of time.

Communication

Effective communication is essential for building relationships and achieving common goals in any collaborative partnership or virtual team (Bozeman & Boardman, 2003; Engineering Research Centers, 2012; Pauleen & Yoong, 2001). One aspect of communication is the means of communication. As discussed by Hertel et al. (2005), virtual teams necessarily rely upon electronic communication (telephone, email, and video-conference). The study participants reported a high use of emails to distribute or collect information and to request or invite investigators to perform a task. However, emails were sometimes misunderstood and requests often required numerous reminders, which were not conducive to positive relationships.

Study participants talked about the importance of face-to-face communication, including non-work-related interactions such as team dinners, for building team relationships. The value of face-to-face communication for building rapport and trust has been reported elsewhere in research on virtual teams (Hertel et al., 2005; Pauleen & Yoong, 2001). While video conferencing can provide an approximation to face-to-face communication, it cannot replace it, particularly as some investigators were unable or unwilling to broadcast their faces via the webcam. With a large team of investigators across considerable geographic distances, face-to-face meetings were expensive. However, the cost of not having communication structures in place to facilitate relationships and CRE commitment is disengagement and lack of a ‘sense of team’. Some study participants noted that communication was easier when they had good pre-existing relationships with other investigators. Where these do not exist, there is a particular need to plan for face-to-face communication that contributes to building relationships.

Management Capacity

A manager, who can deal with the complexity of a multi-institution CRE and communicate effectively with the investigators, staff, students and back offices of all of the partner institutions, is essential. Bozeman & Boardman (2003) recommended a generalist manager with an MBA, but other backgrounds could also be effective. Given the amount of time required for dealing with the complexity, it is not just the level and background of the manager, but also the amount
of resources that is important. Some multi-institution CREs dedicated an insufficient budget for this role. For example, one CRE originally budgeted for a half-time position and soon realized the position needed to be full time. Failure to recruit the position immediately upon execution of the head agreement delayed the execution of partner contracts, disbursement of funds, appointment of positions and commencement of research work. The importance of this position in a multi-institution CRE cannot be underestimated.

The findings discussed in this paper reflect the experiences and perceptions of 13 study participants (from 20) who were involved in the establishment and management of nine multi-institutional CREs funded by APHCRI across Australia. The findings are empirically based so they might be applicable, appropriate or transferable to other situations if the contextual features are adequately similar and pertinent (Bazeley, 2013; Lincoln & Guba, 1985).

**Conclusion**

This study highlighted some of the highly demanding and unusual challenges that can be encountered during the establishment and management of a CRE.

Many of the challenges stemmed from the requirement to accommodate the needs of multiple investigators, in multiple institutions that were spread across multiple sites, and to build relationships and a ‘sense of team’ within a complex organizational structure. Early planning, appropriate communication methods, and effective management of resources are necessary for the successful operation of CREs in terms of efficiency, building commitment to the CRE, and getting true value from the investigators and institutions involved.

Further research could explore investigators perceptions and expectations of their role, approaches to increase investigator engagement in the CRE, and ways to structure investigator responsibilities that complement their career priorities.

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Supporting Knowledge Mobilization And Research Impact Strategies In Grant Applications

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Abstract: Each application to the National Science Foundation (NSF) must contain a Broader Impact (BI) strategy. Similarly, grant applications for most research funders in Canada and the UK require strategies to support the translation of research into impacts on society; however, the guidance provided to researchers is too general to inform the specific impact strategies required by funding agencies and peer review panels. Furthermore, there is almost no training and few tools provided to research managers and administrators to support the development of these strategies. To fill this gap, university based knowledge mobilization professionals in Canada have developed specific tools and services to support research impact strategies in grant applications. Over the last 10 years the Knowledge Mobilization Unit at York University (Toronto, Canada) has used planning tools and standard approaches to support knowledge mobilization strategies in 137 grant applications resulting in 42 funded research projects attracting over $47M in research funding. The Knowledge Translation (KT) Core facility of the pan-Canadian research network, NeuroDevNet, has supported knowledge translation strategies in 11 grant applications resulting in 2 research projects attracting $2.9M in the last 2.5 years. The tools and processes used to develop these strategies have supported grant applications in a range of disciplines and are presented to help research managers and administrators support impact strategies in grant applications.

Keywords: knowledge mobilization, research impact, pathway to impact, research administration, research grant application

Background

The academic research enterprise has always been measured on inputs (such as external funding, dedicated research space, infrastructure) and more recently on outputs (international databases ranking publication performance and citation indices), but what about the impacts of research? Publication citations are a proxy for scholarly impact, albeit a contentious proxy (Archambault
& Gagné, 2004), especially for the humanities and creative arts. But what about beyond the academy, such as impacts of research on the economy, health and wellbeing, society, culture and the environment? The Canadian Federation of Humanities and Social Sciences (2014) has articulated that humanities and social science research can have impacts not only on scholarship and training but also on the economy, society/culture and on public policy. All UK universities are assessed through the Research Excellence Framework [www.ref.ac.uk] in which universities are scored on their ability to articulate their research excellence (80%) and impact of research beyond the academy (20%) such as positive changes in society, economy, culture, health and the environment.

In Canada, the impacts of research are a feature of most research funding programs. Every grant application submitted to the Social Sciences and Humanities Research Council (SSHRC) (2015) requires an outcomes statement (what impacts are anticipated) and a knowledge mobilization strategy (how those impacts will be achieved). The Canadian Institutes of Health Research (CIHR) (2012) and most Canadian health charities require grant applicants to articulate a knowledge translation strategy that articulates what impacts will occur and what efforts will be made to achieve them. The Natural Sciences and Engineering Research Council (NSERC) requires a commercialization plan for grant applications that involve collaboration with industry.

Canada’s Networks of Centres of Excellence (NCE) [http://www.nce-rce.gc.ca/] are uniquely designed to achieve socioeconomic impacts arising from academic research and training. Traditional NCE networks receive $4-5M per year for five years with an option to apply for renewal for an additional two five-year cycles. This results in a potential investment of up to $75M over 15 years. The plans for Knowledge and Technology Exchange and Exploitation (KTEE) and the involvement of Networks and Partnerships are two of five evaluation criteria.

Similar strategies are required by applicants to the seven funders that comprise the Research Councils UK (RCUK). For example, the Economic and Social Research Council requires considerations of impact in all grant applications:

In line with the common position on Excellence with Impact adopted by RCUK, the Economic and Social Research Council (ESRC) expects that the researchers it funds will have considered the potential scientific, societal and economic impacts of their research... Applicants should actively consider how these can be maximised and developed through the Pathways to Impact document (formerly known as Impact Plan) in their application. (Economic and Social Research Council, 2016c, para. 2)

The RCUK has made it a requirement for funding to include a satisfactory impact strategy, confirming the importance of these impact strategies to the application for funding. In their response to recommendations arising from a review of pathways to impact the RCUK stated:

Recommendation 3: RCUK should emphasise the need throughout the application process and the importance of a carefully considered Pathways to Impact as part of the good research proposal.

RCUK Response: A clearly thought through and acceptable Pathways to Impact statement is an essential component of research proposals and a condition of funding. Grants will
not be allowed to start until a clearly thought through and acceptable Pathways to Impact statement is received. Research Councils have agreed that if an application is considered excellent for research in terms of the proposed research but has a poor Pathways to Impact statement, funding will be withheld until a clearly thought through and acceptable Pathways to Impact statement has been received. (Research Councils UK, 2015, p. 1-2)

Similarly, The National Science Foundation (US) assesses the strategy for Broader Impacts (BI) alongside the intellectual merit of the grant application (National Science Foundation, n.d.). The NSF provides direction regarding the BI section of the application:

The Project Description must contain, as a separate section within the narrative, a discussion of the broader impacts of the proposed activities.... Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education. (National Science Foundation, 2013)

To help meet the requirement for a pathway to impact statement in UK grant applications, ESRC provides applicants with an Impact Tool Kit (2016a) and guidance for knowledge exchange (2016b) in grant applications but has no guidance specifically for staff who are supporting the grant application process. In order to assist Canadian researchers, SSHRC (2015) has provided directions on what comprises an effective knowledge mobilization strategy and CIHR (2012) has produced a guide for researchers to integrated (i.e. collaborative research involving non-academic research partners) and end of grant (i.e. dissemination) knowledge mobilization. Yet there is little, if any, guidance for research support staff seeking to assist researchers crafting these impact strategies in their grant applications.

A review of the websites of the Canadian Association of Research Administrators (CARA) [https://cara-acaar.ca/home], Society for Research Administrators International (SRA) [http://srainternational.org/] and the Australasian Research Management Society (ARMS) [https://researchmanagement.org.au/] failed to identify any guidance or tools for research support staff helping researchers develop impact strategies in grant applications although webinars (Canadian Association of Research Administrators, 2016) on enhancing research impact have been offered. The UK Association of Research Managers and Administrators (ARMA) [https://www arma.ac.uk/] provides links to impact related resources from funders but nothing specific to the preparation of either a grant application or its support by research grant professionals. The advice that is provided is tailored to the Research Excellence Framework (REF), not for supporting development of the impact strategies in grant applications.

The need for specific knowledge mobilization planning is underscored by research on research impact. A review (King’s College London & Digital Science, 2015) of the 6,679 REF impact case

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studies demonstrated there were 3,709 unique pathways to impact. With this degree of uniqueness of impact pathways the generic advice available from Canadian and UK funding agencies can only begin the process of planning for impact. Researchers and their partners need tools, training and support by research grants professionals to craft specific knowledge mobilization strategies that will enhance their success at peer review and create the conditions that will maximize impact of their research.

Problem Statement

Technology transfer/commercialization offices routinely support the development of commercialization strategies for grant applications such as those funded by the NSERC “Idea To Innovation” (I2I) competition in Canada. To be eligible for this competition the university’s Technology Transfer Office “must endorse and work on each new proposal” (Natural Sciences and Engineering Research Council of Canada, 2016). However obtaining institutional supports for impact strategies is not a requirement in other grant programs. In an environment where the majority of grant applications require specific strategies to support impacts, how can research managers and administrators support knowledge mobilization strategies which create the conditions that will maximize impacts of university research? This support is present for commercialization and industry engagement so why not for other sectors and other impacts?

Writing for the ESRC on a joint ESRC-DFID (Department for International Development) program, Louise Shaxon (2016b) has called for more effort to be made by institutions seeking to maximize the impacts of research. However, her advice (Shaxson, 2016a) to institutions is predicated solely on a communications/dissemination paradigm. While this is not wrong, it is not complete. Dissemination is necessary but not sufficient to maximize impact. Evidence shows (Bowen & Graham, 2013) that failure to bridge the gap between knowledge and action is not a failure of dissemination but a failure of knowledge production. Indeed Bennet and Bennet (2008) describe effective knowledge mobilization as “collaborative entanglement”. In designing support services to support collaboration and integrated methods of knowledge mobilization, Alison Powell and colleagues (2016) have called on research organizations to better use evidence informed methods of knowledge mobilization including: 1) better use of frameworks; 2) better evaluation; and 3) reduced reliance on push (i.e. dissemination) methods. Addressing the call of Powell and colleagues, this paper presents one approach to this problem that adapts an evidence informed tool (Barwick, 2008, 2013) to support knowledge mobilization strategies including, but not limited to dissemination, that have identified indicators for evaluating progress from research to impact.

Approaches to the Problem

Research offices and other units at Canadian universities in the ResearchImpact network [www.researchimpact.ca] are developing knowledge mobilization services designed to create grant applications that provide specific knowledge mobilization strategies to enable future impact. Research managers and administrators have a long history of supporting application development including grant applications for translational research (Boynton & Elster, 2012) that seek to
create an impact on real world problems. Many research managers and administrators also provide training for grant writing (Porter, 2004). Since the need for impact planning in grant applications is ubiquitous across funders in Canada, the US and the UK, more can be done.

York University’s Knowledge Mobilization Unit in Toronto, Canada has been supporting knowledge mobilization and impact strategies in grant applications for over ten years. The Knowledge Mobilization Unit has developed standardized processes using tools for knowledge mobilization planning that structure knowledge mobilization plans around four key elements: audience/end users; goals of the knowledge mobilization strategy; knowledge mobilization activities; evaluation and accountability. The Knowledge Translation (KT) Core facility has been providing services to NeuroDevNet, a national Network of Centres of Excellence, since August 2013. The KT Core is housed within York University’s Knowledge Mobilization Unit and has adapted their method for planning for use at the beginning of research programs for Autism Spectrum Disorders (ASD), Cerebral Palsy (CP) and Fetal Alcohol Spectrum Disorders (FASD). Each of these processes is described below followed by comparative analysis, reflections and recommendations.

York University’s Knowledge Mobilization Unit

Working under the auspices of the VP Research & Innovation, York University opened its Knowledge Mobilization Unit in 2006 to connect university research to organizations beyond the academy in order to maximize the economic and social impacts of research. These activities are captured under York University’s Academic Plan (York University, 2016) under: Priority 2 - Advancing Exploration, Innovation and Achievement in Scholarship, Research and related Creative Activities; and, Priority 6 - Enhanced Community Engagement. They are also anticipated under the Strategic Research Plan (York University, 2013).

The service model at York University includes support for specific knowledge mobilization strategies in grant applications. In order to meet the growing demand for grant support, the two full time Knowledge Mobilization Unit staff (called knowledge brokers) adapted a Knowledge Translation Planning Template developed by researcher Melanie Barwick (Barwick, 2008, 2013) to support knowledge mobilization strategies in grant applications. This template uses a sequential 13-step planning process which leads participants through the elements of knowledge mobilization planning. To manage the complexity of the Knowledge Translation Planning Template while maintaining its rigour and integrity, York knowledge brokers clustered Barwick’s 13 steps to four basic elements: engagement (i.e. audiences); objectives/goals; activity; and, impact/evaluation (see Table 1). Experience has shown that teams are very strong at articulating their objectives and activities, however, engagement and impact are frequently poorly identified and articulated.

A note on terminology: In this article knowledge mobilization = knowledge translation. The difference is one of organizational structures not one of function. In Canada knowledge translation is used predominantly in health disciplines while knowledge mobilization is used primarily in the social sciences and humanities. Their strategies, activities, underlying theories and evaluation are similar enough to allow these terms to be synonymous from a practice perspective. They are maintained as distinct terms as they reflect the names used by the organizations described in this article.
The knowledge broker meets with the researcher(s) requesting the service. If possible the non-academic research partner(s) also attends these early conversations. The goals of this early engagement are to explain the process, learn about the research and coach the research team on developing approaches to these four elements. The knowledge broker works with the research team in an iterative fashion to refine the approaches and when these four elements are fully described and cohesive with the research plan, the research team completes a knowledge mobilization planning chart as described in Appendix A which organizes these four elements in a logic model-based template. Appendix A includes an example of one completed row using a research forum called KM in the AM as an example (Phipps, 2011). The core of the knowledge mobilization plan is complete when all knowledge mobilization activities are described on this chart.

The knowledge mobilization plan written in the grant application varies according to the requirements of the funding program. For example the knowledge mobilization plan for a SSHRC Connections Grant application (max $50K) is one page whereas the knowledge mobilization plan for a SSHRC Partnership Grant (max $2.5M) is four pages. York’s knowledge brokers have used this process for both of these competitions demonstrating its ability to scale across different grant programs. Finally, the activities described in the knowledge mobilization plan (including the collection of data for evaluation) are fully budgeted and described in the budget and budget justification. The knowledge broker reviews and edits the final knowledge mobilization plan, budget and budget justification in advance of submission of the application.

Since the beginning of operations in 2006, the Knowledge Mobilization Unit at York University has provided tailored knowledge mobilization services supporting 137 grant applications, the

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Table 1. Four core elements of knowledge mobilization planning

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engagement/Audiences</td>
<td>Before Principal Investigators think about what they want to do they need to start with the partnerships and forms of engagement with identified audiences. This speaks to the purposefulness of Knowledge Mobilization/KT and involves end users in the development of the rest of the strategy.</td>
</tr>
<tr>
<td>Goals/Objectives</td>
<td>Frame the project in terms what you want to achieve and how you plan to achieve it.</td>
</tr>
<tr>
<td></td>
<td>• Overall Objective: high level, long horizon</td>
</tr>
<tr>
<td></td>
<td>• Specific Goals: more granular, measurable; achieving goals by undertaking activities (below) allows you to fulfill your overall objective</td>
</tr>
<tr>
<td>Activities</td>
<td>Articulated on the Knowledge Mobilization Planning Chart (Appendix A). Activities need to be mapped to specific audiences and correlated to goals and objective. Activities need to speak to academic and non-academic audiences.</td>
</tr>
<tr>
<td></td>
<td>Identify metrics and key performance indicators.</td>
</tr>
<tr>
<td>Impact, Indicators &amp; Accountability</td>
<td>A longitudinal look at the results of the knowledge mobilization plan. Impacts are measured at level of end user/receptor/partner by measuring indicators specific to the activities.</td>
</tr>
</tbody>
</table>
majority of which have been in the social sciences with population health and health policy forming the bulk of the remainder of the applications supported. This is in contrast to the primarily clinical health research supported by NeuroDevNet (see below). As a result of this support, 42 research teams have been successful in receiving research funding, which amounts to over $47M in research funding to York University.

NeuroDevNet

NeuroDevNet is a federally funded Network of Centres of Excellence (NCE), comprised of 19 research projects and three service ‘Cores’—NeuroInformatics, NeuroEthics, and Knowledge Translation (KT) all working to ensure that children with neurodevelopmental disorders (ASD, CP, FASD): 1) get diagnosed sooner; 2) receive validated interventions; and, 3) are provided with family services to maximize their potential. Funded at approximately $4M/year the Network is in its seventh year of 10 years. The KT Core has been in operation since August 2013 and comprises 1.5 full time staff who offer a suite of services (NeuroDevNet, 2016) including KT planning.

The KT Core provides all researchers with a KT Planning Guide that is an annotated bibliography of KT planning guides (Poetz, Jensen, Johnny, & Ross, 2015). This guide complements tips provided on the KT Core’s blog as well as individualized support for KT planning for one of their own projects which may include support for KT planning for grant applications. Unlike the Knowledge Mobilization Unit the KT Core does not rely on in person support due to the geographically distributed nature of the pan-Canadian network.

The process for KT planning support in grant applications involves the following steps:

1. Receive request for support for KT planning and provide KT Planning Guide
2. Request full proposal and information on funding opportunity
3. Review proposal and provide edits/comments toward weaving KT planning / impact / evaluation throughout the proposal (not just in the KT section) so the KT planning section fits within the application and not as an ‘add on’
4. If KT planning section is blank, write a draft of a KT section including KT goals and activities that fit within the goals and activities of the research plan, audiences/partners and evaluation/indicators. If there is a draft KT plan, provide edits and comments regarding suggested improvements
5. Send document(s) for review by researcher
6. Invite researcher to participate in a meeting (usually telephone consult since NeuroDevNet is a distributed network not located on a single campus) to explain comments and suggestions, hear their feedback and refine draft accordingly

It is necessary to review the entire research proposal before providing advice on KT strategy because each KT plan depends on the research project’s goals, methods and anticipated outcomes. In 2.5 years of operations the KT Core has supported 9 grant applications, 4 of which were successful attracting $2.9M in external research grant funding. The planning approaches of the Knowledge Mobilization Unit and the KT Core are illustrated in Figure 1.
Figure 1 presents a process diagram for knowledge mobilization/translation planning services synthesized from the York University (primarily in person support) and NeuroDevNet (primarily remote support) processes. This can serve as a process tool for research grant support professionals considering supporting research impact strategies in grant applications.

Legend:
- York KMb Unit
- NeuroDevNet KT Core

Figure 1. Process flow for knowledge mobilization grant support
Evaluation and Analysis of Approaches

Working on knowledge mobilization/translation strategies in a combined total of 53 grant applications has allowed the knowledge brokers at York and NeuroDevNet to identify those characteristics common to weak or strong plans to maximize the potential for research impact (Table 2).

Table 2. Four core elements of knowledge mobilization planning

<table>
<thead>
<tr>
<th>Strong KT/Knowledge Mobilization plan</th>
<th>Weak KT/Knowledge Mobilization plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balances end-of-grant and integrated KT strategies (stakeholder engagement) and has effective engagement of end users throughout the research</td>
<td>Only focuses on end-of-grant (dissemination) products and activities, poor engagement of end users in the research</td>
</tr>
<tr>
<td>Demonstrates understanding of impact being change in policy, practice, behaviour, measured at the level of the end user, not the researcher</td>
<td>Conflates impact with outputs such as # of website page views, # of video views, # of document downloads, # of conference presentations which are measures of reach and dissemination of research, not of change for the non-academic research partners/audiences</td>
</tr>
<tr>
<td>Focuses on what the project team will do (i.e. activities)</td>
<td>Literature review about knowledge translation with no link to activities</td>
</tr>
<tr>
<td>Includes: KT goals/objectives, activities that support the achievement of those goals/objectives, budget for activities, accountability</td>
<td>Unfocused, list of activities and stakeholder groups with no unifying goals/objectives, no budget or accountability for KT activities</td>
</tr>
<tr>
<td>Stated evaluation framework with specific indicators</td>
<td>Poor or no evaluation plan, no indicators</td>
</tr>
</tbody>
</table>

In preparing for this article the authors turned to the ResearchImpact LinkedIn group [https://www.linkedin.com/groups/1969705] for perspectives from knowledge brokers. A LinkedIn Discussion with the title, “Seeking your thoughts about knowledge mobilization planning: grant application vs. research project” asked the question, “Are we doing anything different than when researchers and brokers plan knowledge mobilization strategies for already funded projects?” Responses suggest that knowledge mobilization planning for grant applications is different from knowledge mobilization during the conduct of the research project:

*I think it is different. Assistance once the research application is funded is about maximising the processes and procedures, activities and actions that will help to deliver the research objectives.*

-research communications professional (UK)
I see two differences: 1) Discussing knowledge mobilization pre-grant makes it possible to discuss potential impact with researchers. This may make them rethink details about their research questions in order to make them as relevant as possible for users/stakeholders. 2) When knowledge mobilization is discussed pre-grant, there is more likely to be resources for knowledge mobilization activities in the project, and knowledge mobilization activities can be developed from the outset, instead of being regular dissemination of products.

-management consultant in social research (Denmark)

In the recent projects pre-grant I’ve reviewed, I was able to help researchers - although most of the time I had no expertise in their research fields...Having expertise in knowledge mobilization practices and methods, brokers can give a wider view of what researchers do/ could do. Also, as it is relatively new that grant agencies are asking for explicit knowledge mobilization strategies, some researchers are still a bit lost about what it means...I see brokers’ position as an opportunity to explain them [sic] what knowledge mobilization allows...

-university based knowledge mobilization professional (Canada)

Furthermore researchers find this individualized support to be of value. Below is a quote from a NeuroDevNet-funded researcher who benefitted from the KT Core’s input on her grant application, as well as services for informing her integrated KT approach which began with an in-person stakeholder consultation after her funding application was successful securing over $1M in research funding:

Anneliese helped advise on a KT strategy for the grant, and has been working with my team ever since to put together a stakeholders’ meeting. This is completely new to me and her support has been invaluable with planning, selecting invitees, setting the agenda, determining what data to gather, etc. We had our stakeholder meeting on Monday, and it was very well received by our stakeholders. We are still awaiting the report, but the information we gained is going to be extremely useful as we try to move our research forward and ensure it has the maximum possible impact on children.

So again, thank you to NeuroDevNet and the KT team, and Anneliese in particular. I wouldn’t have come up with the idea without her, let alone been able to execute it and produce useful results.

– Dr. Catherine Lebel, University of Calgary and NeuroDevNet researcher

Knowledge mobilization professionals in the UK, Denmark and Canada have identified the value of planning knowledge mobilization strategies early in the grant application which is appreciated by researchers receiving the support. Most tools, theories and guidelines are too general to inform a specific knowledge mobilization plan (Nilsen, 2015) as required by research funders (Research Councils UK, 2014). The need for specific guidance to develop specific knowledge mobilization strategies creates a new role for research support staff and creates new training opportunities for research administration associations such as ARMA, ARMS, SRA and CARA.
Reflections & Recommendations

York University’s Knowledge Mobilization Unit delivers services in person, on campus, while the KT Core of NeuroDevNet delivers services remotely to researchers across Canada. Despite this geographical difference, the processes are similar as illustrated in the process diagram in Figure 1. These similarities and some differences are also illustrated in Table 3 which compares the grant support strategies of NeuroDevNet and York’s Knowledge Mobilization Unit. Despite being in

**Table 3. Comparison of knowledge mobilization/translation planning services**

<table>
<thead>
<tr>
<th></th>
<th><strong>York Knowledge Mobilization Unit</strong></th>
<th><strong>NeuroDevNet KT Core</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Different</td>
<td>Emphasis on building partnerships between community-university collaborators for knowledge mobilization planning</td>
<td>Emphasis on providing services to support the research team to conduct stakeholder engagement which supports integrated knowledge translation planning</td>
</tr>
<tr>
<td>Different</td>
<td>Create and provide numerous in-person workshops and training events for capacity building for knowledge mobilization planning</td>
<td>Create and provide reference documents (e.g. guides, blog) for capacity building for KT planning in addition to one workshop and four webinars on other KT topics</td>
</tr>
<tr>
<td>Different</td>
<td>Provide front-end support for knowledge mobilization planning but not ongoing support for knowledge mobilization throughout the project</td>
<td>Provide front-end support for KT planning as well as ongoing services toward operationalizing the plan</td>
</tr>
<tr>
<td>Similar</td>
<td>137 projects supported attracting $47M (= $310,236/request)</td>
<td>9 projects supported attracting $2.9M (= $253,636/request)</td>
</tr>
<tr>
<td>Similar</td>
<td>Provide review and advice on knowledge mobilization plans for grant applications</td>
<td>Provide review and advice on KT plans for grant applications</td>
</tr>
<tr>
<td>Similar</td>
<td>Engagement and impact often poorly articulated in proposals reviewed</td>
<td>Engagement and impact often poorly articulated in proposals reviewed</td>
</tr>
<tr>
<td>Similar</td>
<td>Use existing tools (Barwick’s 13-steps) customized to York’s knowledge mobilization context</td>
<td>Use existing tools (existing KT guides, Barwick’s 13-steps &amp; Ontario Centre of Excellence for Child/Youth Mental Health KT planning toolkit) customized to NeuroDevNet context</td>
</tr>
<tr>
<td>Similar</td>
<td>Review knowledge mobilization strategies for: engagement, objectives, activities, desired impact, accountability/evaluation</td>
<td>Review KT strategies for: engagement, objectives, activities, desired impact, accountability/evaluation</td>
</tr>
<tr>
<td>Similar</td>
<td>Demand driven, responsive to requests for service</td>
<td>Demand driven, responsive to requests for service</td>
</tr>
<tr>
<td>Similar</td>
<td>Optimally will have 2-3 months to support knowledge mobilization strategy, often get requests for support days before the application deadline</td>
<td>Optimally will have 2-3 months to support knowledge mobilization strategy, often get requests for support days before the application deadline</td>
</tr>
</tbody>
</table>
very different organizational constructs, the campus based Knowledge Mobilization Unit at York University and the KT Core of the distributed NeuroDevNet network provide similar services to support knowledge mobilization/translation strategies in grant applications (see Figure 1).

Knowledge brokers at York and NeuroDevNet have supported knowledge mobilization strategies in applications for the research funders shown in Table 4. Since this process has been successful across a variety of research funders including federal and provincial research granting agencies, federal and provincial ministries and foundations we believe these strategies are transferable to grant programs from a variety of funders including NSF granting agencies from the RCUK.

Table 4. Grant programs supported by York and NeuroDevNet knowledge brokers

<table>
<thead>
<tr>
<th>Type of Funder</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research granting agency</td>
<td>Social Sciences &amp; Humanities Research Council; Canadian Institutes of Health Research; Canada Foundation for Innovation; Ontario Centres of Excellence; Networks of Centres of Excellence; International Development Research Centre</td>
</tr>
<tr>
<td>Ontario Ministries</td>
<td>Ministry of Municipal Affairs and Housing; Ministry of Child &amp; Youth Services; Ministry of Agriculture, Food and Rural Affairs; Ministry of Education</td>
</tr>
<tr>
<td>Federal Government Ministries</td>
<td>Canadian International Development Agency (now Global Affairs Canada)</td>
</tr>
<tr>
<td>Foundations</td>
<td>McConnell Family Foundation; Ontario Trillium Foundation; Carswell Family Foundation</td>
</tr>
</tbody>
</table>

This experience allows reflections on the benefits of using professional knowledge brokers or to build capacity in research support professionals to support knowledge mobilization strategies in research grant applications.

1. **Allows for peer review of the knowledge mobilization strategy.** Now that strategies for knowledge mobilization and broader impacts are part of most grant funding schemes, applicants can receive feedback from reviewers who provide a critical review of the proposed strategy. This assumes a well-trained and impact-literate review panel. But this assumption has not been demonstrated in practice. Surveys showed that most peer reviewers of NSF grants lacked understanding of the broader impacts criteria (Rothenberg, 2010).

2. **Enables more effective evaluation of research impact** since the knowledge mobilization strategy has already been rigorously developed. Evaluation is enabled with planned: 1) goals to measure against; 2) stakeholders who are not only research partners but sources of impact narratives and data describing the evidence of impact; and 3) indicators at each stage.
3. **Ensures resources are allocated to fund the plan.** Funding for knowledge mobilization activities will not be available if the desired activities are not part of the grant application budget. This potentially results in a focus on dissemination and end of grant methods of knowledge mobilization since it is often cheaper to produce knowledge products such as clear language research summaries and develop a social media strategy than it is to pay the expenses of engaging end users in the research process (integrated knowledge mobilization).

4. **Supports integrated knowledge mobilization** to balance the predominance of end of grant (dissemination-based) knowledge mobilization strategies produced without specialized supports provided by knowledge brokers. Integrated knowledge mobilization methods are known to be more effective than dissemination/end of grant methods (Powell et al., 2016).

**Recommendations for research support professionals and institutions:**

1. Use the planning tool of Appendix A and the process flow of Figure 1 to develop an institutional approach to supporting specific impact strategies in grant applications.
2. Provide dedicated supports for knowledge mobilization planning as institutions do for commercialization. This can be either a specific knowledge broker or could be part of the skill set of a research support professional. In either case, seek opportunities to build staff skills such as the Canadian Knowledge Mobilization Forum, the UK Knowledge Mobilization Forum and the Annual Summit of the National Alliance for Broader Impacts (US) or specific courses such as those offered by Melanie Barwick (Barwick, 2008, 2013).
3. Advocate for non-academic research impacts to be part of an explicit institutional priority for the research enterprise similar to York University’s Academic Plan and Strategic Research Plan. If these priorities are not in the institutional planning documents it will be difficult to secure resources.
4. Build in follow up beyond the conduct of the research to collect the evidence of impact. As previously described (Phipps, Johnny, & Wedlock, 2015) impact is measured at the level of the non-academic partner. Knowledge brokers should reach out to non-academic partners on an annual basis after the end of the research project, to collect the evidence of impact that will inform development of impact case studies.
5. Use existing examples of successful impact to create the case for supporting knowledge mobilization strategies. Many universities have researchers who are collaborating with non-academic research partners to create impacts on products, policies and services. Building on existing success will facilitate implementation of a program to further enhance impact of a university’s research.
6. Build in enough time to adequately plan for knowledge mobilization. The experience of York and NeuroDevNet knowledge brokers suggests that three months is optimal to engage in such an iterative process as described in Figure 1. However, experience has shown that requests for service often come in a much more compressed time frame.
Recommendation to research administration associations:

1. Recognize planning for impact is required in many grant programs and therefore is an emerging skill set for research support professionals. Develop training modules to build capacity for research offices to support all aspects of grant applications including impact strategies.

Recommendations to research funders:

1. Complement requirements for institutions to provide specific support for commercialization strategies by requiring institutions to also provide specific support for knowledge mobilization strategies otherwise researchers will be required to develop these specific strategies without tools, training or support.

2. Build capacity of peer reviewers to assess the impact strategies in grant applications. Consider including a knowledge mobilization expert on peer review panels, especially for programs that have a requirement for an impact strategy.
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References


Phipps, Jensen, Johnny, Poetz


### Appendix A: Knowledge Mobilization Planning Chart

<table>
<thead>
<tr>
<th>Activity</th>
<th>Targeted Audiences (engagement)</th>
<th>Details</th>
<th>Key Outcomes (goals)</th>
<th>Outcome Indicators</th>
<th>Desired Impacts (accountability)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KM in the AM</td>
<td>Community leaders, practitioners, researchers</td>
<td>Building trust, proven KMb activity</td>
<td>Brokered research and KMb relationships</td>
<td># people, # meetings; sustained conversations; satisfaction/usefulness survey</td>
<td>Community-university projects (1yr); Informed decisions (5yr)</td>
</tr>
</tbody>
</table>
Enhancing Faculty Productivity Through a Centralized Communications and Project Management Infrastructure: A Case Study at The University of Kentucky Markey Cancer Center

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Jennifer Rogers
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Abstract: Academic careers and institutional reputations are closely linked with the ability to secure funding and publish work. In today's competitive environment, it is essential for research to be clearly communicated. In our experience, many researchers need assistance with communication skills, and institutions that offer professional services in grant, manuscript and project management have an advantage in the development of their faculty and trainees. A review of the literature shows that some institutions offer centralized proposal development resources and personnel to assist with grant writing, some institutions offer workshops and lectures designed to improve researchers' writing skills for grants and/or manuscripts, and fewer institutions offer departments focused specifically on editing manuscripts. In the fall of 2009, the University of Kentucky's (UK) Markey Cancer Center (MCC) developed an infrastructure, the Research Communications Office (RCO), to enhance faculty productivity. The RCO exists to provide: expertise in scientific editing of manuscripts for academic publishing; editing and management of research, training, and career development grants; project management for multi-component and institutionally complex grants; facilitation and tracking of all MCC pilot funding mechanisms; tracking all research outcomes; preparation of graphics for presentations, posters, publications and grants; marketing and design expertise for outreach endeavors; the planning and execution of internal and external communications; and MCC web content creation and maintenance. A successful and valued service for MCC, the RCO has totaled more than 1,400 projects over six years, growing from 189 projects when tracking began in 2010 to 294 in 2015. This article will discuss why and how the RCO was created at the MCC, and in doing so, provide a framework for how the RCO model can be successfully implemented at other institutions interested in offering professional editing and management of grants and manuscripts.

Keywords: research communication; faculty productivity; academic support services; editing; project management; pre-award grant administration; content management; professional graphics

Enhancing Faculty Productivity

The research productivity of an academic department is primarily measured in terms of total publications and grants awarded (Souba & Wilmore, 2000; Souba, Tanabe, Gadd, Smith, & Bushman, 1996), making writing and publishing key to successful career development and academic survival for faculty and trainees, as well as for disseminating expertise and accomplishments (Derish, Maa, Ascher, & Harris, 2007). In today's competitive environment, where resources are limited and competition is fierce, it is essential for research to be clearly communicated. The burden of clarity rests with the author (Stephens & Campbell, 1995); the reader's job is to follow the author's thinking and to agree or disagree, not to decode and reconstruct the paper (Zeiger, 1999). The pressures of securing grant funding, conducting research, and publishing may be further compounded for faculty and trainees who were trained internationally or abroad, are nonnative speakers of English (Wang & Bakken, 2004; Pagel, Kendall, & Gibbs, 2002), or lack scientific writing experience.
Pressure to produce is not new to research institutions, and many have adopted resources to assist their researchers. Major medical centers across the United States, such as The University of Texas MD Anderson Cancer Center, offer a wide range of editorial, educational and publishing services for faculty and trainees (Stephens & Campbell, 1995). Larger institutions have developed entire departments for editing and teaching scientific writing skills to nonnative English speakers. Other institutions, such as the University of California, San Francisco, have developed courses in scientific writing for surgeons, individual writing consultations and editorial review with the objective to improve participants’ ability to write reports of research and clinical observations for publication in scientific journals (Derish et al., 2007). More broadly, the William H. Welch Medical Library offers fee-based editing services for affiliates of the Johns Hopkins Medical Institutions (including the School of Medicine, School of Hygiene and Public Health, School of Nursing and the Johns Hopkins Hospital). These editing services are designed to address the lack of a central resource to help scientists develop and improve their writing skills (Stephens & Campbell, 1995). The School of Information Studies at Syracuse University offers a two-day intensive Grant Writing Workshop to support both grant writing and salesmanship of a proposal idea (Deitz & Stanton, 2016). Prior to this two-day workshop, a research administrator was hired to assist with proposal submissions throughout the school. This individual became a key facilitator of administratively burdensome activities, but there remained an expressed interest among faculty and students for instruction in the art of grant writing (Deitz & Stanton, 2016).

The individual programs offered at these institutions each touch areas of need for researchers: editing, improved writing skills, and grant writing and management. The University of Kentucky (UK) National Cancer Institute (NCI)-designated Markey Cancer Center (MCC) developed the Research Communications Office (RCO) as a crucial piece of infrastructure to help cancer researchers secure grants and publish their research by offering services in these areas of need. The office is staffed with experts in scientific editing, production of high-quality graphics, timeline management, grant guideline interpretation, publishing specifications, as well as grant and manuscript submission at no charge for all cancer-related work.

**RCO Creation and Service Evolution**

In 2009, physician-scientist B. Mark Evers, MD, accepted the role of Director of the UK MCC, and moved to Lexington, Kentucky, with his 32-member research team. In addition to increasing the number of MCC researchers at UK, his arrival also brought an increase in the number of multi-component projects, grants and research outputs such as publications, abstracts and presentations. With this influx of activity, a more efficient infrastructure - one that added to the suite of support services - was needed as the MCC grew and projects became more complex.

Before Dr. Evers arrived, cancer researchers at UK were directly responsible for preparing funding proposals and disseminating their own research findings. Two support staff were in place for grant support: one dedicated to pre-award administrative support such as budget preparation, biosketch collection, and the assembly and submission of the final grant materials; the other for post-award financial administration.
Dr. Evers envisioned an expansion of support services under the umbrella of a new office: the RCO. Initial personnel plans for the RCO included a scientific editor to ensure that research was well articulated and a graphics specialist to ensure the professional presentation of the images and layout of the grant. These individuals would also edit and submit research manuscripts for publication and create presentations and posters for scientific conferences. Demand for editorial and graphic services quickly necessitated the addition of multiple team members to serve as both editors and designers, and demand for MCC website maintenance necessitated the addition of a team member dedicated to refining content and regular maintenance of the site. The current scope of RCO responsibilities and sample staff descriptions are outlined in Table 1.

Table 1. MCC RCO Staff and Responsibilities

<table>
<thead>
<tr>
<th>Position/Title</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manager</td>
<td>• Daily management of personnel and budget</td>
</tr>
<tr>
<td></td>
<td>• Serve as the key point of contact for the office, often helping initiate new projects and communicate RCO skills and expertise</td>
</tr>
<tr>
<td></td>
<td>• Lead project coordinator and manager for proposal development, especially for multi-college and/or multi-department interactions</td>
</tr>
<tr>
<td></td>
<td>• Manage the solicitation and peer-review process for all MCC developmental research projects/pilot funds</td>
</tr>
<tr>
<td></td>
<td>• Lead tracking and routine reporting efforts for the cancer center (for example, membership and publication output)</td>
</tr>
<tr>
<td>Pre-Award Specialist</td>
<td>• Liaison between MCC and UK College of Medicine Sponsored Research Administrative Services and UK Office of Sponsored Projects Administration</td>
</tr>
<tr>
<td></td>
<td>• Assist researchers in identifying funding opportunities</td>
</tr>
<tr>
<td></td>
<td>• Ensure compliance with funding opportunity guidelines</td>
</tr>
<tr>
<td></td>
<td>• Disseminate information about guideline changes for major grant sponsors</td>
</tr>
<tr>
<td></td>
<td>• Budget development for large multi-component projects</td>
</tr>
<tr>
<td></td>
<td>• Coordinate completion of data tables and institutional information components for training grant and career development applications</td>
</tr>
<tr>
<td>Editor/Designer</td>
<td>• Editing grants and manuscripts for grammar, content and compliance</td>
</tr>
<tr>
<td></td>
<td>• Creation and editing of images and figures</td>
</tr>
<tr>
<td></td>
<td>• Project management for small grants</td>
</tr>
<tr>
<td>Web Editor</td>
<td>• Maintenance and content creation for MCC website and social media</td>
</tr>
<tr>
<td></td>
<td>• Design and distribution of newsletters</td>
</tr>
<tr>
<td></td>
<td>• Web project liaison to UK HealthCare Marketing and Public Relations</td>
</tr>
</tbody>
</table>
**RCO Process**

Despite years of experience researching and writing for academic venues, many academics find grant writing especially challenging (Henson, 2004; Porter, 2007). Whether the challenge for a researcher is being unaware of updates to funding specifications, perfecting English writing style and grammar, limited experience with design software, or the need for project management, the RCO is trained to assist with cancer-related communication. In order to offer assistance to as many researchers as possible, RCO services are available at no cost to any UK researcher, clinician, instructor, or student with a cancer-related project.

Projects begin when a researcher contacts an RCO team member; for investigators, using RCO services is voluntary. Commonly requested services include: editing grants, manuscripts and book chapters; creating clear graphics; reviewing guidelines to ensure submission requirements are met; confirming correct file types and documents formats; and serving as the central point of contact for complex projects to provide consistency among drafts from numerous individuals (Table 2).

When a project is requested, special expertise, the amount of time involved and individual workloads are all factors that determine which RCO staff member will ultimately be responsible for project completion. The RCO team meets briefly every morning to discuss current and upcoming projects, much like an editorial team that meets to review and discuss daily topics and assign tasks for short- and long-term projects. Referred to as “whiteboard meetings,” this informal, standing meeting obtained its name from the use of a dry erase board where assigned projects are listed and deadlines are tracked. Initially an experiment in managing incoming work, whiteboard meetings have become fundamental to the RCO teamwork approach. Discussions here allow team members to describe their work, request assistance and input from colleagues, plan for upcoming projects that may require detailed scheduling, and share news that may impact the type or amount of expected projects. The whiteboard meetings also serve as an opportunity to discuss RCO staff needs and expectations, including training, continuing education opportunities and administrative issues.

Most projects are returned to researchers within a week, but this may vary depending on the complexity of the project. For example, reviewing and editing a manuscript submission may take a single RCO team member one day to complete, while management of a complex grant application may require continued effort from the entire RCO team over the course of many months (and in some cases, a year or more).

**Proven Value**

It is exceedingly difficult to “quantify” the effect of editorial review on publishing or funding success. Whether a scientific manuscript is accepted by a journal, or a grant proposal is funded, is simply too complex to lend itself to a financial analysis, or to correlation with revenue-generating units (Derish et al., 2007). As Derish et al. note, there are many factors (e.g., track record, environment, mentoring) besides writing quality that determine publication rates and grant awards (2007). For example, publication of a journal article depends at least in part on the researcher’s track record, notoriety and ability to select an appropriate journal. From the journal’s
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standpoint, acceptance of an article may depend on the number of other researchers submitting on the same topic at the same time, the attitude or interest of the specific reviewers, and reader feedback on previous articles.

Despite these complicated realities, the RCO has systems and tools to track both projects and customer satisfaction. One internal tracking mechanism for output is a simple database of completed projects. This file, maintained and updated by every member of RCO staff throughout the year, includes the commissioner’s name, project type (grant, manuscript, poster), project destination (pilot grant, journal name), work completed (edited, formatted, submitted, figures drawn), project title, initials of who worked on the project, and date of completion. This tool is

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Service Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grants</td>
<td>Ensure all funding organization guidelines are met, review for correct grammar and spelling, check organization, confirm formatting consistency among the various components, including the budget, text and graphics. More complex grants require coordination among several university entities, with the RCO as a planning hub, providing timelines, organization, centralized communication, and acting as a clearinghouse for communication.</td>
</tr>
<tr>
<td>Manuscripts and Book Chapters</td>
<td>Review formatting for adherence to publisher guidelines, check grammar and spelling, check for consistency in heading styles, ensure that writing is clear and concise, verify reference style, review graphics for quality, improve or redraw figures as needed, provide figures in appropriate resolution and file format, submit text and graphic files to the selected journal or publisher, review proofs, and collect copyright forms as needed.</td>
</tr>
<tr>
<td>Presentations</td>
<td>Assistance with an oral presentation or poster by editing and submitting attendee abstract, reviewing preliminary slides or posters, improving figures, condensing text, adding animation where appropriate and ensuring consistent style throughout a slide presentation.</td>
</tr>
<tr>
<td>Internal Communications</td>
<td>Writing and distributing the Markey Minute, a weekly newsletter emailed to MCC employees and interested parties that provides a single, encompassing news source covering a weekly calendar of tumor boards, seminars, speakers and events as well as news specific to the cancer center. Writing and distributing the Markey Quarterly, a newsletter that provides a more in-depth exploration of the people and accomplishments at MCC. A PDF copy of this quarterly newsletter is emailed to the MCC distribution list and posted online.</td>
</tr>
<tr>
<td>Website</td>
<td>Maintain and create content for the MCC website and social media, a subset of the larger UK HealthCare Enterprise website. Serve as web project liaison for UK HealthCare Marketing and Public Relations.</td>
</tr>
<tr>
<td>Pre-Award</td>
<td>Coordinate submission of information requested by sponsors prior to award, work with researchers to ensure that IRB, IACUC, and biosafety approvals are obtained prior to award, provide revised budget or other information to the UK Office of Sponsored Projects Administration for account establishment.</td>
</tr>
</tbody>
</table>

Table 2. MCC RCO Project Type and Services Offered
used by the RCO to show year-over-year growth, manage trends (such as yearly increases in web-related work), determine the needs of the MCC research community and identify the highest-volume users.

The RCO has experienced an increase in project totals each year. From 2010-2015, the RCO completed over 1,400 projects, with 294 projects in 2015 alone. These projects represent work from researchers in 35 departments across 9 colleges at UK. Of note, every project carries the same weight in total count, whether it is a single edit to a manuscript completed in a matter of minutes or the management of a 500-page grant spanning a year or more. The RCO breaks these projects into categories such as the more popular Manuscripts, Grants and Posters/Presentations; as well as the less used services such as Abstracts, Books and Dissertations that are combined into single category and Other, which includes projects such as advertisements, logo creation and promotional items (Figure 1).

![Figure 1. Break down of RCO projects from 2010-2015](image)

Although participating in more projects each year is a critical measure of success for the RCO, equally important is providing excellent service. Customer satisfaction is measured via an anonymous, six-question survey created in and hosted by REDCap (https://projectredcap.org), a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources. Once a project is completed, a RCO team member sends an email request to the researcher to complete the online
survey. Cumulative survey results show that 92% of all respondents are either “very satisfied” or “satisfied” with the work RCO completed. In addition, the RCO’s highest-rated qualities were reasonable turnaround time and clear communication (77%) as well as the feeling that RCO made a positive contribution to the project (75%). Comments indicate that researchers feel the quality of their output was more professionally appropriate as a result of working with the RCO; that the RCO is collaborative and responsive; and that RCO editing for grammar is highly valued by those whose primary language is not English. RCO value has also been honored through programs at MCC dedicated to recognizing outstanding service. Individually, team members have been repeatedly nominated as Markey Difference Makers, an internal award given to MCC employees who go above and beyond in their work, as well being honored as Markey Difference Makers of the Year in 2012 and 2013.

The value of the RCO was also on display in 2012 and 2013, when the MCC was awarded the prestigious Cancer Center Support Grant (CCSG) and received NCI designation. NCI-Designated Cancer Centers are recognized for their scientific leadership, resources, and the depth and breadth of their research in basic, clinical, and/or population science. Patients at the MCC benefit from new drugs, treatment options and clinical trials only offered at NCI-designated centers. Instrumental in the project management of the CCSG, the RCO managed aspects of the proposal ranging from membership approvals to the tracking of hundreds of publications, maintenance of the grant’s budget, and the shepherding of numerous grant drafts between four research programs and five shared resource facilities. Serving as a central repository for all files, the RCO edited hundreds of drafts for grammar and content as well as adherence to CCSG guidelines. In addition, the RCO was responsible for each graphic the grant required from start to finish; including monitoring the quality of every figure included in the 800-plus page application, the layout and construction of 50 binders, and the design of 269 slides presented at the on-site review. Successful RCO efforts were noted in the CCSG review critiques as: “This group should be commended for their outstanding preparation of the written CCSG application and for the well-organized site visit…”

Following the success of the CCSG submission, RCO gained university-wide recognition as a critical resource for researchers and was introduced to a larger client base in need of editing and project management services. In particular, the UK Center for Clinical and Translational Science (CCTS) approached the RCO for assistance with its own grant renewal. The major source of funding for the CCTS is the Clinical and Translational Science Award (CTSA), a major federal grant that is awarded to centers that enable the full spectrum of clinical and translational research at their institutions by providing services and resources to researchers. CTSA awards represent significant funding in infrastructure and research support, making it a crucial funding source for research efforts at UK and MCC. After many CCTS faculty participated in the cancer center’s CCSG submission, CCTS leadership recognized a need for similar infrastructure and approached the cancer center about sharing RCO resources, expertise and time. Much as they did for the CCSG, the RCO managed written drafts of the CTSA grant and graphics and created timelines for document drafts and meetings to ensure the proposal adhered to National Institutes of Health guidelines for grant submissions.
The RCO also works in collaboration with public-facing organizations housed at UK. For example, Kentucky’s most central cancer support organizations, the Kentucky Cancer Consortium and the Kentucky Cancer Program, each funded separate design services. When that arrangement was no longer feasible, both organizations turned to RCO for help completing a range of statewide public-outreach communications and design projects: a revised logo; brochures and pamphlets for local health organizations; and presentation materials used by staff to educate local officials and the general public. With assistance from RCO producing these materials, both organizations saved time and, most importantly, money that would have otherwise been spent on costly outside design services.

**Key Lessons Learned**

The creation and growth of the RCO shows that faculty value institutional support in the form of research communication services, and that such support is beneficial to researchers seeking to fund and publish their research. Over time, it has become clear that the RCO’s evolution and expansion of services enhance productivity. In addition to what we have presented above, our lessons learned include the following.

- **Secure critical buy-in from leadership.** Long-term success of institutional research communication services is dependent on the support of leaders at the highest levels of the organization. Key leaders are uniquely positioned to recommend RCO-like services and set an example promoting the value of editorial review. Leadership must position a central communications office as a resource center and involve both editorial and project management staff as early in the process as possible. At the MCC, researchers have learned to value the importance of editorial review and feedback because faculty at the highest levels of the organization utilize RCO services with success. As those relationships build and work load increases, leadership must continue to invest in staff growth and financial support for research communication services.

- **Use metrics and quality measures to reveal areas of unmet need.** Metrics and quality measures provide important insight about services offered, as well as gaps in those offerings. For the RCO, faculty respond positively to the involvement of editors and designers. This positive response lead to increased workload and therefore the addition of new RCO staff. These increases allowed the RCO to carry more responsibility, such as more thorough reviews of materials and ensuring adherence to guidelines for nearly all grants reviewed. As staff members became increasingly expert at various facets of review and design, the RCO was able to provide a broader portfolio of services that have evolved over time.

- **Emphasize a team-oriented culture.** Early RCO projects were highly individual in nature. However, it soon became apparent that a large amount of coordination and collaboration was needed to successfully complete work. This required staff members to work together more often, sometimes in stressful conditions where critical funding dollars were at stake. Repeatedly revising the same documents resulted in long hours of demanding work. Discord among team members in these types of situations could have disrupted the successful completion of projects that maintain the high standards of the RCO. Therefore,
it is important to plan ahead for this evolution, from strong individual work to closely
interlocked teamwork, and hire staff who excel with individual challenges but also fully
embrace highly collaborative environments.

We have presented a case study of our infrastructure that successfully enhances research
productivity at our institution. Based on our experiences, we believe the ability to provide
research communication services, and to grow and meet identified needs among researchers, is a
unique opportunity for other institutions.

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The Grants Office and the RA Generalist: Parallel Life-Cycles and Development at Small PUIs

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Franklin & Marshall College

Cara Martin-Tetreault
Bowdoin College

Carol Withers, MPA, CRA
University of New Haven

Abstract: If you are a grants or research administrator working at a small predominantly undergraduate institution, have you ever wondered where you stand in relation to other similar institutions? Have you thought about what you need to do to get yourself, your office, and your institution to the “next level” of outreach to or support for the faculty? Have you asked what are reasonable benchmarks or milestones to which you can aspire in leading your office?

In this article the authors focus on two parallel cycles of development within a small grants office at a predominantly or primarily undergraduate institution (PUI). One cycle is the development of the office itself as it is shaped by the institution, faculty research activity, and intramural and extramural funding priorities. The second cycle is the development of the research administrator as the professional grows and matures. The authors will walk the reader through the phases of development as they are influenced by challenges and milestones characteristic of successful research development.

Keywords: Challenges, Grants Administrator, Life-cycle, Milestones, Predominantly Undergraduate Institution, PUI, RA Generalist, Research Administrator, Research Administration Generalist, Small PUIs

Introduction

The authors attempt to address a gap that researchers Derrick and Nickson (2014) identified. Derrick and Nickson suggest that future research on how “research management teams” differ “between universities and other research organizations” (p. 34) should empirically analyze characteristics of successful research management, identify those strategies and structures that are deemed successful, and highlight how they might vary between different types of institutions. As a first step towards an empirical understanding, we attempt to define and then frame this discussion from the perspectives of grants or research administrators at small PUIs. Such research administrators may have more than one role, may be operating as a “one-person shop” or as part of a small team, and may have a reporting line, or lines, that typically range somewhere between the Advancement/Development office and the Provost’s/Academic Affairs office.
The primary audience for this article is grants administrators at some of the smallest, often private, PUIs. The article may also be of interest to research administrators at PUIs supported by research foundations, or PUIs that are large enough to have both a central office and departmental structure. Additionally, research administrators at large R1 institutions with a desire to support PUIs in their geographic area may find this article of interest.

Definitions

Because individuals at PUI institutions who oversee grant-related activities or who make hiring decisions at such PUIs are often unfamiliar with the “research administrator” (RA) terminology, the terms “grants administrator” and “research administrator” will be used synonymously, recognizing there are some limitations to this equivalence.

Additionally, although there may be other definitions, for the purposes of this article the authors will define PUI institutions using the National Science Foundation’s (NSF) definition: those “that award Associate’s degrees, Bachelor’s degrees, and/or Master’s degrees in NSF-supported fields, but have awarded 20 or fewer Ph.D. /D. Sci. degrees in all NSF-supported fields during the combined previous two academic years” (2014, para. 7). The breadth of the NSF PUI definition, however, allows this category to include not only those institutions that have undergraduate only enrollments, but also institutions with quite sizeable undergraduate populations, institutions that also award applied doctorates (e.g. EdD, DSW), or have a sizable Master’s degree program, and institutions that may be part of a larger state-supported system with access to resources from a central grants office or research foundation.

Therefore, while not intending to be definitive, the focus of this discussion is on small PUIs. We define small PUIs as institutions with an undergraduate enrollment of 3,000 or less, that are independent, and that do not have the research administration benefits, resources, and structures available from central offices off-site. We further frame small PUIs as institutions that have a strong research-oriented and grant-active faculty and staff.

These smallest institutions, quite often private, also generally have a strong complement of both faculty research and institutional grants sourced from public and private funders. This means that grants at small PUIs may be organized through a Sponsored Research Office (SRO) under the Provost's Office/Academic Affairs division, through a Corporate and Foundation Relations (CFR) office under the Advancement/Development division, or through some combination of the two. The nature or title of these offices vary and may be called offices of sponsored research or sponsored programs, CFR office, college grants, or simply the grants office.

As the title of this article suggests, the focus of this discussion is on the foundational understanding that grants-related structures at small PUIs have the strong possibility of, and often clear need for, growth and change. Regardless of an institution’s annual volume of grants or size of awards, if an institution receives federal money, that institution is required to comply with all applicable federal rules and regulations.
Background and Expertise

We base our findings on the authors’ own experiences at PUIs with varied types of research administration structures. Each author is currently working at a small PUI that generally fits the profile described above.

**Amy Cuhel-Schuckers** started her career in research administration as an assistant grant writer at a community action agency in western New York State, and subsequently worked first as an institutional grant writer and then as a grants development specialist at a public PUI (approximately 5,000 undergraduates, with about 500 Masters students). The Office of Sponsored Programs there was supported by a state-level research foundation, which operated in some ways as a central office. While at that public PUI, the pre-award operations were integrated into a “life-cycle” model encompassing both pre- and post-award operations with four staff members. The author earned Certified Research Administrator (CRA) and Grant Professional Certified (GPC) certifications in that context. In 2012 she transitioned to Franklin & Marshall College (F&M), a private completely undergraduate national liberal arts college (approximately 2,200 undergraduates) as the Director of Faculty Grants. At F&M, she supported the integration of a newly merged institutional (Foundation and Corporate Relations) and faculty grants pre-award team resulting in the Office of College Grants with reporting lines into two divisions. Post-award matters were handled by the institution’s finance department. The Office of College Grants continues as a blended office and is currently undergoing a second level transformation into a co-located life-cycle model, with reporting lines into three divisions: Office of the Provost; the Office of College Advancement; and Finance and Administration. As part of that transformation, she has been promoted to the Director of Faculty Grants and Compliance Resourcing.

**Cara Martin-Tetreault** started her career working as a Development Officer for two small not-for-profit organizations in Maine before specializing as a Grants Officer at Bowdoin College, a small, private, predominately undergraduate institution (1,790 students). Hired as the Assistant Director of Corporate and Foundation Relations and reporting to the Senior Vice President for Advancement, the 2 ½ person office was charged with the management of all pre-award and stewardship for external grants from private and public granting organizations. A dedicated grants manager based in the “business office” was and remains responsible for post-award financial responsibilities. In 2011, in response to the growing complexity of grants administration and compliance, the College supported a new Office of Sponsored Research Programs, based in the academic dean’s division, dedicated to faculty research grant support and research compliance. In addition, the Office of Corporate and Foundation Relations was also moved to Academic Affairs so that the “grants office” is currently staffed by a Director of Sponsored Research, a Director of Corporate and Foundation Relations, and an Assistant Director of Corporate and Foundation Relations.

**Carol Withers** started at a large public institution, which grew in size, volume of grant activity, and reclassification into the R1 category during her time there. She worked in several smaller academic departments, with responsibilities for both grant-related projects and other academic areas. The title of research administrator and the concept of training and careers in research administration was still relatively new, but working with faculty on pre- and post-award issues gave her a balanced
perspective on the continuum of service that has proved valuable. Access to professionals with many years of experience in the field was invaluable as she learned the process. However, the non-grant responsibilities were equally valuable. Those roles gave her a holistic perspective of grants within the larger institutional structure of higher education, the demands on faculty for teaching, publications, and being awarded tenure, as well as an understanding of curricular issues, and the organization of events and workshops. At PUIs where the faculty mentor structure may be undeveloped or underdeveloped, it is important that one can speak the language of faculty and administrators and address the needs of a broad constituency. She earned her CRA, thanks in part to the well-developed support system that was available at a larger research institution.

Carol left to start a full-time grants office at a private PUI, and is now in her sixth year at the University of New Haven. Without the prior experience, it would have been very difficult to know where to start. Even with the experience, it was a bit daunting to be the only person, with the exception of the accountant in the Finance Office, responsible for an entire campus with four colleges that was just starting to transition from a primarily teaching university to a teacher-scholar model.

**Methodology**

The experiences in these various PUI settings positioned the authors to develop a life-cycle framework within which they could begin to assess the extent to which research administration at small PUI institutions meet certain marks of maturity. Additionally, a similar framework was used to assess individual development as research administrators.

The authors’ personal experiences on this topic were complemented by discussion groups at a session held during the NCURA Region 1 Spring Meeting 2015 in Portland, Maine. The following questions were asked of discussion group participants and co-discussants:

- What institutional infrastructure needs to be in place, or developed, in order to have a functioning and effective grants office?
- As challenges are addressed, what new issues lie ahead? Can challenges be anticipated?
- How does one know when one has “arrived” relative to institutional structures? Is there a defining moment, a gradual realization, or is it an ongoing continuum where some components are reached, but challenges continue to emerge that keep grants or research administrators in crisis management mode?
- How does one measure and celebrate success?
- What part does the professional maturation of the person or person(s) in the grants administrator(s) role play relative to these institutional concerns?

Contemporaneous notes were taken by discussion facilitators for each group. Discussion facilitators were subsequently contacted for more in depth responses and clarification of notes. These notes and responses were then integrated into our life-cycle of a PUI analysis described as follows.
The Grants or Research Administration Generalist

Some of the reasons that research administrators might be drawn to working at a small PUI may include a sense of accomplishment or empowerment, a feeling of having an impact on the campus, the ability to respond quickly to a changing environment, engagement with faculty, or simply the opportunity to break into a new industry.

Regardless of how a grants or research administrator “gets to” a small PUI, the reality is that the individual in a one- or few-person shop is responsible for the same variety of work as teams of individuals who collectively manage the research enterprise at larger institutions. Despite this reality, it is unlikely that the RA or grants administrator at a PUI will have access to in-house legal counsel, an export control officer, or an Intellectual Property or Tech Transfer office. At small PUIs it is also unlikely for there to be stand-alone research compliance operations or other administrators on campus with significant research administration knowledge or experience.

Therefore, the RA or grants administrator at a small PUI must be a generalist who understands the “soup-to-nuts” process of identifying, applying for, negotiating, managing, and closing out an award. The RA generalist may be responsible for providing research support across a range of disciplines and a variety of sponsors, and must know the requirements for each funder and their submission processes. Further, the RA generalist must understand the rules and regulations around grant administration, research compliance, fiscal compliance, and the need for appropriate policies and procedures at his or her institution, which meet the inter-institutional test of “reasonable, allowable, allocable, and consistent.”

Since the RA generalist commonly is the person who knows the most about research administration at his/her institution, s/he often has the lonely and sometimes difficult path as a middle administrator to communicate to institutional administrators both the impact and the risks to the institution of ongoing changes in government regulations. The RA generalist is in a position to lead from the middle (Nickerson, 2014; Robinson, 2010), who needs to have the support and encouragement to communicate to peers and to more senior administrators in the academic and financial/business office sector. Most importantly, the RA generalist needs to keep abreast of changes in the field, thereby necessitating regular and ongoing professional development.

Individuals familiar with grant writing or grants administration in public sectors who are new to research administration within higher education face a steep learning curve to understand the depth and breadth of the field. Those doing the hiring for grants administrators at small PUIs often have an insufficient understanding of the nature of the field and the requisite training necessary to get a new RA generalist well situated in a new role. The institutional focus may be on potential revenues, without a full understanding of the true costs associated with securing and administering grants and a compliant research infrastructure, the time needed to move new faculty from the pipeline to successful awards, and the increasing level of competition for a relatively stable amount of funds from external sponsors.
Grant Office Realities at Small PUIs

The proposed institutional “Life-Cycle” model for small PUIs may be used irrespective of the level of expertise or experience of the research or grants administrator. The model reflects the increasing maturity or sophistication of grants office structures, types, or phases: start-up, developing/expanding, transitional, mature, and disrupted. The model also incorporates an issue not typically encountered at larger institutions: the intermingling of the sponsored research office (SRO) role and the corporate and foundation relations (CFR) role, which the authors term a “blended” office. Finally, the Life-Cycle model incorporates the interplay between the types of offices and the experience level of the RA generalist(s) who may work in these offices. We discuss the phases of the RA generalist at the end of this section.

The titles below reflect general characteristics as the grants office evolves. However, the process is a continuum and, as noted elsewhere, offices may develop at different rates for various milestones.

1) The Start-up Office

Start-up offices are characterized by a lack of internal expertise and support and face the challenge of knowing where to begin. There is often a need to develop and nurture a grant culture. Prospective grant seekers may be faculty members, professional staff members, or administrators. The purpose of a grant may tie to an individual faculty member’s research, but in a “start-up” situation it may as often tie to service, student support, or community outreach. Start-ups additionally may be characterized as having little institutionalization of key components of a grants operation such as written policies and procedures, clear authorization structures, or consistent budgeting rates.

Challenges for start-up offices may include foundational issues such as setting up the office space, creating a web page, developing other forms of communication with faculty and staff, and negotiating F&A agreements if they are not already in place. Additionally, staff in start-up offices are responsible for creating an initial infrastructure for everything from filing systems, data tracking, and reports, to getting registered for the various sponsor portals.

It may take time to convince faculty of the value of working with an RA and working within the system. For institutions that emphasize teaching, RAs may find resistance on the part of senior faculty, who had not been expected to submit proposals or seek significant external funding. Senior faculty who have not been grant-active may also find it challenging late in their careers to be motivated to write for external funding. This also may impact newly hired enthusiastic researchers, who are not encouraged by senior colleagues—those who will ultimately vote on their promotion and tenure.

The challenges, of course, will depend on the strength of the existing infrastructure, the level of research already being conducted by faculty and the value the institution places on research, and whether there are already substantial policies and procedures in place that may need only minor modifications in order to be sponsor compliant.
Milestones may include: 1) setting up systems for regularly sharing information about funders and funding opportunities (NCURA Standards, 2014), and for sharing information among or between key offices; 2) building relationships with peer mid-level administrators around a task-analysis “who does what” focus; 3) creation of a “routing sheet” that documents key individuals’ knowledge of and permission to submit proposals (NCURA Standards, 2014); 4) development of a filing system for submitted grants; and 5) submission of a proposal for a first-time applicant (NCURA Standards, 2014).

2) The Developing or Expanding Office

Developing/expanding offices have procedures in relation to the grants process, and some written policies and procedures in place, but annual updating in order to reflect the changing standards will be required as federal regulations or political administrations change. Developing offices may be in the position where demand for services outstrips available resources. For example, a handful of faculty members may have external funding to support their research, but express dissatisfaction with the ways in which they have to interact with the campus business office.

Communication with other offices, or lack thereof, may point to gaps in relationships between offices. There may be gaps in project management support, which might show up when developing a project, when faculty feel the need to take on responsibilities that they feel should be handled by grants staff, or when a process breaks down leading to project development fizzle.

There may also be attempts at back-office “deals” wherein grant proposers seek informal ways to circumvent or work around institutional fringe benefit or indirect cost rates. Upper level administrators may inadvertently buy into a deal-making culture from the perspective of wanting to keep prospective grant seekers happy, or from a lack of knowledge as to how such “deals” undercut consistent policies and procedures and create institutional risk. Developing/expanding offices are beginning to realize that “compliance” refers not only to fiscal compliance, but to an entire suite of obligations that range from the principal investigator (PI) to the institutional level.

Challenges for developing/expanding offices may include a need for more resources sooner than anticipated or before significant award successes can be demonstrated, getting grant seekers to look beyond their traditional comfort zones or moving beyond discouragement when initial attempts are not successful, especially for faculty who are highly competent and not necessarily tolerant of rejection. There may need to be both top/down and bottom/up efforts to break down barriers between departments, to create an understanding that “grant” problems are institutional issues to be resolved.

The potential move from an indirect cost agreement based on salaries and wages to a modified total direct cost may provoke disagreement or an expansion of the infrastructure in areas outside of the sponsored program office.

Milestones may reflect the increasing professionalization of operations. These could include: 1) the establishment of metrics relative to desired outcomes, e.g. number of submissions, rate of success, resubmissions and their success rates; 2) a broadening of participation among the pool of grant seekers, such as whether new or different faculty are applying and an expansion of the
departments from which proposals are submitted; 3) a broadening of the sponsor base rather than dependence on one or two key funders; and 4) the identification of gaps at the operational level, and the beginning of the formation of a plan to address these gaps (Lintz, 2008).

3) The Transitional Office

We use the term transitional to refer to the increasing maturation of a grants office, while recognizing that this office is “not there yet.” That is, transitional offices are further along in their sophistication relative to overall grants operation than developing offices, but could not be characterized as “mature.”

Transitional offices may see that compliance, development of policy, and procedural issues take up an increasing amount of time. Issues of risk analysis are brought to the fore through this process. For example, if institutional policies and procedures consistent with federal requirements are not in written form, they “do not exist” from an auditor’s perspective, thereby engendering risk to the institution. Needs for principal investigator (PI) or project director (PD) training in project management, both fiscal and programmatic, are seen as important for successful implementation. Training for non-grant staff, including administrators and staff working on grants accounting in a Business Office setting, is identified as an additional need. Conversations may begin about targeted use of indirect cost (IDC) recovery monies as an additional means to support and/or incentivize research-related activities.

Challenges may include providing the level of support that grant seekers have come to expect while addressing infrastructure issues. Challenges from previous stages that have not been fully resolved take on greater importance with increased volume. RAs may be asked to take on more roles within the institution and may have less time to devote to professional development to prepare for those roles. The one- or few-person generalist shop may need to grow to include specialist knowledge. If the staffing of the office has not grown since its inception, the RA(s) may begin to feel the need to move on to an institution offering more advancement opportunities, since opportunities for internal promotion may be extremely limited.

Milestones for transitional offices may include: 1) compliance policies that are developing or in place (NCURA Standards, 2014); 2) training and other support mechanisms that have been developed and are in use for PIs and PDs; 3) training that is seen as a priority both for grants staff, as well as for staff in offices, such as business offices, that handle grant-related expenditures; and 4) a grant culture that is well-established across the institution (Lintz, 2008).

4) The Mature Office

As the category title suggests, the structure of a mature office has moved beyond personalities to established structures that are institutionalized. Written policies and procedures are in place, and are reviewed and updated according to an established schedule. Structures for sustainability and viability are active including standard operating procedures (SOPs) for key activities. The institution is successful at retaining key personnel, and could withstand a change in personnel because of the institutionalization of policies, procedures, and practices. Conversation at this level may shift from “Wouldn’t it be great to grow the number of externally funded projects?” to
“Exactly HOW are we going to manage the growth we’ve already seen, and how can we sustain more such growth in the future?”

Challenges include retaining key personnel since, regardless of planning, owing to the size of operations at small PUIs, loss of a key person would still be disruptive. Since success breeds success, increased workload from accomplishments may make it difficult to sustain forward progress. Small institutions may have periodic turnover, so maintaining training levels in other divisions, e.g. in the financial or business office, may be difficult. A small operation makes it difficult to develop and sustain a system of internal controls, particularly for non-fiscal operations.

Milestones may include: 1) engagement in and embedding of the sponsored research operation in the campus strategic plan; 2) a campus culture of grant engagement; 3) a successful peer review process for proposals; 4) mentors for junior faculty; 5) administrative support for PIs at every stage of the grant cycle; 6) policies and processes that support institutional needs and goals (Chun, 2010); 7) reporting tools development; 8) grant reporting structures match institutional needs, and the academic, financial, and institutional advancement divisions share the same vision and goals for grants on campus; 9) organizational structures meet both PI and administrative needs and address pre- and post-award, as well as financial and non-financial functions; 10) indirect cost recovery use policy, based on strategic reflection, directs IDC returns to the operational fund for general use by the institution and/or to more specific research-related use; and 11) a grants-related advisory board drawn from across the institution helps the institution reflect on the important role of sponsored research/programs to the accomplishment of its goals (Cole, 2010; Lintz, 2008; Drummond, 2003; NCURA Standards, 2014).

5) The Disrupted Office

We include a category of grants offices that have been disrupted to reflect times of retrenchment, reorganization, or turnover of key personnel, which can cause significant setbacks but, if handled judiciously, can result in a stronger infrastructure. Retrenchment may result from fiscal stress at the institutional level, or reorganization, but still may provide opportunities for forward progress. Disruption can occur at any time during the life-cycle and may occur more than one time. Because of size, institutions that have larger numbers of research administrators may be less prone to disruption as discussed here.

Small PUIs are especially prone to disruption by the loss of a key person, particularly if staffing for a PUI’s grant operation consists of a one-person shop led by a RA generalist. Such disruption would impact the institution regardless of whether a PUI’s grants operation has reached the mature level or is a start-up; the impact of the loss of such a key person can be significant.

Challenges for a disrupted office include: 1) maintaining institutional knowledge; 2) preserving expertise; 3) maintaining momentum during time of resource constraint; 4) finding time to do evaluations and implement results of evaluations; and 5) if the disruption is a retrenchment resulting in a decrease in staff support, the challenge would be getting all the work done, and ensuring that an institution remains “compliant.”
Milestones for disrupted offices may vary depending on the source of the disruption. For example, a change in staff person may provide an opportunity to re-think the office structure or positioning. If the disruption involves combining separate CFR and SRO functions, developing a single set of procedures while maintaining support for projects in progress would be important. Conversely, if a combined CFR/SRO office is separating, maintaining relations among personnel and maintaining a consistent, if not a single, set of procedures would be an institutionally sound measure to take.

“Blended” Offices

While not exclusive to small PUIs, “blended” offices are not as common at larger institutions. Blended offices typically involve personnel, or one person, responsible for both CFR and SRO responsibilities located in one office, often under the direction of a single division. Blended offices may follow different timelines and have different priorities, sometimes depending on where the office is positioned—under Provost’s Office/Academic Affairs or under Advancement/Development.

Challenges for blended offices relate to answers to questions such as: Is there a single or are there multiple reporting lines? If multiple reporting lines exist, how are differences in perspective handled, and how are these differences prioritized? How is funding for the office handled? What are the potential advantages or disadvantages of placement in Advancement/Development or in the Provost’s Office/Academic Affairs areas relative to the ability of the RA generalist to fulfill both the CFR and SRO roles?

Milestones for blended offices may include: 1) development of objectives that meet both Advancement/Development and Academic Affairs needs; 2) regular and ongoing reporting meetings with upper-level administrators; 3) secure funding from each reporting line; and 4) clear inclusion of the objectives of the blended office in the strategic plans of each division.

The RA Generalist Life-Cycle or Development Phases

A parallel life-cycle that impacts the organization’s progress is the RA generalist’s own professional and occupational development, which we only address briefly here. Professional development is defined as those opportunities to improve or learn general skills such as software, project management, or communication skills. Occupational development is defined as those opportunities to learn the new and emerging guidance and regulations specific to the day-to-day function of the job, such as workshops on Uniform Guidance, Federal Program updates, or IRB Common Rule changes. We labeled the RA generalist development phases as: 1) Novice (new to RA field and/or higher education); 2) Developing (approximately 3-5 years of experience); 3) Transitional (moved to a new institution or to a new role, e.g. CFR/Advancement to Sponsored Programs); and 4) Experienced.

Challenges from the institutional perspective are tied to answers to the following questions: Did the RA generalist work at another institution in a similar capacity, or is the person new to grants/
research administration? If the person has had experience with grants, was that work in a higher education setting, or in a different non-profit context? Does the person have formal training in research administration, or did they learn about RA on-the-job?

At the campus level, questions to ask include: Could other employees serve as mentors or must the RA generalist engage in a discovery process for each new task? Is the RA generalist role seen by the institution as a simple administrative cog, or is there evidence that the institution recognizes the RA role as a stand-alone profession to which a body of knowledge, skills, and experience is attributed? To what extent is the institution supportive of professional or occupational development activities?

Milestones may include: 1) development of a training plan to increase competencies; 2) use of attendance at professional or occupational development conferences to complete certificate programs; 3) expansion of networking with similarly situated professionals to increase knowledge (Chun, 2010; NCURA Standards, 2014); 4) use of credentialing organizations to earn certifications (e.g. Certified Research Administrator [CRA], Certified Pre-award Research Administrator [CPRA], Certified Financial Research Administrator [CFRA], Grant Professional Certified [GPC]); 5) enrollment in Master’s degree programs in research or public administration; 6) contribution to the field through workshop, session, or poster presentations at regional or national meetings, or as article authors; and 7) contribution to the field through service at the regional or national levels as conference organizers, hosts, journal or magazine editors, or association board or committee members.

Conclusions

While it may be possible to articulate points along a continuum, there are no absolute fixed phases with a linear progression for all elements encompassed within grants offices. Instead, progress in some areas may advance quickly while other areas may lag behind. The Disrupted Phase may push an organization back or, as a result of careful management of the process, may help advance an office to a higher level. The way in which the CFR and the SRO roles and responsibilities are handled vary widely at small PUls, and are an additional complication to the life-cycle of a grants office. Further, the role and capability of the RA generalist in a PUI institution certainly plays a part in the nature and pace of the development of grants or research administration. Thus, institutional administrators need to be aware of the need for foundational and ongoing professional development (Chun, 2010) so that an institution can both recruit and retain individuals seeking employment in research administration at small undergraduate institutions.

It is the authors’ intention that this discussion plants a seed for future dialogue that should be continued for the purposes of strategic planning at small PUI institutions with existing grant or research administration operations, or at small PUls that anticipate creating a sponsored programs office. Hiring a research or grants administrator is only one step and needs to be seen in the context of a larger and longer-term commitment in order to realize the full benefit of the resources that a grants or research administration office can provide.
Follow-up Activities and Directions for Future Research

The next anticipated step is a survey to obtain data on the demographics of research administrators in small PUIs, their backgrounds and experience levels. Additional presentations at professional conferences will enable the authors to expand the scope of the project and, with others, better refine the needs of the PUI RA generalist community.

Work on how an institution can manage and manages through a disruption process for a better outcome than it had prior to the disruption is an additional area of interest, which might initially be investigated through a case studies approach.

Authors’ Notes

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PowerPoint slides from the May 2015 NCURA Regional presentation are available upon request from the authors.

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References


An Analysis of Collaborative Problem-Solving Mechanisms in Sponsored Projects: Applying the 5-Day Sprint Model

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Abstract: In May 2016, the office of Finance and Sponsored Projects at The Research Institute at Nationwide Children's Hospital conducted a 5-day design sprint session to re-evaluate and redesign a flawed final reporting process within the department. The department sprint was modeled after the design sprint sessions that occur routinely in software development and manufacturing processes fields. The Research Performance Progress Report (RPPR) process was not consistent among all Sponsored Project Officers (SPOs), and the department needed to develop and implement quality control measures to safeguard compliance and assure quality in the reporting process. This study in adapting a software design process for use in sponsored projects assesses how this problem-solving mechanism can be utilized with success to replace the formal workgroup model and improve the research administration enterprise. Findings illustrate that several factors influence the success of the sprint application to research administration, including increased time spent dedicated to the problem and a gained shared understanding of the problem and possible solutions. Finally, findings indicate a strong preference for the individual problem-solving technique inherent in the sprint model in combination with the intense and deadline-driven collaboration mechanism.

Keywords: sprint, agile methods, efficiency, work group, teams, organizational science, sponsored projects management, RPPR report, collaboration, problem-solving

Introduction

Sprint design sessions are routinely employed by Google Ventures and at numerous other software companies both nationally and internationally (Knapp, Zeratsky, & Kowitz, 2016). The sprint model puts key members of the team in a room with a Decider and a Facilitator for six hours a day for five days to solve a problem, design a product, or develop a solution. Sprint team participants are forbidden from using cell phones or other technology while participating in the sprint session. By putting all stakeholders in a room, the sprint experience forces team members to commit to making progress, helps teams move abstract ideas and hunches into concrete action, keeps teams focused on what's important, and encourages prompt decision-making and follow-up (Knapp, Sprint, 2016). The sprint also often makes use of a “scrum master,” whose job is to remind the team, via use of a bell or other sound device, when the team veers off-topic or begins developing solutions or ideas that may be valuable but are not applicable to the specific sprint goal. The sprint team must understand, map, develop, and test a working prototype in one week. A one-week deadline motivates sprint teams to produce quickly and efficiently.
Sprints are common in the development of websites, apps, and other software. Google Venture has also introduced the sprint model to manufacturing processes and seen successes emerge from its application in that field as well. The challenge in applying the sprint to sponsored projects is that research administration rarely develops a product or a single-user experience. Processes are multi-layered, over the span of a year or more, involve many players contributing to grant management, and must often be nimble and adaptable to changes in regulation or law. To meet the needs of research administration, the sprint concept would need to be modified to generate an improved process.

Current Problem-solving Mechanisms

Effective teamwork is key in research administration, and in all organizations. The Harvard Business Review published a study in 2016 that found that "the time spent by managers and employees in collaborative activities has ballooned by 50 percent or more" (Cross, 2016). The challenge is to make the most of these collaborative experiences. Sponsored Project offices typically employ long-term workgroups or committees. In these collaborative environments, team members meet for an hour each month or twice a month to analyze a process, project, or department need and to make recommendations for improvement and implementation. The workgroups use brain-storming, mapping, group discussion, and critical questioning to move towards recommendations and create deliverable materials that illustrate process changes or provide training. A variety of individuals with diverse roles appear as contributors on department committees. Workgroup duration commonly varies between several months to several years, with participation fluctuating with staff turnover and committee burn-out. The workgroup model of problem-solving has flaws. Progress towards solutions is slow, individuals miss meetings and lose motivation to contribute, staff turnover challenges process towards achieving goals, outspoken individuals in brainstorming sessions tend to drive progress in a single direction, schedules grow increasingly clogged by meetings, and department morale flags. Teams spend a long time on critical tasks, leading the project to fall behind, and can struggle to complete tasks and achieve their goals (Kisielnicki, 2016).

Additionally, work groups strive to produce a final product or recommendation and do not experience critical iterative design sequences. These final products occur at the end of a work group’s convened effort. Redesign of those end products is slow and cumbersome since the time it takes to convene the work group, gather feedback on needed revisions, and collaborate on a new design stretches over weeks or months, sometimes years. Finally, the larger the work group size, the more prone its team members are to decreased individual effort towards accomplishment of the group’s goal (Latane, 1979). Devine suggests “a great deal of time, effort, and perhaps money is spent in creating teams, but little is done for them once they are in place.”

However, factors impacting team effectiveness are contingent on the team’s context (Devine, 1999). Devine finds that organizations boast a variety of team types: management teams, autonomous work groups, semiautonomous work groups, and project teams. The sponsored projects department tends to rely on semiautonomous work groups, defined as a group of diverse co-workers tasked with a goal or problem to solve and that reports their recommendations to management. This problem-solving model assumes that problems are well defined, processes can
be optimized, and results can be predicted (Devi, 2013). The sprint model is an ad hoc project team, as defined by Devine, responsible for developing a specific project in a specified duration, tasked with being adaptive, collaborative, and in employing design iterations.

Outside of the workgroup model, staff members choose to solve problems on their own and present possible solutions to managers, collaborate with each other on solutions via email communication, or discuss problems and possible solutions during department meetings. The workgroup model is the standard problem-solving mechanism endorsed by the sponsored projects department at The Research Institute at Nationwide Children’s Hospital.

**Rapid-response**

Google Venture’s 5-day sprint accelerates a team’s understanding of the problem at hand and engenders in team members shared understanding of complexity and possible solutions. The sprint model offers an additional advantage in that it is a rapid-response solution team, capable of gathering feedback on a prototype and redesigning in real-time to meet the deadline. Sprints are commonly one piece of the Agile methodology in which projects are managed progressively, with iterations over time. These rapid-response iterations quickly incorporate feedback and redesign a product to eliminate unsuccessful product elements (Kisielnicki, 2016). The Sponsored Projects sprint encouraged iterative design in both the sketching and prototyping days. Iterative design elements are new and offer a potentially valuable alternative to the traditionally linear problem-solving methods evidenced in workgroups.

**Rethinking RPPR Submission**

In 2014, the National Institute of Health began requiring institutions to submit a Research Performance Progress Report (RPPR) for all annual, type 5 noncompeting NIH awards (National Institute of Health [NIH], 2014). In the RPPR, “recipients describe scientific progress, identify significant changes, report on personnel, and describe plans for the subsequent budget period or year.” It is essential to be accurate and timely in working with principal investigators to complete and submit RPPRs.

From 2015-2016, the Sponsored Project Officer team replaced two of its four members and increased the team by an additional two new positions, growing the dedicated SPO team from four to six, including the transition of one SPO to SPO Manager. Consequently, two-thirds of the team was new to submitting RPPRs. The significant staffing changes, in combination with the implementation of the RPPR requirement, resulted in inconsistent submission and a lack of understanding among the SPO team members as to what was truly required on the report, whose role it was to collect and enter different pieces of the report, and how best to organize and communicate regarding the RPPR submission and due date. The director reported significant variation in the information he reviewed in the RPPRs submitted by the SPO team. These inconsistencies and errors required the institution’s signing official to return to the SPO at submission to gain complete information on publications, inventions, intellectual property, aims, and budgets before submitting the RPPR on behalf of the investigator. The process was time-consuming, inefficient, and inconvenient for all parties. Additionally, the SPO team was projected
to grow with the addition of another position, to seven in total by the fall of 2016, and would need a way to train that individual in RPPR submission or risk the same lack of understanding and errors in a new cycle. The SPO team needed to work together to outline best practices for submission, but the team was consistently buried in work and unable to determine how best to dissect the complex process from start to finish in order to educate new members of the team on the multilayered RPPR submission process.

According to the National Institute of Health, “review of the RPPR by NIH staff is a key element in NIH’s monitoring of the grant award” and “funding for non-competing years of the grant can only be awarded after the NIH program and grants management staff review and approve the progress report” (2016). It was imperative for the SPO team to improve their submission process and better communicate with the signing official in order for the principal investigator to continue to receive timely non-competitive funding. Streamlined Non-Competing Award Process (SNAP) RPPRs are due 45 days from the next grant year budget period start date, whereas Non-SNAP RPPRs are due 60 days before the next grant year budget period. In optimal conditions, a principal investigator will initiate an RPPR 60 days before it is due, starting the clock on that submission for the Sponsored Project Officer team. Within that window, SPOs must often coordinate with subsites to gain budget information and documents, complete administrative sections of the report regarding budgets, effort, inventions, and more, and sometimes help train new investigators to use the system and complete their sections of the report.

An RPPR User Guide exists to help guide research staff and investigators in submitting through eRA Commons (NIH, 2016), and yet, because the process involves several different handoff points and individuals along the way through the year of the award, and because each grant funding mechanism is unique, the reporting process is rife for complexity. While the SPO team acknowledged their use of the Instruction Guide in submitting their own RPPRs to the signing official, the team needed best practices in place for handoff, communication, training, and coordination among different roles that all play a part in a successful submission. The team needed to map the process to identify pressure points and common errors.

An Alternative Problem-solving Model

The Research Institute’s Sponsored Project Officer team was willing to pilot the sprint project in May 2016. There were a few key problems to overcome in adapting the sprint for sponsored projects. A review of the literature on sprints did not yield any instances of this model being employed in research administration or to retool a complex internal, multi-user process. The traditional sprint focuses on satisfying the needs of the customer and produces a product to meet that need. In seeking to re-invent the department process, the sponsored project sprint team would be its own customers and the product created by the sprint would be a process for their own use. Would this change the sprint’s success or value to the department?

Resource allocation was another hurdle in implementing the sprint in sponsored projects. Knapp advises a 5-day sprint, with each day consisting of 6 hours. The department could not afford to allocate all the Sponsored Project Officers, two Research Business Coordinators (RBCs), two Grants and Contract Officers (GCOs), and the SPO Manager, a total of ten staff, for six hours
a day for five days, for a total of 300 hours. As a compromise, the department allocated two hours a day for five days—a significant reduction in allocation, yielding just 100 hours. It was an abbreviated version of a sprint, but would it still work?

Conducting the Sprint

The Google Venture team recommends specific tasks for each day of the design sprint. The first day would be dedicated to developing a group understanding of the problem by hearing from experts on the problem. The team would employ “How Might We” notes to contribute to the team understanding of gaps in service or questions about how the team might improve the process. On Tuesday, the team would map the process and develop the goal. On Wednesday, the sprint team would sketch solutions and create storyboards for the process. The team would also use “heat-map” type sticker voting to determine which sketches to incorporate into the new process. On Thursday, the team would develop a working prototype. On Friday, the team would test the prototype on users. To modify the recommended sprint days to fit the time constraints and the unique needs of sponsored projects, Friday’s session developed into a day devoted to designing the process. SPOs would need to test the process over the course of several months after the sprint session.

Day 1: Understanding

The sprint Facilitator explained the origin of the sprint with software teams and Google Ventures and discussed that the session would be an abbreviated version, piloted as alternative problem-solving model. The team would be reinventing the department’s RPPR process throughout the course of the week. The team identified a “Scrum Master” who would keep the team on task and alert the team by striking a toy xylophone when the team drifted off topic. The SPO Manager would serve as the “Decider” and would assist by making the tough decisions, as needed, throughout the week. The SPO team invited two Research Business Coordinators and two Grants and Contracts Officers to be a part of the sprint team as well. The Research Business Coordinators manage the grant budgets and personnel and their perspective would be valuable to the process. The Grants and Contracts Officers issue subawards and communicate with subsites and the SPO team considered that their input on the RPPR process would be valued as well.

Chiu proposes that people who do not share an understanding of the immediate problem may work together collaboratively to generate multiple perspectives and synthesize them to form an effective solution. Sprint team members did not share a universal understanding of the problem. By bringing this divergent team together and achieving a shared understanding, the sprint would allow the team to bring their different perspectives to develop a solution. Two experts were on hand to discuss the problems with the RPPR process and to go over the RPPR form in detail. The sprint team included both seasoned Sponsored Project Officers who had submitted dozens of RPPRs, new staff who had never submitted a report, and Research Business Coordinators who have traditionally contributed a piece of the RPPR for submission and Grants and Contracts Officers who may contribute to the process in the future. On the first day, the Director was on hand to explain the issues he was seeing come up in the RPPRs. The team created a list of the issues he reviewed and asked questions. The team also contributed by compiling lists of “How
Might We” notes. These notes gave team members the opportunity to identify opportunities for improvement in the process. “How Might We...improve communication with investigators about RPPR deadlines?” or “How Might We...ensure all documentation is available from the subsite?”
The team went through each section of the RPPR in detail to identify the different roles that contribute and the time points of interaction in the process. The team ended the Monday session by identifying the goal for the week to be: Accurate, compliant, timely reporting by clarifying and redefining roles and responsibilities and streamlining the process.

Critical to the process of team learning is the concept of psychological group safety. In safe learning environments, team members feel comfortable asking questions, taking risks, and sharing perspectives (Edmondson, 2001). The sprint model attempts to inoculate team members from interpersonal anxiety by offering them a distraction-free zone (no electronics) and a dedicated space and time to learn from experts and from each other about the process and problems. Coordinated action is best accomplished when individuals can synchronize their thoughts, feelings, and behavior (Hackman, 1992) and the sprint model offers individuals a safe place to learn, share, build, and accomplish in a deadline-driven team environment. Membership continuity and familiarity influence group mood and stability (Bartel, 2000); since the sprint model promotes intimacy and familiarity among members who are tasked to show up and contribute to a shared and specific purpose within the teams’ short duration, the sprint model offers strong continuity and builds familiarity quickly. In traditional sprints, team members spend the majority of those five days together, breeding trust and comfort among team members. The greater the degree of stability, the stronger the team’s mood convergence.

Before concluding Monday’s session, the team discussed Tuesday’s plans to map their understanding of the process and organize the “How Might We” notes. Monday was an intensive day of learning and questioning. Team members seemed overloaded with information, but as they were packing up, several expressed hope that the team could improve the RPPR problem with use of the sprint. They expressed frustration with the department’s traditional workgroup model, citing that it was time-consuming and did not produce results efficiently.

**Day 2: Mapping**

Tuesday’s task was to create a simple map of the process (5-15 steps) that would illustrate the team’s understanding of how the process currently worked and help identify flaws or gaps in the process. The team quickly determined that they first wanted to draw a quick graph of the different roles involved in the RPPR process, since the investigator, the SPO, the RBC, the GCO, and the signing officer all had different roles to play at unique times and in relationship to the RPPR form. The Facilitator helped graph form sections A-H and the team isolated the roles involved with each section. This helped the team feel more unified and clear on the sections discussed on Monday.

The map began with the moment of “RPPR Awareness” and ended with “RPPR Submitted and Uploaded.” Defining the middle section of the map was more challenging. The team processed backwards in time from the end point and then forward from the beginning until able to define the middle zone tasks and handoff points accurately. It was a challenge for the team not to recommend solutions to improve the process at this point. The team struggled against this barrier in the sprint
format initially, since seeing the map immediately triggered awareness of flaws and dialogue about how it could improve. Department workgroups not only allow for this free-form idea generation, but encourage it. In workgroup sessions, teams are often free to follow a new idea or solution and explore it through brainstorming. However, evidence has shown that brainstorming sessions do not produce more average quality ideas; in Diehl and Stoebe’s study, they determined that production blocking, or the brainstorming condition of waiting in turn to present ideas while others speak, yields fewer average quality ideas than situations in which individuals produce their own ideas or write their ideas on paper while others speak. Group brainstorming doesn’t tend to work because dominant, outspoken personalities tend to “win” in those sessions, while quiet or new staffers can be overlooked (Novellino, 2016).

The purpose of the sprint mapping exercise is to coalesce group understanding of the existing process, as it related to the RPPR form detailed in Monday’s session.

Figure 1. Mapping the RPPR process.

Once the team was satisfied with the map, the Facilitator began reviewing the “How Might We” notes from Monday’s session, allowing the team to determine where they fit into the map or if they should be on the “parking lot” for discussion at a later date. The “How Might We” notes would help the team determine critical solution needs for Wednesday’s sketching session.
The team identified that there was a lot of potential for improvement around the Sponsored Project Officers’ final review of the RPPR, some potential new involvement for the Grants and Contracts Officers in contacting the subsites or collecting subsite information for the RPPR, some ideas for improvement at the moment of RPPR awareness, and a potential change in the Research Business Coordinators’ involvement in entering personnel into the RPPR.

**Day 3: Sketching**

The sketching day in the sprint most significantly departs from the department’s problem-solving traditions. In workgroup sessions, staff occasionally map processes and learn from experts on a topic, but the concept of individually developing solutions inside of a collaborative group experience was new. After talking about the problem for two days, the team was keen to begin developing solutions.

The Facilitator explained Knapp’s concept of “Crazy 8’s”: team members fold a blank sheet of paper in half four times, then unfold it, to get eight equal rectangles. The team had twenty minutes to develop a sketch and was free to get up and look at the map and notes before beginning. With limited time to develop a sketch, ideas are faster and staff members experience less self-editing.

![Figure 2. “How We Might” notes enhance understanding of process flaws.](image-url)
The team experienced one round of Crazy 8’s, but it may have been more fruitful to do two shorter sessions (Dinakaren, 2013) instead.

The sketching session yielded surprising results. It was incredibly difficult to develop a sketching concept, and the sketches the team developed were very text-heavy. This made them challenging to read and understand without the artist explaining the sketch. Each team member’s sketch boxes were almost paragraphs explaining what happened next. The “sketching” element was minimal. Perhaps research administration processes lend themselves to more text and fewer diagrams. Or perhaps the sketching exercise needed further explanation. Did the team need words to explain what happened next or how the proposed changes would impact another person’s role or part of the RPPR form? Perhaps the value of the sketching session was in helping individual sprint members organize and explore their own solutions for presentation to the team. More study is needed on this in future sprint sessions.

Knapp recommends a few sketching sessions and then developing those sketches into storyboards (Sprint, 2016). The sprint team conducted one longer sketching session and eliminated the storyboards to save time. This may have been a mistake. The storyboards would have helped crystalize the content of the sketches; in future sprint sessions, the storyboard concept should
be reintroduced. The team felt rushed on the sketching day and could have used more time to
develop and analyze the sketches as potential solutions. Despite the sketches’ limitations in
the department sprint, the team universally saw the sketching day as valuable in the post-sprint survey.
Developing individual solutions within a team was a valuable part of the success of the sprint and
the team felt invested in contributing their individual ideas within the safety of the sprint session.
Additionally, the sketches were surprising in that they were difficult to silently critique and grasp
without explanation from the author of each sketch. The team allowed the authors to explain
their sketches and concepts before moving on to vote on the ones that added the most value
to improving the RPPR process.

The team placed the sketches on the map and voted on pieces of the sketches that contained
the most valuable contributions to the process improvement. The Facilitator passed out green
stickers and each person had four stickers to place on the sketches in silence. The Decider had
more stickers to use to vote. Silent voting with stickers was a valuable piece of the team effort.
Team members recommended that future sprints allow pieces of sketches to be cut apart and
moved around, as this would promote recombining the best ideas from different sketches. The
storyboard concept may have promoted this recombination aspect as well and should certainly
be re-introduced into future sprints to more fully explore how that element could contribute to
the iterative process.

Day 4: Prototyping

By Thursday, the team was ready to build a new process and timeline to submission, based on
shared understanding of the process, the most valuable “How Might We” notes, and the sketched
ideas determined to contribute most to the process from the voting session. The Facilitator drew
five timelines on the whiteboard, beginning at the moment of RPPR awareness and ending at
the SPO uploading the final copy of the report into grant management system. The five lines
represented each role that was to be involved in the process: the PI, the SPO, the RBC, the GCO,
and the Authorized Official. The team began the mapping session on Tuesday by defining how
the different roles interacted with the RPPR form, so it made sense to identify the different
places where those roles came into play in the new process and how the team might refine those
intersections in support of increased accuracy and compliance.

Next, the team identified key time points in the process: the notice of award, 120, 90, 60, and 30
days before the report was due and placed tasks into the timeline of roles, using ideas from the
sketches and “How Might We” notes to guide discussion. The sprint team clarified important
handoff intersections between roles, discussed potential changes in responsibilities related to the All
Personnel report and to contacting subsites and obtaining required documentations and budgets.

The new maps helped the team identify the materials needed to empower these changes in
process and guide the interactions. The team determined that it wanted an overall RPPR Process
Checklist that would serve as a roadmap for all department roles in each RPPR submission, from
notice of award through the upload of the final document. That document would be the sprint
team’s primary “product” by the end of the day Friday. However, the team identified the need
for ancillary materials. The SPOs would create email templates that they would use to contact
investigators at different time points in the process. The first would be a template for contacting investigators at the time of Notice of Award and the second one would be an email that would go out to investigators at the 60-day mark before due date. That 60-day email would include language about routing the RPPR to the SPO. The SPOs would also create a final review checklist for the RPPR. The Grants and Contracts Officers would create an email template they would use to contact subsites to solicit documentation and budgets and a review checklist for verifying all subsite documents and budgets are correct at two weeks from submission. The team’s goal for Friday would be the creation of the RPPR Process Checklist, and due to a shortage of time, the team would need to develop the ancillary materials outside of the sprint.

Day 5: Designing

Friday was a rush. After five days of collaboration that included individual problem-solving opportunities, the team was working together very well. Google conducted a study, entitled Project Aristotle, that attempted to quantify what makes good teams successful. The study found that conversational turn-taking and empathy help teams develop trust among one another and assure team members that they are being heard. The teams that can develop those skills and norms are high performing (Duhigg, 2016). By Friday, the sprint team had developed trust, conversational turn-taking and good listening skills. It had morphed into a high performing team. The Scrum Master role was largely forgotten, as team members were highly focused on achieving the goal and contributing to completing the product by the end of the two-hour session. The team had forged a strong bond, and by the close of Friday’s session, had developed a working draft of the RPPR Process Checklist.

The team took the final ten minutes of Friday’s session to discuss impression of the sprint as a problem-solving method in the department. The informal feedback session was positive, with team members saying that they would choose to be a part of a sprint again to solve a problem, specifically when given the choice of a sprint or a workgroup. The team felt that the time devoted to the sprint was insufficient, claiming to need three or four hours each day, or a couple of strategically placed three-hour days within the sprint week. The sprint team had developed a draft document outlining the new process and had identified related collateral materials and templates, but the time allotted in the sprint had been insufficient to develop all materials and to review their use. That sensation of just having clearly identified what the team needed to develop and then ending before the creation of those materials engendered frustration that would have been alleviated if we’d had more time allotted for the sprint. The team was able to begin building momentum towards an idea or decision and ended for the day. It was challenging to pick up immediately the next day at the same energy level and understanding.

Sprint Follow-up Sessions

The Decider scheduled two follow-up sessions for the sprint team in the weeks that followed the event. In these meetings, the team continued developing the supporting materials for the RPPR Process (RPPR Process Checklist, SPO Final Review Checklist, Subcontract Review Checklist, and email templates for key interaction moments in the process). The completed RPPR Checklist
and Subcontract Review Checklists are fillable PDFs that multiple parties can contribute to completing over time. The SPO Final Review is an online form with JotForm. It was much more challenging to motivate the team to produce materials outside of the sprint week.

Figure 4. RPPR Final Checklist for Review.
Feedback on the Sprint Session

Two weeks after the sprint session, all members of the sprint team completed the online anonymous survey. When asked what could have improved the sprint session, respondents overwhelming chose: Dedicated room space (62.5%) and More time dedicated to the sprint (62.5%). Prior education on the problem (37.5%), Increased group participation (25%), and Clearer understanding of how the sprint would work (25%) also scored highly. The team moved rooms three times throughout the week, and it was a challenge to travel the large whiteboard to each room and get set up and cleaned up on time each day. A single dedicated space in which to conduct the sprint would have been ideal. In this adaptation of the sprint model, the department allocated one-third of the advised time for the sprint. While the team may not have needed the full six hours a day, more time is needed to yield a truly successful adaption for sponsored projects use of the problem-solving model. The team felt rushed on several of the days and had to cut out some elements like storyboarding that may have really helped define the process and product earlier in the week.

Table 1. What could have improved the sprint session?

<table>
<thead>
<tr>
<th>What could have improved</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>More time dedicated to the sprint</td>
<td>62.50%</td>
</tr>
<tr>
<td>Dedicated room space</td>
<td>62.50%</td>
</tr>
<tr>
<td>Prior education on the problem</td>
<td>37.50%</td>
</tr>
<tr>
<td>Clearer explanation of how the sprint would work</td>
<td>25.00%</td>
</tr>
<tr>
<td>Increased group participation during the sprint</td>
<td>25.00%</td>
</tr>
<tr>
<td>Daily take-away materials/handouts</td>
<td>12.50%</td>
</tr>
<tr>
<td>Improved facilitation/leadership of the sprint session</td>
<td>12.50%</td>
</tr>
<tr>
<td>Fewer sprint follow up sessions</td>
<td>12.50%</td>
</tr>
<tr>
<td>More individuals participating</td>
<td>0.00%</td>
</tr>
<tr>
<td>Fewer individuals participating</td>
<td>0.00%</td>
</tr>
<tr>
<td>Less time dedicated to the sprint</td>
<td>0.00%</td>
</tr>
<tr>
<td>More sprint follow up sessions</td>
<td>0.00%</td>
</tr>
<tr>
<td>More communication regarding the sprint</td>
<td>0.00%</td>
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</tbody>
</table>

When asked what day of the week specifically needed more time, responses varied. Prototyping day (score of 3.88) edged out Sketching (3.14), but the other three days also scored some votes with participants as well (Designing, 2.88; Understanding, 2.75; Mapping, 2.71). The data seems to indicate that the team could have used more time on all of the days of the sprint. Teams may see increased efficiency and effectiveness in sponsored projects sprints with 3-4 hours a day devoted to the process.
Team members saw the sketching day as the most successful segment of the sprint. This day departs most significantly from the department’s commonly used problem-solving methods of brainstorming in work groups. On the sketching day, the team quietly sketched and solved problems independently, and then discussed and voted on their sketches and recommendations. Team members relished the opportunity to solve the problem on their own and then present their idea for review. When the survey asked the team to rate their preferred problem-solving mechanism for complex problems, they chose the *Sprint* (4.33) but tellingly, *Individual problem-solving and presenting solutions to a manager* was the second choice (3.99), with *Workgroup* (2.38), *Department training* (2.33) and *Email* (2.11) following in the distance.

**Table 2.** Given the need to solve a complex problem in our department, rate these problem-solving mechanisms in order of your preference with 1 being your first choice.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Workgroup</strong></td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>25.00%</td>
<td>37.50%</td>
</tr>
<tr>
<td><strong>Email</strong></td>
<td>11.11%</td>
<td>0.00%</td>
<td>22.22%</td>
<td>22.22%</td>
<td>44.44%</td>
</tr>
<tr>
<td><strong>Sprint</strong></td>
<td>44.44%</td>
<td>44.44%</td>
<td>11.11%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td><strong>Department Training</strong></td>
<td>0.00%</td>
<td>11.11%</td>
<td>33.33%</td>
<td>33.33%</td>
<td>22.22%</td>
</tr>
<tr>
<td><strong>Individual problem-solving followed by discussing a possible solution with manager</strong></td>
<td>33.33%</td>
<td>33.33%</td>
<td>22.22%</td>
<td>11.11%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

This data, when combined with the interest in the sketching day, seems to indicate that the sketching day may have appealed because it brought this preference for individual problem-solving into the collaborative process of the sprint in a way that workgroups, the most common problem-solving mechanisms, do not. With their focus on brainstorming and group collaboration, workgroups do not allow for individual solutions and they can be challenging for more passive team members who struggle to contribute when faced with more vocal peers. Workgroups that build trust and conversational turn-taking can be high performing, but those dominated by a stronger voice will struggle. Workgroups that incorporate time for individual problem solving may see an increase in yields. The sketching day in the sprint model provides staff with the opportunity to individually
problem solve and then equitably discuss and vote on the concepts without the influence of strong personalities that often impacts the brainstorming sessions in workgroups. In the 1987 study, Diehl and Stroebe recommended this same concept in their study:

Because blocking slows down the generation of ideas in groups, it might be more effective to ask subjects first to develop their ideas in individual sessions and next have these ideas discussed and evaluated in a group session. The task of the group would then consist of evaluation rather than production of ideas. This procedure might comb the advantage of group and individual sessions without making unnecessary demands on individual time. (pp. 508-509)

The team found the prototyping day to be the most challenging day of the sprint (83.33%). On our prototyping day, the team struggled to merge understanding, mapping, sketching, and notes into a product to develop. It took the better part of an hour to formulate and identify the product. An hour would not have been a problem within the context of a four-hour sprint day, but with only two hours to use, that hour ate away at half of that session's productivity.

Table 4. If you could choose to double the time allotted on just one of the days of the sprint, which day would you choose? Rank them in order of preference for extra time, with 1 being your first choice.

<table>
<thead>
<tr>
<th>Day: Understanding</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1: Understanding</td>
<td>25.00%</td>
<td>0.00%</td>
<td>25.00%</td>
<td>25.00%</td>
<td>25.00%</td>
</tr>
<tr>
<td>Day 2: Mapping the existing problem</td>
<td>0.00%</td>
<td>28.57%</td>
<td>28.57%</td>
<td>28.57%</td>
<td>14.29%</td>
</tr>
<tr>
<td>Day 3: Sketching and “How We Might” Notes</td>
<td>0.00%</td>
<td>42.86%</td>
<td>42.86%</td>
<td>0.00%</td>
<td>14.29%</td>
</tr>
<tr>
<td>Day 4: Prototyping/Mapping our new process</td>
<td>62.50%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>37.50%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Day 5: Designing our process</td>
<td>12.50%</td>
<td>37.50%</td>
<td>12.50%</td>
<td>0.00%</td>
<td>37.50%</td>
</tr>
</tbody>
</table>

All nine of the respondents indicated that they would recommend the sprint model to solve future department problem and eight of the nine responded that they would be willing to participate in a future department sprint. All but one of the team members were satisfied with the checklists, materials, and process created as a result of the sprint.

Follow Up to the Sprint

In the months that followed the sprint, the team struggled to produce the remaining three deliverables. During the sprint sessions, the team determined a need for three email templates: an email to investigators at the time of the award that advises the investigator on the RPPR submission due date, an email to the investigator sixty days before the RPPR report is due, and an email to subrecipient to request their documentation and information for the RPPR report. Additionally, the sprint team identified the need for a consistent naming convention on documents and files, both for the sprint and throughout their processes. It is possible that sprint
members do not view these remaining tasks as significant and meaningful contributions and are, therefore, less motivated to complete them outside of the sprint sessions. It may be necessary to better connect completion of sprint-originated tasks outside of the sprint with the meaningful aspects of sponsored research in future sprint sessions. Additionally, sprint team members may see these final three auxiliary products as less important than the primary product, and are, therefore, less willing to carve out time in their daily tasks to complete them. Ultimately, sprint teams should strive to produce the primary product as well as any ancillary materials in the course of the sprint session to ensure maximum effectiveness.

Table 5. Would you recommend our department consider the sprint model to solve future problems?

<table>
<thead>
<tr>
<th></th>
<th>100.00%</th>
<th>0.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
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</tbody>
</table>

Conclusion

The data on the sprint conducted by Sponsored Projects at The Research Institute at Nationwide Children’s Hospital indicates that the sprint model would be a successful and welcome way to improve future complex department processes. Increasing the allocation of time for the sprint to four hours a day, gaining a dedicated and consistent room space for the session, and providing advance information on how a sprint works so participants feel prepared to participate fully would improve the sprint experience for all members. It may also be useful for the Facilitator to send out a summary of the problem and educational materials on the process to help increase team readiness in advance of the sprint session.

While a sprint does bind up those team members’ time and limit the department’s ability to provide service during the session, the sprint offers the chance to maximize problem-solving. When ten people engage in a one-hour monthly workgroup over a year (120 hours), problem-solving moves slowly, not everyone can always attend, staff turnover results in stagnation, and groups must spend a portion of each one-hour session getting everyone up to speed and re-focused, while dedicating 100 hours to an abbreviated sprint session produced a working prototype of a complex process without team members experiencing committee burn-out and without having to account for staff turnover within the team. The sprint feedback was overwhelmingly positive because a sprint combines individual problem-solving preferences with safe group spaces for learning and problem-solving and intense and focused collaboration and decision making; these factors empower the team to produce fast-paced, holistic solutions to complex problems.

In looking to fields like software and manufacturing, where process improvement is critical to marketplace success, sponsored projects offices can develop new ways to collaborate and solve the problems unique to research administration. The adapted sprint model proposed here is designed to be an experiment in alternative problem-solving mechanism and is not intended to be a universal blueprint of how best to adapt the sprint for all institutions. However, institutions that
are willing to learn from and adapt methods from other fields create opportunities to filter those problems through a new lens and potentially uncover solutions in a way that supports both the individual problem solving and rich collaborative connections necessary to promote innovation and agility in Sponsored Research and compliance needs.

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References


*The Journal of Research Administration, (47)2*