

Key Considerations in Organizing and Structuring University Research

TL Huong Nguyen

The University of Melbourne

Vincent Lynn Meek

The University of Melbourne

Abstract: *University research capacity building has now become an increasingly important task in both developed and less developed countries. In this capacity building endeavour, research late-developer universities in particular need to develop a sound research organizational structure. However, what elements are needed in organizing and structuring university research has rarely been discussed systematically. Applying Mintzberg's (1979) theory on the structuring of organizations, this study sheds light on the generic parameters of organizing and structuring research. Five of the more visible parameters consist of: (1) create research positions; (2) create research management positions; (3) decide primary organizational units for research delivery; (4) create a research office; and (5) create research oversight committees. The five less visible parameters are: (1) develop rules for research integrity; (2) develop rules and procedures for managing the lifecycle of a research project; (3) develop a mechanism for evaluating the quality of research outcomes; (4) prepare researchers and research managers for the necessary skills and knowledge; and (5) decide vertical and horizontal decentralization. We argue that institutions that pay close attention to these ten management and organisational tasks for creating an environment in which research can flourish are more likely to be successful in building and/or enhancing their overall research capacity than other institutions.*

Keywords: *Organizing research; structuring research; research management; research administration; research leadership; research organizational structure*

Introduction

Once concentrated in the more developed countries, university research capacity building has now become an increasingly important task in both developed and less developed countries (Nguyen, 2013a). In particular, for countries and institutions that are starting to build or trying to improve research capacity and performance, the know-how of university research management is very important for organizational research capacity building. Nonetheless, university research management has been regarded as an “uncharted territory” (Edgar & Geare, 2013), an area “largely unexplored” and a “modestly known” research topic (Bosch & Taylor, 2011). In an attempt to enrich this body of literature, this paper maps out the most essential elements in organizing and structuring university research.

Using Mintzberg's (1979) theory on the structuring of organization as a guide for specifying the main tasks in organizing and structuring research at universities, first of all this study describes in detail five of the more visible parameters and five less visible parameters in research organizational structure. We argue that in order to build a strong research organizational structure capacity, a university needs to pay attention to both the visible and invisible elements. Then, to "test reality" we explore how these ten proposed rules of organization are applied at the Group of Eight universities in Australia. The Group of Eight (Go8) is a coalition of leading Australian universities, comprehensive in general and professional education and distinguished by depth and breadth in research formally incorporated in 1999 [<https://go8.edu.au/>].

This study is helpful for research policy and management researchers and practitioners. It defines clearly generic elements in structuring and organizing research. In thinking about organizing and structuring research, people may simply equate it with a research organizational structure chart. This study shows that in fact apart from some more visible structuring activities, a university must consider carefully a number of intangible tasks which are extremely essential for sustainably developing its research capacity. By using the framework provided in this study as a tool, university research leaders and managers can assess the level of comprehensiveness of their current research organizational structure. From this evaluation, they can identify the gaps and develop relevant strategies for better managing research or for building relevant capacity for organizational research development.

The framework outlined below was developed during the course of an empirical study of research management and capacity building amongst leading research universities in Vietnam (see Nguyen 2013a, 2013b). This paper deals mainly with the theoretical conceptualisation of that framework and its applicability to the Group of Eight universities in Australia.

Background

Structure seems to be at the root of many of the questions raised about organizations (Mintzberg, 1979). Organizational structure refers to:

the typically hierarchical arrangement of lines of authority, communications, rights and duties of an organization; it determines how the roles, power and responsibilities are assigned, controlled, and coordinated, and how information flows between the different levels of management. How an organization is structured depends on its objectives and strategy. (BusinessDictionary.com, para 1–2)

A university's three major tasks are teaching, research, and services (Boyer, 1990); the organizational structure of a university, therefore, is often based on how a university balances these three main functions, particularly teaching and research. If a university prioritizes teaching, it may only care about structuring its organization in a way that best promotes teaching and learning. However, if a university wants to promote research, it must consider building its organizational structure so as to enhance research activity. In other words, in shaping research policy and practice, a university needs to have a sound and appropriate research management structure (Bosch & Taylor, 2011; Pettigrew, Lee, Meek, & Barros, 2013).

Although a university needs a strong research management structure, surprisingly, very few publications have discussed the key elements in organizing and structuring university research from an organizational structure perspective. One argument may be that there is no single model for a university organizational structure because differences in organizational structure reflect local circumstances, in particular, institutional culture and history, an institution's strategic and operational plans, and the financial constraints of the institution (John Taylor, 2006). While this is a sensible argument, there remain generic organizational structure issues that all universities must carefully consider. In shedding lights on these issues, this paper employs Mintzberg's (1979) theory on the structuring of organization to specify the main tasks in organizing and structuring research. Mintzberg's (1979) is used as a guide because this is a classic, comprehensive work on organizational structure that is highly cited. This framework consists of four generic parameters: (1) design of positions (a. job specialization, b. behaviour formalization, and c. training and indoctrination); (2) design of the superstructure; (3) design of lateral linkages; and (4) design of a decision-making system.

Parameters (2) and (4) specifically relate to one of the central issues of management, including research management: centralisation and decentralization. In practice, this is not an either/or issue. Rather degrees of centralisation/decentralization are best considered in terms of a continuum, from total top-down approaches of structural design and decision-making systems to bottom-up ones – although Clark (1983) categorises national system of higher education according to where the majority of their institutions are placed on such a continuum. Moreover, it appears that research intensive universities tend more towards the decentralization of authority structures and decision making. These issues will be elaborated further below through the elaboration and application of the Mintzberg framework.

In teasing out the specific elements of organizing research, the study also relies on a number of other studies on research management such as Briar-Lawson (2008); Harman (1998); Kirkland (2010); Krauser (2003); Langley and Heinze (2009); McNay (2010); Paul (2008); Pettigrew, et al. (2013). These research management related studies help to delineate the four general parameters in Mintzberg's (1979) model into ten specific tasks: (1) create research positions, (2) create research management positions, (3) develop rules for research integrity, (4) develop rules and procedures for managing the lifecycle of a research project, (5) develop a mechanism for evaluating the quality of research outcomes, (6) prepare researchers and research managers for the necessary skills and knowledge, (7) decide primary organizational units for research delivery, (8) create a research office, (9) create research oversight committees, and (10) decide vertical and horizontal decentralization.

It should be noted that this list of tasks is not meant to correspond to all of the characteristics of any one particular university's research organizational structure. They are not listed in the order of development, either. Rather, it is meant to stress ten elements, which are common to most universities' research organizational structure. The importance or weight given to each domain will vary according to context, in particular stages of organizational research development. These generic and specified tasks are summarized in Figure 1.

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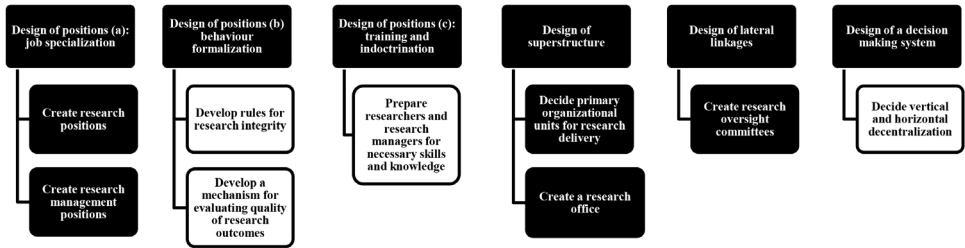


Figure 1. Generic parameters for organizing and structuring university research

Figure 1 displays ten generic parameters for organizing and structuring university research. In this framework, the five more visible parameters consist of: (1) create research positions; (2) create research management positions; (3) decide primary organizational units for research delivery; (4) create a research office; and (5) create research oversight committees. These parameters are considered to be more visible because some specific positions involving people are the end products of these actions. These more visible organizational structure tasks often result in an organizational structure chart, which is usually displayed on a university's website. The four less visible parameters are: (1) develop rules for research integrity; (2) develop rules and procedures for managing the lifecycle of a research project; (3) develop a mechanism for evaluating the quality of research outcomes; (4) prepare researchers and research managers for the necessary skills and knowledge; and (5) decide vertical and horizontal decentralization. These parameters are regarded as less visible because, after these tasks are carried out, no specific positions occupied by human actors are created. The end products are often a number of policies or knowledge and skills. The following section discusses each of the parameters in more detail.

Design of Positions

Job specialization

Two specific tasks in the job specialization parameter are “create research positions” and “create research management positions”.

Creating research positions

Until 1810, universities did not explicitly incorporate research into the traditional function of teaching (Witrock, 1993, as cited in King, 2004)). Today, a number of both old and new universities are still in the process of making the university not only a place of teaching, but also a place of learning (Boyer, 1990). Depending on the intensiveness of research activities and probably how research is funded, academic positions may be specialized into research and teaching combined or research-only positions. Concerning level of expertise, universities may categorize research and teaching combined positions into lecturers, senior lecturers, associate professors, and professors.

Research-only positions may be classified into research fellow, senior research fellow, principal research fellow, and professorial research fellow, or something similar. In the US, for example, these full-time research positions may be classified into Research Assistant Professor (Associate Research Scientist or Assistant Researcher); Research Associate Professor (Research Associate or Research Scientist); Research Professor (Senior Research Associate or Senior Research Scientist).

Most of these research full-time positions have been created recently as a result of the shift in dual funding models (general university funding and competitive research grants) towards an increase in the proportion of funding allocated through competition (Dill and van Vught, 2010). As research money is more short-term, typically about a 3-4 year period, researchers recruited to work in these projects are often employed on a fixed term contract, in accordance with the length of each research project. Many are termed as postdoctoral research fellows. In Australia, for example, historically, the majority of the academics were employed as permanent or continuing staff. However, in a recent survey of 19 Australian universities on work and careers, among 8737 PhD qualified academic participants, 38% is research intensive, 57% is combined teaching and research and only 5% is teaching intensive. Within the research intensive group, 84% were employed on fixed term contracts (Broadbent et al, 2013).

Creating research management positions

In structuring and organizing research, universities need to create appropriate research management positions. For the eight universities both within and beyond OECD (Organization for Economic Cooperation and Development) countries in a study examined by Connell (2004), this task was found to be a key to building research capacity and enhancing research performance. At these institutions, both academic and administrative research management positions were appointed.

At the University of Melbourne – a leading Australian research-intensive university, a number of research management positions have been created. At university level, the Deputy Vice-Chancellor (Research) (or DVC(R)) is primarily responsible for academic leadership in research, and delivery of the University's research agenda. Four Pro Vice Chancellors (PVCs) support this role: (1) Pro Vice-Chancellor (Research Collaboration and Infrastructure), (2) Pro Vice-Chancellor (Research Capability), (3) Pro Vice-Chancellor (Research Partnerships and External Relations); and (4) Pro Vice-Chancellor (Graduate and International Research). The DVC(R) and the four PVCs develop and drive implementation of the University's research strategy and promote University research capacity, performance and outcomes (Melbourne Research, 2012).

At the faculty level, Deans are encouraged to appoint senior academics to the part-time position of Associate Deans (Research) or equivalent. This role provides 'local' leadership in research planning, target-setting, research development and performance review. Heads of Academic Departments also provide crucial leadership in research and research training, supported by Centre directors, senior staff and postgraduate co-ordinators. Most faculties have established the position of Faculty Research Manager (or an equivalent) to manage, amongst a wide range of responsibilities, the administration of research activities within the faculty. The Deputy Vice-Chancellor (Research) has sought to involve Faculty Research Managers more formally in matters impacting upon the University's research processes and research agenda.

To make research and research management positions work effectively, universities should write clear job descriptions, responsibilities, accountabilities, and formal delegations accorded to these positions, along with the expectations and measures of performance. In an OECD study on a typology of knowledge and skills requirements for effective research and innovation management, Pettigrew et al. (2013) suggest that research leaders should take good care of two issues: (1) where possible, limit the number of direct reports to a group (ideally less than 10) that allows adequate attention to be paid by the leader to each individual and their responsibilities; and (2) maintain regular personal communication with each team member and collectively. Information on formalizing researchers' work behaviour is discussed below.

Behaviour formalization

Behaviour formalization is "the design parameter by which the work processes of the organization are standardised" (Mintzberg, 1979, p. 81). In formalizing researchers' behaviour, apart from job descriptions, it appears that universities most importantly need to (1) "develop rules for research integrity" (2) "develop rules and procedures for managing the lifecycle of a research project" and (3) "develop mechanisms for evaluating quality of research outcomes".

Developing rules for research integrity

To maintain scientific excellence and keep the public's trust, universities need to develop rules for research integrity. Research integrity should be defined both for a scientist and for an institution (Committee on Assessing Integrity in Research Environments, National Research Council, & Institute of Medicine, 2002, p. 4):

For a scientist, integrity embodies above all the individual's commitment to intellectual honesty and personal responsibility. It is an aspect of moral character and experience.

For an institution, it is a commitment to creating an environment that promotes responsible conduct by embracing standards of excellence, trustworthiness, and lawfulness and then assessing whether researchers and administrators perceive that an environment with high levels of integrity has been created.

Ideally, the task of promoting research integrity should be carried out jointly by various stakeholders: professional bodies, governments, research institutions, and individual researchers. While professional societies may have codes of ethics and, in a few cases, a comprehensive description of responsible research practices (see e.g., National Academy of Sciences (1995)), governments may pass laws on the responsible conduct of research. At the organizational level, universities are often required by law to develop policies to ensure institutional compliance with laws, regulations, guidelines, and codes of practice governing the conduct of research. Thus, apart from promoting the generally shared values for the responsible conduct of research such as honesty, accuracy, efficiency, and objectivity (Steneck, 2007), universities need to develop policies to ensure research integrity at various research stages.

In Australia, the Australian Code for the Responsible Conduct of Research (2007), for instance, guides universities and other public sector research institutions and researchers in responsible research practices. This Code is jointly developed by two Australian Government Agencies,

the National Health and Medical Research Council and the Australian Research Council and Universities Australia. This Code does not incorporate all the laws, regulations, guidelines and other codes of practice that apply to the conduct of research within Australia. There may be other key guidelines that should be read in conjunction with this Code. Compliance with this Code is a prerequisite for receipt of funding from National Health and Medical Research Council and Australian Research Council—the government’s two major research funding agencies. To develop appropriate policies and procedures for research integrity, Australian universities use to this Code as a basic reference.

To give an example, The University of Adelaide formally adopts the principles embodied in the Australian Code for the Responsible Conduct of Research in its Responsible Conduct of Research Policy (The University of Adelaide: University Policies and Procedures, 2009). The University Academic Board endorsed this Policy on 5 August 2009 and the Vice-Chancellor and President approved it on 14 August 2009. This policy states that the University endorses and adopts the general principles of responsible research outlined in the Code. The university expects all researchers associated with the University such as staff, students or affiliates to conduct their research in a manner consistent with the general principles outlined in the Code and any other related legal or regulatory requirements.

As identified in Table 1 in planning research, universities should ensure that the benefits that all humans gain from human research do not impose unacceptable burdens on some human research participants. In conducting research, universities should have clear regulations for data management, supervisor and trainee responsibilities, and research collaboration. In reporting and reviewing research, adequate attention should be paid to authorship and publication. It should be noted that promulgation of and adherence to policies and procedures are necessary, but they are not sufficient means to ensure the responsible conduct of research (Steneck, 2007). Therefore, universities should foster a culture in which “high ethical standards are the norm, ongoing professional development is encouraged, and public confidence in the scientific enterprise is preserved” (Committee on Assessing Integrity in Research Environments et al., 2002, p. 4).

Developing rules and procedures for managing the lifecycle of a research project

In order to standardize the work processes of research administration, universities need to develop appropriate policies and procedures for managing different research awards/projects throughout the various stages of a project lifecycle. The three main stages may include ‘pre-award’, ‘in-award’ and ‘post-award’. Pre-award processes may cover procedures, guidelines and instructions for preparing and routing proposals for institutional review and submission to the sponsor. In-award processes may cover guidance for managing in line with the award terms and conditions. Post-award processes may detail reporting obligations to the sponsor, financial reconciliations, forms and reports for the institution, and account closeout tasks.

At the University of Queensland, the rules and procedures for managing the lifecycle of a research project are divided into 4 stages: (1) find and apply for funding; (2) establish your project; (3) manage your project; and (4) output and impact (The University of Queensland, n.d.). Regarding (1) “finding and applying for funding” section, all of the information related

Table 1. Research integrity issues at various research stages (synthesized from The Code)

Stage	General Issues	Purposes
Planning research	The protection of human subjects	To help ensure that the benefits that all humans gain from human research do not impose unacceptable burdens on some human research participants
	The welfare of laboratory animals	To ensure the humane care and treatment of animals are used for doing research
	Conflicts of interest <ul style="list-style-type: none"> ▪ Financial conflicts ▪ Conflicts of commitment ▪ Personal and intellectual conflicts 	To prevent researchers from influencing decisions unfairly when there is a divergence between the individual interests of a person and their professional responsibilities.
Conducting research	Data management practices <ul style="list-style-type: none"> ▪ Data ownership ▪ Data collection ▪ Data protection ▪ Data sharing 	To ensure that sufficient materials and data are retained to justify the outcomes of the research and to defend them if they are challenged
	Supervisor and trainee responsibilities	To enhance a productive mentor/supervisor-trainee relationship because this relationship may bring into play potential conflicts
	Collaborative research	To prevent problems arising from collaborative research such as sharing intellectual property, managing research findings, managing conflicts of interest, and commercializing research outcomes.
Reporting and reviewing research	Authorship and publication	To help ensure that the authors listed on papers should fairly and accurately represent the person(s) responsible for the work in question and research results disseminated honestly, efficiently, and without bias.
	Peer review	To promote professional peer reviewing by encouraging: <ul style="list-style-type: none"> ▪ Meeting deadlines ▪ Assessing quality ▪ Judging importance ▪ Preserving confidentiality

to different international, national and institutional research grant schemes is provided. The university also lists all of the procedures necessary for researchers to prepare for and submit their applications. Concerning (2) “establish your project”, the university details all of the steps necessary for accepting research funding, advice on legal issues related to negotiating contracts involving research, ethics requirements for awarded research grants. Only when all required clearances have been provided to the university research and innovation office, all necessary agreements have been executed and any special conditions have been met, the successful grant can be operationalised. This involves the issue of a Grant Record Letter. In (3) “manage your project”, the university lists all of the key considerations with regard to financial management of a research

grant, requirements for progress reports and final reports, types of variations and processes for seeking variations and procedures for project closeout. It is noted that this is a critical component of all research projects which can provide a platform for future research projects. Finally, in (4) “output and impact”, general information related to the University’s research excellence, research impact, and institutional reporting is provided to highlight the University’s research impact, research strengths, and research awards and prizes.

Developing mechanisms for evaluating quality of research outcomes

Universities also need to develop a mechanism for evaluating the quality of research outcomes. The main purpose of evaluating research outcomes is to have in place a basis for evaluating staff performance for promotion and other purposes. This task is critically needed in jurisdictions that have established national research quality reviews. These are national, research-quality frameworks that serve a number of purposes but, most importantly, they provide consistent and comprehensive approaches to assessing the quality and impact of research activities in universities, particularly publicly funded research. Some examples of such exercises are the British Research Assessment Exercise (RAE) and its successor the Research Excellence Framework (REF, <http://www.ref.ac.uk/>), the Australian Excellence in Research for Australia (ERA, <http://www.arc.gov.au/era/>), the New Zealand Performance-Based Research Fund (PBRF, <http://www.tec.govt.nz/Funding/Fund-finder/Performance-Based-Research-Fund-PBRF-/>), and the South African National Research Foundation’s researcher rating system (NRF, <http://www.nrf.ac.za/rating>). A university that evaluates its academic staff research results systematically may be able to improve its total research quantity and quality. As a result, universities that do so may be assessed more favourably in a national research quality review, thereby being allocated more block-grant type research funding, and thus significantly enhancing their public image.

There are two major challenges to developing a mechanism for evaluating the quality of research outcomes. Firstly, research quality cannot be measured directly. Therefore indirect indicators of quality such as bibliometrics (which are only proxies) have to be used (Adams, 2009). Secondly, there may be some negative behavioural effects of the evaluation exercise. For example, the use of citations per paper may potentially affect citation behaviour across the system. The use of journal impact factors may cause an erroneous competition to get any article into a high-impact journal, even if this is not the best medium for the output (Adams, 2009). In short, assessment of research quality is “one of the most important, but one of the most difficult, aspects of the scientific process” (Seglen, 1997, p. 1050).

Three main mechanisms used by universities for measuring the quality of their staff’s research outcomes are: publication counts, peer review, and bibliometrics.

Publication counts involve simply counting the total number of publications and patents a researcher or a department produces. In providing financial incentives or rewards to individual staff to promote output, academic units may decide to count publications from certain journals only (Hall, 2011). One weak point of this method may be that quantity rather than quality of research is measured. Additionally, if only international, highly ranked journals are recognized, dissemination of knowledge at the local level may be ignored.

Evolving from the 17th century in America, peer review is used to “certify the correctness of procedures, establish the plausibility of results, and allocate scarce resources (such as journal space, research funds, recognition, and special honour)” (Chubin & Hackett, 1990, p. 2). In other words, peer review can be used as a means to assess whether a certain grant application is approved prior to the commencement of a research project or whether a manuscript resulting from a research project is accepted to be published in a scholarly journal (Abate, 2004). These research plans or scientific results are scrutinized by scientific colleagues who are assumed to possess “the necessary expertise” (Seglen, 1997, p. 1050).

As the most traditional method of research evaluation, peer review has been advocated for a number of reasons. Firstly, in terms of eligibility, proponents of peer review argue that peers or colleagues active in the same field are the best “gatekeepers” of science (Eisenhart, 2002, McClellan, 2003, as cited in Bornmann & Daniel, 2005). They know whether quality standards have been met and a contribution to knowledge made. Secondly, empirical studies have shown that peer review helps to improve a manuscript’s quality significantly, particularly from an author’s point of view (Benos et al., 2007). Lastly, in analyzing the selection procedure used by the Boehringer Ingelheim Fonds (a foundation for the promotion of basic research in biomedicine), Bornmann and Daniel (2005) found that peer review helps to select the best junior scientists as fellowship recipients. In brief, peer review has long been established as a valid method for scrutinizing research quality.

Peer review has also been severely criticized. Firstly, critics suspect that reviewers who are involved in the decision-making process may not perform the functions either properly or well (James & Thomas, 1977, as cited in Chubin & Hackett, 1990). Those invited to review a piece of research may lack adequate working knowledge of the subject area. This is particularly true for novice scholars (Seals & Tanaka, 2000, as cited in Rojewski & Domenico, 2004). Secondly, peer review is criticized for being unfair, that is, even though reviewers are expected to judge an application or a manuscript based solely on scientific merit, a reviewer’s judgment may be influenced by ideological differences/sameness between those of the author/s and the reviewers themselves. The likelihood of acceptance or rejection may depend largely on the reviewers’ view of the subject (Benos et al., 2007).

Other weak points of peer review are poor reliability of the peer review procedure (i.e., disagreement among reviewers regarding acceptance/rejection of a manuscript or an application) and a lack of predictive validity (i.e., little or no relationship between the reviewer’s judgment and the subsequent usefulness of the work to the scientific community) (Bornmann & Daniel, 2005). One final disadvantage of peer review may be the inconsistency of panels across disciplines and over time, and obscure criteria for assessment (McNay, 2010). However, all in all, while flawed, it seems that peer review is still regarded as the best process for judging the quality of research (Benos et al., 2007; Bornmann & Daniel, 2005; Chubin & Hackett, 1990; Rojewski & Domenico, 2004).

Bibliometrics relies on a combination of several quantitative indicators such as publication numbers, citation rates, and journal impact factors. A citation rate is the number of times a particular reference has been cited during the previous year as initially indexed by the Institute for Scientific Information (ISI) in its *Science Citation Index* (SCI). Journal impact factors

are mean citation rates for journals, which are published separately by ISI as the annual *SCI Journal Citation Reports*.

Among the three methods, bibliometrics seems to be the most advanced method for assessing research quality (Adams, 2009). Bibliometrics combines both the peer review and publication count methods. Additionally, by using citation rates and impact factors, this method enables comparative analysis at the individual, departmental, as well as institutional levels. As a result, this method has been widely supported (Moed, Burger, Frankfort, & Van Raan, 1985; Jim Taylor, 2011). However, due to the unreliability of the databases used for calculating citation rates and journal impact factors, the bibliometrics method also has its critics (Adams, 2009; Paul, 2008; Seglen, 1997).

Bibliometrics may be criticized for four main reasons. Firstly, the Thomson databases which are used for calculating citation rates and journal impact factors necessarily represent only a proportion of the global literature (Adams, 2009; Seglen, 1997). Secondly, citations cannot be compared across different research fields (Seglen, 1997) because each discipline often has its own assumptions and practices regarding the various aspects of how the literature should be used: for example, article length, frequency, and citation structures (Adams, 2009). Thirdly, journal impact factors are a poor indicator because of the variation in citation rate (Adams, 2009). Accordingly, some researchers concluded that journal rankings are not a good indicator of the quality of any paper published in that journal, nor necessarily are they a good indicator of the combined quality of all the papers in that journal (Paul, 2008). Finally, due to the increased use of impact factors, academics may be expected to publish in the “top” journals rather than do interesting and important research (Otley, 2010).

In practice, universities may vary greatly in how they use the above mentioned mechanisms to encourage academics to enhance the quantity and quality of their research outputs. There may not be a one-size-fits-all mechanism. Due to the differences in how research is assessed in different disciplines, the application of any faculty-wide or university-wide research management systems to achieve this purpose may be highly controversial. Among the Go8 universities, The University of Western Australia (UWA) appears to have applied a quantifiable institution-wide system for integrating research metrics for evaluating staff research performance. The university created and used Socrates – a research management system that collates data from existing core UWA databases and two ISI databases and Scopus for individual staff members to create a detailed research profile, known as a Socratic Index. The Socratic Index II, which was launched in 2009, was determined by Research Output Points, Research Input points, and HDR points for a five year period (Owens, 2011). Research Output Points for each academic were determined by publication types. For example, while Nature and Science papers were given 5 points, non-indexed journal papers were given only 1 point. This system has proven to be an effective tool to change academics’ publication behaviours. For example, the number of C1 (refereed scholarly) journal articles published by UWA staff members that are indexed by ISI has increased by 10.19 percent from 1561 in 2006, to 1720 in 2007 (Mast, Glance and Owens, 2008). However, the Socratic Index II is not able to map the performance of UWA publications against the expected citations for the journals they are published in or to display the index information.

Training and indoctrination

In designing research and research management positions, universities also need to pay attention to the training and indoctrination parameter. According to Mintzberg (1979, p. 75), “training refers to the process by which job related skills and knowledge are taught, while indoctrination is the process by which organizational norms are acquired”. Mintzberg (1979) also argued that, for professional jobs, professionals are often trained over long periods of time, before they ever assume their positions. However, for research and research management positions at a university, although these are professional jobs, this argument is not necessarily true. While it is true that most research-intensive universities hire only adequately trained professionals (PhD graduates) to work as independent research fellows, in a number of newly upgraded universities, many of the continuing academic staff who used to work only as lecturers may not yet have undertaken research training courses. As their organization becomes a ‘university’, these lecturers may be expected to do research as well. For this reason, training should be considered as a continuing on-the-job process.

Prior to the rise of the knowledge-based economy – ‘economies which are directly based on the production, distribution and use of knowledge and information’ (OECD, 1996, p. 7), research management positions were either non-existent or not professionalized. However, since the advent of the knowledge economy, there has been a demand for knowledge creating organizations such as the university to manage the knowledge production processes more professionally. As a result, most of the research management positions have been created relatively recently. Therefore, universities cannot expect research leaders and managers to have acquired all the necessary skills and knowledge prior to taking up their positions. Instead, universities should, on the one hand, describe the expected behaviour and qualities of the different research management positions. On the other hand, universities should provide professional development to advance the capabilities of these research leaders and managers so that they can meet the new work demands. The details on how this should be accomplished are beyond the scope of this paper, but see Nash and Wright (2013) and Pettigrew et al. (2013).

At Go8 universities, researchers, research candidates and research administrators can participate in a broad range of research training and development opportunities. For example, At the University of New South Wales (UNSW), academics can access the UNSW Researcher Training and Development Framework - an integrated and comprehensive researcher induction, training and development framework based on the career path of a researcher, from early career to research leader. For professional and technical staff who provide administrative support to researchers and research projects, there are two sources of support: research administrators network and finance for research administrators. The former is established to strengthen the working relationships between the university’s grants management staff and those who manage/support research within schools and faculties. The later is set up to support research administrators in designing and managing a research budget. Research students also get access to a number of seminars which induct them to their research training programs or write their annual progress review reports, etc. (University of New South Wales, 2014).

Design of the Superstructure

According to Mintzberg (1979), the design of the superstructure of an organization involves answering two questions: How should the designed positions be grouped into units; and how large should each unit be? For a university research, this means (1) “deciding primary organizational units for research delivery” and (2) “creating a research office”.

Deciding primary organizational units for research delivery

In structuring research, universities have to decide what the primary organizational units are for research delivery. The basic units or building blocks of a university are academic departments. These are traditionally the basic units for organizing both teaching and research activities. However, in some universities, related academic departments are now being grouped into “faculties”, “colleges”, or “schools” (John Taylor, 2006). Within schools, staff may be clustered by research group. Existing alongside or within the schools may be research centres or research institutes. It appears that rather than treating research as a purely individual activity, universities now seem to prefer organizing research activity at the departmental level or within research centres such as centres of excellence (Hazelkorn, 2004; Jerrams, 2008; John Taylor, 2006).

Even though most institutions want to move the locus of research activity away from individuals and towards clusters, there is no single model for a university organizational structure. According to Pettigrew et al. (2013, p. 52), how a university organizes its research groups may be influenced by “the notions of critical mass and inter-disciplinarily on the one hand, and practical issues such as space, infrastructure and other academic responsibilities such as teaching on the other”. In fact, in developing academic research in a way that helps to balance teaching and research, the Dublin Institute of Technology in Ireland maintained that “to ensure that research informs teaching and learning, and to avoid the proliferation of specialist research teams divorced from the academic process, R&D centres and groups must be grounded in and across faculties” (Jerrams, 2008, p. 193). However, in a teaching-oriented university in which not many lecturers are involved in research, a centralized research centre may perform better. In whatever form, individual researchers should have scope to build teams with partners having complementary strengths.

Recently, due to an increasing need in interdisciplinary research, universities are increasingly employing an inter-disciplinary based research organization. For example, in investigating the strategies and policies employed by 21 American Research Universities to develop interdisciplinary collaboration among intra-university departments, Harris (2010) analyses policy documents such as strategic plans, master plans, annual reports, presidential addresses, etc. The author found that in pursuit and support of collaborative research interdisciplinary activity, these universities do not only build and implement a commitment through rhetoric policy documents and leaders’ addresses. These universities also ‘restructure or reorganize’ themselves to sustain and institutionalize collaboration (Harris, 2010, pg. 29). More specifically, they provided both physical space (through the construction of interdisciplinary facilities) and social space (through fostering a campus climate supportive of collaborative research via hiring interdisciplinary faculty, providing collaborative incentives such as tenure and promotion policies, etc.). In short, research collaboration is facilitated within among disciplinary departments inside a university boundary.

In another study on inter-disciplinary research cluster development, Birx, Anderson-Fletcher and Whitney (2013) shared the experience of the cluster strategies employed by New Mexico State University and the University of Houston to advance the research enterprise. A research cluster is defined as a flexible and inclusive, team-based, multidisciplinary structure which is defined by a common theme or broad focus area inspired by a major 21st century challenge. This structure encompasses faculty, centers and departments, as well as outsider partners in the community (including other universities). The authors argue that although research centres (as described above) can succeed in integrating research to some extent, they may become another level of management which may duplicate or conflict with traditional disciplinary departments. Research clusters provide an alternative structure which can integrate the strengths of individual researchers, discipline-based structures, centers and even the local community to yield transformational discoveries. A flexible research organizational structure that is not over organized appears to be more effective. In short, this example illustrates how the two universities develop research clusters for both within and beyond a university border.

At the University of Melbourne, there exists a combination of the above mentioned super structural forms. Research is primarily organized in ten discipline-based faculties. The University is involved with 15 Cooperative Research Centres (CRCs) and is the lead participant in five Centres of Excellence. These centres are a part of a scheme designed by the Australian Government to encourage collaboration between research institutions and industry (CRCs) and to maintain and develop Australia's international standing in the Australian Government's designated priority areas of research (CoEs). Research is also conducted in a number of semi-independent medical research institutes and teaching hospitals that the university is affiliated with. The University is also a key collaborator and partner in a further 15 centres (University of Melbourne, 2014).

Although the University has a strong and well developed central research office that provides general oversight to research management, the day-to-day functions of research management are devolved to individual faculties. Each faculty has a separate research office and research manager. Moreover, the various research units and clusters are semi-autonomous, led by powerful research professors. This is a model applicable generally to all of Australia's research-intensive universities. While the model creates some tension between faculties, individual research units and the central bureaucracy, it appears to deliver results as measured by research impact factors, such as citations and position in university ranking tables. Driving this principle of a devolved authority structure is the argument that researchers require an appropriate level of scientific freedom if they are to maximise their creative potential. Knowledge workers cannot be treated the same as factory workers.

Creating a research office

A research support office is a key structural and organizational ingredient to help create a helpful working environment for conducting research (Connell, 2004; OECD, 2005; John Taylor, 2006). A research office serves as a centre for both internal research coordination and external linkages. Its main role is to provide support to researchers throughout the university. The most common activities performed by research offices are: coordinating the overall university strategy in research, providing information and advice about funding opportunities, assisting and directing costing and pricing procedures, coordinating major research initiatives, giving advice on legal and

ethical aspects of research and intellectual property, and developing a code of practice for the conduct of good research (Taylor, 2006).

Notably, much of the work done by research offices is advisory in nature (Lues & Lategan, 2006). Research officers should not merely be regulators and enforcers of the rulebook. Instead, they should be de facto members of the research team who can give helpful and constructive advice (Taylor, 2006). University research support should be professionalized so that academic staff can be released from the administrative burden and focus on research. Indeed, these professionalized research administrators should be located in specialized specific management units. These people populated these offices are developing their own professional cultures and building their own professional bodies such as Society of Research Administrators (SRA); Australasian Research Management Society (ARMS); and European Association of Research Managers and Administrators (EARMA). The challenge is to “establish productive relations with the faculty and departmental levels such as to enable creativity at the local level, while achieving institution-wide research goals and to work in ways which achieve a productive balance between the collegial and the managerial” (Connell, 2004, p. 55).

Figure 2 provides an example of the organizational chart of UNSW’s research division. This office is led by the Vice-President and Deputy Vice-Chancellor (Research). This position is assisted by two Pro-Vice Chancellors, Pro-Vice Chancellor, Research and Pro-Vice Chancellor, Research

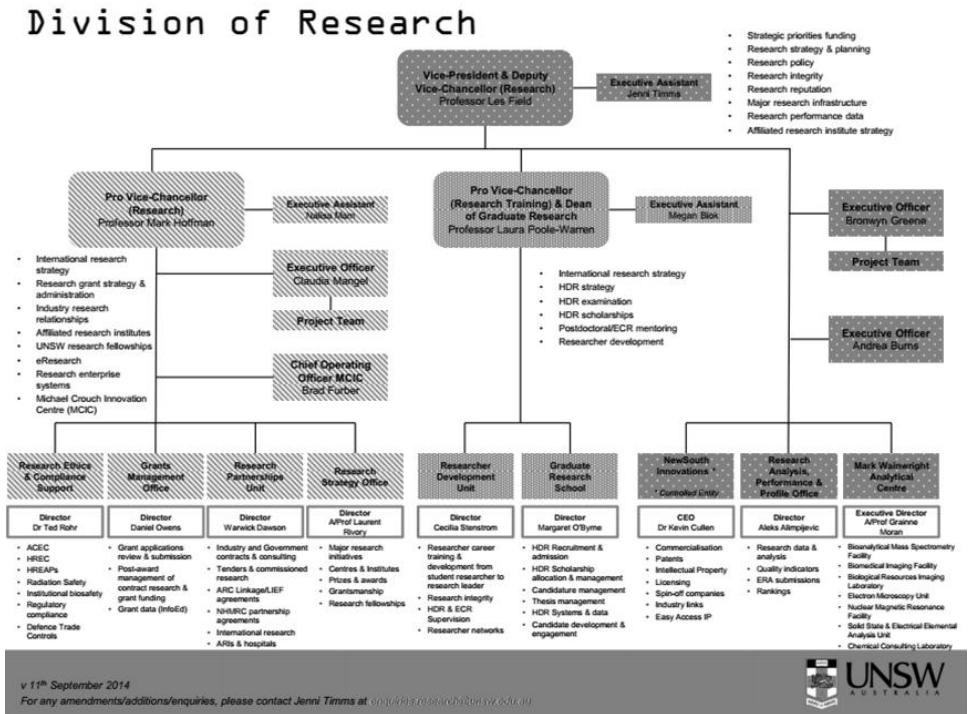


Figure 2. Organizational Chart for the Division of Research (UNSW, 2014)

Training. The Pro-Vice Chancellor (Research) is responsible for four main research management areas: Research Ethics and Compliance Support, Grant Management Office, Research Partnership Unit, and Research Strategy Office. The Pro-Vice Chancellor (Research Training) is in charge of the Researcher Development Unit and the Graduate Research School. The research office also oversees other research management related tasks such as research commercialization, research analysis, performance and profile.

Design of Lateral Linkages

Apart from designing individual positions and vertical organizational units, universities also need to achieve mutual adjustment for coordination via linkages that are lateral. Research oversight committees are one formal device for universities to link the organization laterally. In other words, apart from appointing individuals to executive and management positions, universities also need to establish committees that facilitate policy and administrative development and monitoring of activities across different management portfolios. These committees may be standing or ad hoc. The numbers and functions depend on each organizational context. These committees are expected to add value to the operations of the institution. There may be cross-portfolio committees and specialist committees. In order to make them work effectively, universities should induct and train committee members so that they will be able to add full value to the work and challenges that they are asked to address (Pettigrew et al., 2013).

At Australian National University, the University Research Committee advises the Academic Board and the Vice-Chancellor on matters relating to the quality and standard of Australian National University research, and on major issues of research relevant to strategic plans and overarching policy (Australian National University, 2014). This committee comprises members from the University's Ethics Committees, Deans of College, University Librarian, etc.

Design a Decision-Making System

The last task in structuring and organizing research is to design a decision-making system, or to decide the level of decentralization. Decentralization refers to power over decisions made in an organization (Mintzberg, 1979). In a centralized structure, the top layer of management has most of the decision-making power and has tight control over departments and divisions. In a decentralized structure, the decision-making power is distributed and the departments and divisions may have different degrees of independence. To decentralize a structure, both vertical and horizontal decentralization are needed. Vertical decentralization is "the dispersal of formal power down the chain of line authority" (Mintzberg, 1979, p. 185). Horizontal decentralization refers to "the extent to which non-managers control decision processes" (Mintzberg, 1979, p. 186).

A decentralized structure, both vertically and horizontally, appears to be most suitable for research to take place. This is because the university is a type of work organization in which the majority of its members are professionals. According to Mintzberg (1979), in these organizations, standardization of skills, not work processes, is what largely coordinates organizational members' work. Decision power is concentrated largely in the operating core, that is, the academics. The

organization is strongly decentralized in the vertical dimension because this power rests at the very bottom of the hierarchy. And it is strongly decentralized in the horizontal dimension since this power rests with a large number of non-managers, namely the operators.

A number of scholars examining research management strategies also support a decentralized organizational structure. Kirkland (2008, p. 720) notes that “a good research management strategy should not produce central control, or even supervision, but will combine a framework within which academics make their own decisions, and a system to identify any emerging problems at an early stage”. Taylor (2006, p. 8) also maintains that the one key style in research management is “encouraging, supporting and monitoring, but not, except in certain circumstances, directing and controlling”. This argument is reinforced by Edgar and Geare (2013) who examine features of managerial practice and culture within university departments associated with superior research performance. By classifying a range of academic departments in several New Zealand universities into high and low performers, and then exploring how these outcomes might be influenced by managerial practices and cultural characteristics, the authors found that the high-performance group reports a greater degree of autonomy, displays more egalitarianism and places less emphasis on formality than does the low-performance group. In a similar vein, Pettigrew et al. (2013, p. 52) also believe that “leaders of research in institutions are most effective when they have the support of colleagues in positions of responsibility who can exercise judgment, have authority to make decisions and who can manage operational requirements”. In sum, a decentralized structure is needed for research development.

In summary, applying Mintzberg’s (1979) theory on the structuring of organization as a guide, this paper specifies the ten most desirable tasks in organizing university research. These tasks are summarized in table 2.

Table 2 shows that there are both “more visible and less visible” tasks in organizing and structuring research. Although both of these groups of tasks are complex and not easy to perform effectively in practice, the more visible group of tasks may be more readily accomplished. Conversely, the

Table 2. Ideal research organizational structure tasks

More visible tasks	Create research positions
	Create research management positions
	Decide primary organizational units for research delivery
	Create a research office
	Create research oversight committees
Less visible tasks	Develop rules for research integrity
	Develop rules and procedures for managing the lifecycle of a research project
	Develop a mechanism for evaluating the quality of research outcomes
	Prepare researchers and research managers for necessary skills and knowledge
	Decide vertical and horizontal decentralization

less visible group of tasks seem to be much more complex and the outcomes of performing these tasks may be more controversial. Using the model outline above, empirical research can be used to analyse where a particular university is at in creating an effective organisational structure for building research capacity along with identifying strategies for improvement.

Conclusion

For some, research management may appear to be an oxymoron. There persists a strongly held belief amongst academics that research is best left to the individual scientist who knows best what are the most interesting research questions and how they should be pursued. The creative process of research cannot be managed. While there may be some truths underpinning such beliefs, with the advent of the global knowledge economy, research has become too important to governments and other key stakeholders, and too expensive, to be left entirely to the whims of individual academics.

Research drives innovation and nearly everywhere innovation drives global competition and economic prosperity. Governments and research institutions alike must make hard decisions about identification of research priorities for funding purposes, and pursue policies of concentration and selectivity to obtain the best research outputs possible under given circumstances. Nonetheless, an over-managed and hierarchical organisational structure for research is most likely to stifle creativity and end up killing the “research goose that lays the institutions golden research eggs”.

The organisational research structure model proposed here is designed to set the broad parameters for building research capacity and enhancing research outputs, hopefully ensuring all of the organisational elements are pointed in that direction. It is not meant as a universal blueprint for successful research capacity building – as previously stated, historical, cultural, political, and geographical differences makes application of any such blueprint impossibility. However, we do argue that institutions that pay close attention to the ten management and organisational tasks outlined above for creating an environment in which research can flourish are more likely to be successful in building and/or enhancing their overall research capacity than other institutions.

Author Note

This paper is based on the primary author’s PhD thesis completed at The University of Melbourne. Correspondence concerning this article should be addressed to Huong Nguyen, Postdoctoral Research Fellow, Swinburne Business School, Swinburne University of Technology, PO Box 218, Mail H25, Hawthorn, VIC, 3122, Australia, huongnguyen@swin.edu.au/lanhuonghic@gmail.com

TL Huong Nguyen

Doctor
Swinburne University of Technology
PO Box 218, Mail H25
Hawthorn
VIC 3122, Australia
huongnguyen@swin.edu.au

Vincent Lynn Meek

Professor
The University of Melbourne
Parkville
VIC 3010, Australia
vmeek@unimelb.edu.au

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