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Research Management and Administration (RMA) in Singapore: Development of RMA Capability in Nanyang Technological University (NTU)

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Abstract

Singapore's research has grown significantly since the first national R&D plan was launched in 1991, the same year Nanyang Technological University (NTU) was established. NTU's research progression, vitally funded by the government, mirrored the substantial growth of Singapore's research. NTU began as an engineering-based higher education institution that also had a school for accountancy and business, but more schools were added after 2000. Since then, the university has established a research ecosystem that includes research centres of excellence, corporate labs, and medium-sized research centres. Concurrently, the development of research administration in NTU has evolved from providing pre- and post-award support, extending to include outreach, research integrity and ethics, bibliometrics analysis, and talent recruitment and career support. The evolution of administrative needs

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and capabilities following the changing environment underscores the dynamic nature of research management and administration in Singapore.

Keywords: Research management and administration; Singapore; skill development; Nanyang Technological University; career; talent

Research and Innovation in Singapore

The modern research and innovation landscape in Singapore has seen drastic changes over the course of a short three decades, with a nation embarking on a master plan to transform Singapore from the legacy of a labour-intensive workforce into a knowledge- and innovation-based economy. As a young nation, Singapore separated from the Federation of Malaysia in 1965 to become an independent and sovereign state. At the time, the gross domestic product (GDP) was derived from labour-intensive industries such as manufacturing and food. The 1986 Economic Committee Report titled *The Singapore Economy: New Directions* (Ministry of Trade & Industry, Republic of Singapore, 1986) indicated challenges to Singapore's economic growth ahead, spearheading a national strategic reprioritisation. The report emphasised the need for a high-technology policy of capacity and value add to secure the nation's future growth. The outlining of such policies would be the beginning of the restructuring of the Singapore economy towards a smart nation. The government set out to develop master plans which drove the directions and policymaking towards meeting the ambitious goals (Hang et al., 2016). The National Science and Technology Board (NSTB) was launched in 1991 with the mission of pivoting Singapore's economic strategy from manufacturing and product assembly to high technology. The board was tasked with long-term research strategies for the nation's development, which would later evolve to become the Agency for Science, Technology and Research (A*STAR¹). The National Research Foundation (NRF²) was established in 2006 as part of the Prime Minister's Office (PMO³) to establish national research directions and fund strategic initiatives.

Since 1991, the Singapore government released five-year strategic initiatives and funding plans. While the agencies involved experienced reorganisation and renaming within 30 years, the objectives to align public funding with national interests remain constant. From \$2 billion earmarked as the National Technology Plan 1995 (National Science & Technology Board, Republic of Singapore, 1991), the earliest version of a national R&D blueprint, at present the government invested \$25 billion for the Research, Innovation and Enterprise 2025 (National Research Foundation, 2020) Plan to serve 2021–2025, with the 5-yearly quantum for R&D continuing to increase over the years. In its present form, for a nation-state of 5.8 million people, the country has amongst the highest researchers per million (> 6,000) and is one of the highest spenders for research and development (R&D), with an estimated 2.64% of GDP on gross R&D spending in 2020 (Heney, 2021). The success of the research and innovation initiatives has made Singapore attractive as a technology hub, with globally recognised universities and public research institutions as part of the research ecosystem. With the burgeoning research, the administration and management necessarily grew and scaled in parallel to the funding.

¹ <http://www.a-star.edu.sg>

² <http://www.nrf.gov.sg>

³ <http://www.pmo.gov.sg>

Present Form

The research landscape in Singapore in its present form is multi-faceted, addressing strategic research thrusts, with a multi-agency approach. The strategy is a concerted effort between public and private stakeholders. One of the key drivers of the growth of Singapore's research and innovation landscape has been the development of the Research, Innovation and Enterprise (RIE) ecosystem, under the management of the PMO. The RIE contains five-year strategic plans and policies to support research, economic growth, and address future challenges. The ecosystem is defined by the Research, Innovation and Enterprise Council (RIEC) under the PMO. Agents within the system consist of the PMO, government ministries, and R&D performers. Eleven government agencies, including the Ministry of Trade and Industry (MTI⁴), Economic Development Board (EDB⁵), Ministry of Education (MOE⁶), and A*STAR are amongst those involved ([National Research Foundation, 2022](#)). Each agency supports the research agenda based on their scope, such as in policymaking, funding support, or strategic domain knowledge. R&D performers can include private sector entities and corporations, research institutes or government labs, universities, and polytechnics. There are six publicly funded autonomous universities conducting research, namely Nanyang Technological University (NTU⁷), National University of Singapore (NUS⁸), Singapore University of Technology and Design,⁹ Singapore Management University (SMU¹⁰), Singapore Institute of Technology,¹¹ and Singapore University of Social Sciences.¹²

For the inaugural RIE 2015 plan ([Ministry of Trade & Industry, Republic of Singapore, 2011](#)), the government budgeted S\$16.1 billion for over 5 years to establish Singapore's research & development capabilities, and nurture a knowledge-based economy, with knowledge and intellectual property as a source of competitive advantage ([Lay Lek & Al-Hawamdeh, 2001](#); [Mok, 2015](#)). The structure of the RIE plan consists of strategic thrust domains and supporting programs which target areas with economic and industrial innovation potential. In the most recent RIE 2025, approximately 1% of the GDP was invested to build on foundations laid from previous strategic plan cycles to fortify Singapore's long-term competitive advantage and position as a technology and innovation hub. The strategic domains are expected to extend trade and connectivity, expand precision medicine and early childhood development, ensure sustainability and resilience of the built environment, and support digital transformation and preparedness, to become a trusted digital innovation hub. Behind these, academic research, manpower, and innovation and enterprise programs will support the development in parallel, for which administrators are central to the operations of the research networks and initiatives ([National Research Foundation, 2020](#)).

Research Management and Administration in Singapore

Research administration in the context of R&D performers in Singapore provides the infrastructural support of scientific activities, which can include award management,

⁴<http://www.mti.gov.sg>

⁵<http://www.edb.gov.sg>

⁶<http://www.moe.gov.sg>

⁷<http://www.ntu.edu.sg>

⁸<http://www.nus.edu.sg>

⁹<http://www.sutd.edu.sg>

¹⁰<http://www.smu.edu.sg>

¹¹<http://www.singaporetech.edu.sg>

¹²<http://www.suss.edu.sg>

research compliance, strategic initiatives, technology transfer, and outreach. These may be overseen and executed by single or multiple functions. At its core, research administration serves to represent both researchers and funders in ensuring research outcomes are met. For example, pre- and post-award management processes typically requires collaboration with funding agencies, principal investigators, and other institutional stakeholders during various stages of the award cycle. The pre-award scope of work represents the early stage of the award life cycle. This may be at the award application stage, such as identifying funding opportunities and providing application support such as verification or endorsement, proposal review, budget preparation and planning, award acceptance and compliance to ensure adherence to funder guidelines, and legal and regulatory compliance. Post-award management activities can include budget scrubbing, manpower hiring processes, procurement management, along with project variations, closure, and reporting. Some examples of award support functions in Singapore include the NUS Office of the Deputy President (Research & Technology),¹³ SMU Office of Research and Tech Transfer,¹⁴ and A*STAR Office of Grant Management.¹⁵ Aligning with RIE plans for a knowledge-based economy, the research management portfolio requires capabilities to support initiatives and funding directions involving industry partnerships, through commercialisation activities (Hooi & Wang, 2020; Wong et al., 2007) and strategic initiatives, such as attracting talent towards manpower development (Ng, 2013).

In the RIEC ecosystem, national-level engagement of R&D performers included universities as well as research agencies. University proportion allotments grew over 11 times from the initial investment of US\$35 million in research funding to US\$400 million in 11 short years. The RIEC research strategy included the adoption of inter-university research centres of excellence,¹⁶ corporate labs, and medium-sized research centres. The development of research management and administration (RMA) within NTU,¹⁷ a RIEC-aligned young university (< 50 years old) propelled by government-led

¹³ <https://www.nus.edu.sg/research/research-management>

¹⁴ <https://research.smu.edu.sg/about/introduction-office-research>

¹⁵ <https://www.a-star.edu.sg/gis/our-people/research-administration>

¹⁶ The Centres of Excellence aimed to spur local research within NTU and NUS. NTU hosts two of the five established centres, which are operational: Earth Observatory of Singapore (EOS) and the Singapore Centre for Life Sciences and Engineering.

¹⁷ NTU was inaugurated in 1991 as a merger between Nanyang Technological Institute (NTI, 1981–1991) and National Institute of Education, where the former was built on the legacy of its predecessor, Nanyang University (1955–1980) (Andersson et al., 2022). In 1982, NTI served to prepare the nation's engineers with hands-on training in three engineering disciplines: civil and structural, electrical and electronic, and mechanical and production engineering (Nanyang Technological University (NTU), 2022; Su, 2020). In 1987, the School of Accountancy was added, and a year later the School of Applied Sciences was established, introducing computer engineering degrees in Singapore. Alongside economic growth and demand for workers, enrolment grew from 582 students in 1982 to 6,832 by 1990. Other faculties were progressively added, starting with the Wee Kim Wee School of Communication and Information in 1992, followed by the School of Materials Science & Engineering in 2000. The formation of the School of Biological Sciences in 2002 marked the first natural sciences faculty, followed by Humanities and Social Sciences in 2004. Deepening a commitment to science and technology, the School of Chemical and Biomedical Engineering and School of Physical and Mathematical Sciences were established in 2005. NTU was granted status as an autonomous university in 2006. In present form, NTU consists of five colleges under which the aforementioned schools exist, namely: College of Engineering, College of Science, College of Humanities and Social Sciences, College of Business, Graduate College, and three autonomous institutions: Lee Kong Chian School

strategic planning is given as a case study of RMA development within Singapore. To facilitate research excellence, administration at the university-level similarly needed to scale and evolve at pace with R&D initiatives. At NTU, early work was enabled by a singular research office, which evolved to and branched into three entities in the university research ecosystem. The earliest form of a research grant administration office at NTU was established in 2004 as the Office of Research with a portfolio consisting of research grant administration, post-award administration, and outreach. Research visits and conference attendance¹⁸ were a vital component in raising the visibility of a young research university. The Office of Research participated regularly in delegate visits to universities abroad, which introduced and showcased NTU research to the global stage. In 2007, the Office of Research was renamed as the Research Support Office (RSO), to reflect the specific function which it served. The RSO continued its commitment to reporting and management to facilitate high-calibre research, but also expanded with headcount allotted for officers in research ethics and integrity, bibliometric analysis, and talent recruitment. Later, the Research Integrity and Ethics Office (RIEO) was established in 2016, followed by the Talent Recruitment and Career Support Office (TRACS) and Bibliometrics Analysis in 2018. RIEO works to uphold research trustworthiness, on matters of misconduct, integrity training, and adherence to ethics protocols and standards on research involving human or animal subjects. On the other hand, TRACS functions in talent recruitment for early career researchers and research intelligence and analytics. Today, there are over 70 professionals at both university and departmental levels (NTU, 2023a, 2023b). The evolution of the research management structures at NTU is shown in Fig. 5.15.1.

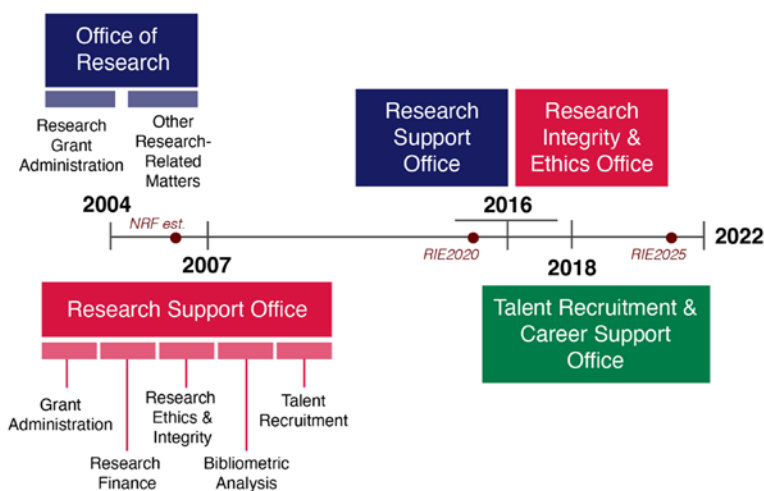


Fig. 5.15.1. Timeline of the Evolution of Research Management and Support Structures at NTU.

of Medicine established in collaboration with Imperial College London, National Institute of Education, and the S. Rajaratnam School of International Studies. The progression from a vocational training institute to advanced research and development institute occurred in parallel with strategic reorientation and introduction of the NTP 1995. Today, NTU stands as a comprehensive university aiming to foster lifelong learning for all.

¹⁸Conference attendance included American Association for the Advancement of Science (AAAS) Annual Meeting and the EuroScience Open Forum (ESOF) conference.

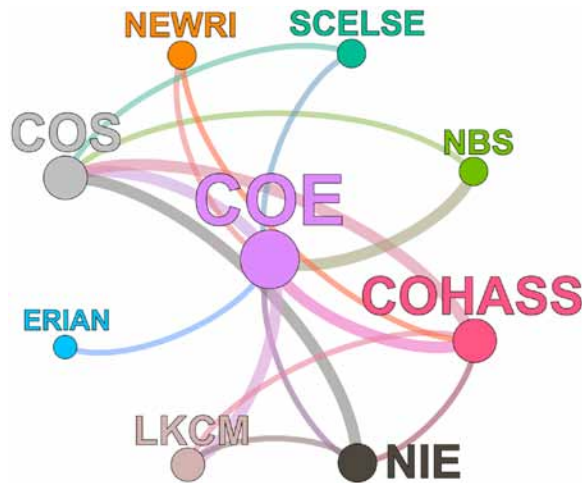


Fig. 5.15.2. Network Collaboration Map at the College Level for ACE Award Grantees for a Five-year Period.

We expound further on TRACS as a case study in portfolio diversification from a research administrator perspective. Recognising the evolving requirements of a knowledge-based economy, a robust pipeline of contributors to research excellence is a mainstay on the national agenda. TRACS is an entity facilitating such needs for the university, particularly within the realm of early career researchers whether in prestigious postdoctoral fellowships such as the Presidential Postdoctoral Fellowship (PPF) or elite young faculty awards such as the Nanyang Assistant Professorship (NAP). The former provides candidates with up to S\$200,000 in funding, while the latter with research grants of up to S\$1 million from a highly competitive applicant pool. Meanwhile, the Accelerating Creativity and Excellence (ACE) award, provides interdisciplinary funding to explore cutting-edge research domains which can lead to new approaches or address global challenges. The program prioritises partnerships between science, technology, engineering, and mathematics (STEM) disciplines and non-STEM disciplines such as the humanities within the university, as shown in Fig. 5.15.2. TRACS also supports research intelligence and analytics, providing data-driven insights to understanding author-, department-, university-level research performance, performance benchmarking of global subject rankings, along with topical horizon scanning and emerging trends scoping. With the exponential growth of scientific publications, the ability to ingest and distil such information can support more informed strategies. Here, the administrator portfolio is an intersection of grant management, stakeholder coordination, communication, and information and decision sciences, unified by a strategic mission.

In parallel, RMA career development opportunities have become available in Singapore through professional associations providing networking opportunities and skill development. The Singapore chapter of the Australasian Research Management Society (ARMS), a professional organisation serving the Australasia regions such as Australia, New Zealand, and Singapore, was established in 2013. The chapter hosts ARMS research administration conferences, most recently in 2015, and chapter meetings, with NTU and SMU as association members, and accreditation programs, including a Singapore-specific module on the research and innovation system within the country (ARMS, 2023f, 2023g).

Future Directions and Outlook

Driven by the development of Singapore's knowledge-based economy, and research as a key driver, RMA has grown in its complexity. These offer opportunities to diversify the portfolio of a research administrator with three key areas for professional development: engagement with key stakeholders within the university, collaboration skills and role-defining opportunities, and communication and coordination. Research, inherently dynamic in nature, calls for agility and flexibility on the part of the administrator. A typical day for a research administrator encompasses the breadth of partnering with stakeholders in research-related needs. This may include assisting a principal investigator with grant applications, or responding to urgent requests from funders and ministries. The administrator must be able to collaborate with diverse stakeholders, balance tasks, and manage tight timelines.

Towards the future, we expect that research management will continue to evolve to a broader scope in both the day-to-day operational aspects and in the longer-term strategic support. In the context of Singapore, this would also align with the five-year research plans. For the former, the large volumes of data and information being generated are a prompt for refining the adoption of digital transformation and centralisation tools. These activities may leverage enterprise software and management technologies. The performance administrator should gain sufficient operational and technical competency across multiple platforms. There may also be more involvement in supporting longer-term strategic missions or thrust areas. In pursuit of excellence, research management such as commercialisation, technology translation, and intellectual property development is likely to become more prevalent, aligning with the strategy to grow enterprise-driven capacities for market-oriented innovation. With the establishment of the Singapore National Research Foundation in 2006, there has been a significant push for technology transfer and spin-off. The research-innovation-enterprise nexus is another segment in the development of administrative expertise, in patenting, licencing, and liaising with industry.

Whether through national programs, or collaborative research and joint projects, effective research administration is essential to actualise strategic priorities and ensure progress. As research becomes increasingly multidisciplinary and globally connected, administrators act as critical agents for these connections within the shifting landscape.

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