Allegedly, in a flattening-world, transnational research collaboration opens doors and facilitates access to new markets, finds solutions to interconnected and inter-dependent global challenges and problems, nurtures lasting relationships and perhaps promotes democratic values.

Within higher education, transnational research collaboration is important and appears to be a natural extension of what scholars across national borders have done for decades. However, in the context of globalisation as collaboration moves from between nations in the developed world to collaboration with the newly-developed and developing world, from between individual scholars to between institutions, layers of cultural, legal, political and systems nuances are added.

As higher education institutions that are generally not geared for collaboration expand their engagement in transnational research, they face special complexities including a different set of challenges to collaboration in domestic settings and recognise globalisation as not the end of differences.

Sustainable transnational research collaboration, by necessity, must move beyond research per se. This entails deeper analysis, understanding, honest appraisal of the processes itself and finding solutions to differences in legal systems, national regulations, export controls, intellectual property and political agendas, research environments and practices and working with cultural diversity. While businesses compete in a flattening world for market share, profitability and shareholder wealth-generation, and higher education institutions compete for students, academics, scholars and research funding, the success of creation, distribution and application of knowledge through sustainable research collaboration across national systems requires holistic solutions. Here an analysis of literature is distilled into a series of frames and conceptual tools to form a basis for this work.
INTRODUCTION
Transnational research collaboration (TNRC) – academics and institutions collaborating across national borders in the production of knowledge – has a long history. Historically TNRC has predominantly been between nations in the developed world. Globalisation and the new world order necessitate a deeper understanding of policies, drivers, structures, processes, outcomes and sustainability of TNRC. The literature reveals diverse needs and expectations which can be schematised to enable a better understanding, and distilled into basic conceptual tools for application. This broad reading of the literature offers insights to the challenges, drivers, pain-points, strategy-making for success and options for a holistic approach to the production, distribution and application of knowledge through transnational collaboration.

BACKGROUND
Globalisation has had diverse impacts on different regions of the world and contributed to tensions of building a nation’s human capital. The economics of knowledge involves questions of research – the value, the process of production as well as distribution and application of knowledge. Patterns between the development, provision, distribution and consumption of knowledge are changing, informed largely by a set of neo-liberal assumptions (Rizvi & Lingard, 2010). While universities themselves have come full circle, from medieval-age centres of learning, to institutions pursuing national interests to international centres of learning, scholarship and research, many governments see universities as centres of research that will yield positive economic returns. In that context it is critical to acknowledge that globalisation is accompanied by the development of a two-tier university system of top, selective, branded, globally ranked, research-institutions and a mass of other institutions (Marginson, 2007).

There is an important connection which needs to be made between economic activity, nurturing research, producing skilled employment-ready youth and sowing the seeds of a middle class in developing nations. As a larger number of countries become more research active, and achieving knowledge-intensive growth no longer the prerogative of developed nations, there is an observable trend, from before the onset of the global financial crisis, of the centre of gravity of global R&D investments shifting east towards Asia.

The emergence of new countries with significant research capability, and who are on a path to establish partnerships with the developed world, impacts Australia. If the nation wishes to position itself as a global leader in research and innovation, it will need to strengthen collaborative relationships with these newly-developed and developing countries, while recognising that their emergence impacts on the nation’s competitive position in the global research community. Research collaboration boosts productivity and increases research impact, has received considerable attention, and has increased in recent decades (Laband & Tollison, 2000). Bibliometric studies and Persson et al (2004) note increasing numbers of co-authored publications, and increasing citations of publications co-authored by collaborating transnational academics, further evidencing increase in both the quantity and quality of transnational research collaboration.

For Australia transnational research collaboration is a national priority. Although R&D investments is not the sole indicator of a nation’s performance it remains a fundamental consideration for a broad range of factors including science, technology, engineering, capital markets, healthcare, infrastructure, intellectual property rights and even immigration policy.

The Australia in the Asian Century White Paper (2012) recognises the need for research collaboration with Asia. This initiative, perhaps influenced by Asian diaspora in Australia has contributed to a growth in collaboration between Australia and Asia, and to the launch of enthusiastic government initiatives, the Australia-India Strategic Research Fund (AISRF) and the Australia China Science and Research Fund (ACSRF). In April 2013, the Chief Scientist noted three critical pathways to increase Australian engagement on the global stage:

■ maintaining and strengthening research relationships with high performing nations that enhance our performance;
■ nurturing long-term research relations with emerging nations, particularly in our region; and
■ Collaborating with nations that have complementary research priorities and challenges (Office of the Chief Scientist, 2013).
Quality and impact of transnational research collaboration is dependent on successful harnessing and management of cultural differences between the collaborating parties. Collaboration is an intrinsically social, complex phenomenon that involves different parties located in separate contexts, each with their own structure, constraints, and assumptions connecting, sharing, problem solving and working together. Gajda (2004) and Austin (2000) reiterate that collaboration is successful when individuals connect personally and emotionally, with one another and with the purpose of collaboration. When major cultural and language differences are obvious, when commonalities reduce, when trust and respect is lacking and actions and non-actions are viewed with suspicion, there is a reminder for the collaborating parties to continually renegotiate understandings. Although a wide range of factors that enable and facilitate collaboration-activity is known, no good reasons have emerged to explain how ‘real’ collaboration occurs.

Academics belong to multiple ‘cultures’, of institution, of discipline and of nationality. Universities bring cultures that generally are a manifestation of institutional mission, shared values, reputation, business processes, global rankings, leadership and management style and nationality. The ‘culture(s)’ and perceptions of ‘culture(s)’ influence collaboration activities and processes. Even with the modern day technology and communication tools TNRC shows increasing tendency to commence with face-to-face engagements that lends itself to follow-up communication and exchange of ideas. Over time successful collaborations are cemented through mutual respect and trust-building through deep understanding of cultures. Perhaps ‘culture’ in this context reflects a shared understanding of how the world works, influenced by artefacts, behaviours, and cross cultural knowledge. It becomes imperative that leaders and managers of TNRC understand the elements and dynamics of cross cultural interactions so that they are able to identify cultural differences that should be harnessed and cultural differences that should be managed, acknowledging that this is mission-critical to progress and success of TNRC.

A university’s mission is to educate through teaching and publication of research. They usually consider working with transnational partners and industry as worthwhile if it advances this mission. Universities are generally not designed for collaboration. They are built upon individual missions, and their leaders make every effort to establish unique and recognisable institutional identities. Universities typically do not work with other universities but instead work side-by-side and compete with one another on every level from recruitment of students and academics to accessing research funding.

In 2005, Kezar wrote that there has been “virtually no research on how to enable higher education institutions to conduct collaborative work” (p. 831). The typical university is autonomous by tradition, by design, and practice (Stacy Duffield, Alan Olson & Renee Kerzman, 2012). Academics are rewarded to develop and lead independent research. Teaching practice, too, is inherently independent, disseminating their disciplinary knowledge and expertise.

Most universities struggle to implement collaborative initiatives due to inherent barriers in organisational structure, an institutional culture that has evolved through prestige of rewarding and promoting autonomy, and lack measures of both collaboration–progress and collaboration-outcomes.

Kezar argues that transformation from a culture that supports individual work to one that facilitates collaborative work as essential for the academic community responsible for production of knowledge, to capitalise on their collective intellectual capacities, and contribute to global communities.

Entrenched beliefs, not institutional or state agendas influence and drive research collaboration between academics. Traditionally this form of collaboration has been driven bottom-up. Adams (2012) recognises the profound influence of history, culture and language on collaborations mediated through personal preference and relationships. Commentary indicates that personal relationships and friendships nurtured between academics are highly valued and protected. Details of such relationships rarely reach those in formal institutional hierarchies nor are they readily shared with colleagues.
Generally when academics change employers, accept employment overseas or their employment status the collaboration relationship, friendships, contextual and cultural experience and intelligence moves with them. From an institutional perspective this makes TNRC unsustainable.

**COLLABORATION BETWEEN ACADEMICS**

At the most basic level of a continuum, collaboration occurs when individual researchers engage informally in consultations, provide advice, participate in conferences or create complementary research agendas. In instances where agreements exist, the general rule is this neither requires institutional approval nor incorporates sanctions for non-compliance.

Along that continuum of increasing intensity, funding, authority for decision making, university-wide participation, engagement of other stakeholders and industry partners and complexity of contractual terms, collaboration extends to sharing of research infrastructure and facilities, access research data, linking research centres and virtual networks, joint research projects, application and commercialisation of research outcomes, research training, PhD supervision and development of qualified personnel.

Bozeman & Corley (2004) suggest that academics select their collaboration partners depending on which of six collaborator types they belong to:

- **taskmasters**, select partners based on their reliability and work ethics;
- **nationalists**, select those fluent in their own language and at the same nationality;
- **mentors**, collaborate to support junior colleagues or students;
- **followers**, select collaborators with strong reputation;
- **buddies**, prefer collaborators that they have worked with before and that are fun to work with; and
- **tacticians**, select collaborators with skills compatible to their own.

Collaboration between researchers draws complimentary, willing and able partners with diverse attributes to work together. Even when collaborating partners do not consider each other as “equals”, each partner will have some value to gain, which they would not achieve working on their own.

Leydesdor & Wagner (2008) recognise the global community of collaborative researchers as a self-organising system where selection of partners, research location, publication of output and all other collaboration-relevant decisions are choices made exclusively by the researchers, with minimal influence, if any, from the institutions they represent. The collaborating individuals willingly exchange ideas, agree on research methods and time lines, are committed to jointly address challenges they may encounter and are motivated to collectively seek funds for research collaboration.

Publication of research results is seen as a necessary part of the research process (Bukvova, 2009) and articles published by multiple authors are seen as a convenient measurable-output of research collaboration (Melin & Persson, 1996; Laudel, 2002). Though the assumption of co-authored publications as evidence of TNRC is not unproblematic, Greene (2007) and King (2012) on further analysis suggest:

- women scholars to be less likely to engage in TNRC; and
- older and senior researchers more likely to be involved in TNRC.

Wray (2006) argues that transnational research collaboration can lead to problems with assigning credit, and due to unclear responsibility and limitations of accountability creates tensions, adversely impacting both the quality of research as well as the collaboration relationship.

In a survey conducted by the International Development Research Centre of the Association of Universities and Colleges of Canada, academics identified key benefits of transnational research collaboration as: development of international networks for joint initiatives and information exchange; increased opportunities, funding, partners and facilities for scholarship and research; and professional development through exchanges and sabbaticals abroad. To facilitate participation respondents agreed that faculty-exchange agreements, seed grants and funding for international teaching, study, research and other activities as essential.
The survey demonstrated barriers to research collaboration with developing countries to include lack of funding, lack of institutional recognition of staff efforts, lack of formal and informal methods of reward, the absence of a coherent government policy framework expressly in support of research collaboration for development, competing domestic research priorities, and a lack of internal institutional support.

**COLLABORATION BETWEEN UNIVERSITIES**

Generally the purposes of TNRC between universities fall into three categories:

- **Increase predominant capability**, where the strongest in a particular discipline collaborates with the strongest counterpart in another country;
- **Complementary collaboration**, where a university strong in some areas and less so in others collaborates with a university that brings what is lacking; and
- **Technical collaboration**, where one university helps the other.

It is essential for the university to understand both its own cultural identity and the nature of the collaboration it is seeking when articulating the benefits of TNRC. Contradictory cultures within the various faces of the one institution or across partnering institutions render true collaboration difficult. TNRCs that are of a one-off, short term project nature are different to medium term collaboration programs. The longer term structural collaboration is the most cross cultural in nature, impacting partnering institutions, or forms the nucleus of a spin-off entity.

When the collaboration-relationship grows it is possible to expect the main purpose and articulated objectives to evolve, reflecting experiences and learnings, trust-building, synergies and increased transparency. From an organisational-model perspective, institutional readiness and arrangements for increasing the chances of achieving the articulated objectives of TNRC may be considered at two levels:

- the formal institutional structural-level arrangements, processes of interaction, and decision making authority; and
- coordinating-level behavioural rules and procedures governing people–people interactions between the parties.

Universities are known to establish research centres and offer funding to support TNRC. Amabile et al. (2001) and Sargent & Waters (2004) argue that while such actions facilitate, and perhaps positively influence, the quality of research and the collaboration-relationship itself is influenced by other factors. Although TNRC is regarded by many as an indicator of high-quality research (Kim, 2006), it often is an effective way to access developed knowledge, expertise and technologies for the developing and newly-developed countries. In that context the collaboration is not an indicator of research quality as such but a means to reach that quality.

**KEY DRIVERS**

Literature provides details against which the purpose of collaboration can be assessed and here identified as key drivers. Katz & Martin (1997) and Amabile et al (2001) agree that collaboration with researchers’ front and centre is a special form as it is for the purpose of knowledge creation. Bozeman & Corley (2004) and Katz & Martin (1997) agree that key drivers of TNRC include being able to:

- access expertise, equipment, datasets, research subjects or research environments;
- participate in global networks of scholars;
- monitor and access knowledge being developed elsewhere;
- obtain prestige, visibility or recognition and increase likelihood of publishing in high impact journals;
- pursue cross fertilisation across disciplines;
- improve access to international funding streams;
- learn tacit knowledge about a technique;
- establish links with stakeholders best placed to develop the outcome of their research; and
- enrich and enhance student learning.

TNRC features often within strategic priorities of universities as a direct consequence of its importance on global rankings. Other key drivers for transnational research collaboration between universities include:

- their mission to support knowledge-transfer, knowledge-exchange and equity;
- access to and facilitate recruitment of research-rich academic staff with perhaps a global profile; and
- facilitate recruitment and future supply of quality international research candidates.
The influence of these key drivers varies for individuals and institutions. Governments, recognising the value of engagement of intellectuals in trust and relationship-building across cultural contexts have expanded on the drivers of TNRC as it could:

- attract transnational direct investments;
- build lasting relationships across cultures and nation borders and increase diplomacy-influence and alliances-forming capability and capacity;
- develop strategic advantages over competing powers and improve responsiveness to both global and regional events;
- facilitate and find solutions through greater access to local context;
- enhance research capability of partner nations and draw congruence to international research norms;
- open doors and establish new markets in countries including in those where political and economic relations are complex;
- provide for rapid advancement through problem solving;
- transcend historical issues of race and power imbalances and parochial cultures; and
- promote democratic values and human advancement based on facts and not on nationality, ethnicity or political affiliation.

By mapping characteristics of TNRC from the literature and observed practice it is possible to highlight five dimensions of significance. Figure 1 provides a basis for managing the processes of TRNC and influencing the outcomes.

<table>
<thead>
<tr>
<th>Individual scholars with similar discipline expertise</th>
<th>Across the faculty, school and institution</th>
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<tbody>
<tr>
<td>Individual scholars with similar discipline expertise</td>
<td>Trans-discipline</td>
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<tr>
<td>One off, limited life Project-based</td>
<td>Ongoing, longer term Partnership-based</td>
</tr>
<tr>
<td>Dyadic network</td>
<td>Elaborate network including internal and external stakeholders and partners</td>
</tr>
<tr>
<td>Lab-centred</td>
<td>External-centred</td>
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<tr>
<td>Funded internally by Collaborating institutions</td>
<td>Funded externally by commercial interests</td>
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DISTILLATION OF CHARACTERISTICS AND FACTORS INFLUENCING OUTCOME OF TRANSNATIONAL RESEARCH COLLABORATION

There is consensus that increasing research collaboration in a knowledge-based international economy is an economic and social imperative. Implicit in both Australia’s and the developed world’s enthusiasm for research collaboration with emerging economic powerhouses, recently-developed and developing countries are numerous yet–to-be-tested assumptions related to similarities and differences in culture, in legitimate national security needs, in practice, in expectations and in critical needs in education and training.

As collaborations move from between scholars to between institutions, and institutions establish research centres and offer funding for TNRC, the literature indicates that it is imperative to be sensitive to the layers of cultural, legal, political, governance and systems nuances that are added. As collaborations become larger, more complex, involves more players and stakeholders, and is longer-term they are more influenced by cultural rules, norms and expectations.

By mapping these dimensions it is possible to articulate characteristics and factors that influence the outcome of TNRC. It appreciates TNRC and its management to be at the nexus of education, research, policy, culture, society and ethics. It explores TNRC as people-centric, cross-cultural relationships within institutional and national contexts. These include:

- Develop a memorandum of agreement at the outset, following the signing of symbolic memorandum of understanding, that clearly articulates the purpose-of and benefits-for each participant; details roles, structures, leadership, time frames, proposed external partners, disposition of data, background intellectual property, sharing of results, and process and authority for resolving issues;
- Introduce early, even if within greatly contrasting research cultures, processes for accountability, measures of progress, sharing of rewards, benefits and esteem;
- Agree on frequency, follow-up and management of planned, formal meetings;
- Collectively identify both short term and longer term funding requirements, sources of funding to cover both, approving authorities, contractual arrangements with providers of funding and of audit procedures;
- Proactively mitigate risks, promote legitimate institution-wide acceptance, active support and longer term commitment;
- Reach agreement on ownership and application of intellectual property, recognition and credit-awarding, and possible applications of research outcomes;
- Increase transparency and communication of processes for selection, appointment and assigning collaboration – specific research leadership and key planning and management roles;
- Reach agreement on research boundaries;
- Establish processes for dealing with differing work cultures, including possible conceptions of time, views of hierarchical authority, employee rights;
- Recognise and sensitively manage aspects of possible assymetry, contrasting and conflicting perceptions of neo-colonial exploitation, historical issues of race and power;
- Monitor and manage research integrity and the responsible conduct of research; establish clarity with governance structures and policy priorities; establish appropriate ethical guidelines and framework fitting for such new research collaboration modalities;
- Ensure ethical behaviour and practice-choices protecting confidentiality, security and privacy;
- Manage tensions between research capacity-building goals and research output deadlines;
- Generate institution-wide support for the collaboration, communicate status with internal and external stakeholders, celebrate milestones, success and achievements;
- Prioritise processes for resolving conflicts, and potential legal issues and compatibility of problem solving styles;
- Develop, if not already fluent, ability to communicate in the native language;
- Understand export control regulations, trade embargos and sanctions and their impact, if any on the outcomes of collaboration;
- Establish processes, and checks and balances for the generally non-communicative administration systems to ‘speak’ with each other;
Maintain a mindset appreciative of quality in diversity, of inquisitiveness, of different paradigms;

Enhance understanding of cultural differences, cross cultural communication, culture-centric perspectives, native community practices and sensitivity to not over-compensate for a lack of understanding;

Acknowledge collaboration of convenience, motivated by funding rather than the desire of researchers, and recognise that there are differences between partners that are key-to and underpin the collaboration which must be effectively harnessed, and other incidental differences that must be effectively managed;

Invest in the development and maintenance of positive interpersonal relations and relationship-building with and between all members of the collaboration team.

CONCLUSIONS

Literature predicts that the future top universities will be those that have established strong collaborations transnationally, and that success of these relationships be determined by the quality of collaboration-leadership and how cultural differences are managed. Contradictory cultures within the various faces of the one institution or across partner institutions render true collaboration difficult. TNRCs that are of a one-off, short term project nature are different to medium term collaboration programs. The longer term structural collaboration is the most cross cultural in nature, with impact felt across both institutions, or forms the nucleus of a spin-off entity.

Many governments see universities as centres of research that yield positive economic returns, and TNRC influencing foreign relations, soft diplomacy, international trade, regional security, global investments, regional alliances, political and social reform, beyond the benefits of research per se. For fruition coherent government policy that expressly supports transnational research collaboration with selected countries and regions is essential.

Universities by their very nature are not geared for collaboration. Though the volume and citation of co-authored publications indicates growth and quality in TNRC between researchers and perhaps increased inter connectedness between nations, it is not a measure of outcomes of collaboration between institutions. The self-organising system influencing TNRC between scholars governs the collaboration not the institution that scholars represent.

The collaboration relationship is usually protected and kept private by the scholars.

Research collaboration facilitates the production, distribution and application of knowledge within a knowledge-based international economy. As collaboration moves from between individuals to the departmental, school and institution, from dyadic to an elaborate network, and from with the developed world to the newly-developed and developing countries, layers of cultural nuances and ambiguities surrounding expectations and practices are added. At a minimum continuous communication, questioning of understandings, and review of practices between collaboration partners, is critical for success.

For collaboration-success mutual interest, articulation of benefits for each participant, sufficient collective resources covering entire requirements, a memorandum of agreement – a formal contract of roles, structures, leadership, time frames, partners, sources of funding, disposition of data, background intellectual property, sharing of results, process and authority for resolving issues – at the outset is essential.

FUTURE RESEARCH

TNRC is unique in that it is region, country and institution, time and expectations-specific and is under theorised. The dynamics discussed in this paper (i.e. problematics around TNRC, understanding and measuring success and impact, characteristics and factors influencing outcomes) provides numerous opportunities for further study including specific aspects of:

- Process, challenges and cultural context for collaboration with Asia Pacific countries;
- Governance framework for TNRC of Australian universities;
- Government policy and expectations;
- Recognition and rewarding TNRC.

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