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Creating value for SMEs: A collaboration readiness index and tool



Authors

Prof. Martie-Louise Verreynne, Associate Prof. Rui Torres de Oliveira, Prof. Anne-Laure Mention, Dr George Feast.

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Introduction

An important recommendation from the [Enablers and barriers to industry-research collaboration report](#) (Verreynne, et al. 2021) was to better understand the collaboration readiness of businesses and researchers alike. It found that when small- to medium-sized enterprises (SMEs) collaborate with Universities and Research Institutes (URIs) in Australia, they have higher levels of innovation, are more able to deal with uncertainty (e.g., COVID-19), and are more profitable. It also showed that some types of businesses are more prepared to collaborate with universities than others.

To create solutions from science that help address the most pressing economic, societal and environmental challenges facing Australia, businesses and URIs need to find 'ways of working better together and ways of reinventing and creating new industries that [grow] new jobs as well' (Marshall, 2022, p. 1). SMEs have an important role to play in this process, and it is therefore necessary to understand how they mature over successive stages of collaboration, from being a non-collaborator to a regular URI-industry collaborator. In addition, while research is clear about the importance of collaborations for the sustainability of SMEs and the impact of innovations on their opportunities and growth (Di Maria, et al. 2019;

Nave and Franco 2019; Wirsich, et al. 2016), we know little about how 'ready' different parties are to take part in a collaborative process. This problem is exacerbated for facilitators in technology transfer agencies, URI business development offices, and institutional funding bodies; all want to work with businesses and researchers who are prepared to engage, yet without an understanding of the knowledge asymmetries between parties, successful relationship establishment is highly uncertain (Johnston and Huggins 2018).

This report describes the process of developing a URI-industry collaboration readiness index that can help businesses understand appropriate engagement activities, as well as assist academics, managers, policy-makers, and facilitators to measure SMEs' readiness to collaborate with URI partners.

'Collaboration' can come in many forms, and the collaboration readiness index aims to cover the entire spectrum from informal mechanisms (e.g., joint lectures and attending workshops) to formal agreements (e.g., R&D consortia, patenting and licensing arrangements, and contract research).



Building a URI collaboration readiness index

DeVellis' (2016) approach to scale development was used to design, develop and validate a Collaboration Readiness Index (CRI) and accompanying diagnostic tool. The process involved validating literature-led survey questions with a group of experts, conducting an extended survey with Australian SMEs, and utilising advanced data analysis to create and refine the collaboration readiness levels and associated diagnostic tool. An overview of this process is provided in Figure 1.



Literature review (Step 1)

While no index has been previously developed to assess the readiness of SMEs to collaborate with URIs, our review of the literature identified several papers from which we could draw on to develop our collaboration readiness index. These included the well-known Technology Readiness Index (Mankins 2009) and Technology Readiness Levels (TRL) (Parasuraman 2000) as well as the Commercialisation Readiness Index (ARENA 2014). In addition, we drew from collaboration models developed in other contexts, such as the automotive industry (e.g., Badillo et al. 2017) and service industries such as tourism (e.g., Yang and Ren 2021) and software (Chedid et al. 2020). The development of these existing tools guided our research design.

The systematic literature review and previous research further helped to identify 16 behavioural constructs suitable to inform collaboration readiness. Existing scales (questionnaires) were utilised to assess a business' performance for each of these constructs. Where no questions existed, the themes of that construct were used to develop a set of questions.

Interviews with experts and survey (Steps 2 and 3)

Using our literature review and previous work, a survey to assess behavioural constructs was developed. We then:

- sought expert opinion on draft survey questions from 11 innovation and collaboration experts, including academics, facilitators, senior officials, and senior managers
- finalised the initial survey, which comprised 52 questions about general business characteristics, collaboration, innovation, and financial performance
- undertook computer-aided telephone interviews (CATI), targeting a sample of 800 companies (254 responses were reached) to test the initial survey and further inform the final scale.

Figure 1: Research method

Final survey items and final scale (Steps 4 and 5)

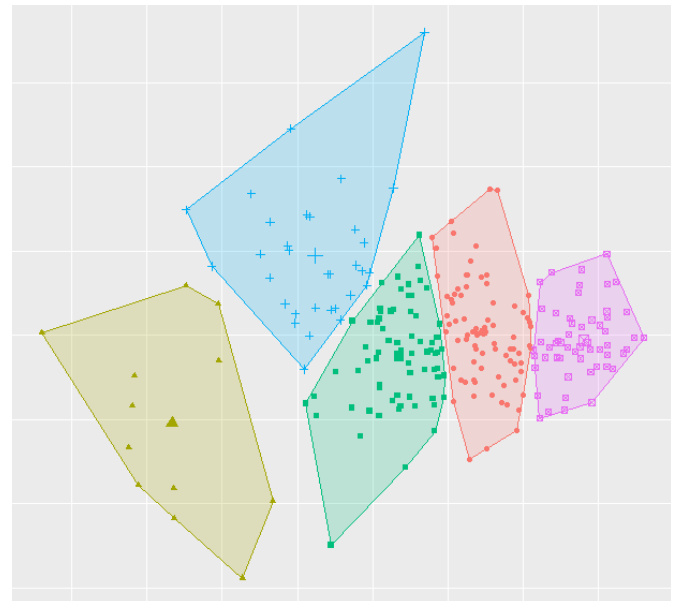
To refine the index and reduce the survey length by omitting questions deemed less important, a three-staged analytical strategy was undertaken:

1. Explanatory factor analysis (EFA) extracted factors such as leadership capabilities.
2. The convergent and discriminant validity of each dimension/factor was tested with a CFA model to evaluate 10 factors: *Teamwork orientation, risk orientation, co-creation orientation, leadership capabilities, employee capabilities, business resources and capabilities, mutual trust, knowledge sharing; systems and process; and outcomes.*
3. Additional predictive validity tests were conducted by running regressions, analysis of variance (ANOVA), and t-tests for the ten resulting factors. The results show that *teamwork orientation, employee capabilities, co-creation orientation, and mutual trust* were not significantly associated with collaboration.

Five factors remained after completing the analysis: (i) *leadership capabilities*, (ii) *systems and processes*, (iii) *outcomes*, (iv) *knowledge-sharing* and (v) *business resources and capabilities*. This also led to the final survey, which consisted of 17 questions related to these five factors.

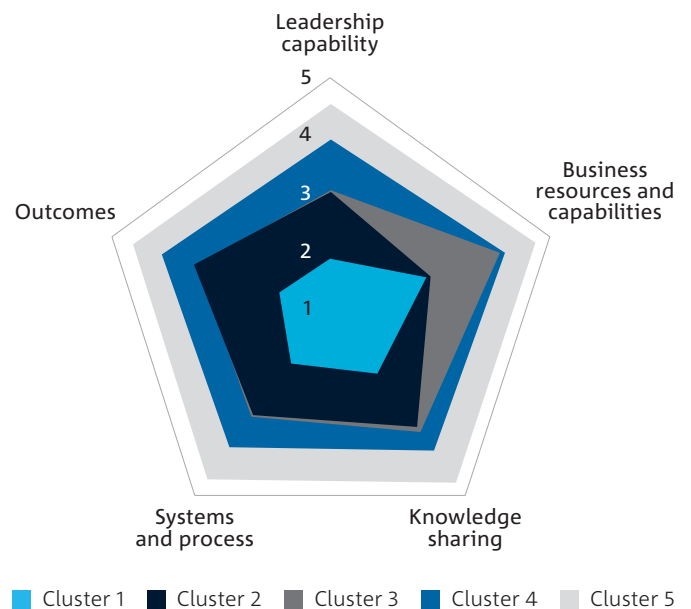
Once the five factors were identified, we sought to understand how these inform the different levels of collaboration readiness. A cluster analysis was performed to group businesses, which led to five groups (see Figure 2) – these became the five levels of collaboration readiness.

The five factors were then benchmarked across each of these levels to group businesses according to their collaboration readiness (see Figure 3).



Cluster 1 Cluster 2 Cluster 3 Cluster 4 Cluster 5

Figure 2: Cluster analysis (K-means clustering) to group businesses.



Cluster 1 Cluster 2 Cluster 3 Cluster 4 Cluster 5

Figure 3: Benchmarking each cluster level across the five factors via a radar chart.

Final URI collaboration readiness index and tool

The following five levels form the basis of our final Collaboration Readiness Index (Figure 4).

1. *Considering*: Not all businesses collaborate with URIs, and even businesses that previously collaborated, at one point, needed to decide deliberately whether to enter a new collaboration.
2. *Networking*: Initial conversations around collaborative research are instigated and/or businesses present to students or industry placements occur.
3. *Cooperating*: Collaboration is in the form of coordinated partnerships, often on smaller projects, to test initial ideas/approaches.
4. *Engaging*: Businesses formally engage with URIs through established relationships with specific objectives.
5. *Partnering*: Businesses undertake URI collaborations of a recurrent and ongoing nature.

Based on CSIRO SME Connect expert feedback, types of collaboration activities at each level have been proposed, and relevant programs and activities suggested for businesses at each level.

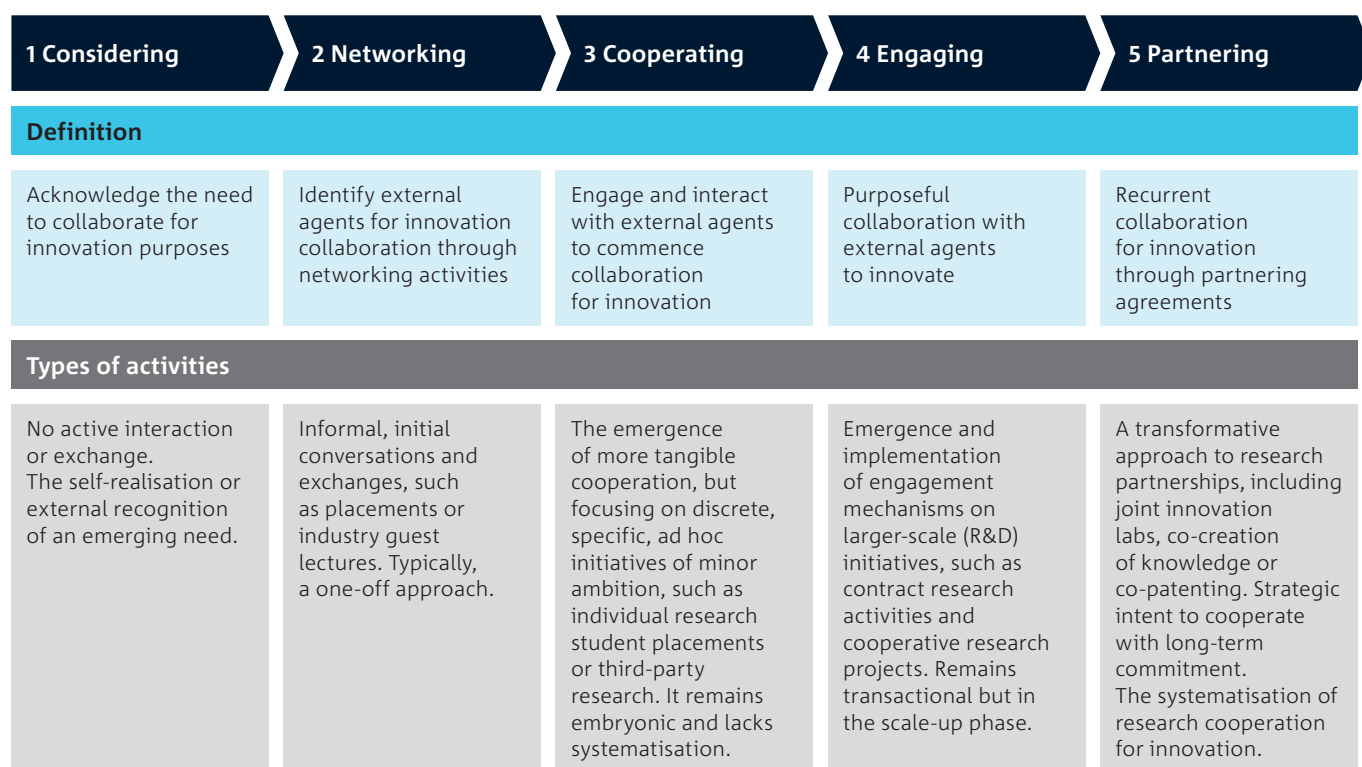


Figure 4: Collaboration Readiness Index

Collaboration Readiness Tool

Available online at collaborationreadinesstool.com, businesses will be able to complete a survey and receive a report that provides information and guidance on areas of potential focus to better engage with URIs. Each report will consist of:

- 1 An overall collaboration readiness score with an accompanying description of what that means for the business and engagement recommendations.
- 2 A description of the types of collaborative activities with URIs they should consider along with relevant links and resources.
- 3 A further breakdown of their scores in each factor of the scale (*leadership capabilities, systems and processes* etc.) along with recommendations.

Importantly, a business can be put in one level for the overall collaboration readiness but have different scores in individual factors. For example, some businesses that are in overall CRL1 may have a similar or even higher score in the *business resources* and *capabilities* factor than those in CRL2. Therefore, recommendations are given for both the overall collaboration readiness level and the individual factors.

Business characteristics at each level

The tool also allows a deeper dive into the general characteristics of SMEs at each level. A complete matrix table of characteristics/levels is provided separately, and general observations from our data are outlined below (Figure 5).



Figure 5: General business characteristics at each level.

Conclusion

Earlier studies, coupled with our previous work (Verreyne, et al. 2021), show that businesses thinking about collaborating with URIs exhibit certain characteristics. These characteristics can be grouped into five clusters which have become collaboration readiness levels. A self-assessment tool was created, which:

- provides information to participants on the types of collaborative activity with URIs that most suits their business at the present time.
- enables facilitators and granting bodies to manage the expectations of SMEs.
- enables SMEs to focus business developmental efforts on specific areas for improvement.
- indicates how businesses can move through stages to increase collaboration readiness.

Of course, firms should carefully assess their individual circumstances in relation to collaboration with URIs before making strategic investment decisions. This data does not assess the marginal returns of an increase in readiness level on performance outputs (e.g., measured as new products, services, or increases in turnover from innovative sales), but past research shows a positive relationship between collaboration and innovation outputs. It is anticipated that the tool will help build relationships between SMEs and URIs at an entry-level appropriate for the business, and by growing relationships gradually, collaborations are well set for successful outcomes.



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