Building team research targets and capacity in innovation hubs

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ABSTRACT

This study describes how a multidisciplinary team at an Australian university's innovation hub developed their research targets and capacity. The process through which research teams establish their research targets and strategies for achieving them is often tacit, which makes process sharing challenging. Referencing *Situated Learning Theory* (Brown et al., 1989) and using the *Design and Development Research* (DDR) framework (Richey and Klein, 2007) we document the process of how researchers negotiate to develop team research targets in this study. Our workshop data suggests that if researchers want to leverage the research abilities of others in their team, their targets must remain flexible. Additionally, a range of individual and organisation hinderers, barriers and enablers of conducting research were identified, that can inform practical actions to realise research strategy targets for innovation hubs.

Keywords: Team research; research capacity; research strategy.

INTRODUCTION

A team's ability to produce research within innovation hubs is fundamental to enhance innovation practices with evidence-based findings. In our experience, when researchers can apply their findings in their hub's innovation practices, they 1) experience first-hand how their work engages and impacts practice, 2) validate their findings in practice, 3) develop more rigorous research, and 4) provide clearer insights to further improve innovation processes. Therefore, it can be argued that the ability to produce research, also referred to as an individual's research capacity, is crucial in advancing innovation practice. While it may appear logical that having more researchers in a team will boost a team's research capacity, this is not always true. In multidisciplinary teams, members have less shared knowledge and research training (Tobi & Kampen, 2018), which may instead diminish the team's overall research capacity. To overcome this reduction, researchers must find ways to increase their team research capacity, such as leveraging one another's research capacity so that they can achieve more than what they each could accomplish alone.

Yet, such strategies are often kept tacit and shared within the researchers' organisation. As a result, there is a scarcity of empirically based information to guide teams in boosting their research capacity. Compared to research in allied health professionals (see e.g. Cooke, 2020; Iles-Smith & Ersser, 2019; Matus et al., 2018) and teacher education (see e.g. Hammad & Al-Ani, 2021; Murray & Vanassche, 2019; Tatto, 2021), where building research capacities have been documented in

literature, this topic is underexplored in design and innovation studies. And much more so in teams comprised of researchers with diverse levels of experience and disciplinary backgrounds.

Our study responds to this gap by documenting and analysing the ongoing *Team Research Strategy Project* at an Australian university's innovation hub. The *Team Research Strategy Project* is a programme that aims to help the participants 1) identify and capture their team members' unique research skills and expertise, 2) uncover a research strategy that represents the teams' distinctive abilities and 3) maximises each members' research capacity. This innovation hub has a strong focus on applying research to industry projects and frequently collaborates with industry clients to identify and develop innovation prospects into concepts and prototypes. The team in this innovation hub is made up of multidisciplinary academics and professionals that research, teach, and service industry clients. Due to the lack of existing research to guide the *Team Research Strategy Project*, this study is guided by two research questions. Firstly, how can researchers integrate their individual research needs into a team's research target? This question seeks to identify insights into how the team set their research targets. Secondly, what factors do teams perceive as enhancing or diminishing their capacity to achieve their research target? This question seeks to identify factors that are perceived to obstruct the team's ability to reach their targets and potential mechanisms that can bolster their pursuit of the targets. In doing so this study provides evidence-based guidance to help teams in other innovation hubs improve their research capacity.

THEORETICAL BACKGROUND

This study is informed by Situated Learning Theory (SLT) (Brown et al., 1989; Cobb & Bowers, 1999; Greeno, 1998; Lave & Wenger, 1991). In SLT, an individual's environment and context, which includes the ideas, tools, and physical resources available to them, shape how they learn and what they know. Brown et al. (1989) argued that an individual builds new knowledge through their activities, situation and culture. Additionally, Greeno (1998) argued that people's interactions with each other within the situation is key to initiate learning within the individual. These two arguments, though part of SLT, are different, for the former is based on an individual perspective and the latter on a collective perspective (Cobb & Bowers, 1999). Nonetheless, both perspectives are necessary to describe how SLT is examined in practice.

Through this SLT theoretical lens, learning and knowing can only occur in a context. In other words, only when individuals acknowledge their environment and engage with the people within that environment can they begin learning and knowing. Within our study context, team members must first become aware of their context to 1) contribute what they know, 2) learn from other members, and finally, be able to 3) create a team-based research strategy project. Through this theoretical perspective, the team research strategy emphasises processes where team members share inquiry and learn from one another, to become aware of one another's 1) research interests, 2) research targets, and 3) research needs and obstacles. Only when these factors are made clear to each other the team members can work to leverage one another's research experience and, ultimately, boost their team research capacity.

The project uses Design and Development Research (DDR) framework (Richey & Klein, 2007) to execute the situated learning perspective. Unlike the general design and development process, in which designers and innovators iteratively prototype an idea into a solution, DDR focuses on identifying insights in current processes and offering solutions to address obstacles identified in present practices. According to Richey and Klein (2007), DDR is used in the field of instructional design to specifically generate new knowledge and validate existing practices. There are two types of research studies that can achieve both goals, 1) research on products and tools and 2) research on design and development models (Richey et al., 2004). This study adopts type 1 and focuses on a tool to facilitate a group of researchers develop their own team research targets (to answer RQ1) and examine their existing research practices (to answer RQ2). This framework also enables the participants to 1) create a team-based knowledge and generate new understanding of the participants' research targets, and 2) examine their existing research target setting practices. Finally, this specific explorative study enables us to further develop our tool to improve the process of setting team research targets.

METHOD AND DATA

The project uses a case study methodology (Yin, 2018), with data from action-researcher observations triangulated with written workshop outcomes analysed using thematic analysis. To ensure team inclusivity, we invited all staff in the innovation hub (n=11) to participate in this study. Nine staff expressed interest, and six staff participated in the study. We note that the staff that did not participate in the study were mostly professional staff (non-academic roles). Thus, they had limited career and institutional incentives to conduct research. The six participants held different academic positions, from research assistant to hub directors. In academic positions, the university expects staff to frequently produce research outputs. These participants also worked in the hub for different lengths of time, ranging from one year to ten years.

Data collection

We collected qualitative data using an intervention workshop. The two-hour in-person workshop had two goals. The first goal was for participants to co-create their team research targets for the next 1.5 years (i.e. until the end of 2023). The second goal was for the team to identify factors that block, hinder, and accelerate their research capacity. We used the Sailboat technique (Tan, 2021) to structure the brainstorming session, which we describe below. We collected data in the form of 1) the written workshop outcomes documented in multiple photographs, and 2) observational data documented in notes from the two action researchers that facilitated the workshop with the team. The facilitators documented these observations during the workshop and in an activity reflection a few days after it was conducted. We conducted this workshop in June 2022. In this section, we first explain how the workshop was conducted and, then, how this process relates to the research questions defined.

To achieve workshop goal #1, we first asked participants to list down on their individual whiteboard their research targets for the next 1.5 years. Secondly, we asked the participants to share with each other their individual targets. This sharing was an important step prior to co-creating a team research target because, drawing on Situational Learning theory, participants need to first become aware of one another's goals to ensure the development of the team research target attempts to build on one another's research target.

To achieve workshop goal #2, we used the Sailboat technique to extract factors that block, hinder, and accelerate their research capacity. The Sailboat technique is a retrospective exercise that prompts teams

to share the external and internal factors that negatively and positively impact their team performance. Blockers are external factors that the team is unable to remove without external intervention. Hinderers are internal factors that the team can overcome without external intervention. Accelerators are both internal and external factors that the team considers to be able to boost their research performance.

We set these two workshop goals to directly answer both our research questions. Through workshop goal #1, we observed how the participants negotiated with one another and transposed their individual research targets into part of their team's research targets. Additionally, we observed the challenges the participants faced when attempting to address misunderstandings with one another during the process. Through workshop goal #2, we sought to reveal the factors that diminished (i.e. blockers and hinderers) and enhanced (i.e. accelerators) the participants' research capacities.

Data analysis

We analysed the workshop and observational data thematically (Boyatzis, 1998; Braun & Clarke, 2006). Observational notes taken by the action researchers were inductively analysed using affinity diagramming. Observations focused on the process of target setting and integrating individual and team goals, and not the component of the workshop exploring blockers, hinderers and enablers.

We explained the differences between blockers, hinderers, and accelerators at the start of the activity and instructed the participants to annotate each of their factors accordingly. Preclassifying the information in such a way, enabled us to conduct the first level of thematic grouping directly from the data. This data set consisted of 30 factors written down by the participants (all factors listed in tables 2-4), with the division into

blockers, hinderers and accelerators reflecting the workshop participants' situated assessment of the factors rather than a coding choice of the authors. Next, we inductively grouped the factors based on the same or similar keywords which the participants wrote per factor (refer to Figure 1). Finally, we supplemented the analysis with thick description (Geertz, 1973; Ryle, 2009). We used thick description to add situational details to give deeper and contextual meaning to the generated groups.

Fig. 1. Data analysis process.
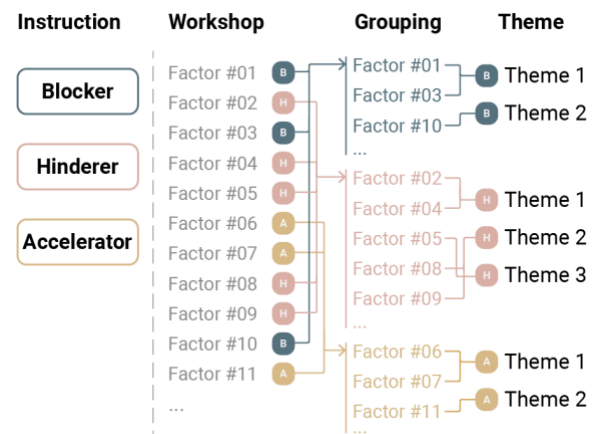
RESULTS

During the workshop, six participants listed and shared their individual research targets with the team before working together to create a list of team-based research targets for 2023 (refer to Table 1). The types of research targets were based on how the innovation hub performance is measured by its university in terms of research outcomes.

Table 1. Individual (P1 to P6) and team-based research targets.

Research Targets	P1	P2	P3	P4	P5	P6	Team
Journal article	1x	3x	2x	2x	✓		10x
Conference paper				1x			
Book publication						1x	
NTRO – Industry report	1x		1x			1x	1x
NTRO – Creative work			1x				
NTRO – Unspecified		1x				1x	
Research income			✓		✓		
Research grant	1x	1x					2x
Research awards			1x		✓		4x
Impact outcomes				✓	✓	✓	5x – 10x
Business model						1x	
L&T programme			1x		1x		

NTRO stands for Non-Traditional Research Outputs. L&T stands for Learning & Teaching. ✓ indicates that the participants identified their target to achieve that form of research output but did not set a fixed quantity.

Integrating individual research targets into a team research target

We first describe the overall changes from individual to team research targets, then the tensions we observed during the workshop when the participants were negotiating the list of team targets.

Transforming individual targets to team targets
Instead of simply adding up everyone's target to create a list of team targets, the team created their joint targets from scratch. Immediately after writing down their individual lists, participants were instructed to negotiate with one another to identify a set of team targets. The differences in their individual targets served as prompts for the team to identify whether targets were relevant to their needs and whether the quantity per target was achievable based on their collective experience. Overall, targets were discarded, reduced, accumulated, multiplied, and made measurable.

Disregarded targets: When it came to research publications (journal articles, conference papers and book publications), conference papers and book publications were disregarded from the team target. A possible reason for this omission is that these outcomes were unattractive for most participants. For example, only P4 listed one conference paper and only P6 listed one book publication, whereas P1 to P5 listed a total sum of at least nine journal articles. Something different occurred with the Non-Traditional Research Outputs (NTROs), where creative work and unspecified NTROs were disregarded from the team target. A possible explanation for why these targets were discarded could be that most of the team was unfamiliar with the NTRO application process. Thus, perhaps NTROs were considered more achievable research outputs at the start of the exercise. However, during the workshop, another team member who had recently submitted an NTRO shared that the process was rigorous and time-consuming, which may have helped reassessing the team expectations.

Reduced targets: The participants originally identified six NTRO research targets, but eventually only set one NTRO target. Through their discussions, they realised that, while the team was ambitious to produce NTROs, they were also unfamiliar with the process. Hence rather than attempt to produce various NTROs, they instead sought to learn and produce only one NTRO (industry report).

Accumulated targets: Some targets appear to have been accumulated. For example, P1 and P2 each listed one research grant as their targets and the team listed two research grants as their targets. While the team did not explicitly mention what these grant targets were, the awareness of two individuals pursing research grants

might have led the team to integrate their individual targets into the team's overall target.

Multiplied targets: Only P3 and P5 listed awards as their research targets. Yet, during the negotiation of awards, the final target doubled to four.

Targets made measurable: P4, P5, and P6 listed impact outcomes as their personal targets without setting a quantity. One participant even wrote a question mark next to their 'impact outcomes', as if to note that it was important to achieve but had no idea how to do so. Yet, through the discussions, the team was able to not only set a range of five to ten impact outcomes to aim for but started writing down future events that were suitable to capture as one of these impact outcomes.

Tensions between individual and team targets
While the innovation hub was not given explicit research targets by their university, future projects needed to sustain and grow the innovation hub existing targets. For example, during the workshop, one of the directors shared a vision of the hub expanding to also become an innovation training centre. But to reach that stage, the hub's existing members must begin to amass a specific body of research to demonstrate credibility when starting the training centre. This meant that the team members needed to pursue specific research targets to contribute to the innovation hub's future credibility.

Research capacity factors: blockers, hinderers, accelerators

The sections below report workshop activity #2 outcomes, which are the factors that block, hinder, and accelerate research capacity in the innovation hub. Blockers are external factors that the team cannot resolve by themselves. Hinderers are internal factors that the team have agency to make changes and alleviate the issue. Accelerators are support mechanisms the team identified that will improve their capacity to conduct and produce research.

Research capacity blockers
The participants identified six factors that block them from doing research (refer to Table 2). On top of research activities, the university expected the innovation hub and its members to perform other roles, such as educators and workshop facilitators (#3 to #5). While these various roles deepen the participants understanding of their expertise, it also robs them of their research time. Additionally, when participants are assigned across multiple projects (#1), they are unable to develop the research for specific projects. While spreading the work to different people might alleviate the problem, the participants also reported the lack of people (#2) to impede their research capacity.

Table 2. Research process and production blockers.

#	Blockers
	Resource allocation
1	Too many projects running simultaneously
2	Lack of people to do research
	Individual expectations
3	Workload models
4	Key performance indicators
5	Teaching activities compete with research activities
	Hub expectations
6	University expectations of the innovation hub

Research capacity hinderers

The participants identified ten factors that hinders their research capacity (refer to Table 3). Unsurprisingly, the lack of time is the most reported hinderer (#1 to #4), followed by the lack of research prioritisation (#5 to #7). While it might appear that these are hinderers the team can address (by managing their time and prioritising research), these hinderers might realistically be symptoms of *resource allocation* and *individual expectations*, which the participants identified as blockers in the section above. Since such internal issues are meant to be addressable by the team, but may in fact be a symptom of an external issue, this might have led some participants to develop negative feelings about research (#8 and #9), which would deter them from doing research.

Table 3. Research process and production hinderers.

#	Hinderers
	Poor time management
1	Time allocation
2	Time to plan and define all phases
3	Limited writing time (reporting research)
4	Lack of time to do research (conducting research)
	Lack of research prioritisation
5	Lack of project prioritisation
6	Prioritisation of deadlines [over research work]
7	Prioritisation of project needs [over research needs]
	Negative emotions
8	Sense of guilt with not contributing to hub's research
9	Tired and burnt out – lack of energy and motivation to think deeply and critically [about research]
	Limiting research processes
10	Lack of data collection rigor

Research capacity accelerators

The participants identified 14 factors that enhances their research capacity (refer to Table 4). The participants identified two forms of accountability: to an individual (#1 and #2) and to the team (#3 and #4). Participants found that setting boundaries, whether for tasks (#5) or time spent on task (#6), could help them progress their research more regularly. Being able to visualise what the

research outcome will be like (#7), whether it has a significant impact on the team's target (#7 and #8) and map out the milestones for the project (#9), were thought to help the team decide strategically which research projects or tasks to work on first. The participants felt that assigning the right researcher to the right project (#10) and to have a clear research leader (#11) would accelerate the research process. One participant even identified that prioritising tech development and commercialisation (#12), which is the participant's area of expertise would progress the research quicker. Finally, the participants also thought that having external support such as a dedicated research programme (#13 and #14), may help them temporarily put non-research work on hold to focus on their research projects.

Table 4. Research process and production accelerators.

#	Accelerators
	Having accountability
1	Buddying up
2	Accountability partner
3	Periodic research review meeting
4	Culture and critical mass to support each other
	Setting boundaries
5	Well defined task
6	Setting deadlines
	Strategic planning
7	Determine output type and priority
8	Setting priorities [to research project]
9	Pro-active planning
	Aligning expertise to research
10	Determine how we value add to [research] projects
11	Tailcoat lead researcher/team
12	Prioritise tech development and commercialisation
	Having external support
13	Writing retreats
14	One day [as] research day

DISCUSSION AND CONCLUSIONS

This study – the first study in the ongoing *Team Research Strategy Project* – focused on documenting and analysing how an innovation hub developed their team research targets based on their team experience and expertise. In the sections below, we describe the main findings, describe the subsequent research opportunities that follows from this study and give recommendations for innovation hubs on developing team research targets.

RQ1 How can researchers integrate their individual research needs into a team's research targets?

Researchers need to first learn their team members' research needs before attempting to develop team

research targets. When researchers are aware of what their team members are aiming to achieve may help the researcher gauge the practicality of their own targets. Through the development process, certain targets may be discarded, (e.g. conference papers and books) for they may not have a significant impact compared to other targets (such as journal articles). Researchers may also need to reduce their targets after learning from one another the magnitude and unfamiliarity of work needed to achieve the target (e.g. NTROs). In convenient cases, researcher's individual targets are simply added to the team's research target (e.g. research grants). In productive cases, researchers may be inspired to take on new targets after learning from another the simplicity and ease to achieve the target (e.g. awards). Finally, through the discussion process, researchers can triangulate unclear targets to understand collectively how such targets are defined and can be made more measurable as a target (e.g. impact outcomes).

When researchers unintentionally withheld research targets, especially targets needed to grow the innovation hub, it created some tension during the development of the team research targets. This is because such innovation hub targets require every team member to contribute, and when these expectations are not transparent, it places a hidden expectation on the team members to perform.

RQ2 What factors enhance or diminish a teams' research capacity to achieve their research target?

Overall, there is a consensus that the expectations of the researcher to work across different projects and perform multiple roles, such as an educator and a workshop facilitator, stops them from conducting research. This is in line with previous findings where people working in academia face conflicting goals between teaching and research, which often hindered their research performance (Locke et al., 1994). Different time-horizons seem to play a role, and act in favour of short-sighted activities (Levinthal & March, 1993). While this expectation is a serious blocker of research activities, the severity is compounded by the poor resource allocation; assigning researchers to too many projects and the lack of human capital to manage the project workloads.

While researchers may identify factors they think they can rectify to improve their research capacity, such factors may reveal itself to be symptoms of the external blockages. In this case, the lack of time management and prioritisation (research hinderers), may not be addressable by the researcher because they are in facts the symptoms of project overload and lack of human capital (research blockers).

Finally, researchers identified having accountability and external supports can motivate them to do more research. Additionally, being strategic in choosing projects and gaining clarity on the research tasks needed to be completed by a certain date motivates them to do their research as well. There are varied reports on the impact of goal setting on research performance. In innovation context, Stetler and Magnusson (2015) found a curvi-linear relationship between project goals and innovation performance. High clarity on goals provide direction and focus (Zhou & Shalley, 2003) which in turn may lead to research performance in a particular direction. Having ambiguous goals could generate research ideas and outcomes in an entirely new area.

Furthermore, in innovation context, having a general goal to be innovative seem to generate positive innovation performance (Stetler & Magnusson, 2015). In the context of this study, participants may benefit from an explicit mandate by the hub directors to be more research-driven; something that was not mentioned in the results.

Theoretical implications

This study demonstrated how peoples' ideas and actions (specifically the participants' research goals and targets) adapted to their environment, which evidences Lave and Wenger's (1991) SLT. This study also demonstrated the importance of people interaction within the situation (Greeno, 1998) and that individuals may not have learnt anything new without this interaction (Brown et al., 1989). Specifically, the target-setting workshop (i.e. the situation) that facilitated participants to compare their goals and resolve their differences (i.e. the interaction) so as to create a set of team-based research targets (i.e. the new individual learning). Finally, the design and development of the workshop, specifically the question prompts used to get participants to describe, compare, then form a set of team research goals, evidence how the DDR framework was used to generate new knowledge and validate existing practices (Richey & Klein, 2007). In particular, how the workshop brought out the tension between individual and team targets (i.e. the new knowledge) and examined existing practices (i.e. the blockers, hinderers and accelerators of research).

Limitations and recommendations for future research

A study limitation is that participants were unable to gauge whether they set realistic research targets, be it independently or as a team. Providing a time frame of 1.5 years alone is not enough, as there was a large disparity in the number of research targets set by the participants. Being specific about aspirational, vs minimum viable targets, and understanding future workload allocations and available resources for conducting research may help assist target setting. We also recommend future researchers to use their past research outcomes, benchmark targets based on similar researchers past research outcomes, or use organisational guides if available to define achieveable research targets.

Another study limitation is the lack of emphasis in defining what research targets are. As the participants are more than just researchers in the innovation hub, it is inevitable that they are involved in projects through different capacity. As such, we recommend future

researchers to give their participants guidelines on what constitutes a research target.

Due to workshop time constraints, the team focused on negotiating the quantity of each target based on their collective experience in achieving those targets. While they brainstormed what potential projects would help the team achieve their targets, they were neither able to reach a consensus on which existing projects would be geared towards which target, nor were they able to identify all the projects needed to hit every target. Hence, subsequent workshops of this *Team Research Strategy Project* will be engaged to focus on unpacking each target. Similarly, subsequent workshops will facilitate participants to unpack their blockers, hinderers, and accelerators further, to identify strategies to remove research capacity blockers and hinderers, and develop strategies to implement and/or maintain their research capacity accelerators.

Implications for teams working in innovation hubs

A two hour co-design workshop was effective for teams to create shared understanding of indivudal and innovation hub research goals. Individuals had drafted prior to the workshop their research goals and interest, with individuals provisionally revising goals during the workshop according to the team research targets that were collectively set. Researchers in innovation hubs should incorporate some flexibility into their research targets so that they can adapt to organisational research demands and research opportunities that arise, leverage the expertise, interests and experience of others to set and/or achieve more research targets, or share with others the responsibility of learning an unfamiliar research process while attempting to achieve its outcome. When it comes to the factors that diminishes research capacity, innovation hub directors need to consistently work with relevant organisational parties to reduce the blockers as much as possible so that their research team can focus on absolving the hinderers. In order to make short co-design workshops more effective, hub directors could provide more strategic instructions, by sharing organisation or innovation hub targets in advance to accelerate the balancing and negotiating of individual and team research targets. However the presentation of such information in advance should be carefully considered so not to be counter-productive to the co-design methods where individuals have agency to collectively influence the outcome (in this case, the research hub strategy). It is important that the workshop and sets the tone for a supportive culture that motivates one another to perform research.

In terms of methods, a limitation on the study is the potential bias of action research observations, with notes and reflection as data sources for analysis. Recordings of conversation and/or reflection from all participants could be alternative ways to address this, however given time constraints to run a quick pilot, dual researcher viewpoints and triangulation with written workshop outcomes was selected.

Conclusion

This study contributes to the innovation literature by describing how a multidisciplinary team within an innovation hub developed their research targets and overall research capacity. To the best of our knowledge, how such research teams establish their research targets and build a research strategy has yet to be studied and reported. Hence, we case studied the process by which a research team at an Australian university's innovation hub establish their research targets. The findings reveal that a two hour co-design workshop enabled researchers to adapt their own targets to leverage research abilities of others in their team in developing innovation hub research strategies, and was useful to create shared understanding of future hub level goals. A range of hinderers, barriers and enablers were identified and spanned many themes including; resources, expectations, planning and management, accountability, emotions, boundaries and alignment from both individual and organisation levels. These findings are useful to inform the development of practical actions that aim to both leverage research enablers, and address hinderers and blockers in forming strategies for collective research targets.

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