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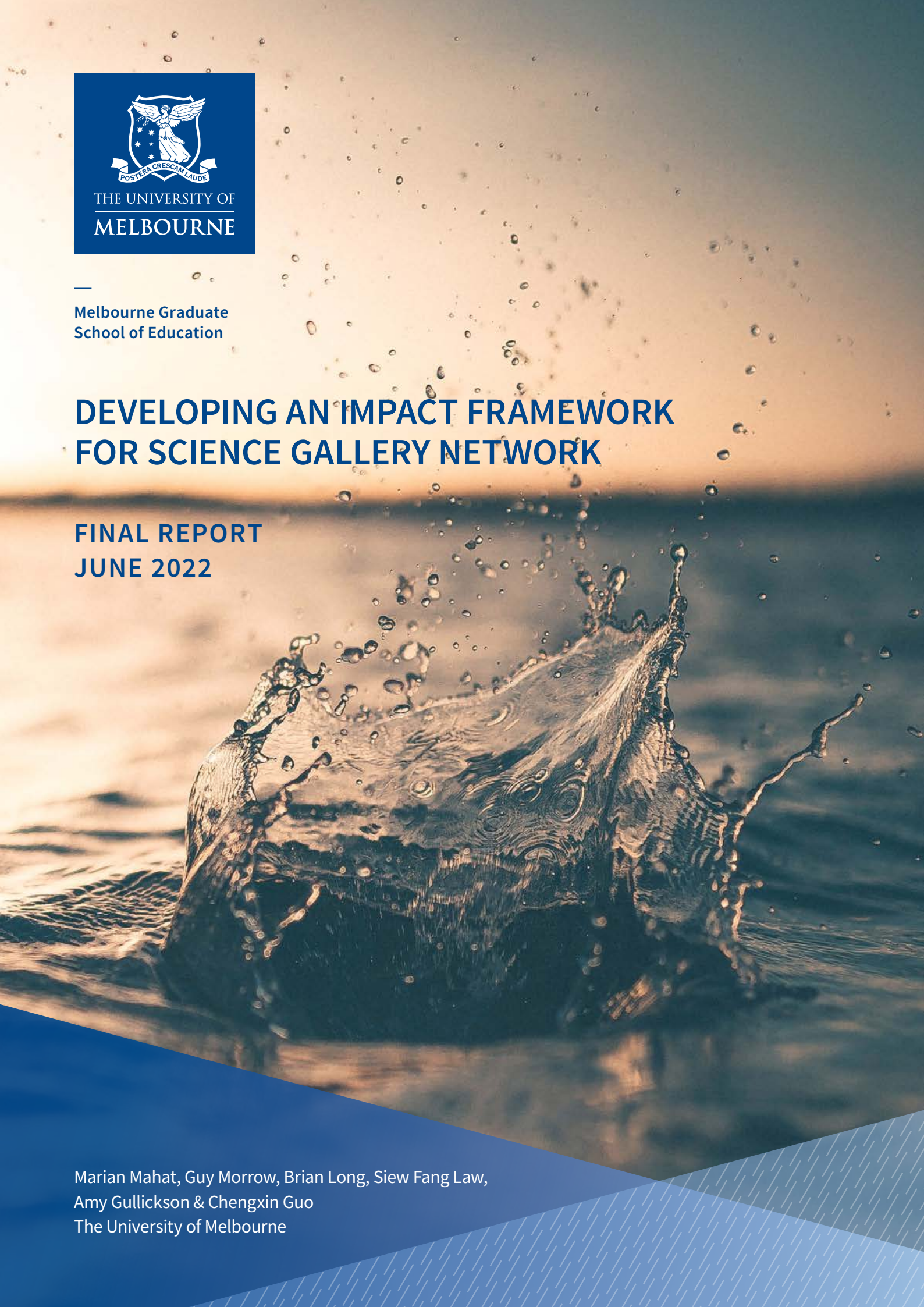
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Title:
Developing an impact framework for Science Gallery Network: Final report

Date:
2022

Citation:
Mahat, M., Morrow, G., Long, B., Law, S. F., Gullickson, A. & Guo, C. (2022). Developing an impact framework for Science Gallery Network: Final report. University of Melbourne.

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THE UNIVERSITY OF MELBOURNE

Melbourne Graduate School of Education

DEVELOPING AN IMPACT FRAMEWORK FOR SCIENCE GALLERY NETWORK

FINAL REPORT
JUNE 2022

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RECOMMENDED CITATION

Mahat, M., Morrow, G., Long, B. Law, S. F., Gullickson, A. & Guo, C. (2022). *Developing an impact framework for Science Gallery Network: Final report*. The University of Melbourne. https://doi.org/10.46580/124372

ACKNOWLEDGEMENTS

This work was contracted to the University of Melbourne by the Science Gallery International. We would like to acknowledge the contributions of Andrea Bandelli and Katrina Enros for setting the scope of the study and providing feedback throughout the project.

ACKNOWLEDGEMENT OF TRADITIONAL OWNERS

The University of Melbourne acknowledges the Aboriginal and Torres Strait Islander traditional owners of the unceded land on which we work and learn. We pay respect to the Elders, past and present, and the place of Indigenous knowledge in the academy.

DISCLAIMER

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PART 1: EXECUTIVE SUMMARY

The aim of this project was to develop an impact framework for the Science Gallery Network (SGN). This work was commissioned by the Science Gallery International (SGI). The SGN has eight member organisations across four continents: Dublin, London, Melbourne, Bengaluru, Detroit, Rotterdam, Atlanta and Berlin. Whilst the network consistently sees unprecedented levels of accomplishment by its members, a testimony to their capacity, innovation and vision, the SGN does not have a systematic way to measure and monitor this impact. An impact framework that can assist with understanding and reporting the value of this impact will provide important recognition that the SGN has achieved what it sets out to do—bringing science, art, technology and design together to deliver world-class educational and cultural experiences for young people.

This report details the robust consultation approach that was undertaken by the University of Melbourne's project team—one that included a desktop review, focus group discussions, surveys and interviews—to ensure multiple perspectives were gathered on what could be considered a multi-faceted concept. The desktop review provided a thorough review and an environmental scan of the impact literature and its measurement. In addition, the focus group discussions and interviews provided a rich understanding of what 'good impact' means for the SGN and the implications of this to the measurement of impact outcomes.

Five key recommendations are provided and summarised below. Note that these key recommendations should be taken as a point of departure for further in-depth consultation throughout the wider SGN.

KEY RECOMMENDATIONS

Recommendation 1. The SGN consists of "leading universities united around a singular mission: to ignite creativity and discovery where science and art collide" (Science Gallery, 2022). This mission is unique and, partly because of this uniqueness, there is a need to pluralise creativity. The term 'creativities' could be used to ensure that transdisciplinary perspectives are captured in a way that does not problematically filter and conflate them. Further to this, there are various methods (see Sawyer, 2012) that could be used to evaluate whether SG's exhibitions, workshops and events lead to the generation of unique/original ideas or products that have value, thus determining whether SG has ignited different types of creativity.

Recommendation 2. Through a co-design process that aligns with the Theory of Change, findings provided clarity on the definition of good impact from broad (global and network) to narrow (local and individual) perspectives. In simple terms, 'good impact' for the SGN can be seen as "developing authentic connections and relationships, creating change that has a positive and sustainable effect on young people's lives whilst aligning to the broad objectives and goals of the university." This definition should be shared with the wider network and used as a point of departure for further conceptualisation and to generate discussion on impact.

Recommendation 3. 45 key impact indicators could be used to demonstrate 'good impact' across the network whilst taking into account the nuances of local contexts. It is important that the SGN ensures provision of salient and robust outcome-oriented metrics focusing on the 'areas that count'. A summary of the indicators is provided in **Table 1**.

> *Good impact for SGN is about "developing authentic connections and relationships, creating change that has a positive and sustainable effect on young people's lives whilst aligning to the broad objectives and goals of the university".*

TABLE 1. SUMMARY OF IMPACT INDICATORS

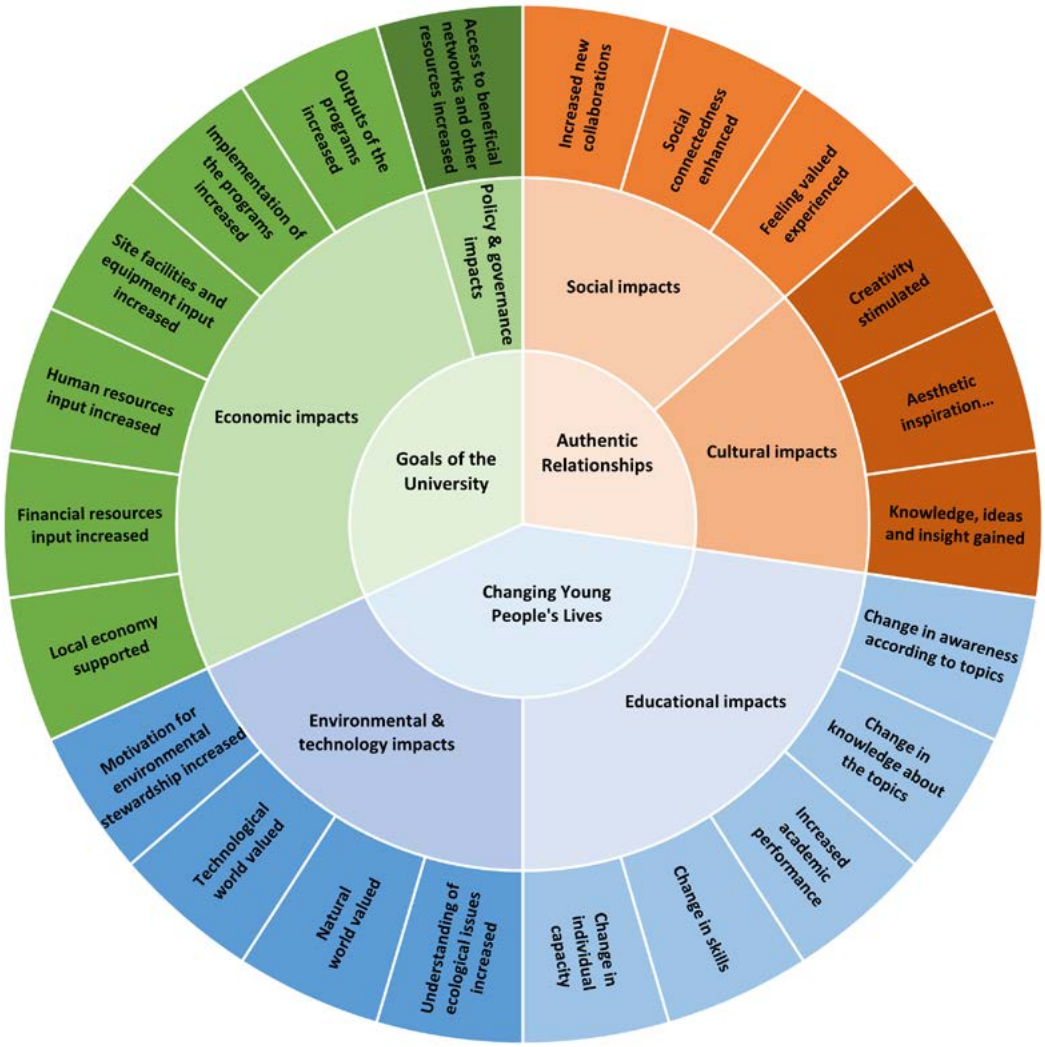
Impact theme	No.	Impact outcomes	Impact indicators
Educational Impacts	1	Change in awareness according to topics	Awareness of global issues raised
	2	Change in knowledge about the topics	The ___ (e.g. program, exhibition) was different from things I've experienced before
	3	Increased academic performance	Types, quality and depth of learning increased
	4	Increased academic performance	Engagement of students increased
	5	Increased academic performance	Increased learning opportunities
	6	Increased academic performance	Student learning outcomes improved
	7	Increased academic performance	Longitudinal impact on student learning enabled
	8	Change in skills	Cognitive problem-solving skills improved
	9	Change in skills	Interpersonal skills improved
	10	Change in individual capacity	The ___ (e.g. program, exhibition) was thought-provoking
	11	Change in awareness according to topics	Awareness of local issues raised
Social Impacts	12	Increased new collaborations	Number and sustainment of new modes of collaboration increased
	13	Increased new collaborations	Stimulated transdisciplinary and collaborative research projects
	14	Increased new collaborations	Collaboration among artists & researchers increased
	15	Increased new collaborations	Artist-Scientist Collaboration Experiences increased
	16	Social connectedness enhanced	The connection among participants is enhanced
	17	Increased new collaborations	Activated researchers' communication
	18	Feeling valued experienced	Voice of participants is respected
	19	Feeling valued experienced	Contribution from participants increased
Cultural Impacts	20	Creativity stimulated	Participant's creativity is inspired
	21	Creativity stimulated	Participant's curiosity is sparked
	22	Creativity stimulated	A new point of view is explored or presented
	23	Aesthetic inspiration experienced	The ___ (e.g. program, exhibition) was well thought through and put together
	24	Knowledge, ideas and insight gained	The ___ (e.g. program, exhibition) was different from things I've experienced before
	25	Knowledge, ideas and insight gained	New insight or knowledge is gained
	26	Knowledge, ideas and insight gained	A relevant understanding of today's world is generated
	27	Knowledge, ideas and insight gained	New understanding and perspective of the arts is generated
Environmental & Technology Impacts	28	Understanding of ecological issues increased	Awareness of environmental issues is raised
	29	Natural world valued	The ___ (e.g. program, exhibition) has something to say about the world in which we live
	30	Natural world valued	The ___ (e.g. program, exhibition) opened my eyes to issues in the environment
	31	Technological world valued	The connection between technology and people is recognised and appreciated
	32	Motivation for environmental stewardship increased	Pro-environmental activity increased
	33	Motivation for environmental stewardship increased	Conversation about local environment increased

TABLE 1. SUMMARY OF IMPACT INDICATORS

Impact theme	No.	Impact outcomes	Impact indicators
Economic Impacts	34	Local economy supported	Growth of new audiences
	35	Local economy supported	New income streams generated
	36	Financial resources input increased	Number of donors and amount of donations increased
	37	Financial resources input increased	Number of grant proposals (submitted and successful) increased
	38	Human resources input increased	Range of expertise widened
	39	Human resources input increased	Inputs from participatory activities increased
	40	Human resources input increased	Quality of partnerships increased
	41	Site facilities and equipment input increased	Multilingual services provided
	42	Implementation of the programs increased	Quality of material used for target audience improved
	43	Outputs of program increased	Rate of returned visitors increased
	44	Outputs of program increased	Proportion of target population increased
Policy & Governance Impacts	45	Access to beneficial networks and other resources increased	Community networks enhanced



FIGURE 1. THE SGN IMPACT FRAMEWORK



Recommendation 4. Whilst there are several relevant extant impact frameworks, none of these frameworks perfectly matches the needs of the SGN but each casts light on the core questions of the study. Our examination of them advances an SGN Impact Framework that takes into account the definition of good impact (see Recommendation 2) and impact outcomes (see Recommendation 3) in a way that is in-line with current practice (see Desktop review). Figure 1 illustrates the SGN Impact Framework. The first inner most layer relates to the three themes of good impact: Authentic Relationships, Changing Young Peoples' Lives and Goals of the University. The second layer relates to the outcome themes identified as most important for SGN. Finally, the third and outer most layer relates to the impact outcomes that SGN wishes to achieve. Taken together, the SGN Impact Framework provides an approach that conceptualises and measures 'good impact' across disciplinary boundaries.

Recommendation 5. Capability building of the SGN staff on Theory of Change and impact management is essential. This ensures that the SGN impact is well thought-through, planned, documented, and communicated from the beginning to the end of each new initiative. Professional learning and capacity building can be structured and formal, including training programs and seminars, or informal, which could include the establishment of communities of practice and mentoring.

Key recommendations in the study are provided as a starting point rather than an end point. This provides a launching pad for SGN's implementation of a change management process that focuses on the SGN's overall purpose—a commitment to bringing science, art, technology and design together to deliver world-class educational and cultural experiences for young people—and its impact.

PART 2:
FULL REPORT

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1. INTRODUCTION

The aim of this study was to develop an impact framework for the Science Gallery Network (SGN). The framework has dual aims: (1) to allow the institutional members of the SGN to apply coherent impact measures appropriate to each location; and (2) to allow for Network-wide use of some metrics with the view of identifying the network and scale effects of the SGN. Many indicators and metrics suitable for this framework exist, but they are mostly found in research and practice literature from separate fields and disciplines. We drew on multiple approaches to develop this framework. It is designed to capture the socio-cultural, economic, environmental and governance outcomes and impact achieved across the SGN.

Our work here was underpinned by a Theory of Change (Weiss, 1995). In addition, our team brought together academics from the University of Melbourne with expertise in arts and cultural management (Morrow and Long), learning environments (Mahat and Guo), evaluation (Gullickson), education (Law, Mahat and Guo), and social psychology, engagement, and partnerships (Law). Note that this project did not involve assessing the impact of the SGN. Our aim here was to assist the SGN to develop an overarching impact framework for the future generation of the Network's impact data.

This project is significant because this framework will help understand and report the value of the impact that is achieved by the SGN to its stakeholder groups. Proof of impact is more potent when an organisation such as the SGN can describe why its impact is essential, and to whom. Mapping impact will help the SGN to focus on its overall purpose, rather than on the process of assessing its impact. A focus on impact will also help the SGN ensure the best possible return from the investments its members make. Measuring impact is notoriously difficult, hence the need to develop a coherent framework for the SGN that includes both quantitative and qualitative indicators. This will provide a more holistic view of the SGN's impact on society. Two key research questions provided the scope for the study:

1. What qualitative and quantitative indicators and metrics can be used to track the effectiveness of Science Gallery across multiple audiences and contexts?
2. How can these indicators be presented in a framework that can simultaneously showcase impact appropriate to each location and across the network as a whole?

This work was commissioned by Science Gallery International (SGI). The SGN has eight member organisations across four continents: Dublin, London, Melbourne, Bengaluru, Detroit, Rotterdam, Atlanta and Berlin. The SGN consistently achieves remarkably high levels of accomplishment among its members, a testimony to their capacity, innovation and vision. The SGN consists of "leading universities united around a singular mission: to ignite creativity and discovery where science and art collide" (Science Gallery, 2022). This mission is unique and, partly because of this uniqueness, the SGN does not have a systematic way to measure and monitor its impact. The SGN is committed to "bringing science, art, technology and design together to deliver world-class educational and cultural experiences for young people" (Science Gallery, 2022). There was therefore a need for the development of indicators and metrics that can specifically measure the SGN's transdisciplinary approaches to education and innovation. Simultaneously, the framework needed to assist the SGN to understand and report the diverse types of value its impact generates for its various stakeholders.



2.
THEORY OF CHANGE

A Theory of Change is one of the many methods for impact evaluation. It is a description of why a particular way of working is effective, and it shows how change happens in the short, medium and long term and how this change achieves the intended impact. There are many models for a Theory of Change which provide a wide range of possible uses in developing, managing, and evaluating interventions (Mayne, 2015). When developing a comprehensive and effective Theory of Change, diverse stakeholders—including, but not limited to, staff, funders, board of committees, beneficiaries, partners and collaborators—are typically included in conceptualising what 'impact' means to them individually, and as a group. In this way, the Theory of Change emphasises the importance of involving diverse stakeholders and enabling them to make linkages between early activities and longer-term outcomes to strengthen the evaluation process. This helps to identify, prioritise, and determine the feasibility of impact measurement in advance, rather than retrospectively.

A Theory of Change is contextual. For a global organisation like the SGN, having global, local and organisational lenses is crucial. To establish a clear Theory of Change, the group could begin by viewing a broader global conceptualisation of the network, and then zoom in and narrow down the focus to make sense of local-organisational contexts. For example, what are some of the distinctive stakeholder groups of the local Science Galleries? To what extent, how, when, and where should conversations concerning 'impact' take place to include these unique stakeholder groups? For theories of change to be successfully implemented, multiple strategies should be included for achieving long-term outcomes. Connell and Kubisch (1998) reiterated that "plausible theories of change will no doubt be complex and pluralistic, but if they are to be implemented (doable) they cannot be contradictory and if they are to be evaluated (testable) they cannot be unarticulated" (p. 8).



3.
STUDY DESIGN

A multi-method approach (Hunter & Brewer, 2015) over four phases was used in this study. There are several advantages of using a multimethod approach. These include the ability to triangulate and validate data and results by combining a range of data sources and methods and widening the scope of the study to take in contextual aspects of the study undertaken (Tashakkori & Teddlie, 1998). Additionally, collecting different kinds of data using different methods from multiple sources provides a wider range of coverage that may result in a fuller picture of the unit under study than would have been achieved otherwise (Bonoma, 1985). This study and its data collection methods were approved by the University of Melbourne's Human Research Ethics Committee (Project ID: 23592).

PHASE 1: DESKTOP REVIEW

A desktop review involves collecting data from existing resources, scanning the literature, analysing secondary data, and creating a reference list so that relevant information is organised in an easily accessible way. The data gathered in this desktop review were sourced from extant literature on impact measurement. The full desktop review includes definitions of key terms and is available in **Part 3: Desktop Review.**

The SGN is unique. The impacts and indicators that are tabulated and discussed in the desktop review were drawn from similar contexts, such as other galleries, STEM (Science, Technology, Engineering and Mathematics) and STEAM (Science, Technology, Engineering, Arts and Mathematics) mediation projects and research initiatives. We also drew some from further afield such as from the fields of higher education, schools, industry and governments. It is important to note here however that each context has its own distinctive features and contingencies; simple one-to-one transfer of impacts or indicators is rarely possible.

PHASE 2: FOCUS GROUP DISCUSSIONS

Focus group discussions are a research technique that collect data through group interactions (Morgan, 2002). The team adopted digital tools to enable the focus group discussions. Zoom, a cloud-based video conferencing platform, was used for the synchronous virtual meetings. MIRO, an online interactive visual collaboration platform, was used to assist data collection. MIRO enables the whole team to brainstorm ideas with digital sticky notes. The project team created and set up the MIRO board with digital content, such as an overview of the project, a brief introduction of the project team, some brief guides for the focus group processes and four key focus group questions. These were built into the MIRO boards to ensure shared goals and effective communication.

The focus group discussion focused on four key subsidiary research questions:

1. What does 'good impact' look like?
2. What is the purpose of developing an impact framework? What does a 'useful' impact framework look like to the SGN members?
3. Who has been impacted by the SGN's activities so far? Who do you want to be impacted?
4. If this is what 'good' looks like, what kind of data do we need?

The project team consulted with the Executive Director of SGI to co-identify key participants for the focus group discussions. Based on feedback from this consultation, the team proposed a focus group structure and collaborative process to maximise participation from the Directors of the eight Science Galleries, including staff from SGI. A suitable meeting date and time was established to accommodate time zone differences and to align with SGN's regular meetings.

A total of eight participants took part in the one-hour focus group discussion on 20 April 2022 (AEST). The session started with a brief introduction, a 15-minute large group discussion on the first question, and 30 minutes of breakout-room discussion focusing on the subsequent questions. Once the focus group discussion was completed, two researchers engaged in data sorting and thematic analysis. The process included reading the text-based content on each digital sticky note and organising them according to patterns and themes. The broader project team was then consulted to provide further input on themes.

The second focus group discussion provided an opportunity for participants to discuss the data consolidated in the first focus group discussion and provide further feedback on the key research questions. This enabled the project team to validate the findings in the first focus group discussion. Additionally, insights on the key impact indicators were captured and included in the survey (see Phase 2). Six participants attended the second focus group discussion on 25 May 2022 (AEST).

PHASE 3: SURVEY

Survey research is a useful and legitimate approach to research that has clear benefits in helping to describe and explore variables and constructs of interest (Ponto, 2015). Two online surveys conducted via Qualtrics asked participants about the list of indicators that were important for Science Gallery as a network and in their local context. The two surveys are available in Appendix A.

Consistent with the literature and validated by data from the focus group discussion in Phase 1, 140 indicators were categorised into seven themes: (1) Cultural impacts, (2) Social impacts, (3) Educational impacts, (4) Health and wellbeing impacts, (5) Economic impacts, (6) Environmental and technology impacts, and (7) Policy and governance impacts. It was also noted that some of the indicators did not work in isolation. The power of their impact is on how the indicators are interconnected and/or intersected with each other to offer a more holistic view of impact for the SGN. In assessing the indicators by their importance, participants were asked to consider them independently and as indicators that are interconnected. A total of 17 completed responses were included in the final analyses.

PHASE 4: INTERVIEWS

The interviews were semi-structured and occurred over Zoom. Researchers used the questions to guide the discussion instead of controlling responses. All questions were asked in an unbiased, friendly, and non-threatening manner to allow participants to provide meaningful commentary about the topic (Yin, 2003), and to allow the participants to convey their views, experiences, and 'heart of the stories' that are valuable and useful for the study (Marshall & Rossman, 1989; Seidman, 2006). One researcher conducted all the interviews, with at least one other researcher attending the interviews to observe and take notes. The guiding questions for the semi-structured interviews were the same key research questions used in Phase 1 with one additional question: how do you think the SGN might gather data within the proposed framework to demonstrate 'good impact'?

Participants in Phase 3 included some Science Gallery Directors, as well as stakeholders they nominated. In total, eight participants were involved from Bengaluru, Berlin, Dublin, London and Melbourne.

DATA ANALYSIS

Quantitative survey data were analysed using SPSS and Excel. A range of analyses were conducted including descriptive and mean analyses. Qualitative focus group data were collected via MIRO. Interviews were conducted via Zoom, recorded, and transcribed. The qualitative data were analysed with the support of MaxQDA. Thematic analysis, a process of identifying patterns or themes within qualitative data (Braun & Clarke, 2006), was used in this part of the study.

SAMPLE

Participants included a combination of Directors of the SGN and their nominated staff, staff from SGI as well as stakeholders of the SGN nominated by the Directors. The distribution of participants for each phase is summarised in **Table 2**.

TABLE 2. NUMBER OF PARTICIPANTS ACROSS PHASES BY LOCATIONS

Location	Host university	Phase 1		Phase 2		Phase 3
		FDG 1 (*n*)*	FDG 2 (*n*)*	Survey-Global (*n*)	Survey-Local (*n*)	Interview (*n*)
Atlanta	Emory University	1	-	-	-	-
Bengaluru	Indian Institute of Science	1	1	-	2	2
Berlin	Technische Universität Berlin (TU Berlin)	-	1	2	2	2
Detroit	Michigan State University	-	-	-	-	-
Dublin	Trinity College Dublin	-	-	-	-	1
London	King's College London	1	1	-	-	-
Melbourne	University of Melbourne	1	-	-	11	2
Rotterdam	Erasmus Medical Center Rotterdam	1	-	-	-	-
	Science Gallery International	3	3	-	-	-
TOTAL		**8**	**6**	**2**	**15**	**7**

*FDG - Focus Group Discussion

4.
FINDINGS

The project team facilitated a thinking process centring on the long-term outcomes of impact for the SGN through the focus group discussions and interviews. Thematic analysis of the qualitative data was centred around the four subsidiary research questions.

The qualitative data on the MIRO boards are illustrated in **Figure 2**. The following provides a succinct overview of findings integrating data from the focus group discussions and interviews.

FIGURE 2. A SCREENSHOT OF THE MIRO BOARDS



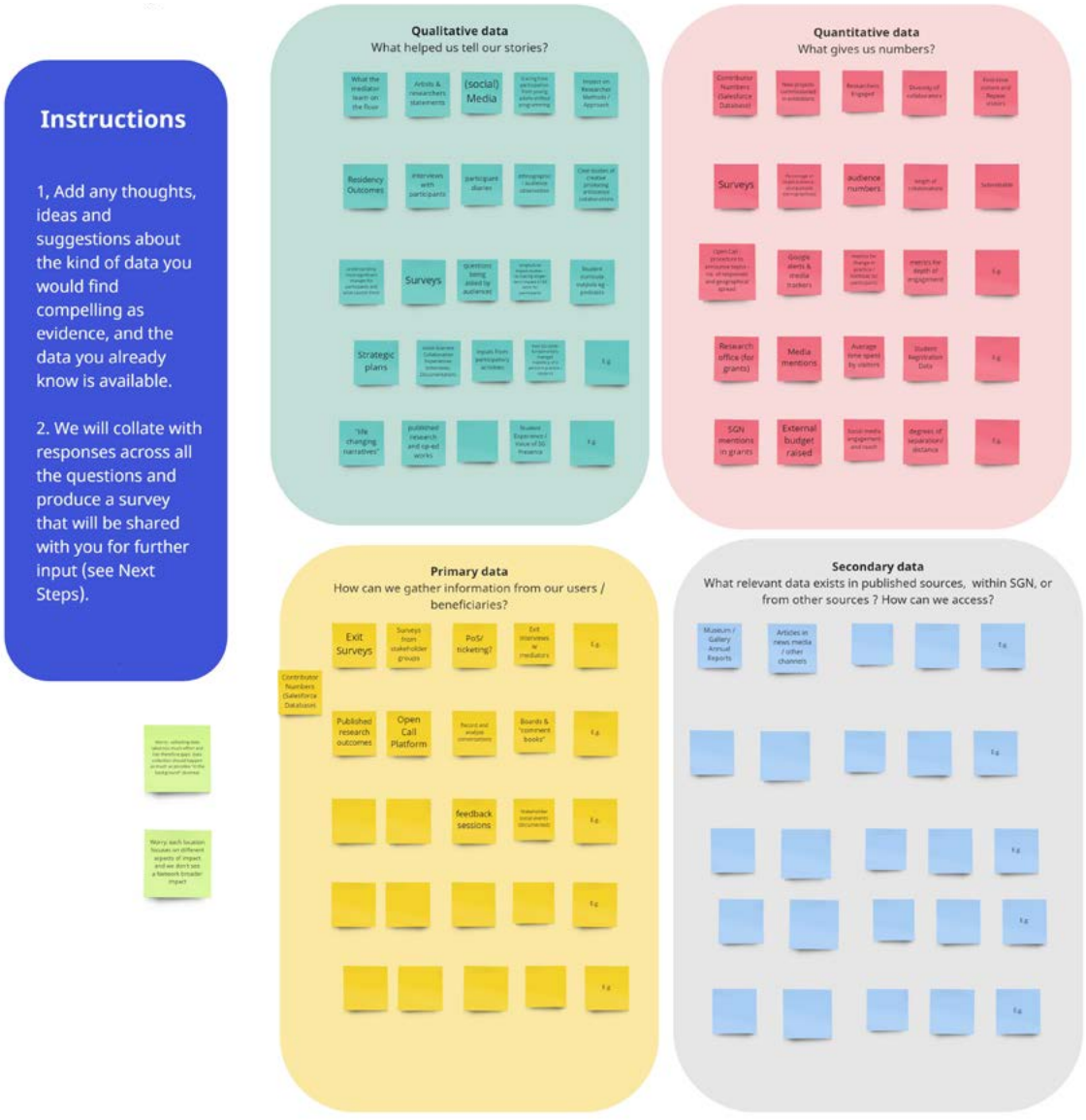
Question 1 - Small Group Discussion: What is the purpose of developing an impact framework? What does a 'useful impact framework' look like for SGN?



Question 2 - Small Group Discussion: 1) Who has been impacted by SGN's activities so far? 2) Who do you want to be 'impacted'?



Question 3 - Small Group Discussion: If this is what 'impact' looks like, what kind of data do we need?



‘GOOD IMPACT’ FOR THE SCIENCE GALLERY NETWORK

Three key themes emerged concerning what good impact means for the SGN: accountability to the host university, connections, and creating a change.

ACCOUNTABILITY TO THE HOST UNIVERSITIES

Each Science Gallery is accountable to its host university. Consequently, it is important for each Science Gallery to provide evidence on its impact on student enrolment, learning opportunities, research collaboration and reputation. As noted by Participant A: “The gallery is supposed to create an access point to the [university] but also increase the reputation.”

In ensuring that the universities understand the impact of the SGN, it is important to describe its impact on people’s lives and their ability to learn and engage in the community. Hence ‘good impact’ needs to be articulated not only by statistics but by the way Science Gallery tell ‘its story.’ The way Science Gallery gathers this information is incredibly important, as described by Participant E: “It’s telling that story and our statistics and the way we are … we need to have all the rigor but also be able to tell the story differently.”

CONNECTIONS

Connections appeared as a recurring theme throughout the interviews. In the context of ‘good impact’, connections refer to the ways in which Science Gallery is linked or associated with something else. These include links between Science Galleries and the universities, society and industry and the relationship between research and technology. These are evident in the comments made by participants such as these:

> *Produce a stronger engagement between the university and gallery.* Participant A

> *One of the sorts of pillars of impacts measured … is connecting innovation in research and technology and transferring that into services or goods or start-ups or implementations on the level of society.* Participant B

> *I think the industry partnerships are very, very important to this university and increasingly there is at least some sort of measure of a massive impact that’s going on.* Participant B

> *We’re actually showcasing how the university can be relevant in people’s lives without doing a degree. And how the university can share its resources to make the community a richer learning and more stimulating place to be.* Participant E

“We’re actually showcasing how the university can be relevant in people’s lives without doing a degree. And how the university can share its resources to make the community a richer learning and more stimulating place to be”.

“Another good impact for us would be that we can help reshape and remove the boundaries around the thinking in young people’s lives about what they are capable of, or they have access to, or [what] is a possibility within their lives”.

CREATING CHANGE

Another theme that frequently arose was the ability for the SGN to create change. In the context of ‘good impact’, creating change is about making or becoming different, or “broadening” (Participant F). Being a Science Gallery, creating a change in perceptions toward science and knowledge is critical for its impact agenda. For instance, Participant C felt that Science Gallery was where:

> *People recognise that there is a difference between science as a collection of facts and science as the process … for people to come to the gallery to think of a place where they can experiment and come to the science gallery as a place of engaging with the scientific method, rather than just the facts that already exist.*

Participant D felt that Science Gallery needed to make “new things so first you laugh, and then you think, or first you are horrified, and then you think, and it gives you space to perhaps shift.”

Creating a change in young people’s lives was also a recurring sub-theme. One participant noted that ‘good impact’ was about connecting young people to themselves, others, and society:

> *Another good impact for us would be that we can help reshape and remove the boundaries around the thinking in young people’s lives about what they are capable of, or they have access to, or [what] is a possibility within their lives … Having good impact is being able to have conversations that they wouldn’t have had if they hadn’t come to a Science Gallery …* Participant D

Additionally, creating change in the lives of young people is about developing their agency and empowering them to think about local and global challenges. As Participant D noted: “We really do want to be this welcoming space for young people to feel like they’ve got voice in agency within the organisation.” Participant F spoke about creating the change,

> *… needed for them to be able to deal with sort of the challenges of the workforce, or the challenges of the planet, whatever it might be … to sort of empower them ... and to be able to deal with [theses issues].*

FEATURES OF A SCIENCE GALLERY IMPACT FRAMEWORK

Participants listed several features that would be useful for a Science Gallery Impact Framework. These features included indicators that would show the impact "because we are a network" and engaging with the goals of the university such as climate change (Participant A), indicators that would provide longitudinal data (Participant D), indicators that are contextualised to the local context, such as quantitative data that suits a more technical university (Participant B), or indigenous contexts, internationalisation, and languages (Participant B), regions in the country (Participant C) or particular events such as the pandemic (Participant A). There was also a conception that the wording or phrasing of the indicators was critical, and the necessity to differentiate 'funding bodies' from 'industry' in stakeholder groups. Depending on the audience, more sophisticated language might be needed to generate interest and provide a sense of importance (Participant A).

Several participants sought a "simple platform to capture measurements" that "helps to develop strong [impact] narratives" (Focus Group Discussion). Participant G summarised a useful framework as one that is: "going to capture the collective impact of activities across maybe themes or centres or groupings of individuals … and the flexibility that this framework would allow for the evolution and growth over time."

It is important that any impact framework is articulated within the local and broader context within which the SGN is located. It is also critically important that staff are provided the professional development opportunities that enable them to learn about impact and what it means specifically to the SGN. As articulated in the focus group discussion, "professional development for staff, mediators, stakeholders … [on] what good impact means for SG" will enable and empower all staff members to achieve SGN's impact mission and goals.

"A Science Gallery Impact Framework is one that is: "going to capture the collective impact of activities across ... themes or centres or groupings of individuals ... and the flexibility that this framework would allow for the evolution and growth over time".

YOUNG ADULTS AS KEY STAKEHOLDERS OF THE SCIENCE GALLERY NETWORK

SGN has myriad stakeholders, each with specific ideas about impact. Young adults are a key constituency. Participant F, for example, felt that among "the major stakeholders, the first are young adults who are sort of our key target audience." The importance of young adults also emerged from the focus group discussions. Compiling several postings on focus group MIRO boards showed that empowering "young adults [to] become active change makers" so that they "have a sense of ownership and are shaping the galleries program and platforms" was a key focus at the SGN. The focus group discussion suggested that as young adults' "interests, concerns, passions are reflected in the programming," the Science Gallery's impact could be evidenced by this group's reporting "feeling positive change due their experience with SG."

TYPES OF DATA TO DEMONSTRATE 'GOOD IMPACT'

Participants provided a range of data that would demonstrate 'good impact' for the SGN. These included "hard data" (Participant B), films and photographs (Participant E), comments and feedback (Participant C), repeat visitors (Participants A, B and C), surveys and interviews (Participants A and D), stories, observations and case studies (Participant D), demographic data (Participant E), social media (Participant B) and the impact of physical buildings (Participant C). With regard to demographic data, Participant E stated:

> *I think a lot of the young people that are coming to us are not the top students. Coming at it from a different level where they're interested in other subjects. Because of this trans-disciplinary approach, they can see themselves in there somewhere. That's really important in terms of the information that we're gathering, the data we were collecting, and how it does represent other types of people outside of STEM. And who can be involved in it, without even knowing they're involved in it, and that is relevant to their lives and that's something I think we need to collect as well.*



Impact data that draws on qualitative "narratives" (Focus Group Discussion), stories, observations and case studies, are critical for the SGN because they provide the human connections that are important for cultural organisations. This is reiterated in previous subsections on the importance of connections to demonstrate 'good impact'. Participant D commented:

> *I would love to ensure ways of checking in that [visitors] feel welcomed in the space they occupy, that they feel welcomed in the space to say things that are important to them, whether that be positive or negative about the organisation. I guess a space where you are welcome, then you belong.*

Participant F thought that while "quantitative metrics would be really useful and is fairly standard … I think qualitative is where the meat is really at the end of the day." Participant G added that "The [impact narratives] should be really empowering and enabling and it should be tied to professional development."

Several participants discussed the need for data that indicates change, consistent with previous findings on what 'good impact' is. For instance, Participant B noted that:

> *In terms of measuring impact metrics … it would be important to sort of capture how people shift in their attitudes or opinions about what our creativity is, what the art science spaces [create], I think that would be really important.*

> *An effective Science Gallery Impact Framework should enable us "to say 'no' to what doesn't produce [good] impact – or adapt it so that it does".*

Participant E reiterated the importance of longitudinal data in an impact framework:

> *Imagine doing research on the impact over a long period of time and tracking those students and what the influence we had on them and their career choices, all the ways in which they engage as a community member with science and the future ideas. I think that real long-term research is a possibility that really excites me then in terms of schools and education.*

For most of the participants, the need to document change was the key element that sets the Science Gallery apart. Participant D reiterated that this was the 'point of difference' for an organisation like Science Gallery.

Most importantly, participants articulated the importance of 'good impact' aligning with the organisation's missions and goals. The metrics could ensure the activities would have "clear links to SG missions" and that the "true impact can be measured against SG goals" (Focus Group Discussion). The SG impact framework will enable the internal team to "[be] able to say 'no' to what doesn't produce [good] impact – or adapt it so that it does" (Focus Group Discussion).



IMPACT INDICATORS AT GLOBAL AND LOCAL LEVELS

Impact indicators were assessed at both the global and local levels. The findings are summarised in **Table 2**. A mean of 2.0 or greater indicated than an impact indicator was considered to be important or very important (highlighted in green in **Table 2**), whilst a mean of 1.0 or less was thought to be slightly important or not important (highlighted in red). A mean of between 1.0 and 2.0 indicates some disagreement between respondents about its importance. This is highlighted in amber in **Table 2**.

Only two staff completed the survey at the global level. The survey (See **Appendix A**) asked respondents to assess the impact indicators on their importance across the whole network. The analysis of the survey data at the global level showed that 73 impact indicators were considered to be important or very important, while 50 impact indicators were perceived to be slightly important or not important. There were variable responses on 17 of the indicators.

Fifteen staff from three Science Gallery locations (Melbourne, Bengaluru and Berlin) completed the survey at the local level. The survey (see **Appendix A**) asked respondents to assess the importance of the impact indicators in their local context. The analysis of the survey data revealed that 45 impact indicators were rated as important or very important by the respondents. Three indicators were perceived to be slightly important or not important by the respondents from all three locations.

Local differences were found between locations. There were several indicators that were considered important or very important by respondents of one location but not others. For instance, five indicators were important or very important to respondents from the Science Gallery Melbourne but not others. In a similar way, 24 indicators were important or very important to respondents from the Science Gallery Bengaluru. Only one indicator was rated as important or very important in the Science Gallery Berlin. These indicators could be used to measure impact relevant to these locations. These indicators are bolded in **Table 2**.

The comparison of the data at the global level and local levels suggested some similarity, with 38 indicators rated as important or very important both locally and globally. These 38 indicators were spread over six themes: educational impacts (10), social impacts (5), cultural impacts (8), environmental and technology impacts (4), economic impacts (10), and policy & governance impacts (1). It is interesting to note that none of the impact indicators in health and wellbeing were consistently rated as important or very important across the network. These indicators are summarised in **Table 3**. An additional seven indicators were rated as important or very important at the local level, across three locations, but not at the global level. These include impact indicators measuring educational, social, environmental, technology, and economic outcomes. These seven indicators are summarised in **Table 4**. These 45 indicators could be considered the key impact indicators that could be used to measure impact across the SGN and at each location. These indicators could be considered practicable and substantive, i.e., linked to outcomes (Mahat, 2016).

TABLE 3. SUMMARY OF SURVEY FINDINGS

Impact theme	No.	Impact outcomes	Impact indicators	Global mean (*n*=2)	Local mean		
					Bengaluru (*n*=2)	Melbourne (*n*=11)	Berlin (*n*=2)
Health & Wellbeing Impacts	**1**	**Physical and/or mental wellbeing improved**	**Ability to overcome challenges is strengthened**	**2.5**	**2.5**	**1.89**	**1.5**
	2	Physical and/or mental wellbeing improved	Experiments of trying new things increased	2	2.5	2.56	1.5
	3	**Physical and/or mental wellbeing improved**	**The capability of participants is stretched**	**1.5**	**2.5**	**1.78**	**1**
	4	Physical and/or mental wellbeing improved	I felt like I could be myself	1	2.5	2.44	1
	5	Physical and/or mental wellbeing improved	I feel more confident about doing new things	1	2.5	2.11	1
	6	Physical and/or mental wellbeing improved	The ___ (e.g. program, exhibition) helped me to see myself differently	0.5	2	2	1
	7	Physical and/or mental wellbeing improved	Physical activeness improved	0.5	1.5	0.89	0
	8	**Physical and/or mental wellbeing improved**	**Mental wellbeing improved**	**1**	**2.5**	**1.56**	**1**
	9	Physical and/or mental wellbeing improved	Increased descriptions of agency and hope	2.5	2.5	2.11	1
	10	**Physical and/or mental wellbeing improved**	**Understanding of health issues increased**	**1**	**2.5**	**1.44**	**0**
	11	Emotional wellbeing improved	Feelings of enthusiasm, joy, happiness and excitement increased	1.5	2.5	2.22	0
	12	**Emotional wellbeing improved**	**Visual pleasure experienced**	**0**	**1.5**	**2.11**	**0**
Educational Impacts	13	Change in awareness according to topics	Awareness of global issues raised	3	3	2.5	3
	14	Change in awareness according to topics	Awareness of local issues raised	1	3	2.3	3
	15	Change in practice according to topics	Change in practice for participants increased	2.5	2	1.7	3
	16	Change in knowledge about the topics	The ___ (e.g. program, exhibition) was different from things I've experienced before	2	3	2.5	3
	17	Change in knowledge about the topics	Public knowledge about topics promoted	1	3	2.3	1
	18	Change in knowledge about the topics	Number of new ideas for research increased	2	2	2	1.5
	19	**Change in knowledge about the topics**	**Number and types of research and researchers involved increased**	**2**	**2.5**	**1.7**	**1.5**
	20	Change in knowledge about the topics	Ratings and descriptions of the SGN's relevance, use and value to research improved	3	2	1.8	2
	21	**Change in knowledge about the topics**	**Published research outcomes increased**	**1.5**	**2**	**1.2**	**0.5**
	22	Change in knowledge about the topics	Research-informed policy making assisted	2	2	1.4	2

TABLE 3. SUMMARY OF SURVEY FINDINGS (CONT'D)

Impact theme	No.	Impact outcomes	Impact indicators	Global mean (*n*=2)	Local mean		
					Bengaluru (*n*=2)	Melbourne (*n*=11)	Berlin (*n*=2)
	23	Increase academic performance	Types, quality and depth of learning increased	3	3	2.44	3
	24	Increase academic performance	Engagement of students increased	3	3	2.89	3
	25	Increase academic performance	Increased learning opportunities	3	3	2.56	3
	26	Increase academic performance	Increased student mobility and exchange	2	2	1.89	2
	27	Increase academic performance	Student learning outcomes improved	3	2.5	2.33	2
	28	Increase academic performance	Longitudinal impact on student learning enabled	2	2.5	2.67	2
	29	Change in skills	Sensory skills improved	2	2.5	1.56	2
	30	Change in skills	Mapping skills improved	2	2.5	1.56	2
	31	Change in skills	Cognitive problem solving skills improved	3	2.5	2	3
	32	Change in skills	Interpersonal skills improved	3	2.5	2	3
Educational Impacts	**33**	**Change in skills**	**Artistic skills improved**	**0.5**	**2**	**1.33**	**0**
	34	Change in individual capacity	The ___ (e.g. program, exhibition) was thought-provoking	3	3	2.89	3
	35	**Change in individual capacity**	**Help-seeking behaviour increased**	**1**	**2.5**	**1.44**	**0.5**
	36	**Change in individual capacity**	**Resilience enhanced**	**1**	**2.5**	**1.89**	**0.5**
	37	Change in individual capacity	I did something I didn't know I was capable of	0.5	2.5	2	0.5
	38	Change in individual capacity	I feel motivated to do more creative things in the future	0.5	2.5	2.33	1
	39	**Change in individual capacity**	**Self-awareness increased**	**1**	**2.5**	**1.75**	**1**
	40	Quality of the programs increased	Number of strategies implemented to reach out increased	3	2.5	1.56	3
	41	Quality of the programs increased	Quality of strategies implemented to reach out improved	3	3	1.78	3
	42	Increased new collaborations	Number and sustainment of new modes of collaboration increased	3	2.5	2.4	3
	43	Increased new collaborations	Activated researchers' communication	1.5	2.5	2.1	2
	44	Increased new collaborations	Number of research collaborations increased	2	2.5	1.9	2
Social Impacts	45	Increased new collaborations	Stimulated transdisciplinary and collaborative research projects	3	2.5	2.6	3
	46	Increased new collaborations	Collaboration among artists & researchers increased	2.5	2.5	2.4	2.5
	47	Increased new collaborations	Artist-Scientist Collaboration Experiences increased	3	2.5	2.5	3

TABLE 3. SUMMARY OF SURVEY FINDINGS (CONT'D)

Impact theme	No.	Impact outcomes	Impact indicators	Global mean (*n*=2)	Local mean		
					Bengaluru (*n*=2)	Melbourne (*n*=11)	Berlin (*n*=2)
Social impacts	48	Increased new collaborations	Corporate and alumni engagement enhanced	2.5	1	1.2	1
	49	Social connectedness enhanced	The connection among participants is enhanced	2	2	2	2
	50	**Social connectedness enhanced**	**Supportive behaviour is increased**	**2**	**1.5**	**2**	**1**
	51	Social connectedness enhanced	Sense of belonging is increased	1	2	2.3	0.5
	52	Social differences bridged	Equality is improved	2	2.5	2.2	1
	53	Social differences bridged	Access to cultural activities increased	0.5	2	2.4	0.5
	54	Social differences bridged	The ___ (e.g. program, exhibition) helped me understand other people's points of view	3	2.5	2.5	1
	55	**Social differences bridged**	**Recognition of contribution improved**	**1**	**2.5**	**1.6**	**0**
	56	Feeling valued experienced	Voice of participants is respected	1.5	2.5	2.6	2
	57	Feeling valued experienced	Contribution from participants increased	1.5	2.5	2.3	2
	58	**Feeling valued experienced**	**Helpful feedback is provided for participants**	**0.5**	**2**	**1.4**	**1**
	59	**Sense of safety and security supported**	**A sense of safety increased**	**0**	**2.5**	**1.7**	**0**
	60	Sense of safety and security supported	Feeling of inclusion enhanced	2	2.5	2.4	1
	61	Sense of safety and security supported	Self-acceptance enhanced	1	2.5	2	0.5
Cultural impacts	62	Creativity stimulated	Participant's creativity is inspired	3	2.5	2.55	3
	63	Creativity stimulated	Participant's curiosity is sparked	3	2.5	3	3
	64	Creativity stimulated	A new point of view is explored or presented	3	2.5	2.64	3
	65	**Creativity stimulated**	**I feel more able to express myself creatively**	**1**	**2**	**1.73**	**1**
	66	Aesthetic inspiration experienced	Participants are affected emotionally	0	1	1.73	1
	67	Aesthetic inspiration experienced	A sense of joy, beauty and wonder is experienced	0	2.5	2	1
	68	Aesthetic inspiration experienced	The ___ (e.g. program, exhibition) was well thought through and put together	3	3	2.55	3
	69	Knowledge, ideas and insight gained	The ___ (e.g. program, exhibition) was different from things I've experienced before	2	3	2.64	3
	70	Knowledge, ideas and insight gained	New insight or knowledge is gained	3	2	2.64	2

TABLE 3. SUMMARY OF SURVEY FINDINGS (CONT'D)

Impact theme	No.	Impact outcomes	Impact indicators	Global mean (*n*=2)	Local mean		
					Bengaluru (*n*=2)	Melbourne (*n*=11)	Berlin (*n*=2)
Cultural impacts	71	Knowledge, ideas and insight gained	A relevant understanding of today's world is generated	3	3	2.45	3
	72	Knowledge, ideas and insight gained	New understanding and perspective of arts are generated	3	2	2	3
	73	Knowledge, ideas and insight gained	Participants feel more confident around contemporary art	0	1	1.55	1
	74	Diversity of cultural expression appreciated	Understanding of culture deepened	2	2	1.64	2
	75	**Diversity of cultural expression appreciated**	**Advocacy for culture increased**	**1**	**2**	**1.64**	**0**
	76	Diversity of cultural expression appreciated	Cultural diversity is respected	3	2.5	2.64	1
	77	Diversity of cultural expression appreciated	Participants are provided opportunities to reflect on their own beliefs	0	2	2.18	0
	78	Diversity of cultural expression appreciated	A broad and inclusive range of voices is reflected	3	3	2.64	1.5
	79	Diversity of cultural expression appreciated	Participant's cultural pride is strengthened	1	1	1.36	0
	80	**Placemaking**	**The ___ (e.g. program, exhibition) helped me to feel connected to people in the community**	**1**	**1.5**	**1.91**	**2**
	81	Placemaking	The ___ (e.g. program, exhibition) provides an important addition to the cultural life of the area	0	1.5	2.18	1.5
	82	Sense of belonging to a shared cultural heritage deepened	The ___ (e.g. program, exhibition) strengthened my cultural pride	0.5	0.5	1.45	0
	83	Sense of belonging to a shared cultural heritage deepened	Connection to a shared history/culture is built	1.5	1	1.55	0
	84	Sense of belonging to a shared cultural heritage deepened	Participant's cultural heritage is celebrated	1	0.5	1.45	0
Environmental & Technology Impacts	**85**	**Positive sense of place in the local built and/or natural environment enhanced**	**Appreciation of the places is increased**	**1.5**	**2.5**	**1.75**	**0**
	86	Positive sense of place in the local built and/or natural environment enhanced	Sense of pride for local area is increased	1	1.5	1.63	0
	87	Understanding of ecological issues increased	Awareness of environmental issues is raised	3	2.5	2.25	3

TABLE 3. SUMMARY OF SURVEY FINDINGS (CONT'D)

Impact theme	No.	Impact outcomes	Impact indicators	Global mean (*n*=2)	Local mean		
					Bengaluru (*n*=2)	Melbourne (*n*=11)	Berlin (*n*=2)
Environmental & Technology Impacts	88	Natural world valued	The ___ (e.g. program, exhibition) has something to say about the world in which we live	3	3	2.75	3
	89	**Natural world valued**	**The ___ (e.g. program, exhibition) made me feel connected to nature**	**1**	**2.5**	**1.75**	**0**
	90	Natural world valued	The ___ (e.g. program, exhibition) opened my eyes to issues in the environment	2.5	3	2.38	2
	91	Motivation for environmental stewardship increased	Pro-environmental activity increased	1.5	2.5	2.13	2
	92	Motivation for environmental stewardship increased	Conversation about local environment increased	1.5	2.5	2.13	3
	93	Technological world valued	The connection between technology and people is recognized and appreciated	3	2	2	3
	94	Technological world valued	Increased use of technology	1	1	1.38	1
Economic Impacts	**95**	**Professional practice capability enhanced**	**Professional development for stakeholders**	**1**	**2.5**	**1.38**	**0**
	96	**Professional practice capability enhanced**	**Confidence about future employment improved**	**1.5**	**2**	**1.75**	**0**
	97	Professional practice capability enhanced	Network in working field enhanced	1	2.5	2.25	0
	98	**Professional practice capability enhanced**	**New opportunities for employment created**	**1**	**1.5**	**2.63**	**0**
	99	Employment enhancing skill development facilitated	Impacts on career choices enacted	2.5	3	2.63	0
	100	Employment enhancing skill development facilitated	New skills related to work gained	1	3	2.25	0.5
	101	Employment enhancing skill development facilitated	Increased employment	1	2	2.25	0
	102	Individual economic wellbeing increased	Individual's financial situation improved	0	1.5	1.13	0
	103	Individual economic wellbeing increased	Individual's arts practice or business developed	1	1.5	1.25	0.5
	104	Local economy supported	New platforms created for new work	3	2	1.88	3
	105	Local economy supported	The profile of the artists and/or organisations raised	1	2	2.5	1.5
	106	Local economy supported	Growth of new audiences	3	3	2.5	2.5

TABLE 3. SUMMARY OF SURVEY FINDINGS (CONT'D)

Impact theme	No.	Impact outcomes	Impact indicators	Global mean (*n*=2)	Local mean		
					Bengaluru (*n*=2)	Melbourne (*n*=11)	Berlin (*n*=2)
Economic Impacts	107	Local economy supported	Diversity of demography groups increased	3	3	2.63	1
	108	Local economy supported	New income streams generated	3	2	2.25	3
	109	Financial resources input increased	Number of donors and amount of donations increased	3	2	2	3
	110	Financial resources input increased	Dollar amount from internal source increased	3	2	1.88	3
	111	Financial resources input increased	Number of grant proposals (submitted and successful) increased	2.5	2.5	2	3
	112	Human resources input increased	Number of staff increased	1.5	2.5	1.88	2.5
	113	Human resources input increased	Range of expertise widened	3	2.5	2.13	2
	114	**Human resources input increased**	**Staff: client ratio increased**	**2**	**2**	**1.25**	**0**
	115	Human resources input increased	Inputs from participatory activities increased	3	3	2.17	2
	116	**Human resources input increased**	**Number and types of partners increased**	**2.5**	**2.5**	**1.88**	**1.5**
	117	Human resources input increased	Quality of partnerships increased	3	2.5	2.5	2.5
	118	Site facilities and equipment input increased	Disability access improved	2	2.5	2.38	1
	119	Site facilities and equipment input increased	Multilingual services provided	3	2.5	2	2
	120	Administrative resources input increased	New software/apps purchased	0.5	1.5	0.88	0.5
	121	Implementation of the programs increased	Number of exhibitions in a year increased	0	0.5	0.13	0
	122	Implementation of the programs increased	Number of workshops implemented in a year increased	1.5	1	0.75	1
	123	Implementation of the programs increased	Number of artists involved in a year increased	1	1	1	0.5
	124	Implementation of the programs increased	Other activities increased (BBQs, networking, media release, book launches etc)	1.5	1.5	1.25	1.5
	125	Implementation of the programs increased	Media coverage increased	3	1.5	2.25	3
	126	**Implementation of the programs increased**	**Quantity of material used to catch people's attention increased**	**1**	**1.5**	**2**	**0**
	127	Implementation of the programs increased	Quality of material used for target audience improved	2.5	2.5	2.25	2.5

TABLE 3. SUMMARY OF SURVEY FINDINGS (CONT'D)

Impact theme	No.	Impact outcomes	Impact indicators	Global mean (*n*=2)	Local mean		
					Bengaluru (*n*=2)	Melbourne (*n*=11)	Berlin (*n*=2)
Economic Impacts	128	Outputs of program increased	Student enrolment increased	3	1.5	2.5	3
	129	Outputs of program increased	Proportion of target population increased	1	2	2.63	2
	130	Outputs of program increased	Rate of returned visitors increased	3	2	2.5	3
	131	Outputs of program increased	Number of new key stakeholders increased	1.5	2	2	1.5
	132	**Outputs of program increased**	**Average time spent by visitors increased**	**2.5**	**2.5**	**1.75**	**0**
Policy & Governance Impacts	**133**	**Access to beneficial networks and other resources increased**	**Number of people involved in voluntary activities for the community increased**	**0.5**	**2**	**1**	**0**
	134	Access to beneficial networks and other resources increased	Community networks enhanced	2	2.5	2.25	2
	135	Access to beneficial networks and other resources increased	Means for communication and mutual learning are provided	3	2.5	2.13	1
	136	Agency and voice enabled	Civic-minded behaviour increased	2	2	2.13	1
	137	Agency and voice enabled	Engagement with local or school politics increased	1.5	1	1.63	1
	138	Civic pride enhanced	Architectural and/or cultural heritage is preserved	1	1.5	1.38	0
	139	Civic trust inspired	Relationships with municipal and regional government improved	2	1.5	1.5	1
	140	**Civic trust inspired**	**Higher levels of generalised trust, political trust and efficacy**	**1.5**	**2**	**1.63**	**0**

TABLE 4. IMPACT INDICATORS THAT ARE IMPORTANT OR VERY IMPORTANT ACROSS THE NETWORK

Impact theme	No.	Impact outcomes	Impact indicators	Global mean (*n*=2)	Local mean		
					Bengaluru (*n*=2)	Melbourne (*n*=11)	Berlin (*n*=2)
Educational Impacts	1	Change in awareness according to topics	Awareness of global issues raised	3	3	2.5	3
	2	Change in knowledge about the topics	The ___ (e.g. program, exhibition) was different from things I've experienced before	2	3	2.5	3
	3	Increased academic performance	Types, quality and depth of learning increased	3	3	2.44	3
	4	Increased academic performance	Engagement of students increased	3	3	2.89	3
	5	Increased academic performance	Increased learning opportunities	3	3	2.56	3
	6	Increased academic performance	Student learning outcomes improved	3	2.5	2.33	2
	7	Increased academic performance	Longitudinal impact on student learning enabled	2	2.5	2.67	2
	8	Change in skills	Cognitive problem-solving skills improved	3	2.5	2	3
	9	Change in skills	Interpersonal skills improved	3	2.5	2	3
	10	Change in individual capacity	The ___ (e.g. program, exhibition) was thought-provoking	3	3	2.89	3
Social Impacts	11	Increased new collaborations	Number and sustainment of new modes of collaboration increased	3	2.5	2.4	3
	12	Increased new collaborations	Stimulated transdisciplinary and collaborative research projects	3	2.5	2.6	3
	13	Increased new collaborations	Collaboration among artists & researchers increased	2.5	2.5	2.4	2.5
	14	Increased new collaborations	Artist-Scientist Collaboration Experiences increased	3	2.5	2.5	3
	15	Social connectedness enhanced	The connection among participants is enhanced	2	2	2	2
Cultural Impacts	16	Creativity stimulated	Participant's creativity is inspired	3	2.5	2.55	3
	17	Creativity stimulated	Participant's curiosity is sparked	3	2.5	3	3
	18	Creativity stimulated	A new point of view is explored or presented	3	2.5	2.64	3
	19	Aesthetic inspiration experienced	The ___ (e.g., program, exhibition) was well thought through and put together	3	3	2.55	3
	20	Knowledge, ideas and insight gained	The ___ (e.g., program, exhibition) was different from things I've experienced before	2	3	2.64	3
	21	Knowledge, ideas and insight gained	New insight or knowledge is gained	3	2	2.64	2

TABLE 4. IMPACT INDICATORS THAT ARE IMPORTANT OR VERY IMPORTANT ACROSS THE NETWORK (CONT'D)

Impact theme	No.	Impact outcomes	Impact indicators	Global mean (*n*=2)	Local mean		
					Bengaluru (*n*=2)	Melbourne (*n*=11)	Berlin (*n*=2)
Cultural Impacts	22	Knowledge, ideas and insight gained	A relevant understanding of today's world is generated	3	3	2.45	3
	23	Knowledge, ideas and insight gained	New understanding and perspective of arts are generated	3	2	2	3
Environmental & Technology Impacts	24	Understanding of ecological issues increased	Awareness of environmental issues is raised	3	2.5	2.25	3
	25	Natural world valued	The ___ (e.g. program, exhibition) has something to say about the world in which we live	3	3	2.75	3
	26	Natural world valued	The ___ (e.g. program, exhibition) opened my eyes to issues in the environment	2.5	3	2.38	2
	27	Technological world valued	The connection between technology and people is recognized and appreciated	3	2	2	3
Economic Impacts	28	Local economy supported	Growth of new audiences	3	3	2.5	2.5
	29	Local economy supported	New income streams generated	3	2	2.25	3
	30	Financial resources input increased	Number of donors and amount of donations increased	3	2	2	3
	31	Financial resources input increased	Number of grant proposals (submitted and successful) increased	2.5	2.5	2	3
	32	Human resources input increased	Range of expertise widened	3	2.5	2.13	2
	33	Human resources input increased	Inputs from participatory activities increased	3	3	2.17	2
	34	Human resources input increased	Quality of partnerships increased	3	2.5	2.5	2.5
	35	Site facilities and equipment input increased	Multilingual services provided	3	2.5	2	2
	36	Implementation of the programs increased	Quality of material used for target audience improved	2.5	2.5	2.25	2.5
	37	Outputs of program increased	Rate of returned visitors increased	3	2	2.5	3
Policy & Governance Impacts	38	Access to beneficial networks and other resources increased	Community networks enhanced	2	2.5	2.25	2



TABLE 5. IMPACT INDICATORS THAT ARE IMPORTANT OR VERY IMPORTANT AT THE LOCAL LEVEL ONLY

Impact theme	No.	Impact outcomes	Impact indicators	Global mean (*n*=2)	Local mean		
					Bengaluru (*n*=2)	Melbourne (*n*=11)	Berlin (*n*=2)
Educational Impacts	1	Change in awareness according to topics	Awareness of local issues raised	1	3	2.3	3
Social Impacts	2	Increased new collaborations	Activated researchers' communication	1.5	2.5	2.1	2
	3	Feeling valued experienced	Voice of participants is respected	1.5	2.5	2.6	2
	4	Feeling valued experienced	Contribution from participants increased	1.5	2.5	2.3	2
Environmental & Technology Impacts	5	Motivation for environmental stewardship increased	Pro-environmental activity increased	1.5	2.5	2.13	2
	6	Motivation for environmental stewardship increased	Conversation about local environment increased	1.5	2.5	2.13	3
Economic Impacts	7	Outputs of program increased	Proportion of target population increased	1	2	2.63	2

5.
DISCUSSION AND RECOMMENDATIONS

The aim of this project was to develop an impact framework for the SGN. We began the study by taking stock of the diverse perspectives of impact, considering the transdisciplinary and multinational essence of the SGN. The desktop review presents an overview of impact across a range of sectors that were aligned, for the most part, with the project brief. This desktop review includes frameworks, case studies and examples drawn from the cultural field and the cultural partners of Science Gallery, the communities where the SGN is active, the university and academic partners where it operates, the industry and private sector, government and public policy, and schools.

In consultation with Science Gallery International, we conducted focus group discussions, interviews and surveys to ensure that the study considered the contextual aspects of impact across the network and delivered a fuller picture of impact that considers multiple perspectives. The findings from the qualitative component of the study were centred around the conceptualisation of 'good impact', features of a useful impact framework, and types of data that could demonstrate this impact. The findings from the quantitative component of the study found key indicators that could be useful across the network, and a range of additional indicators relevant to local contexts.

Taken together, the findings of the study provide five key recommendations that respond to the two research questions set out at the beginning of the study and that provided the scope of the project:

1. What qualitative and quantitative indicators and metrics can be used to track the effectiveness of SGN across multiple audiences and contexts?
2. How can these indicators be presented in a framework that can simultaneously showcase impact appropriate to each location and across the SGN as a whole?

KEY RECOMMENDATIONS

Recommendation 1. The term 'creativities' could be used to ensure that transdisciplinary perspectives are captured in a way that does not problematically filter and conflate them.

The SGN consists of "leading universities united around a singular mission: to ignite creativity and discovery where science and art collide" (Science Gallery, 2022). This mission is unique and, partly because of this uniqueness, there is a need to pluralise creativity. The term 'creativities' could be used to ensure that transdisciplinary perspectives are captured in a way that does not problematically filter and conflate them. Further to this, there are various methods (see Sawyer, 2012) that could be used to evaluate whether SG's exhibitions, workshops and events lead to the generation of unique/original ideas or products that have value, thus determining whether SG has ignited different types of creativity.

Recommendation 2. A definition of 'good impact' for the SGN can be conceptualised as "developing authentic connections and relationships, creating change that has a positive and sustainable effect on young people's lives whilst aligning to the broad objectives and goals of the university."

Through a co-design process that aligns with the Theory of Change, findings provided clarity on the definition of good impact from broad (global and network) to narrow (local and individual) perspectives. In simple terms, 'good impact' for the SGN can be conceptualised as "developing authentic connections and relationships, creating change that has a positive and sustainable effect on young people's lives whilst aligning to the broad objectives and goals of the university." This definition should be shared with the wider network and used as a point of departure for further conceptualisation and to generate discussion on impact.

Recommendation 3. 45 key impact indicators that demonstrates 'good impact' could be measured across the network whilst taking into account the nuances of local contexts.

Indicators that demonstrate 'good impact' could include 45 key impact indicators that could be measured across the network whilst taking into account the nuances of local contexts. These indicators are those that are considered important or very important across the network (see **Tables 4** and **5**). Several additional impact indicators could be considered relevant to local contexts. It is important that the SGN ensures provision of salient and robust outcome-oriented metrics focusing on the 'areas that count'. A summary of the indicators is provided in **Table 6**.

TABLE 6. SUMMARY OF IMPACT INDICATORS

Impact theme	No.	Impact outcomes	Impact indicators
Educational Impacts	1	Change in awareness according to topics	Awareness of global issues raised
	2	Change in knowledge about the topics	The ___ (e.g. program, exhibition) was different from things I've experienced before
	3	Increased academic performance	Types, quality and depth of learning increased
	4	Increased academic performance	Engagement of students increased
	5	Increased academic performance	Increased learning opportunities
	6	Increased academic performance	Student learning outcomes improved
	7	Increased academic performance	Longitudinal impact on student learning enabled
	8	Change in skills	Cognitive problem-solving skills improved
	9	Change in skills	Interpersonal skills improved
	10	Change in individual capacity	The ___ (e.g. program, exhibition) was thought-provoking
	11	Change in awareness according to topics	Awareness of local issues raised
Social Impacts	12	Increased new collaborations	Number and sustainment of new modes of collaboration increased
	13	Increased new collaborations	Stimulated transdisciplinary and collaborative research projects
	14	Increased new collaborations	Collaboration among artists & researchers increased
	15	Increased new collaborations	Artist-Scientist Collaboration Experiences increased
	16	Social connectedness enhanced	The connection among participants is enhanced
	17	Increased new collaborations	Activated researchers' communication
	18	Feeling valued experienced	Voice of participants is respected
	19	Feeling valued experienced	Contribution from participants increased
Cultural Impacts	20	Creativity stimulated	Participant's creativity is inspired
	21	Creativity stimulated	Participant's curiosity is sparked
	22	Creativity stimulated	A new point of view is explored or presented
	23	Aesthetic inspiration experienced	The ___ (e.g., program, exhibition) was well thought through and put together
	24	Knowledge, ideas and insight gained	The ___ (e.g., program, exhibition) was different from things I've experienced before
	25	Knowledge, ideas and insight gained	New insight or knowledge is gained
	26	Knowledge, ideas and insight gained	A relevant understanding of today's world is generated
	27	Knowledge, ideas and insight gained	New understanding and perspective of arts are generated
Environmental & Technology Impacts	28	Understanding of ecological issues increased	Awareness of environmental issues is raised
	29	Natural world valued	The ___ (e.g., program, exhibition) has something to say about the world in which we live
	30	Natural world valued	The ___ (e.g., program, exhibition) opened my eyes to issues in the environment
	31	Technological world valued	The connection between technology and people is recognized and appreciated
	32	Motivation for environmental stewardship increased	Pro-environmental activity increased
	33	Motivation for environmental stewardship increased	Conversation about local environment increased

TABLE 6. SUMMARY OF IMPACT INDICATORS

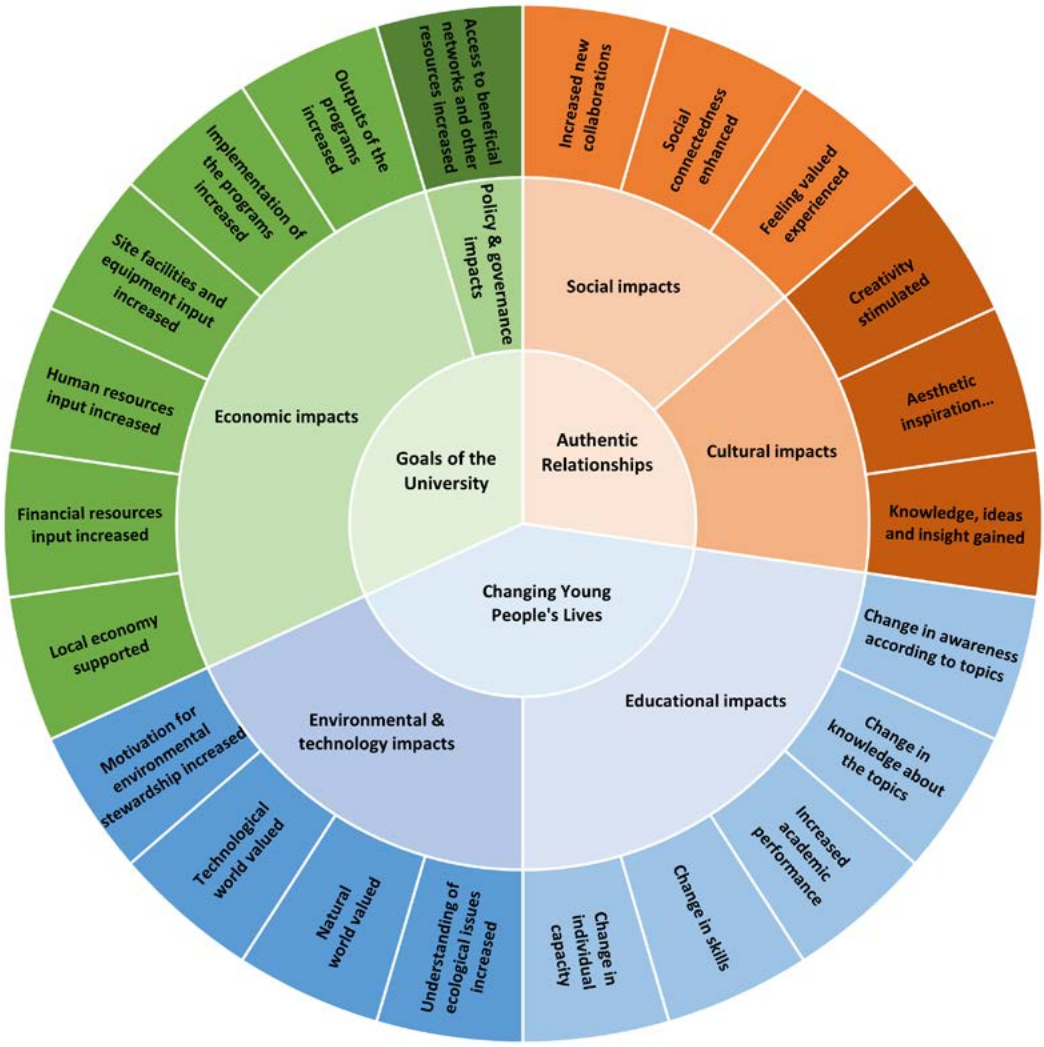
Impact theme	No.	Impact outcomes	Impact indicators
Economic Impacts	34	Local economy supported	Growth of new audiences
	35	Local economy supported	New income streams generated
	36	Financial resources input increased	Number of donors and amount of donations increased
	37	Financial resources input increased	Number of grant proposals (submitted and successful) increased
	38	Human resources input increased	Range of expertise widened
	39	Human resources input increased	Inputs from participatory activities increased
	40	Human resources input increased	Quality of partnerships increased
	41	Site facilities and equipment input increased	Multilingual services provided
	42	Implementation of the programs increased	Quality of material used for target audience improved
	43	Outputs of program increased	Rate of returned visitors increased
	44	Outputs of program increased	Proportion of target population increased
Policy & Governance Impacts	45	Access to beneficial networks and other resources increased	Community networks enhanced

Recommendation 4. An SGN Impact Framework that conceptualises and measures 'good impact' across disciplinary boundaries could be used as part of SGN's broader discussions on impact.

Whilst there are several relevant extant impact frameworks, none of these frameworks perfectly matches the needs of the SGN but each casts light on the core questions of the study. Our examination of them supports the development of an SGN Impact Framework that takes into account the definition of good impact (see Recommendation 2) and outcome indicators (see Recommendation 3) in a way that is in-line with current practice (see Desktop review). Figure 3 illustrates the SGN Impact Framework

The first inner most layer relates to the three themes of good impact: authentic relationships, changing young peoples' lives and goals of the university. The second layer relates to the outcome themes identified as most important for SGN. Finally, the third and outer most layer relates to the impact outcomes that SGN wishes to achieve. Taken together, the SGN Impact Framework provides an approach that conceptualises and measures 'good impact' across disciplinary boundaries.

FIGURE 3 THE SGN IMPACT FRAMEWORK



Recommendation 5. Capability building of SGN staff on Theory of Change and impact management is essential to ensure impact is well thought-through, planned, documented and communicated from the beginning to the end of each new initiative.

Capability building of SGN staff on Theory of Change and impact management is essential. This will ensure that SGN impact is well thought-through, planned, documented and communicated from the beginning to the end of each new initiative. Professional learning and capacity building can be structured by way of formal training programs and seminars, or by way of informal 'communities of practice' and mentoring.

6.
CONCLUSIONS AND IMPLICATIONS



Impact, as the desktop review alluded, is a multifarious concept that can mean different things to different individuals and institutions. Developing a coherent impact framework for any organisation requires a shared understanding of what 'good impact' is and how this is aligned to the overall vision of the organisation. This becomes critical for an organisation that is as transdisciplinary and as global as Science Gallery. A shared collective understanding will also ensure that any framework that is developed meets the needs of the organisation and its constituents.

This study provided a robust approach to understanding impact for Science Gallery and the range of impact indicators that could be used to track the effectiveness of Science Gallery across multiple audiences and contexts. One limitation to the study however is noteworthy. The surveys had limited responses from across the Science Gallery Network. In particular, the global survey had only two responses and both from the same location. Whilst the small response rates may not necessarily lead to biased results, it is acknowledged that a larger group is likely to give more reliable results.

The key recommendations in the study are provided as a starting point rather than an end point. More work is needed to further explore and gain consensus on what impact means to Science Gallery and the range of impact indicators that would demonstrate 'good impact.' Any change management process—from the earliest stages of conception and preparation, through implementation and, finally, to resolution—takes time. This work would be worthy and important because it would help Science Gallery focus on its overall purpose—a commitment to bringing science, art, technology and design together to deliver world-class educational and cultural experiences for young people, thus enabling the Science Gallery Network to ignite creativity and discovery where science and art collide.

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PART 3:
DESKTOP REVIEW

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1. INTRODUCTION

In its simplest form, impact can be defined as “the force of impression of one thing on another: a significant or major effect” (Merriam-Webster, 2022). Spurred on by national assessments of research impact, impact is now present in many facets of higher education and academic life. In a higher education context, impact can be defined as "an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia” (Research Excellence Framework, 2019, p. 68). Much has been written about the definitions of impact and what they include, exclude, or marginalise (for example, Smith et al., 2020). The nuances of how impact is conceptualised make for worthwhile debate, however, what “good impact” looks like sits with individuals or institutions. As a result of this lack of clarity, there is uncertainty about how institutions can understand and achieve impact.

The following desktop review contextualises our proposed impact framework that is detailed in the main report. The desktop review provides an overview of relevant frameworks viewed through the prism of SGN’s rubrics as detailed in its brief. None of these frameworks perfectly matches the needs of SGN but each casts light on the core questions of our study: what is “good impact” and how can such impact be effectively documented and measured? The purpose of this desktop review is, then, not so much to highlight exemplars or best practice, as to survey noteworthy approaches and to capture the range of diverse understandings of impact and its evaluation.

OVERVIEW OF THE DESKTOP REVIEW

This project mirrors both the transdisciplinary and multinational essence of the Science Gallery Network. Understanding impact in this context calls for the inclusion of diverse perspectives ranging from research impacts to social and community outcomes as well as economic and industry-focussed outputs. This range of impacts means that most of the frameworks we present here are case studies chosen to provide coverage for most of the locations where the SGN operates and with differing rationales that we highlight in each of the following sections.

The structure and themes of this desktop review broadly align with those of the SGN brief:

1. the cultural field and the cultural partners of Science Gallery;
2. the communities where Science Gallery is active;
3. the university and academic partners where Science Gallery operates;
4. the industry and private sector;
5. government and public policy; and
6. schools.

GLOSSARY

This glossary provides definitions for the main terms used in this desktop review.

Term/concept	Definition
Dimensions	Dimensions are metrics used to measure an intrinsic quality of a work (Counting What Counts, 2022). A dimension statement is made up of an outcome and a statement that captures that outcome. They are standardised statements that respondents can agree or disagree with by ranking their response on a sliding scale.
Evaluation	"The process of assessing the significance and reach ... of both positive and negative effects of research. Impact may be evaluated over different time horizons, at different social scales (from individuals to society), spatial scales (from local to international) and across multiple domains (including social, economic, environmental, health and well-being, and cultural)." (Reed et al.), 2021, p. 3. Gullickson's (2020) "hybrid definition of evaluation is based on Scriven (1991) and Fitzpatrick et al. (2011): Evaluation is the generation of a credible and systematic determination of merit, worth, and/or significance of an object through the application of defensible criteria and standards to demonstrably relevant empirical facts" (p. 4).
Impact	Impact is an organisation's long-term goal or ultimate objective that is closely linked to their mission or vision statement. It is "the end state you would like your beneficiary to be in" as a result of your outcomes (see definition of outcomes) (Analytics in Action, n.d.). Impact is often difficult to measure since it frequently occurs over a long period of time with other influencing factors. Examples include increase literacy rate, improve graduate employment outcomes, and reduce poverty.
Impact significance	"The magnitude, or intensity of the effect of research on individuals, groups or organisations" (Reed et al., 2021, p. 3).
Impact reach	"The number, extent or diversity of individuals, groups or organisations that benefit from research (after Douthwaite et al. (2003) and Research England (2019))" (Reed et al., 2021, p. 3).
Indicators	"An indicator helps us understand where we stand in relation to a certain objective but if measured over time also the direction in which we are moving, and how far we are from our destination. It can help us spot problems and adjust the course" (Education International, 2017, p. 5). Indicators should be selected based on the three criteria of: practicability (i.e., available, comparable and stable), technicality (i.e., valid and reliable), and substantive (i.e., linked to outcomes) (Mahat, 2016).
Outcomes	"Outcomes are the short to medium effects one is looking to have or the 'step changes', which need to occur in order to achieve one's long term or ultimate goal" (Analytics in Action, n.d.). They are more difficult to measure as they frequently relate to individuals' perceptions, emotions and other internal states. Outcomes must be relevant, i.e. they are useful for stakeholders, and valid and reliable, i.e. they measure what they claim to measure (Mahat & Goedegebuure, 2014). Examples of outcomes are increase in confidence, improve self-esteem and greater awareness of topics and issues.

2.
THE LITERATURE ON IMPACT MEASUREMENT

THE ROLE OF IMPACT MEASUREMENT

The task of evaluation is to understand how a program or undertaking works and then to judge how well it functions (Davidson, 2005; Gullickson, 2020; Scriven, 1991). That task can be approached from various perspectives, for example:

- by studying the effects and value of the context, inputs, processes, implementation, and outcomes (e.g., Stufflebeam & Zhang, 2017), or
- attempting to understand the causal logic that underlies the program and determining its effects (e.g., Chen, 2015; Pawson & Tilley, 2014), or
- focusing on the evaluation of users' needs (Patton, 2008).

Impact evaluation is one of those perspectives, focusing on the causality underlying the program – what is the program trying to create, does it actually accomplish its intents, and to what extent? It comes out of the deontological ethical tradition, focused on the greatest good for the greatest number (Roorda & Gullickson, 2019). To address the critique of that ethical tradition, good impact evaluation considers not only what has happened as a result of the program, but the value of those effects for different stakeholder groups (Pawson & Tilley, 2014) and any side effects or side impacts (Scriven, 1991; 2003). Understanding the effects and value of a program through impact evaluation is critical both for improving it, and for determining whether it should continue or be expanded (Patton, 2008).



3.
IMPACT FRAMEWORKS IN THE CULTURAL INDUSTRIES

The gallery, libraries, archives and museums (GLAM) sector has professionalised its approach to measuring impact. A key part of recent advances in impact measuring is enhanced standardisation that makes comparing data sets easier. Users of Arts Council England's Impact and Insight Toolkit (discussed in more detail below), for example, can compare their evaluations with hundreds of other surveys, giving managers a useful benchmarking tool. A prerequisite for such benchmarking is, though, aligning the indicators that organisations use. This has its critics (Belfiore & Bennett, 2007, 2010). Frameworks such as Culture Counts (discussed below) allow users to customise their surveys by selecting indicators from a catalogue, but the wording of indicators is, in most cases, fixed. A "trade-off" thus lies at the heart of the drive for benchmarking of impact measurement: easy benchmarking by peers requires accepting some rigidity in formulating indicators and survey questions.

CULTURAL DEVELOPMENT NETWORK AND CULTURE COUNTS

The Cultural Development Network (CDN) is based in Melbourne, Australia. Its framework seeks to "enable government and arts agencies to undertake outcome-focussed planning and evaluate their progress in meeting desired outcomes" (Cultural Development Network, 2019a). CDN's evaluation framework presupposes that an organisation has a cultural development plan or similar against which the realisation of specified impacts and outcomes are measured using the framework. Its work represents a pioneering attempt to systematically evaluate impact and value creation in the creative industries.

The CDN framework focuses on impacts in five domains: cultural, social, economic, environmental and governance. A suite of four or five indicators then measures impact in each of these domains. In the environmental domain, for instance, one of the indicators is the extent to which "motivation for stewardship of built and/or natural environment has increased" (Cultural Development Network, 2019b), while one of the cultural outcomes is entitled "Creativity stimulated … The sparking of imagination, creativity or curiosity that leads to a desire for creative expression" (Cultural Development Network, 2019b). Of course, this latter outcome is particularly relevant for the SGN given its mission "to ignite creativity and discovery where science and art collide" (SGN, 2022). However, given that the SGN takes a transdisciplinary approach to education and innovation, "creativity" needs to be defined here in a way that allows for the extent to which the SGN is designed to harness creativity in a specific, transdisciplinary way.

CDN provided the basis for Culture Counts in Australia. It is a fee-for-service provider of impact-evaluation tools that includes online surveys (Culture Counts, 2022). Its success has helped it become a leading player and benchmark in the sector, particularly in the United Kingdom and Australia. The Culture Counts platform grew out of a desire to agree on a set of standard measures of impact and evaluation. In Australia, Culture Counts applies CDN's thinking about domains of impact while in the UK, they draw from Arts Council England's Impact and Insight Toolkit. Culture Counts uses an extensive set of indicators in the following domains: Cultural, Social, Environmental, Economic and Civic outcomes. Science Gallery Dublin has already made use of Culture Counts' services.

TABLE 1. DISTILLATION OF THE CULTURAL DEVELOPMENT NETWORK (CDN) EVALUATION FRAMEWORK

Outcomes	Definitions
Cultural outcomes	
Creativity stimulated	"The sparking of imagination, creativity or curiosity that leads to a desire for creative expression."
Aesthetic enrichment experienced	"Experience that comes through the senses that is special and outside the everyday. This might include being moved or challenged through feelings such as beauty, awe, discomfort, joy or wonder."
Knowledge, ideas and insight gained	"Intellectual stimulation, critical reflection, creative thinking and deeper understanding"
Diversity of cultural expression appreciated	"Valuing the different ways people express themselves through diverse cultural forms, reflecting their life experience and interests."
Sense of belonging to a shared cultural heritage deepened	"How one's identity and values are rooted within a history and heritage that is shared with others."
Social outcomes	
Physical and/or mental wellbeing improved	"physical and mental health and the state of being comfortable, healthy and coping with life events and challenges"
Sense of safety and security supported	"feeling of being free from danger, risk or injury at home or in the community"
Social connectedness enhanced	"bonds between people who share common characteristics or interests. These could be family, friends, neighbours or like-minded people"
Social differences bridged	"overcoming barriers and strengthening understanding between people of a different social identity"
Feeling valued experienced	"sense of self-esteem or worth that comes when an individual or their achievements are recognised or admired by someone who is important to them and whose opinion matters to them."
Economic outcomes	
Professional practice capability enhanced	"an individual's knowledge and experience that informs their practice such as management, creative and production, leading to more efficient use of resources, increased productivity and the potential for practice leadership."
Employment enhancing skill development facilitated	"Development of skills or knowledge considered beneficial to obtain employment, or to effectively and efficiently carry out tasks and responsibilities within your employment."
Individual economic wellbeing increased	"an individual has the economic resources they need to meet their living costs, maintain an acceptable standard of living and manage in times of financial difficulty."
Local economy supported	"the local economy and its goods and services that benefit financially directly or indirectly by cultural activities."
Environmental outcomes	
Positive sense of place in the local build and/or natural environment enhanced	"how we experience and make meaning of our environment both natural and built and how we describe, interact and value it."
Understanding of ecological issues increased	"the comprehension an individual has about environmental issues and the impact on their immediate community and the world."
Natural world valued	"its connection to us is recognised, understood and appreciated"
Motivation for environmental stewardship increased	"an increased sense of responsibility to care for the built and/or natural environment."
Governance outcomes	
Access to beneficial networks and other resources increased	"The linkages between individuals and groups within the local community that have the potential for benefit, such as links between community members and council services or artists and the cultural sector."
Agency and voice enabled	"the freedom to express one's opinions publicly and they are welcomed, respected and valued."
Civic pride enhanced	"the deep sense of pleasure or satisfaction that is felt for the people/environment of a location that is based on civil interaction between individuals, communities and the governing authority."
Civic trust inspired	"a feeling that the authorities and institutions of governance and other members of society can be trusted, operate fairly, transparently and for the good of the community."

Note. From Cultural Development Network, 2019b, About Measurable Outcomes (https://culturaldevelopment.net.au/measurable-outcomes/about-measurable-outcomes). Copyright Cultural Development Network.

4.
IMPACT FRAMEWORKS IN THE COMMUNITY, SOCIAL AND HEALTH FIELDS

Since the 1970s, social impact appraisal has come to play a central role for development agencies and academics (Vanclay, 2020). In the last two decades there has also been a shift from measuring inputs such as funding or allocated resources to evaluating impacts created (Scott, 2006). These developments now encompass the education and cultural sectors (Sandell, 2002) while growing attention is also given to the impacts created by organisations and government agencies providing social and health services.

In a recent article, San-Jose, Garcia-Merino, and Retolaza (2022) applied the concept of Social Accounting to museums. Through more than one hundred interviews with museum workers in eight Spanish museums, they identified fifteen "non-market value variables showing the social value of museums and that they are not directly included in financial statements" (San-Jose et al., 2022, p. 12). Table 2 lists these variables along with proposed indicators for each one. Of note here is the emphasis on inputs as indicators.

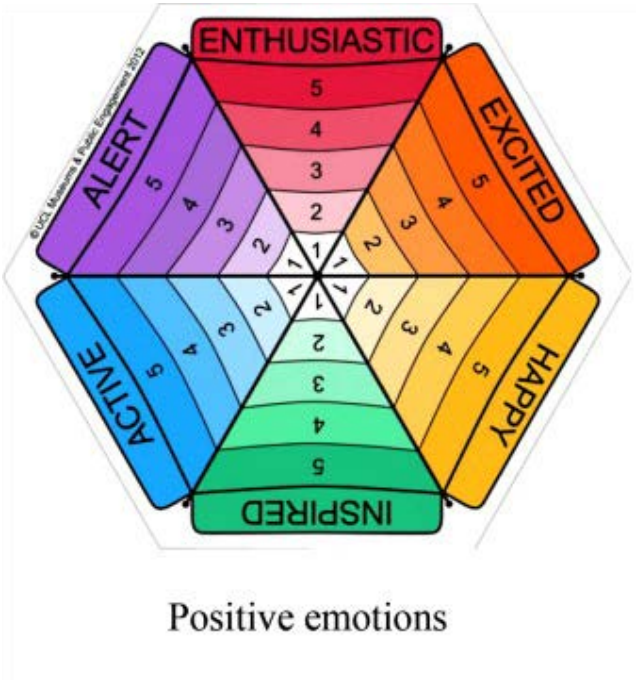
TABLE 2. SOCIAL VALUE VARIABLES AND ASSOCIATED INDICATORS

Social value variable	Suggested indicators
Education and pedagogy	Hours per person participating in educational activities at the Museum
Training and professionalisation	Hours of training through scholarship programmes,
Development and promotion of critical thinking-awareness	hours of training for professionals of the entity and hours of internship contracts
Generation of knowledge and dissemination of culture	Hours per person in dissemination activities, talks, conferences, number of web visits, event attendees, attendees to temporary exhibitions, festivals and guided visits
Generation of quality content and programming	Hours of dedication to media outreach programmes
Use of spaces	Days of use of rooms for events
Reinforcement of Identity	Informative notes to the Friends of the Museum
Social cohesion	Free entrances and hours by person attending activities for special groups
Visibility	News about the Museum in the general media
Prestige	Generating publications in prestigious specialised magazines
Culture	Internationally renowned people that participate in museum activities
Research	Research project amount
Preservation of heritage and memory	Assignments of pieces / works, hours of dedication to attend inquiries about heritage and memory (valuation of restored works, restoration diagnoses, etc.), donations and preservation, maintenance
Promotion of professional networks	Number of activities on networking
Boost and opportunity for professional development	Activities organised for new artists and exhibitions

Note. From *Social value in the orange economy: social accounting applied to museums* by L. San-Jose, J. D. Garcia-Merino & J. L. Retolaza. 2022.

The literature has established myriad positive health and well-being impacts from participating in arts and cultural activities (Daykin, 2020). Researchers have also shown that museum and gallery programs can improve health and well-being (Morse, 2015; Riches et al., 2022; Thomson & Chatterjee, 2015). By way of example, in a project that responded to a need established by surveying 32 specialist museums in the UK, Thomson and Chatterjee (2015) developed a "set of 'pick and mix' measures designed to assess levels of well-being arising from participation in museum activities and events" (p. 49). This Museum Well-being Measures Toolkit gauged participant responses to statements about what they had experienced during the respective museum activities. The statements used positive and negative well-being words found in other research tools such as the Positive Affect and Negative Affect Schedule (PANAS) (Watson, et al., 1988). One of the innovative features of Thomson and Chatterjee's (2015) toolkit is its use of "umbrellas" such as that in Figure 1 to collect participant responses.

FIGURE 1. EXAMPLE OF PANAS WELL-BEING UMBRELLA



Note. From *Measuring the impact of museum activities on well-being: developing the Museum Well-being Measures Toolkit* by L. J. Thomson & H. J. Chatterjee. 2015.

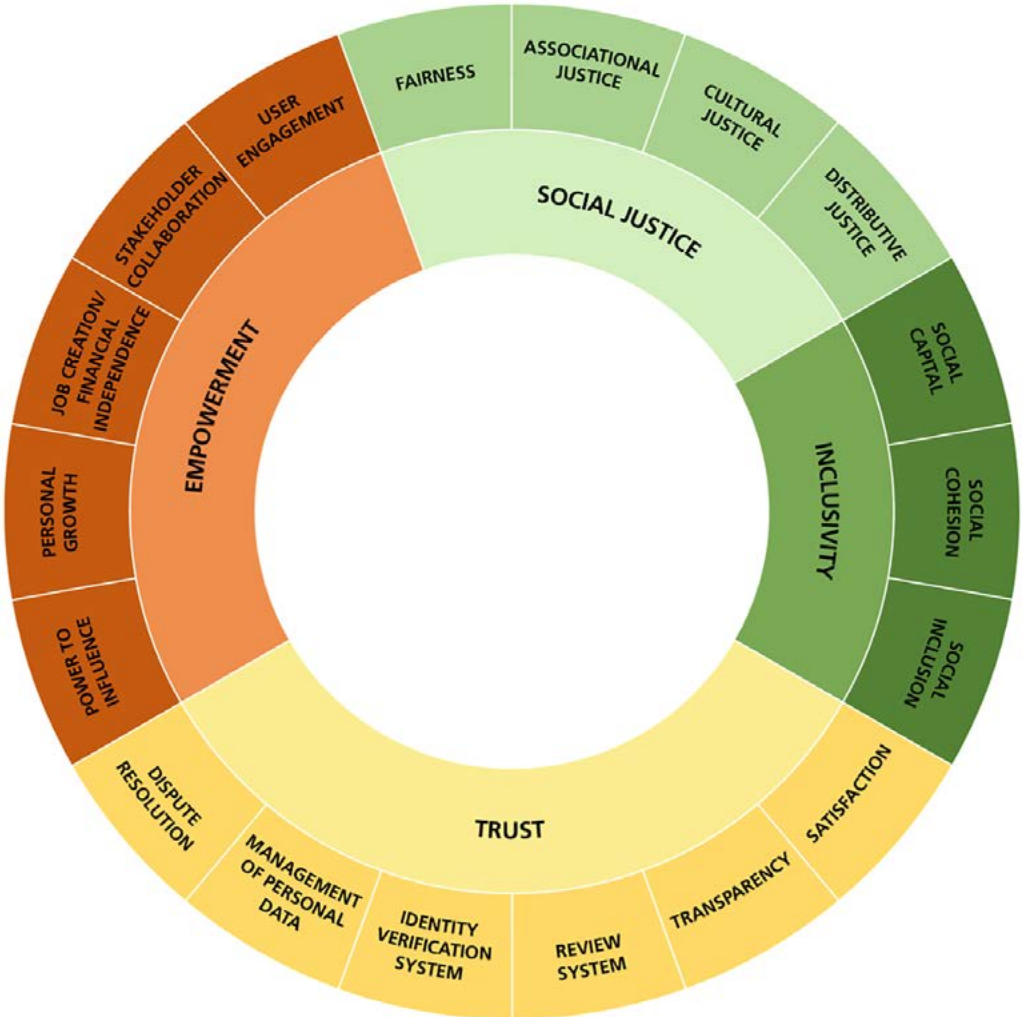
A recent study by Curtis et al. (2020) widened the field to consider social impact in the sharing economy. The authors developed a framework that focusses on "trust, empowerment, social justice and inclusivity" (Curtis et al. 2020, p. 1)) along with a range of eighteen indicators. The trust section of the framework places importance on the implementation of user review systems and includes indicator such as "number of reviews in relation to number of transactions" (Curtis et al. 2020, Table 5). Most of the other indicators are specific to the sharing economy but several may also be relevant to the SGN:

- "demonstrable examples of how users contribute/are heard" (Empowerment)
- "representation of different socio-economic groups and under-represented groups in decision making" (Social Justice)
- "possibility of citizens (i.e. non-users) to make suggestions or participate in dialogue" (Inclusivity) (Curtis et al. 2020, Table 3).

Figure 2 depicts the framework's four social aspects and eighteen indicators.

Looking at applied research undertaken in the field, the Centre for Social Impact in Australia serves as an example of the nexus between universities and impact research in organisations and institutions. The focus here is on understanding how organisations and initiatives such as the SGN can conceptualise their impacts by considering frameworks used by specialised providers in the community-service field.

FIGURE 2. FRAMEWORK TO ASSESS SOCIAL IMPACTS OF SHARING PLATFORMS.



Note. From *Systematic framework to assess social impacts of sharing platforms: Synthesising literature and stakeholder perspectives to arrive at a framework and practice-oriented tool* by S. K. Curtis, J. Singh, O. Mont & A. Kessler. 2020.

THE CENTRE FOR SOCIAL IMPACT (CSI)

The Centre for Social Impact (CSI) was established as a research and teaching institution in 2008 and is run by a consortium of Australian universities. It has published a suite of tools and guides to help understand and measure social impact. Of particular interest in the current context is its Community Services Outcome Tree. Using a botanical metaphor, this framework maps outcomes onto twelve "leaves" (Wilson et al., 2021a). The leaves are: 1) choice and empowerment, 2) daily life, 3) employment, 4) family, 5) finance, 6) health, 7) housing, 8) justice, 9) learning skills and development, 10) safety, 11) services and government benefits, and 12) social inclusion (Wilson et al., 2021a). Some of these outcome categories (as highlighted in bold) are more relevant to Science Gallery Network than others. The health group, for example, includes one impact as "developing resilience and a positive sense of self, self-esteem and self-confidence; emotionally healthy including emotion regulation; developing communication, relational and reflective skills to manage own needs, feelings and choices in relation to others; connection to culture" (Wilson et al., 2021b, p. 1). Impacts listed under Social Inclusion include "being able to safely identify with your culture; having a knowledge of your culture; feeling connected to culture; being actively involved in or attending cultural events" (Wilson et al., 2021c, p. 3). The framework includes a complete set of detailed indicators and survey questions for the twelve "leaves" of the Outcomes Tree (https://communityservicesoutcomestree.com/).

5.
IMPACT FRAMEWORKS IN HIGHER EDUCATION

The Science Gallery Network aligns its work with its auspicing universities. How higher education providers understand their impacts is thus critical to measuring the SGN's impact. Many higher education institutions have proud histories as hosts to museums, scientific collections, and galleries. Oxford University's Ashmolean Museum dates from 1682. Partnerships between universities and public or private museums also play a key role in higher education in many countries, especially when teaching features object-based learning (OBL). These partnerships also go beyond conventional OBL parameters. Museums and universities often share research interests. Internships and practicum courses increasingly represent essential career stepping stones for students (Kingsley, 2016). The SGN represents one eaxmple of growing efforts around the world to lift science education among the public and to bridge gaps between science within the academy and beyond (Bell et al., 2016).

The breadth and depth of impacts created and monitored by universities mirror the range of their activities. Faced with the sheer diversity in the impacts they produce, a key challenge in the higher education sector is prioritising, ranking and contextualising impacts and their attendant indicators. Bayley and Phipps (2019) highlight the need for "impact literacy", which they define as the "ability to identify appropriate impact goals and indicators, critically appraise and optimise impact pathways, and reflect on the skills needed to tailor approaches across contexts" (p. 3). Measuring research impact is core to university evaluation frameworks (Reed et al., 2021). The University of Melbourne's *2030 Advancing Melbourne* plan (2020), for example, includes an aspiration to operate at the "leading edge of discovery, understanding and impact" (p. 12). This goal is operationalised in the University's research planning which, amongst other features, emphasises a "need for flexible systems that capture information about our research and research training" (2012, p. 23).

The centrality of public funding in research in many countries dictates that research funding agencies have developed detailed systems to assess research impact. The United Kingdom's Research Excellence Framework (REF), for example, defines impact as an "effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia" (Research Excellence Framework, 2019, p. 68). The framework adds that,

> Impact includes, but is not limited to, an effect on, change or benefit to the activity, attitude, awareness, behaviour, capacity, opportunity, performance, policy, practice, process or understanding of an audience, beneficiary, community, constituency, organisation or individuals in any geographic location whether locally, regionally, nationally or internationally (Research Excellence Framework, 2019, p. 68).

In 2014, the UK's Research Excellence Framework published 6,975 case studies of research impact in UK universities. These studies are all available online at: https://webarchive.nationalarchives.gov.uk/ukgwa/20180903113600/http://impact.ref.ac.uk/CaseStudies/

Science engagement can also be seen as multidirectional when, for example, attention turns to outcomes and impacts of use to scientists. The SGN presents valuable opportunities for researchers to engage people outside their peer circles. Peterman et al. (2017) note an "intent for public engagement activities to be reciprocal rather than one-way exchanges between scientists and the public" (p. 49). They propose a "Self-Efficacy for PES [public engagement with science] Scale to measure scientists' perceived ability to conduct public engagement" (Peterman et al. 2017, p. 49). This nineteen-item scale is based on a survey with indicators for scientists, such as "I am able to explain a scientific idea in many different ways" or "I am good at helping people think about the ways that science applies to them" (Peterman et al. 2017, p. 44). With their emphasis on self-reflection and multidirectional forms of impact, such frameworks show that organisations such as the SGN along with its staff and volunteers are themselves shaped by the impact that they achieve. Impacts can be circular and reciprocal. A successful impact framework that embraces the diversity of activities in higher education will take this into account. The next section turns to industry and economics perspectives on impact.

6.
IMPACT FRAMEWORKS IN INDUSTRY – ECONOMIC PERSPECTIVES

The interests of industry and private-sector partners in the impacts created by the SGN vary greatly and align closely with the missions of individual corporations. Without wanting to oversimplify the drivers of corporate and private engagement with the SGN, it is, however, reasonable to view economic forms of value creation as central to understanding impact from this perspective. As Falk (2022) notes,

> Unless the value of museum experience outcomes can be expressed in dollars (or Euros, Yuan, Pound, etc.), and thus directly compared with the cost it might take to deliver those outcomes, there is little hope that any policymaker, nor vast swaths of the general public, will ultimately know how to valuate museum experiences and thus appropriately apportion funds to museums (p. 4).

Measuring economic impact has become a much discussed and widely used approach to quantifying industry-focussed impact in the gallery and museums sector (Seaman, 2020). A case study of such an approach can be found in a 2019 report by Oxford Economics that quantified value creation in Canadian GLAMs (Oxford Economics, 2019). The study used a Total Economic Value framework that combined measures of use and non-use values. Various economic measures including a Travel Cost Model (TCM) and Willingness to Pay (WTP) were used to establish use and non-use valuations.

The study calculated use value in Canadian GLAMs by tallying "information about the users of the services provided by GLAMs, as well as on data about the revenue generated by GLAMs from fees paid by users" (p. 24). "Physical use value" quantifies the sum of visitors' "willingness to pay" to visit GLAMs … by adding together the cost people actually pay for a ticket to enter GLAMs (if applicable); and the difference between that cost and the maximum amount visitors would have been willing to pay to visit the GLAM. This difference is known as their "consumer surplus" (p. 24).

The study's inclusion of non-use values means it includes measures and perspectives that are not covered by the organisation Culture Counts that was outlined above. Three forms of non-use value were included in the study:

- Existence value — "The value people attach to the existence of GLAMs despite the fact that they may have no intention of visiting them";
- Bequest value — "The value that people place on GLAMs as a benefit to future generations"; and
- Option value — "The value people attach to having the option of visiting GLAMs at some point, whether or not they ever exercise that option" (p. 40).

The large-scale survey across Canada was used by Oxford Economics to establish willingness-to-pay measures that were used as proxies of such non-use values.

The Oxford Economics study includes separate measures for what it calls 'online value', noting that "GLAMs websites and social media portals are becoming an increasingly important resource for users" (p.45). The study estimates online value by measuring the amount of time users spend on institutional websites and social-media channels. As the authors put it, "The key to understanding the value of online services is to see them as a form of information, with the cost of accessing such information mainly being expressed in terms of time" (2109, p. 45). Survey respondents were asked to nominate "time spent and frequency of use of GLAMs website, catalogues and social media portals" (p. 47) as well as "Which online channels were most useful for you in completing the task that you were trying to achieve?" (p. 128). Institutions taking part in the research also supplied their own data on the duration of online visits.

Four other forms of value were measured in the Oxford Economics study:

- Well-being effects
- Social capital
- Informal education effects (of children and adults)
- Long term economic "spillover" effects (p. 53).



Well-being effects included "overall health (physical and mental), quality of life (overall wellbeing), volunteering (charity and support) and closeness with neighbours" (p. 55). Survey respondents were, for example, asked to record the extent to which they have "benefitted from using GLAMs' resources in your education, or your professional or personal development?" (p. 126).

Survey questions on well-being used by Oxford Economics focussed on measures such as:

- Life satisfaction—How satisfied a person was with their life;
- Health—How a person rated their health;
- Neighbourliness—Whether a person knew most or none of their neighbours;
- Volunteering—Whether a person had volunteered or not in the last 12 months (p. 57).

The Oxford Economics study primarily concentrated on quantitative and economic measures but also sought to capture "intrinsic social values that economic frameworks cannot address" (p. 9). Using a multi-criteria analysis, the study used questions in a national survey and in a more limited study of specific sectoral stakeholders. Seven measures were included:

1. Community engagement and civic participation;
2. Preserving cultural and historical heritage;
3. Providing access to resources for research, innovation and education;
4. Protection of truth, integrity and social values;
5. Quality of life, mental and physical health and wellbeing;
6. Providing inspiration for creativity; and
7. Nurturing of identity for marginalized communities, contributing to community cohesion (p. 70).

The study asked survey respondents to assess the contribution to these dimensions by asking participants to indicate on a scale of 1 to 10 "how important you think the role of each institution is in contributing to the key social objectives" (p. 126).



7.
IMPACT FRAMEWORKS IN THE GOVERNMENT SECTOR

National governments and their specialist agencies across Australia, Europe, India, the UK, and the US use impact evaluation frameworks to measure impact in science engagement and impact in the cultural sector. These frameworks are often specific to their national and sub-national contexts. This section highlights the frameworks of Arts Council England, the National Endowment for the Arts in the US as well as Americans for the Arts. These frameworks are discussed here because their roles in influencing funding decisions and policy outcomes in their respective jurisdictions means that they have 'gatekeeper' roles and as such they help set standards across the cultural industries.

Arts Council England's Impact and Insight Toolkit features an extensive suite of indicators (known as "dimensions") covering, for example, "relevance" referring to "It has something to say about the world in which we live", and "rigour" referring to "It was well thought through and put together" (Arts Council England, 2020). Further dimensions are grouped under the following categories: participatory, cultural experience, placemaking and groups with relevance to particular cultural forms such as "museum specific". The full list of dimensions is viewable here: https://impactandinsight.co.uk/docs/dimensions/.

The National Endowment for the Arts (2021) in the US has set out a five-year research agenda that includes a priority question asking:

> What are measurable impacts of the arts on the following outcome areas: health and well-being for individuals; cognition and learning; and U.S. economic growth and innovation? Under what conditions do such impacts occur, through what mechanisms, and for which populations and/or sectors? (p. 1)

Though it is a non-government organisation (NGO) undertaking research and advocacy, Americans for the Arts has also developed a range of resources that are designed to help organisations including galleries and museums to measure impact. The approach here is predominantly on meeting the needs of stakeholders. This suggests that impact indicators should identify stakeholders, and establish what their priorities are, how might organisational strategies be tailored to meet stakeholder interests, as well as asking "what do we want to be able to tell the key players and constituents about outcomes/value?" and "what type of evidence is likely to convince key players and constituents?" (Dwyer, n.d.). Americans for the Arts' *Continuum of Impact* (Americans for the Arts, 2017) highlights six "families" of outcomes: 1) awareness and knowledge, 2) dialogues and discourse, 3) attitudes and motivation, 4) capacity, 5) behaviour and action, and 6) conditions, systems and policies (p. 19). In the capacity category, for example, this framework suggests that desirable outcomes might include identifying and working "with artists, integrate creative strategies to engage others, illuminate issues, enhance public processes, engage new ways of thinking, and reveal new ideas and possibilities" (p. 40). A suggested attendant indicator is "development of skills to apply arts and culture to civic engagement or social change".

8.
IMPACT FRAMEWORKS IN THE SCHOOL SECTOR

Some Science Gallery campuses engage with schools. We therefore included primary and secondary education contexts in this desktop review. The literature evaluating impact in schools is very extensive. The focus in this section falls on science education.

The website (2022) of the Center for Advancement of Informal Science Education (CAISE) lists various evaluation tools, instruments and sharing platforms used in the USA including:

- Activation Lab: http://activationlab.org/tools/
- Building Informal Science Education: https://www.visitorstudies.org/bise
- Collaboration for Ongoing Visitor Experience Studies (COVES): http://www.understandingvisitors.org/
- Developing, Validating, and Implementing Situated Evaluation Instruments (DEVISE): https://www.birds.cornell.edu/citizenscience/measuring-outcomes/
- Online Evaluation Resource Library: https://oerl.sri.com/instruments/instruments.html
- STEM Evaluation Repository: https://comm.eval.org/stemeducationandtraining/resources/stem-tig-repository
- STEM Learning and Research Center (STELAR): http://stelar.edc.org/resources

These tools are typically designed for use with 10- to 14-year-old students. Activation Lab, for instance, uses four dimensions to gauge Science Learning Activation: Fascination, Values, Competency Belief, and Scientific Sensemaking. The Fascination dimension encapsulates pupils' "interest and positive affect towards science, curiosity about the natural world, and goals of acquiring and mastering scientific skills and ideas" (Chung et al., 2016a, p. 1). It is used to "measure an individual's fascination with natural and physical phenomena" (Chung et al., 2016a, p. 1) and records participants' level of agreement with statements such as "I wonder about how nature works", "After a really interesting science activity is over, I look for more information about it" or "I want to read everything I can find about science" (Chung et al., 2016a, p. 2). Activation Lab's Scientific Sensemaking dimension asks pupils to choose suitable responses to small-scale scientific problems. It thus measures participant interaction with "science-related tasks and text as a sensemaking activity using methods generally aligned with science" (Chung et al., 2016b, p. 1).

SYSTEM2020

Science Gallery Dublin coordinated the SySTEM2020 project with the aim of better understanding "science learning outside the classroom" (System2020, 2019). Focusing on students between the ages of 9 and twenty, SySTEM2020 created a suite of tools to map "learning beyond the classroom" (System2020, 2019). Of particular interest to the current study are two evaluation tools for use with school-aged children: a Self-Reflection Tool, and a Self-Evaluation Tool. The Self-Reflection Tool uses four short prompts and has been described as a "lightweight, flexible, but effective self-assessment tool ... recommended for short activities (e.g. museum visits) or online activities" (Zolotonosa & Hurley, 2021, p. 38). The Self-Evaluation Tool is larger in scope and focuses on four fields: Creativity, Communication, Collaboration, and Critical Thinking. Science Gallery Dublin used the Self-Reflection Tool to help understand participants responses to its OPEN MIND Studio during 2020. Participants were aged between 15 and 17.

The Self-Reflection Prompts were as follows:

- What was the activity you did today? Summarise in your own words!
- Did it remind you of something you've done or learned before, at school or elsewhere?
- How do you think this topic may impact you and/or others?
- What would you do differently next time related to this topic? (https://system2020.education/resources/practising-self-reflection/)

9.
CHALLENGES OF IMPACT MEASUREMENT



This desktop review has highlighted a range of frameworks through which the impacts of arts-based science communication of the type provided by the SGN can be understood. It is also important that attention be paid to the challenges involved. Such evaluation is rarely straightforward or simple. A recent survey of "arts-based approaches to public engagement with research" undertaken by RAND Europe (Ball et al., 2021) is instructive on the nature of these challenges.

The authors observed that, "while the evidence we found in the literature for the effectiveness of arts-based approaches and their constituent interventions in engaging a range of stakeholder groups is promising, it is generally weak due to the lack of systematic evaluation" (p. 69). Ball et al. (2021) discuss four critical challenges that lie behind the identified weakness in systematic evaluation of arts-based science engagement: the difficulty of establishing engagement aims, the "intentionally emergent" nature of much such engagement, the long-term unfolding of impacts, and a "lack of guidance on how best to evaluate arts-based engagement approaches and their constituent interventions" (p. 50-51). A key aim of this desktop review is to address this lack of guidance on best practice and to help the SGN deal with the impact evaluations challenges it has experienced.

10.
SUMMARY OF THE DESKTOP REVIEW



Impact is a diverse concept with multiple definitions depending on sectors and contexts. Indeed, the nature of an undertaking such as one driven by the SGN—with its aim to overcome disciplinary barriers—calls for particularly innovative approaches to conceptualising and measuring impact.

This desktop review provides several points of departure to aid in developing a coherent impact framework for the SGN. Firstly, impact is linked to an organisation's mission or vision statement, hence one organisation's impact differs from another. There is a need to explicitly define what this means for the SGN. Secondly, in addition to practicality, technicality and substantive criteria, indicators within any frameworks must be transparent.

Transparent reporting of impact clearly defines and addresses targeted stakeholders and acknowledges the multidimensionality between and within stakeholder groups. Finally, in an era of big data, it is important that the SGN ensures the provision of salient and robust outcome-oriented impact metrics focusing on the 'areas that count'. The report that accompanies this desktop review develops a tailored impact framework that responds to these three essential elements.

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APPENDIX A SGN SURVEYS

SGN IMPACT INDICATORS SURVEY – GLOBAL

Q1 INTRODUCTION

You are invited to participate in an online survey to help gain a deeper understanding of the range of impact indicators that are important for the Science Gallery Network. Your contribution is vital as it will enable the network to develop a coherent impact framework. This study has been approved by the University of Melbourne's Human Research Ethics Committee (Project ID: 23592). A Plain Language Statement is available here - Plain language statement.

Q2 CONSENT TO PARTICIPATE

I consent to participate in this project, the details of which have been explained to me, and I have been provided with a written plain language statement to keep. I understand that by ticking the check boxes below, I am giving consent to participate in this research. I understand that my participation involves an anonymous online survey. I acknowledge that:

- The possible effects of participating in the study have been explained to my satisfaction;
- I have been informed that I am free to withdraw from the project at any time without explanation or prejudice and to withdraw any unprocessed data I have provided;
- The project is for the purpose of research; I have been informed that the confidentiality of the information I provide will be safeguarded subject to any legal requirements;
- Data will be stored at the University of Melbourne and will be destroyed after five years of the completion of the project;
- My name or my institution's name will be referred to by a pseudonym in any publications arising from the research; I have been informed that a copy of the research findings will be made available to me upon request to the researchers.

Please select on option.

I consent to this study.

I do not consent.

Q4 WHICH SGN MEMBER ORGANISATION DO YOU BELONG TO?

- SG Atlanta
- SG Bengaluru
- SG Berlin
- SG Detroit
- SG Dublin
- SG London
- SG Melbourne
- SG London
- SG International

Q5 ALL THE INDICATORS THAT ARE LISTED ON THE FOLLOWING PAGES HAVE BEEN CATEGORISED UNDER SEVEN THEMES.

You will be asked to rate each of them by their **importance** across the Science Gallery Network.

- Cultural impacts
- Social impacts
- Educational impacts
- Health and wellbeing impacts
- Economic impacts
- Environmental and technology impacts
- Policy and governance impacts

We acknowledge that some of these indicators do not work in isolation. The power of their impact is on how the indicators are interconnected and/or intersect with each other to offer a more holistic view of impact for Science Gallery. In assessing the indicators by their importance, we ask that you consider them independently and as a multi-faceted indicator.

Q6 THEME: CULTURAL IMPACTS

How important are these indicators across the Science Gallery Network?

	Very Important	Important	Slightly Important	Not Important
Participant's creativity is inspired	◯	◯	◯	◯
Participant's curiosity is sparked	◯	◯	◯	◯
A new point of view is explored or presented	◯	◯	◯	◯
I feel more able to express myself creatively	◯	◯	◯	◯
Participants are affected emotionally	◯	◯	◯	◯
The ___ (e.g. program, exhibition) was well thought through and put together	◯	◯	◯	◯
The ___ (e.g. program, exhibition) was different from things I've experienced before	◯	◯	◯	◯
New insight or knowledge is gained	◯	◯	◯	◯
A relevant understanding of today's world is generated	◯	◯	◯	◯
Participants feel more confident around contemporary art	◯	◯	◯	◯
Advocate for culture increased	◯	◯	◯	◯
Cultural diversity is respected	◯	◯	◯	◯
Participants are provided opportunities to reflect on their own beliefs	◯	◯	◯	◯
A broad and inclusive range of voices is reflected	◯	◯	◯	◯
Participant's cultural pride is strengthened	◯	◯	◯	◯
The ___ (e.g. program, exhibition) helped me to feel connected to people in the community	◯	◯	◯	◯
The ___ (e.g. program, exhibition) provides an important addition to the cultural life of the area	◯	◯	◯	◯
Connection to a shared history/culture is built	◯	◯	◯	◯
Participant's cultural heritage is celebrated	◯	◯	◯	◯
A sense of joy, beauty and wonder is experienced	◯	◯	◯	◯
New understanding and perspective of arts are generated	◯	◯	◯	◯
Understanding of culture deepened	◯	◯	◯	◯
The ___ (e.g. program, exhibition) strengthened my cultural pride	◯	◯	◯	◯

Q7 THEME: SOCIAL IMPACTS

How important are these indicators across the Science Gallery Network?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Activated researchers' communication	◯	◯	◯	◯
Number of research collaborations increased	◯	◯	◯	◯
Stimulated transdisciplinary and collaborative research projects	◯	◯	◯	◯
Collaboration among artists & researchers increased	◯	◯	◯	◯
Artist-Scientist Collaboration Experiences increased	◯	◯	◯	◯
Corporate and alumni engagement enhanced	◯	◯	◯	◯
Supportive behaviour is increased	◯	◯	◯	◯
Sense of belonging is increased	◯	◯	◯	◯
Equality is improved	◯	◯	◯	◯
The ___ (e.g. program, exhibition) helped me understand other people's points of view	◯	◯	◯	◯
Recognition of contribution improved	◯	◯	◯	◯
Voice of participants is respected	◯	◯	◯	◯
Helpful feedback is provided for participants	◯	◯	◯	◯
A sense of safety increased	◯	◯	◯	◯
Self-acceptance enhanced	◯	◯	◯	◯
Number and sustainment of new modes of collaboration increased	◯	◯	◯	◯
The connection among participants is enhanced	◯	◯	◯	◯
Access to cultural activities increased	◯	◯	◯	◯
Contribution from participants increased	◯	◯	◯	◯
Feeling of inclusion enhanced	◯	◯	◯	◯

Q8 THEME: EDUCATIONAL IMPACTS

How important are these indicators across the Science Gallery Network?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Awareness of local issues raised	◯	◯	◯	◯
The ___ (e.g. program, exhibition) was different from things I've experienced before	◯	◯	◯	◯
Public knowledge about topics promoted	◯	◯	◯	◯
Number of new ideas for research increased	◯	◯	◯	◯
Number and types of research and researchers involved increased	◯	◯	◯	◯
Published research outcomes increased	◯	◯	◯	◯
Research-informed policy making assisted	◯	◯	◯	◯
Engagement of students increased	◯	◯	◯	◯
Increased learning opportunities	◯	◯	◯	◯
Increased student mobility and exchange	◯	◯	◯	◯
Student learning outcomes improved	◯	◯	◯	◯
Longitudinal impact on student learning enabled	◯	◯	◯	◯
Sensory skills improved	◯	◯	◯	◯
Mapping skills improved	◯	◯	◯	◯
Cognitive problem solving skills improved	◯	◯	◯	◯
Interpersonal skills improved	◯	◯	◯	◯
Artistic skills improved	◯	◯	◯	◯
The ___ (e.g. program, exhibition) was thought-provoking	◯	◯	◯	◯
Help-seeking behaviour increased	◯	◯	◯	◯
Resilience enhanced	◯	◯	◯	◯
I did something I didn't know I was capable of	◯	◯	◯	◯
I feel motivated to do more creative things in the future	◯	◯	◯	◯
Self-awareness increased	◯	◯	◯	◯
Quality of strategies implemented to reach out improved	◯	◯	◯	◯
Awareness of global issues raised	◯	◯	◯	◯
Change in practice for participants increased	◯	◯	◯	◯
Ratings and descriptions of SGN's relevance, use and value to research improved	◯	◯	◯	◯
Types, quality and depth of learning increased	◯	◯	◯	◯
Number of strategies implemented to reach out increased	◯	◯	◯	◯

Q9 THEME: HEALTH & WELLBEING IMPACTS

How important are these indicators across the Science Gallery Network?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Ability to overcome challenges is strengthened	◯	◯	◯	◯
Experiments of trying new things increased	◯	◯	◯	◯
The capability of participants is stretched	◯	◯	◯	◯
I felt like I could be myself	◯	◯	◯	◯
I feel more confident about doing new things	◯	◯	◯	◯
The ___ (e.g. program, exhibition) helped me to see myself differently	◯	◯	◯	◯
Visual pleasure experienced	◯	◯	◯	◯
Physical activeness improved	◯	◯	◯	◯
Mental wellbeing improved	◯	◯	◯	◯
Increased descriptions of agency and hope	◯	◯	◯	◯
Understanding of health issues increased	◯	◯	◯	◯
Feelings of enthusiasm, joy, happiness and excitement increased	◯	◯	◯	◯

Q10 THEME: ECONOMIC IMPACTS

How important are these indicators across the Science Gallery Network?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Confidence about future employment improved	◯	◯	◯	◯
Network in working field enhanced	◯	◯	◯	◯
New opportunities for employment created	◯	◯	◯	◯
Impacts on career choices enacted	◯	◯	◯	◯
Increased employment	◯	◯	◯	◯
Individual's financial situation improved	◯	◯	◯	◯
Individual's arts practice or business developed	◯	◯	◯	◯
New platforms created for new work	◯	◯	◯	◯
Growth of new audiences	◯	◯	◯	◯
Diversity of demography groups increased	◯	◯	◯	◯
New income streams generated	◯	◯	◯	◯
Dollar amount from internal source increased	◯	◯	◯	◯
Number of grant proposals(submitted and successful) increased	◯	◯	◯	◯
Number of staff increased	◯	◯	◯	◯
Range of expertise widened	◯	◯	◯	◯
Staff: client ratio increased	◯	◯	◯	◯
Inputs from participatory activities increased	◯	◯	◯	◯
Number and types of partners increased	◯	◯	◯	◯
Quality of partnerships increased	◯	◯	◯	◯
Disability access improved	◯	◯	◯	◯
Multilingual services provided	◯	◯	◯	◯
New software/apps purchased	◯	◯	◯	◯
Number of exhibitions in a year increased	◯	◯	◯	◯
Number of workshops implemented in a year increased	◯	◯	◯	◯
Number of artists involved in a year increased	◯	◯	◯	◯
Other activities increased (BBQs, networking, media release, book launches etc)	◯	◯	◯	◯
Media coverage increased	◯	◯	◯	◯
Quantity of material used to catch people's attention increased	◯	◯	◯	◯
Quality of material used for target audience improved	◯	◯	◯	◯

Q10 THEME: ECONOMIC IMPACTS (CONTINUED)

How important are these indicators across the Science Gallery Network?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Student enrolment increased	◯	◯	◯	◯
Rate of returned visitors increased	◯	◯	◯	◯
Number of new key stakeholders increased	◯	◯	◯	◯
Average time spent by visitors increased	◯	◯	◯	◯
Professional development for stakeholders	◯	◯	◯	◯
New skills related to work gained	◯	◯	◯	◯
The profile of local artists and/or organisations raised	◯	◯	◯	◯
Number of donors and amount of donations increased	◯	◯	◯	◯

Q11 THEME: ENVIRONMENTAL & TECHNOLOGY IMPACTS

How important are these indicators across the Science Gallery Network?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Sense of pride for local area is increased	◯	◯	◯	◯
Connection to nature is increased	◯	◯	◯	◯
The ___ (e.g. program, exhibition) opened my eyes to issues in the environment	◯	◯	◯	◯
Conversation about local environment increased	◯	◯	◯	◯
Increased use of technology	◯	◯	◯	◯
Appreciation of the places is increased	◯	◯	◯	◯
Awareness of environmental issues is raised	◯	◯	◯	◯
The ___ (e.g. program, exhibition) has something to say about the world in which we live	◯	◯	◯	◯
Pro-environmental activity increased	◯	◯	◯	◯
The connection between technology and people is recognized and appreciated	◯	◯	◯	◯

Q12 THEME: POLICY & GOVERNANCE IMPACTS

How important are these indicators across the Science Gallery Network?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Community networks enhanced	◯	◯	◯	◯
Means for communication and mutual learning are provided	◯	◯	◯	◯
Engagement with local or school politics increased	◯	◯	◯	◯
Number of people involved in voluntary activities for the community increased	◯	◯	◯	◯
Civic-minded behaviour increased	◯	◯	◯	◯
Architectural and/or cultural heritage is preserved	◯	◯	◯	◯
Relationships with municipal and regional government improved	◯	◯	◯	◯
Higher levels of generalised trust, political trust and efficacy	◯	◯	◯	◯

Q13 ARE THERE ANY OTHER INDICATORS THAT YOU CAN THINK OF THAT ARE RELEVANT AND IMPORTANT FOR SGN?

SGN IMPACT INDICATORS SURVEY – LOCAL

Q1 INTRODUCTION

You are invited to participate in an online survey to help gain a deeper understanding of the range of impact indicators that are important for the Science Gallery Network. Your contribution is vital as it will enable the network to develop a coherent impact framework. This study has been approved by the University of Melbourne's Human Research Ethics Committee (Project ID: 23592). A Plain Language Statement is available here - Plain language statement.

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I do not consent.

Q4 WHICH SGN MEMBER ORGANISATION DO YOU BELONG TO?

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- SG Bengaluru
- SG Berlin
- SG Detroit
- SG Dublin
- SG London
- SG Melbourne
- SG London
- SG International

Q5 ALL THE INDICATORS THAT ARE LISTED ON THE FOLLOWING PAGES HAVE BEEN CATEGORISED UNDER SEVEN THEMES.

You will be asked to rate each of them by their **importance** at your local context.

- Cultural impacts
- Social impacts
- Educational impacts
- Health and wellbeing impacts
- Economic impacts
- Environmental and technology impacts
- Policy and governance impacts

We acknowledge that some of these indicators do not work in isolation. The power of their impact is on how the indicators are interconnected and/or intersect with each other to offer a more holistic view of impact for Science Gallery. In assessing the indicators by their importance, we ask that you consider them independently and as a multi-faceted indicator.

Q6 THEME: CULTURAL IMPACTS

How important are these indicators in your local context?

	Very Important	Important	Slightly Important	Not Important
Participant's creativity is inspired	◯	◯	◯	◯
Participant's curiosity is sparked	◯	◯	◯	◯
A new point of view is explored or presented	◯	◯	◯	◯
I feel more able to express myself creatively	◯	◯	◯	◯
Participants are affected emotionally	◯	◯	◯	◯
The ___ (e.g. program, exhibition) was well thought through and put together	◯	◯	◯	◯
The ___ (e.g. program, exhibition) was different from things I've experienced before	◯	◯	◯	◯
New insight or knowledge is gained	◯	◯	◯	◯
A relevant understanding of today's world is generated	◯	◯	◯	◯
Participants feel more confident around contemporary art	◯	◯	◯	◯
Advocate for culture increased	◯	◯	◯	◯
Cultural diversity is respected	◯	◯	◯	◯
Participants are provided opportunities to reflect on their own beliefs	◯	◯	◯	◯
A broad and inclusive range of voices is reflected	◯	◯	◯	◯
Participant's cultural pride is strengthened	◯	◯	◯	◯
The ___ (e.g. program, exhibition) helped me to feel connected to people in the community	◯	◯	◯	◯
The ___ (e.g. program, exhibition) provides an important addition to the cultural life of the area	◯	◯	◯	◯
Connection to a shared history/culture is built	◯	◯	◯	◯
Participant's cultural heritage is celebrated	◯	◯	◯	◯
A sense of joy, beauty and wonder is experienced	◯	◯	◯	◯
New understanding and perspective of arts are generated	◯	◯	◯	◯
Understanding of culture deepened	◯	◯	◯	◯
The ___ (e.g. program, exhibition) strengthened my cultural pride	◯	◯	◯	◯

Q7 THEME: SOCIAL IMPACTS

How important are these indicators in your local context?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Activated researchers' communication	◯	◯	◯	◯
Number of research collaborations increased	◯	◯	◯	◯
Stimulated transdisciplinary and collaborative research projects	◯	◯	◯	◯
Collaboration among artists & researchers increased	◯	◯	◯	◯
Artist-Scientist Collaboration Experiences increased	◯	◯	◯	◯
Corporate and alumni engagement enhanced	◯	◯	◯	◯
Supportive behaviour is increased	◯	◯	◯	◯
Sense of belonging is increased	◯	◯	◯	◯
Equality is improved	◯	◯	◯	◯
The ___ (e.g. program, exhibition) helped me understand other people's points of view	◯	◯	◯	◯
Recognition of contribution improved	◯	◯	◯	◯
Voice of participants is respected	◯	◯	◯	◯
Helpful feedback is provided for participants	◯	◯	◯	◯
A sense of safety increased	◯	◯	◯	◯
Self-acceptance enhanced	◯	◯	◯	◯
Number and sustainment of new modes of collaboration increased	◯	◯	◯	◯
The connection among participants is enhanced	◯	◯	◯	◯
Access to cultural activities increased	◯	◯	◯	◯
Contribution from participants increased	◯	◯	◯	◯
Feeling of inclusion enhanced	◯	◯	◯	◯

Q8 THEME: EDUCATIONAL IMPACTS

How important are these indicators in your local context?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Awareness of local issues raised	◯	◯	◯	◯
The ___ (e.g. program, exhibition) was different from things I've experienced before	◯	◯	◯	◯
Public knowledge about topics promoted	◯	◯	◯	◯
Number of new ideas for research increased	◯	◯	◯	◯
Number and types of research and researchers involved increased	◯	◯	◯	◯
Published research outcomes increased	◯	◯	◯	◯
Research-informed policy making assisted	◯	◯	◯	◯
Engagement of students increased	◯	◯	◯	◯
Increased learning opportunities	◯	◯	◯	◯
Increased student mobility and exchange	◯	◯	◯	◯
Student learning outcomes improved	◯	◯	◯	◯
longitudinal impact on student learning enabled	◯	◯	◯	◯
Sensory skills improved	◯	◯	◯	◯
Mapping skills improved	◯	◯	◯	◯
Cognitive problem solving skills improved	◯	◯	◯	◯
Interpersonal skills improved	◯	◯	◯	◯
Artistic skills improved	◯	◯	◯	◯
The ___ (e.g. program, exhibition) was thought-provoking	◯	◯	◯	◯
Help-seeking behaviour increased	◯	◯	◯	◯
Resilience enhanced	◯	◯	◯	◯
I did something I didn't know I was capable of	◯	◯	◯	◯
I feel motivated to do more creative things in the future	◯	◯	◯	◯
Self-awareness increased	◯	◯	◯	◯
Quality of strategies implemented to reach out improved	◯	◯	◯	◯
Awareness of global issues raised	◯	◯	◯	◯
Change in practice for participants increased	◯	◯	◯	◯
Ratings and descriptions of SGN's relevance, use and value to research improved	◯	◯	◯	◯
Types, quality and depth of learning increased	◯	◯	◯	◯
Number of strategies implemented to reach out increased	◯	◯	◯	◯

Q9 THEME: HEALTH & WELLBEING IMPACTS

How important are these indicators in your local context?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Ability to overcome challenges is strengthened	◯	◯	◯	◯
Experiments of trying new things increased	◯	◯	◯	◯
The capability of participants is stretched	◯	◯	◯	◯
I felt like I could be myself	◯	◯	◯	◯
I feel more confident about doing new things	◯	◯	◯	◯
The ___ (e.g. program, exhibition) helped me to see myself differently	◯	◯	◯	◯
Visual pleasure experienced	◯	◯	◯	◯
Physical activeness improved	◯	◯	◯	◯
Mental wellbeing improved	◯	◯	◯	◯
Increased descriptions of agency and hope	◯	◯	◯	◯
Understanding of health issues increased	◯	◯	◯	◯
Feelings of enthusiasm, joy, happiness and excitement increased	◯	◯	◯	◯

Q10 THEME: ECONOMIC IMPACTS

How important are these indicators in your local context?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Confidence about future employment improved	◯	◯	◯	◯
Network in working field enhanced	◯	◯	◯	◯
New opportunities for employment created	◯	◯	◯	◯
Impacts on career choices enacted	◯	◯	◯	◯
Increased employment	◯	◯	◯	◯
Individual's financial situation improved	◯	◯	◯	◯
Individual's arts practice or business developed	◯	◯	◯	◯
New platforms created for new work	◯	◯	◯	◯
Growth of new audiences	◯	◯	◯	◯
Diversity of demography groups increased	◯	◯	◯	◯
New income streams generated	◯	◯	◯	◯
Dollar amount from internal source increased	◯	◯	◯	◯
Number of grant proposals(submitted and successful) increased	◯	◯	◯	◯
Number of staff increased	◯	◯	◯	◯
Range of expertise widened	◯	◯	◯	◯
Staff: client ratio increased	◯	◯	◯	◯
Inputs from participatory activities increased	◯	◯	◯	◯
Number and types of partners increased	◯	◯	◯	◯
Quality of partnerships increased	◯	◯	◯	◯
Disability access improved	◯	◯	◯	◯
Multilingual services provided	◯	◯	◯	◯
New software/apps purchased	◯	◯	◯	◯
Number of exhibitions in a year increased	◯	◯	◯	◯
Number of workshops implemented in a year increased	◯	◯	◯	◯
Number of artists involved in a year increased	◯	◯	◯	◯
Other activities increased (BBQs, networking, media release, book launches etc)	◯	◯	◯	◯
Media coverage increased	◯	◯	◯	◯
Quantity of material used to catch people's attention increased	◯	◯	◯	◯
Quality of material used for target audience improved	◯	◯	◯	◯

Q10 THEME: ECONOMIC IMPACTS (CONTINUED)

How important are these indicators in your local context?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Student enrolment increased	◯	◯	◯	◯
Rate of returned visitors increased	◯	◯	◯	◯
Number of new key stakeholders increased	◯	◯	◯	◯
Average time spent by visitors increased	◯	◯	◯	◯
Professional development for stakeholders	◯	◯	◯	◯
New skills related to work gained	◯	◯	◯	◯
The profile of local artists and/or organisations raised	◯	◯	◯	◯
Number of donors and amount of donations increased	◯	◯	◯	◯

Q11 THEME: ENVIRONMENTAL & TECHNOLOGY IMPACTS

How important are these indicators in your local context?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Sense of pride for local area is increased	◯	◯	◯	◯
Connection to nature is increased	◯	◯	◯	◯
The ___ (e.g. program, exhibition) opened my eyes to issues in the environment	◯	◯	◯	◯
Conversation about local environment increased	◯	◯	◯	◯
Increased use of technology	◯	◯	◯	◯
Appreciation of the places is increased	◯	◯	◯	◯
Awareness of environmental issues is raised	◯	◯	◯	◯
The ___ (e.g. program, exhibition) has something to say about the world in which we live	◯	◯	◯	◯
Pro-environmental activity increased	◯	◯	◯	◯
The connection between technology and people is recognized and appreciated	◯	◯	◯	◯

Q12 THEME: POLICY & GOVERNANCE IMPACTS

How important are these indicators in your local context?

	Very Important (1)	Important (2)	Slightly Important (3)	Not Important (4)
Community networks enhanced	◯	◯	◯	◯
Means for communication and mutual learning are provided	◯	◯	◯	◯
Engagement with local or school politics increased	◯	◯	◯	◯
Number of people involved in voluntary activities for the community increased	◯	◯	◯	◯
Civic-minded behaviour increased	◯	◯	◯	◯
Architectural and/or cultural heritage is preserved	◯	◯	◯	◯
Relationships with municipal and regional government improved	◯	◯	◯	◯
Higher levels of generalised trust, political trust and efficacy	◯	◯	◯	◯

Q13 ARE THERE ANY OTHER INDICATORS THAT YOU CAN THINK OF THAT ARE RELEVANT AND IMPORTANT FOR SGN?

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RFQ06722