FINDINGS REPORT

Science Festivals and Museums/Centers Combined Needs Assessment
The Circuit

May 2022

Prepared by:

Joe E. Heimlich, Ph.D.
Laura Weiss
COSI's Center for Research and Evaluation

This report was produced for The Circuit, a project funded by the National Science Foundation (Grant #DRL - 1906998). The authors are researchers for the project.

We would like to acknowledge the work of Rebecca Kemper, Ph.D. for her work on this project before becoming the CEO of the Columbus Landmarks Foundation. We also recognize the tremendous contributions made by our colleagues at the Oregon State University STEM Research Center, the Association for Science Technology Centers, and the Science Festival Alliance. We thank the following science festivals, museums and centers for responding (note other participating institutions chose not to identify):

Air Zoo
Arkansas Science Festival
Bay Area Science Festival
California Academy of Sciences
Chicago Science Fest
Children's Museum of the Brazos Valley
City of STEM
Columbia Memorial Space Center
Coca-Cola Space Science Center
Eureka! Festival
Exploration Place
Florida Museum of Natural History
iExploreSTEM
Indian River Lagoon Science Festival
InterPlanetary Festival
Lancaster Science Factory
Las Vegas Science & Technology Festival
Los Alamos ScienceFest
Maine Science Festival
Michigan State University Science Festival
MIT Museum
Montana Science Center
Montshire Museum of Science
Museum of Science and Industry, Chicago
Natural History Museum of Utah
National Math Festival
Nebraska Science Festival
North Carolina Science Festival
Northern Ontario Science Festival
Pensacola MESS Hall
Philadelphia Science Festival
Randolph College Science Festival (Central Virginia's Science Festival)
Rochester Museum & Science Center
Science Central
Science Learning Tent at the Arless Celebration
Science Museum Oklahoma
Siskiyou Science Festival
Sitka WhaleFest
Sky Science Festival
Space Foundation Discovery Center
St. Petersburg Science Festival
Texas A&M Physics & Engineering Festival
The Science Zone
Virginia Tech Science Festival
Waco Cultural Arts Fest
Wisconsin Science Festival

Suggested Citation:

Heimlich, J.E., & Weiss, L. (2022). Science Festivals and Museums/Centers Combined Needs Assessment. *The Circuit/Science Near Me*. Columbus, OH: COSI Center for Research and Evaluation.

Table of Contents

Introduction

For this needs assessment, the primary focus was on gaps between the current state (what is) and the desired state (where they want to be) tied to opportunities that might be afforded in the design of *ScienceNearMe*, the website developed under the NSF project *The Circuit.* The gap measures focused on three areas: role in the ecosystem, areas of work, and data. The purpose of this report is not to interpret the findings, but to present the findings so that The Circuit Team can make meaning of the findings to serve the purpose of the project. The findings, however, may have very different implications for the science festivals and SFA, and the science museums/centers and ASTC.

Methods

For this study, CRE worked with the Association of Science and Technology Centers (ASTC), The Science Festival Alliance (SFA), and Oregon State University's STEM Research Center to determine what might be of value to science museums/centers and science festivals that could be either built into or used by the developers of the app to enhance the desirability of institutions and festivals to promote and use *ScienceNearMe* as a tool for building new or broader audiences. One particular focus of the study was what types of programs and act ivities are offered by these institutions and organizations so that it would be possible to compare how these providers identify and name the programs/activities and how potential audiences understand each through a needs assessment that was concurrently conducted by the OSU partner team.

These ideas were then formulated into questions that were descriptive, explanatory, or designed to measure a gap—in this case gaps that The Circuit could possibly help bridge as part of the *ScienceNearMe* app. The instrument had six components starting with a description of the type of museum or center and the role of the individual responding. This was followed by the gap study with five comparison scales:

1. capacity to do current work relevant to what *ScienceNearMe* might be able to provide,
2. information about and tracking visitors across program and experience in and beyond the science museum/center,
3. role of the museum/center in the local and regional science education ecosystems,
4. types of programs and experiences offered by the museum/center, and
5. capacity of the museum/center in several key job function areas.

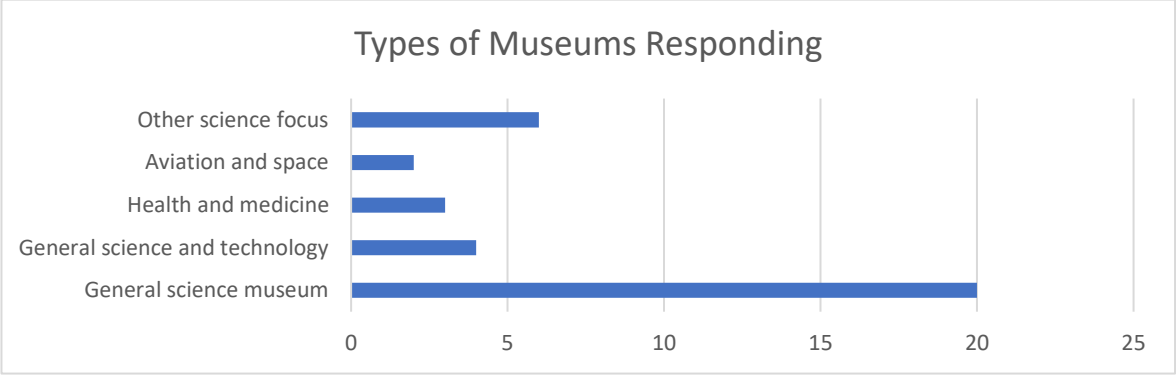
The questionnaire was reviewed by the ASTC, SFA, and Stem Research Center partners, entered into the online survey platform Qualtrics, and then sent to the partner contact at ASTC or ASF. This study was conducted under the Oregon State University IRB.

Findings

It was important for this assessment to look at the types of institutions and the roles of individuals responding to the questionnaire to understand the breadth of representation to ensure there would not be a strong bias in the small population for this study. For the first question, the types of museums responding, it was not surprising that general science museum was the largest category of response, with several museums noting general science museum plus a special focus of their museum as multiple responses were allowed. In looking at the names of the institutions, some of these "other science focus" responses become clearer.

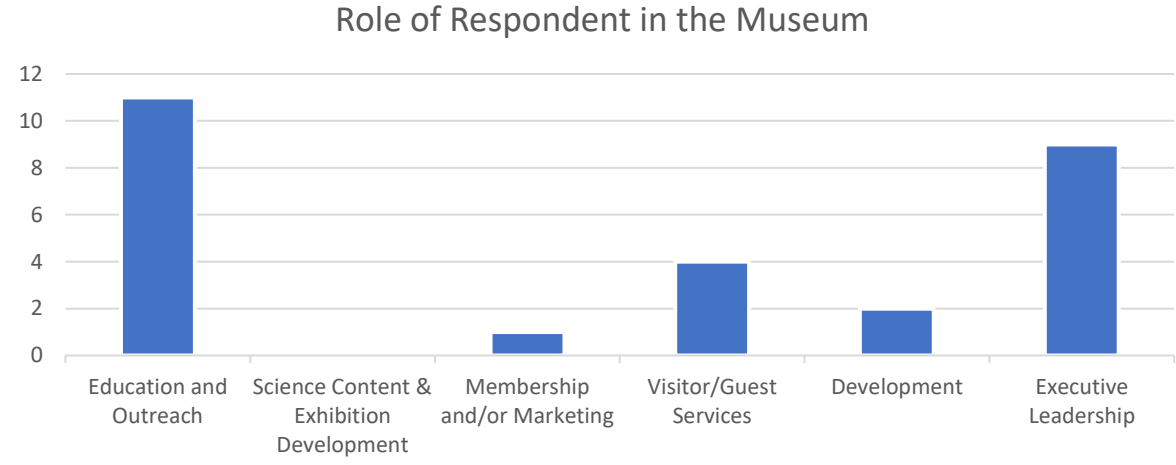
The first question for the science museums/centers simply asked each person responding for an institution to identify the type of museum they represented. Multiple responses were allowed. As expected, the great majority of responses were that they were a general science museum with 20 of the 27 respondents identifying as such. Six institutions identified as having an "other science focus,"

Chart 1: Types of Museums



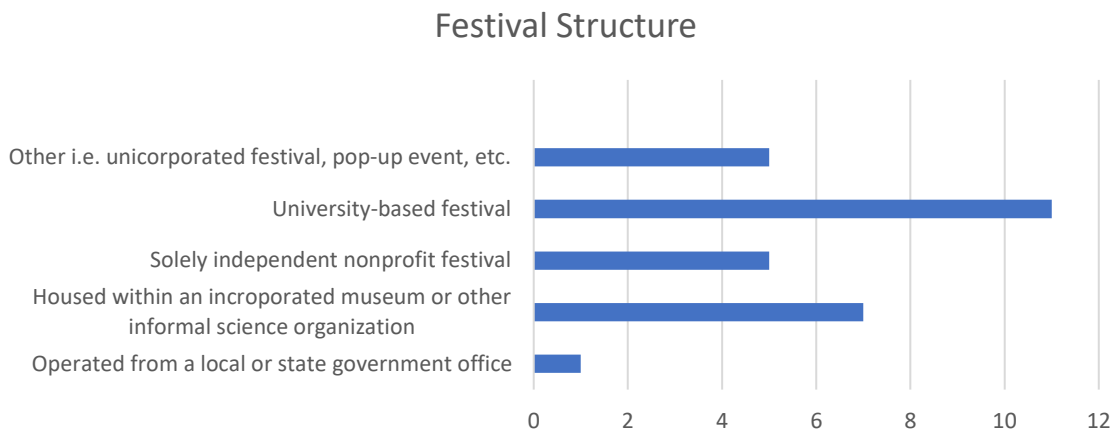
Twenty of the individuals responding for their institutions were either involved in Education & Outreach (11), defined as those with educational programming and other educational efforts with the public, or Executive Leadership (9) or those responsible for upper-level organizational management. The chart below shows the distributed responsibilities of those responding.

Chart 2: Role of Respondent



It was also important for this assessment to look at the types of festivals and the roles of individuals responding to the questionnaire to understand the breadth of representation to ensure there would not be a strong bias in the small population for this study. For the first question, the structure of the festivals responding, the largest category of "sponsor" was a university response, followed by a festival housed in a museum or other informal science organization.

Chart 3: Festival Structure



When asked about area of focus, twenty (68.9%) do not have a specific topic area of focus beyond general science. Of the nine festivals that do have an area of focus, 4 (26.67%) focus on general science and technology, 3 (20%) are focused on health and medicine, 2 (13.33%) have an aviation and space focus, and 6 (40%) are other science focused (the festivals were able to select more than one).

In a query about partnerships, 3 of the festivals have a zoo/aquarium as a partner, and 3 have a park or park system as a partner. Nature centers or conservancies, gardens/botanical gardens, and planetariums/observatories were partners for 2 festivals. One festival partnered with a historic site and another with a forest or nature preserve. One festival noted having a partnership with a local museum, and another focused on informal mathematics organizations, mathematics education groups, professional mathematics societies, science and children's museums, and others. One festival partner had an advisory group on an Indigenous reservation, two tribes, a Powwow committee, and tribal college, and local libraries.

We also wanted to know the role of the individual who responded to the questionnaire. Knowing that often individuals play multiple roles in festivals, respondents were able to select all options that applied to them. As is evidenced in Chart 2 below, most of the respondents were responsible for many of the administrative tasks of running a festival.

Chart 4: Responsibilities

As seem in chart 2 above, all five responsibilities had a strong majority of the festival contacts engaged in that activity. The common responsibility across all respondents was managing and spending science festival operational funds, followed by communicating offerings to the publics.

The greatest stated area of capacity need is that of raising science festival funds as well as promoting ongoing donation support, with 8 of the 24 responding institutions (33.3%) selecting it. Five (20.83%) desire more capacity for curating attendee experiences at science festivals' activities, and four (6.67%) lack capacity for scheduling partners for science festival programming and other efforts with the public for informal science education offerings. Three noted coordinating partner work for science festival programming and other efforts with the public for informal science education offerings, and three noted a need for capacity in communicating offerings to the public. One institution noted managing and spending science festival operational funds as an area of capacity need.

Gap Study

The first gap measure looked at tracking participant attendance across the institution's offerings, tracking participant attendance at other science museums and/or festivals, and awareness of how the institution's activities coincide with other science festivals' and museums' program offerings. The largest gap (3.86/6.0) was on tracking attendance, and the lowest mean score was on the ability to track attendance at other festivals and museums (See Table 1). However, the value of doing so was the lowest of the three desired state means ($\bar{x}$= 5.73). The highest perceived value state was that of tracking participant experience across the organization's programs and exhibitions with a very high mean of 6.60 on the 7-point scale. Please note: the questions included were tailored to either the festivals or the science museum/center but the gap being measured was parallel.

Table 1: Tracking participants

	Mean	St. Dev.	Gap
We are able to track participant attendance across our organization's programmatic and exhibition offerings.	5.13	1.15	1.47
It would be useful for our organization to track participant attendance across our organization's programmatic and exhibition offerings	6.60	0.49	
We are currently able to track participant attendance at other science museums and/or science festivals	1.87	1.15	3.86
It would be useful to track our participant attendance at other science museums and/or science festivals	5.73	1.29	
We are aware of how our activities coincide with other organizations' program offerings	4.73	1.73	1.40
It would be useful to know when our activities coincide with other organizations' program offerings	6.13	1.26	

Attendee information and communication platforms

For the museums and festivals, the largest gap score in attendee information and communication patterns had to do with the information regarding attendee's/visitors' emgage across programs, events and offerings currently, and what would they want more of with a gap score of 3.27/6.00. This item had the lowest current state mean (a negative $\bar{x}$=3.33) tied for the highest ideal state score with information on who is currently visiting and participating at 6.60.

The lowest value smallest gap score (-0.74) was on tracking demographics of participants to programs, and the ability of the institution to do so. This item also had the highest current state score with a mean =6.27. This

suggests that institutions feel they do not need to do more with tracking participant demographics than they are currently doing.

Table 2: Attendee information/communication platforms

	Mean	St. Dev.	Gap
Our organization has adequate information of who the attendees are at our programs, events, and other offerings	4.40	1.14	2.20
Having better data regarding our participants' interests would be useful in our execution of our programs, events, and other offerings	6.60	0.71	
Our organization is satisfied with the information we have regarding attendees' patterns across our programs, events, and other offerings	3.33	1.14	3.27
Having additional data regarding attendees' patterns across our organization's programs, events, and other offerings would be useful	6.60	0.71	
It is important to our organization to track demographics of participants to our programs, events, and offering	6.27	1.29	-0.74
Our organization needs to be better at tracking participant demographics to our programs, events, and offerings	5.53	1.89	
Our organization is effective in posting upcoming events, programs, and offerings across all of our current marketing outlets	4.93	1.49	1.93
Our organization would benefit from a more unified presence when posting upcoming events, exhibitions, programs, and other offerings	6.33	0.94	
Our organization is effective at recruiting more volunteers for our festival	4.53	1.67	1.40
Our organization would benefit from having more information to help recruit more volunteers	5.93	1.48	
Our organization has the needed capacity (people and money) to sustain a system that accomplishes the types of things listed above	2.87	1.41	2.46
Our organization would need to consider trade-offs in other areas to sustain a system to accomplish the types of things listed above	5.33	1.19	

Science museums'/centers' role in STEM learning ecosystem

As *ScienceNearMe* was to be designed as a way of individual knowing and tracking all the ways they could engage in informal science learning in their communities, the project team felt it was important to see how well the institutions understood their role in the local and regional science education ecosystems.

The organizations overall are in moderate agreement that they understand their role within the local ecosystem ($\bar{x}$= 5.07) and weak agreement about understanding their role in the regional science education ecosystems ($\bar{x}$=4.60). . They are also in slight agreement that they maximize the opportunities to fulfill that role. Both gap scores were negative but do not necessarily mean this is not important for the institutions, rather, given the wording, it simply reflects that they are not currently focusing on maximizing the role of the institution in the local and regional science education ecosystems.

Table 3: Role in STEM learning ecosystem

	Mean	St. Dev.	Gap

Our organization currently understands its role within our local science education ecosystem	5.07	1.48	-1.07
Our organization maximizes the opportunities to fulfill our role within our local science education ecosystem	4.00	1.41	
Our organization understands our role in our regional science education ecosystem	4.60	1.20	-1.07
Our organization maximizes the opportunities to fulfill our role within our regional science education ecosystem	3.53	1.26	

Programs and activities offered

Given the changed conditions in the institutions due to the pandemic, the project team had an interest in understanding not only what types of programs are offered by the institutions, but also how many of them had shifted to virtual or both in-person and virtual. All the institutions responding offer in-facility events, in-facility special events, and school group events with all but one conducting intergenerational programs, youth-only events, and fundraising events. Under half offered science festival events, citizen science projects, and arts-based events that integrate science. For all program offerings, there was a mix of in-person only, virtual only, and both offered by the responding institutions.

Table 4: Program offerings

	In-person only	Virtual only	Both	Total
In-facility events (Museums/Centers)	6	0	9	15
In-facility special events (Members/Centers)	4	0	11	15
In-facility ticketed experiences (not exhibits)	6	2	2	10
Intergenerational (Museums/Centers)	4	0	10	14
School group events	3	0	12	15
Youth only events	2	0	12	14
Bar events (21+)	8	0	0	8
Adult events (21+)	9	0	2	11
Large expo-style events	5	0	5	10
Community/outreach events	2	0	11	13
Community/outreach projects	8	0	0	8
Maker events	6	0	2	8
Member events (Museums/Centers)	7	0	5	12
Arts-based events that integrate science	3	0	4	7
Science festival events	1	0	5	6
Citizen science projects	3	0	3	6
Fundraising events	4	2	8	14

When asked if they have programs or experiences that do not fit into any of the categories, the institutional respondents only had a couple of general comments. One institution noted they host virtual birthday parties.. A few comments related to take-home resources—one institution and one festival both named science kits. There were also media events and other digital resources for experiences mentioned by both festivals and museums/centers.

For those who reported they have citizen science projects, we learned they include a couple that are large, national efforts including GLOBE Observer and eBird used in youth programs and City Nature Challenge through iNaturalist. One institution received a grant to create a community science (citizen science) project to study invasive species regrowth from a burn area near a popular hiking area on a nearby mountain. Another has a partnership with NASA/JPL and the GAVRT Radio Telescope. A festival offers Science Cheerleaders, a cell phone

swab Water Goats, and catch debris from stormwater drains. Other festivals capture sounds of meteors, sun flares, and Jovian storms; another does Bioblitzes. One institution hosts a number of museum-based projects both locally and state-wide on the research of the institution's scientists.

Festivals had many individualized things that they do that were not listed, but many of those could be categorized into one of the above

Capacity Needs

Knowing that any new activity stresses capacity of most institutions, the project team felt it was important to understand where the most "sticky" parts of capacity reside for science centers and museums and a different set of capacity issues for the frestivals. We also wanted to see if there might be ways of developing *ScienceNearMe* to ease some of the burdens on the responding organizations. The item named the area of work, then explicitly stated the activity most related to the app. For science ,museums/centers, the areas were tied to divisions within the institution:

- Education & Outreach – those involved with programming and other educational opportunities to the public
- Science Content & Exhibit Development – those involved with developing science content and exhibits
- Membership and/or Marketing – those assisting with managing an organization's members and/or communicating offerings
- Visitor/Guest Services – those assisting front-line operations
- Development – those responsible for fundraising and philanthropic giving
- Executive leadership – those responsible for upper-level organizational management

Using a scale of 1= no more capacity is needed to 7= Much more capacity is needed, fundraising was the capacity most needed ($\bar{x}$=6.13) followed by developing science content and exhibits and programming and other educational opportunities ($\bar{x}$= 5.93 and 5.53 respectively). Executive leadership was the capacity least needing support and was the only area of capacity that had a mean score below neutral ($\bar{x}$=3.53).

Table 5: Capacity ranking and distribution – Museums/Centers

		-1-	-2-	-3-	-4-	-5-	-6-	-7-	Mean
Education & Outreach		0	1	1	0	5	3	5	5.53
Science content/exhibition development		0	1	0	1	3	2	8	5.93
Membership and/or marketing		0	1	0	1	3	5	5	5.73
Visitor/guest services		1	2	0	3	2	3	4	4.87
Development		0	0	0	2	3	1	9	6.13
Executive leadership		4	1	1	4	3	1	1	3.53

For festivals, the items were named by describing the type of work as SFA advised the researchers that size and type of festival led to jobs that overlap, have unique titles, and intersect in different ways.

Using the same scale structure as above, , fundraising was the capacity most needed with a mean of 5.69, followed by communicating science festival offerings to the public, and communicating attendee experiences ($\bar{x}$=5.15 and $\bar{x}$=5.08 respectively). Managing and spending operational funds was the capacity least needing support and was the only area of capacity that had a mean score below neutral ($\bar{x}$=3.81).

aTable 6: Capacity needs

	-1-	-2-	-3-	-4-	-5-	-6-	-7-	Mean
Scheduling partners for science festival programming and other	1	1	2	9	7	4	2	4.54

efforts with the public for informal science education offerings								
Coordinating partner work for science festival programming and other efforts with the public for informal science education offerings	-	1	4	6	9	3	3	4.69
Communicating science festival offerings to the public	-	3	1	4	3	11	4	5.15
Curating attendee experiences at science festivals' activities	-	-	5	3	7	7	4	5.08
Raising funds for our science festival funds as well as promoting ongoing donation support	-	-	3	1	5	9	8	5.69
Managing and spending science festival operational funds	4	4	4	3	5	4	2	3.81

Museums and Centers were asked one additional question asking them to identify key partners with whom they collaborate in co-creating content. The limited number of responses still demonstrates a wide range of partners, very much tailored to the local community. The partners included:

- A maker organization
- Art museum
- Nature-focused organizations for a community festival
- Other science education organization
- Local NBA team
- Meteorologists

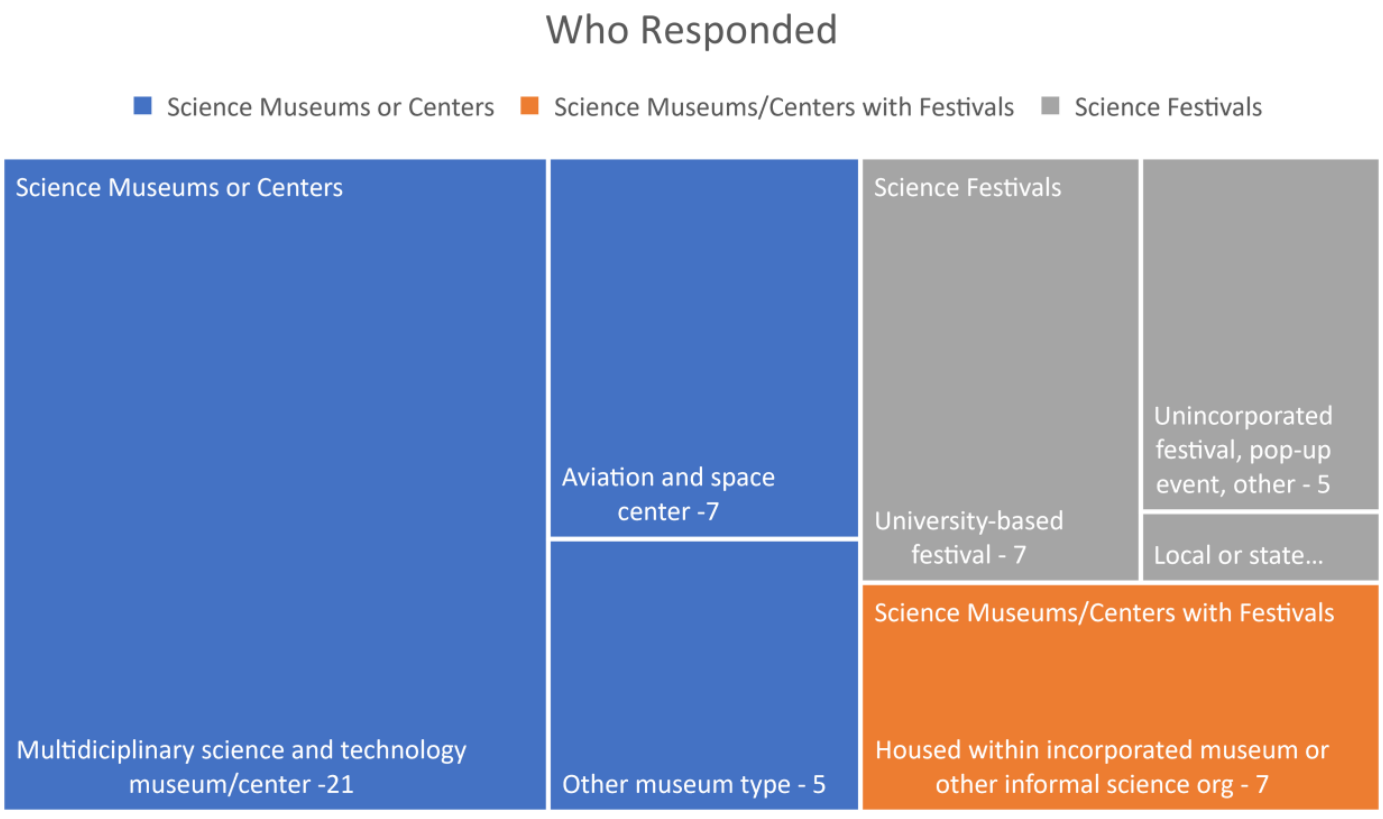
Concluding observations

The purpose of this study was to inform The Circuit partners as they made decisions regarding the development of the *ScienceNearMe* app. The study is not representative of the field, though the findings are likely transferrable across science museums/centers and science festivals.

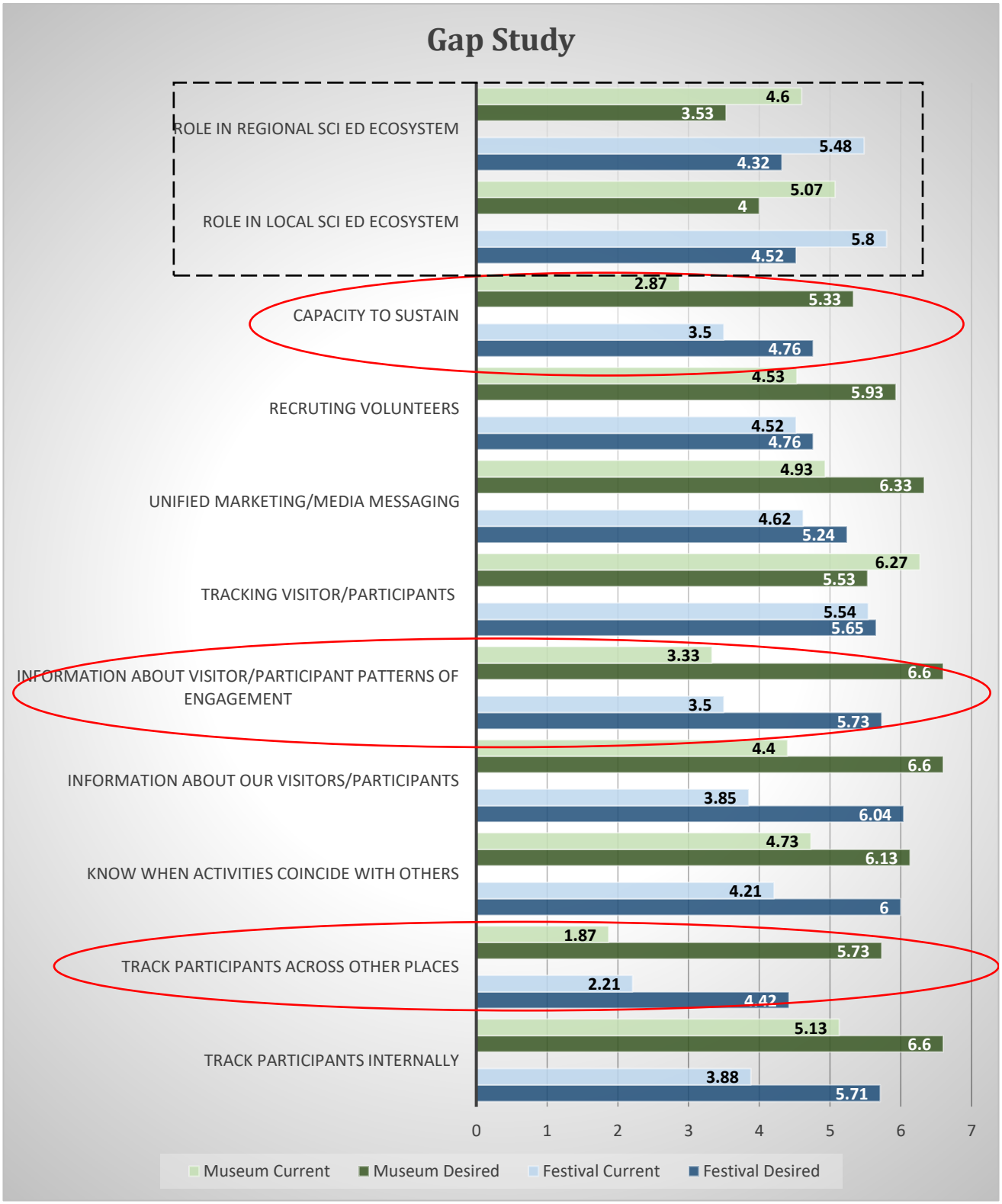
The Circuit: Needs Assessment

High level findings – Science Museums/Centers and Festivals

10 May 2021



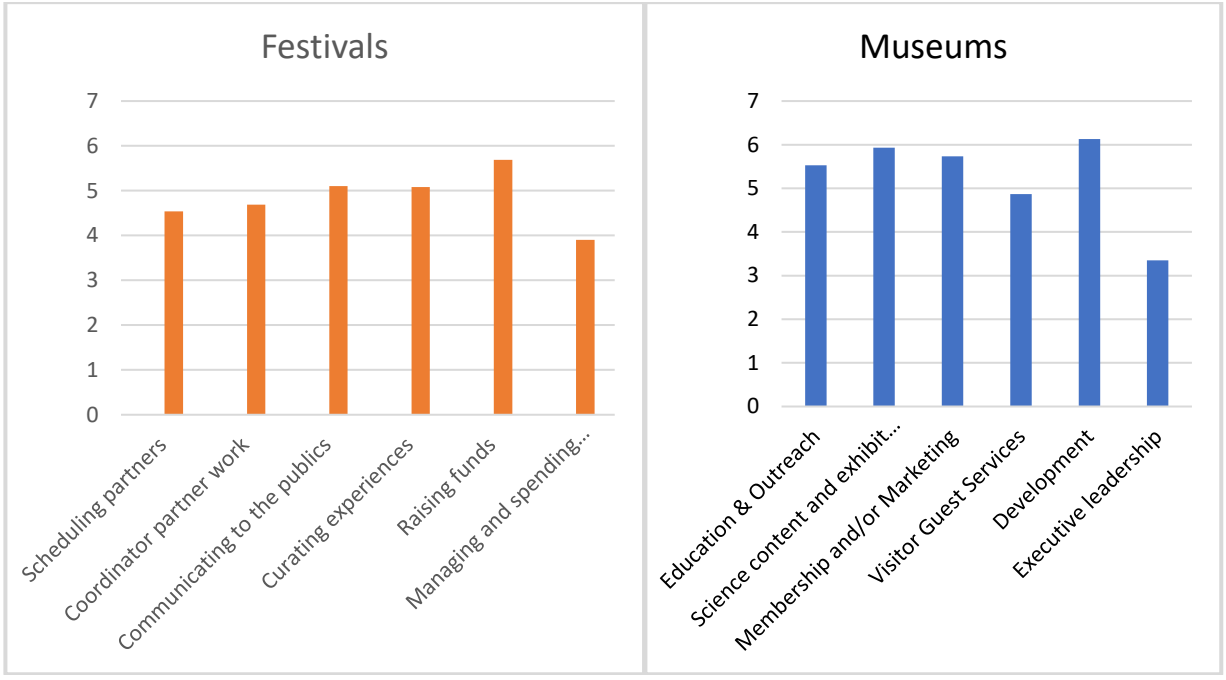
For the needs assessment, the primary focus was on gaps between current state (what is) and desired state (where they want to be). The gap measures focused on three areas: role in ecosystem, areas of work, and data. The following chart shows the mean scores for museums/centers and festivals comparing the current state and the desired state.



Circled in **red** we can see those areas where both science centers/museums and science festivals are currently most dissatisfied with current abilities and filling the gap to the desired state would turn them positive. In the **black** box, we see the only negative gaps (they are happy with where they are) which relate to their role in the science education ecosystem.

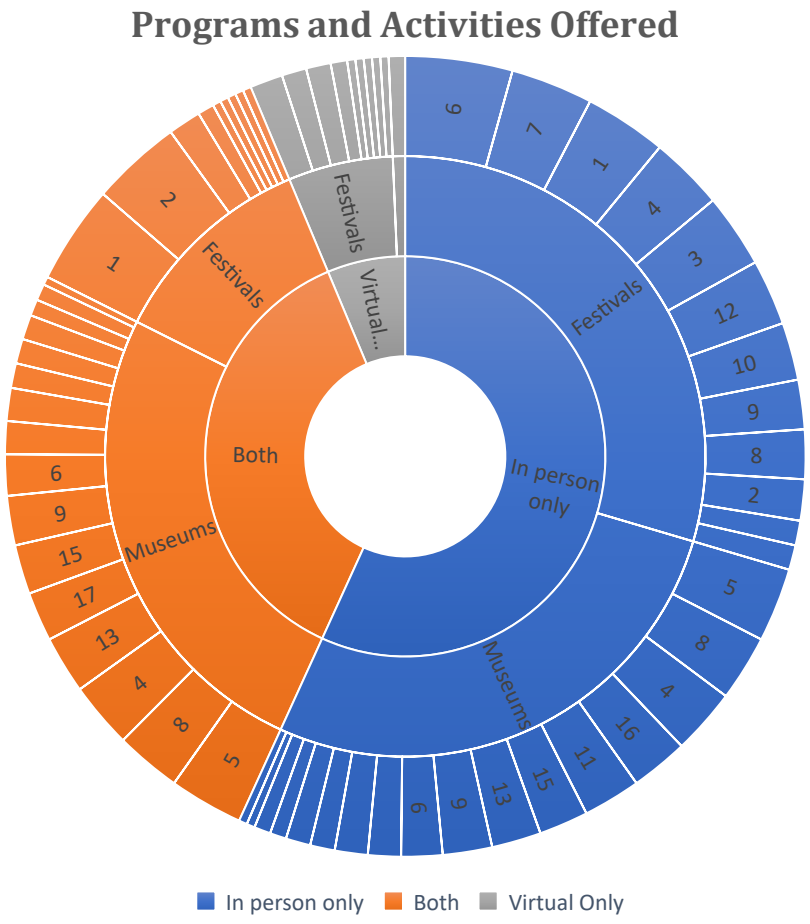
We also asked specifically about capacity needs. For this, we used a 7-point scale that ranged from 1 = No added capacity needed to 7 = significant added capacity needed. Overall, the organizations in the study only had one item each where capacity need exceeds the middle point. Museums overall have higher capacity across the functions of interest.

Where is the capacity need?



Festivals feel they most need capacity is in raising funds, followed by communicating to their publics, and curating experiences. Overall, they need the least support in managing and spending science festival operational funds. But all items ranged from ratings of 1 – 7.

The Science museums/centers very much felt they needed capacity in development. They were also fairly strong overall in needing capacity in science content and exhibitions, and strong in needing capacity in membership/marketing and education and outreach. Most but not all the museums/ centers felt they have good capacity in their executive functions.



1 – Intergenerational/Family Events
2 – School Group Events
3 – Youth-Only Events
4 – Bar Events (21+)
5 – Adult Events (21+)
6 - Large Expo-Style Events
7 – Community/Outreach Events
8 – Community/Outreach Projects
9 – Maker Events
10 – Arts-Based Events that Integrate Science
11 – Citizen Science Projects
12 – Fundraising Events
13 – In-Facility Events (regular) Museums only
14 – In-Facility Special Events Museums only
15 – In-Facility Ticketed Events Museums only
16 – Member Events
17 – Science Festival Events

In this pandemic year, many festivals and museums closed for part or most of the year. Even so, with the switch to virtual, it was in person followed by both virtual and in-person programs and offerings that were conducted. Of particular interest to The Circuit platform architects, as well as science museums / centers and festivals, are the frequencies with which visitors/attendees and content providers use programmatic descriptors; such findings across these instruments could provide more insight on how to successfully disseminate opportunities on the app. The study's component of programmatic descriptors use will be included when we have the findings from the member/public study for the sake of comparison. Additional analyses are needed to make meaning across content providers' needs assessment responses and responses from the forthcoming visitors' needs assessment.