EXECUTIVE SUMMARY

VISION TO REALITY: CRITICAL DIMENSIONS IN SCIENCE CENTER DEVELOPMENT

ASSOCIATION OF SCIENCE-TECHNOLOGY CENTERS

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CENTERS

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The Association of Science-Technology Centers is a nonprofit organization founded in 1973. ASTC seeks to enhnace the ability of its science-museum members to foster public understanding of the principles, practices, and implications of science and technology, and to encourage the public to apply that understanding in their daily lives. ASTC facilitates communication among its members, helps them to broaden and diversify their staffs and audiences, and seeks to foster excellence and innovation in informal science education.

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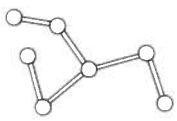


PREFACE

Twenty years ago, when the Association of Science-Technology Centers was founded, just over a dozen museums joined—a widely scattered array of older institutions and a few that had recently opened, bound by a common commitment to hands-on learning about science. Today, there are more than 200 science centers in the United States alone, and a quarter of the U.S. population visits them every year. Nearly a hundred other start-up projects are now underway.

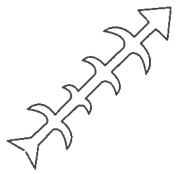
In an effort to understand how these new science centers are founded, and what factors contribute to their success—or failure—the National Science Foundation asked ASTC to undertake a study in 1991. This three-part report is the result.

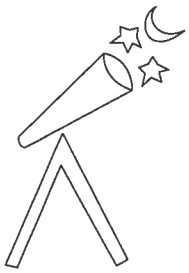
The study was designed to be both broad and deep in scope. Quantitative data were collected from nearly a hundred institutions, and case studies were conducted at half a dozen. We were fortunate to have as our researchers a team that has combined experience of many years working in and with start-up science centers—Sheila Grinell, now executive director of the Arizona Museum of Science and Technology and former executive director of ASTC, and Mark St. John, principal of Inverness Research Associates in California. In addition to their extensive consulting and evaluation experience, they helped develop the ASTC Institute for New Science Centers (first held in 1988) and have contributed to a broader program of publications and workshops for new science center founders, the ASTC New Science Centers Support Program. Grinell was the author of the 1992 volume *A New Place for Learning Science: Starting and Running a Science Center.* Grinell and St. John bring to bear on this study not only the results of the survey and case studies, but their own rich experience in this field.

To the many who shared their experiences, including several museums in Florida and Louisiana who served as case study sites, we owe our appreciation. Although many are relative newcomers to the field, they have contributed to the tradition of collegial support that has helped science museums to flourish.

And to the National Science Foundation for its longstanding support of science centers, and for the grant that funded both this research report and the New Science Centers Support Program, we express our deep gratitude.

Bonnie VanDorn
Executive Director
Association of Science-Technology Centers





VISION TO REALITY:
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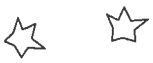
EXECUTIVE SUMMARY

There is no formula for starting a science center. Science centers are as variable as the communities that surround them and the people who plan them. They may be of modest or monumental proportions and grow at different rates and in a variety of ways. Nevertheless, it is possible to identify a number of common themes and dimensions that appear to be critical to their success.

The Survey



Late in 1992, a survey was sent to 199 institutions dedicated to informal science education that had been identified by ASTC and related professional organizations as incorporated and working toward opening or open not more than five years; 96 completed the form, a return rate of 48 percent. Of the 96, 74 were in the United States and 22 outside the U.S.; 78 were new, and 18 were adding a science wing or changing missions; 59 were science centers or museums, and 37 were other types of science-based informal learning institutions. This is a heterogeneous set of institutions, some open, some existing only on paper. Based on survey results taken as a whole, the following are general trends in science center development.

Founding a science center

Founders—The process of founding a science center involves the collaboration of a wide range of individuals and groups. Community leaders, teachers, and scientists figure prominently among these leaders. A coalition of supporting institutions is also generally involved. In the U.S., community groups play a significant role (cited by 41 percent in the U.S., only 9 percent elsewhere); abroad, governmental bodies provide more support (cited by 54 percent abroad, 24 percent in the U.S.).

Support—Financial support for new science centers comes from a broad range of sources. For capital, 48 percent have city or county funding, 38 percent have state funds, 52 percent have private foundation support, and 51 percent have support from individuals. Other sources of capital support include federal grants (15 percent), board members (28 percent), earned income (19 percent), and corporate or business sponsorship, loans, and schools (35 percent). On the operating side, the most frequently cited sources of support are individuals (54 percent) and private foundations (47 percent), while earned income, corporate and business funding, board members, and city government each provide support for about a third of the responding institutions. In the U.S., individuals are a more important source of support than in other countries.

Scope—Continuing an earlier trend, most of the science centers being founded in the 1990s are small—more than 50 percent of those responding to the survey are under 20,000 square feet in total area. Institutions outside the U.S. are building a relatively higher percentage of larger science centers, often in major cities; in the U.S., most major cities already have a science center. These foreign museums devote a comparatively smaller percentage of floor space to exhibits than do U.S. start-up centers, which tend to give exhibit-based educational offerings highest priority, at least in their start-up years.

Timing—Most of those responding to the survey have either opened or expect to open in the period from 1987-1997. Overall, respondents required or plan to require an average of six years from initial conception of the institution to opening, with over half requiring five years or less. Established museums adding a new science division need only three years on average for their transition.

Method—Like other start-up operations, a science center can choose to launch a pilot project and expand gradually over time, or it can choose to capitalize a full-fledged effort from the start. Overall, the survey indicates that 51 percent of respondents have chosen to open a "finished" museum, while 32 percent are opting to grow gradually; 16 percent follow different patterns. Looking just at the U.S. museums, however, the percentages are reversed: 50 percent grow gradually, while 35 percent plan to open in a new or renovated structure with the bulk of exhibits finished; 15 percent follow different patterns. U.S. museums' preference for gradual growth may be a product of their generally small size and reliance on citizen activism; it is easier to get a small center going with volunteer labor than to organize and finance a large, state-supported effort.

Resources—Science centers generally rely on a wide range of outside resources to help them in their development. More than half receive substantial help from other museums (61 percent), professional associations (58 percent), and the business community (60 percent). For new U.S. museums, local citizens are a major source of assistance (cited by 68 percent); for foreign museums, universities play an important role (cited by 45 percent).

Operating a new science center

For an analysis of actual operations of science centers, the study examines a subset of the data: responses from 37 U.S. institutions opened in or before 1992. Because these museums are actually operating, the data they provide can be considered an accurate reflection of actual practice.

Governance and facility—Most of these 37 institutions are private, nonprofit corporations (68 percent); 15 percent are units of government, 3 percent are units of a private parent organization, and the remainder fall into a variety of other patterns. Current average museum area is 24,000 square feet, with 65 percent of the interior devoted to exhibits. Almost half (47 percent) are already actively planning or engaged in capital campaigns to support further growth. Most institutions undertake exhibit development and capital construction simultaneously, and planning for educational programs generally begins a year into the exhibit development effort.

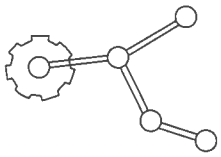
Audience, budget, and staff—130,873 visitors through the door is the average number served each year for the subgroup of recently opened U.S. museums; 63 percent of these visitors are under 18 years of age. In addition, 15,805 on average are contacted through outreach. Outreach audiences show greater ethnic diversity than general audiences. The average staff includes 26 full-time employees (or their equivalent) and 90 volunteer positions (or eight full-time equivalents). The average facility spends just over $1 million each year, or about $8 per visitor. On average, about half of the budget is earned through a combination of admission and program fees, sales, and interest. Although these new science centers earn a higher percentage of their budget than the field in general, fundraising clearly remains a critical function for the vast majority.

Exhibits and ongoing development— New science centers rely on both local volunteers—scientists and educators—and professional exhibit designers to create their exhibits. About one-fourth of the time, exhibits are conceived in-house but fabricated outside; one-fourth of the time, exhibits from other institutions are purchased or copied; and one-fourth of the time, exhibits are conceived and built at home.

Accomplishments and challenges— Reflecting on the previous year, respondents rated their most significant accomplishments and major challenges. Fundraising and exhibit program development figure on both lists. Achievements in both areas are vital, and disappointments in either threaten the institution. Issues around acquiring and developing an appropriate facility are prominent. The rankings also show that new institutions still need to expend a great deal of effort on cultivating, motivating, and properly utilizing the many different kinds of people who, by necessity, are involved. Relations with other institutions and community groups are also central in importance.

The researchers conclude that any outside initiatives to help support new science center efforts would do well to focus on these areas.

Issues and Dynamics



Case studies of six U.S. museums, and the long experience of the two researchers, provided the basis for an analysis of critical dimensions of science center development and how these dimensions interact over time to affect the institution's ultimate success or failure.

Critical dimensions of science center development

Critical dimensions in the successful development of science centers operate cumulatively in a probabilistic way; science centers that build strength in several dimensions develop a kind of cumulative strength and have momentum to carry them across inevitable pitfalls. The four dimensions that appear to be most critical are *leadership*, *vision*, *support*, and *facility*.

Leadership— Community activists, teachers, and scientists, in that order, are most likely to serve as founders of new science centers. Many founding groups consist of all three types of individuals. Very often, the effort is driven by the energy, commitment, and leadership of a single person, often surrounded by a core group of supporters who are willing to do a great deal of work to make the vision happen. Leaders often choose to start a science center at some transition point in their own lives, such as retirement or turning community volunteer work into a professional job.

The study found that successful leaders are:

- knowledgeable in many areas, but with a real strength in a particular area
- persistent, optimistic, and willing to take on new challenges
- artful at identifying resources and willing to ask for help
- skilled at teamwork

Leaders act as "guardians of the mission," helping to articulate and promote a vision for the science center, and to maintain the vision throughout the sometimes long and challenging course of development.

Vision— A clear, specific, and compelling vision is critical to the development effort. The emphasis of the vision may vary along a continuum from what might be described as "outside in" to "inside out." The outside-in vision is essentially institutional in nature. It begins with an image of the building and its site, then moves to programs, exhibits, content, and finally the experience the founders want visitors to have. In contrast, the inside-out vision begins with a sense of what the visitor's experience should be (based on pedagogy, or esthetics), then moves to programs, exhibits, content, and only later to the building. Most efforts tend to fall near one end of the continuum or the other, but eventually every museum needs to address all of these issues. Founders need to be clear about the experiences they wish to provide their visitors; they also need to have a realistic and compelling vision of how their museum can concretely be developed to produce these experiences. Whether the emphasis is experiential or institutional, the quality of scientific content must be part of the vision, as well as a clearly articulated educational philosophy.

Support—The ability of the leadership team to develop a broad base of political support that includes, but extends beyond, the local community is another important dimension in assuring the success of a start-up museum. Community recognition, volunteer support, political commitment, and funding are inextricably linked.

A realistic assessment of local community resources, and scaling the museum accordingly, contribute to a start-up's success. Starting too big can lead to delays, but starting too small can inhibit the effort and lead to the need to shift sites or conduct repeated fundraising campaigns. Achieving a balance between being "market driven" and being "mission driven" is crucial in an institution's self-definition. There is considerable danger in building a museum on borrowed funds, with the promise of repaying debt with future earned revenue. Although some large

institutions have no choice—aquariums, for instance—this approach requires sophistication in financing and marketing. And museums tend to overestimate revenues, underestimate expenses, and be unrealistic about timelines.

Facility—Museums may opt for one of two alternative strategies, opening a finished facility, or starting small and moving their museum into increasingly larger and more permanent sites as their expertise, community recognition, and resources grow. Each approach has different implications. Those that open finished must raise funds and manage research and development up front, for example, but can offer donors a more polished product. Those that grow gradually can learn more from visitor feedback and adjust to community responses, but their offerings will be rougher, less complete, and may fail to attract significant support. A few start-up institutions try to reap the benefits of both approaches, testing their philosophy in temporary quarters while planning for the total vision; but this takes greater resources.

Choice of site must be compatible with the overall mission and, in particular, must be suitable for the target audiences. In selecting a site, museums need to think about synergy (or lack of it) with other nearby institutions. Getting the scale right, so that it fits the mission and the community, is critical. If the envisioned facility is too large, costs of construction, operation, staffing, and maintenance may dwarf the market's potential to cover these costs. Too small a facility, and the ability of the institution to grow and develop a critical mass needed for self-sufficiency is hampered.

Overall, there has to be congruence between the site, the design and size of the building, the vision, the exhibits, and the programs. The planned facility has to be realistic in terms of the museum's ability to raise capital, but should stretch the vision as far as possible so that it is not outgrown immediately.

In several respects, developing science centers can be compared with small start-up businesses. Both benefit from strong team leadership and shared "ownership"; both have a greater chance of success when the level of initial funding is appropriate to the size of the effort; and both do better when they can address a market that is regional as well as local. Both are likelier to fail if they make unrealistic estimates of the market, lack flexibility and adaptability, and grow too fast or unevenly, or if leadership fails to promote a strong vision, develop a balanced and committed team, and resolve personal conflicts.

Dynamics

Science centers follow different pathways as they develop, depending on local circumstances. All seem to move through a series of common phases, though not always in the same sequence, nor in a strictly linear fashion. Each phase presents common challenges to start-up efforts.

Initial concept—Typically, the founder visits one or more science centers and decides that his or her hometown would benefit from having such a facility. Never having started a museum, but encouraged by the informality of most science centers, and aware of the lack of hands-on science

in the schools, the founder begins to discuss the idea and gather a core group. The group researches the idea and begins to define its niche in the context of other educational and cultural institutions; sometimes they bring in a consultant at this point. From this research, the group, typically held together by a single individual, begins to articulate its vision. If the vision remains loose enough, as is often the case, new perspectives are readily incorporated and factions are less likely to splinter the group. The founder's flexibility, persistence, and large capacity for work are crucial at this stage.

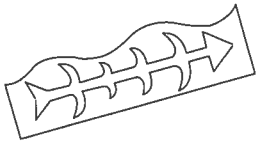
Demonstration—Seeking a higher political profile and public recognition, most founders look for ways to demonstrate hands-on science and their vision for the new center to the larger community. They may borrow exhibits and programs and enlist volunteers to present them at various venues like schools. Successful demonstrations build knowledge, confidence, and solidarity among the core group and volunteers, as well as raising the level of community awareness and an appetite for more. A balance must be struck, however, between energy devoted to demonstrations and energy devoted to planning and fundraising.

Incorporation—In order to move ahead, the founding group must formalize, incorporating, applying for nonprofit status, and establishing bylaws and a committee structure to carry its work forward. At this stage, the board of directors is still a "working board," consisting of hard-working, mission-minded individuals. Recruiting and managing volunteers can be a challenge. Again, patient, inclusive, flexible leadership is required.

Program planning—The chief task at this stage is to "size" the effort appropriately so that it is sustainable over the long run. Some boards at this point may blur the original vision with marketing concerns, opting for quantity—"visitor throughput" --over quality. Another distraction may be the offer of a "free" building or architectural work, which may eat up precious time and divert the board from the hard work of self-definition, achieving recognition, and building alliances. Once again, it takes vigilance on the part of leadership to keep the vision from becoming diluted.

Implementation— With plan in hand, the board now faces the challenge of raising capital for building renovation, exhibits, or new construction; and operating support for planning, staff, or demonstration programming. The transition from "working board" to "funding board" must take place during this phase. This can be stressful for workers who were part of the founding group; and the departure of a charismatic leader may deal the organization a blow. An executive director is usually hired now, and additional staff and volunteers brought on, sometimes more oriented toward maintaining the institution than toward research and development.

Expanding an existing center—An expanding center goes through stages similar to those facing start-up institutions, but progress may be easier because a cadre of experienced people (with office support) can be relied on to perform many of the tasks—as long as they can free up time from the task of running the existing center. The process takes less time than starting an entirely new science center.



Conclusion

The process of starting a science center is complex, requiring time and energy over several years. Facing a set of common challenges, successful start-ups seek out and exploit external resources available both locally and nationally.

° **Leadership**—
They attract and nurture a core group of dedicated, able individuals with a variety of expertise and supplement their management skills with pro bono advice from local business, finance, management, and legal experts. They use relevant management literature from both private- and public-sector organizations.

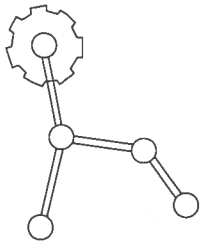
° **Vision**—
They look to other science centers as models and tap them for information, products, and advice. They draw on the resources of professional organizations like ASTC for information and professional staff opportunities. They include representatives from the science and education coommunities in their planning process.

° **Support**—
They demonstrate their intentions to the community and seek out alliances with political and community-based organizations. They establish a presence with local decisionmakers and incorporate their perspectives into the institution's plans.

° **Facility**—
They use professional expertise to help determine the appropriate scale of their facility. They subscribe to collaborative exhibit development efforts. They welcome donations, but consider trade-offs involved.

Leadership is key. Leaders absorb and synthesize extensive external input, hold the vision and share it with others, and put themselves wholeheartedly into the effort --deeply believing in the value of science, of exploration, and of interactive learning.



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