PURPOSE BUILT CASE STUDY

Science and Engineering Centre

Australia's Queensland University of Technology created a place for staff, students, and the wider community to connect, learn, and grow interest in STEAM education and research.

Executive Summary

Organization
Queensland University of Technology

Location
Brisbane, Queensland, Australia

Construction Type
New construction

Opening Date
2012

Project Area
45,000 square meters (484,376 square feet)

Project Cost
A$230 million

The Atlantic Philanthropies Contribution
A$25 million ($16 million)

Queensland University of Technology (QUT) is a public university and major research institution located in Brisbane, Australia. With a practical approach to education and applied research, QUT adopted "A University for the Real World" as its motto. At the time Queensland's "Smart State" initiative was launched in the late 1990s to promote the state's science, technology, and innovation sectors, QUT faced several infrastructure challenges that limited the effectiveness of its research, education, and public outreach. Housed in five monolithic concrete buildings, the University's science, technology, engineering, arts, and math (STEAM) disciplines were physically separated. This setup hindered interdisciplinary collaboration among researchers, limited more interactive and engaging instruction for students, and fostered an image of exclusion that directly conflicted with the University's values.

In 2008, QUT developed a proposal to build a Science and Engineering Centre on its Gardens Point campus that would bring the University's STEAM disciplines together. Through this facility, the University sought to raise the caliber of its research, support new forms of teaching and learning, and make STEAM more accessible to the public.

To fund the project, QUT employed a hybrid strategy that combined contributions from the state and federal governments, as well as from The Atlantic Philanthropies. This support allowed QUT to think and act more ambitiously and creatively about how to serve the project mission, and about the role the new building could play on campus and in its surrounding community. Wilson and Donovan Hill Architects designed two 10-story towers linked by a recreation center and plaza. An open-plan layout for the research facilities intended to bring researchers together from across disciplines. Student learning and collaboration spaces responded to the changing higher education landscape by incorporating interactive features tailored to the use of technology. The centerpiece of the building was The Cube—a giant, interactive touchscreen display to feature visualizations related to the University's STEAM curriculum and engage visiting students and community members.

Since opening in 2012, the Science and Engineering Centre has advanced the University's STEAM research and its application across and beyond campus. The redesigned learning spaces created a dynamic campus hub that facilitates more interactive forms of student learning and collaboration. The space has also allowed the University's STEAM outreach program to flourish and has strengthened the relationship between QUT and the broader Brisbane community. The Cube in particular has become a notable city destination for locals and visitors—while its programming upkeep is costly, it fulfills an essential aspect of the QUT mission. This project demonstrates how investments in academic infrastructure can impact research and education while advancing the values and public perception of an institution.

This case study is based on research conducted by MASS Design Group in October 2015. Funded by The Atlantic Philanthropies, this case illustrates how a capital project can support improved performance for building occupants and connect them with other stakeholder groups to advance an institution's goals.

Purpose Built Series

Capital projects often bring lasting benefits to nonprofit organizations and the people they serve. Given this opportunity, foundations grant more than $3 billion annually to construct or improve buildings in the United States alone.[i] Each capital project affects an organization's ability to achieve its mission—signaling its values, shaping interaction with its constituents, influencing its work processes and culture, and creating new financial realities. While many projects succeed in fulfilling their purpose, others fall short of their potential. In most instances, organizations fail to capture and share lessons learned that can improve practice.

To help funders and their nonprofit partners make the most of capital projects, The Atlantic Philanthropies and the S. D. Bechtel, Jr. Foundation commissioned *Purpose Built*—a multi-faceted study by MASS Design Group, a nonprofit architecture and research firm. In 2015 and 2016, MASS conducted interviews, reviewed literature, and examined a diverse set of completed projects around the world; each project was supported by one of the above funders.

The study generated a set of core principles as well as tools for those considering or conducting capital projects:

Introducing the Purpose Built Series is an overview of the study and its core principles.

Making Capital Projects Work more fully describes the *Purpose Built* principles, illustrating each with examples.

Planning for Impact is a practical, comprehensive tool for those initiating capital projects.

Charting Capital Results is a step-by-step guide for those evaluating completed projects.

Purpose Built Case Studies report on 15 projects to illustrate a range of intents, approaches, and outcomes.

See the full *Purpose Built* series online at **www.massdesigngroup.org/purposebuilt**.

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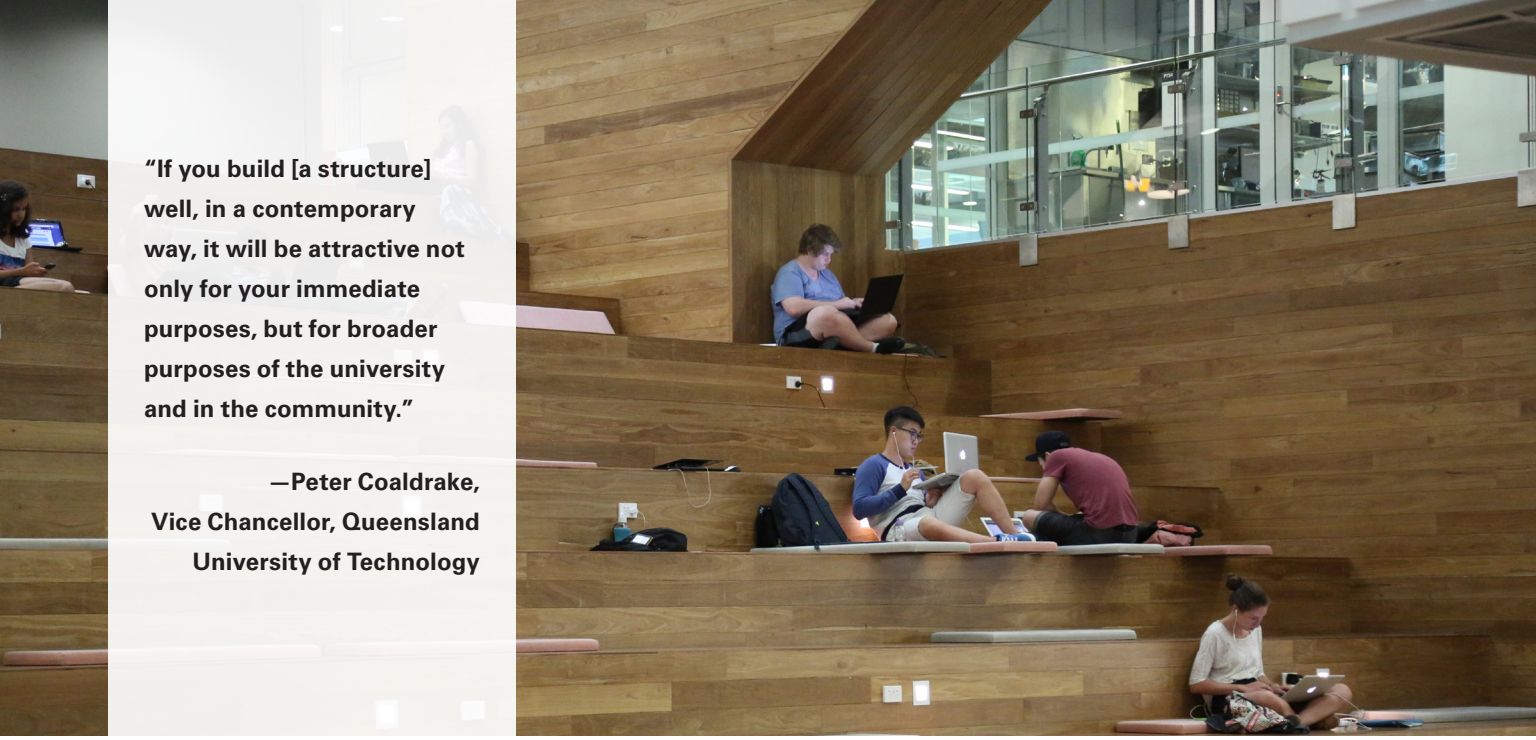
i *Foundation Center, Foundation Maps data based on grants made in the United States, 2006-2015.*



"If you build [a structure] well, in a contemporary way, it will be attractive not only for your immediate purposes, but for broader purposes of the university and in the community."

—Peter Coaldrake, Vice Chancellor, Queensland University of Technology

Above. Informal study spaces encourage students to stay on campus and accommodate new modes of learning and collaboration.
Cover. The Science and Engineering Centre has a public atrium, learning and teaching spaces on the ground floor, and research facilities above.

Introduction

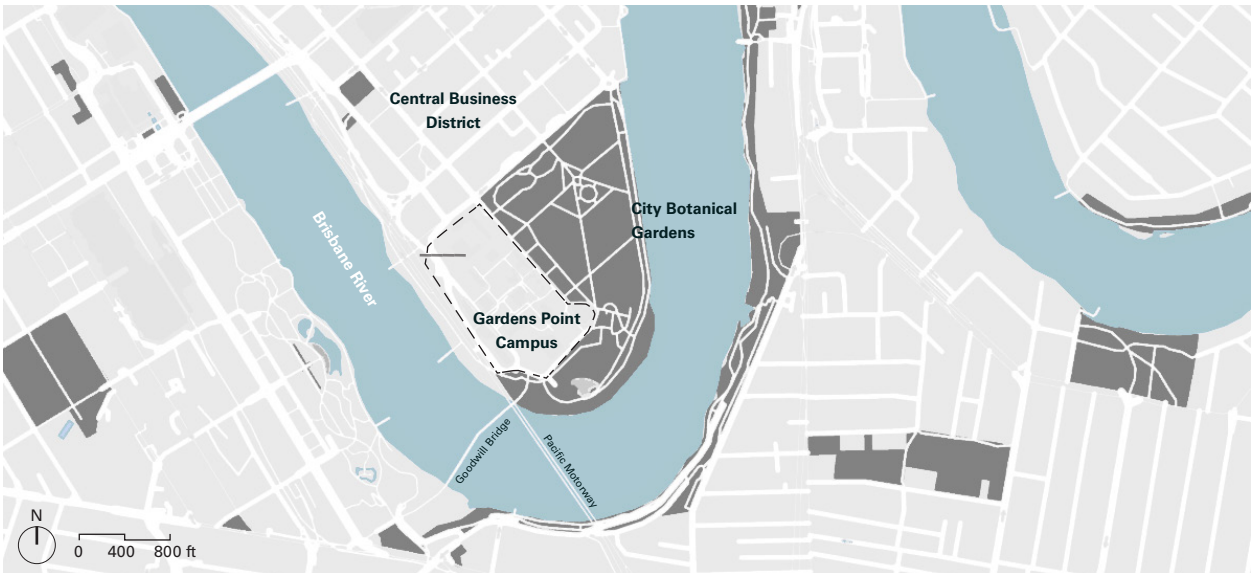
In the late 1990s, Premier Peter Beattie (the Australian equivalent of a United States governor) launched a strategic initiative to transform Queensland, one of six states in Australia, from a vacation state known for its beaches and barrier reef into a knowledge economy. At the time, Queensland's economy depended primarily on its tourism and mining industries—sectors that showed little potential for growth. Understanding that "any future governmental economic strategies could not ignore innovation and knowledge, which would be a major driver of future economic growth,"[1] Beattie launched the "Smart State" initiative in 1998, creating programs to strengthen the state's science, technology, and innovation sectors. Under the Smart State initiative, Queensland's government invested in education and training for a new generation of the state's workforce and expanded infrastructure for research and development in growth sectors.[2] The Science and Engineering Centre at Queensland University of Technology (QUT) is one example of Smart State building.

As one of Queensland's major research institutions, QUT was well positioned to participate in the Smart State initiative. QUT focused on practical education, applied research, and close links to industry, particularly within the areas of science, technology, health, and business. As reflected by its motto, "A University for the Real World," QUT sought to "provide outstanding learning environments and programs that lead to excellent outcomes for graduates, enabling them to work in, and guide a world characterized by increasing change."[3] This practical approach to education aligned well with Beattie's ambition of building a knowledge-based workforce able to understand the changing needs of growing industries.

CHANGING INFRASTRUCTURE TO MEET DEMANDS

While the values and focus of QUT helped position its contributions to Queensland's Smart State agenda, several infrastructure challenges facing the University in the early 2000s constrained its ability to develop environments that fostered and rewarded high-quality scholarship and built a sense of community.

At the time, QUT's science, technology, engineering, arts, and math (STEAM) infrastructure was inhibiting the University's desire to strengthen its real-world positioning in teaching and research through better partnerships internally and externally. The STEAM facilities, which consisted of five concrete buildings at the southern tip of the University's Gardens Point campus, were not only "inadequate for sustaining vibrant communities of staff and students" according to one respondent, but also physically divided research disciplines rather than bringing them together. As reported in a 2008 grant



Above. This map shows the location of QUT's Gardens Point campus in Brisbane.

proposal to The Atlantic Philanthropies, "in particular, there [was] a lack of amenities and spaces for interaction [in the buildings], as well as barriers to accessibility, and poor visual appeal."[4] Given that Australian institutions tended to have fewer resources than competing European and American universities, QUT recognized that the physical separation of STEAM disciplines was preventing the University from establishing a strong center of collaboration that fully supported the expertise of its staff, integrated student learning, and rich outreach programs for the community.

The design of the existing buildings also reflected a rigid approach to STEAM education that was limiting the University's ability to integrate information and communications technology, and students' changing needs. The lecture theaters made it difficult for professors to incorporate collaborative, interactive, and student-driven teaching methods, which were important in making STEAM disciplines more accessible and approachable. The buildings also failed to provide sufficient learning spaces for students to gather and work collaboratively. As a commuter campus without student dorms, Gardens Point needed spaces that would attract students to spend more time on campus and engage in both formal and informal learning opportunities.

In addition to inhibiting the quality of QUT's research and education, the outdated buildings also expressed qualities that conflicted with the University's community-minded and inclusive values. From the exterior, the buildings' concrete façades and meager windows made the campus appear more like a fortress than an educational institution. According to QUT's Vice Chancellor Peter Coaldrake, who acts as both principal academic officer and chief executive officer, the buildings were monoliths that failed to welcome the community into the University and created an atmosphere of exclusivity and intimidation that was inconsistent with its organizational mission and ambitions. University administrators reflected that the fortress-like buildings sent a message to students and the public that STEAM disciplines were also unapproachable. QUT realized that in order to pursue its goal of strengthening regional STEAM education—which would not only mean encouraging university students to pursue STEAM coursework, but also getting primary and secondary school students interested in STEAM subjects at an early age—the University would need a more welcoming and public-facing environment for its science and engineering disciplines.

The geographic location of the Gardens Point Campus presented an optimum opportunity for the University to rethink its approach toward research, education, and public outreach. Gardens Point is situated in the heart of Brisbane's Central Business District, bordering the City Botanic Gardens, Queensland Parliament House, Goodwill Pedestrian Bridge, and Pacific Motorway. The Pedestrian Bridge alone carries up to 100,000 pedestrians every week. The campus also contains Brisbane's Old Government House, an important city heritage site that the University refurbished in 2009. Due to its adjacency to key heritage sites and attractions, an intervention on Gardens Point campus would have the potential to not only create an active campus hub but also a civic destination for the community.

Project Mission

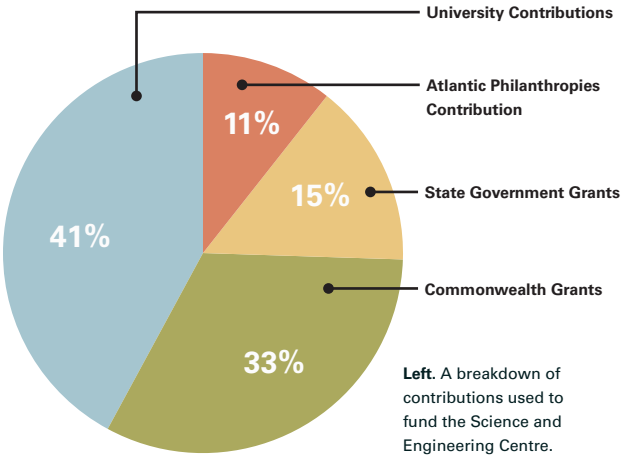
In 2008, QUT developed a proposal to build a Science and Engineering Centre (SEC) on the southern end of Gardens Point campus. The new initiative sought to raise the caliber of the University's STEAM research by facilitating interdisciplinary collaboration among faculty and departments, accommodating more interactive forms of learning and teaching, and making STEAM subjects—as well as QUT as an institution—more accessible to the public. The capital project included the demolition of the existing science buildings and the construction of two new buildings that would house laboratory and office space for researchers, classrooms, collaborative learning spaces, dining and recreation facilities, and STEAM education attractions for the community. At the heart of the new SEC complex, QUT envisioned a large multi-story interactive display—later called The Cube—that would showcase ongoing research, advance new modes of data collection and visualization, and create an interactive platform for engaging public engagement.

Process

LEVERAGING FUNDING FROM MULTIPLE SOURCES

QUT's ambitious vision for the SEC and the project's close alignment with Queensland's Smart State priorities helped the University leverage funding opportunities. The project's total budget of A$230 million was supported by a combination of University, philanthropic, and government funds. After receiving A$35 million from the Queensland government's Smart State Innovation Building Fund, QUT approached The Atlantic Philanthropies. Vice Chancellor Coaldrake had already established a strong relationship with Atlantic's founder, Charles F. "Chuck" Feeney; Atlantic had supported previous capital projects at QUT. Atlantic committed to investing in the project if the national government would also contribute. Ultimately, Atlantic pledged A$25 million, and QUT was able to leverage an additional A$75 million from the Australian Commonwealth Government through its Education Investment Fund. The remainder, A$95 million, came from the University.

This funding scheme was consistent with much of Atlantic's giving in Australia. The prime minister at the time, Kevin Rudd, described, "In [Feeney's] view, it was very important to have buy-in by all levels of government and all political persuasions. Without that level of cooperation, he said, the projects will not be properly valued. Shared funding, he said, was the best way to build a supportive constituency." All told, the larger set of grants that Feeney and Atlantic invested in Australian research and education helped leverage more than A$2 billion in the country.[5]



Left. A breakdown of contributions used to fund the Science and Engineering Centre.

DESIGNING FOR COLLABORATION

Funding support from the Commonwealth government and Atlantic allowed QUT to think even more ambitiously about how to serve the project mission, and consider unconventional means to advance its vision. As one member of the capital project planning team recalled, "The Atlantic Philanthropies money allowed us to be bolder about design philosophy and our aspirations for the building."

While QUT finished securing the project's funding, the project team began the search for a project architect. In late 2008, QUT's project team selected Wilson and Donovan Hill Architects, a collaboration between two local, medium-sized firms. The resulting design for the 11,200-square-meter site[6] included two 10-story towers[7]—one with a large open atrium that would be accessible to the public. The towers would be linked underground by a recreation center and plaza with restaurants, a bookstore, and gym. Learning and teaching spaces would be situated on the ground floor, with research facilities above. The layout of the research spaces would incorporate open-plan offices, private meeting spaces and workrooms, and a central laboratory facility.

Since the SEC was intended to bring together expertise from across small, previously-isolated departments, the office spaces surrounding the laboratories were designed in open plan to encourage collaboration, with researchers working in open cubicles instead of private offices. As Coaldrake explained, by taking out private academic offices, QUT would establish an environment for "moving culture so most research happens in collaborative environments." The

incorporation of centralized lab facilities would not only reinforce the idea of collaboration, but also offer other practical advantages. The lab would concentrate more costly and sophisticated machinery in a common location, more effectively sharing resources and thus allowing QUT to invest in more equipment—in one researcher's words, "minimizing duplication and maximizing utilization." Labs and research spaces located on the upper floors of the SEC would be designed with glass walls looking out onto a three-story public atrium, providing students and visitors a sense of visual connection to research activities.

DESIGNING FOR CHANGE

In the design of student learning and collaboration areas, QUT aimed to respond to the changing higher education landscape by incorporating more interactive, technology-based spaces into the building. Instead of creating teaching spaces that used a traditional, lecture-hall format, most classrooms would feature group project tables, with five chairs around a rectangular table and a digital computer monitor on one end. As one designer described, "We wanted to create learning spaces that turned the notion of someone standing at the front upside down." To support more independent student learning and accommodate a range of personal preferences, the buildings also would include a wide variety of study spaces, from computer lab clusters, to café-like study booths, and lounge spaces with beanbags and couches.[8]

Above. A café in the SEC complex is adjacent to an open, green lawn and is frequented by students, staff, and the public.

Above. Informal gathering spaces at the SEC help to foster collaboration and non-hierarchical interactions.

QUT's project team understood that both the research spaces and redesigned classroom experiences would necessitate a significant cultural shift in the University's approach to research and teaching—one that would require user input and careful transition management. QUT invested two years into mocking up and testing the designs for the new office and classroom spaces elsewhere on campus. Portions of private office spaces in existing buildings were renovated into open offices to get user feedback and to mentally prepare academic staff for the change. Temporary classroom spaces were also set up to test table configurations, study appropriate group dynamics, and inform classroom sizes. The user-feedback process was important for identifying and refining the concept behind the classrooms. The original designs had featured round or tear-shaped tables for group work, but user testing and feedback revealed that rectangular units with five chairs and a screen at one end would better support group work. Participants indicated that the learning process was important in cultivating a general attitude at QUT that encouraged University administrators to more openly seek out student opinion and feedback.

DESIGNING FOR COMMUNITY

The design of the SEC complex was devised in parallel with the development of The Cube, a multi-story interactive digital display which would serve as the building's centerpiece and its main public-facing feature.

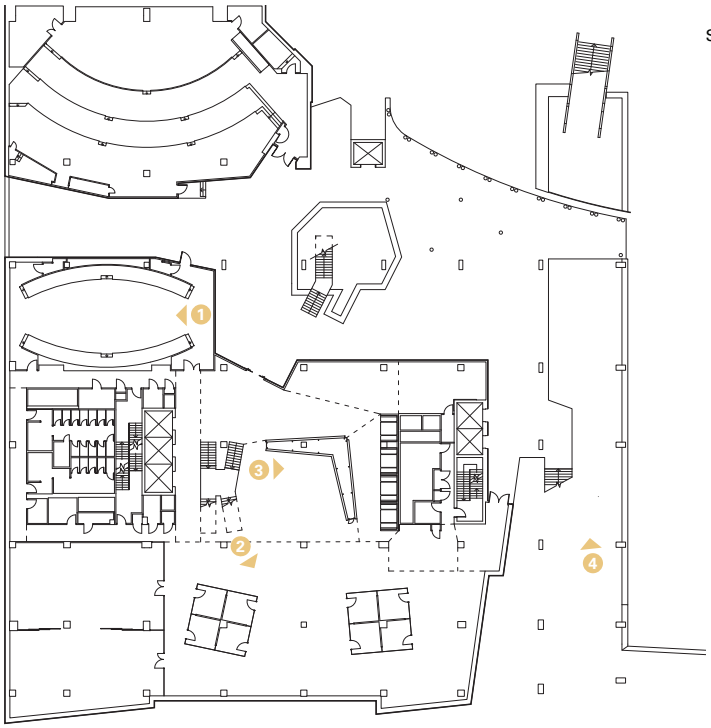
In 2009, as the initial schematic design for the SEC was being developed, Vice Chancellor Coaldrake assembled a task force to conceptualize the public space for the capital project. The team included a diverse group of science, technology, and creative industries faculty and staff. Acknowledging that "physical engagement

means better learning," the team's objective was to create an interactive learning platform for the public. Ian Mackinnon, former executive director of the Institute for Future Environments and project manager of The Cube, said, "We knew we had a lot of capability in visualization and quite a lot of very good applied mathematicians, so we said, 'Let's do something visual and interactive that [allows] people to engage with this space and that puts science and engineering on display.'"

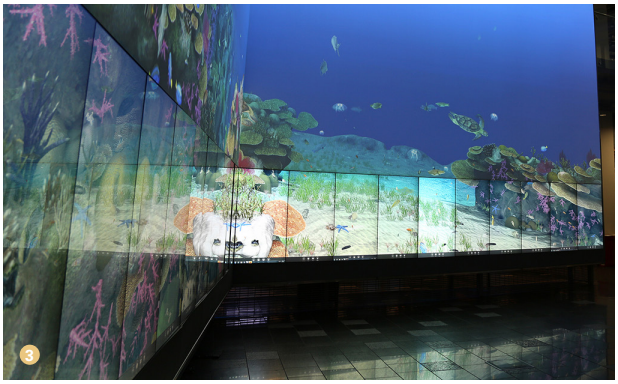
In the fall of 2009, the project team presented its vision to Coaldrake for "an interactive center displaying and facilitating information and learning about the building from an energy, sustainable design, and [scientific research] point of view." With this concept in hand, members of the team planned a trip to the United States to study existing precedents for learning and teaching visualization displays. According to Mackinnon, it was on this trip that the team drew its first sketches of an immersive sensory environment where visitors could walk inside and interact with a cube-like arrangement of screens. Tests quickly showed that a fully enclosed cube of screens was not feasible, so the team adapted the design into a two-story, V-shaped display with interactive touch screens at the base—but the project's original name, The Cube, stuck.

With the basic design for The Cube in place, the team began to invest time in researching potential technologies and developing visual programming for the displays. The team anticipated that touch-screen technology would undergo rapid advancements over time, and in response developed a panelized system of screens that would allow the display's cables to be retrofitted or replaced with ease. As the hardware and details were being refined, software developers began to work on concepts for programming the screens, beginning with a series of interactive displays that would include a virtual coral reef, a physics "playroom," and a data wall. A local teacher-in-residence, Anne Brant, was hired to consult on the visual programming of the displays and develop supplemental educational workshops and programs for primary and secondary school students. Brant ensured that The Cube's visualizations corresponded with local STEAM curricula and developed an outreach program to engage Brisbane middle and high schools. This collaboration between software developers and educators allowed QUT to develop digital experiences that would not only align with existing school curriculums and be scientifically accurate, but also be accessible and engaging for students.

Below. The Cube's interactive features showcase the technological work of the University and simultaneously provide a welcoming feature to visitors.



To provide amenities and spaces for interaction, the fourth floor of the SEC complex incorporates formal teaching and conference spaces (1) as well as informal learning and collaboration spaces (2). The Cube (3) and open outdoor dining and gathering areas (4) contribute to the project design goals of accessibility and visual appeal.



OVERCOMING SETBACKS DURING CONSTRUCTION

With the SEC design completed, QUT selected Leighton Contractors as the managing contractor for the project, who also became the project manager for the architects. A linear communication flow from QUT to Leighton to the architect reduced the risk and burden of managing the project for QUT, but limited the architects' communication with the University. The architects, who expressed that they were not aware of QUT's intent to use an outside contractor for project management, were no longer able to present to the client and hear direct feedback on design. This communication bottleneck ultimately led to a breakdown in the relationships between the client, the contractor, and the architects, and resulted in the architects leaving the project in 2010. As a consequence, Leighton Contractors took on the role of finishing design development and construction documentation through the end of the year.

Even with the loss of the project's architect, the construction of the SEC remained on time and on budget until the Brisbane flood occurred in January 2011. The unprecedented flooding cost the Brisbane City Council A$440 million in recovery work and set the project back a year.[9] The SEC was rescheduled to open at the end of 2012,[10] and QUT used the flood as an educational opportunity by creating an interactive display featuring geographic data on the extent of the Brisbane flooding—one of the first programs featured on The Cube. QUT also took advantage of the opportunity to use the building as a way to expose students to design, construction, and project management. During the construction of the SEC, Leighton Contractors gave lectures to hundreds of students through a series sponsored by QUT.[11]

Impact

Since opening in November 2012, the SEC has had significant impacts on QUT's STEAM research, undergraduate education, and public outreach. Vice Chancellor Coaldrake described the ways the new infrastructure has enhanced the University and the local community:

> If you build [a structure] well, in a contemporary way, it will be attractive not only for your immediate purposes, but for broader purposes of the university and in the community. I think that the return on investment is seen in terms of the academic indicators that you'd expect, but also in terms of the propulsion around science and technology disciplines at this university and in this town.

SUPPORTING RESEARCH BY CONNECTING DISCIPLINES

In the few years since the building has been operational, the SEC has raised the caliber of QUT's STEAM research by creating avenues for interdisciplinary research and collaboration, providing higher quality facilities that promote and reflect the University's expertise, and attracting more funding, faculty, and students. In 2016, Science and Engineering faculty were collectively awarded A$1 million in Australian Research Council Grants for linkage infrastructure, equipment, and facilities.[12] That same year, the UK Higher Education Academy recognized 13 Science and Engineering staff as fellows, and the department saw the highest demand on record for course enrollment with student numbers passing the 10,000 mark.[13] "In the beginning, we had to try and attract industry partners who were looking at capability. Now that's changed," said one QUT staff member. "Industry comes to us as the people with the knowledge and equipment."

> As one faculty member described, the facilities "open up different avenues of research that people hadn't thought about before."

One of the major goals for the SEC was to capitalize on QUT's existing expertise across STEAM fields and provide a space where researchers could work across disciplines on important, practical projects. In addition to bringing the University's STEAM disciplines together under a single roof, the building's design enabled distinct transformations in the way researchers work. As one faculty member said, the facilities "open up different avenues of research that people hadn't thought about before." The SEC also serves as a permanent home for QUT's Institute for Future Environments (IFE), an interdisciplinary research center with the mission to "find ways to make the world more sustainable, secure, and resilient."[14] The IFE is modeled after a similar health-focused institute, the Institute of Health and Biomedical Innovation, which is housed in another Atlantic-funded building on another QUT campus, Kelvin Grove.

Focusing the SEC's lab research around a central facility open to all disciplines has not only encouraged collaboration and dialogue between researchers, but also has allowed QUT to invest in higher quality laboratory equipment that permits scientists to produce better work. The improved facilities have played an important role in raising the reputation and perception of QUT's STEAM research. As one faculty member explained, the University's research environment is an essential part of peer-review criteria; reviewers must believe the research is "able to be pulled off in the setting and with the resources available . . . Reviewers are now checking off that box and saying that [the SEC] is a place where research can happen." According to

Above. The Glove Box is one example of high-quality laboratory equipment at QUT that allows scientists to produce better work.

staff, the building has also made it easier to attract top postgraduate students and retain faculty members. One researcher articulated that without the opportunity provided by the SEC, "Nothing like this in terms of quality of resources would be available in Australia. I would have to go elsewhere in the world." As of 2015, the SEC hosts approximately 360 researchers, and the IFE boasts over 2,600 participants.[15]

Similarly, the design of the building has also played an important role in demonstrating institutional competence and attractiveness to potential funders and partners. One researcher explained that she can have funders visit the building and "not just talk to them about statistics, but display that there is wide expertise in the building itself." Another faculty member described that external partners "want to have a meeting here because they find the space very inspiring." Overall, faculty members expressed that the facilities have improved their research quality as well as ability to attract funding. The IFE's research revenue has grown from approximately A$3 million in 2012 to A$17 million in 2015.[16]

USHERING IN NEW WAYS TO TEACH AND LEARN

In addition to providing researchers with access to state-of-the-art facilities, the SEC has enabled QUT to pursue a more interactive and student-driven approach to education. Faculty report that students taking classes and studying within the SEC have "come to work in groups in better ways." The desk configurations in the classrooms have changed how students learn and have also required faculty to employ new instructional methods. Now, faculty claim that students learn more from actively engaging with one another, rather than through passive listening and note-taking.

The SEC's informal study spaces support this new pedagogy by encouraging students to collaborate in groups and spend more time on the commuter campus. Informed by user feedback during the mock-up phase of the design process, these collaborative spaces empower students to feel ownership over their own learning. As a result, the SEC has become a hub for student life that is busy even during nights and weekends. As demonstrated through a wireless internet usage study conducted by the University, the buildings have proven to be an attractive place for students to spend time on campus, even when not in classes. The study found that students are spending much more time on campus and inside the SEC buildings than anticipated. As one project member said, "This building, more than any other building, including the library, is where students come and they stay . . . They are choosing to be on campus."

The success of the research and study spaces within the SEC building has inspired QUT to implement a number of open collaborative research spaces and group-oriented classrooms across other buildings on campus. The project has also set an important precedent for other universities and organizations seeking to pursue similar building programs and interactive digital displays. According to multiple respondents, the interactive aspects of The Cube have been attractive to the Malaysia Automotive Institute, and a mini-Cube experience has been replicated in Sydney.

ENHANCING PUBLIC OUTREACH

Since opening, the SEC has also become an important link between QUT and the Brisbane community, spurring interest in STEAM disciplines as well as broader public engagement with the University.

In alignment with the original goal to support the Smart State initiative, the SEC hosts a variety of programs and events aimed at making STEAM subjects more accessible. A dedicated teaching space on the ground floor houses QUT's STEAM outreach program, led by Anne Brant. The program offers workshops and courses for local high schoolers, encouraging students to pursue STEAM fields and exposing them to higher education opportunities. In 2015, 5,340 students from 60 schools in Queensland participated in the QUT STEAM outreach program.[17] The University also hosts major annual events on the SEC grounds, such as the Robotronica Festival which drew 18,000 attendees in 2015. These outreach initiatives, together with the public appeal of The Cube, have boosted QUT's profile within Brisbane, Queensland, and Australia as a leader in practical STEAM education.

In many ways, the SEC has changed QUT's broader relationship with the public. The Cube has become a notable destination in Brisbane for the local community as well as visiting tourists. The display is open to the public every day of the week, allowing families to visit on the weekends and spend time at QUT. According to one

administrator, The Cube has helped to establish the SEC as one of the only places on campus where families bring their children: "There is nowhere else on campus that people will do that or even think about doing that," said one respondent. An interesting and unexpected user group are the political and community leaders who have begun to use The Cube as a media outlet. Politicians occasionally broadcast public announcements from other spaces in the SEC. In the eyes of faculty, this attraction is one indicator of the project's success. In Ian Mackinnon's words, the SEC has turned the University into "a place people want to come to and not run away from."

Although the upkeep of the SEC spaces, together with the continuing software development and updating required for The Cube, have necessitated consistent intellectual support from the University, the range of impact on QUT's relationship with the local community offset the time and human resources spent on efforts to keep the technology relevant. The high-tech novelty of The Cube in particular has contributed to the project's success with community outreach opportunities. Coaldrake considers the University's investment in community outreach and local education as an essential component of QUT's mission. In Coaldrake's words, the greater opportunity behind SEC is "that it sends a message about the University's ambition and its ideals . . . Individuals who visit the SEC will see a high-quality and accessible place, and they'll think about the University as a high-quality and accessible place."

A post-completion intercept study of 150 visitors from 2014 revealed that the SEC's design positively shifted the public's perceptions of QUT's Gardens Point campus.[18] Of those surveyed, 85 percent of visitors reported feeling welcome to use the new buildings, and 72 percent saw the facilities as a public space that could be used at any time. As of 2015, estimated foot traffic through the SEC was about 60,000 people per week.[19] As one faculty member articulated, the University has had "lots of new buildings that did not fundamentally change the way people felt about the place. This building has changed the way people feel about the whole campus, but it's also changed the way people feel about QUT."

Above. Desk configurations in the classrooms allow students to engage with one another.

Conclusion

Since opening in 2012, the Science and Engineering Centre has served as an embodiment of QUT's institutional aspirations and its mantra, "A University for the Real World." The building's research facilities have advanced and expanded the University's STEAM research, encouraging collaboration and a broader applied focus. The south end of the University's Gardens Point campus has become an active student hub that supports a range of learning opportunities. Finally, The Cube and its complementary STEAM outreach programs have made QUT a focal point for tourists and the Brisbane community. Altogether, this project demonstrates that investments in academic research facilities can have resounding impacts not only on the quality of research and education, but on the perception of an institution, its values, and its relationship with the public.

Videos

For additional information on this case study, see the following videos available at www.massdesigngroup.org/purposebuilt:

Research and Education Impact

The Cube and Community Impact

Lessons from the Science and Engineering Centre

Envision greater possibilities for impact.

Careful decision-making supports ambitious goals: Capital projects can present an opportunity for organizations to reconsider their goals and recalibrate their role within a community or sector. In the case of QUT's Science and Engineering Centre, the project advanced the University's aspiration to develop an applied approach to research and education and break down barriers between academia and the public. Decisions made in site selection, building design, and programming all contributed to improving the perception of the University and creating new opportunities for community engagement. The site's proximity to civic attractions and highly-trafficked walking routes in Brisbane, combined with the development of The Cube, have created a new focal point for educational outreach and public engagement. The design of the facility has changed the perception of STEAM research at the University. While known as high caliber, this research had been viewed as unapproachable and intimidating; it is now seen as accessible and open to all. The educational programming developed at the Science and Engineering Centre has acted as an important complement by attracting broader interest in STEAM topics and in higher education opportunities. Since the opening of the Science and Engineering Centre in 2012, all three of these aspects—site planning, building design, and programming—have supported an ambitious and integrated vision for a project that has changed QUT's pedagogical approach, as well as its broader relationship with the public.

Engage stakeholders for insights and buy-in.

User testing informs effective design: Involving intended users in the project process can elevate impact and results. When the QUT project team began developing the design for its new facilities, they recognized that a significant cultural shift would occur as a result of the open research space layout and the interactive, technology-based learning spaces. In response to the anticipated changes, the project team invested two years into mocking up spaces on campus for student and academic staff to test and provide feedback. This process was vital to the refinement of the final design concepts. The result of this user-feedback process is a collection of environments where researchers can collaborate to enhance their work, and students can study and learn interactively.

Lessons from the Science and Engineering Centre

Identify the correct metrics for success.

Future focus equips a building to adapt: Capital projects must accommodate new technologies and consider the changing needs buildings face over time. When designing and planning its new Science and Engineering Centre, the QUT team knew that it had to carefully consider how the building could be future-proofed to allow for changes, particularly advancements in data visualization displays. The building revolved around a two-story, touch-screen installation named The Cube, which was to be one of the world's largest digital interactive learning and display spaces, aimed at providing students and visitors with a participatory experience of QUT's science and engineering research. QUT assembled an expert in-house team, which tested and mocked up various physical trials and programs. The team was able to create a panelized display system integrating the latest touchscreen technologies, while still allowing for updates and upgrades over time. If QUT had not invested the time and resources into future-proofing the design, The Cube would have been a riskier long-term investment, rather than a robust system able to adapt to changing needs.

End Notes

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