

Experiences and Insights from Use of a Design-Build Process in Founding a New Campus

Design-build was the best choice for K-State Olathe because of the flexibility with regard to unknown users and change stakeholder expectations.

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Introduction

At public research universities, state funding is decreasing and budget cuts are now the norm. Establishing a new campus may seem impossible under these conditions; however, Kansas State University (K-State) recently established a new campus in Olathe, Kansas. K-State Olathe's first building, the International Animal Health and Food Safety Institute, a \$28 million, 108,000 square foot facility, expands K-State into a three-campus system and provides the Kansas City region with increased access to the university's programs. K-State was able to take this significant step during an economic downturn, in part because of strategic planning with a focus on innovation coupled with the support and hard work of some nontraditional stakeholder groups.

Background of Innovation at the K-State Olathe Campus

The K-State Olathe campus emphasizes public-private, university-industry partnerships. The campus serves working professionals by providing graduate degree

programs, credit and noncredit courses, certificates, and continuing education opportunities. At the same time, the campus partners with local school systems to offer K–12 student and teacher outreach programs and workshops. In addition, there are active collaborations between K-State Olathe and neighboring higher education institutions. This innovative mission is reflected in the processes used for campus planning, design, and construction, as detailed below.

Several aspects of the development of the K-State Olathe campus were innovative, including the nature of funding, the spectrum of stakeholder groups involved, and the building delivery. First, the campus was funded by a countywide sales tax passed in November 2008. To our knowledge, this is the first local sales tax passed in support of a higher education initiative in the nation. The tax campaign succeeded in large part because of a partnership between K-State and the University of Kansas, the two largest public research universities in the state. It is unlikely that either university's action alone could have succeeded in persuading voters to support the tax. However, by collaborating to engage the alumni and support bases of both schools, the initiative was successful and each university now receives proceeds of the sales tax. Second, a variety of nontraditional stakeholders were engaged in campus planning. The City of Olathe donated the land for the campus, and the citizens of Johnson County passed the tax initiative that provides funding for the campus. Third, the campus pursued a design-build process for the acquisition of its first building; design-build is an alternative to the design-bid-build construction delivery process traditionally used on higher education campuses.

The innovative pursuit of the design-build process is the focus of this article that (1) describes the design-build delivery method and contrasts it with the traditional design-bid-build method; (2) details the method used to acquire the first building at K-State Olathe; (3) discusses stakeholders' perceptions of the design-build process, including challenges encountered; and (4) summarizes lessons learned during the process. Although there are a wide variety of construction project delivery strategies, this article focuses on two—the strategy that was pursued on the K-State Olathe campus and the strategy that is most commonly pursued on college and university campuses. This article aims to inform higher education administrators about the design-build process and to share experiences that may inform the efforts of others who pursue this delivery method.

Design-Build vs. Design-Bid-Build

Design-bid-build (i.e., the traditional approach) involves two separate teams making contributions to the delivery of a building. In this process, an architect/design team develops *design* plans for the building and then a *bid* is sought from a construction company, which in turn *builds* the building (Mohsini and Davidson 1992); these steps occur sequentially. In contrast, design-build is an approach to construction project delivery that overlaps a project's design and construction phases (Janssens 1991). The design-build approach involves asking teams made up of both design and construction professionals to propose a solution to a set of requirements within a set budget. It is an integrated delivery strategy that combines two groups together from the outset under a single umbrella of risk management.

Of these two approaches, the design-bid-build delivery strategy is more prevalent in the United States, in part because of restrictions embedded in state and federal laws and policies. For example, design-bid-build has been used more frequently for public projects such as those on university campuses (Thomas et al. 2002) because, until recently, state statutes did not allow design-build on public projects. The design-build strategy, which has been used frequently in the private sector, experienced a dramatic increase in public sector use after Congress passed the Clinger-Cohen Act in 1996. This act established guidelines for identifying when design-build is an appropriate strategy for public projects (Hale et al. 2009). Before that time, federal acquisition regulation made it difficult to use the design-build project delivery system.

Gordon (1994) described some advantages of the design-bid-build approach over other approaches. For example, with respect to building design, there is more owner control because the owner and design team interact directly; the contractor is not involved in the design process. With respect to building construction, the cited advantages of design-bid-build include a set price, price competition, and unbiased selection of one service provider. There may also be more control over the contractor than in other approaches because the designer can monitor the contractor's progress.

While the design-bid-build project delivery system has some positive aspects, a review of the literature reveals that the design-build approach is more advantageous when it comes to time, cost, and sometimes quality (Gordon 1994; Hale et al. 2009; Konchar and Sanvido 1998; Ndekugri and Turner 1994; Songer and Molenaar 1996,

1997; United States Department of Transportation Federal Highway Administration 2006; Water Design-Build Council 2009). For example, Hale and his colleagues determined this to be the case when comparing a set of 38 design-build and 39 design-bid-build projects conducted by a U.S. public sector organization; they reported that the design-build method was superior to design-bid-build due to less time required for project completion and less increase in both time and cost (Hale et al. 2009). In addition, Konchar and Sanvido (1998) studied 351 U.S. building projects and compared three methods: design-bid-build, design-build, and construction management at-risk. Construction management at-risk is an approach in which the designer and contractor are separate entities, but the contractor has input into the design and usually guarantees the construction cost. These researchers identified design-build as the "optimum" delivery system because it can achieve advantages related to schedule and cost and sometimes better quality.

Design-build is preferred when complex, resource-constrained projects are planned on an accelerated time line.

Several benefits of design-build result from the teamwork and collaboration of the designers and contractors (Gordon 1994; Ndekugri and Turner 1994). The increased communication between the designers and contractors decreases project length by overlapping the design and construction portions, lessens the likelihood of adversarial interactions, and increases the quality and constructability of the design. Ndekugri and Turner (1994) conducted a survey of perceptions of design-build among clients, designers, and contractors in the United Kingdom. They cited the following advantages of the design-build method due to the designer and contractor working together: constructability, savings in time and cost, and reduction of disputes. Similarly, Gordon (1994) reported that the design-build delivery system shortens the duration of projects, provides flexibility to allow changes during construction, and encourages collaboration between the designer and contractor. Gordon noted that the early involvement of the contractor in the design-build process provided the owner with more accurate cost estimates and provided the contractor with significant incentives to save

on costs. With design-bid-build, the two teams work together only after the bid has been approved; as a result, working out issues between the teams before and during construction can slow the schedule and create unanticipated costs. On this basis, it was concluded that design-build is preferred over design-bid-build when complex, resource-constrained projects are planned on an accelerated time line (Gordon 1994).

Various factors or characteristics affect the success of a design-build project. Songer and Molenaar (1997) investigated 15 such project characteristics in the U.S. public sector. Characteristics identified as having the greatest effect on project success were (1) a well-defined scope, (2) a shared understanding of scope, (3) the owner's construction sophistication, (4) adequate staffing, and (5) an established budget. Further, Molenaar and Songer (1998) developed a model to predict the success of the design-build approach in the U.S. public sector based on specific project characteristics. Success was correlated with a defined scope, schedule, and budget; the complexity of the project; the owner's/agency's experience and staffing; the owner's input into the design; the design-build market; the design-build team's prequalification; and the method of selecting the team.

Overall, performance related to time, cost, and the quality of the design and work has the greatest effect on the success of a design-build project; as a result, these elements must be considered in the selection of a construction strategy. Songer and Molenaar (1996) demonstrated that owners may choose the design-build approach over design-bid-build for any of the following reasons: shortening project duration, establishing cost, reducing cost, increasing constructability/innovation, establishing schedule, reducing claims, and more easily managing large project size/complexity. The number one reason that owners selected design-build was to shorten project duration, while the lowest ranked reason (of the seven listed) was to manage large project size/complexity. Generally speaking, these results applied to both the private and public sectors; the one difference was that public owners were more likely than private owners to choose design-build to reduce claims.

The decision to use design-build over design-bid-build or other methods is typically made on a subjective basis, generally by eliminating methods viewed as inappropriate for the project based on cost, schedule, and design parameters (Songer and Molenaar 1997). Interestingly, owners with limited knowledge of the inner workings of

the construction industry are often encouraged not to use the design-build procurement method, despite its established advantages (Gordon 1994; Ndekugri and Turner 1994). This may reflect varying perceptions in the design and construction communities regarding the suitability of design-build for complex projects. Ndekugri and Turner (1994) noted that the once widely held belief that design-build should only be used for simple structures has been proven inaccurate, as many of their survey respondents described large, complex buildings executed using design-build. Similarly, Konchar and Sanvido (1998) reported that design-build outperformed design-bid-build and construction management at-risk for projects such as complex offices, high-tech buildings, and light industrial facilities. Together with the cited data regarding advantages related to cost and schedule, these findings suggest that the design-build process should be seriously considered by universities that are planning science and technology spaces.

Methodology of Process Pursued at K-State Olathe

In late 2008, shortly after the passage of the local sales tax, K-State Olathe contracted with an owner's representative, DesignSense, Inc., to develop a building acquisition strategy for its first building; gain assistance in defining the scope, cost, and schedule for the project; and advertise its need for services to the market. After performing a risk analysis to identify expectations (e.g., programmatic requirements of the building) and constraints (e.g., physical, economic, political, environmental, time), the decision was made to pursue a performance-based design-build approach. This section outlines the process followed by K-State Olathe to initiate the project, select the design-build team, and start construction. Specific dates are included to enhance readers' understanding of the events in this process, and a detailed time line is presented in figure 1.

Figure 1 **K-State Olathe Design-Build Process Time Line**

December 2008	K-State Olathe contracted with the owner's representative
April 8–10, 2009	Initial meetings of faculty expert teams held to identify needs of K-State Olathe building
April 13, 2009	Request for Qualifications (RFQ) for design-build team posted on K-State Olathe website
April 23, 2009	Follow-up meeting held with faculty expert teams to identify room adjacencies
April 27, 2009	Follow-up meeting held with faculty expert teams to confirm all building needs were captured
May 8, 2009	Responses to RFQ due
May 15, 2009	Announcement made of three "short-listed" teams that would receive the RFP
June 25, 2009	Request for Proposals (RFP) posted
July 7, 2009	One-on-one meetings held with design-build teams to clarify questions about the RFP
August 4, 2009	Responses to the RFP (building proposals) due
August 6, 2009	Three proposal presentations/interviews held
August 25, 2009	K-State Olathe announced 360/Weitz as selected design-build team
September 2009	360/Weitz met with faculty experts for modifications to design plans prior to build
October 2009	360/Weitz met with food safety faculty experts for modifications to food areas of building
November 12, 2009	K-State Olathe groundbreaking of building
January 2011	Substantial construction completion
March 2011	Owner occupancy of building

The design-build approach requires collaboration among a variety of groups to achieve a goal. The owner's representative facilitated the steps necessary to create a request for qualifications (RFQ) and a request for proposal (RFP). The RFQ process involved advertising a set of necessary qualifications for the project and selecting a short list of the most qualified among the responding teams. The RFP process provided the short-listed teams with a set of prioritized programmatic requirements, a budget, and a schedule, thereby establishing a basis for the final selection of the team that offered the solution with the best value.

For K-State Olathe, the budget and schedule were easily determined; however, the programmatic requirements had to be identified and compiled. For this purpose, K-State sought input on space requirements from assembled teams of faculty, staff, and collaborators with specific expertise. The teams, each made up of four to six experts, represented six functional areas relevant to the mission of the first building (animal health and food safety): (1) food service/food safety; (2) diagnostic analytical services; (3) interactive education and presentation; (4) veterinary clinical demonstration (for wet labs/continuing education); (5) investigator-initiated research; and (6) reception/administration.

The owner's representative facilitated a meeting with each of the six teams to gather information about the needs and expectations of the various user groups. Team members were asked to emulate the future occupants of the new building to identify required and desired components (e.g., types of rooms and equipment). They were challenged to describe their vision of the ideal space, assuming no budget constraints. These team members described what the spaces would look like, the types and sizes of rooms to include, and the types and even specific brands of equipment to install. They also suggested specific mistakes to avoid.

At the next meeting, the owner's representative invited team members to participate in an exercise to identify critical adjacencies between the identified spaces. Participants divided into four new groups with expertise distributed among the teams (e.g., there were not two food service experts on the same team). They were asked to indicate the appropriate positioning of rooms to show which rooms needed to be close or adjacent to each other.

Later, the owner's representative invited the participants back to review and validate an exhaustive list of room requirements compiled from feedback gathered at previous meetings. The expert team members were asked to

confirm the necessity and the size (square footage) of the rooms and to consider whether there were redundant spaces that could be eliminated. Input also was sought related to which walls could be fixed (i.e., "hard") to provide infrastructure for the building and which walls needed to remain changeable. Participants were asked to identify *needed* versus *wanted* spaces by prioritizing which rooms should be considered "mission critical," "highly desirable," and "if possible" spaces. The owner's representative compiled all data collected from these expert team meetings into an RFP.

At the same time, K-State Olathe began moving forward with the RFQ process. An RFQ for a design-build team for the first campus building was posted on the campus website, and 23 teams responded. Their responses were reviewed by two groups of stakeholders and administrators. The first group (technical committee) evaluated the responses for compliance with the technical requirements of the RFQ, and its feedback was then provided to a group responsible for the selection of the finalists (selection committee). References for five teams were contacted, and the three most qualified were placed on the short list of teams that would be invited to respond to the RFP.

The three short-listed teams were provided with the RFP, which challenged them to respond to K-State Olathe's prioritized needs with a campus plan and building design that specified which of the programmatic requirements could be delivered within the budget and schedule constraints. Individual and group meetings allowed each design-build team to provide feedback to K-State Olathe administrators and the owner's representative about the clarity and achievability of the RFP, including the feasibility of its scope, budget, and time line.

Shortly after submitting their responses to the RFP, interviews were held with the three design-build teams. The finalists made individual presentations to an audience that included members of the technical and selection committees and the K-State Olathe board of directors. After the presentations, the proposals were reviewed and evaluated first by the technical committee and then by the selection committee, with the latter considering the presentation, proposal, and technical committee's comments. The technical and selection committees were the same for both the RFQ and RFP process. Ultimately, the design-build team offering the solution with the best value (i.e., achieving the most programmatic requirements

within budget and schedule) was selected. The team selected was 360/Weitz, a collaboration between 360 Architects and Weitz Construction.

Over the next few months, the selected design-build team met with teams of faculty experts who reviewed its design solution and suggested modifications prior to construction to ensure that the spaces were designed to match the intent of the RFP and fit the needs of the users. The groundbreaking for the building occurred on November 12, 2009, and major construction was completed in January 2011. Owner/architect/contractor meetings were held on a weekly basis to keep the lines of communication open between K-State Olathe, the owner's representative, and the design-build team and to ensure the design conformed to the RFP.

Stakeholders' Perspectives on the Design-Build Process

Stakeholders involved in the founding of K-State Olathe (the founders) were interviewed to assess their perspectives on and perceptions of the design-build process. The 20 interviewees included K-State administrators and staff from the Olathe ($n = 4$) and Manhattan campuses ($n = 8$), stakeholders from the City of Olathe ($n = 4$), and others in leadership positions related to the design-build process ($n = 4$). Responses were compiled using content analysis to identify themes related to general perceptions of the design-build process. Founders shared a number of perceptions: design-build had been a smooth, successful process to date; it gets a good result in a short time frame; it requires a lot of effort up front; and it requires trust in the design-build team. These themes are expanded below.

Less than one year elapsed between contracting with the owner's representative and groundbreaking.

The design-build process has been smooth and successful to date. Individuals involved in selecting the design-build team perceived that the RFQ/RFP process succeeded in selecting the correct team. Individuals who continued to be involved through the implementation of the construction phase also had positive perceptions of the design-build approach. Despite some day-to-day issues

(which come up in any project), these individuals appreciated how the design-build process involved gathering input from stakeholders up front. Some mentioned the benefits associated with having only one team responsible for delivering the building rather than two; because the design-build team must reach an agreement prior to submitting its proposal, interactions with the owner are smoother than if the owner had to address the requests of two separate teams.

Design-build gets a good result in a short time frame. Individuals shared that gathering stakeholder input, selecting the design-build team, and getting construction underway happened relatively quickly, with less than one year elapsed between the time K-State Olathe contracted with the owner's representative (December 2008) and the groundbreaking of the building (November 2009).

Design-build requires a lot of effort up front. As described above, extensive work was done prior to the selection of the design-build team. To extract the building program requirements from the stakeholder groups, K-State Olathe and the owner's representative had to meet a number of times with faculty and staff experts. The owner's representative used these articulated program requirements to develop a comprehensive RFP. The short-listed design-build teams then incorporated these program requirements into a "solution" that they proposed to the owner. Accordingly, by the time the design-build team was selected, much of the up-front work was done. That said, it is still possible to modify design plans in response to additional stakeholder feedback after the design-build team is in place, as happened at K-State Olathe.

Design-build requires more trust in the design-build team, compared to teams involved in design-bid-build. To some extent, the design and construction members of the design-build team serve as checks and balances on each other. However, unlike design-bid-build, these checks and balances are internal to the team. Therefore, the owner is not likely to be aware of all the choices that are discussed between designers and builders. Instead, it is likely that the owner will receive whatever choice will allow the design-build team to achieve the product within the already agreed upon budget.

Challenges Experienced

K-State Olathe founders also shared comments related to the challenges experienced during the design process.

Content analysis of these responses resulted in the following themes describing areas of challenge: designing a building for unknown users; identifying accurate expectations of all stakeholder groups; meeting the expectations of all stakeholders within budget constraints; and having the faculty and the owner's representative adapt to and understand each other. These themes are discussed below.

Designing a building for unknown users. K-State Olathe solicited input from "emulated users," including K-State faculty, staff, and collaborators. Faculty experts had to be convinced that their input was needed to design the space, given that they would not be its occupants. Moreover, as the time for construction approached, the faculty experts became fatigued with the process and were reluctant to "approve" the design; this affected the construction time line. A related challenge created by not knowing the end user involved the need to incorporate as much flexibility as possible in the design (i.e., maximizing the use of moveable equipment, furniture, and walls) in order to more easily adapt to the actual end users. As mentioned, design-build allows for much more flexibility than design-bid-build; while this can be a benefit, it can also be a challenge, especially when modifications to the design continue to be made even after construction has begun.

Identifying accurate expectations of all stakeholder groups. As part of the process, the expectations of faculty experts were gathered during formal meetings. This input was then incorporated into the RFP; however, the translation of the faculty experts' feedback into language appropriate for design and construction professionals did not always accurately communicate the faculty's intent. Therefore, modifications had to be made to the original design. Other stakeholders did not make their expectations known until after the building design was completed. This created a challenge because it led to unexpected iterations in the design process and delayed construction.

Meeting the expectations of all stakeholders within budget constraints. Many groups had a stake in this project and deserved to have their desires taken into account; stakeholder expectations were included in the RFP in detail. The final design-build team was selected because it responded to the RFP with the design solution that offered the best value (i.e., met the most requirements within the budget). After being awarded the project, the team invited stakeholders to provide additional feedback. Some wanted all of their expectations met. Meeting these demands would have required K-State Olathe either to set

aside other "mission critical" programmatic requirements or to increase the project budget by using funds designated for academic programs to cover construction costs. Although the most significant aspects of the building (e.g., overall square footage) did not change, modifications had to be made in some areas (e.g., the installation of fewer window blinds) to meet some expectations. It was challenging to satisfy all stakeholder expectations when meeting one expectation meant taking something else away.

Having the faculty and the owner's representative adapt to and understand each other. In this project, an owner's representative who was accustomed to working with other business and industry professionals needed to work with academic faculty experts. Similarly, faculty members who were accustomed to research and teaching collaborations in academic settings were required to work with business people to design a building. Both sides had a limited history of working with the other, which made communication challenging.

Lessons Learned

The authors' experiences during the design-build process led to a number of "lessons learned" that may be useful to other higher education administrators considering pursuit of the design-build approach. These lessons learned are described below.

It is important to involve all stakeholder groups in the process as early as possible. All stakeholder groups should be consulted to gain their input before the development of the RFP. Early involvement will lead to increased awareness of stakeholders' expectations of the building's design and allow unrealistic expectations to be addressed early in the process. It is easier to plan for these expectations initially than it is to modify plans to incorporate them later in the process.

Stakeholders should be engaged consistently throughout the process. Stakeholders should be engaged throughout the entire process—prior to development of the RFP, after the design solution is proposed and before construction, and during the construction process if questions arise. Consistent stakeholder involvement will contribute to a well-defined scope and will decrease the length of the project by reducing the need to make changes during construction. A mechanism should be established to keep stakeholders engaged but not overloaded. This mechanism should allow them to see how their input was

incorporated (or why it was not or could not be) into the finished building in order to maintain their buy-in regarding the value of the building and their involvement in the process.

Engagement of stakeholders should be broad based. The receipt of input from a large and diverse group of stakeholders provides the owner with comprehensive information about important building components. However, it may be practical to directly involve only a limited number of individual stakeholders in the process. Establishing an infrastructure for communicating back to the larger stakeholder groups will ensure that these individuals are aware of what is occurring with the building process and allow them an opportunity to provide input. Broad-based engagement will help facilitate feelings of connectedness to and support for the new campus within the larger university and faculty groups. It also will ensure that stakeholders are aware of potential opportunities to use the building and can make plans for such use upon construction completion.

Administrators and staff of the new campus should strive to overcommunicate during campus development. Ideally, each individual within the administrative structure of the new campus would be aware of all happenings related to campus development, including the building process and the development of academic programs, or one person would have primary oversight for every aspect of the new academic entity. However, with only limited personnel available to a forming entity, the reality is that campus administrators and staff have different foci of responsibility (i.e., building or programs) that may vary over time. In contrast, individual stakeholders may be engaged actively and simultaneously in both the building process and academic program development. To address stakeholder inquiries accurately and in a timely fashion, the members of the campus leadership team must communicate effectively among themselves.

The owner's representative can be critical to success, particularly in the case of owners who are not familiar with design-build. At K-State Olathe, the owner's representative was involved in every step along the way—usually leading the way—through the building process. This consultant served as a facilitator in the gathering of stakeholder expectations, translated input from academic-minded individuals into language understandable by the industry, guided the design-build team selection process, and served as the “go between” for day-to-day issues during the construction process to ensure that the design-build team was fulfilling all that was contracted through the RFP.

It is important to select an owner's representative that can be trusted to act in the owner's best interest. The owner's representative fulfills the role of “the bad guy” with the design-build team and can take considerable demand off the owner in the day-to-day management of the project. It is vital to select an owner's representative that knows when it is important to bring decisions back to the owner. Further, given that the owner's representative provides advice based on experience, it would be beneficial for an owner in a university setting to retain a representative that has worked with design-build in a similar setting. Academic experience would enhance the representative's ability to serve as translator between academic faculty and design-build industry professionals and to get along well with all involved parties.

Few changes have been necessary, and very few unanticipated needs have been discovered.

Design-build was a good fit for K-State Olathe. Construction was completed within budget, on time, and with a high level of quality. Further, stakeholders are consistently using the building spaces. In its first eight months of being open to the public, the building hosted 375 events involving more than 7,500 people. Stakeholders have embraced the building for its quality and flexibility. Many compliments have been received about the moveable walls and cabinetry as well as the ample access to electrical outlets in most spaces. Few changes have been necessary after construction, and very few unanticipated needs have been discovered. One such discovery was that there can never be too much electrical access in classrooms, including in the middle of the room. The building is meeting people's needs and has expansion capabilities. Because the building was designed for potential users rather than known users, it was completed with some unfinished office and laboratory spaces; given the demand for space in the building, work to finish these spaces will likely begin this year.

Conclusion

In summary, while the design-build strategy is not without its pitfalls, it has served K-State Olathe well, and it appears to be a viable option for future buildings on the K-State

Olathe campus. This approach allowed K-State Olathe to secure the building at a set cost and on a reduced time schedule. Design-build was the best choice for K-State Olathe because of the flexibility needed to design a building for unknown users and meet various stakeholders' expectations throughout the design and build process. Having users and other stakeholders involved in the process has better ensured that the building is a success—that the end product meets the needs and functions of its users. ❧

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