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Leveraging a New Building to Overcome First and Second-Order Barriers to Faculty Technology Integration

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This study uses the context of a School of Education's transition from an old adapted building to a new dedicated structure to explore ways in which that occasion created an opportunity to address first and second-order barriers to faculty technology integration and pedagogical innovation. Barriers were address through the convergence of a purposeful application of an adult learner model to technology support and planning, and the opportunities provided by the move to a new building. Findings from pre and post-move faculty and administrator interviews highlight intended and unintended strategic, symbolic, and functional outcomes, as well as the unique aspects of faculty professional work life that complicate these efforts.

Introduction

Over the past several decades campus planners, educators, architects, administrators, and other constituents have become deeply invested in using spatial design and cutting-edge technology to attract highly sought after faculty and students and to improve student learning outcomes. Despite the recession, colleges and universities began construction on nearly eight billion dollars' worth of new campus buildings in 2010, off from the 2006 historical high of $10.3 billion (Abramson, 2011). Within many of these new structures, use of flexible classroom elements, interactive multimedia, and well-lit, aesthetically-pleasing spaces (sometimes including fireplaces, large windows, and comfortable seating) are familiar if not standard practices (Dittoe, 2002). Often these designs are intended to meet the unique needs of a discipline, field, or profession, and seek to provide maximum spatial flexibility to allow class facilitators and students to tailor elements to pedagogical approaches, such as clusters that allow math students to easily collaborate on problems and receive instructor feedback (Lewis & Starsia, 2009; Hammons & Brady Oswald, 2009).

In a higher education context innovative design and technology infrastructure still depends on correspondingly innovative delivery and support. Although creative and engaging use of space and instructional techniques certainly occur in low-tech or no-tech contexts, learning space technology offers unique avenues for student engagement, expression, collaboration, and exploration. As a result, researchers have explored at length the factors that influence faculty technology adoption and integration into their pedagogical practices. Rogers (2003) work on the diffusion of innovations in educational contexts is foundational to this conversation, and the application to faculty by Jacobsen (1998) and others is the conceptual starting point in a range of studies (Adamy & Heinecke, 2005; Findley & Hartman, 2004; Nicholle, 2005), including this one. According to Rogers and others, the eagerness of faculty to embrace new technology and pedagogy can generally be represented on a normal curve, with a small number of enthusiastic early adopters at one end and a small number of Luddite change resisters at the other. The largest segments are constituted from those who are mildly inclined or disinclined, but for whom adoption of innovation is occasionally or often displaced by other priorities, pressures, and commitments.

Subsequent waves of research have identified factors that may contribute to or result in technology innovation as a displaced priority. Ertmer (1999) argues that these factors generally fit into two categories, or what she calls "first order" and "second order" barriers. First-order barriers are person-external, such as a lack of adequate direct support, including issues of accessibility, training, and understanding of pedagogy and faculty issues by support staff (Finley & Hartman, 2004; Gallant, 2000; Jacobsen, 1998; Nicolle, 2005). First-order barriers might also include larger organizational patterns, commitments, and resources, including culture and attitudes toward technology

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integration campus-wide and administrative incentives, disincentives, and expectations (Adamy & Heinecke, 2005; Brunner, 1992; Gallant, 2000; Hoffman & Klepper, 2000; Parker, 1996; Silver, 1998).

Second-order barriers are person-internal and may be based on long-held beliefs, attitudes, and conceptualizations that represent important aspects of individual sense-making, such as the importance of the teacher as authority and expert in the classroom. Second-order barriers may include such issues as aversion to risk (Baldwin, 1988) and a sense that new technology is a threat to preferred teaching practices (Mehlinger & Powers, 2002; Zisow, 2000). Although reluctance to adopt technology into pedagogical practices is typified here as a "barrier" implying a negative state, the current lively debate over appropriate integration of technology, such as student use of laptops in the classroom setting, raises worthwhile questions as well. In the context of this study we do not consider those concerns to be barriers in the cases where they are based on the pursuit of the best possible learning experience and not a *carte blanche* rejection or resistance to technology.

The sum total of these barriers is that moving individual faculty members from their current position to a greater level of technology integration requires an internal conviction regarding the value of innovative technology, related teaching spaces, and pedagogy. It also requires an institutional or unit commitment regarding the technological resources and assistance required to actualize those convictions. In short, Ertmer (1999) and others argue that the relationship between first-order and second-order barriers is complex: external resources can influence but not replace an internal commitment to innovation, and internal commitments can exist without external resources. However, convergence of internal states and external resources and support provides the greatest likelihood of increased openness to innovation.

For many faculty members with minimal to moderate levels of commitment to innovation (e.g., those in Jacobsen's (1998) "early majority" and "late majority" categories, typically representing 68% individuals), habitual instructional technology use may receive a new or renewed focus during a singular event or initiative that allows them to reframe or re-prioritize this aspect of their professional work. In the context of this study, that moment came about through a School of Education's transition from an old adapted structure to a new dedicated building. Reflective of the culture at Ewell University[1], the design process was highly inclusive and involved extensive input from faculty members on a range of subjects, from classroom layouts to furniture upholstery patterns. This moment of transition was also identified by Dr. Nigel Updike, the Director of Academic Technology, as an opportunity to simultaneously alleviate first and second-order barriers through the application of an adult learning model. This model addresses both the development of innovative pedagogy through technology integration and a new process of technological support.

Thus, this paper investigates the following question: How can a new building be leveraged to overcome first and second-order barriers to faculty instructional technology integration in ways that result in innovative learning experiences?

Methodology

This paper utilizes the data from a larger study on the individual and organizational impact of a School of Education's move from an old brick and cinderblock mixed use classroom building constructed in the 1960s, to a building designed specifically and only for this academic unit. The research team collected interview and survey data, gathered artifacts, and engaged in participant-observation in the spring prior to the move and in the spring following the move. Interview participants were full-time faculty members of any employment status (tenured, tenure-track, and contingent employment). All School of Education faculty members were invited to complete a paper and pencil survey (prior to the move) and an online survey (after the move) to establish descriptive baseline demographic, space use, and technology use patterns (see Appendix A and B for survey instruments). A limitation of the study was that technology use and integration was one of several foci of the study and consequently, the survey instrument provided limited quantitative evidence toward this specific investigation. However, we found the pre-move and post-move approach to offer a comparative view much richer than post-move evaluation only. Future building transition studies would profit from more extensive utilization of survey instruments.

After stratifying the qualifying faculty members by academic area, we selected participants at random from these sub-groups. Twenty-one faculty members were invited to participate in a semi-structured interview, with 15 faculty members participating in both interview phases, representing about 40% of all qualifying professors. The research team also interviewed three administrators and the building architect to better understand the planning and design process, and to corroborate faculty participant accounts. One of the administrators, the Director of Academic Technology, became a key informant for this

[1] All names are pseudonyms

paper, and we conducted several follow-up interviews and fact-checking sessions with him after the principle data had been collected.

We also engaged in several forms of artifact collection and participant-observation to triangulate faculty self-report accounts and add depth and detail to our understanding of group processes and behaviors. These activities included documenting faculty spaces and use through photographs, attending building design and planning meetings held for and by various faculty groups, reading building needs assessments completed by the architecture firm, attending class sessions in both new and old building structures, and gathering input from students and staff formally and informally. Interviews were audio recorded, transcribed verbatim, and coded through a two level open coding process using Nvivo ethnographic software, allowing the research team to develop second-round questions from participant responses to the first round of interviews.

Building Contexts

Webster Hall was constructed in the mid-1960s as a mixed-use structure and had since housed the School of Education, department of Mathematics, and on the basement level, much of the University's information technology support and equipment base. The School of Education controlled only four classrooms in this building though it used many others: one that seated 50 students and was equipped with a podium computer and projector, a methods lab with hook-ups for science-related projects, and two standard classrooms with attached desk and seat combinations, seating thirty-five students each. Two other tiered classrooms were also frequently used, both with fixed desks and rolling chairs facing a central podium with drop-down projection screens on either side. Class sizes were typically small, ranging from seminars with about ten students to introductory courses (graduate and undergraduate) with as many as 35-40 students.

Although these facilities were adequate for basic technology-based instruction, faculty members complained of frequent system bugs, connectivity issues (particularly with laptops and other non-integrated devices), and overlapping systems, such audio levels that had to be adjusted at three different inputs and electronic components added over decades that were not completely compatible. The tiered formation of some rooms seating reflected a professor-focused orientation and reduced options for student interaction, group work, and other non-traditional configurations. In addition to the outdated and inconsistent technology and the limitations of classroom arrangement due to equipment type, the small size of Webster Hall meant that faculty members often found their room assignments located in other nearby buildings where technology options and classroom equipment were similarly inadequate, inconsistent, or decrepit.

The new School of Education building includes 19 learning spaces, six of which are in an education conference center. The remaining 13 rooms are also grouped by function: four collaboration rooms with flat screen monitors on each wall for group work and sharing, eight classrooms with movable furniture that seat 24-44, and one tiered classroom outfitted specifically for video conferencing that seats 50.

Findings

The School of Education at Ewell University benefits from a pre-existing culture of achievement, openness to innovation, and a deep commitment to teacher preparation that has included a basic level of technological proficiency. However, the application of this final priority has been hampered by a variety of first and second-order factors (Ertmer, 1999) that are a product of this high level of professional involvement. Similar to faculty members at other institutions, commitments to scholarly productivity, teaching, mentoring and advising, and service to local schools and education-related agencies divide time and attention, leaving minimal opportunities to think creatively and innovatively about technology use in the classroom (Alleman, Holly, & Costello, 2011).

Pre-move survey responses illustrate how faculty perceived and used technology in all parts of professional life prior to the move. Although all the faculty members that completed the survey (N=22) used e-mail as their primary means of communicating with students and colleagues, only 15-20% of respondents used social networking, cloud based document software, telephone or video conferencing, or wiki's on a regular basis. Only the use of online discussion boards received a higher usage rating by 50% of the respondents. When asked how each faculty member allocated instructional time (lecture, groups work, guest speakers, and technology-related activities), technology-specific activities received an average time allocation of 12.4%, with 32% of faculty members using 0-5% of class time in technology-based instruction. In short, survey data indicates that faculty use of technology generally and instructional technology specifically was widespread but not extensive.

Interviews with faculty members prior to the building transition raised three themes regarding faculty technology integration. First, several faculty participants began with qualifiers, downplaying their technological ability. Andrea reflected: "I'm not the most progressive person with regard

to technology, but I'm looking forward to learning about it, and incorporating it, and I do now as much as I can." Andrea's comment highlights the intersection of competing time claims as well as the gap between what faculty value and what they often feel they have time to accomplish. Her statement also typifies a general enthusiasm for the learning opportunity that she and others anticipated would come with the move to the new building. Second, and similarly, faculty members expressed concerns about the quality and consistency of implementation. When asked how she felt about the new technological resources, Barb exclaimed, "Oh, I'm excited, I love to try new things out! I hope we have the support to teach us, and to offer us the support we need to be able to use it effectively. I think it's great." Despite her positive response, Barb demurred, reflecting on a negative experience she hoped would not occur in this situation: "One of my colleagues taught a class over at the business school this spring, and it sounds like a nightmare and disaster with all kinds of problems. So I'm a little bit nervous as well." Third, although many faculty participants echoed the twin sentiments of anticipation and enthusiasm, these expressions were coupled with trepidation for the time that might be required to learn new systems, concerns about access to support, and worries that the technology itself would not be accessible or would not be fully operational. With this theme, faculty participants also commented that they expected something of a learning curve, requiring mastery of new software, interfaces, and classroom systems.

An Adult Learning Approach

Over the past several decades academic technology support has undergone a shift from an enterprise focused primarily on technical support to one through which pedagogical innovation is fostered and encouraged through thoughtful application of technology. This shift or increased complexity of technical support roles has necessitated a corresponding shift in the credentials and expertise of support staff members, with a particular emphasis placed on hiring those who have academic training and experience in addition to technical proficiency. Ewell University hired Dr. Updike, the Director of Academic Technology, under this contemporary reconceptualization of technology support, granting him a dual appointment as an executive faculty member.

Dr. Updike's doctoral training in adult education equipped him with a learning perspective that he has, over the past decade, worked to integrate into a vision for technology integration throughout Ewell University. At the heart of the adult learner approach is an emphasis on learner-centered education that de-emphasizes the instructor and the instructor's knowledge in favor of self-directed, experiential learning. This perspective gives special consideration to the process or stages of learning through which information is acquired, understood, mastered, and applied (Kolb, 1984). The distinction between this approach and traditional teaching methods is clearly seen in the comparison made between the teaching paradigm and the learning paradigm (Barr and Tagg, 1995). The *teaching paradigm* emphasizes delivery of information, the expertise of the instructor, and the student as a passive recipient. The *learning paradigm*, by contrast, places the onus on the student not only to direct the thrust of education, but to actually participate in the creation of knowledge, owning responsibility for the process and product that result.

At Ewell University a learning paradigm approach results in at least three points of application. First, a vision for the way in which technology can benefit classroom instruction promotes learner-centered behavior. Namely, by facilitating self-directed learning that leads to inquiry and exploration. Second, reconceptualizing faculty members' encounter with technology through an adult learner model changes the types of technology learning opportunities that are designed. From this perspective, faculty members are more apt to welcome new technology when their interaction with it comes as a result of their own desire for professional improvement and student engagement, rather than an isolated mastery-focused workshop. Third, application of the learning paradigm results in an approach to technology support that mirrors the treatment of faculty as adult learners. Faculty are encouraged through the type, quality, and pervasiveness of support resources to explore new approaches to student involvement in learning, with the expectation that those student-driven ideas will leech out through the academic unit through informal exchanges, classroom observations, and other informal information exchange processes.

Although these designs for faculty technology integration have made gains over the past decade, they also faced many of the first-order barriers that tend to hinder faculty members in other contexts, in several ways. Because of Ewell University's context as a mid-sized public institution, resources, both technological and human, are often limited. Although upgrades had been made to many of the classrooms in the old building, faculty participants reported inconsistencies in the reliability and type of equipment between classrooms. Furthermore, staffing funds limited the School of Education to one full-time technical support person in addition to the university-wide technical assistance hotline and center. Although Dr. Updike also served as a point person for conversations with faculty about pedagogical needs, his duties around campus limited the time he had available for these interactions.

Technology Implementation in the New Building

After decades housed in a building noted even before initial occupation as insufficient for the needs of the academic unit, the state, in conjunction with private funding, agreed to support the construction of a new dedicated School of Education structure. Indicative of the institutional culture, the design process involved a battery of meetings that gathered suggestions and feedback from the faculty on most areas related to the new structure. However, in the swarm of discussions, classroom technology design was not a point of extensive reflection and analysis. A faculty planning committee representing the interests of professors was also intimately involved with most aspects of the design process but had only a few meetings with the external audio-visual consultant hired to handle AV planning and implementation. At least one member of the information technology staff raised questions about the hardware and software designs but received no response from the consultant. During the time when blueprints were drawn and equipment lists developed, communication about educational technology plans with faculty members was non-existent. Exacerbating the situation, miscommunication between administrative levels about the anticipated involvement of existing IT personnel inadvertently removed almost all internal oversight from the AV development process. Worse still, once lines of responsibility were clarified and IT staff began to review the specific AV plan, the consultant was unresponsive and exercised what participants considered to be inappropriate levels of independent decision-making without faculty or administrative input.

With only months left before building occupation, responsibility for educational technology was shifted to Dr. Updike and his staff. Faculty were briefed about the shift in responsibility and the IT team worked with many faculty members to identify needs and test potential technological solutions for classrooms and the grant-funded centers. Based on input from those meetings the IT staff extensively revised the technology plan, including retrofitting all podia so they accommodate both computers and books.

Although this unforeseen and undesired turn of events led to a few compromises and considerable last-minute scrambling, one positive result was the opportunity for the information technology services unit to implement their vision for faculty instructional technology use by hiring several new staff members and by providing direct guidance that linked creative, learner-centered pedagogy with the sorts of technology needed to support it. For example, although several of the classrooms had been outfitted for video capture and video conferencing, there were no microphones positioned to pick up feedback and interaction from the class, indicative of an instruction-centered view of education. Dr. Updike commented:

> Whoever designed that classroom in the beginning did not understand how teaching and learning actually takes place. They were looking at it through the lens of the teacher presenting material; they were not looking at it all in the way that would fit with what we believe about the nature of teaching and learning here, reflecting a presumption of a teacher-focused model of instruction.

Simultaneously with the updates and shifts in infrastructure and support planning, information technology services staff implemented a two-phase technology roll-out design. The first phase set in place the basic technological and design elements of classroom instruction: flexible seating with tables that could be easily reconfigured for different sorts of group work, overhead projectors, and a touchpad that provided controls for the screens, shifts between inputs, and offering as well the ability to annotate projected material. As pre-move faculty interviews suggested, this basic level of functionality was a common source of concern. Providing ample opportunities for faculty members to build familiarity and competence with this new equipment standard was an often-stated goal, though it did not eliminate the tendency of faculty to develop new ideas at the last minute without the technical knowledge to fully implement them. The success of the first phase was reflected in faculty member's comments, hailing the consistency, ease of use, and reliability of technical systems. One participant commented that "It's more like a layer of concern that has been removed. When I go into a classroom here, everything is going to be working, looking professional, ready for us, and I don't have to worry about that."

The second phase, introduced after the first year of initial occupation of the new building, focused on introducing faculty members to more advanced collaborative tools and distance learning resources. This phase is particularly challenging since it demands intellectual mastery (understanding the concept) and technical mastery (the ability to handle the hardware and software effectively), requiring imagination for instructional use and willingness to invest the time necessary to overcome technical and logistical hurdles. Although these steps may be daunting to a harried faculty member, Dr. Updike's injunction that "there is simplicity on the other side of complexity" is a reminder that overcoming the learning curve can actually reduce stress and improve performance in the long run, if faculty can be convinced to do so.

Addressing First-Order and Second-Order Barriers

Peggy Ertmer (1999), building on the work of Brickner (1995), observes that first-order barriers to change are extrinsic factors. Extrinsic factors are those that impede or fail to promote an individual's ability to integrate technology into an innovative classroom experience. The shift to the new building either facilitated or caused four such barriers to be reduced or removed. First, Strudler and Wetzel (1999) note that in many cases, the failure of organizational leaders to support innovation though formal expectations and staffing and infrastructure funding represents a significant barrier to technology integration across a professional group. At Ewell University academic unit leaders may have previously assented to the importance of applying cutting-edge technology to classroom instruction to improve teacher training and to promote student ownership of the learning process, yet movement toward actualizing those values had been incremental and inconsistent. The new construction introduced additional resources which in turn resulted in new conversations about organizational priorities and goals. This occasion also provided the impetus for the Dean to directly and indirectly encourage faculty members to improve their instructional practice, in part through improved technology integration. As Dr. Updike characterized it, "if you have leadership that understands technology objectives and support, you can do more than if you have to wait for everything to bubble up from the bottom."

Second and related to the first, the Dean's commitment to support technological innovation was reinforced structurally by adding it as a new element in faculty member's annual review process. Tying technological integration into performance evaluations reinforces this aspect of professional development as an organizational priority and norm (Jacobsen, 1998).

Third, and also following from the first, the School of Education's commitment (or recommitment) to enhanced active learning through technology integration and the environmental opportunity brought on by the new building resulted in the creation of two new support positions: one for a technical expert to address traditional hardware and software issues, and a second for an education specialist with an instructional background to help faculty imagine fresh approaches to pedagogical innovation through the use of new technological resources.

These new staff lines played two critical functions in the overall philosophy of faculty support. First, by matching the non-traditional hours of instruction with morning through night professional assistance for glitches and problems as they arose, but more importantly by building among faculty members the confidence that a specialist was readily available to help them design new approaches to course delivery and student engagement as needed. Dr. Updike characterized the impact of this new support feature in terms of the nature and tone of assistance available:

> So when [faculty members] go there and say… 'How am I going to deal with this?' I think you have to have an environment where it is okay for [them] to ask, and then the person that they ask is probably going to say, 'Wow, I'm glad you asked that because it is really a good question. Here are some ways you might want to get started and here are some places you might want to go'.

In short, a unit-wide commitment to this technology integration approach could not happen without human support to solve problems and germinate new ideas for instructional methods. Faculty interviews and observations confirmed the value of a more pervasive and better equipped support system. Reflective of some others' comments, one faculty member's praise was effusive, connecting technology support to improved educational delivery:

> I can't say enough about how wonderful all of the instructional technology folks [have been], 'cause [one support person] takes care of the equipment, whereas some of the other people are really showing you, 'Alright what do you want to accomplish in your class? You could use this or this to help you accomplish that' because they know about the teaching piece of it. So it's coming, I don't know how to use all of it so far because I haven't had the need, [but] if you want to grow they're there to support you and I just can't say enough.

Fourth, information technology services at Ewell began to design faculty learning opportunities around a "watch and react" philosophy. Rather than stacking the calendar with workshops, the technology support staff tracked faculty inquiries and issues and then developed group learning experiences around common problems or interests.

Additionally, the centrally located technology support center staffed from early morning to late at night gave faculty members the confidence that when the need for consultation arose a knowledgeable staff person was on hand to work at the problem to completion. The staff also embraced the fact that a majority of their interactions with faculty members will be responding to "last minute" technology issues. Their positive attitude toward these requests helped to avoid an unproductive schism between

faculty and technical support staff.

Second-Order Barriers

Unlike first-order barriers, many of which can be removed through policy and structure changes, second-order barriers are person-internal points of resistance that are linked to values, beliefs, and concerns that are firmly embedded and often slow to change. In the interview portion of data collection participants articulated first-order barriers quite clearly, but faculty members only hinted at second-order barriers, likely reflective of their deep-seated connection to larger ontological and philosophical positions about teaching styles and technology use. Nevertheless, those few faculty members who displayed or discussed technology use indicative of second-order barriers were of three types: the resisters, the fearful, and the over-committed.

Of those we characterize as "resisters", none of them were committed to an outright rejection of technology use that typifies Rogers' most extreme position. This handful of faculty members tended to be mid to late career, prefer lecture-style content delivery, and view their technology use as "appropriate", as one professor termed it. Their perspective and behavior resulted in a use of basic technology focused on presentation: PowerPoint, occasional video clips, and other display and observation-based implementation. These faculty members were pleased with the standardization of technology infrastructure and the improvements made to technology support that allowed them to worry less about the functionality of systems they preferred to use. However, since they already viewed their technology use as sufficient we saw little evidence that their technology use patterns or their pedagogy had changed significantly, at least over the first year in the new building.

Several faculty members expressed trepidation about the new technological systems and the amount of time and energy that might be needed to learn them. More than busyness only, these few faculty members used terms like "fear" and "intimidating" to describe their apprehension prior to the move to the new building. Once in the new building however, the removal of first-order barriers alleviated at least some of the second-order barriers they were experiencing. Jan, a mid-career faculty member, described this process of acclimation and increased confidence:

I mean it's just so easy now, and so I'm experimenting with different things and would have been less likely to do that in the old building because it was not so easy. This is just so user friendly, so the star board or whatever they call it, it's a no-brainer, so it takes that fear of trying something out of the equation for me, and you know, I've been doing lots of different things and using lots of different media because it is just so easy to do.

The degree to which Jan's instructional philosophy has changed is not yet clear. However this example shows the convergence of factors that removed first and second-order barriers for her, thus presenting the opportunity for a corresponding shift or sharpening of pedagogical perspective.

Unlike the first two groups that represent relatively small cohorts, nearly all faculty members were in some sense over committed. In part this is a hallmark of faculty life at a small research university. In part it also stems from the culture of this academic unit in particular, intensified by pressure (external or internal) to justify the state's and the institution's investment in the new building. Aware of this general professional and specific institutional tendency and the dampening impact it could have on technology adoption, information technology services personnel standardized systems to reduce wasted time and introduced new support systems to meet both technical and pedagogical needs on-demand. As a result many first-order barriers were removed or reduced that also removed excuses that protected some faculty members from learning new systems or approaches. Susan commented that with prior technological and logistical barriers gone, the onus for change was now upon her:

> Personally I still need to get a whole lot better at all of this, but the equipment and the possibilities are there, and the support.
> *So you feel like there is still some good potential for you?*
> Oh tons of it, but that's my fault.
> *Is that something that you want to take on? Is something that you're hopeful to you'll embrace over time…?*
> Oh yes, it's just been limits on time. To get up to speed it takes time and practice.

The pace of professional life was a kind of first-order barrier: an external expectation and culture of productivity that resulted in faculty members' juggling teaching, advising, scholarship, administration, and other tasks, leaving few opportunities to learn new systems and consider new instructional approaches. Although difficult to quantify, we also sensed that for some faculty members these elements represented second-order barriers in terms of a commitment to a self-perception of busyness that precluded exploration of new technology that might lead to more engaging instructional approaches. The existence and persistence of all these second-order barriers will become evident in the coming years if improved support and infrastructure resources are not utilized.

Conclusions

This paper posed a single research question to which we now return: how can a new building be leveraged to overcome first and second-order barriers to faculty instructional technology integration in ways that result in innovative learning experiences? In this single case analysis not all decisions turned out to be effective and not every faculty member developed mastery of technology in ways that increased student engagement and ownership in the learning process. These realities reflect the complexity of organizational life and the individual autonomy of faculty members to decide how they teach, how they use new spatial resources, and what technology they utilize in them.

During the second phase of research after the building move some faculty members commented that it was too soon to know what impact new technology, classroom design and equipment, and technical support resources would have on their instructional practice and approach. One year following the end of phase two research we queried previous participants to learn whether and how their instructional technology use had changed with the passage of time. The twelve short narrative replies we received (of twenty invited participants) showed largely positive results: although four faculty members said their use had not changed, seven respondents said that theirs had changed (one had been on leave and was unable to comment). Most descriptions also included examples of new forms of technology implementation or integration, or explanation for why patterns had not changed. Among those that said it had not changed, two were already extensive technology adopters whose commitment to technology integration was already motivated by a belief that these tools improved creative instruction and learning engagement.

Among faculty respondents whose education technology use had changed, two interrelated themes predominated that largely reflected our initial findings: first, faculty use it more and think about it more due to the consistency of platforms across classrooms and the timely, thoughtful, and well-prepared IT staff. Of her use patterns, one faculty member wrote:

> I have not once had an exchange with anyone in the technology integration center that made me feel silly or stupid for asking a question or needing help or support. That has encouraged me to take even more risks and to continue to try new things, at a pace that is comfortable for me. The tools themselves without the people to support them would not have been nearly as useful.

Second, many respondents noted new and increased use of collaboration tools, both synchronous and asynchronous, that facilitate student input, reflection, and creativity. These include wikis, blogs, video chat, and use of the multi-screen collaborative classrooms. In many cases these forms are not necessarily cutting edge, but as a result of the new-found confidence in support and infrastructure, these tools are newly available to faculty. In short, responses indicate that the normative culture of academic technology use has begun to shift, resulting in an increased imagination for, interest in, and willingness to see educational technology as not simply an added element, but an integral element to classroom learning.

In a relatively short amount of time many participant faculty members have begun to embrace and creatively utilize, in conjunction with support personnel working from a learner-centered model, new physical and technological classroom resources. Although the goal to improve teaching through the technological and spatial opportunities of the new classrooms and building had yet to be fully realized, the analysis of this study shows that the building was positively leveraged in the following three ways, applicable to other contexts. First, strategically, the planning process for the new building provided a moment of academic unit self-reflection and analysis when new attention could be brought to the importance innovative pedagogy through technology integration. It also created a liminal moment when faculty members expected to have to make changes to their typical routines and habits, providing an opportunity to engage them in practices that some had previously found intimidating or did not feel they had time to learn. These strategic opportunities may have addressed first-order organizational and technological impediments as well as second-order resistance to exploring new classroom technologies.

Second, symbolically the emphasis placed on new human and infrastructure resources and associated planning by academic and administrative leaders conveyed the importance of this aspect of instructional practice to the faculty. As well, the Dean's reinforcement of technological innovation and application as an organizational value through the annual evaluation process buttressed the efforts of academic and technology services administrators. Third, functionally, with the new construction came a financial allotment that allowed the planning team to begin actualizing values that had been held in check by the limited facilities of the old building. Technology support services personnel recognized that the mass of new technology might overwhelm and discourage faculty from learning anything but the minimum necessary to accomplish classroom goals. Support services were thus

designed to be responsive to faculty member's needs and to offer assistance both with technical and pedagogical integration tasks.

This research contributes to the current field of knowledge, building on Ertmer's (1999) framework by focusing on the distinctive factors that impact the classroom technology integration practices of faculty members in the context of a new building. In particular, as noted by many faculty members in this study, the pace and variety of professional life is one of the most pronounced and persistent impediments to learning and implementing new technology. Ironically, for at least some faculty members, new technological and learning space opportunities can merely add to their sense that organizational expectations are overwhelming the time allotted for instructional tasks. When this happens, what was a first-order barrier (professional time commitments) can easily become a long-term second-order barrier (resistance and protection of time) if faculty member's frustrations with the variety and pace of technological innovation are not stemmed by consistent infrastructure and ready support services. As Ertmer (1999) argues, there is little gained by overcoming first-order barriers if a teacher lacks a vision for classroom technology use. In this case, a new building provided an opportunity for a clear change of direction on both fronts, though renovations or unit reorganization may offer a similar prospect.

Inspiring engagement with these physical and technological tools has occurred in some planned and unplanned ways. Planned, in that centralizing support personnel and resources within a building that now houses its entire user base means that workshops and informational sessions can be held adjacent to common faculty work spaces, increasing convenience and the likelihood of attendance. Unplanned, in that the new building was designed to house a variety of grant-funded research and community outreach centers that had been dispersed to outlying houses and professional complexes due to the lack of space in the old building. Dr. Updike commented that it is a sensitive thing to suggest to faculty members that there might be a better way to deliver course material than their current approach. However, faculty members have been highly receptive to technology-based solutions within the grant-funded centers, where the tasks of clinical observations, conferencing from multiple locations, and experiential learning are ripe opportunities for cutting-edge solutions. In the process, faculty gained technical mastery over hardware and software that they then imported to their instructional practices and discussed with their faculty colleagues (as Jacobsen (1998) found, this is the preferred method of learning and adoption for faculty), planting seeds that resulted in faculty members developing new interests in the technical and educational supports that were already primed to assist them. As well, a diverse population of undergraduate and graduate students brought their technology ideas to coursework and research projects, which also acted as a driver for faculty action and inquiry.

This study describes the opportunities for breaking down barriers to instructional technology adoption that come with a new construction or significant renovations. In the process it also highlights several questions for future investigation that were not answered here:

The context of this study was a School of Education: what impact might these resources and services have on the culture and practices of another field or discipline, particularly one where pedagogical methodology is a less pronounced focus?

What impact will the described spatial and technological resources and services have long-term? How will they need to evolve or shift to meet new or redefined needs of an academic unit with a strong community service component and the non-traditional learners and learning contexts related to those activities?

This study points to the variety of types of work and the functional autonomy of faculty members as a unique challenge to the technology integration goals of the new building. Theoretically and practically, since Ertmer's (1999) work was based on K-12 teachers, are there other important differences between the barriers and adoption behaviors and attitudes of secondary and postsecondary educators that should be taken into account in these contexts? Differences may be particularly stark given increases in mandated testing that may further reduce autonomy.

What other sorts of institutional or organizational change, such as a major grant, new unit leadership, or organizational realignment, might offer a similar liminal moment and represent a catalyst for removing barriers to technology integration, creative pedagogy, and the ways faculty think about learning spaces?

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Pre-Move Faculty Survey

Please note: all data will be used in aggregate only, and will not be used in any way that would identify survey participants.

Demographic Information

Are you (circle one): Male Female

Please indicate your age range:

20-29
30-39
40-49
50-59
60-60
70-79

How many years have you been a faculty member at [institution]?

1-10
11-20
21 or more

Use of Space
Please indicate your level of satisfaction for the following workspace elements:

Current office:

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

If applicable, current office space in education facilities outside of [SOE building].

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Common area spaces (lounges, support areas, meeting rooms) in [SOE building].

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

If applicable, common area spaces (lounges, support areas, meeting rooms) in education facilities outside of [SOE building].

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Classroom and laboratory spaces in [SOE building].

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

If applicable, classroom and laboratory spaces in education facilities outside of [SOE building].

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Control over office elements and décor.

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

How do you divide your work time between your university office and other locations? Please allocate a percentage in each area, adding to 100%

Percent time spent working on campus ____

Percent time spent working at home ____

Percent time spent working at another location ____

What priority do you place on the following items? Please rank order these items from 1-10 (1 is the most important, 10 is the least important).

Proximity to parking _____

Personalization of office space _____

Proximity to library _____

Common space for faculty/student meetings _____

Proximity to administrative offices _____

Proximity to colleagues in other departments _____

Proximity to food services _____

Proximity to recreational facilities _____

Proximity to [nearby historical area] _____

Use of Technology

Please indicate what types of programs or services you use to communicate with students and colleagues in a typical week (circle "yes" or "no").

Social networking websites	yes	no
E-mail	yes	no
Instant messaging	yes	no
Video conferencing	yes	no
Blogs	yes	no
Discussion boards	yes	no
Wiki's	yes	no
Collaborative document software	yes	no
Teleconferencing	yes	no

Have you ever used online activities or content to substitute for a meeting of class?

Yes No

Over the course of the semester, how much time in class do you spend using the following? Please allocate a percentage in each area, adding to 100%

Group project/exercise work	_____
Lecture	_____
Guest Speakers	_____
Technology related activities	_____

New Facility Process

What are you most looking forward to in the new education facility? Please rank order these items from 1-10 (1 being the most important, 10 being the least)

Having all departments in the same facility	____
Working in a LEED certified facility	____
Access to improved technology	____

Increased classroom space ____

Flexibility of classroom space ____

Large common areas ____

New office space ____

Food/retail space ____

Ability to host events for alumni and others ____

Other _____ ____

How satisfied are you with the level of communication surrounding the planning and building of the new facility?

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

How satisfied are you that your input has been valued and taken into consideration?

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Do you anticipate spending more time in the new facility than you currently do in the current [SOE building]?

Yes No

Do you anticipate having to adapt different communication techniques, due to the proximity of the new facility to campus?

No Adaptation		Moderate Adaptation		Significant Adaptation
1	2	3	4	5

Do you anticipate changing the way you utilize class time due to the types of new devices and technological support in the new facility?

No Adaptation		Moderate Adaptation		Significant Adaptation
1	2	3	4	5

Thank you for your participation!

Post-Move Faculty Space Survey

Please note: all data will be used in aggregate only, and will not be used in any way that would identify individual survey participants.

Demographic Information

Are you male or female (circle)? Male Female

Please circle your age range.

20-29
30-39
40-49
50-59
60-60
70-79

How many years have you been full-time faculty member at [institution]?

1-10
11-20
21 or more

Spatial Elements
Please indicate your level of satisfaction with the following workspace elements in the new School of Education building:

Your office:

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Common area spaces (lounges, support areas, meeting rooms):

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Classroom and laboratory spaces:

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Ability to decorate or arrange your office to suit your tastes and needs:

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Ability to arrange classroom spaces to meet your instructional needs and preferences:

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Currently, what value do you place on these work-life elements? Please rank-order these elements (1 is the most important, 10 is the least important).

Parking convenience _____

Personalization of office space _____

Proximity to library _____

Common space for faculty/student meetings _____

Access to administrative offices _____

Proximity to colleagues in other areas of campus _____

Proximity to food services _____

Proximity to recreational facilities _____

Proximity to [nearby historical area] _____

Other _____ _____

In an average week, do you spend more time in the new building than you did in [the old SOE building]?

Yes No

How do you currently divide your work time between the following locations in a typical work week? <u>Please allocate a percentage in each area adding to 100%</u>)

Time spent working on campus _____

Time spent working in your home _____

Time spent working in another location _____

= 100%

New Facility/Community

Please indicate the impact that working in the new SOE building has had on the following elements for you:

Amount of interaction with faculty members within my SOE program area:

Not impacted		Moderately impacted		Significant impacted
1	2	3	4	5

Amount of interaction with faculty members from other SOE program areas:

Not impacted		Moderately impacted		Significant impacted
1	2	3	4	5

Amount of interaction with faculty and staff members within the centers and institutes:

Not impacted		Moderately impacted		Significant impacted
1	2	3	4	5

Amount of interaction with non-SOE faculty and staff located in other areas of campus:

Not impacted		Moderately impacted		Significant impacted
1	2	3	4	5

Please answer yes or no to the following questions:

In your opinion, has the sense of SOE community improved since moving to the new building?

Yes No

Has the new building resulted in increased opportunities to develop new professional and social relationships within the SOE?

Yes No

Has the new SOE building resulted in increased opportunities for professional collaboration?

Yes No

Technology

Please indicate your level of satisfaction with the following workspace elements in the new School of Education building:

Accessing and using technology in my office:

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Accessing and using technology in other spaces in the building:

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Availability of technology instruction and support:

Dissatisfied		Moderately Satisfied		Very Satisfied
1	2	3	4	5

Please answer yes or no to the following questions.

Has your use of technology in the following areas changed since moving to the new building?

Yes No

Instructional purposes

Yes No

Communication purposes

Yes No

Scholarly purposes

Yes No

Administrative purposes

Yes No

Service Purposes

Yes No

Center and grant purposes (If applicable)

Yes No

Have you attended any sessions or used any of the available online resources to learn about how to incorporate technology?

Yes No

Thank you for your participation!