UNIVERSITY INNOVATION ALLIANCE RESEARCH REPORT

Student Success through Digital Innovation: A Change Management Model

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INTRODUCTION

Higher education institutions increasingly innovate with digital technologies to facilitate learning and the educational journey of students (Miller, 2017). However, to effectively improve student success through digitalization (Parviainen, 2017), these organizations must negotiate rapidly changing landscapes of technologies, stakeholders, and institutional arrangements (Miller, 2017).

To meet new requirements, unarticulated needs, and existing demands (Maranville, 1992), they introduce and apply novel solutions through digital innovations that transform "socio-technical structures that were previously mediated by non-digital artifacts or relationships" (Yoo et al., 2010, p. 6) and render previous systems, processes, and roles inadequate, (Nambisan et al., 2017). Improving student success through digital innovations therefore raises important questions related to change management.

Against that backdrop, we studied digital innovation initiatives across Georgia State University's (GSU) highly successful and widely reported Student Success Program (SSP) (Gumbel, 2020; Kurzweil & Wu, 2015; U.S. News & World Report, 2020) based on the following research question: How does a higher education institution effectively manage change through digital innovations for student success? We conducted 26 semi-structured interviews with key staff and faculty and collected archival data in the form of documents, presentations, and news articles. To guide our investigation, we adapted Pettigrew's (1985, 1987, 1990) organizational change theory on the interactions between the context, the process, and the content of change.

Context of change refers to the environment in which organizations and stakeholders operate, including the outer context of social, economic, and technological factors, and the inner context of structural, managerial, and cultural arrangements through which ideas of change proceed. In the case of GSU, the outer context includes the economic and socio-cultural context of Georgia, higher education in the US, and the technological context around the world, whereas the inner context includes the structural, managerial, and cultural arrangements inside GSU. The process of change refers to the continuous and interdependent sequence of events that shapes the origins, continuance, and outcome of transformation, including the vertical dimension of interdependencies between higher and lower levels of change, and the horizontal dimension of how change unfolds over time. At GSU, the vertical dimension encompasses the organization of digital innovation initiatives within the overarching structure of SSP, whereas the horizontal dimension includes two decades of digital innovation initiatives and how each of them was conceptualized, initiated, and continuously developed. Finally, the content of change are the specific areas of transformation. At GSU, the content of change includes the value propositions, structures, processes, systems, and people that were transformed through digital innovations for student success.

Digital Innovation at Georgia State University

To share insights from GSU for how higher education institutions can successfully design and manage digital innovation initiatives for student success, we first present the digital innovation areas that support a student's educational journey at GSU: (1) how students are taught and learn; (2) how students are monitored and advised; and (3) how students are engaged and informed. Second, we turn to lessons for managing the involved changes, summarized into a change management model.

Support Student Learning

Higher education institutions were early adopters of the first learning management systems in the late 1990s. These systems automate the documentation, administration, tracking, reporting, and delivery of educational courses, training programs, or learning and development programs (Ellis, 2009). Acting as platforms for quality teaching and learning (Gyurko & Snow, 2020), they changed the technological and competitive contexts of higher education and GSU quickly responded by adopting different versions.

GSU's most recent learning management system, iCollege, is a rebranding of the system Brightspace developed by Desire 2 Learn. Implemented at the turn of the century to share course contents with students, the system has developed to cover the pedagogical process with functionalities, such as taking online quizzes, submitting assignments, grading of quizzes and assignments, monitoring progress of each student, and tailoring communications. At GSU, iCollege currently supports online learning delivery and acts as the platform for both asynchronous and synchronous courses.

To improve student learning, GSU faced unique challenges from its socio-economic context. Georgia's diverse demography means that the majority of students are African-American, Hispanic, and immigrants. Moreover, most students are first-generation college students from low-income families. Nationally, low-income students earn bachelor's degrees at lower rates (Stewart, 2020). To support these students, GSU experimented with adaptive learning technologies that use computer algorithms to support learning by selecting and adapting the presentation of materials and activities based on each student's previous performance.

GSU initiated adaptive learning technologies in 2006 through its Mathematics Interactive Learning Environment (MILE). The rationale for MILE was that mathematics historically has been challenging for underprivileged students, who consistently failed or underperformed in introductory gateway mathematics courses. To break this pedagogical barrier, GSU redesigned these mathematics courses using MILE. Before the redesign, drop, fail and withdrawal (DFW) rates regularly topped 40% in these courses. After failing once, students had to retake the course, often picking up another D or F. As a result, each semester hundreds of students lost their scholarships and dropped out because of this one requirement.

GSU no longer offers traditional lecture-focused sections of any of these introductory mathematics courses. Instead, students attend MILE lab sessions in large groups with dedicated instructors. In each lab session, students sit at individual terminals working on the same material using adaptive learning systems and receiving support from teaching assistants orchestrated by instructors. Using MILE, GSU was able to drop DFW rates across the introductory mathematics courses from an average of 31% in 2007 to 23% in 2014, helping hundreds of additional students pass the mathematics requirement in their first attempt each semester. Encouraged by this success, in 2017 GSU deployed adaptive courseware in five gateway courses in economics, political science, and psychology. The involved professors praised the adaptive learning technologies, emphasizing that they help students manage enormous amounts of information in a structured way that is tailored to their evolving knowledge and capabilities.

Monitor and Advise Students

Since the majority of students at GSU come from low-income backgrounds, GSU closely monitors and frequently advises students. Starting in 2011, GSU has collaborated with Education Advisory Board (EAB) to continuously develop a graduation progression system (GPS) that monitors students and predicts problems, and complementary advising technologies that help students avoid or overcome these problems. GPS uses predictive analytics with a system of more than 800 alerts to track all undergraduate students daily to identify at-risk behaviors. Advisers respond to alerts by intervening in a timely manner to get students back on track. The high impact of such data-driven monitoring systems on improving student success is echoed in previous research (Devlin & Bushey, 2019).

GSU has created a centralized structure of 60 trained academic advisers, the University Advisement Center (UAC), to monitor the alerts and respond with timely, proactive advice to students at scale. Previously, advising was fragmented and fraught with problems such as high student to adviser ratio, no common record keeping, little systematic tracking, and little coordination. The UAC has implemented a vertical governance structure for common advising systems and technologies that offers systematic tracking and record keeping, coordination among advisers, reduced student-adviser ratio, and career paths and systematic training for academic advisers. UAC is continually working towards providing timely information to students, to increase retention, progression, and graduation rates, through individualized education planning, proactive risk targeting, and personalized interventions.

The GPS system went live in August 2012. Based on 10 years of 144,000 student records and 2.5 million grades, the system offers analytical models that predict potential problems for any student and refer them to an academic adviser at UAC for consultation. In the 2019-2020 academic year, the GPS system generated more than 55,000 individual meetings between students and advisers to discuss specific alerts and get students back on track toward graduation. Before GPS went live, many students were confused about which major to choose and which courses to register for. Since GSU initiated GPS advising, the number of students in majors that fit their academic abilities increased by 13 percentage points, progression rates increased by 16 percentage points, and changes of major in the sophomore, junior and senior years decreased by 32%. Also, freshman fall-to-spring retention rates increased by 5 percentage points and graduating seniors are taking fewer excess courses toward graduation. As the SVP of student success commented “we are engaging with students and really changing their trajectory.”

In 2016, GSU consolidated with Georgia Perimeter College, a two-year institution with multiple campuses around the metro Atlanta area. With grant funding, GSU has deployed its GPS system and adapted its advising strategy to increase graduation rates for the additional 20,000 students seeking associate degrees with 42,000 meetings between students and advisers in 2017-2018. The GPS was launched at Perimeter College in 2016-2017 and GSU hired an additional 30 academic advisers. Early data shows that the GPS is equally effective in improving outcomes for associate and baccalaureate degree students. In each case, 90% of the upfront costs were directed to personnel, not technology. In addition to providing much-needed support to students seeking associate degrees, GPS provides the opportunity to better understand and support transfer pathways between two- and four-year institutions. With data-driven predictive analytics and student-centric proactive advising, GSU continues to improve student success.

Engage and Inform Students

The journey of college education is overwhelming even before it begins, especially for first-generation, low-income students. Many students become victims of “summer melt” by accepting offers of admission during summer but not showing up in fall. In 2015, 19% of GSU’s incoming freshman class were victims of summer melt. Although they were accepted and had confirmed their plans to attend, these students never showed up for classes. GSU tracked these students using National Student Clearinghouse data and found that, one year later, 274 of them (74% of whom were low-income) never attended any college.

To successfully begin their college education, accepted students need answers to questions about financial aid, FAFSA, registration, immunization, housing, admissions, and academic advising. Although student advisers may have answers to these questions, they cannot reach all students. Moreover, students also feel vulnerable and hesitant to share personal information with a stranger. Hence, GSU realized the need to be far more proactive and personal in interacting with students between high-school graduation and the first day of college classes and deployed an artificial intelligence (AI) chatbot to reduce summer melt. Later on, the chatbot became a platform for communicating with all students, incoming or continuing, on myriad of issues.

In summer 2016, GSU collaborated with Admit Hub to deploy its first chatbot—a texting system named after the school mascot "Pounce"—that allowed students to text any questions 24/7 from their smart phones. GSU built a knowledge base of 2,000 answers to commonly asked questions and in the three months leading up to the Fall 2016 classes, Pounce replied to 201,000 student questions, with an average response time of 7 seconds. Similar usage was tracked in 2017 and 2018. With the help of Pounce, in 2016 GSU lowered summer melt by 324 students (22%), mostly first-generation and low income. One year earlier, these students were sitting out the college experience. In 2017 and 2018, summer melt declined by an additional 4 percentage points.

Students asked Pounce questions on a broad range of topics—about FAFSA, the difference between a grant and a loan, immunization records, and so on. After receiving a question from a student, the AI integrated in Pounce determines if there is an appropriate answer in the knowledge base or whether the student's question needs to be directed to a staff member to write an answer and add that to the knowledge base. As such, the knowledge base continues to grow and the AI learns to derive the meaning of more questions over time.

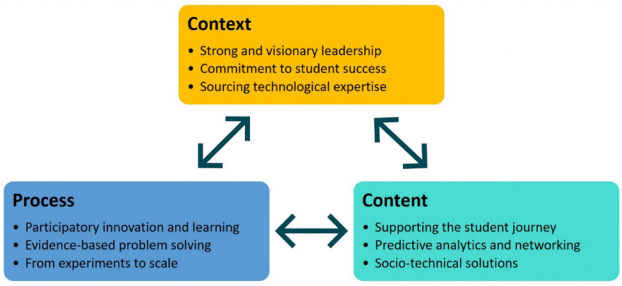
Students communicated with Pounce in surprising ways. They used the system more heavily at 1:00 am than at 9:00 am. They confided problems to the chatbot they would never have shared with a human being, knowing that the chatbot would not judge them. With Pounce, access to information for all has been achieved. Students do not need access to someone with knowledge of college bureaucracies, they just need access to Pounce. As the project director of the chatbot stated, "this technology lets us touch students faster and more effectively."

After Pounce's success in admission, GSU expanded its knowledge base to help students in retention. Today the chatbot sends reminders, conducts guided tutorials, takes surveys, and provides targeted human support on topics including academics, financing, student life, student organizations, housing, meal plans, sports, and more. Critical to Pounce's success was building an adequate knowledge base of answers that students can rely on. Currently, the knowledge base includes 3,000 answers and the chatbot continues to learn.

A Change Management Model

Combining our analyses of digital innovations at GSU with Pettigrew's change theory (1985, 1987, 1990), we offer a change management model for digital innovations. Along the dimensions of context, content, and process of change, GSU took important steps to rationalize, initiate, and administer requisite organizational transformations. As summarized in Figure 1, we draw on these experiences to offer general lessons other institutions can adapt to manage digital innovation initiatives for student success.

Figure 1: A Change Management Model



Context of Change

Strong and visionary leadership: At the heart of GSU's transformation is the visionary leadership of its President and Senior Vice President for student success. Under their leadership, in 2011 GSU accelerated its activities for student success through a five-year strategic plan with five goals: become a national model for undergraduate education by demonstrating that students from all backgrounds can achieve academic and career success at high rates; significantly strengthen and grow the base of distinctive graduate and professional programs by developing the next generation of researchers and societal leaders; become a leading public research university by addressing the most challenging issues of the 21st century; be a leader in understanding the complex challenges of cities and developing effective solutions; and, achieve distinction in globalizing the university. Through this bold and timely strategic plan, GSU made a conscious decision to build on various student success initiatives to transform itself through digital innovations. Although the new SSP led the way from the top by initiating and implementing each digital innovation, their success depended on leaders at every level of the organization. As such, a vertical structure of organic leadership fueled the ongoing horizontal transformation and the realization of change through digital innovations.

Commitment to student success: Inspired by the strong, visionary leadership, the faculty and staff at GSU demonstrated an unrelenting commitment to student success. In terms of supporting learning, the respective faculty and staff played an instrumental role in creating the systems and the contents, always putting students' needs first. They selected textbooks that would be affordable and useful for students, created contents for the new systems that would

best serve student aspirations, and organized and conducted adaptive learning sessions to help students. When COVID-19 forced GSU to move courses online, the staff worked round the clock to prepare iCollege for the mass transition and to provide online tutorials on how students and faculties could effectively use iCollege. In terms of monitoring and advising students, the staff at GSU tirelessly collected, cleaned, and processed student records from previous years to train the predictive models of GPS. Moreover, when GPS predicted problems for students, the advisers at UAC conducted personalized one-on-one consultations to get them back on track. Finally, in terms of engaging and informing students, the staff at GSU has been working relentlessly to develop the knowledge base of Pounce by adding new answers to potential questions and by expanding its use from admission to retention. Significant outcomes were achieved with this high level of commitment to student success with digital innovation.

Sourcing technological expertise: GSU's decision and commitment to support student learning, to monitor and advise students, and to engage and inform students led to a series of strategic digital innovation decisions, including how to source requisite professional expertise, select technology vendors, specify system features, communicate requirements to potential vendors, and customize and rebrand systems according to GSU requirements. Rather than developing technologies purely in-house, GSU outsourced most of them, creating close collaborations with technology vendors. Outside technological expertise provided GSU with a wider range of options and an unrestricted focus on its principal function of delivering value based on these innovations. This combination of external and internal technological expertise helped GSU continually create and share knowledge and resources with EAB, Desire 2 Learn, Admit Hub, and other technology vendors, while at the same time growing its own dedicated expertise for student success.

Process of Change

Participatory innovation and learning: Under the central leadership of SSP, GSU fosters a culture of collaborative and participatory innovation and learning. Although SSP holds the authority to evaluate, decide on, initiate, and orchestrate innovation options, ideas emerge from different levels of diverse functional units across GSU. To facilitate such an organic incubation of innovation, SSP holds a manger meeting every week to discuss the current status, future trends, and potential innovation opportunities. Representatives from different functional units attend these meetings to learn about the ongoing development of SSP and contribute their expertise on future innovations. As such, even though the authority is centralized at GSU, the genesis of innovation is decentralized, emergent, and organic. The commitment of people at these meetings to student success motivates them to proactively participate in innovation and learning, generating a wider range of innovation options, reducing the time to realize innovation opportunities, and eliminating potential bureaucratic obstacles.

Evidence-based problem solving: GSU's digital innovations are sophisticated yet rational—targeted to solve underlying problems—rather than speculative. The economic and socio-cultural outer context of Georgia posed unique challenges for GSU. Most students come from low-income families and are first-generation college students. GSU interpreted this unique context as an opportunity to innovate its value propositions, structures, processes, and systems. Moreover, GSU had to appreciate its existing structural, managerial, and cultural arrangements in its inner context to ascertain and realize possible solutions. Thus, GSU's innovations are a consequence of continually analyzing existing problems and measuring the impact of solutions.

From experiments to scale: Finally, GSU's transformation entailed experimenting and testing configurations of technologies and organizational arrangements in small scale and implementing the best solutions at scale. For example, GSU experimented with adaptive learning technologies in small scale with one MILE lab for one introductory mathematics course. After learning from this experiment, GSU gradually increased the number of labs and expanded the adaptive learning technologies to other courses in mathematics, economics, political science, and psychology. Similar actions were taken regarding the GPS and advising systems and the AI chatbots. For example, GSU initially launched its chatbot "Pounce" to support students in admission, and after its success, expanded the knowledge base and question repertoire to support students in retention as well.

Content of Change

Supporting the student journey: Realizing that GSU students would benefit from additional support, GSU identified digital options to support the student journey. The feasibility of these options was evaluated based on existing needs, the context, potential impact, and available resources. After careful consideration, GSU zoomed in on digital options in teaching, advising, and engaging students. This selection process required evaluation of digital options for nonconventional teaching, early detection of adverse student outcomes, personalized advising to avoid or overcome adverse outcomes, and guidance through
the labyrinth of the university bureaucracy. This led GSU to innovate the way students were— (1) taught with learning management systems and adaptive learning technologies, (2) monitored and advised with graduation progression and advising systems, and (3) engaged and informed with AI chatbots. To realize these digital options, GSU implemented necessary changes in organizational structures and systems, including a centralized SSP to lead all initiatives, UAC to timely advise students, and MILE labs to effectively improve student performance in select courses. As such, supporting the student journey was the ultimate goal of all of GSU's digital innovations.

Predictive analytics and networking: Students at GSU are monitored closely and guided individually. GSU opted for a data-driven strategy to make the student journey easier and, hence, implemented predictive analytics and networking technologies. GSU innovated GPS, that uses predictive analytics to monitor and predict problems that students might face. In terms of networking, GSU innovated complementary advising systems and technologies to guide students to avoid or overcome such problems. Using these systems, advisers can respond to alerts by intervening in a timely manner to get students back on track. GPS and complementary advising systems and technologies together act as a navigation system that guides students through their educational journey. Analytics is also integrated in adaptive learning technologies to predict the proficiency level of a student in a subject and adjust learning contents accordingly. Professors and teaching assistants working in an adaptive learning session provide further guidance in terms of networking. As such, GSU is a perpetual laboratory of new ideas for using big data analytics, networking technologies, and data-driven experimentation to improve student success.

Socio-technical solutions: Finally, the technologies innovated at GSU are only as effective as the people who utilize them. As such, GSU's success story is a socio-technical one in which people with unrelenting commitment to student success interact with technologies with potential to make the journey easier for students. For example, the learning management system is a platform for disseminating knowledge. However, it is the teacher who decides the specific contents and the organization of those contents. Although adaptive learning technologies can help students learn at their own proficiency level and speed, whenever students are in doubt instructors and teaching assistants are there to guide them. Similar patterns emerge in advising and engaging students. GPS can predict potential problems that a student might face, but without the guidance of an adviser a student might not be able to avoid or overcome such problems. Similarly, the AI chatbots are useful only because they have a knowledge base of answers, regularly updated by people.

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