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Leveraging Digital Communications Technology in Higher Education:
Exploring URI's Adoption of Google Apps for Education 2015

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Abstract

Many institutions of higher education are accelerating efforts to implement technology in support of the learning process. This research paper examines the adoption of Google Apps for Education (GAFE) by the University of Rhode Island (URI). GAFE is a suite of cloud-based integrated communication and productivity applications and Google is offering this software platform to educational institutions and nonprofits free of cost. The GAFE product has many options to consider when deployed within the university setting and the university's technical personnel are the first to encounter configuration choices that affect the functionality and usability of GAFE's software's design. Interviews with the professional personnel responsible for deploying GAFE at URI were conducted to explore each staff member's experience in planning and deploying the product at the University. The university's technical personnel are asked questions that investigate their roles and responsibilities in the GAFE deployment project, inquire into the goals, accomplishments, complications, perceived affordances, disappointments and business model reasoning concerning the adoption of GAFE, as well as explores the influence using the GAFE product has on communications behavior. This research paper correlates the principles recommended in the National Education Technology Plan (NETP, 2016) with GAFE functionality by providing examples of how NETP's recommendations may apply to the adoption of GAFE at an institution of higher education, including the topics of productivity, risk management, teaching, learning, collaboration, Internet presence, twenty first century skills development, and communications activity in the digital learning environment.

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Introduction

As part of the United States Department of Education, the Office of Educational

Technology's mission is to provide leadership for transforming education through the power of

technology. The Office of Educational Technology published the National Education

Technology Plan (NETP 2016) entitled "Transforming American Education: Learning Powered

by Technology", with the help of leading education researchers, academic leaders and

instructional focused organizations to establish a national vision and plan for harnessing the

power of technology to maximize all learning outcomes.

> "The NETP 2016 is a common vision and action plan that responds to an urgent national
> priority. It describes specific actions the United States should take to ensure learners of
> all ages have opportunities for personal growth and prosperity and remain competitive in
> a global economy" (U.S. Department of Education, 2016, p. 6).

The Office of Educational Technology (OET) advocates for technology use in teaching methods

as a revolutionary transformation rather than a gradual evolutionary process of change. To assist

academic institutions in transitioning to a more technology integrated curriculum, the OET

provides the NETP 2016 as a best practices outline for technology implementation in the

classroom. Along with promoting academic objectives that infuse technology into all students

learning outcomes, the NETP 2016 also provides recommendations for using technology in

support of learning and teaching research. The NETP 2016 identifies five critical goals to focus

on when considering the integration of technology into educational practice as: learning,

teaching, leadership, assessment, and infrastructure.

The NETP 2016 identifies the goal of using technology in the learning process is to

create a personalized, engaging and empowering educational experience for all learners. In both

formal and informal settings, technology can prepare learners to be active, creative,

knowledgeable, and ethical participants in a globally connected society. At all opportunities,

learning activities should be driven by the learner's personal interests and passions. Using their

sense of agency, learners emotionally connect to the academic material, increasing their own

motivation and self-efficacy beliefs. Non-cognitive competencies, such as growing student's

social and emotional capacities of self-awareness, control of impulsivity, executive function,

working cooperatively, and caring about oneself and others are added into the learning process.

New teaching objectives also incorporate affective domain competencies and impart social

values as a goal for learning outcomes.

Concerning what people need to learn, NETP 2016 identifies a shift in the skill sets that

are now needed by modern day citizens in the workforce. Beyond the essential core of numeracy

and literacy skills, these new twenty first century competencies include critical thinking,

complex problem solving, collaboration, and digital media communication skills. Technology is

no longer just a tool in the learning process; technology proficiency is part of the learning

objective. Technical abilities to actively create, design, build, explore, and collaborate using

digital media are valued over technology use for just the presentation of media. The NETP 2016

emphasizes the need to address the problem of the new digital use divide; one which not only

recognizes the financial divide that limits access to technology but considers the inequality

between those with the technical savvy to produce digital content and those who can't.

The NETP 2016 identifies the goal for the use of technology in teaching is that people,

data, content, resources, and expertise are connected together in the learning experience to

empower and inspire both the student and teacher. Authentic learning experiences are encouraged, where real world challenges are examined in a meaningful way. The proliferation of personal networked computing devices into the home has created the chance for teachers to engage with students beyond the classroom and provide students with the opportunity to participate in a virtual academic community at any time and place they wish. While using technology in the classroom, educators are not only seen as guides, facilitators, and motivators of learners but also co-learners with students and peers. Teacher preparation is critical to maximize the application of technology in support of the learning process. Investments will be needed in developing a teaching force skilled in online and blended instruction to create compelling learning activities that improve assessment and instructional practices.

The NETP 2016 identifies the goal for leadership to support the use of technology in the educational process is to create a culture and conditions for innovation and change. Technology is center stage in the learning process and essential to the vision of transforming learning by leveraging the features of a digital learning community to support the learning experience. Leadership is essential to building a digital learning community, in that leaders implement a new academic vision through a collaboratively developed strategic plan with all shared stakeholders. Along with securing sustainable streams of human and capital resources to support their efforts to transform education; leaders must model a tolerance for risk and experimentation to create a culture of trust and innovation. When developing new learning outcomes, it is essential that leaders establish sets of learning outcomes that recognizes technology's transformative impact on society. Curriculum, instruction, and assessment design reflect the multidisciplinary nature of knowledge and prepare students for participation in a digital culture as future citizens. "Although

vision is critical to transforming teaching and learning, a strategic implementation plan is key to success" (U.S. Department of Education, 2016, p. 42). Leaders need to clearly communicate teaching and learning goals that are facilitated by technology.

The NETP 2016 identifies the goal for the use of technology for assessment in the educational process is to "leverage the power of technology to measure what matters and use assessment data to improve learning" (U.S. Department of Education, 2016, p. 51). Embedded assessments are part of the digital classroom that are often invisible to the learner but serve as a dashboard of tools for teachers to monitor and measure individual progress in real time or over time, to identify learners that need assistance. Embedded assessments also have the potential of being useful for experimental research, historical analysis, pedagogical adjustments and designing personalized feedback. The challenge with achieving a useful assessment system is to create and validate a reliable and cost-effective design that measures the complex aspects of twenty first century competencies.

The NETP 2016 identifies the goal for infrastructure in the use of technology for the educational process is to enable access and promote the effective use of technology so students and educators can engage in the learning process when and where they need it. "Building a robust infrastructure for learning begins with an understanding of the goals and desired outcomes that support engaging and empowering learning experiences. When based on learning goals, technology infrastructure decisions become clear" (U.S. Department of Education, 2016, p. 65). Responsible use policies and security protections are needed to safeguard and guide learners as well as ensure the digital learning environment is accessible and used appropriately by all. From a technical perspective, the digital learning environment should support the interoperability of

systems and the convenience of single sign-on authentication. Today, every modern student

needs an Internet accessible device and appropriate software and resources for research,

communication, multimedia content creation, and collaboration to support the education process.

In the pages that follow, I will provide an overview of the significance of living in the

twenty first century and the compelling changes that technology and the internet are requiring

societies, industry, and educational systems to make, in order to remain relevant and competitive.

Focusing on models for digital communication in higher education, I explore the rollout of the

Google Apps for Education product for faculty and staff at the University of Rhode Island

between January 1, 2015 and February 29, 2016. Midway between the GAFE adoption projects

projected completion date, I interviewed university information technology staff concerning the

GAFE product adoption project's objectives, planning, and delivery. The results of my

investigations are the transcribed text of the interviewee's answers to the questions posed in this

research. In the methods section, I explain my plan to use the interview process to build

knowledge by using action research as a method. The results section has a summary of the

interviewees' answers to my research questions. The answers focus on the roles and

responsibilities of the team members, goals and accomplishments of the GAFE adoption project,

affordances, disappointments and the role of GAFE on communication behavior, as well as

explore ways to leverage GAFE in universities as part of a business model. In the discussion

section, I highlight key themes of efficiency cost effectiveness, cloud computing, legacy systems,

systems control, privacy issues, training, support, communication, teaching and learning. In the

conclusions section, I examine the key themes from the perspective of the National Education

Technology Plan's five areas of focus; learning, teaching, leadership, assessment and

infrastructure and apply these themes to the GAFE product. In the future research section, I

present the documentation that pertains to why I recommend more research on GAFE domain

designs for institutions of higher education. In the final thoughts and last update sections, I

examine the critical considerations that remain in the GAFE adoption process, as well as report

the last available documentation concerning the GAFE deployment project at URI that was

available by the completion of this research paper.

Significance

The twenty first century's great recession has put a lot of economic strain on this nation's

communities, making it harder for prospective students to afford the rising cost of an advanced

education. In "Why does a college degree cost so much", CNBC reports that the average cost of

tuition and fees at a private, nonprofit, four-year university was $31,231 and students borrowed

around $100 billion, making 2015's outstanding student debt total more than $1.2 trillion

(Schoen, 2015). According to the Davis Educational Foundation (2012); the "costs required to

keep campuses up to date with technology have grown dramatically over the last twenty years. It

is not only the cost of the hardware, laboratory equipment, and software but also the talented

staff needed to maintain and assist faculty, staff, and students in their use. Decisions as to which

innovations we employ and how they are implemented will significantly impact costs moving

forward" (p. 5-6). Technology is expensive but a necessity in the modern adult learning

environment, to give students relevant skills and prepare them for work in modern day industries.

In the twenty first century, an information economy drives industry which needs skilled

workers to do advanced tasks in data manipulation (Bybee, 2009). Skills in gathering, searching,

selecting, evaluating and organizing information is valuable, not necessarily the raw information

itself. Content, information and technology are readily available, what is needed are workers who can utilize their skills to abstract, apply, manipulate and process these resources (Rotherham & Willingham, 2009). Capitalism works best as a progressive change. Industry expands with the growth of technology; valuable skills develop to best support this growth. Evolving industries require workers that are dedicated to lifelong learning, so they continue to remain valuable in the labor force (Ananiadou & Claro, 2009). Today's global economy demands highly educated citizens who have critical thinking talents, collaboration abilities, and multi-dimensional communication skills. A successful individual must have adaptability, complex communication social skills, non-routine problem solving skills, self-management, self-development skills and systems thinking skills (Bybee, 2009). "In the 21st century, ability to participate in collaborative knowledge building activities is increasingly seen as a core ability that schools and societies should cultivate in order to prepare students for the realities of knowledge work" (Roschelle, 2013, p. 67). Modern students and citizens alike must master these new basic competencies, currently referred to as twenty first century skills, to stay informed and connected in modern society.

Technology plays a major role in industry development. It is logical that technology skills become part of the basic skill sets for advanced workers. "Technology literacy" comprises science skills, digital media fluency, advanced computer and Internet communications abilities labeled as "technacy" — a deep knowledge of technological systems (Silva, 2008a). The core attitudes of naiveté, risk-taking, tolerance for ambiguity, and group trust embody progressive workers in the twenty first century (Piirto, 2011). Many variations of technical literacies are considered new and required job skills. Digital literacy, new media literacy, information literacy,

lateral literacy, photo-visual literacy, reproduction literacy, visual literacy and multimedia literacy expertise are all beneficial talents for the modern worker and citizen (Jones & Flannigan, 2006).

The success of our nation is more than ever contingent on our capacity to educate our citizens in the skills that are valuable, in order to collectively advance as a nation and provide a path to prosperity for all. Reported in a Pearson's commissioned research in 2012; the United States ranks fourteenth in the world in cognitive skills and educational attainment (Wilson, 2014). Twenty years after Internet access became prominent in the classroom, the United States is still struggling to transform its education system by leveraging digital communications technology to support educational practice.

Extolling the potential of technology use in the classroom to improve learning outcomes for students, the NETP 2016 endorses the use of computing technology and the Internet to change the effectiveness of the learning process and transform learning outcomes for all users. Web 2.0 Internet technology and mobile technology has revolutionized the idea of media use and content delivery to support education. The dynamic content features of Web 2.0 technologies can foster student learning and improve academic performance by assisting in engagement, encouraging autonomy, directing intentionality, advocating for reflection, and building notions of community (Piotrowski, 2015). "The Internet is changing the very nature of society in ways unparalleled since the industrial revolution. The Internet is affecting local, national and global economies and their infrastructures. Information is available at any time from any place to any Internet user. This is creating tremendous opportunities for universities to provide a learning environment that is accessible to all" (Aggarwal, 2000, p. 2). Learning outcomes are impacted

by teaching methods and introducing technology use into learning environments will involve

changes in educational practice (Twining, 2002). The new digital learning environment has been

compared to an ecosystem where learning flourishes (Tucker, 2014). Students are encourage to

define, explore, explain, present, evaluate, reflect, revise and discuss in this environment, in an

effort to build twenty first century skills (Antonenko, Jahanzad, & Greenwood, 2014). Students

become more independent in this new learning environment and must develop disciplines in self-

regulation, such as self-motivation, time management, self-assessment, as well as regulate their

social engagements (O'neil, & Perez, 2008).

"A technology enriched learning environment should be created that enables students to

manage their own learning and to assess their own progress" (Tucker 2014, p.168). "The value of

rich, multidisciplinary, technology-infused learning seems so obvious to educators who have

seen its impact on young people that it is often frustrating to be asked to prove it using tests.

What gets measured gets taught, we must measure what we value — or it won't be taught"

(Salpeter, 2008, p. 9). Student engagement, compelling learning environments, rigorous,

carefully sequenced and flexible curriculum, innovative delivery of instruction, interdisciplinary

work and collaboration, student-centered learning communities, professional development, smart

use of technology, and performance-based assessments are all needed by both students and

teachers to build skills that can be adapted for use while participating in an information age

society (Bray, Green, & Kay 2010). Student agency is fostered in a climate of achievement

within an engaged community in modern learning ecosystems (Brown, 2014). The globalization

of the labor market has increased competition for available jobs; more than ever students need to

excel in order to achieve the most success. Lessons that include the seven I's of inspiration:

insight, intuition, incubation, improvisation, imagery, and imagination are needed to solve advanced problems (Piirto, 2011). "The 8 Keys of Excellence are meant to teach students flexibility, adaptability, initiative, self-direction, productivity, accountability, leadership, responsibility, and communication skills" (Velez, 2012, p. 77).

Teacher Competencies and Skills

Communication is at the core of the learning process. Gavriel Salomon (1981), in "Communication and Education" explains the crucial connection simply as, "There is no educational goal that can be achieved in the absence of communication" (p. 35). In "Fostering a collaborative and creative climate in a college class through idea-centered knowledge-building" by Hong, Chang, and Chai (2014), the authors allude to the recent call for educational procedural reform to one that fosters knowledge building using collaboration methods to transform schools into shared knowledge learning communities. The authors assert that in the past teamwork has been viewed as a process of the division of labor. This view is shifting to a concept of group creativity, leveraging collaboration for knowledge building and culminating in a growth in the group's cognition levels. "In the 21st century, ability to participate in collaborative knowledge building activities is increasingly seen as a core ability that schools and societies should cultivate in order to prepare students for the realities of knowledge work" (Roschelle, 2013, p. 67). The possibilities for infusing twenty first century skills into classrooms are endless, but you can't use existing twentieth century teaching practices; it requires a fundamental re-conception of what the objective is and how to achieve it (Walser, 2008). "Teachers and leaders cultivate a learning environment where students are able to create knowledge, be innovative, have solid communication and collaboration skills, and are critical thinkers and problem solvers, as well as

being flexible, adaptable and conscientious citizens. These skills are summed up in the term

scholar and scholarly behavior" (Velez, 2012, p.72).

Advances in technology are forcing educational institutions to reexamine their teaching

strategies and objectives to determine how to leverage digital technology to improve learning

outcomes, provide twenty first century job skills training, stay competitive in the marketplace,

accommodate for diversity in learning needs, tap into social networking's engagement potential

and research the learning environment to identify areas for future improvements.

For teachers that means making lessons that are relevant, progress through many

disciplines, encourage learning transfer, develop thinking skills, instruct individuals on how to

learn, address misunderstanding directly, treating teamwork as a learning outcome, exploit

technology for learning support, and foster creativity (Saavedra & Opfer, 2012). Furthermore,

these types of higher-order skills cannot be measured in reliable, cost-effective, or scalable ways,

meaning academic institutions are not prepared to teach or evaluate these types of advanced

skills (Silva, 2008b). Emotional connections to the learning experience are encouraged by giving

students more opportunities to personalize the learning in directions that match their interests. A

recurring theme in all learning is the behavior modification objective to instill positive prosocial

and environmentally conscious behaviors in students. The educational system has a crucial role

in transmitting values and standards to the next generation as part of the learning process that

teaches the skills and imparting the knowledge that will secure the existence of our future society

(Hills, 1979).

Google Apps for Education

Google Apps for Education is a broad suite of cloud sourced applications, first developed

as productivity software for the modern business environment. The GAFE product line is also touted as the solution for academic institution's need for a unified digital technology platform to support the modern classroom. Available for free to all educational institutions since 2006, many universities are considering or have recently deployed this product line for their institution. Not only does this product offer platform independent access to the integrated applications but also allows users unlimited digital storage space. GAFE has the potential to substantially lower the cost of technology expenditures for educational institutions, and investments in the adoption of GAFE will result in greater returns.

As with all software product installation, configuration choices will impact how the product works for each individual installation. Additionally, all communication processes have constraints that limit the quality and effectiveness of the messages that are sent and received. Communication messages are shaped by the limitations of the technology being used. While each educational institution that adopts GAFE has to create their own deployment objectives and face their own particular challenges imposed by its current state of resources and finances; universally all academic institutions do face similar choices and obstacles that need to be addressed when configuring GAFE for any learning environment.

The choices made in the GAFE deployment process involves creating a digital space for academic interactions, which has legal and safety obligations that any institution must address prior to adopting the GAFE product. Interviewing the personnel responsible for deploying GAFE in a modern institution of learning will provide insight into the objectives, conflicts, decisions and ramifications of choices made in designing a learning environment. This insight will help any other institutions seeking to adopt the GAFE product so that they may prepare for the

choices that they will inevitably be confronted with. The discussion section of this research paper is intended to review how GAFE products can support learning environments to meet the standards set by the National Educational Technology Plan, as well as identifies the real world challenges in meeting those standards.

Personal Qualifications

As both a graduate student and employee at the university, I had a unique opportunity to be a member the technical team that assisted in the task of deploying the GAFE product at URI, while I was enrolled in the Department of Communication Studies graduate degree program. I work for the University Computing Systems (UCS) department, employed as a Senior Technical Programmer. One of my many responsibilities was to maintain the Microsoft Windows Exchange 2007 email server, which by 2015 was at the end of its life cycle and needed to be replaced. My major task in the Google adoption process was to identify all the remaining valid URI Exchange email users so they could have their email redirected and accepted by a new Google email account. I created the internal email redirections for the URI Exchange server's email delivery to a new GAFE system account on January 1, 2015. I was also responsible for creating the instructions on how use the "Google Apps Migration for Microsoft Outlook" tool to assist Exchange users to independently move their old email off of the URI Exchange server into their new Gmail user accounts. These instructions were made available on the UCS department's "Email Migration to Google Apps for Education" website, dedicated to providing information and resources regarding the GAFE migration project at URI.

Research Questions

The interview questions for this research paper seek to adduce the tasks and major

objectives that were part of the GAFE adoption process from the perspective of the professional

staff that facilitated the process of transitioning the university into using the GAFE product line.

The interview questions also ask the staff to reflect on the impact the GAFE product has had on

the university community, as well as explores the changes that access to this product line has on

their personal communications and productivity activities. These research questions ask the

technical staff for the advice that they would give to any institutions who were considering the

adoption of the GAFE product, as well as to explain the business model advantages that adopting

the GAFE product offers to institutions of higher education.

Method

Action Research

The methodology employed by this scholarly investigation is action research. In "*Why*

Action Research?" Mary Brydon-Miller, Davydd Greenwood, Patricia Maguire and Members of

the Editorial Board of Action Research explain action research as; a participatory research

process that seeks to bring together action and reflection, theory and practice for practical

solutions to pressing concerns of people and society. Action research has axioms founded in the

democratic process and has a global mentality that seeks to understand social science

experimentation as a knowledge building process, that serves valuable prosocial purposes.

Action research has a long history of use in heuristic investigations of complex human

dilemmas, with the objective of finding better solutions. John Dewey is identified as a researcher

that employed action research in both his philosophical work and in his studies and experiments

in education (Brydon-Miller et al, 2003). Dewey's work is a good example of where all

stakeholders engage in a conversation together in an effort to advance human interests. While

Dewey did promote using scientific measurements to assess the progress of learning objectives;

Dewey also understood that the learning process is complex, and not all the instruments

necessary for recording and measuring complicated human and social processes have been

created. For social science research in particular, human investigators who have a passionate

connection to the research material, can assist in processing research data where no measurement

tools exists. Action research is making a resurgence in recent years, after many years of apathetic

use in academia. Action research methods also support the injection of political and moral

agendas into research methods. Action research challenges the conventional wisdom touted by

physical science research that states; in order to be credible, research must remain objective and

value-free (Brydon-Miller et al, 2003). Action research views some aspects of knowledge

building as socially constructed within a system of values, which serve as a model for human

interactions. Instead of always removing bias from the experimental design, action research is a

form of research which can challenge unjust and undemocratic economic, social and political

systems and practices within the experiment. These characteristics of persuasive research

practices allows for researchers to address social problems in the context of human values.

> "Action research goes beyond the notion that theory can inform practice, to a
> recognition that theory can and should be generated through practice, and, as the earlier
> discussion of values would suggest, that theory is really only useful insofar as it is put in
> the service of a practice focused on achieving positive social change" (Brydon-Miller et
> al, 2003, p. 7).

For many reasons, educators and research practitioners have shied away from using action

research as their experimental method. Scholars-in-training report that they were often

discouraged by their mentors to even try and combine research and action. Action research owes

some of the resurgence in interest for this research method to the phenomenon of the Internet and

the global connectedness of modern society. Moral and ethical issues that require human

intervention for solutions benefit from an action research methodology. Controversial subjects

such as feminism, gender identity, politics, ecological and sustainability can utilize data

gathering as a knowledge building process, where the research process is part of the research

methods agenda. Action researchers face great difficulties to bridge the two worlds of theory and

praxis. Ultimately, the social function of action research is to enhance democratic participation

and to create public spaces in the economy. Action researchers are basically a hybrid of

scholar/activist in which neither role takes precedence (Brydon-Miller et al, 2003). The

significance for the scholarly work generated by action research is often founded in

commitments expressed by community activists, where the research objective is to inform people

about the issues. Social quagmires exemplify the chaos that constitutes issues that are considered

"a mess". When applied to the human experience, messes are complex, multi-dimensional,

intractable, dynamic problems that need to be addressed but may have no permanent solutions.

Action Research has a multi-college, multi-disciplinary, critical view, and a source of a renewed

university–society relationship. Action research is more often being viewed as an alternative to

the old social sciences notion as the entrepreneurial centers of research revenue generation.

Action researchers envision a corporate entrepreneurial university of the twenty first century that

is moving away from the neo-liberal global market view; which is being replaced by a balanced

view that incorporates imparting prosocial values into corporate communication as part of the

university's mission. To accomplish this mission, universities must conduct research that has a

collaborative relationship with the relevant stakeholders to develop a complete understanding,

from all perspectives. Action research methods compensate for the complexity of local situations

and for the knowledge people gain in the processes of everyday life. Being able to deliver what

the 'people' think and want is important consideration for any prospective solution.

> "Based on both democratic and empirical principles, action research moves on to the affirmation that action research is much more able to produce 'valid' results than ordinary or conventional social science. This is because expert research knowledge and local knowledges are combined and because the interpretation of the results and the design of actions based on those results involve those best positioned to understand the processes: the local stakeholders" … "Conventional researchers worry about objectivity, distance, and controls. Action researchers worry about relevance, social change, and validity tested in action by the most at-risk stakeholders" (Brydon-Miller et al, 2003, p. 17).

Identifying Interviewees

Participating in the technical group that deployed GAFE at the university gave me

personal insight into the identity of other URI staff members who were also part of the GAFE

deployment team. From this personal insight I created a list of the individuals to request an

interview from for this research paper.

The Information Technology Services (ITS) department was entrusted with the task of

deploying the GAFE product line at the university. I requested an interview from the ITS

members of; the Chief Information Officer of ITS, the Director of University Computing

Systems (UCS), the Director of Media and Technology Services, the Manager UCS Internal

Systems, the Special Assistant to the Vice President for Information Technology Services, two

Senior Technology Programmers, the Associate Director of end user support, a Senior

Information Technologist and the Manager of Telecommunications. Outside of the ITS

department, I contacted the Director of learning, assessment and Online education and requested

an interview.

On May 28, 2015, I sent a personalized form email to the URI staff members listed above requesting an interview to discuss their involvement with the deployment of GAFE at the university. I offered the staff members the option to either meet face to face, and I would record their answers to the nine questions listed at the bottom of the email, or they could return an email with a typed reply to the nine questions. I also offered the option for my interviewees to remain anonymous as part of the conditions of the interview process. The reasoning behind the request for an interview is explained as; the documentation of the insights gained by completing the deployment phase of the GAFE product line will be valuable to anyone looking to adopt the GAFE platform.

By June 5, 2015, I had received a reply of acceptance for my request for an interview from Chief Information Officer of (ITS) Garry Bozylinsky, the Director of University Computing Systems (UCS) Charles Schifino, the Manager UCS Internal Systems Terry Wild, Senior Technical Programmer Jacqueline Hughes, the Associate Director of end user support Mary Fetherston and the Manager of Telecommunications Robert Viens. All the interviewees accepting my request for an interview indicated that they did not wish to remain anonymous. Both the Director of Media and Technology Services and Director of learning, assessment and online education replied to my interview request email. They both informed me that they did not significantly participate in the GAFE adoption project at URI; therefore they felt that they did not fit my research criteria of URI staff that had direct participation in the GAFE adoption project. The remaining interview contacts chose not to participate in the research project. Five of the interviewees preferred that I setup a meeting to record the interview process. Mary Fetherston typed her replies to the interview questions and returned her answers by email. Over

the next month and a half I set up interview dates with ITS staff members participating in this

research project. I went to each interview with a HI-8 digital camcorder to record the interview,

as well a laptop running https://dictation.io/, a browser based speech to text dictation software. I

found that stopping the interview process after the interviewee finished answering each question,

to save the text capture of the dictation.io software and refreshing the page to clear the cache,

worked best because the capture program would stop recording after about five-ten minutes.

Though the dictation software was surprisingly accurate, occasionally the software incorrectly

recorded a word that did not correspond to what the interviewee actually spoke. I had the video

and audio recorded on the Hi-8 camera as a backup for any errors in the dictation software. All

the dictation.io software captures were uploaded and stored on my URI GAFE account. The Hi-8

camera footage was digitized in Adobe Premier Elements 9 and all the combined footage was

burned to a DVD. I watched the DVD on the computer and matched the spoken words of the

interviewee to the captured text of the dictation software, making any corrections necessary. The

resulting text document is a verbatim text transcription of the interviewees' spoken answers to

the research questions. For the results section of this research paper I paraphrased the major

topics of each interviewee to condense the information, reducing overlapping redundancy and

ensuring each interviewee's answers in the results section was a unique perspective and valuable

as research data.

The six members of the Information Technology Services personnel at the University of

Rhode Island were instrumental members of the GAFE adoption planning and deployment team.

Garry Bozylinsky is the Chief Information Officer at URI; Garry's responsibilities include

overseeing the technology services provided by the university. Garry also functioned as a

communication interface between all the university's stakeholders and the technical staff deploying the GAFE product. Charles Schifino is the Director of University Computing Systems (UCS), the department responsible for deploying GAFE at the University. Charles was charged with gathering the technical resources needed to move the existing university's email accounts to Google mail accounts. Terry Wild is Manager of UCS/Internal Systems and she performed the function of project manager for the deployment process. Jacqueline Hughes, as a Senior Technical Programmer had Google Apps Administrator responsibilities and she configured the settings required for the University's Google domain and mail routing changes. Mary Fetherston is the Associate Director of end user support at URI and she worked with the university wide technical support staff to coordinate the migration process with supported end users. Mary also worked with the help desk staff to prepare documentation and trained helpdesk student support in an effort to assist URI staff members in the migration process. Robert Viens is the Manager of Telecommunications; he assisted in the process of informing the faculty and staff about the options available when converting over to the GAFE product. Robert also helped to train and educates users on how to use the GAFE products to increase their productivity.

I asked each of the individuals that participated in my research interview the same nine questions. The questions ranged from inquiring about the roles and tasks that each staff member performed as part of the GAFE adoption process, to exploring the problems that each staff member encountered while performing their tasks. I investigate lessons learned and solicit recommendations for other institutions who are adopting the GAFE product to consider. I also ask each participant to describe the impact that adopting the GAFE product has had within the university community. I ask each research participant to describe what they personally like and

do not like about the GAFE product. I also ask a question that probes for any new or changed

communication behaviors by the interviewees that were adopted as part of their daily work flow

related to their new access to GAFE products. Finally, I ask the participants to imagine the

potential possibilities for the GAFE product if leveraged to the maximum by the university. Each

individual participant in this research study had a complex set of demands that they had to

navigate through to accomplish their tasks. The interview questions give insight into the

objectives, conflicts, resolutions, and critical reflections from the perspective of higher education

professional staff members, as they deploy a digital communication and integrated productivity

suite of cloud based applications for academic and institutional use.

Personal Connections

I have personal experience from the various perspectives of an employee, student, and

researcher, which affects the way I gather and interpret data. While my research focus is on

communication in twenty first century digital learning environments in general, I have personal

experience with the University of Rhode Island taking classes, including online classes, as well

as supporting the university's technology infrastructure. My employment responsibilities have

transitioned from a Microsoft domain and systems engineer and VMware ESX virtualized server

hypervisor administrator to a PHP, MySQL web developer. I have a personal interest in wanting

the university to be successful in the future to ensure my continued employment. I also have the

need to remain valuable as an employee, by becoming proficient with new technologies required

for employment. As a code developer I am particularly interested in Google's Developer's Cloud

Platform coding environment to both customize administrative programming using the GAFE

product, as well as significantly change the learning environment and research practices at the university.

Data Validity

I have a professional working relationship with all the interviewees in this research paper. I am subordinate to both Garry Bozylinsky and Charles Schifino in the ITS organizational chart and I reported directly to Terry Wild, as the project manager for the GAFE deployment project, concerning the Exchange email server users migration to GAFE. I had some level of collaboration with all of the interviewees as part of the GAFE adoption process at URI. I also personally attended many of the departmental meetings set up to distribute information and answer questions concerning the transition from our URI supported email to Google email. At these meetings I was present to answer any questions concerning Exchange users email migration to GAFE.

My past experience with computer domain design and the security provisioning of technology for academic environments assists in both my understanding of the experiences being described by the interviewees, as well as the technical challenges presented by the GAFE adoption process. My personal experience with the GAFE adoption process assisted in organizing the interview results and ensuring the paraphrasing process was accurate. My experience as a student assisted me with associating the principles outlined in the NETP 2016 concerning technology use in the classroom.

<div align="center">Results</div>

Interviews with participants provided answers that help to explain how a typical institution of higher education might adopt the GAFE product. URI is like many other

universities who adopt GAFE, in that the university's interest stemmed from its struggle to support the growing array of mobile devices and operating systems that require email support. GAFE's platform independence accompanied with Google's vast technical resources for support were viewed as a better solution to support the email needs of the university. As a result of economic decline left in the wake of the "Great Recession," there is a greater need to make higher education affordable for all students. Reducing the cost of technology associated with the support of the education process is viewed as one possible way to reduce tuition. GAFE's free access for universities offered the possibility of immediately eliminating a substantial cost from the university's technology budget. The technical staffs responsible for the university's email systems are commonly the first to encounter GAFE's complex configuration and design options that must be resolved as part of the adoption project. The following interviews seek to gather information from the technical staff concerning the issues, conflicts and decisions that had to be made while adopting the GAFE product for institutional use. The answers to the interviewee's questions give insight to the specific objectives that were identified in the adoption process. The questions ask the interviewees to assess the impact that adopting the GAFE product has had on their personal communication and productivity practices, as well as gauge the academic community's reactions to the product adoption. Some of the questions ask these highly experienced and trained professionals what the possibilities the GAFE product may offer, when applied to the academic environment. The following section steps through each question and organizes each interviewee response so the reader may get a picture of the process of adopting the GAFE product from the various perspectives of the individuals who were ultimately responsible for initial deployment of the GAFE product to the university community.

Roles and Responsibilities of the Team Members

The first question I asked each participant was: "What was your role in the Google Apps for Education deployment process at URI?". This question enabled the interview subjects to reflect on the tasks they were required to perform to implement GAFE at URI. As the university's Chief Information Officer, Garry Bozylinsky felt his major contribution was in the form of sponsorship. He began the conversations that enlisted the support of the Dean's Council and the Provost to approve a transition from a University hosted email system to an outsourced service provided by Google. A driving force in the decision to move to Google was the impending budgetary cost of maintaining the current email systems on campus. Students had been moved to GAFE in 2010, and for Gary, it made more fiscal sense to adopt a free service from Google, than to invest more of the technology budget on upgrades to a variety of legacy email systems being maintained on campus. Garry admitted that this may have been the easiest sell for a new technology adoption in his professional career, with the general attitude among stakeholders being; "why couldn't we have done this years ago, or can we do it next week". Charles Schifino as Director of UCS felt his role was to assemble the team of staff who would perform the deployment process and formally release the product for use by the campus community. Charles also provided direction for the process. While objectives and timelines were established quickly, a majority of his energy was focused on removing external obstacles to the project to meet the deployment goals. Charles points out achieving cut over to the Google Core Apps ahead of schedule as an example of one of the biggest achievements of the project. Terry Wild, acting as the project manager, expressed her role as being focused on the primary task of moving all existing university faculty and staff email accounts to the university's new Google

email service and retiring the old legacy email servers. The project was estimated at a year for

completion. At the time of this interview, Terry's team had completed the first phase of the

project; creating the initial set of existing URI faculty and staff's institutional email accounts in

Google. Terry's team had also completed the redirection of the delivery of all email from URI

legacy email servers to each user's official URI email account in Google. The entire URI

community was now using some version of a URI Google account to receive their university

email, which Terry felt was a challenging accomplishment. Migrating all of the old email of the

faculty and staff off of the legacy URI email systems was one of the remaining tasks that still

needed to be completed. The project's final objective was to completely retire the forty years'

worth of legacy email systems on campus. Terry was pleased that one of the outcomes of the

Google email service adoption was to take all the many disparate email systems, various aliases,

and email forwarding tables that had grown within the University community over forty years,

and finally consolidate it all down to one user account, all with the common root of @uri.edu.

Jacqueline Hughes, as a Senior Technical Programmer, was part of a team whose role was to

weed through the spaghetti of the university's past email systems and create single identity user

accounts. Jacqueline felt her major objective was to configure the technical process of cutting

over the university's controlled email handling to a Google email service. In addressing end user

needs, Mary Fetherston as the Associate Director of End User Support, provided oversight in the

URI help desk in support for the conversion process, presented weekly group training sessions,

and provided personal or WebEx initiated training and problem solving meetings. Mary

expressed her role as user centric support on a vast scale, with each individual URI email user

having their own distinct needs and circumstances. Robert Viens, working as the interim

Associate Director for Telecommunications and the Help Desk, felt his major role was in distributing information concerning timelines and expectations to end users, as well as develop training programs for distributed technical support personnel within university departments. Robert remarks that the most successful strategy has been to deploy the GAFE suite of applications to individual university departments by giving a full explanation of the combined Google products and presenting how these new tools impact productivity behavior, business communication, and collaboration activities.

Goals and Accomplishments

The second question I asked the research participants was: "From the perspective of your role in the deployment process, what were the goals in your tasks and how successful were you in achieving them?". This question invites the deployment team to identify their major objectives and reflect on their accomplishments for the project. Garry Bozylinsky identified two goals; one set in the planning and implementation first phase, and the other set in the successful communications needed to advance the project. Gary states that bulk emails were sent announcing the university's email service change to Google, and meetings for twenty six different major stakeholder groups were set up explaining the adoption plan. Gary explained that purchasing issues forced a change in plans, from a vender assisted migration in a staged deployment, to a single day cutover for all users. All the interview participants in my research cited vendor purchasing issues as a major hindrance in the project's progress, causing changes to the migration plan, which added complications to the communications process. Garry felt these changes in the initial plan, ultimately had a positive outcome, with the entire university being cut over on the same day, instead of a staggered deployment that activated the GAFE product one

department at a time. Charles Schifino felt he had gathered the right team to do the demanding

task. One key to the team's success was timing the conversion date to occur between semesters,

causing the least amount of disruptions. Terry Wild viewed the current state of the migration

process as phase one in the yearlong project of finally retiring the university hosted email

systems. Aside from the vendor purchasing issues, Terry feels the project is going well because

people are receiving email delivered to their new Google account, and these users now have

access to many new Google applications. Terry states that overall, the reaction has been good.

From a technical standpoint, Terry was happy that the standardizing of the University's email

infrastructure has unified a lot of redundant email accounts and consolidated systems; moving

the university closer to single sign on authentication. Jacqueline Hughes said her focus was on

the migration and retirement of the old email systems, a task that she states was not fully

complete because the generic departmental accounts, identified as etal accounts, still needed

conversion; but the bulk of individual user accounts had been transferred to GAFE. Jacqueline

indicates that transferring university run email systems to Google's free mail service, as a major

reason for the "going Google" adoption decision. Mary Fetherston had two areas of focus; help

desk and training. Mary noted in the first three weeks after cutting over to Google that the help

desk had quite a few calls from users that could not get their mail, and while some of these

problems were communications issues, she felt the University had made good efforts in getting

the word out a change in email was coming. Concerning training, Mary felt there could have

been more of an effort in advertising options for training. Mary noticed attendance to the training

sessions dropped off as the school semester advanced, but those who did participate learned a lot.

Bob Viens held dual roles as communicator and trainer. Bob hints that he felt that greater efforts

could have been made in training and informing users about the benefits of using all of the

applications in the GAFE product line. Bob recommends that any institution deploying Google

Apps to begin the process of documentation, training and reaching out with communications as

early as possible.

Problems and Complications

The third question I asked the participants was: "What were some of the problems or

complications in the deployment process of Google Apps for Education?". This question

requests the technical personnel to identify some of the major issues they were confronted with

while navigating through the deployment process. Garry Bozylinsky remarked that failing to

quickly process a vendor through purchasing has delayed the completion of the project. Charles

Schifino credits planning and preparation as being successful in identifying issues that occurred

in the process, which helped to more quickly accommodate for the problems as they happened.

Charles echoed Garry's views in expressing the opinion that the forced changes in deployment

strategy had a better result, with the entire university community being cutover in one day,

opposed to a staggered adoption, which would have been more confusing for users. Terry Wild

felt not enough time was devoted to the planning stage, which was complicated by the intricacies

and size of the old email systems. Terry also felt that while they were prepared for common

productivity tool use, such as calendar and contacts; the deployment team did not have any

guideline or use policies for other applications such as Google drive or Google +. Terry added,

some applications such as YouTube and Blogger have not been vetted by the university and are

unavailable to the campus community at this time. Jacqueline Hughes indicates that the

complexity of email aliasing and forwarding that was done in the past has made it difficult to

develop a migration design that ensures that all users get their email and not lose any of it. Mary

Fetherston notes that conflicting information plagued the project's management and the

university support personnel felt information regarding vendor-provided assistance was less than

sufficient. Mary was disappointed with the roll out of the GAFE applications at URI because she

had high expectations for the impact the products would have on the community and she felt the

adoption process left many uninspired. Mary felt that a more cohesive leadership and a united

team effort strategy would have improved GAFE adoption outcomes for all users. For Bob

Viens, the complexity of the email environment determines how difficult your adoption of

Google Apps will be. For a completely new environment it is fairly straightforward and easy.

Bob also mentions he encourages users to move away from their previous mentality of locally

installed software applications and embrace the Google chrome browser to access the cloud-

based environment. Bob felt the long term benefits to switching to a single application standard

will help support personnel by reducing the variety of applications that need support and it will

also help users curtail application incompatibility issues.

Advice to Other Academic Institutions

The fourth question I asked was: "What preparation would you recommend for any

academic institution that is planning for the adoption of Google Apps for Education to consider

before deploying this product line?''. This question asks the technical staff for their advice for

potential new adopters of GAFE. Garry Bozylinsky's main advice is to plan and communicate

well. All the interviewed staff for this research paper echoed Gary's assessment in this respect.

Reflecting on the adoption experience, Garry felt the University did a "pretty good job" under

the circumstances. Gary felt the planning and implementation team did an excellent job, but

changes in the adoption plan meant going out and meeting again with all the stakeholders, and

sending out a lot of updates in email announcements, which was disappointing. In hindsight,

Charles Schifino wished there was an advisory committee in place prior to the deployment to

assess what the faculty actually wanted. Charles viewed the adoption of GAFE core components

as a mandatory step but what was missing was early faculty input to guide the adoption process

because, as Charles clarifies, "ultimately this product was put in mainly for faculty, to assist in

collaboration". Terry Wild's advice focuses on addressing security assessments when deploying

a system that is capable of open access and public collaboration spaces, integrated with a secure

research and administration management area that needs both restricted access and private

collaboration spaces. Terry felt employees that were previously accustomed to private local

systems for operations will need training in the delicate art of sharing in an open access cloud

based environment. Terry stresses security breaches are a big concern without communicating

best practices and developing policies for users to follow. Jacqueline Hughes recommendation is

to really understand your current email environment, which in turn will affect every institution's

adoption strategy decisions. Mary Fetherston recommends starting early and be thorough in

setting objectives and timelines because GAFE is a big product with lots of functionality. Mary

calls for prudence in the planning process and to avoid making policy decisions while the project

is in motion. Mary's recommendation is to have faculty and students in the same domain

structure, and not in two separate isolated domains. Mary states an isolated domain model for

students always worked well from a security perspective in the past but under Google's

administration, this design does not allow for new Google learning management applications

such as Classroom; and basic GAFE sharing functionality does not work well using this domain

design strategy. Bob Viens stresses that adopters of the GAFE product must deliver communication that educates users on GAFE applications for productivity and disseminates information concerning the migration process.

Perceived Impact of GAFE

The fifth question posed to the participants was: "From your perspective, what type of impact has the adoption of Google Apps for Education had at the University of Rhode Island?". This question invites the interview participants to share their observations of any changes that they feel are the result of the university's adoption of the GAFE product line. Garry Bozylinsky feels converting to a new email system has provided the opportunity to clean up old email accounts and set policies for email use. Gary states that mandating a single official email account with no forwarding or aliases has reduced the university's liability and improved communication by requiring a consistent set of email addresses. Charles Schifino feels it is too early to really appreciate the impact that the adoption of GAFE will have on the university. Charles states, "I think in the long term it will have a positive impact on everything from, communication, collaboration, and online learning". Charles expressed that from his perspective; where Google is trying to position itself within the productivity software market and where the university is trying to position itself as providing its students with relevant job skills; both these ideals overlap. Charlie's opinion is that since this effort is all for the support of faculty and students in the support of teaching and learning; then the university is in the right place. Terry Wild feels that there has been a lot of positive feedback but there are some hurdles to overcome before the university can perfect its configuration. Terry hopes a steering committee will help provide future direction and vet requests for additional functionality. Jacqueline Hughes feels the

first objective and main focus has been email and an email service change does not have that much impact on users. Jacqueline does feel that some users are beginning to play with all the extras that come with this suite of applications, which may result in greater benefits. Jacqueline feels that Google drive's unlimited storage and sharing functionality in particular has been well received. Mary Fetherston notes that URI staff is excited by the extensive collaboration possibilities offered by this diverse range of integrated applications. Bob Viens acknowledges that people are beginning to leverage the potentials of new applications but he adds; there is still a long way to go and there will need to be a much deeper and broader conversation for users to reap the most rewards.

Affordances of GAFE for Users

I asked, "What do you personally like about Google Apps for Education?" to investigate the personal appeal of the product for each interviewee. All the interview participants singled out Google Drive as a stand out for valuable functionality. Garry Bozylinsky acknowledges that Google can handle the rapid advance of technology much better than the University, which was beginning to have trouble managing the rapid growth of mobile device access and rising support costs. Gary insists that from a cost to benefit perspective, the offer by Google to academic institutions for free access to the GAFE products is beyond comparison. Garry remarks that GAFE applications are of good quality and extensive, and he has found that he is spending more time learning all of the products integrated features to become more productive. Charles Schifino notes that email is not necessarily reason enough for someone to adopt the entire Google product line. From an administrative perspective, Charles felt that adopting Google Drive practices will have a major impact on increasing productivity as well as reducing the need for the university to

maintain the server infrastructure needed to provide this type of networked resource. Terry Wild

appreciates the calendar, as well as the sharing and communications aspects of the integrated

applications. Within her own team, Terry has found that sharing Google documents among team

members has already assisted workflow. As a GAFE administrator, Jacqueline Hughes

appreciates the responsiveness of Google's support for their administrative dashboard; especially

the feature that automatically alerts her to any detected problems in the GAFE domain

configuration. Mary Fetherston likes the ease of the unified applications and co-worker

collaboration design in the product, as well as the mobile device support offered by all the GAFE

applications. Bob Viens admits that he had never actually used Google products before, and was

working quickly to increase his proficiency. From a help desk manager's perspective, Bobs sees

the benefits of supporting a single hosted system in the cloud, as opposed to supporting an

assortment of local installations of software applications. Bob feels users have a lot of autonomy

in deciding how they want to use the applications that come with GAFE, which allows users to

choose to use only those applications that have the most benefit for their daily workflow. Bob

adds having all your applications and data available in the cloud anywhere, anytime, will free

users to be more independent of location and operating system platform.

Disappointments of GAFE

The seventh question: "In your opinion, what is disappointing about Google Apps for

Education?" , encourages the interview participants to share their critical thoughts concerning the

GAFE product. Garry Bozylinsky expressed disappointment with some URI community

members who have been reluctant to completely switch over to all Google products, which he

felt had more to do with working habits and proficiency with their current applications, than a

comment on the product itself. Charles Schifino was disappointed in the bundling of the GAFE

software for Higher Education, with its multiple licenses and individual contracts for the assorted

features that complicated the GAFE product configuration in a university setting. Charles also

felt that a Higher Education implementation of this product is different than elementary or

secondary schools, or even the commercial market; having clear insight on those differences

would have been helpful in determining an adoption path. Terry Wild admits there is a learning

curve and everything is not as seamless as she envisioned, or do all things work the way she

expects. Jacqueline Hughes is concerned about giving Google so much control over URI's

critical systems. Jacqueline also expressed concern over the amount of access Google has to URI

information. Mary felt the deployment could have been improved if the project had better

communication, resolved the isolated domain conflict, and vetted more of the GAFE applications

for use. Bob Viens likes the GAFE product, but acknowledges that it can take some time to get

accustomed to the new concepts. Bob states, from a support perspective, Google has a large and

helpful online presence but limited phone support.

Role of GAFE on Communication Behavior

For question eight I ask: "From your perspective, how has using Google Apps for

Education changed or assisted your communications activities?", so that interview participants

could consider any changes in their communication behavior that can be attributed to the

adoption of the new GAFE products. Garry Bozylinsky likes using cloud storage with its shared

permissions. Garry states that disseminating information, enabling collaboration, or accessing

personal files is more efficient and easier than ever. Charles Schifino sees the deployment of the

Google Apps project as a model for all the things that they will be able to do better; now that the

university has adopted the GAFE product. Charles feels that the tools available in the GAFE

product, once utilized correctly, will help disseminate information and communicate with the

university community; assisting any technology deployments in the future. For Terry Wild, the

sharing and group editing of documents are heavily used within her team. Terry also finds

planning meetings with the calendar appointment feature useful. Jacqueline Hughes has already

incorporated the product as part of the normal workflow for business collaboration and it has

only been six months since the product has been active. Mary Fetherston explains that the Help

Desk has been power users of the Google products for many years to support information sharing

and increased productivity. Bob Viens sees a future where voice, data, and email are all accessed

from any device using the GAFE product.

Business Model Issues

The final question I asked was: "In your opinion, aside from email services, are there any

opportunities to utilize Google Apps for Education at the University to add value, increase

quality, reduce cost and/or boost efficiency? - If yes, what are some examples." This question

asks the interview participants if they can envision business model use case scenarios for

leveraging the GAFE product for the University's mission. Garry Bozylinsky explains that the

quality of our email service will be improved with GAFE technology and he believes cloud

sourced applications will make life a whole lot better for everyone. Garry indicates that working

to get the students and teachers domains more tightly integrated as the next challenge to

overcome. Charles Schifino feels that the university is in the process of addressing question nine

by creating an advisory committee. Charles explains, in some sense these technologies are not

cutting edge any more, but they are essential for students coming in, who have been raised with

technology and learn differently. Charles states "our job is to provide the best technologies available, so the faculty can enhance teaching, learning and research". Charles imagined that the GAFE product will change the way teachers plan their curriculum. For students, this new learning experience may translate to more activities that involve problem solving and creative thinking with online interaction, rather than being a passive listener in a classroom lecture. By learning to use and to become proficient with GAFE technology, each student is building valuable skills that are needed in the modern workforce. Terry Wild feels there is much more work to do; especially in the area of developing the environment where students and teachers interact. Terry felt the communication and collaboration tools will continue to have a beneficial impact on the entire university community. Jacqueline Hughes explains that the faculty is clamoring for more features but there is a process to go thru to get there, which can be frustrating. Jacqueline adds, the freedom that comes with having access to unlimited cloud data storage is a great enticement to embrace GAFE. Mary Fetherston comments that GAFE has already helped to create a consistent project management process and a student employee supervisory process for the help desk staff. Google applications are also a place for personal or group video interaction for the help desk. Mary adds that GAFE products help provide immediate feedback, boosts efficiency and increases morale; because everyone feels included and better informed. Bob Viens acknowledges that everyone will use the product differently depending on their needs but the objective is to have the good tools available, so users can focus on their core tasks.

Discussion

The Information Technology Services (ITS) department was charged with the task of deploying GAFE at the University of Rhode Island. By examining the responses to the interview questions, readers can see some important themes emerge that will be valuable considerations for professionals working with, or who plan to adopt the GAFE product for academic purposes.

Efficiency and Cost Effectiveness

Of course, the most obvious theme that arises with adopting a free product as an institutional practice is financial capitalization. The scope of leveraging the potential offered by adopting the GAFE product line is vast and rapidly expanding. Applications for research, community connectivity, data storage, programming, custom development, teaching, learning, assessment and global presence all have opportunities to be leveraged to increase value while eliminating cost.

The GAFE project at URI was the logical solution to the high cost of supporting university funded email servers, which made Google's offer of free access to the GAFE product line, too good to refuse. While the predominant motive to adopt the GAFE product at URI was driven by the financial burden of supporting multiple internal email systems, the institutional benefits of the adoption project focused on Google and its vast resources, including their ability to support the growing plethora of new mobile devices that require email application support. For the bottom line, Google was able to supply a better quality of email service than the university's internal computing infrastructure could support; at no cost. Free access to unlimited data storage alone is a game changer for tightly budgeted technology departments. When you add in free access to a suite of integrated communication and productivity applications, then it is no wonder URI's CIO Garry Bozylinsky personally likes the cost to benefit perspective of

adopting the GAFE product line. Google's software integration is extensive and the product design is well thought out, which translates to a high-quality experience for the user. For educational institutions that commonly talk about technology lifecycles in terms of return on investment, adopting the GAFE product can be another avenue of reclaiming costs. The NETP 2016 points out, "As technology enables new learning opportunities and experiences, it also can render existing processes and tools obsolete, freeing up funds to pay for technology" (U.S. Department of Education, 2016, p. 45). If carefully leveraged, maximizing the utilization of the GAFE product can save the university a substantial amount of money over time to reinvest.

All the interviewees list opportunities to utilize GAFE, and explain that the product must be fully adopted and effectively used to have the greatest impact, which is essential to produce the greatest returns. Unquestionably, the potential for financial savings by adopting the GAFE product are unprecedented opportunities for universities to reduce cost. The responsibility for financially supporting the technical infrastructure that is eliminated when adopting the GAFE product is difficult to calculate, as the university transitions to new models for educational productivity and digital communication that best utilizes the GAFE product in the future. An additional benefit from a human resources perspective is that many the employees' jobs that are loss in technical support for one area can be transitioned to a similar responsibility focused on GAFE support. Part of the GAFE adoption plan needs to include the capturing of eliminated budgetary costs for support, infrastructure and software licensing; these savings will be used to invest in training, research and development for the GAFE product line. Advanced uses of the GAFE product include accessing the GAFE programming infrastructure to develop specific customized applications that meet the needs and mission of the university. Every opportunity to

utilize the free GAFE product can be viewed as an opportunity for the university to recapture the cost of having to support that same action on a university funded system.

Beyond Legacy Systems

The challenge for universities who adopt GAFE is to maximize the use of the product by abandoning previously institutionally budgeted legacy technology and software use practices. The deployment team's primary focus for the initial migration to GAFE was supporting the URI legacy email user account as the transition takes place. While users often initially experience GAFE email technology as part of the new technology adoption process, a great deal of legacy technology use can be impacted with the adoption of the GAFE product line. Before the internal URI technical staff could transition to administering and supporting the GAFE domain and user account structure, the existing URI email user account structure needed to be migrated to GAFE. As with the student email service that was migrated to GAFE five years earlier, the UCS professional staff supporting the existing URI email services were given the responsibility of providing a plan to deploy the GAFE product for faculty and staff. Technical professionals who maintain the university's email user accounts are the first to encounter critical configuration deployment decisions concerning GAFE's learning environment's options. Configuration options that affect functionality, permissions, and user rights need to be addressed before the GAFE product can be deployed. These configuration choices can impact the functionality, usability and appeal of the GAFE product. Communication between stakeholders, management and the technical staff is critical to a successful adoption of the GAFE product.

Planning was a demanding task because of the size of the faculty and staff email accounts user base and the large number of existing email servers supporting university departments. A

positive result of the planning process was that migrating to the GAFE product provided an

opportunity to cleanup, consolidate, and standardize all email accounts for university faculty and

staff. Successfully achieving this goal of a single email account per user for all formal university

communication brings the university a step closer to providing a single sign on credential for

accessing all university digital services. Once the process of converting URI user account

identities over to Gmail accounts is completed, all the additional applications that come with the

GAFE product are a bonus for users to explore the benefits of.

   To cause the least amount of impact, the GAFE product was deployed between

semesters, and the community reaction to the product has been positive. Only the first phase of a

two phase project; creating all the new Google email accounts and redirecting all incoming

existing email to the new Google email accounts, was fully completed at the time of the

interviews for this research. The second phase; the migration of all users past email data off of

the existing URI email servers to the user's new Google accounts, still needed to be completed.

Users were free to migrate themselves after the January 2015 cutover and many users

independently performed this operation themselves. Procuring vendor assistance for legacy

email data migration through state purchasing proved particularly daunting and ultimately forced

changes in the deployment strategy after an initial staged deployment plan was communicated

with stakeholders. The problem with purchasing end user migration support is cited as a major

complication for this particular product rollout and this problem is not a Google deployment

issue per say. These purchasing problems resulted in changes in the deployment plans, which

made it difficult to keep all users informed as to the changing status of the project, added to end

user frustration.

Though changes plagued the planning process, especially concerning user's legacy email data migration, ultimately these conflicts resulted in choosing a better deployment strategy that cut over all users' email accounts to their new Google accounts on a single day. The single cut over day strategy was perceived as less confusing and complex than a planned staged deployment that moved one institutional department over to GAFE at a time. There was a general consensus among all interviewees that the GAFE deployment process could have been better for all with more time and finances to plan, deploy and promote the product launch, but under the circumstances, the final objective of transferring to GAFE as the university's official email service provider was accomplished.

Systems Control

Jackie Hughes hints at the general sense of apprehension and trepidation that comes with trusting and outside vender with so much of the university's proprietary information. Jackie's sediments references the underlying risk that comes with many opportunities. After all, Google has agreed to having no advertising content or data mining on GAFE site's; this makes it difficult to discern Google's future business model for this product line. The biggest concern being a sudden increase in fees for service. If Google's continued philanthropic support of free access to the GAFE product for educational institutions in the future is in question, then it is hard to justify taking a risk with a grand investment in this product line. While Google's business strategy concerning GAFE maybe suspect, ultimately, we have to believe that Google's marketing plan is to distribute GAFE products to any academic institution for free because this product is valuable for twenty first century learners and these learners will be the workers and entrepreneurs of the future. Clearly, having more individuals already proficient in the use of GAFE applications; to

drive businesses to purchase Google Apps for Work to support their corporate enterprise, is a

credible justification for Google's strategic marketing plan for the academic use of GAFE.

Effective communication is critical for systems control in any change management

project to sustain progress and respond to changes or demands. Understandably, communication

is cited by all the interviewees as being critical for a successful and affable GAFE adoption

process. An assortment of communications methods, such as meetings, emails, websites, and

request for comment options are needed to ensure all stakeholders feel they are informed and

have input on the adoption process of GAFE for academic use. Documentation is an essential

element to all organizational structure; the GAFE product offers opportunities to leverage the

features of web publishing, archiving, collaboration permissions, and file ownership to assist in

recording and auditing of university created information. Mary Fetherston makes the

recommendation to start early with planning for those challenges presented by the adoption

process because GAFE is a big product, with lots of decisions that need to be made. All factions

of the academic community will need to be involved to build an inclusive digital learning

environment. The interviewees indicated that having an advisory committee that represents the

administration's, faculty's and student's interests to guide the deployment process could assist in

setting comprehensive objectives. Several interviewees also identified the frustration of not

having any guidelines and use policies with the GAFE product that specifically applied to higher

education. Any new GAFE digital learning environment needs research, development,

participation and attending to, for it to flourish. GAFE adoption as a university wide solution

requires a strategic plan for securing, maintaining, and regulating the very diverse technical

environments of students, faculty, administration, and alumni. Developing open access, restricted

use, and file sharing policies, as well as educating users on standards for academic integrity are needed when using GAFE technology for learning.

It is the legacy email accounts and the identity of the responsible person behind that account that is translated into the new GAFE authentication environment. The resulting set of user accounts use the Google domain structure to demarcate between internal and external identities when applying sharing permissions. The division of internal and external resource permissions is critical for a secure and useful deployment of the GAFE product line. External users, in the broad sense of the enterprise model is the public face of the university's communications channels. Public facing GAFE functionality is more than just allowing Google's sites to display a website on the world wide web, but it is an area where the cloud computing environment can run custom programming for GAFE based mobile or computing applications. Enterprise permissions that accommodates for the needs of developers to access the external interface of the GAFE product becomes critical when leveraging the functionality of cloud computing. The public face of the GAFE product is an area where many risks have been identified but intrepid actions are needed for development and advancement the this most essential element of leveraging the product line for university interests.

The complication that account identities pose in the university is setting the permissions for access rights to digital resources or services. Computer authentication designs have been around for many years, and some products, such as Microsoft's Active Domain structure allow for fine granular settings for both domain and user accounts concerning setting digital resource and services access rights and permissions. GAFE domains are not as robust in options for either domain or user accounts rights and permissions. This means administrators and designers of

GAFE domains need to be mindful of the restrictions placed on technology that is still in its relative infancy. The transition of the rights and permissions of alumni, emeriti and university affiliates pose particular problems for an authentication system that allows for a single logon account for all digital resource access.

Cloud Computing is the New Normal

Communication, collaboration, efficiency and productivity are increasingly being leveraged through the use of cloud computing technology. Cloud computing equates to independence and unified software integration. Google drive was the stand out in quality and value, and interviewees liked that you could set editing and sharing permissions to easily collaborate among co-workers. Collaborative communication for productivity is often mentioned as a focus of more growth in the standard workflow process while using cloud computing technology.

 All the interviewees found opportunities to leverage the GAFE product in their current workflow and all acknowledged they were continuing to explore new uses for the product line. In many cases, cloud computing technology; with its browser accessed applications and network share permissions are a brand new experience for users. Robert Viens points out the benefits of an all in adoption philosophy. Collaboration, technical support, storage, communication, interoperability, and platform independence are all benefits from the adoption of GAFE's cloud computing technology. While there are numerous reasons why cloud computing technology is superior to the personal computer model of local application execution, Terry Wild identifies security breaches a serious safety concern that must be addressed to effectively use GAFE in the academic environment. Training could assist in establishing practical new workflows that

leverage these state-of-the-art features, as well as ensure that policy security and best practices

information is communicated to users.

Theoretically, any limits placed on full access to all aspects of the GAFE product for

academics support are self-imposed, for regulatory compliance or achieving institutional policy

objectives. Achieving regulatory compliance while pressing the legal boundary for a seamless

integration of faculty, students, research, and public interactions will need to be approached from

a balanced perspective, where risks are mediated by policy guidelines that address all legal

compliance regulations. This means understanding the functionality of cloud computing is

essential to developing policies that successfully leverage the benefits of GAFE's cloud

computing technology.

Responsible Use Policy Issues

The NETP 2016 indicates "Responsible Use Policies" need to be in place when utilizing

technology in the digital learning environment to ensure that student's safety, rights and

freedoms are secure. Individual safety and emotional comfort is a major objective when

designing digital learning environments. Student to student interactions must also follow

etiquette appropriate for an academic setting within the digital learning space. When you add the

possibility of public Internet interaction, the modern digital learning environment can quickly

become a regulated and monitored environment of enforced policy and controlled engagement.

Unlike the closed intranet security of the K-12 learning environment, a modern university's adult

learning setting recognizes that there is a value in public engagement for both the university and

the student. For the student the public face of the digital learning environment is an opportunity

to develop an academic Internet identity to be leveraged when seeking employment and as a

place to show examples of their knowledge and skills. The student also has the opportunity to share their learning experience or academic interests with others using digital media and communications technology. Faculty has the opportunity to leverage student learning projects as resources to be used by future learners or to engage and inform the public; cultivating a connection to the larger community. The university also has the opportunity to abstract student digital activity for gathering research data as part of the digital classroom experience. A programming interface or classroom dashboard can be used to access and create student support tools that identifying learners who are having difficulties with their tasks to determine when a teacher's intervention is needed. The university also has the opportunity to establish its brand on the Internet as being part of a global digital academic community by encouraging the URI digital learning community to create media content that promotes the mission and vision of the university. All these opportunities pose legal risks and have privacy concerns as well. The twenty first century digital learning environment will need to enforce security and privacy regulations, and regulate discourse, while promoting academic freedom and encouraging online access for a global community of learners all ages.

Advancements in the academic learning environment for higher education will come with legal compliance that is creatively managed through academic discourse. The university has a judicial process for students that could be leveraged in risk management, when dealing with student infractions. The university can leverage Google's "terms of use" as a reference for the adult use policies provided by a free Google account. Limiting the GAFE product in functionality beyond what an adult user can independently get at Google for free, decreases the value of a URI GAFE account. Universities need to leverage the unique qualities of the GAFE

product and its ties to the learning community, to encourage a student to value their URI GAFE account identity even after graduation, to promote that student's continued engagement with the academic community and maintain ties to the university as alumni. The university must access its culture, community, mission, and vision to manage risks and advance the GAFE adoption process in order to cultivate a new twenty first century digital learning environment.

Also, part of any GAFE adoption plan must have a risk management component that deals with the typical conflicts that erupt from increase communication engagement, as well as the personal safety and safety of identity and information of the individuals that use the GAFE products. Whether it is taking risks to develop a learning and research environment with a product that has a great deal of risk exposure or taking risks by encouraging interaction and communication among the academic community, or taking risks to allow students avenues for freedom of public expression; the university setting has always been a place where controversial ideas and topics are intellectually contemplated. This distinctive element intrinsic to the university setting that takes risks to promote advancement and encourages debate to ameliorate conflict makes the academic setting the ideal place for investigating and developing the designs for the twenty first century learning environment.

The NETP 2016 also indicates that: "If policies and procedures for the use of devices are too strict, they often have unintended negative consequences" (U.S. Department of Education, 2016, p. 74). Concerning moving forward with the GAFE product configuration, the challenge for the university will be to leverage the opportunities in developing a robust learning environment while managing and mitigating risks.

Training, Support and Communication

The NETP 2016 states "to realize fully the benefits of technology in our education system and provide authentic learning experiences, educators need to use technology effectively in their practice" (U.S. Department of Education, 2016, p. 1). Universities educate adults. Faculty will need to be competent in andragogical teaching methods. Complex digital learning environments are so new and untested, it is the teachers who take risks by experimenting with educating using new technology centric adult education that develops and advances modern twenty first century learning environments. Charles Schifino predicts changes in curriculum design and classroom communication practices that utilize the GAFE product will enhance teaching, learning and research at the university in the future. Charles adds that considering the modern student learning objectives, obtaining GAFE product proficiency is a basic skill set required by anyone seeking employment in the twenty first century workforce.

Universities will need to support their faculty with training on how to most effectively apply GAFE technology as they transition to new learning practices. Renee Hobbs in: *A White Paper on the Digital and Media Literacy: Recommendations of the Knight Commission on the Information Needs of Communities in a Democracy*, points out that despite the extensive investment in technology to support learning; for many reasons, teachers are still struggling to effectively use this technology in their instructional practices. Hobbs recommends that "colleges and universities should develop certification programs in digital and media literacy so that school districts can hire teachers with this specific set of knowledge and skills" (Hobbs, 2010, p. 41). Digital and media literacy skills will be needed by all teachers, especially university faculty, who have as part of their learning objective; to give students the opportunity to develop the skills that will be valued in the modern workforce. Digital literacy, which comprises a broad range of

competencies, including ability to find, evaluate, utilize, share, and create content are

increasingly essential skills needed in an information society for workers, consumers and citizens

alike.

In fact, the NETP 2016 distinguishes the University of Rhode Island as making an impact

on teacher preparation by providing a program that equips teachers to educate using digital

technology tools. Under the section titled "Building Digital Literacy in Teaching" the NETP

2016 highlights the URI Graduate Certificate in Digital Literacy, co-developed by Renee Hobbs

and Julie Coiro, as an example of how teachers instruct and the objectives learners set, are being

transformed in the twenty first century digital classroom. NETP 2016 states that "by targeting a

broad audience to participate in the program, URI is expanding the number of educators with the

professional capacity to help students to learn, access, analyze, create, reflect, and take action

using digital tools, texts, and technologies in all aspects of their lives" (U.S. Department of

Education, 2016, p. 34).

Teaching and Learning

The NETP 2016 states, "For all the possibilities of technology-enabled learning, it also

creates challenges we will face as we embrace the change necessary to realize its potential" (U.S.

Department of Education, 2016, p. 80). Each institution will have to actively develop the best

strategy to leverage the GAFE product for their needs. Finding the best opportunities to use the

GAFE products will require experimenting with new teaching methods, as well as developing

curriculums that offer students the opportunity to actively practice building twenty first century

skills. Solutions for challenges will inevitably require taking risks. There is also an expectation

of a learning curve on how to best utilize the GAFE product, as institutions customize the use of the GAFE applications to meet their individual needs.

Additionally, there are levels of utilization of the GAFE product, such as the Developer's Cloud Platform environment, that are advanced and require more investment and greater commitment by the university to produce the greatest returns. One of the best opportunities for academic impact is presented by leveraging Google Apps / Google Developers Cloud Platform's access to the GAFE applications coding environment to create anything from custom research applications to advanced digital learning resources. Coding skills will increasingly be required as a twenty first century skill set essential for modern, digitally savvy students. In the academic setting, leveraging the coding environment that is available with the GAFE product requires securing the classroom management code environment, while also providing student access to the GAFE coding development environment.

Perhaps the apex of the potential presented by the GAFE product adoption for a university is the opportunity to develop an academic presence on the Internet in the form of a digital learning community. Twenty first century learning environments are essentially an educational networking system that is very similar to modern social networks but with a greater dedication to academic synergy. In the twenty first century digital learning environment, the learner not only builds a sense of identity through agency; the learning objectives are focused on imparting critical values and modeling ethical digital citizenship behavior.

The Internet has changed the process of learning and learning objectives. Digital content plays an important role in developing new knowledge, making content creation in demand for the learning environment. The surrounding local, state, national, and global communities, outside

the university are experiencing the impact of a transitioning global economy. Public schools are struggling with the lack of digital resources, higher costs and budgetary cutbacks. With a growing population of unemployed and low wage earners, there is a great need for continued education and new skills training. Harnessing the university's student's creative capacity using a purposeful lesson plan can result in digital content creation for the benefit of the academic learning environment and surrounding public community in general. When consciously focused, faculty can design student learning outcomes to include instilling prosocial behaviors and promoting the university's vision of global advancement, while developing a wide variety of valuable academic digital content. Access to the developers coding environment will be critical to the design of interactive and engaging learning resources for both the university and K-12 learning environments Sharing university created educational resources for the K-12 digital learning environment will increase community engagement for the university as well.

The challenge for the university is to carve out a branded presence as a learning community on the Internet that represents the university's values and reinforces its reputation for quality. Together, teachers, students, and the university's leadership strategically plan, design and execute the new twenty first century digital learning environment with the underlying goal of advancing society through academic contribution. The NETP 2016 indicates "technology allows greater communication, resource sharing, and improved practice so that the vision is owned by all and dedicated to helping every individual in the system improve learning for students. It is a time of great possibility and progress for the use of technology to support learning" (U.S. Department of Education, 2016, p. 80).

<div align="center">Conclusion</div>

The NETP 2016 identifies the conceptual areas of learning, teaching, leadership, assessment and infrastructure as the core elements to focus on in executing an educational technology plan. The GAFE product line adoption by institutions of higher education offers opportunities to leverage digital communication technology in all the essential areas outlined in the NETP 2016.

Learning

The academic learning environment that the GAFE product can help standardize is based on principles derived from the learning sciences. Using the flexibility and power of GAFE technology, academic institutions can create an accessible learning ecosystem to engage the global learning community. Every university has a major role in researching the effectiveness of teaching practices using technology, so it can design the best online teaching resources that support the learning process for their students.

Classroom; Google's learning and teaching management application, serves as an administrative dashboard for the digital learning environment. The top benefits for using Google's Classroom are its easy setup to share information in the class stream, simple assignment management, automatic filing of materials in Google Drive, and enhanced communication, integrated with all GAFE applications (Google, 2016a). The Chrome extension "Share to Classroom" allows the creation of interactive content that is pushed to the learner's device. The Google Classroom share button provides a seamless way for teachers and students to exchange digital classroom materials. Apps integration allows educators to access third-party add-ons. Chrome Web Store also has many applications and extensions that support learning objectives (Google, 2016b).

Accessing the integrated GAFE developers environment will aid in creating a digital learning management system and classroom dashboard for teachers to utilize in assessing and assisting student performance. Researchers have access to a cloud based programming architecture that supports responsive application design, custom programming, and data storage.

Teaching

Using the GAFE product in teaching methods increases both the educator's and student's competency in using twenty first century technology. Utilizing the GAFE product allows educators opportunities to engage with their learners anywhere anytime and provide the on-line resources that are specifically designed with research to improve learning outcomes. Individual university departments have the opportunity to promote their mission, highlight their faculty's prestige and present their student's achievements by coordinating with all the academic community members to develop curriculums that leverages the communication capacity of the GAFE products. The university's vision should be interpreted in every classroom to promote the university's unique message with engagement using digital communication.

Leadership

Leadership is needed to establish the environment and conditions for change. Leaders also foster a culture that encourages innovation and experimentation. Leadership must bring all stakeholder groups to the table to create a vision for technology use in the learning environment that best supports the interests of all parties. Academic leaders recognize the importance of having an influential academic voice on the Internet for mediating the process of human advancement in a digitally connected world. Leadership encourages the growth of the academic digital learning community and advocates for a scholastic environment, where controversial

debates are best resolved and cultural advancement promoted. For leadership, capturing all the

savings offered in support of an adept business model that utilizes GAFE technology is second in

priority only to harnessing the power of digital communications to improve learning outcomes

and impact social change.

Assessment

Assessment begins with establishing the safety and protection of information in the

learning environment. Leveraging GAFE products for assessment translates to information

gathering and access rights to monitor specific student activities that relate to the learning

process to assist faculty improve their teaching practice.

This assessment strategy objective is to aid in implementing teacher interventions in support of

individual student learning needs. The specific learning activities that relate to GAFE technology

proficiency and twenty first century skills in general, need more exploration by the learning

sciences to develop new educational objectives and performance assessments that measure what

is important. Along with developing useful student performance assessments tools for teachers,

assessments are used for continuous improvement of the learning system and refining teaching

methods. The challenge is to develop teaching methods that engage learners and supports

learning behavior while measuring the progression of competencies needed for mastering

complex skills.

Infrastructure

The benefits GAFE adoption offers for infrastructure are substantial and for a university,

most of the savings are achieved as a recapture of all the costs of purchasing physical computing

systems and software. Along with the free outsourcing of a large amount of the physical

hardware that is required for a robust twenty first century learning environment, the human resource costs for maintaining that system are also eliminated, as well as all costs for developing and upgrading the core product in the future. The infrastructure also consists of the software that runs on user's devices, and the software is the area where most of the benefits of the GAFE product will be realized. Utilizing and developing advanced custom learning software will require the most effort and commitment for the University to leverage Google's programming environment to achieve maximum rewards.

Leveraging Digital Communication

From the research interviews we learn that GAFE tools have a positive impact on productivity for users in the Information Technology Services department at URI. The tools and resources needed by contemporary information technology personnel to perform the collaborative effort of supporting the university's information technology systems, are similar to the tools and resources needed by modern students to communicate, collaborate and interact with their peers and the digital learning community. Improving communication supports better outcomes in both corporate and learning environments. Part of every learning curriculum created by faculty, should be devoted to developing a student's mastery of GAFE applications. GAFE applications have similar functionality as many of the competing communication and productivity software products. Students benefit when they acquire GAFE skills and become familiar with digital technology.

The learning environment is a student's connection to academic partners who share similar passions. For the student the value of a URI student GAFE account can be measured in several ways. It becomes valuable to a student if teachers design curriculums that utilize the

GAFE products to develop productivity skills and most importantly to engage the digital learning environment, so students have the opportunity to digitally connect with their classmates and the larger learning community. This opportunity also encourages a student to participate in the public space of the Internet, in a way that represents appropriate academic use.

Teachers have a role in developing a student's academic digital portfolio of resources as part of the learning process to increase the value of a URI student account. Teachers validate student contributions to the educational process and assist in improving the quality and promoting academic communication. Teachers design opportunities for students to interconnect with each other and the digital; learning environment space in a way that represents the academic values of the university.

When leveraging an academically constructed public interface, Universities have the chance to produce the content that will benefit all learners in the global community. Having a university-created, public digital space advances the institution's academic mission and brands its Internet presence. Students are the greatest resource for a university to leverage for the purpose of creating academic digital content. Faculty is the greatest resource for a university to leverage for the purpose of validating and managing digitally created academic content.

After graduation, a URI student account retains value as a digital archive that documents a student's education progress and all the contacts they have made in their academic experience. The value of a URI account to an alumni decreases if that URI account has restrictions on it that a generic free Google account does not.

Designing the best technical configuration for the learning environment is critical for leveraging GAFE to achieve maximum results. The GAFE product is designed as Google's

solution for twenty first century businesses that need to communicate, store and create information. The immediate opportunity for universities who adopt the GAFE product will be to utilize the capacity of programming development to accelerate, assist, and assess the learning process. Universities in particular, have an ideal setting to conduct experimentation in an effort to produce applications specifically created to support technology use in the digital learning environment. Universities also have a great opportunity to develop the tools that measure what matters for assessing twenty first century learner competencies.

Google Apps for Developers Cloud Platform offers opportunities to transform the GAFE core applications into more than just a standard suite of communication and productivity applications; the GAFE product now becomes a foundation to build customized applications the specifically meet and advance the university's mission.

The programming environment for GAFE is hosted in Google's Cloud Platform infrastructure. The "Cloud Platform provides the building blocks so you can quickly develop everything from simple websites to complex applications" (Google, 2016c). The opportunity Google's Cloud Platform offers the university the is possibility of creating its own customized applications to fill teaching, learning, assessment, experimentation, research, development and design needs. Integrating programming with a learning management administrative dashboard; faculty benefit from the tools, instruments and programmatic interventions that measure and assist the modern learning process. The same opportunities that Google's Developers Cloud Platform offers for the advancement of the educational process, must be offered to students, so they may learn the tools and develop the programming skills needed for employment in the twenty first century global workforce. Students benefit from having access to Google's

Developers Cloud Platform environment. Learning activities that involve programming can range from students adding code snippets to personalize their web page project to a Graduate researcher processing "Big Data" in the cloud in their research experiment. Google Apps for Developers allows the corporate enterprise access to the underlying programming architecture for GAFE to customize application deployment. With Apps Script, you can build add-ons for Sheets, Docs, or Forms, automate workflows, and talk to other APIs (application program interfaces). The Drive API lets you sync data from your app with your user's Google Drive account to read, write, and sync files stored in Google Drive from your mobile and web apps. Leveraging the Developer's environment is the most important aspect to leveraging the GAFE product when universities designing their business workflow around custom programs that utilize the integrated applications to solve enterprise operational needs. These same opportunities apply to the academic environment for both management operations and the learning environment, and for a university in particular, this access to the GAFE programming architecture offers great opportunities for research and experimentation.

The university will need a robust vetting process to handle the continuously expanding development of GAFE applications, programming add-ons, Google Play applications and Chrome Web Store applications. The goal in creating an academic digital learning environment for higher education is to develop a domain structure that allows both the university's learning management access to a Google Developer's Cloud Platform environment for teaching objectives, as well as allows students access to a Google Developer's Cloud Platform environment to build advanced twenty first century skills as part of the educational process.

Importance of Domain Design

Concerning the GAFE deployment process at URI, all the interviewees expressed regret over the isolated domain dilemma that separates the faculty and students. Traditionally, universities have relied on multiple domain models to separate user access rights by domain to ensure the security of networked resources. It was desired by the university to have contact sharing turned on for the faculty and staff, so all domain users can search a global address book which will list the users in the domain, but this functionality was in conflict with the student's FERPA rights to tell the University to NOT publish their name in an online directory.

The "Google Apps for Education: Domain best practices" document indicates that there are three ways you can setup your Google domain as either a primary domain, multiple domains or separate Google Apps accounts option and the one you select depends on your environment (Google, 2016d). In the Google documentation titled' "Limitations with multiple domains", it states "you can't set different policies or configuration settings for different domains" and "you can't restrict sharing to users in a single domain" (Google, 2016e, p.1). The document entitled "Managing Multiple Domains with Google Apps" states: "When you manage multiple domains in the same Google Apps account all domains share certain account wide configuration settings: All users appear in a single Global Address List (GAL), based on your contact sharing settings" (Google, 2012, p.12). Additionally, this document also states that: "When you manage multiple domains in separate Google Apps accounts, you can specify different values for these settings: Each account has its own Global Address List (GAL) and list of Calendar resource" (Google, 2012, p.12).

Google documentation indicates at the time that the research for this paper was conducted; Google domains only allowed for the global implementation of some domain

functionalities. Within the GAFE domain structure contact sharing, which allows for user accounts to appear in a GAL can either be turned on or turned off. Using separate Google Apps accounts option, you can specify the GAL setting for each individual domain independently. Having the capacity to turn off the GAL for the students in a separate Google Apps accounts domain and have the GAL turned on for the faculty and staff domain made a GAFE separate domain option design the immediate solution to a complicated problem.

The scope of this particular functionality may change in the future, as the GAFE product matures and more functionalities are added. The students were already in their own functioning domain of "my.uri.edu", at the time the GAFE adoption project for faculty and staff was initiated. Unable to immediately create a domain design that would accommodate for the security and legal concerns of students and faculty together, as well as already having Sakai in place as the university's official learning management system, URI implemented the Separate Google Apps domain option to create two separate isolated domains. One GAFE domain was created for faculty and staff; the student's domain continued to function as an their own independent domain. This GAFE separate Google Apps accounts domain design was judged as the safest and fastest solution to move forward with the adoption process. In the "Google Apps for Education: Deployment Guide", managing multiple Google Apps instances, URI's current separate Google domain options structure is listed as "not recommended, due to inability to collaborate seamlessly between separate Google Apps instances" (Google, 2016f, p.3). The "Google Apps for Education: Domain best practices" also states some of the other disadvantages of separate GAFE domain options are complex sharing settings, contact sharing limitations, unable to use Android setup across n-n, and unable to use full Google Play for Education functionality

(Google, 2016d). The Google Apps for Education Deployment Guide indicates that "managing one domain/Google Apps instance" is the "best option" (Google, 2016f, p.3). Google is still in the process of developing the GAFE product and new features may eventually be added.

The most complex and challenging part of attempting to truly leverage the GAFE product at universities and colleges will be to design and vigorously use a digital learning environment that adds value to the educational process and acceptably balances efforts to manage risks while encouraging exploration. Adult learning environments are different than K-12 domain models; adult students are expected to be responsible for their actions. Security is enforced through authentication but diverse communication interaction methods are to be expected. Identity becomes a very important consideration as universities unify their authentication systems around a single account identity. The changing permissions that a student transitions into as they graduate to be an alumni, may add complexity to the GAFE domain design.

The NETP 2016 envisions a digital learning environment highly reliant on technical programming customized to support the learning process. The goal for creating a modern digital learning environment is to create an online academic community that represents the unique culture that is created by embracing the values, mission, and vision of the learning community's culture. The academic community that is created online brands the university's presence on the internet, and establishes a place where individual safety, content credibility, and scholarly knowledge building are paramount. In this way, universities have an important role in contributing value to the Internet landscape congested with inaccuracies and outright manipulative agendas. The digital learning environment provides an avenue to balance and mitigate the disparate doctrines accessible on the Internet.

Future Research

The Google (2016e) document "Limitations with Multiple Domains" states, "Applications that use Google App Engine are not available for users at non primary domains" (p. 1). Google App Engine is a platform for building scalable web applications and mobile back-ends. This indicates that applications designed for the learning environment, where both teacher and students reside may need to be in a primary domain to use Google App Engine. More research is needed in identifying the best GAFE domain design to meet the university's future needs. The goal in creating an academic digital learning environment for higher education is to develop a domain structure that allows both the university's learning management access to a Google Developer's Cloud Platform environment for teaching objectives, and also allows students full access to the coding environment.

Understanding the technical specifications of the GAFE product ultimately determines the university's ability to mitigate any risks that are presented by users having full access to all the features and application for the GAFE product. It is critical that institutions of higher education fully understand the risks that are presented by adopting the GAFE product so the appropriate remedy can be determined allowing the learning environment to flourish. Following Google's best practices recommendations is the objective when creating a domain design that serves adult learners in institutions of higher education.

The most complex and challenging part of attempting to truly leverage the GAFE product at universities and colleges will be to design and vigorously use a digital learning environment that adds value to the educational process, while acceptably balancing efforts to manage risks and at the same time encourage communication and exploration.

More research is needed into a GAFE domain design's legal compliance and responsible use policies as it applies to adult learners at institutes of higher education.

Closing Thoughts

The Motto for the University of Rhode Island is: "Think Big. We Do". It might be this maxim that best describes how universities should approach the GAFE adoption project. Increased GAFE use offers the university a chance to capture a tremendous amount of savings, auto-generating the capital needed to reinvest in experimentation, research, and development of GAFE as a platform to create a digital learning environment modeled after the NETP 2016. Leveraging the GAFE product may be one of the only ways for universities to afford to create their own twenty first century digital learning environment. Removing the cost to host and maintain the systems needed to support GAFE like functionality will impact a university's bottom line. Data storage and access to a developer's coding environment is an area where universities can capture substantial savings leveraging the GAFE products. To increase the opportunities to leverage GAFE's adoption at the university, leadership will need to make GAFE research, development and experimentation an institutional top priority.

GAFE has three domain options; primary domain, multiple domains (an extension of the primary domain) and separate Google Apps accounts domain. GAFE's recommended domain structure is a primary domain. Currently, URI is using a separate Google Apps accounts domain option for the students. Using the namespace "my.uri.edu", the student domain is pulled out from under the primary domain of "uri.edu". This causes problems because, for users, it looks like the my.uri.edu domain is in a multiple domain design under the primary domain of "uri.edu". The separate Google Apps accounts domain design causes sharing conflicts.

If the university determines that students and faculty must not exist in the same GAFE domain as Google recommends; a better solution might be to create a primary domain for students, such as: "myURI.edu" or "goURI.edu". Putting students in their own primary domain retains all the security features of a separate Google Apps accounts option, without the confusion and limitations, and gains all the benefits of a primary domain and this design also follows Google's domain recommendations.

Final Information

From the date of the initial cut over to GAFE on January 1, 2015, the estimated completion time frame for the URI email migration project was one year. Throughout the GAFE adoption project the University Computing Services department maintained a website entitled "Email Migration to Google Apps for Education", which was the official online location to get information concerning the progress of the URI email migration project. By the final completion of this research paper in the spring of 2016, the URI "Email Migration to Google Apps for Education" web site reported:

> "The migration of email messages, calendars, and contacts has finally been completed. Both the Exchange and Zimbra ITS email servers have been retired. Due to purchasing, contractual, and technical delays the SADA vendor migration team was not able to complete their work until mid-February. At this point, all Exchange and Zimbra accounts, including etal accounts, have finally been migrated to Google Apps for Education" (University of Rhode Island, 2016).

I personally, permanently powered down the URI Exchange email server in December 2015. The Google deployment project at URI took just two months longer than the originally projected; one year completion date.

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