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Journal of the Midwest Association for Information Systems

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Editorial Board

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COVID-19 and Examples of "Best" Teaching Practices from the Lens of Different Stakeholders

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Abstract

The COVID-19 pandemic impacted how we teach and learn at all educational levels. It created significant challenges but also some opportunities for various stakeholders we all can learn from for the future. In this editorial, we identify some of the "best" teaching practices that we have seen developed, improved, and that potentially can be further improved as the focus has shifted to add hybrid, HyFlex, and fully online modes of course delivery to the traditional F2F instruction. We focus on different stakeholders – students, faculty, and educational institutions. Based of review of the literature, we did not see much differences in terms of "best" teaching practices between the Midwest region and the rest of the country.

Keywords: VOVID-19, "Best" teaching practices, various stakeholders

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1. Introduction

Since the COVID-19 pandemic started around March 2020 in the US and around the world, all aspects of our lives, including how we educate learners, at all levels, has significantly changed. Around the end of April 2020, UNESCO (2020) reported that about 1.3 billion students were impacted by the closing of their educational institutions. Some students and faculty at colleges and universities were familiar with online education as early as 1994 (Alavi, 1994, Hiltz, 1994, Leidner & Jarvenpaa, 1995) and a lot of research on this topic has been done since then. In many institutions, even before the pandemic, hybrid and fully online modes of course delivery were relatively common. Even so, there were, and still are, some faculty and students who, for various reasons, prefer the face-to-face (F2F) mode of course delivery. Another point is that the sudden change to fully remote instruction, due to the pandemic, created significant challenges, such as the lack of choice for all involved. Besides, at the high-school and lower levels, there was little familiarity with fully online teaching and learning.

More recently, various studies have been conducted looking at the short and long-term implications that the new normal has created for students, educators, education delivery, and educational institutions. Pelikan et al. (2021) conducted a multi- country study of more than fifteen thousand students using self-determination theory (Deci & Ryan, 2012), looking at the less structured nature of remote learning and its implications on the learners' intrinsic motivation. Similarly, Kirk-Jenkins & Hughey (2021) looked at the sudden shift for faculty and institutions from the instructional process perspective. In particular, they looked at opportunities as well as challenges that the new normal has created from the equity lens, gender inequity, and opportunities for life-work related balances. Mothers in particular, had a harder time maintaining work-life balances.

Koch and Schermuly (2021) used an extension of the job-demands resources model (Bakker & Demerouti, 2007) to look at the amount of stress placed on employees due to COVID. Educators and learners, most likely, are impacted by this kind of stress. Colclasure et al. (2021) identified five specific challenges "learning patterns, technology access, additional responsibilities, learning community, and mental health" (p. 1) associated with the sudden change to remote teaching and learning. A set of recommendations were made for each of the challenges (p. 18).

The purpose of this editorial is to identify some of the "best" teaching practices that we have seen developed, improved, and that potentially can be further improved as the focus has shifted to add hybrid, HyFlex, and fully online modes of course delivery to the traditional F2F instruction. We focus on different stakeholders, and in particular, look to see if some of the current teaching practices were influenced by the nature of our Midwest region.

2. Online Learning Challenges and Possible Opportunities for Various Stakeholders

The most obvious and impactful stakeholders are students, faculty, and educational institutions. There are, of course, other stakeholders including instructional designers, accreditation agencies, parents, Internet service and instructional technology providers. Not all these groups are affected equally by the shift to more online course delivery. We will focus on students, faculty, and educational institutions.

2.1 Implications for Students

Before the pandemic, many students were familiar with online and hybrid modes of course delivery, but some were not and preferred F2F delivery, in particular, in courses such as accounting. This is one of the reasons most institutions which had a larger number of learners offered their course sections using different modes of course delivery. When the sudden shift to fully online occurred, students no longer had any choice but online courses. This created significant challenges among them in terms of motivation and time management. It became necessary, more than before, for faculty and instructional designers to design learning assignments to increase students' motivations (Pelikan et al., 2021).

The lack of technology availability and access to high-speed Internet, in particular, for low income and indigenous families as well as students who live in the rural areas of the Midwest created additional burden. This further added to the existing equity related problems that already existed in some school districts, colleges, and universities in the Midwest region. Some households had to share computers among family members for schooling as well as remote work. Some institutions tried to provide loaner laptops, and some Internet service providers in the Midwest provided low or no cost Internet access, at least for a period of time during the early stages of the pandemic.

Learners generally have different learning styles. Innovative faculty found ways to compensate for the lack of F2F instruction with more instructional videos and/or individualized audio/video sessions available for students on a demand basis. Regular and frequent faculty accessibility via online tools and technologies (online office hours), online and group discussions to increase students' engagement, project and case study-based instructions, and generally providing some flexibility are other ways to remedy some of the challenges of the lack of F2F class meetings.

Assigning group projects, encouraging team work for group projects, and building learning communities to support students and improve outcomes facilitates and enhances engagement for the learners who are normally shy and do not actively participate in class room discussions. Introducing students to class discussions by starting with an icebreaker discussion question or similar concepts such as a "what's up" section in the course content is helpful for students who are normally more reserved for class participation. Asking all members of teams to participate in their group projects' presentation is another effective way to enhance communication skills of learners in online and hybrid courses. Improvement in communication skills of learners will also increase their career readiness.

The lack of social contact and athletic participation were other disruptions for many students that created short and potentially long-term effects. Again, paying attention to engagement and improving motivation may remedy this problem.

For students who feel comfortable with online and hybrid learning, some opportunities exist. The flexibility and commuting time and cost savings that online learning affords could potentially be significant. These will allow students to devote more time to real learning or other activities including part-time or full-time employment. Some employers, particularly in the private sector, have informed their employees that they could work remotely indefinitely. This will allow current students and future employees not only be able to do better future planning, but it also provides them some needed experience with potentially similar technologies they will use when they start working. As communication and team work is an important skill set for any employees these days, current students can use the experience they gain as they work remotely with their classmates in the group project assignments if they start working remotely.

2.2 Implications for Faculty

Many faculty members at different institutions were already familiar with online and hybrid modes of course delivery. Some faculty members, however, were opposed to teaching their courses in any delivery mode except fully F2F before the pandemic. When the pandemic hit, at many institutions, the sudden shift created significant challenges for this group of faculty members, their students, and their institutions due to the short time period over which transition needed to occur. Some institutions created new and enhanced already existing professional development activities in their instructional support services, to facilitate the learning and skills necessary for faculty members to be able to effectively teach online and hybrid courses. Developing instructional technology training is not sufficient. It is essential to provide training in online and hybrid pedagogy related skill set development. Team teaching with colleagues who were already familiar with online and hybrid teaching is an option used by some institutions.

More recently, some institutions, at least at the graduate level, have been offering their courses using the HyFlex mode of delivery, which affords learners the ability to attend sessions either F2F or online. This option, in particular, needs more planning for faculty who are not familiar with various instructional technologies. Team teaching would be very beneficial in this kind of environment with one faculty have the responsibility for F2F discussions and the other monitoring and incorporating online comments in class discussions. Engagement and active participation of all learners are essential in this kind of environment for effective teaching. Highly reliable technology is another critical necessity, as is readily available help from trained technical support staff.

Quality Matters (QM) professional development and certification is highly encouraged for improving teaching effectiveness for all faculty members, in particular, for those with less online teaching familiarity and experience. Carefully designed and clearly articulated syllabi are essential for all courses, in general, and for online and hybrid courses in particular. Developing and clearly articulating assignments' rubrics facilitate effective teaching. Engaging students with real world examples and active learning practices, and inviting guest speakers to bring examples to the classroom that connect course contents to the real-world events in their respective organizations, help improve students' learning.

The loss of work-life balances has been another aspect of the remote work that many faculty members and their families have been experiencing since the pandemic (Colclasure et al., 2021). For some faculty working remotely, a days' work became more than an eight-hour work day -- rather it became a ten or even twelve-hour work day. For families with children, especially younger children, sharing computers and quiet space became a challenge. Given that in most households with children, female members of the family have the majority of the responsibilities for taking care of the children, the pandemic created significant challenges for female members of the family. The impact of remote work for families with children was felt a lot more by female faculty members and, of course, by other female professionals. There were cases were some females resigned from their positions or temporarily left the workforce to take care of their children.

Now that majority of faculty have experienced online and hybrid teaching, the hope is that this will create an opportunity to use some of the innovative practices and lessons learned from online teaching for F2F teaching as well. These practices include focusing more on a variety of students' learning needs, increasing students and faculty engagement, flexibility, adaptability, innovative thinking in instructional design, team work and group projects, more frequently on-demand office-hours using communication technologies, and more technology-rich course contents.

2.3 Implications for Educational Institutions

Even before the pandemic, a large number of educational institutions at all levels around the world were investing in educational technologies to cope with the digital transformation of education. The pandemic expedited this transformation to a great degree. Creating online teaching and learning units and teaching innovation centers to provide training such as Quality Matters (www.qualitymatters.org) and help in the development of effective and accessible online course contents will facilitate overall online teaching and learning. Professional pedagogy training should also address Diversity, Equity, and Inclusion (DEI) contents. Creating classrooms equipped with the required technology to deliver courses in HyFlex mode of delivery provides access more broadly and increases flexibility for learners.

Some textbook publishers have programs (https://www.bncollege.com/academic-solutions/first-day-complete/) to allow universities to add textbook charges to tuition and fees so that students will have access to the textbooks from day one of the semester. In some cases, the cost of textbook ordering this way is less, which is another benefit of this kind of program. This practice will allow students to have access to the required textbooks from first day of the semester.

3. Conclusion

Given the un-predicable nature of the world we live in, students, faculty, and educational institutions be better prepared for the next emergency, whether a pandemic or some other type of emergency. For students, remote learning creates an opportunity to become more of an active rather than passive learners. They can more frequently participate in group discussions and team work. They can improve their communication skills and team skills, which are often among the specific significant talents employers are seeking. Familiarity with remote learning and using related technologies gives students experience for working remotely in the future. A valuable experience for faculty teaching remotely is to use best teaching practices they have implemented for their F2F courses in the online instruction and vice versa. Increasing more variety of learning activities for students are among other advantages that familiarity with remote teaching potentially can afford faculty members.

Although technology is not the solution to all of our institutional challenges, no doubt the pandemic demonstrated that it can be used very effectively to moderate and remedy, if not totally eliminate, significant challenges. We need to make sure institutions allocate adequate technology and human resources to be better prepared next time around.

4. Overview of the Contents of this Issue

This issue of the journal includes three traditional research articles.

John Muraski and Jakob Iverson in their timely article look at the growth of information systems and technology related workforce demand over the last decade. As a result, they suggest that school districts are increasing their technical course offerings. In particular, they report on the collaborative efforts of three school districts in the Midwest with local industries and other institutions to increase technology skills of k-12 students.

Makato Nakayama, Charlie Chen, and Yoris Au in their interesting article look at the impact of remote work on workers productivity. Their study is based on the analysis of survey data collected from sixty IT professionals. Implications of their findings and some future research agenda is also discussed in their article.

In his important article, Robert Miller studies the inappropriate social media postings of college students and implications their action has for future employment. The article looks at friends' group as a possible motive for this behavior. The article includes future research agenda related to this area.

We appreciate and wish to acknowledge the contributions of reviewers for this issue of the journal, including Gaurav Bansal (University of Wisconsin, Green Bay), Queen Booker (Metropolitan State University), Omar El-Gayar (Dakota State University), Deepak Khazanchi (University of Nebraska, Omaha), Barbara Klein (University of Michigan, Dearborn), Alanah Mitchell (Drake University), Kevin Scheibe (Iowa State University), and Troy Strader (Drake University).

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Growing Computer Science and Information Technology Education in K-12: Industry Demand and Ecosystem Support

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Abstract

Demand for IT skills has grown dramatically in the last decade. Companies have realized that they need more people to fill roles in their IT departments, and modern life increasingly relies on being able to navigate digital environments and use digital tools. Many school districts have responded to these demands by attempting to increase their offerings of computer science and information technology coursework. In this paper, we describe one region's effort to support K-12 schools in increasing digital skills for all students and the pipeline of IT professionals. We describe three approaches taken by three school districts to respond to these efforts in collaboration with local industry and other institutions. One school district partnered closely with local higher education institutions to offer early college classes, another focused on providing robust computer science courses of their own to high school students, and the third focused on developing broad digital skills especially at the grade school level (K-8). We argue that the collaboration maturation of efforts in the region allowed school districts to expand computer science offerings more easily and to use regional partnerships to increase the likelihood of being successful with their efforts.

Keywords: Collaboration, Alliance Maturity, Computer Science, Information Systems

DOI:10.17705/3jmwa.000075

1. Introduction

Over the last decade, demand for information technology (IT) related skills has grown dramatically. In the workplace, employees are often more technical and work in jobs and careers that involve direct use of technology and digital skills. These organizations also have a specific need for IT and computer science (CS) skilled employees to work in technology-related careers. In our home and personal life, we rely on being able to navigate digital environments and use digital tools. Our interactions with others are often managed via digital platforms and social media. Society now requires us to be digital citizens. Students will need more technology-related skills to navigate these different realms.

Due to the high demand for their skills, computer science and information technology (CS/IT) professionals enjoy stable, high-income careers. According to the Bureau of Labor Statistics (2021), the median annual salary for CS/IT occupations was $91,250 in May 2020, about $45,000 greater than the median wage for all occupations in the U.S. The Bureau has also projected that the demand for CS/IT professionals will continue to grow at a 13% rate between 2020 and 2030 adding an additional 667,600 new jobs (U.S Bureaus of Labor Statistics, 2021). Despite these salary and job prospects, organizations have not been able to attract sufficient talent into their ranks (Vegas & Fowler, 2020).

Companies and higher education institutions in the Northeast Wisconsin region founded the Northeast Wisconsin Digital Alliance (NEW Digital Alliance) in 2015 to address the talent shortage in the region. This organization started as a loose affiliation of individuals, organizations, K-12 schools, universities, non-profits, and economic development organizations but has matured into a formal organization focused on building collaboration (Muraski, et al., 2021).

Spurred on by demands from local employers for CS/IT talent, parent interest, and societal trends, school districts across Northeast Wisconsin have begun to step up to service the need for CS. We describe three different approaches taken by three different school districts to respond to these efforts in collaboration with local industry and other institutions. One school district partnered closely with local higher education institutions to offer early college classes, another focused on providing robust computer science courses of their own to high school students, and the third focused on developing broad digital skills especially at the grade school level (K-8). We argue that the collaboration maturation of efforts in the region allows school districts to expand computer science offerings more easily and to use regional partnerships, including industry partners, to increase the likelihood of being successful with their efforts.

This paper is organized as follows. Section 2 addresses the case background, including collaboration networks and alliance maturity, as well as the state of computer science in the United States and Wisconsin. Section 3 describes the case study research methodology that was used as well as provides an overview of the case environment. Section 4 provides a case description and analysis. Section 5 provides a discussion of the findings. Finally, Section 6 includes the summary, limitations, and direction for further research.

2. Background

This section covers the recent history of collaboration networks and alliance maturing in Northeast Wisconsin and provides an overview of the state of computer science education in Wisconsin and across the United States.

2.1 Alliance Formation

After the dot-com collapse of 2000, enrollments in computer science and information systems degree programs dropped dramatically at regional colleges and universities and then slowly rose back to 2000 levels over nearly 15 years. See figure 1 for degrees conferred by University of Wisconsin institutions in Northeast Wisconsin. By 2015, with minimal interest among parents, companies, and students in pursuing these kinds of educational programs, school districts were not encouraged to offer more than the bare minimum of classes. Over time, however, this led to companies having difficulty finding qualified talent to fill an increasing number of IT job roles.

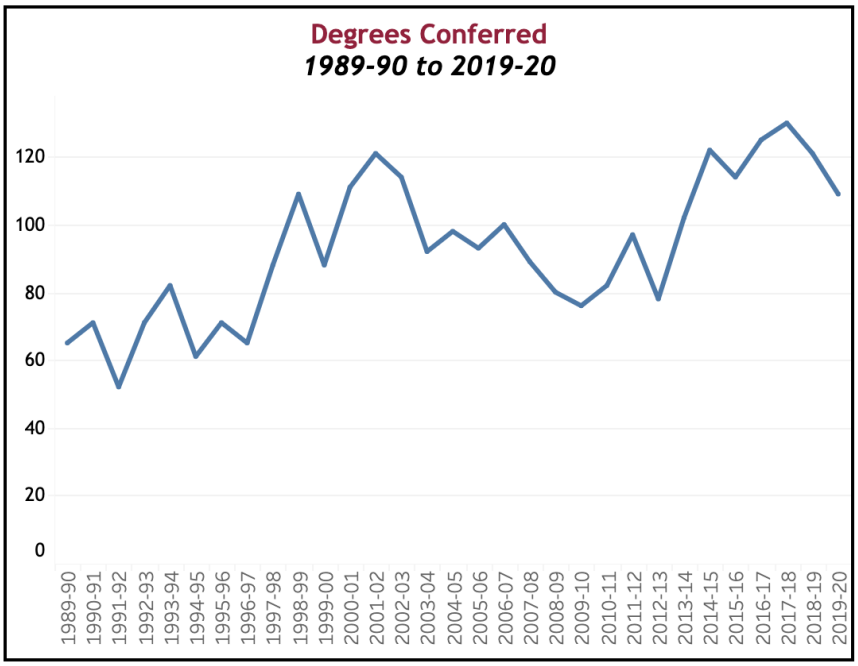

Figure1: Degrees conferred by University of Wisconsin Institutions in Northeast Wisconsin (UW-Green Bay, UW Oshkosh, and UW-Stevens Point) in Computer Science and Information Science (UW System, n.d.)

In 2015, several executives at regional companies worked to bring together a group of leaders from business, economic development, K-12, universities, and non-profits to discuss what could be done to increase the pipeline of people interested in filling the increasing number of IT jobs. While most businesses were simply interested in hiring graduates from 2- and 4-year university programs, they quickly realized that they also needed to focus on building greater interest among younger students.

However, school districts had few offerings and lacked teachers and other resources to dramatically increase their offerings. Several organizations tried to fill the void. Among them were the regional Cooperative Educational Service Agencies (CESAs), which were created in the 1970s to serve as a link across school districts and between school districts and the state. There are twelve CESAs across Wisconsin, three of which cover the NEW North region – CESAs 6, 7, and 8. Early on, they worked to identify model curricula, such as Project Lead the Way (PLTW) that could be purchased and implemented in school districts.

Several Chambers of Commerce in the region also hosted events aimed at attracting and retaining IT students to the region. This included the Fox Cities Chamber of Commerce hosting a 3-day event for IT college students from in and out of the region to convince them to live and work in the region post-graduation. Similarly, Amplify Oshkosh established an education committee connecting K-12 and higher education. Another organization that successfully launched during this period was Women in Technology Wisconsin, with a focus on providing support for women working and studying IT. One of the pillars of their work is WIT4Girls, which developed a curriculum for WIT4Girls Clubs, which ran as after-school activities at many school districts across the region.

In late 2015, a survey of local businesses was conducted that determined that by 2021, the region would have an additional 3,000 unfilled IT jobs given the rate of graduates at the time. This led many businesses to realize that the problems they had experienced with hiring IT workers for their companies were broader and not just something they would be able to resolve on their own. This led to the formal formation of the NEW IT Alliance, which would focus on attracting and retaining a robust IT workforce for the region. The Alliance was later renamed the NEW Digital Alliance, which is how we refer to it throughout this paper to avoid confusion. At the end of 2016, several local businesses and higher education institutions joined to formalize the organization further by hiring a director for the Alliance, which would allow for progress to be made consistently.

Schilling (2015) identified that shock and uncertainty lead to alliance formation and the establishment of a collaboration network that works to innovatively solve a challenge. In Northeast Wisconsin, Muraski et al. (2021) identified a regional CS technology talent demand challenge that resulted in the formation of an alliance (NEW Digital Alliance). The NEW

Digital Alliance facilitated the growth of a supportive collaboration network. Figure 2 illustrates this collaboration framework.

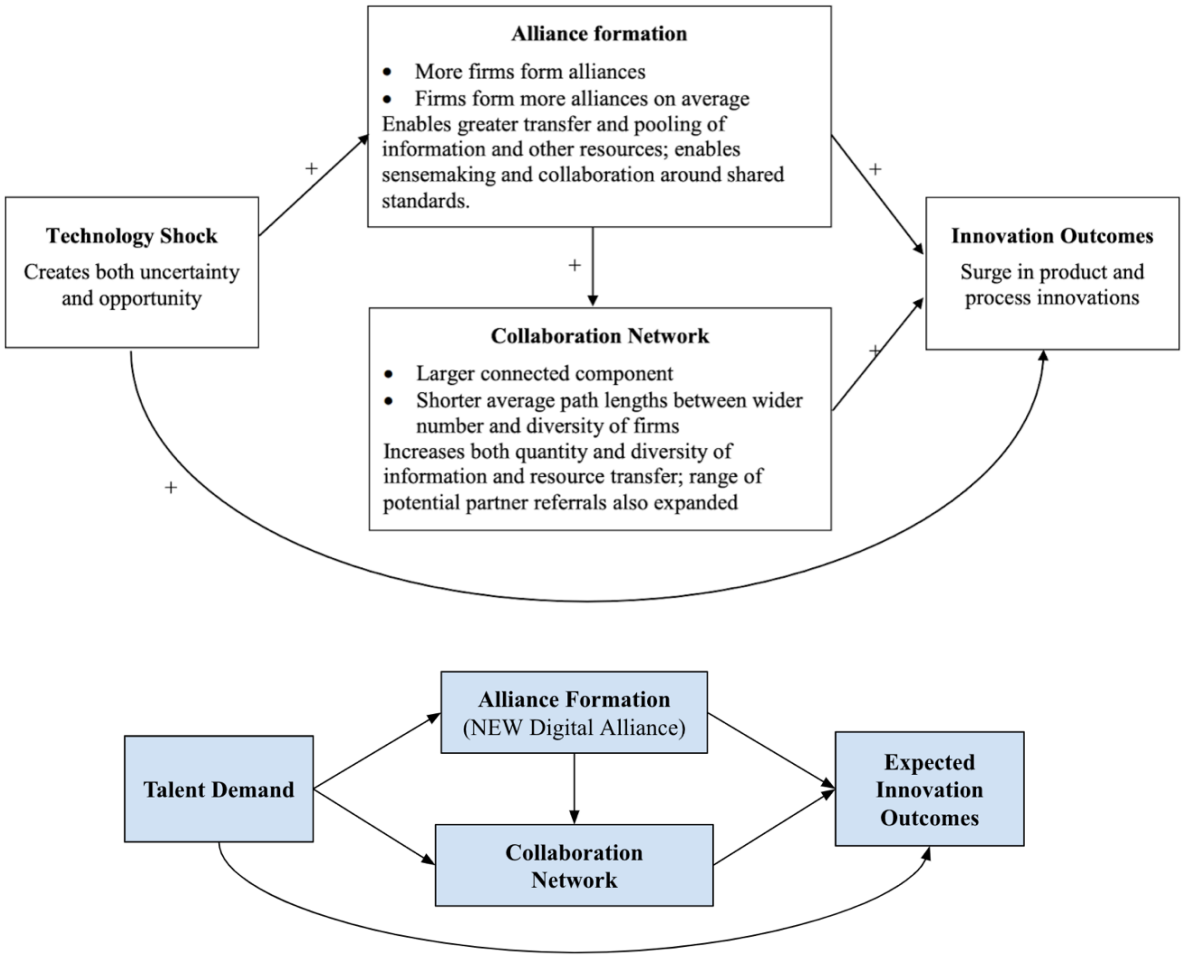

Figure 2: (Top) Original Schilling (2015) model and
(Bottom) NEW Digital Alliance Collaboration (Muraski et al., 2021)

2.2 Alliance and Collaboration Maturity

With a full-time director on board, the NEW Digital Alliance matured rapidly and became a central hub for all activities focused on the IT ecosystem in the region. The Alliance also launched several activities of their own, including NEW Connect IT, which is the only IT job and career fair focused on high school students in Wisconsin. This event has been held annually and attracted several hundred high school students to Lambeau field to learn about careers in IT and meet with universities and potential employers.

To support rural regions across the country in competing more effectively in the digital economy, Microsoft launched its TechSpark initiative and chose to focus on two counties (Brown and Outagamie) in Northeast Wisconsin. This became a key development that brought attention and energy to the region. One of the early goals set by TechSpark was to have every high school student take at least one computer science course before graduation.

One of the key programs Microsoft brought to the region was TEALS, which builds sustainable solutions by partnering high school teachers with industry volunteers and standardized curriculum in computer science. This allowed teachers to learn while teaching and eventually be able to teach the courses without having an IT professional in the classroom. The TEALS program has been successful and has grown from covering 32% of high schools in the region in 2017-18 to 75% in 2020-21 (M. Schuler, personal communication, June 1, 2021). The number of students has also grown – from 200 to 500 students during the period and the average number per school has increased by 34%. (M. Schuler, personal communication, June 1, 2021).

In 2018, Microsoft TechSpark and NEW Digital Alliance collaborated on a survey of school districts to determine the level of computer science offerings by school districts as well as what challenges they were facing. The presentation of the survey data was one of the first times that administrators and computer science teachers from school districts across the region had an opportunity to discuss together how to improve their offerings. This meeting formed the basis for the creation of the NEW CS Advisory Board.

The NEW CS Advisory Boards[1] composed of administrators and computer science teachers from regional K-12 school districts, higher education faculty, and local company representatives. The purpose is to enhance collaboration among school districts, higher education, and companies in the offering of computer science education in K-12 school districts. The advisory board was formed in 2018 as a collaboration between NEW Digital Alliance and Microsoft TechSpark but has since become an effort of the NEW Digital Alliance. The Advisory Board meets several times a year. The Advisory Board has served as a place where school leaders and teachers have been able to learn about trends and best practices in computer science education. Each meeting typically has a speaker that will present topics such as Diversity in the CS Classroom, Code.org Curriculum, and the CSforAll program. However, the advisory board has also allowed for information exchange between industry leaders, higher education partners, and schools on developing talent pipelines and pathways from K12 to professional IT jobs. A special focus of the CS Advisory Board has been on establishing local CS Advisory Boards in districts to support the efforts locally. And finally, the CS Advisory Board has allowed school districts to develop professional networks with other school districts.

As collaboration continued to increase, the role of the NEW Digital Alliance became more prominent in the region. During this time, the state took notice and the Department of Public Instruction (DPI) requested that the Alliance lead the development of formal High School, College, and Career Pathways for IT. Based on the NEW Digital Alliance collaboration, DPI now has a standard template for use across all the different regions of Wisconsin. This pathway shows core IT fields (Business Analysis & Project Management, Cybersecurity, Data Technology, Network & Systems Infrastructure, and Software Development & Programming), the related high school courses, certifications, both technical diplomas and associate degrees from the Wisconsin Technical College System, as well as bachelor's degree programs in the region.

As collaboration networks mature over time, Morgan (2012) identified five stages of collaboration maturity including unaware, exploratory, defined, adoptive, and adaptive. Each of these states has related characteristics including goals and objectives, organizational culture, process, technology, and governance. Figure 3 shows the emergent collaboration maturity model.

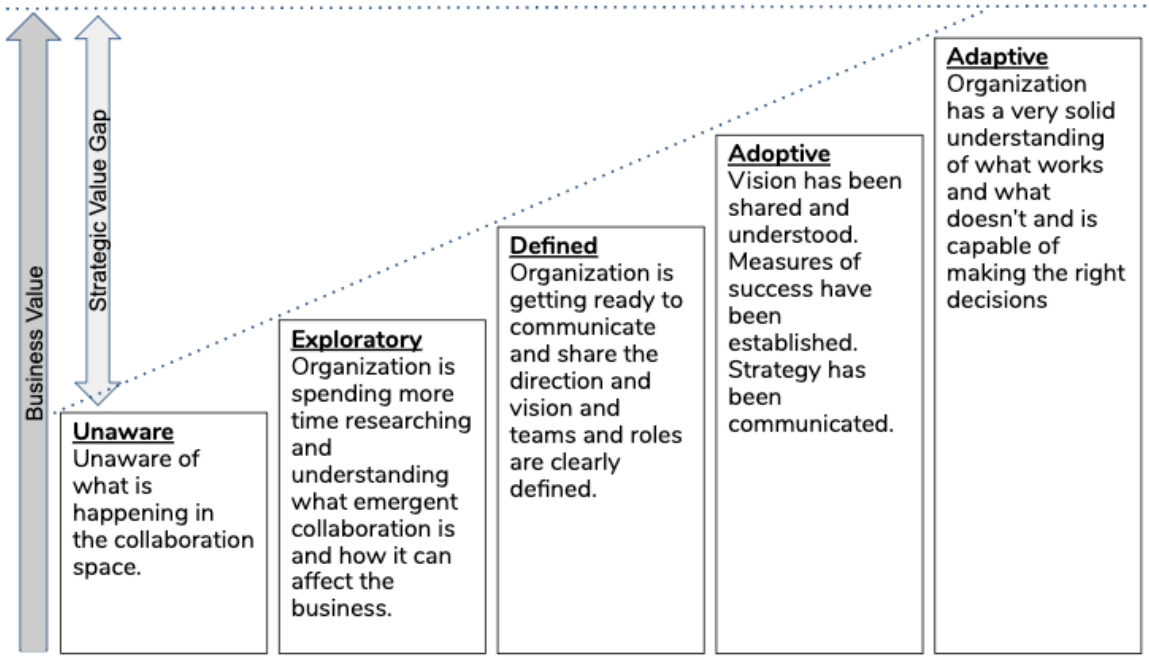

Figure 3: Emergent Collaboration Maturity Model. Adopted from Morgan, 2012.

[1] https://newdigitalalliance.org/new-cs-advisory-board/

In Northeast Wisconsin, the NEW Digital Alliance and the larger collaboration network achieved an adoptive level of maturity with plans to support an adaptive level in 2021 (Muraski et al., 2021). This maturing network and alliance are positioned to solve issues related to growing the IT talent shortage that could not be addressed with less mature networks and alliances (Muraski et al., 2021).

2.3 Partner Organizations in the Ecosystem

Throughout the region, several organizations have focused on the need to strengthen computer science education. This section includes brief descriptions of each of these organizations and their role in supporting computer science education. Table 1 shows the key collaboration partners in Northeast Wisconsin.

Organization	Collaborative Role
Amplify Oshkosh	A local organization started by the Oshkosh Chamber of Commerce to promote the confluence and capabilities of technology in Oshkosh. This organization has an education committee that has helped support schools in the Oshkosh area.
Code.org	National nonprofit dedicated to expanding access to computer science in schools and increasing participation by women and underrepresented minorities. Offers standard curriculum to schools as well as materials for organizing Hour of Code events to introduce students to programming concepts.
Cooperative Education Service Agency (CESA)	Serve educational needs in all areas of Wisconsin by serving as a link between school districts, and between school districts and the state. Wisconsin is divided into 10 CESA districts. The Northeast Wisconsin area is covered by CESA 6, CESA 7, and CESA 8 (each of the CESA districts also cover areas outside of Northeast Wisconsin). CESA 7 has had strong collaboration with Microsoft and is organizing several activities through an initiative called CSTEY.
Computer Science Talent Ecosystem Youth (CSTEY)	A service of CESA 7, the goal of Computer Science Talent Ecosystem Youth (CSTEY) is to teach all K-12 students computer science prior to graduating from high school.
CSforAll	This national non-profit provides training and frameworks for school districts to help implement strong computer science programs.
CS Teachers Association Wisconsin DairyLand	Wisconsin chapter of organization focused on collaboration among computer science teachers.
Department of Public Instruction (DPI)	State organization that sets standards for public schools in Wisconsin and provides a regional Digital Technology Career Pathway that was developed by the NEW Digital Alliance.
Department of Workforce Development (DWD)	State organization, developing youth and adult apprenticeships in IT. One of their significant efforts has been to expand the offerings of Youth Apprenticeships to IT.
Inspire Wisconsin	Started as Inspire Sheboygan, this organization aims to help businesses build talent supply chains and connections with educators and students throughout Wisconsin.
Microsoft TechSpark	Microsoft TechSpark is focused on regional internet connectivity, digital skills development, career skills development, nonprofit support, and digital business transformation. Northeast Wisconsin was chosen as the second of six regions in the US (and one in Mexico) for TechSpark to focus on.
NEW Digital Alliance	Regional non-profit, funded by local employers, to help attract, develop & retain diverse IT talent in Northeastern Wisconsin to support economic growth.
NEW Manufacturing Alliance	Group of manufacturers, educators, workforce development, chambers of commerce and state organizations working to promote manufacturing in the Northeast WI region.
New North	Regional marketing and economic development organization representing the 18 counties of Northeast Wisconsin.
Northeast Wisconsin Education Alliance (NEW ERA)	Alliance that fosters regional collaboration among public colleges and universities in Northeast Wisconsin.
Technology Education and Literacy in Schools (TEALS)	TEALS is a Microsoft Philanthropic initiative whose mission is to get computer science in every high school, with a focus on AP (Advanced Placement) level CS classes. This program supports high school teachers by pairing them with IT professionals and ready-made curricula.

Women in Technology (WIT) Wisconsin	Regional non-profit focused on initiatives designed to attract, grow, and retain women and girls in technology related careers. They developed WIT4Girls Clubs, which could be offered as extra-curricular activities in schools throughout the region.

Table 1– Collaboration Partners

2.4 State of Computer Science Education in the US and Wisconsin

According to the 2021 State of Computer Science Education, nationwide, only 51% of high schools teach formal computer science classes (Code.org, et al., 2021). Only 30% of K-8 schools offer any type of computer science foundation course (Code.org, et al., 2021). Arkansas and South Carolina lead the nation with 93% of high schools offering computer science classes, while Minnesota lags with only 24% (Code.org, et al., 2021). These differences are exacerbated by existing socio-economic trends. Throughout lower-income and rural areas, computer science courses are only available in 46% of schools (Gallop & Amazon, 2021). Similarly, Black and Hispanic students in urban areas are less likely to say their school offers computer science courses (Gallop & Amazon, 2021). At the same time, interest in computer science courses is higher than actual participation in computer science courses. Nationwide, 62% of students indicate they would like to learn about computer science, and yet only 49% of these students completed a computer science course (Gallop & Amazon, 2021).

The Code.org Advocacy Coalition, the Computer Science Teachers Association (CSTA), and Expanding Computing Education Pathways (ECEP) have developed a set of core state policies that are designed to make computer science a fundamental part of high schools across a state. In Wisconsin, four of the nine recommended policies are met (Code.org, et al., 2021). Table 2 shows policies that are met in Wisconsin and those policies which remain unmet in Wisconsin.

Policies Met in Wisconsin:	**Unmet Policies in Wisconsin:**
• Define computer science and establish K–12 CS standards • Implement clear certification pathways for computer science teachers • Create computer science preservice programs at post-secondary schools • Allow computer science to satisfy a core graduation requirement	• Create a state plan for K–12 computer science (in progress) • Allocate funding for CS teacher professional development • Establish dedicated state computer science positions • Require that all secondary schools offer computer science (in progress) • Allow CS to satisfy admission requirements at post-secondary schools.

Table 2 – Policies in Wisconsin (Code.org, et al., 2021)

In Wisconsin, the percentage of high schools that teach formal computer science classes has risen dramatically since 2017. During the 2017-2018 school year, only 34% of high schools offered a computer science course (Code.org, et al., 2021). That percentage grew to 62% during the 2020-21 school year (Code.org, et al., 2021). Access to computer science predicts interest in the topic and sustains interest in computer science as students leave high school. In Wisconsin, high school students participating in a computer science course are 6 times more likely to major in a computer science-related major and female students are 10 times more likely (Code.org, n.d.).

This research attempts to showcase three school districts in Northeast Wisconsin as they tackle these issues by documenting their approach and presenting key insights for other communities and school districts.

2.5 Research Questions

In considering collaboration networks, alliance maturity, and the state of computer science education in the US, we identified the following research questions:

1. What was the driving force for these school districts to increase their CS/IT course offerings?
2. How have individual school districts interacted with the existing collaboration network in building their CS/IT course offerings?
3. What challenges did school districts face as they sought to increase their CS/IT course offerings?

3. Research Methodology & Case Environment

Prior research has not explored the impact of external collaboration on the development of computer science and information technology-related offerings within a school district. In reviewing the success of three different school districts, we can provide insight and share our findings from these school districts.

3.1 Research Methodology

We explored collaboration across Northeast Wisconsin to understand three separate school districts and how they approached growing their computer science and information technology-related offerings.

3.1.1 Case Selection

Following a critical case sample approach (Patton, 2014; Yin, 2017), we sought to identify school districts that exemplified computer science and information technology offerings for students. These cases would showcase the phenomenon we are seeking to research and have the potential to provide the most information (Patton, 2014). Finally, Patton (2014) notes that studying critical cases enable generalizations to be made from the gathered evidence. Based on our engagement in the region and initial interviews with regional non-profit leaders, we identified three school districts viewed as being very progressive in advancing computer science and information technology education. These districts include Howard-Suamico School District, The Hortonville Area School District, and The Sheboygan Area School District.

3.1.2 Interviews

We created separate interview guides (Patton, 2014) for each category of participants: directors of regional non-profit organizations involved in growing STEM-related activities, high school administrators, information systems and computer science K-12 teachers, school district computer science advisory board members, and 2-year technical college administrators.

We conducted semi-structured interviews to guide conversations while focusing on the relevant issues (Patton, 2002). The co-authors jointly collected data via video conferencing technology (MS Teams), following standardized interview protocol, including (1) presenting the study to the interviewee, (2) asking the pre-defined questions, (3) probing for additional follow-up data, (4) recording answers, and (5) managing the interpersonal relations that transpire during an interview (Fowler, 2014). During each virtual interview, one of the authors acted as the primary interviewer while the other acted as a recorder. All interviews were recorded with video, audio, and transcription. In addition, the interviewers took detailed notes.

A total of 12 interviews were conducted. Interviews by category include directors of regional non-profit organizations (three interviews), high school administrators (two interviews), information systems and computer science K-12 teachers (three interviews), school district computer science advisory board members (three interviews), and 2-year technical college administrators (one interview). By school districts, we conducted four interviews relating to the Howard-Suamico School District, two interviews for the Hortonville Area School District, and three interviews relating to the Sheboygan Area School District.

3.1.3 Qualitative Data Analysis

The survey design allowed for exploration of CS and IT education in each case as well as from regional perspectives. Interviews were summarized and analyzed. Key learnings and themes emerged that are included in the discussion. Similarly, district websites and course offerings were identified, analyzed, and presented in section 4.4.

3.2 Case Environment

This case explores computer science education within Northeast Wisconsin. Making up nearly a quarter of the state of Wisconsin, this region comprises 18 counties. Primary industries in the region include transportation equipment manufacturing, dairy foundries, product manufacturing, (pulp, paper, paperboard manufacturing, and converting), electrical equipment manufacturing, machinery manufacturing, and fabricated metal product manufacturing (New North, 2020). Manufacturing in the region has become increasingly reliant on technology and 25% of the workforce is estimated to work in advanced manufacturing industries (NEW North, 2020). This region can be seen in figure 4 along with the location of each of the school districts and higher education institutions involved in the case.

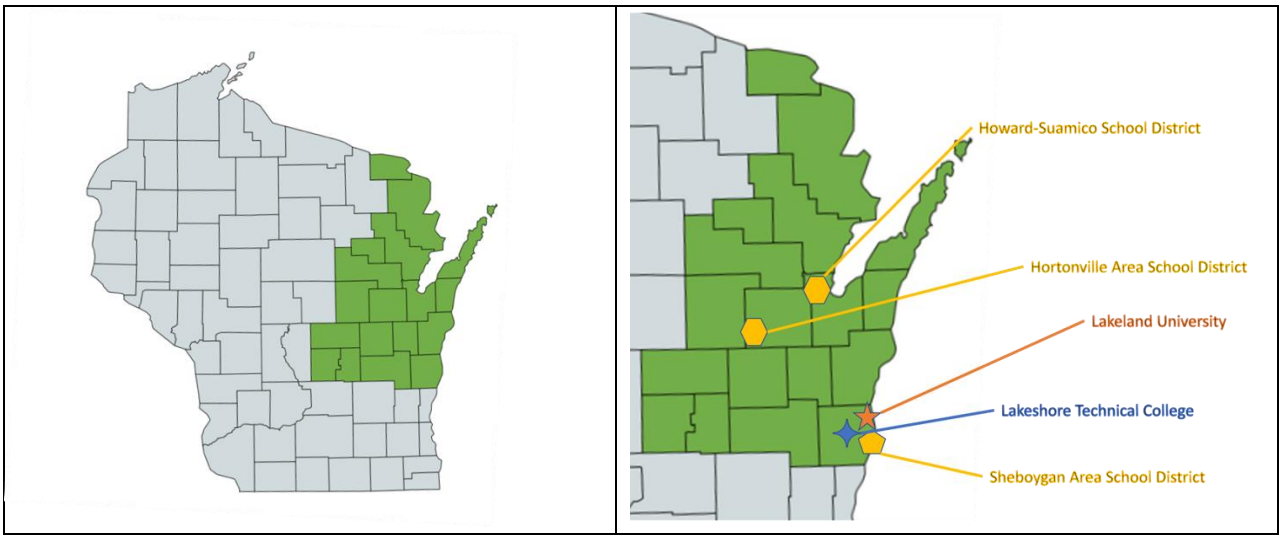

Figure 4: Map of the 18 counties that make up Northeast Wisconsin as well as the location of the schools and higher education institutions involved in the case.

This 18-county region has 91 school districts, servicing approximately 186,235 students (National Center for Education Statistics, n.d.). In addition, the region is serviced by the Wisconsin Technical College System. The Wisconsin Technical College System overlaps this economic region with four separate 2-year colleges: Fox Valley Technical College, Lakeshore Technical College, Moraine Park Technical College, and Northeast Wisconsin Technical College. Additionally, the region is home to several universities with degree programs in information systems and computer science, including the University of Wisconsin-Green Bay, University of Wisconsin Oshkosh, and Lakeland University.

The authors have been active in both education and industry across the region for several decades. One of the authors has consulting, strategic planning, and IT project management experience across several companies and organizations in the region before joining UW Oshkosh as a faculty member. He has since been involved in several NEW Digital Alliance committees and initiatives, including the regional computer science advisory board as well as the Howard-Suamico computer science advisory board. The other author was involved from the very early days of the NEW Digital Alliance in 2014 when it was just a loose affiliation of companies, universities, K12 schools, and interest groups, and was able to follow the early stages of the formation of the collaboration. He is also involved in the regional computer science advisory board.

4. Case Description & Analysis

In this section, we describe the efforts over time that have led to school districts increasing their support for expanding computer science and IT offerings, as well as case descriptions of the very different approaches taken by three separate school districts in expanding their computer science course offerings.

4.1 Howard-Suamico School District Computer Science Approach

The Howard-Suamico School District (HSSD) encompasses the Village of Howard and the Village of Suamico northwest of Green Bay, WI. Serving 6,000 students, the district is the 25th largest in the state of Wisconsin and includes five elementary schools (K-4), an intermediate school (5-6), a middle school (7-8), and one high school (9-12). In 2018, School administrators attended a chamber of commerce event showcasing school district successes across Brown County, including those school districts that were offering computer science (CS) courses. HSSD's Bay Port High School was not listed. At the same time, the district began hearing from parents seeking courses that would prepare their children to work with computers and technology, including programming and computer science. As they looked at program offerings across schools, administrators realized there was no coordinated or consistent approach to offering digital skills. Similarly, parents, business organizations, and post-secondary schools were clearly signaling that they were not getting enough students with interest or experience with digital skills. The motivation quickly crystallized around a goal of

integrating digital literacy across the curriculum at all ages and increasing awareness and enrollment in new technology-focused electives at the high school.

4.1.1 Implementation

Early in the process, HSSD attended a Regional CS Advisory Board meeting hosted by Microsoft and the NEW Digital Alliance. Based on learnings and best practices shared during the regional meeting, HSSD established a local CS Advisory Board comprised of 40 community members. One of the authors serves on HSSD CS Advisory Board as a parent and regional college professor of information systems. The CS Advisory Board stands as one of the only community advisory boards within the school district. This board has contributed to the overall vision and strategy as well as specifics on K-12 pathways and digital immersion programs across the district.

Throughout this early collaboration with Microsoft and the NEW Digital Alliance, HSSD drafted an initial written strategy covering both 3-year goals and 5-year goals. As the strategy matured, HSSD formulated 3-6-12 month tactical plans that are updated each year and align to the 3-year and 5-year strategic plans. State of Wisconsin Computer Science standards for K-8 as well as recommended CS electives for high school were implemented.

Another valuable early collaboration partner was CSforAll. CSforAll provides both a network of school districts and other educational-related organizations across the country working on growing, advancing, and implementing CS programs. CSforAll also provides content and curriculum to assist school districts in establishing and growing CS programs. The HSSD CS team attended a CSforAll workshop as well as virtual conferences since joining. Similarly, HSSD partnered with Microsoft TEALS. Girls who Code also partnered with HSSD to host a Girls who Code Event for girls in grades 5-8. Before the event was canceled because of COVID-19, over 100 girls had signed up for the event.

Finally, HSSD established the role of Digital Integrators. In each elementary school, digital integrators work with and train teachers on innovative technology, integrating technology into the curriculum and developing formative assessments. These digital integrators also meet regularly and are part of the strategic planning for the districts and included in HSSD CS Advisory Board meetings.

4.1.2 Challenges

While the community, administration, and most individual teachers supported the movement toward integrating CS into the curriculum and increasing CS-related courses at the high school, several challenges remained. Specifically, at the elementary school level, the immersion of CS into all content areas proved to be challenging. Elementary school teachers face many challenges and requirements, including managing increasingly complex and growing classrooms, parents, increasing state and district requirements, and recently COVID-related challenges. While technology integrators were added to the staff across the schools, arranging ongoing training to improve digital literacy and develop immersive experiences in all content areas provided a challenge. In addition, some teachers believed that specific content areas should not be adapted for two outcomes (content and digital immersion). While there are specific CS courses in all other grade levels, gaining immersion of the technology into the actual academic curriculum at the elementary level is a longer-term goal.

4.1.3 Outcomes

Several outcomes have been identified. The CS-related strategic plan has matured throughout the process. HSSD has developed a CS-related 3-year and 5-year plan with related 3-month, 6-month, and 12-month operations plans. Teachers at all levels are included in both the operational plans as well as the strategic plans. A strategic planning committee now includes an Assistant Superintendent, Director of Technology, several Technology Integrators, and teachers from elementary, intermediate, middle, and high school.

At the high-school level, HSSD is measuring student enrollment in various CS-focused courses. Anecdotally, they are seeing students encouraging other students to enroll in classes, so they meet the required 13-student minimum. All courses that have been offered have run and the number of courses is increasing, especially at the high school level. Administrators can also track the progression of courses as students advance through the offerings. The data is too new to draw any conclusions. It is hoped that the increase in required digitally focused courses at the elementary, middle, and intermediate schools will drive interest and enrollment in high school courses. Similarly, as new high school courses are developed, HSSD is working closely with regional 2-year and 4-year colleges and universities to ensure the courses are aligned with offerings at the post-secondary level and offer students either dual credit or advanced standing. The goal is to ensure students have a pathway to continue their education. Many courses aligned with the Wisconsin DPI Digital Technology Career Pathways.

4.2 The Hortonville Area School District Approach

Hortonville Area School District is a small but growing school district located in Northeast Wisconsin and primarily serving the communities of Hortonville and Greenville. In 2019-20 the district had a total enrollment of 4,135 students. The district has three elementary schools (K-4), two middle schools (5-8), and a single high school with 1,150 students.

In 2016, one of the math and computer science high school teachers in the district retired, opening a position for the current computer science teacher, who had realized that very few schools were doing STEM education well, so she decided to go through Code.org training to become certified to teach computer science and put some of her ideas into practice. Hortonville was one of the first districts in the region to join the TEALS program after two Microsoft leaders (Michelle Schuler, Manager of TechSpark Wisconsin, and Brad Smith, President), met with district administrators to introduce the program. By having IT professionals as volunteers in the classroom, the district was able to start offering AP Computer Science A to students without having a CS qualified teacher.

4.2.1 Implementation

The district strategy has revolved around strong industry collaboration and input in developing their own robust computer science courses that address industry needs. Hortonville has implemented a robust local CS Advisory Board with strong representation from industry as well as participation from teachers, district administrators, and the district's curriculum director. One unique aspect of the board is that the board is co-chaired by a student and the high school principal with the student facilitating the meeting. In recent years, the district has had a number of students in the CS program both strong technical and leadership skills who have had an impact throughout the region. Student Sam Schiedermayer presented at regional CS Advisory Board and was featured in IoT (Insight on Technology) Magazine (Thiel, 2019). Similarly, student Grace Vandenheuvel interned with NEW Digital Alliance and facilitated large panels at the annual NEW Connect IT event.

The CS Advisory Board plays a significant role in determining strategy and direction for CS offerings. The district looks to industry for input on which classes to offer. One example of this industry-focused mindset was to move the introductory programming class from C++ to Python. The district has worked with a local insurance company to establish a youth apprenticeship program where students will work in the IT department of the company while still going to school. Through this program, students gain valuable real-world skills, including writing code to be deployed to the production environment.

At the middle school level, the district has implemented a digital literacy requirement that is integrated into required courses like English, social science, and math. This is supported by a Technology Coordinator, who works with teachers to integrate concepts and technologies into their classes. In addition, they offer a few IT-related clubs, including WIT4Girls and Girls Who Code.

4.2.2 Challenges

Some of the challenges faced by Hortonville included:

- Getting enough student enrollment, especially girls.
- Teacher availability
- Teacher training
- Lacking a ready-made curriculum for data analytics
- Avoiding classes being cancelled for low enrollment – making sure CS classes are not competing against each other for the same students.

4.2.3 Outcomes

Industry involvement in the form of the CS Advisory Board had a significant influence on class offerings in the district. The board helped the district develop a pathway from Middle School through high school, introducing the right classes in high school, establishing a Youth Apprenticeship program for IT, and establishing coding clubs in the middle schools.

4.3 The Sheboygan Area School District Approach

Sheboygan Area School District is located in Eastern Wisconsin about an hour north of Milwaukee and an hour east of Fond Du Lac. The area is home to several large companies, including Kohler Company, Acuity Insurance, and Johnsonville Sausage. Due to its relatively isolated location, companies have had to rely on local talent development and have had a tradition of supporting the local workforce development efforts.

The district is the largest of the three we looked at with approximately 10,000 students and two high schools, Sheboygan

North (1,489 students) and Sheboygan South (1,040 students). In addition, they have three middle schools and ten elementary schools. The district also offers eight charter school options at various levels.

The Sheboygan area is home to two institutions of higher education, Lakeshore Technical College (LTC), which is part of the state's public Technical College System, and the private 4-year institution, Lakeland University (Lakeland). Both institutions have had a history of collaboration with local businesses and other educational institutions.

Prior to the 2019-20 academic year, the CS offerings in the district had been similar to many other school districts: a hodgepodge of offerings with no clear direction or reason for including courses. They did have a very popular district-wide coding club for elementary students and had done some work to establish an E-sports team, but were not able to get it all put together.

4.3.1 External Collaboration

When Acuity Insurance had difficulty attracting the necessary IT talent, they approached the school district for help. The district quickly realized they did not have the resources to support the needs, so they brought in LTC and Lakeland University. During the initial discussions, the partners decided to develop a larger program that would go beyond the needs of Acuity. They designed a program called College Here and Now[2] here students would be able to take an associate degree in web and software development while in high school through courses offered by LTC. After high school, students would be able to either find employment immediately based on their associate degree or continue their education at Lakeland University and complete a bachelor's degree in Management Information Systems in two years.

The LTC courses were offered at both high schools in classrooms that were furnished by LTC and branded to look like college classrooms to give students a strong sense that they were participating in a college program. LTC is expanding the College Here and Now initiative to other smaller school districts in the area through online and remote class delivery allowing students in smaller and rural districts to access the courses.

Outside of collaborations with LTC and Lakeland, the Sheboygan Area School District has participated in the NEW Digital Alliance regional CS Advisory Board as well as in that organization's NEW Connect IT job and career fair aimed at high school students. Outside of this, they have not collaborated strongly with other partners. Prior to College Here and Now, Sheboygan South had a well-functioning advisory board working on a computer science pathway. However, this was abandoned after College Here and Now was launched.

4.3.2 Implementation

College Here and Now was launched in Fall 2019 with a lot of excitement and much stronger demand than initially envisioned. While having a goal of 10 students at each of the two high schools, a total of 103 students signed up for the program initially. In the first year, those students received three courses in programming, databases, and web development. Two courses were taught by LTC instructors and one by a high school instructor.

At the middle and elementary school levels, no IT or CS coursework was offered – neither as standalone courses nor through structured integration into existing courses. Several schools did have clubs and extra-curricular activities where students learned and gained experience outside of formal classroom settings.

4.3.3 Challenges

The program encountered several challenges along the way. These fall into three categories:

4.3.3.1 Expectations of College-Level Courses

There was a mismatch between student preparation/maturation and the college-level expectations of the courses.

- The entry-level LTC course was seen as not appropriate for high school students. Work is currently underway on developing a better entry-level course.
- The maturity level of some of the students – especially among those in their first year – was not high enough to handle the college-level coursework.
- The school district did not have offerings in elementary and middle school leading to students not having much exposure to IT and CS concepts before going into college-level courses.
- The college-level classes had fewer formative assessments, which led to high failure rates among students.
- Some examples and assignments in the college-level classes assumed life experiences and interests of the typical

[2] https://www.sheboygan.k12.wi.us/programs/college-here-now

30-year-old technical college student. This made it hard for younger students to sometimes understand and care. This was especially true for female students.

LTC tries to alleviate this mismatch by allowing students to switch from college grade to transcript audit about two thirds of the way through each class.

4.3.3.2 Teacher Preparation

Finding teachers qualified to teach computer science courses is challenging for any school. Since this program relies on dual credit courses that are taught in high schools and provide college credit, the instructors must follow the same qualification standards as would be expected of the college instructors, including having a master's degree in the field they are teaching. LTC worked with the district to help qualify some high school teachers to teach the college courses.

In Fall 2020, the school district hired a computer science teacher with extensive industry experience. He has worked to revise several courses and provide better introductory experiences for the students before moving into the College Here and Now courses.

4.3.3.3 Technology-Related Challenges

The LTC courses were based on development using PCs whereas the school district provided Chromebooks to students. While LTC had computers in the classrooms, it became a challenge for many students whose families did not have their own computers. The school district was able to resolve this by providing PCs to students in this situation. The program also faced issues with lack of broadband access for many families - similar to what many schools have faced during the COVID-19 pandemic.

Internet access in high schools is severely limited by filtering which sites students have access to. It became necessary to create allowed lists of websites that students would be able to access from the LTC classrooms to support working on assignments and looking up reference materials.

4.3.4 Outcomes

Because of the College Here and Now program, the school district was able to provide a robust course offering to students without needing to hire additional teachers. LTC gained significant brand recognition among students and parents and saw significant publicity around the initiative. While the program is too new to have produced students who have earned an associate degree while in high school, many students have earned some college credits through the program and earned valuable IT/CS skills. The first associates degree graduates are expected in spring 2022. Because of the success of the program at Sheboygan, the program is being expanded to other nearby school districts.

4.4 Assessment of High School Courses

During our research, we identified many CS/IT-related courses offered across the three school districts. We used the five career pathways identified by the Wisconsin Department of Public Instruction (DPI) to categorize the course offerings. These pathways include:

- Business Analysis and Project Management
- Software Development and Programming
- Network and Systems Infrastructure
- Cybersecurity
- Data Technology

Table 3 lists all the courses offered in the three districts by the DPI Career Pathways with a more detailed breakdown of Software Development and Programming to identify clusters of courses in this area. Several digital technology courses offered in the districts do not match with any of the DPI pathways, so we listed those separately in Table 4.

The analysis shows that programming and software development courses are the most commonly available across all districts with 23 out of the 32 courses offered. All three districts have robust offerings in this area – and it's the only category where all districts have offerings. We did not find any courses offered in Business Analysis and Project Management, though it is possible that some aspects of these areas are covered in programming courses. The remaining three categories have a few offerings in some of the districts.

As the largest district, and with support from LTC and Lakeland, Sheboygan has the widest set of offerings with the other two districts having fewer offerings in a narrower set of areas. It should be noted that we did not evaluate how frequently courses run or the number of students enrolled.

DPI Pathway	Category	HSSD	Hortonville	Sheboygan	Category Count	DPI Count
Business Analysis & Project Management					0	0
Software Development and Programming	**Programming**	• Coding • Advanced Placement Computer Science Principles • AP Computer Science A	• Computer Programming I • Computer Programming II • AP Computer Science A - TEALS • AP Computer Science Principles - TEALS	• PLTW Computer Science Principles 1 & 2 • Programming Introduction – LTC (taught by SASD) • Object Oriented Programming 1 – LTC Course • Object Oriented Programming 2 – LTC Course	11	23
	Web Development	None Identified	• Multi-Media & Web Design • Advanced Multi-Media Web Design	• Advancements in Web Design & Development • Digital Web Design • Web Development 1 – LTC Course (taught by SASD) • Web Development 2 – LTC Course • Web Development 3 – LTC Course	7	
	Mobile App development	• Mobile Application Design and Development	None Identified	• Mobile Device Development 1 – LTC Course • Mobile Device Development 2 – LTC Course	3	
	Video Game Development	None Identified	• Computer Animation and Game Design	• Advanced Programming & Game Development	2	
Network & Systems Infrastructure		None Identified	• Cisco Networking I • Cisco Networking II	• Cisco IT Essentials	3	3
Cybersecurity		• Cybersecurity and Ethical Hacking	None Identified	• Web Security (South HS only) - Lakeland University	2	2
Data Technology		• Artificial Intelligence • Solving Big Problems with Big Data	None Identified	• Introduction to Database Design & Development – LTC Course • Database Basics - Lakeland University online	4	4
	Total:	**7**	**9**	**16**	**32**	**32**

Table 3. Course offerings at the three school districts categorized by DPI Career Pathways

Several of the digital technology courses offered did not fit into any of the DPI Career Pathways. Those courses are listed in Table 4, and include course work on general office technology, such as Microsoft Office. We also identified courses that were computer science introductions as well as applications of digital technologies in areas such as robotics and digital marketing. Howard-Suamico also offered several courses in video game design that did not appear to have a software development component to them.

Category	HSSD	Hortonville	Sheboygan	Category Count
General Office Technology	Business Communications	• Keyboarding • Office for the 21st Century - FVTC • Microsoft Information Management • Advanced Microsoft Office - FVTC	• Microsoft Office Specialist 1 • Microsoft Office Specialist 2	8

		• Computer Applications		
CS Intro	Keys to Computer Science	None	Intro to Computer Science	2
Digital Applications	• Digital Marketing • E-Sports • Introduction to Robotics • Robotics I	None	• Exploring Robotics and Automation (North HS only) • Computer Modeling for Robotics	6
Video Game Design and Graphics	• Video Game Design and Development 1 • Video Game Design and Development 2 • 3D Character Creation and Animation • Intro to Digital Media/Graphics	None	None	4
Total:	**10**	**5**	**5**	**20**

Table 4. Digital Technology Course offerings that do not fall under any of the DPI Career Pathways

5. Discussion

In this case study, we explored the adoption of computer science and information technology coursework across three school districts in Northeast Wisconsin. Many of these collaboration opportunities originated from the founding and maturation of the NEW Digital Alliance as a central hub for collaborative solutions for the CS talent shortage across Northeast Wisconsin (Muraski, et al., 2021).

5.1 Drivers

RQ1: What was the driving force for these school districts to increase their CS/IT course offerings?

First, all three school districts identified the engagement of local and regional businesses. In the Howard-Suamico School District, these industry partners communicated expectations to administrators for all students to graduate with a wide range of digital skills. The Computer Science Advisory Board includes many parents representing many large employers from around Green Bay who highlighted the ongoing need for more digital and technical skills from all graduates. In the Hortonville Area School District, the CS advisory board had strong participation from local companies. This board provided input to drive the offering of courses that would be valuable to industry and instrumental in adding required digital literacy elements in core middle school courses like English, social science, and math supported by technology integrators. At the high school level, progress was driven in large part by a dedicated and qualified computer science teacher. In Sheboygan Area School District, the need for skilled IT workers was felt acutely by one of their largest employers in the region. Across all three school districts, the driving force for increasing CS/IT course offerings and additional digital skills came from local business and industry encouragement.

Second, all three school districts faced a push from outside groups to offer more CS.IT course offerings. These groups included Teals (Microsoft), NEW Digital Alliance, local Chambers of Commerce, and the Wisconsin Department of Public Instruction (DPI). Third, two of the school districts highlighted the role of specific teachers and their interests in growing CS/IT courses. These two teachers were actively recruited and asked to spearhead new CS/IT course development. Surprisingly, we did not identify additional funding as a significant reason for school districts to provide additional coursework in CS/IT. In other words, money was not a direct source of motivation for the school districts. We also did not find that parents and students were significant drivers of additional courses. While a few parents with a background in IT did engage in the advisory boards at Hortonville and Howard-Suamico, we did not see a broad push from parents and students. In fact, both Howard-Suamico and Hortonville struggled to get enough enrollment in their classes.

5.2 Collaboration Networks

RQ2: How have individual school districts interacted with the existing collaboration network in building their CS/IT course offerings?

Considerable interaction occurred between the school districts in the existing collaboration as they built their CS/IT course offerings. The Howard-Suamico School District collaborated with the Regional CS Advisory Board to learn about options, partners, and pathways across Northeast Wisconsin and beyond. HSSD then established its own CS Advisory Board to increase engagement with the community, including parents, industry partners, large employers, and post-

secondary schools. Initial collaboration with the NEW Digital Alliance and Microsoft TEALS led to the integration of CSforAll and TEALS into the schools. HSSD also utilized technology integrators in the K-8 grades to build digital skills into the curriculum and grew student interest in enrolling in more CS-related courses in high school. The Hortonville Area School District has been influenced strongly by external collaborations. They were early adopters of Microsoft TEALS and established Youth Apprenticeships with local companies. They also participated strongly in the Regional CS

Advisory Board. They took advantage of several collaborative opportunities throughout the region, including TEALS meetups with other teachers and industry volunteers, DairyLand Computer Science Teachers' Association, and Code.org training at Marquette University. The Sheboygan Area School District experienced collaboration between the school district, the technical college, and the university to develop an accelerated pathway from high school through an associate degree in web development to a bachelor's degree in management information systems. The effort relied heavily on dual-credit coursework offered by the technical college in the high schools and strong articulation agreements between the institutions, allowing students to efficiently bring all their credits from high school. All three school districts benefited from a mature collaboration network across Northeast Wisconsin. Collaboration network maturation results in improved collaboration and increased innovative outcomes (Muraski, et al., 2021).

5.3 Challenges

RQ3: What challenges did school districts face as they sought to increase their CS/IT course offerings?

Each school district faced challenges as they sought to increase their CS/IT course offerings. In the Howard-Suamico School District, integrating CS/IT into the elementary curriculum faced several challenges. In addition, both Howard-Suamico and Hortonville faced challenges in getting enough enrollments in high school courses, especially female students. Hortonville and Sheboygan were challenged by the lack of teacher availability and concerns about teacher training and qualifications. The Sheboygan Area School District experienced strong interest among high school students, but soon realized the courses were challenging and not all high school students were prepared for the rigor of college coursework. The school district and the technical college are now working on developing more appropriate introductory coursework to prepare students better. Finally, the school district was also challenged by technology availability since students needed PCs for the classes, but the school district was based on Chromebooks. This was overcome by the district making PCs available to students who needed them.

6. Conclusion

Growing technology-related skills in our K-12 schools will benefit students in many areas of society, home, and personal life. Industry demand for information technology-related skills continues to soar. Despite the personal and societal benefits, high job demand, and high salary, high school students are not pursuing CS/IT-related majors or careers at a rate that can meet demand. We describe three different approaches taken by three different school districts to respond to these efforts in collaboration with local industry and other institutions.

The Howard-Suamico School District responded to parents and regional businesses in growing their offerings of technology and programming courses. Working through the Regional CS Advisory Board, HSSD established a local CS Advisory Board to provide input on curriculum structure. HSSD utilized the CSforAll framework and TEALS volunteers in building technology into the entire K-12 curriculum.

The Hortonville Area School District relied heavily on input from local industry in shaping their offerings. As an early adopter of the TEALS program, they leveraged industry professionals to support classroom teachers in offering coursework that would otherwise not have been possible to put up. They used their local CS Advisory Board to provide input on class content and curriculum structure, including integration of a digital literacy requirement in middle school. The CS Advisory Board was also notable for its inclusion of students in co-leading the board. The district had a qualified CS teacher with strong ideas on how to organize a CS program for high school students, which also contributed to their success.

The Sheboygan Area School District has long-standing connections with local industry and a tradition of collaborating on talent development issues in the local area. When local companies were facing problems finding IT talent they reached out and established a collaboration with the school district and two local higher education institutions to establish a new program called College Here and Now. Through this program, Lakeshore Technical College offered an associate degree in web development at the high schools, and Lakeland University allowed students who completed the associate degree to transfer all credits and complete a bachelor’s degree in Management Information Systems in two years. In effect, this allowed students to earn a bachelor’s degree in two years following high school. The technical school set up two

classrooms inside the high schools dedicated to the program that were furnished and branded as college classrooms.

There are two key limitations to this study. First, this paper focused on only three school districts. It could be insightful to explore additional school districts in the same geographic area or school districts in different geographical areas to increase generalizability. Second, this study did not include all perspectives. While we attempted to include regional leaders, administrators, industry leaders, parents, and teachers, we acknowledge that we only captured limited perspectives. Wider interviews and surveys could yield richer results and greater insight into the approaches and collaboration these school districts underwent.

There are several paths for future research. First, issues of diversity, including racial and gender, have not been addressed in this research. Efforts to recruit women and racially diverse students deserve added attention. Second, the role of technology integrators should be explored. Digital integrators are those that help teachers incorporate technology and digital skills directly into the curriculum. Schools may not have time or educators to offer specific technology-related courses at all grade levels. By embedding technology and digital skills into the curriculum, schools can ensure students are able to apply these 21st century skills while focusing on core curriculum learning. Finally, research including a broad survey of stakeholders in K-12 education could shed additional light on this issue. Stakeholders would include parents, students, teachers, administrators, local organizations, industry leaders, as well as former students.

This study argues that collaboration maturation throughout the Northeast Wisconsin region facilitated the expansion of computer science offerings within school districts. Similarly, the use of regional partnerships, collaboration, and industry partners increased the likelihood of school districts being successful with their efforts. While the IT/CS talent shortage remains, these school districts have taken steps to address the need.

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Author Biographies

John Michael Muraski is an assistant professor of information systems in the College of Business at the University of Wisconsin – Oshkosh. After 20 years of working and consulting in industry, he transitioned into higher education and earned his DBA at the University of Wisconsin – Whitewater. Over the last 10 years, he has taught at both the undergraduate and graduate level and led the development of several new programs, include the ERP and Business Analysis programs at UW Oshkosh. Dr. Muraski conducts research into two main areas: (a) new technology characteristics that enhance infusion between a software and an employee in an organizational context and (b) challenges and opportunities relating to high school and college student reluctance to explore technology-related educational pathways.

Jakob Holden Iversen is a Professor of Information Systems with 20+ years of experience in higher education teaching, research, and administration. He currently serves as Associate Dean for the College of Business at University of Wisconsin Oshkosh. He earned his Ph.D. at Aalborg University in Denmark with a focus on Software Process Improvement. He has been at UW Oshkosh since 2000 where he has taught a range of courses at both the undergraduate and graduate level in Information Systems. Throughout his time at the University of Wisconsin – Oshkosh he has worked on creating new degree programs in collaboration with other departments as well as other universities in the University of Wisconsin System. This included leading the development of the Interactive Web Development Management major, the Information Systems minor, and participation in the creation and redesign of a number of other degree programs. As a scholar he has published in leading academic journals including MIS Quarterly, and is the co-author of two textbooks on Mobile app development and C# programming. A recent focus for his research and teaching has been in the area of mobile app development and usage.

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Digital and Non-Digital Distractions for IT Professionals' Remote Work

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Abstract

The pandemic has forced many firms to adopt remote work practices. However, recent surveys show that remote work productivity is mixed. Primary negative factors against productivity are digital and non-digital distractions at home. Considering that IT professionals heavily rely on digital devices, how is their remote work productivity affected by digital and non-digital distractions? The survey data from 60 IT professionals shows that IT professionals' productivity is not significantly affected by digital distractions compared to those in their office work. On the other hand, non-digital distractions at home lower their productivity. However, their work/life goal commitment counters distractions at home. Implications and future research agendas are discussed.

Keywords: Digital distraction, non-digital distraction, remote work, work performance, distraction-conflict theory, self-determination theory, goal commitment

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1. Introduction

The COVID-19 pandemic has dramatically increased the extent of remote work practice worldwide. According to the 2021 Upwork survey (Ozimek, 2021), nearly 60% of U.S. workers work from home, and 41% are fully remote workers. When it comes to productivity, the 2021 Owl Labs survey (Owl Labs, 2021) notes that those remote workers are as productive or more than when they work in the office. However, a 2021 study by the University of Chicago (Gibbs, Mengel, & Siemroth, 2021) reports that remote work productivity declined by 8-19%, especially among women and workers with children at home. In other words, distraction at home may hurt remote work performance.

Besides distractions at home, digital distraction is prevalent. A recent survey shows that 21% of working hours are used for entertainment, news, and social media and 40.1% of the respondents multitask with communication tools for checking email and IM, on average, every 6 minutes (MacKay, 2019). At the same time, one-third of us continue working while on vacation as digital technology use changes the way we work (Buchanan, Kelley, & Hatch, 2016). Reliance on digital devices can be a double-edged sword. They enable work by removing the constraints of office presence and work hours. At the same time, they allow access to non-work communication and online enjoyment during work – a source of unsought distractions.

How is IT professionals' productivity of remote work affected by digital and non-digital distractions? Previous studies (e.g., Bailey, Leonardi, & Barley, 2012; Hafermalz & Riemer, 2021) indicate that remote work performance generally depends on the type of work. The work of IT professionals heavily depends on accessing digital devices regardless of work locations. The study then posits that their digital distractions at work are not significantly different from those at home. However, non-digital distractions at home are a significant factor in the work performance of IT professionals at home. Furthermore, the study hypothesizes that the higher the degree of goal commitment, the higher the remote work performance of IT professionals.

To examine the hypotheses, we collected data in 2021 from alumni of an IT college who engage in remote work as IT professionals for two days or more every week. The analysis of a survey questionnaire from 60 IT professionals shows that remote work performance is positively associated with the extent of goal commitment at work and in life. In addition, the level of their digital distractions is positively associated with their mobile phone dependency but negatively so with age. While digital distractions were not a factor in their performance, those IT professionals were negatively affected by non-digital distractions at home.

The structure of the paper is as follows. We first review the extant studies on digital distraction and then present our hypotheses, followed by the research method and results. Finally, we discuss research implications and conclusions.

2. Literature Review

Past studies on digital distraction are seen predominantly in educational settings. For example, the extent of digital distraction is alarming among college students as reading from screens has become increasingly commonplace, and younger generations like to multitask (Liu, 2021). Szpunar, Moulton, and Schacter (2013) reviewed studies before 2013 and summarized "the prevalence of attentional lapses and mind wandering in the classroom and during online learning" (p. 5). More recent studies include Duncan, Hoekstra, and Wilcox (2012), Dobler (2015), Hart Barnett (2017), Chen, Nath, and Tang (2020), and Huang, Zhang, Burtch, Li, and Chen (2021). Studies that focus on business and remote work settings started appearing relatively recently (e.g., Hafermalz & Riemer, 2021; Rosen & Samuel, 2015; Sciandra & Inman, 2016; Wrycza & Maślankowski, 2020).

There are four categories of findings and observations of the extant studies: (i) pervasiveness, (ii) consequences, (iii) causes and contributing factors, and (iv) solutions of digital distraction. First, the phenomenon of digital distraction is commonplace in our lives. Berthon and Pitt (2019) note, "Simply, we live in an age of digital distraction" (p. 132). A recent study by Pew Research Center shows that 85% of US adults go online at least once and that 31% say they are almost constantly online. University students used their digital devices nine times during daily classes for non-class purposes, according to a 2018/19 survey conducted by (McCoy, 2020). Chief consequences of distraction are inattention (Szpunar et al., 2013), reduced attention span (Hanin, 2021), incomplete note-taking (Flanigan & Titsworth, 2020), and poor academic performance (Duncan et al., 2012) in the school settings.

Studies noted a variety of distraction causes and contributing factors. They include distracting websites such as YouTube (Belo, Ferreira, & Telang, 2014); excessive dependence on social network sites and social games (Kwon, So, Han, & Oh, 2016); overuse of digital devices coupled with forms of anxiety that border on obsession or compulsion - FOMO (fear of missing out), FOBO (fear of being offline), and nomophobia (fear of being out of mobile phone contact) (Rosen & Samuel, 2015); anxiety, escapism, and distraction by others' cyberslacking (Taneja, Fiore, & Fischer, 2015); attentional impulsiveness, internet addiction, and habitual technology use (Chen et al., 2020); habitual digital device use (Sciandra & Inman, 2016); and digital device dependence and even mere presence of the digital device (Hanin, 2021). Among college students, the top four sources of digital distractions are constant social networking, instant messages, alerts, and email temptation (Liu, 2021).

Regarding solutions to minimize distractions, Rosen and Samuel (2015) proposed the strategic use of digital tools by systematically turning away from the information stream that digital devices give us. Although multitasking is commonly seen as a way to improve efficiency, people multitasking frequently perform poorly in organizing thoughts and screening irrelevant information (Agrawal, Sahana, & De', 2017). Thus, Agrawal et al. (2017) recommend stopping to multitask, turning off notifications, and limiting visits to time-inducing websites. Other suggestions include time pressure to accomplish tasks (Wu & Xie, 2018), mindfulness as remembering and returning to activities and tasks at hand (Berthon & Pitt, 2019), and not using digital devices (Aaron & Lipton, 2018). Biedermann, Schneider, and Drachsler (2021) examined the outcomes of 16 publications on 28 digital self-control interventions – for instance, apps and browser extensions to block certain apps and websites, and to enhance self-awareness of distraction through visualizing device usage statistics. The effectiveness of those digital self-control interventions is limited if they solely rely on self-awareness of distraction.

While most extant studies do not offer a theoretical framework, Nicholson, Parboteeah, Nicholson, and Valacich (2005) applied the distraction-conflict theory (Baron, 1986), which focused on the impact of others' presence as a source of arousal. However, whether the distraction-conflict theory is applicable or not remains to be seen, given the theory was proposed well before the digital era.

This study examines the applicability of the distraction-conflict theory in the context of digital distraction. However, this theory does not address the factors for bringing in a source of arousal, one of which is digital device use. Then, we apply a psychological theory that can explain the motivations that remote workers allow themselves to be distracted by digital and non-digital distraction sources.

3. Hypotheses

This paper focuses on the impact of digital distraction in the context of remote work. We define digital distraction as unintended, unplanned, or undesired interruption of work at hand through digital device uses.

Today's global, distributed IT development environment routinely demands IT professionals to engage in work outside of both their office space and the usual 9-5 work hours. Thus, digital distractions are deemed not significantly different between work and home for IT professionals. However, non-digital distractions may pose a challenge for them. The counterforce to those distractions is their commitment to achieving goals. The self-determination theory (Ryan & Deci, 2000; Ryan, Deci, Vansteenkiste, & Soenens, 2021) posits three psychological needs – autonomy, competence, and relatedness – play roles in one's psychological well-being and autonomous motivation. Remote workers need to feel in charge of their professional activities (autonomy), advance their professional knowledge and skills (competency), and experience the sense of being connected to colleagues (relatedness). Thus, we posit the level of one's goal commitment increases remote work performance. Work-life balance is often considered a personal issue (Emslie & Hunt, 2009). However, the absence of work-life balance or conflict can often cause poor job performance (Yasbek, 2004), decreased employee satisfaction, and organizational commitment (Talukder, 2019). Therefore, it is imperative to investigate employees' work performance by simultaneously considering their personal life and work factors. The global pandemic is reshaping the work-life balance issues because many employees need to work from home remotely. The dramatic changes create urgent business continuity and work-life balance challenges. Many companies now need to manage the remote work performance of employees by developing a remote-friendly working environment, digital working norms, new work-life balance policies, and productive collaboration systems (Gigauri, 2020).

With working environmental shifts, employees have more flexibility and time to value their personal life as much as their job performance. For instance, many employees can now manage the immediate duties of the family (e.g., chatting with children, cycling outdoors, eating, and helping with homework) during the family's Golden Hours (12:30-13:00) on working days (Leanai, 2022). Work-life balance is highly related to an employee's psychological well-being and overall sense of harmony in life (Clark, 2000). People with high work/life goal commitment are committed to fulfilling their duties in family and workplace roles and

related goals. With the time saved for commuting and the advantage of attending to the immediate needs of family members, IT workers who have goal commitment in work and life are more likely to be motivated to complete tasks efficiently and productivity at home. Thus, we propose:

H1: Remote work performance of IT workers is positively associated with the extent of goal commitment in work and life.

Some organizations are open to employees working from home because they believe their employees are more productive and communicative when working from their comfort space/home zone. Other organizations consider that employees working from home may get distracted and become less productive. Although IT workers' remote work performance may vary among individuals, digital distraction could impact remote work performance differently. Digital distraction refers to the situation where people are distracted by a digital technology device, such as a smartphone, laptop, game console, while engaging in a primary task domain (e.g., completing a job-related task and homework before the deadline). When IT workers constantly attend to non-work urgency needs (e.g., text messaging, emailing, web surfing, social media, and playing games), their remote work performance could be negatively affected.

Many studies have shown the negative correlation between digital distraction and employee performance, productivity (Chen et al., 2020), self-regulation, and work engagement (Orhan, Castellano, Khelladi, Marinelli, & Monge, 2021). IT workers could experience more frequent digital distractions when working at home because it is easier for them to switch between job-related and non-job-related tasks constantly. Humans cannot multitask because their average screen time focus is 47 seconds (Kundal, 2020). IT workers need to perform multiple tasks on multiple devices constantly. As such, they are more likely to have a higher chance of digital distraction, causing them a higher cognitive workload, making more mistakes, and having decreased job performance. Thus, we propose:

H2: Non-digital distraction at home negatively impacts IT workers' remote work performance to the extent they have non-work urgency needs.

Millennials, now the largest generation in the workforce, have extensively used Internet technologies for non-work-related reasons while at work (Kim, 2018). Such cyberloafing activities are prevalent in the workplace because the boundary between work and non-work is becoming blurring with the prevalence of Internet technology (Lim & Teo, 2005). It is common for companies to implement Internet monitoring tools so that employees will not be distracted from streaming videos and non-work-related websites. Many studies have shown that these distracting activities are still prevalent in many workplaces despite these efforts. For instance, a study shows that employees spend an average of 2.09 hours out of 8 hours of workday surfing non-work-related sites (Martin, Brock, Buckley, & Ketchen Jr, 2010). Internet distractions have resulted in poor job performance, low morale, and resentment of the monitored employees.

Many IT employees are working remotely. Companies are utilizing alternative Internet monitoring tools to achieve the same purpose. For instance, some companies have implemented monitoring software on the company computer to track email activities (Kalantari, Put, & Decker, 2021) and productivity. Other companies leveraged project management apps to track the task completion rate and workload (B. Wang, Liu, Qian, & Parker, 2021). The alternative PM software can further provide social support and increase job autonomy. Although it may seem harder for companies to implement the same Internet monitoring tools in the workplace, this alternative monitoring software designed for remote work could be as effective as those traditional monitoring tools. Therefore, it is unlikely that remote work performance of IT workers could be affected more by cyberloafing activities than those workers at the workplace. Thus, we propose:

H3: Digital distraction at home watching online videos and browsing non-work-related websites does not affect the remote work performance of IT workers compared to the same digital distraction at work.

When users depend on smartphones, they often exhibit one or many of these symptoms: (1) excessive use in numerous calls and messages, (2) interference with daily routine activities, (3) a graduate increase in use to obtain the same satisfaction, level, (4) need to upgrade the old functioning phone to a new model of phone, and (5) the increase of social anxiety without phone use is prohibited (Choliz, 2012). When people become dependent on smartphones, they often experience more distractions and interruptions in work life. Consequently, smartphone overuse can result in a loss of productivity for people (Duke & Montag, 2017). Digital nomads who do not have high levels of discipline and self-discipline can easily fall into the trap of smartphone dependence. As a result, distractions from non-work activities could become problematic when it starts interfering the time and attention the digital nomads need to spend on their work-related activities. Therefore, the higher the mobile phone dependency, the greater extent of digital distraction IT workers will experience when working remotely. In addition, the younger the remote workers, the more likely they depend on mobile phones, and consequently, they are distracted from their work. Thus, we propose:

H4: The extent of IT workers' mobile phone dependency influences digital distraction at home.

While mobile phone dependence can be seen in any age group, a recent survey (Pew Research Center, 2021) shows that younger adults (18-29) rely on smartphones more than other adult age groups. Many studies have discovered this issue in people of younger age groups, including children (Park & Chung, 2015), college students (Hao et al., 2019), and adolescents (Rovithis et al., 2021). Indeed, the medical literature reports mobile phone addiction among adolescents and young adults (Choliz, 2012; Ozkan & Solmaz, 2015; Subramani Parasuraman, Yee, Chuon, & Ren, 2017). Therefore, we posit:

H5: The younger the IT worker, the more digital distraction is seen at home.

Our conceptual model is as follows.

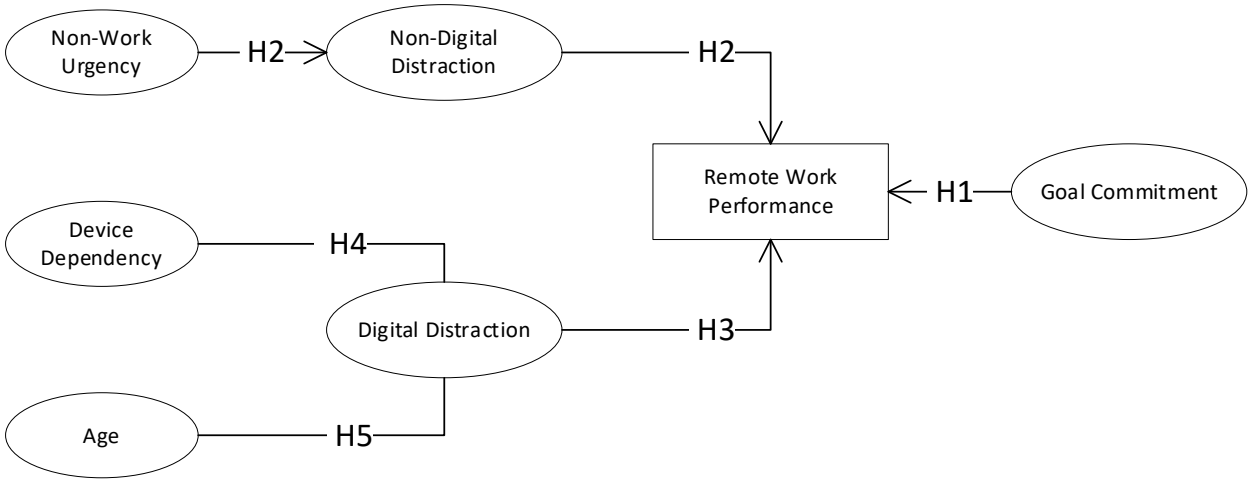


Figure 1. Conceptual Model

4. Method

We collected data in 2021 with a survey questionnaire to alumni of a mid-western university who took a graduate systems development course between 2011 and 2018. We contacted 691 alumni and asked them to participate in the survey with a $3 Amazon.com gift card if they lived and worked full-time in the US and worked remotely at least two days/week in the past three months. We had 87 valid returns (an effective response rate of 12.6%). This study used the data from 60 of those whose work was IT, given the nature of remote work varies by work type (Hafermalz & Riemer, 2021).

Each variable was assessed with the 7-point Likert scale (1 - strongly disagree, and 7 - strongly agree). Remote Work Performance (RWP) was evaluated with the question, "I am as productive at home, compared to working at the office," adapted from Y. Wang and Haggerty (2011). The constructs for Digital Distraction (DD) and Non-Digital Distraction (NDD) were adapted from Chen et al. (2020). DD was measured by the question form, "While working, I stop the task and [*distraction source*] more than I do at my office," where the distraction sources were "read/write private email/text messages," "visit social network sites," and "view online videos (e.g., YouTube) and non-work-related website sites." NDD used the question form, "While working at home, I [*distraction source*]" where the distraction sources are "frequently stop working and attend to my family/pet/household matters," "take a break more often than I would at my office," and "frequently do chores setting aside the work tasks I am having." Device Dependency (DEP) was assessed with the question form, "I feel uncomfortable unless I have access to [*device type*] all the time," where the device types were "mobile phone" and "PC/Mac/notebook/tablet device." Those survey questions are shown in Appendix A.

We compared the first and second halves of DD, NDD, DEP, and RWP data items to test the sampling bias. We used the Kruskal-Wallis test with 10,000 Monte Carlo simulation samples. The results show that those measurement items' first and second halves are not significantly different.

The profile of the survey respondents is summarized in Table 1 below.

Table 1. Respondent Profile

Gender	Age	Remote Work Frequency
male (60.0%)	20-29 (15.0%)	2-3 days/week (10.0%)
female (38.3%)	30-39 (55.0%)	4-5 days/week (60.0%)
other (1.7%)	40-49 (23.3%)	6-7 days/week (30.0%)
	50 or above (6.7%)	

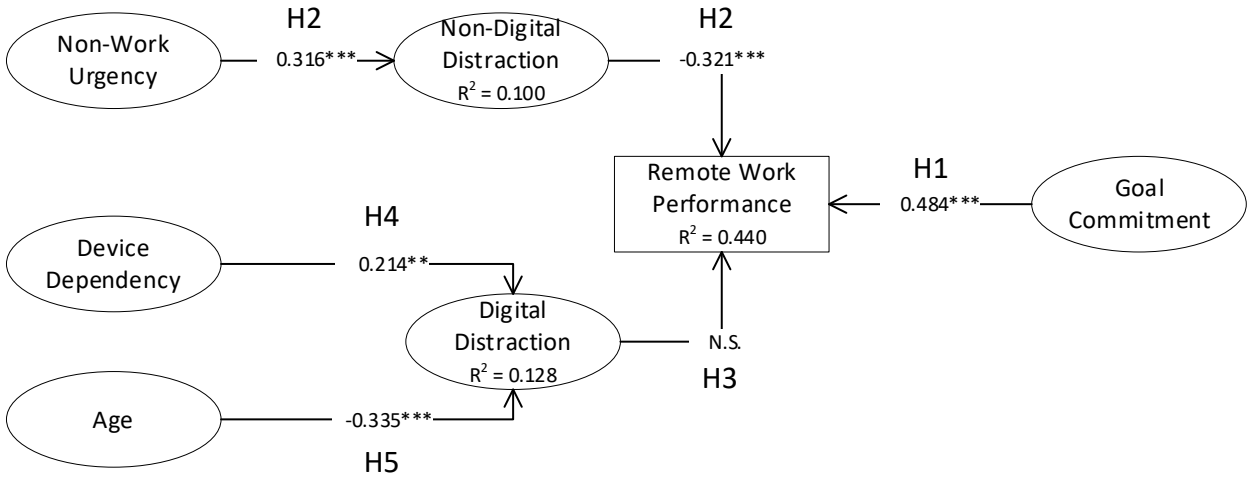
5. Results

We chose SmartPLS 3 (Ringle, Wende, & Becker, 2015) for statistical analysis. The variables for distractions, device dependency, and non-work urgency are formative since each of them depends on different distraction sources, devices, and urgency reasons, respectively. There was only one statistically significant measurement item for each of those variables, however; those statistically significant measurement items are "view online videos (e.g., YouTube) and non-work-related website sites" for digital distraction (DD), "frequently stop working and attend to my family/pet/household matters" for non-digital distraction (NDD), and "mobile phone" for device dependency (DEP). As a reference, the model has the standardized root mean square residual (SRMR) of 0.00 and the Bentler-Bonett index or normed fit index (NFI) of 1.00 (Henseler, Hubona, & Ray, 2016). The correlations among the variables are shown in Table 2. The results of the PLS analysis are given in Figure 2.

Table 2. Variable Correlations

	Age	DEP	DD	NDD	NWUN	RWP	GCM
Age	1						
Device Dependency (DEP)	0.211	1					
Digital Distraction (DD)	-0.290	0.143	1				
Non-Work Distraction (NDD)	-0.142	-0.198	0.299	1			
Non-Work Urgency Needs (NWUN)	-0.192	-0.109	0.178	0.316	1		
Remote Work Performance (RWP)	0.219	-0.136	-0.337	-0.403	-0.123	1	
Goal Commitment (GCM)	0.158	-0.140	-0.189	-0.076	0.002	0.537	1

Construct reliability indicators such as Cronbach alpha and average variance extracted (AVE) were 1.00 since there was only one statistically significant measurement item for each variable.



Path-significance: * (α = .10), ** (α = .05), *** (α = .01), n.s. (not significant)

Figure 2. PLS Results

The PLS results affirm all the hypotheses. **H1** (goal commitment positively impacting remote work performance of IT workers) is supported (β=0.484, p=0.000). This aligns well with the self-determination theory; the more commitment in life and work one has, the higher one's remote work performance. As expected, **H2** (non-digital distraction at home negatively impacting remote work performance) was also supported (β=-0.321, p=0.000). To the degree the remote workers felt non-work urgency needs, they were distracted by family matters, and then their work performance decreased. **H3** (digital distraction not affecting remote work performance) was affirmed since digital distraction was found non-significant. Finally, the results validate both **H4** (digital distraction depending on mobile phone dependency) with β=0.214 and p=0.045 and **H5** (the younger the remote worker, the more digital distraction) with β=-0.335 and p=0.003. They confirm the implications of the previous studies' findings, as we discussed in the hypotheses section.

In addition, we compared the differences in digital and non-digital distraction between IT and non-IT workers and between male and female workers. The Mann-Whitney tests show that their differences were not significant concerning "view online videos (e.g., YouTube) and non-work-related website sites" for digital distraction (DD) and "frequently stop working and attend to my family/pet/household matters" for non-digital distraction (NDD). Thus, there were no significant differences in digital and non-digital distraction between genders and between IT and non-IT workers.

6. Implications

6.1. Theoretical implications

This study builds on distraction-conflict, self-determination, and work-life balance theories and expands them to the IS literature in six significant aspects. First, theoretical understanding of digital distraction and its specific impact on information systems workers remains limited (Chen et al., 2020). This study mainly focuses on the impact of digital distraction on the remote work performance of IT workers. All subjects who participated in this study were IT workers. Second, this study aims to understand how IT workers attempt to achieve the life-work balance when working from home. This study further divides remote work distractions into digital and non-digital distractions to provide insights into the issue. This classification enables us to compare their relative influence on remote work performance. Our study shows that non-digital distraction poses a more significant influence than a digital distraction on the remote job performance of IT workers at home. The current research on job distraction remains largely on general digital distraction. Our study offers a comparative view to enrich the current IS literature on digital vs. non-digital distraction. Third, the study confirms the central finding of the distraction conflict theory of social facilitation that the negative impact of the conflict between giving attention to a person and giving attention to a task can significantly impact job performance (Baron, 1986). It is not the presence of digital devices but the attentional conflict that can negatively affect IT workers' job performance (Sanders, 1981). Fourth, our research contributes to the literature by studying specifically IT professionals who work remotely. Our finding supports the hypothesis that digital distraction does not increase or reduce work performance at home relative to the office due to IT workers' more abundant access to digital devices regardless of their work location. Fifth, life/career goal commitment plays a determinative role in remote work performance. This finding confirms the importance of autonomy and competence as the motivators for high-quality forms of engagement. Our study further expands this finding of self-determination theory to the remote job engagement and performance of IT workers. Sixth, the higher degree of device dependence, the higher degree of digital distraction IT workers will experience. In the meantime, the younger the IT workers, the more likely they are to be distracted when working remotely. These two findings offer additional insights into extraneous and demographical factors affecting the digital distraction of IT workers.

6.2. Managerial implications

Our findings have important implications for IT workers and companies allowing them to work remotely. Companies that chose not to offer remote work options are experiencing higher turnover rates for skilled IT workers. In contrast, companies that embrace remote work options can better respond to the changing demands of their workforce, especially millennials and Gen Z (Robinson, 2022a). However, these companies are afraid that employee productivity and performance could be severely affected by digital and non-digital distractions when working from home. Although anecdotal, some employers claimed that projects took longer to complete with remote work, and problems that would generally take an hour to solve in the office now require a day or longer (Cutter, 2020). To a certain extent, this issue can be attributed to the non-digital distraction at home, which our study has uncovered to have a negative effect on remote work performance. This implies that workers need to take extra care in ensuring that they protect their work time by not allowing household or family matters to interfere with their work despite them being physically at home during work hours.

Our research model provides practitioners with a holistic perspective of digital vs. non-digital distraction to IT employees working at home. Non-digital distraction appears to have a detrimental effect on decreasing remote work performance. IT workers are less susceptible to the negative influence of digital distraction at home as they are used to the similar influence even working in the office. Companies adopting remote work practices can provide mini-seminar or training sessions to educate their remote IT workforce on protecting themselves from impromptu non-digital distractions, such as impromptu visits from friends, children, pets, or family. One major challenge for remote workers is background noise in their home environment (Logitech, 2022). Achieving a better work-life balance should not be at the expense of decreased remote work performance. Companies should take a proactive approach to help their remote IT workers avoid unnecessary non-digital distraction.

Reduced operating and office space costs are two significant benefits to companies advocating remote work practices (Lund, Madgavkar, Manyika, & Smit, 2020). Remote work can also be as effective as onsite work. However, this does not mean that IT workers are no longer necessary to never come to the office and meet the team for team projects requiring more interpersonal communication. Face-to-face (F2F) or collocation meeting in the same room enables osmotic communication where team members can hear conversations in the background and join in as necessary. Collocation effectively provides positive team support, improves team communication (Eccles, Smith, Tanner, Van Belle, & Van der Watt, 2010), and enables more efficient team autonomy (Hildenbrand, Geisser, Kude, Bruch, & Acker, 2008). For instance, successful project management relies on the F2F kickoff meeting, where the project team, project sponsors, and related stakeholders get together to establish common goals and the project's purpose. Conducting F2F meetings at some important events (e.g., milestones, project kickoff) throughout a project can further improve the degree of social interactions and job goal commitment (Kotlarsky & Oshri, 2005), thereby enhancing the job performance of remote workers. Thus, companies should try to optimize the design of hybrid work options to improve the project goal commitments of their IT workers. Furthermore, as discussed in the extant literature and revealed in this study, a strong goal commitment will counteract the negative impact on remote work performance, although this does not necessarily discount the need for workers to fend off all the unnecessary non-digital distractions.

IT employees are knowledge workers. A study shows that 60% of knowledge workers have switched to working from home during the global pandemic (Forrester Consulting, 2022). Even after the pandemic, most IT workers will continue to work from home in some capacity. The landscape shift signals the growing changes in business attitudes toward remote work. One key factor discouraging companies and their IT workers from embracing remote work is a potential distraction in their home working environment. This study provides a fresh perspective on dividing distraction into digital and non-digital distraction and provides empirical evidence on their impact on the remote work performance of IT workers.

7. Limitations and Future Research Agenda

There are several limitations of this study. First, we focused on IT professionals in general. Since digital distraction depends on the types of work, future studies should investigate the impact of digital and non-digital distractions among, for instance, IT and non-IT professionals virtually "facing" clients such as remote relationship managers and tele-nurses (Hafermalz & Riemer, 2021) and professionals working under team-oriented vs. non-human-object-oriented work contexts (Bailey, Leonardi, & Barley, 2012). Second, the data were collected from graduates of IT-related master's programs in the Midwest of the US. Future studies should collect more data from professionals with different educational backgrounds in other regions or countries. Third, the study is based on the self-perception of remote workers' work performance. Future studies can use the objective measurements of work performance or the perspective of the supervisors of remote workers.

Remote work is expected to stay and will likely increase in the near future (Robinson, 2022b). As the results show the significant impact of non-digital distractions, future research should look into remote workers' family circumstances and work/life-style values. For example, assessing the research model based on children's ages at home and workers' work-life balance would be intriguing. Then, the question we should ask is perhaps not how to avoid inevitable non-digital "distractions" (e.g., care of sick infants, family emergencies) but how to cope with those "distractions" and yet to keep performing the professional tasks in the family environment. Similarly, might those who strongly desire promotions and leadership opportunities not be easily sidetracked by non-digital distractions?

8. Conclusion

How is IT professionals' productivity in remote work affected by digital and non-digital distractions? The results show that they are negatively affected by non-digital distractions but not by digital distractions. In addition, the level of their commitment to goals in work and life is positively impacting remote work performance. That is, the professional aspiration of IT workers can

keep their focus on the tasks at hand - the finding consistent with the distraction conflict theory where the negative impact of the conflict between giving attention to a person and giving attention to a task can significantly impact job performance. As remote work appears to stay in the next few years, achieving a better work-life balance should not be at the expense of poor remote work performance. Managers of IT remote workers should communicate proactively with their remote IT workers and make them aware of their non-digital distractions. Finally, it should be reminded that the study finds the influence of digital distractions non-significant in relation to those at the office of IT workers. That is, the results do not tell us that digital distractions among IT professionals do not exist. Rather, we should accept the fact that there are distractions but that the spirit of professionalism can counterbalance those distractions.

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Appendix A. Survey Questions

Each variable was assessed with the 7-point Likert scale (1 - strongly disagree, and 7 - strongly agree).

Work Digital Distraction at Home (WDDH)

- While working at home, I stop the task and read/write private email/text messages more than I do at my office.
- While working, I stop the task and visit social network sites more than I do at my office.
- While working, I stop the task and view online videos (e.g., YouTube) and non-work-related website sites more than I do at my office.

Non-Digital Distraction at Home (NDDH)

- While working at home, I frequently stop working and attend to my family/pet/household matters.
- While working at home, I take a break more often than I would at my office.
- While working at home, I frequently do chores setting aside the work tasks I am having.

Remote Work Performance (RWP)

- I complete tasks as efficiently at home, compared to working at the office.
- I am as productive at home, compared to working at the office.
- The quality of my task outcomes at home is as high as that at the office.

Device Dependency (DD)

- I feel uncomfortable unless I have access to my mobile phone all the time.
- I feel uncomfortable unless I have access to my PC/Mac/notebook/tablet device all the time.

Non-Work Urgency Needs (NWUN)

- I have non-work matters that constantly require my attention.

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College Students' Inappropriate Posting Behavior Across Social Media Sites: The Role of Friend Group Overlap

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Abstract

Research has shown that college students routinely post content on Facebook and Twitter that could be viewed as inappropriate by potential employers. Attempts to explain why students engage in this risky behavior have, so far, been inconclusive. The current paper expands the research on inappropriate posting by examining social media sites beyond Facebook and Twitter. The paper then investigates friend groups as a potential factor influencing inappropriate posting behavior. First, the degree of friend group overlap between sites is examined. Second, posting behaviors are compared between sites with high and low degrees of friend group overlap. The paper ends with a discussion of the results and implications for future research.

Keywords: Social media, inappropriate posting, cybervetting

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1. Introduction

College-aged young people have been, and continue to be, the single largest group of social media users (Auxier and Anderson, 2021). Through social media, college students create friend networks where they share information on a wide array of topics from relationship updates to social/political commentary. Some of this shared content can be intensely personal – providing an unfiltered view into the student's thoughts, beliefs, and personality. Early on, employers recognized the value of social media accounts as potential "windows into the soul." They began reviewing the social media accounts of job candidates in order to uncover the "real" people behind the resumes. This process, called cybervetting, has become extremely popular with recruiters (Berkelaar and Buzznell, 2015). In fact, Jobvite (2014), reports that 93% of recruiters will review a candidate's online presence before making a hiring decision. Recruiters defend their use of cybervetting, pointing to research that indicates social media content can be used to assess the candidate's personality traits (Stoughton et al., 2013) and potential job performance (Kluemper et al., 2012). Cybervetting also uncovers content that some employers view as problematic - with 55% of recruiters reconsidering a candidate based on what was uncovered during the online review (Jobvite, 2014). Given that college students routinely post exactly this type of inappropriate content (Peluchette and Karl, 2010), cybervetting has become a serious issue for many students entering the job market.

The interesting thing about cybervettting is that it is hardly a secret. According to Root and McKay (2014), students are aware of the widespread use of social media screening. If they are aware their accounts could/will be reviewed, why would students continue posting inappropriate content? This question has been addressed by researchers with limited success. Much of this research has focused on users of Facebook and, to a lesser degree, Twitter. Researchers have noted that inappropriate posting is present on both sites, with Twitter having significantly more inappropriate content (Miller and Melton, 2015). This raises some interesting questions - does this pattern hold across other major social media sites and why would some sites have more inappropriate content than others?

In order to address these questions, the current paper begins by discussing the differences in social media sites. It then discusses the phenomenon of inappropriate posting, defining "inappropriate" in the context of corporate recruiting and cybervetting. Given that inappropriate posting has been reported on Facebook and Twitter, the paper questions whether the behavior is also present on other social media sites popular with college students (e.g., Instagram and Snapchat). The paper then discusses the posting behavior of close friends as a possible factor influencing a student's decision to post inappropriate content. Extending existing research in this area, the paper proposes comparing the posting behavior of students on sites based on the degree of friend group overlap. If friend groups are a significant contributor to inappropriate posting, then sites with high friend group overlap should have similar levels of inappropriate posting. By the same token, site-pairs with low friend group overlap should have dissimilar levels of inappropriate posting. To test this theory, the paper reports the level of inappropriate posting present on Facebook, Twitter, Instagram, and Snapchat. The paper then reports the degree of friend group overlap by site-pair (e.g., Facebook-Twitter, Twitter-Instagram, etc.). Finally, the paper compares the level of inappropriate posting by site-pair where the degree of friend group overlap is high and low.

2. Literature Review

The following sections present a review of literature related to social media sites and their use by college students. Specifically, the posting of inappropriate content by students and their close friends is discussed. In order to investigate the possible relationship between student and friend group posting behaviors, a theoretical framework based on uses and gratifications theory is employed to develop a series of research questions.

2.1 Social Media Site Differences

Four of the most popular social media sites used by college students are Facebook, Twitter, Snapchat, and Instagram (Alhabash and Ma, 2017). Although all these sites allow users to share content, they are actually quite different in terms of function, format, and demographics (Barnhart, 2022):

- Facebook is primarily used to connect with family and friends. It allows user to set up a profile and post updates, photos, links, etc. Facebook's users are slightly older, with the largest number of users being 25-34. The second largest group of users is 18-24.

- Twitter is a microblogging site that allows users to send short messages about what they are doing or links to resources of interest. It's largest number of users is 18-29.
- Instagram is a photo-sharing application that allows users to take pictures, apply filters, and share them with friends on the site and other platforms. The largest group of users is 25-34 with 18-24 a close second.
- Snapchat is a mobile application that allows users to send and receive time-sensitive photos and videos that expire upon being viewed. Snapchat's largest group of users is 15-25.

While these sites may differ in function and format, they are all still popular with college-aged users. College-aged users constitute the first or second largest group of users on each site. This popularity means that college students are posting a lot of content on these sites. Based on previous research (e.g., Peluchette and Karl, 2010; Miller and Melton, 2015), it could be argued that much of that content can be viewed as inappropriate.

2.2 Inappropriate Social Media Posting

Using the term "inappropriate" to describe something as improper or undesirable can be very subjective. As with much in life, what is and is not appropriate is in the eye of the beholder. This is especially true for social media because the content is often intensely personal. While the majority of people in a social network may view a given posted item as appropriate, others may not. How then should inappropriate social media content be defined – if it can be?

In order to avoid the subjectivity trap, this study defines inappropriate social media content in a very specific context, namely the view of recruiters while cybervetting candidates for employment. In this context it is possible to define inappropriate content as content that a company would view as problematic – leading to a candidate being reconsidered or rejected. Recruiting literature has identified specific "red flag" content that companies look for when reviewing social media accounts (Jobvite, 2017). Examples of this inappropriate content include excessive use of profanity, discussions of alcohol/drug use, political rants, racist comments, and sexually-explicit photographs, etc. Peluchette and Karl (2010) found that college students, as a group, routinely post just these types of inappropriate content on Facebook. Follow-up research has confirmed that inappropriate content is even more prevalent on Twitter (Miller and Melton, 2015). To date, there has been no research into inappropriate posting (as defined herein) on Instagram or Snapchat. Given their popularity with college-aged users, and their functional/format differences from Facebook and Twitter, investigation of these sites appears justified. Does inappropriate posting happen outside of Facebook/Twitter and, if so, to what extent?

2.3 Posting Behavior of Close Friends

Given that inappropriate posting has been confirmed on multiple platforms, a better understanding of the phenomenon is needed, especially the factors that lead students to engage in this risky behavior. Various factors that could affect inappropriate posting have been studied including personality traits, time to graduation, and being "on the market". In addition to these factors, researchers have also found that the posting behavior of close friends influences a student's decision to post inappropriate content (Miller, 2020). Specifically, students with close friends who post inappropriate content on Facebook and Twitter are more likely to post inappropriate content on their own Facebook and Twitter accounts, respectively. Essentially, the posting behavior of close friends acts as a social factor, creating a subjective group culture with shared norms and values. Students then adopt these norms because they wish to be considered part of the group (Triandis, 1980). If the friend group posts inappropriate content, then the student will internalize this behavior as a group norm and post similar content in order to show that they belong.

2.4 Theoretical Framework

Uses and gratifications (U&G) theory proposes that individuals actively seek out media content that suits their needs (Lariscy et al., 2011). A number of researchers (e.g., Belk, 2013; Seidman, 2013; and Hollenbaugh and Ferris, 2014) have used this theory to explain why individuals use social media. According to this research, individuals use social media because, through that use, they are able to satisfy certain needs. Employing U&G, Whiting and Williams (2013) identified 10 motivations for using social media: social interaction, information seeking, passing time, entertainment, relaxation, expression of opinions, communicatory utility, convenience utility, information sharing, and surveillance. Also using U&G, Alhabash and Ma (2017) identified seven motivations for social media use: information sharing, self-documentation, social interaction, entertainment, passing time, self-expression, medium appeal, and convenience. Alhabash and Ma (2017) were able to show that the level of each motivation differed when measured across Facebook, Twitter, Instagram, and Snapchat. This result is not particularly surprising given the differences between the sites in terms of function and format. As an example, a user concerned with self-expression is probably more motivated to use

Twitter than Facebook because Twitter is designed around sharing one's own thoughts through blogging while Facebook is designed to keep friends and family connected. Since differences in the function and format of sites can lead to differences in use motivations, it could be argued that there could also be differences in inappropriate posting behavior. Differences have already been noted between Facebook and Twitter. How will the differences in Instagram and Snapchat affect inappropriate posting?

Given the differences in social media sites and the subsequent differences in use motivation, it could be argued that students will not, necessarily, use the same sites as their close friends. By extension, it could also be argued that students could end up with different friend groups on each site. While this is a logical argument, there is no current research to verify it. Do friend groups differ by site? Are there some site-pairs with more friends in common? Essentially, how much do the friend groups overlap between sites? These are important questions because it has already been shown that student posting behavior is affected by the posting behavior of close friends (Miller, 2020) – at least for Facebook and Twitter. If friend posting behavior influences student behavior, then sites with similar friend groups should have similar levels of inappropriate content. This could also help explain why Twitter has more inappropriate content than Facebook assuming, of course, that there is little overlap between Facebook and Twitter friend groups.

Based on existing literature and the theoretical framework, the following research questions should be addressed:

1. How does inappropriate posting behavior compare across major social media sites (i.e., Facebook, Twitter, Instagram, and Snapchat)?
2. How much friend group overlap is present among major social media sites?
3. Is inappropriate posting behavior a function of the friend group?

3. Research Method

3.1 Measures

To address the first research question, the Revised Faux Pas Scale was used to assess how inappropriate posting compares across social media sites. The scale was developed by Miller (2020) based on the original Faux Pas Scale created by Karl et al. (2010). Miller (2020) revised the original scale to include items that recruiters had determined to be problematic when uncovered during cybervetting. Specifically, the revised scale asks if the social media account in question contains a lot of the given item. The eight items include "alcohol references", "drug references", "sexist comments", "racial comments", "gun references", "profanity", "sexual references", and "political comments". Participants responded using a seven-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree).
Previous research (Miller and Melton, 2015) has shown that students don't exhibit the same posting behavior across social media sites. For that reason, participants were asked to complete the Revised Faux Pas Scale for each of their social media accounts separately.

The Revised Faux Pas Scale was also used to address the third research question. In this case, participants were asked to report the amount of inappropriate posting present in the social media accounts of their close friends. As with their own accounts, participants completed the revised scale for each social media site separately – using the friend group relevant to each site.

For the second research question, participants were asked to report the level of overlap in friend groups between site-pairs. Specifically, participants were asked how much their friends overlapped between the following combinations: Facebook-Twitter, Facebook-Instagram, Facebook-Snapchat, Twitter-Instagram, Twitter-Snapchat, and Instagram-Snapchat. Participants responded with "Same friends", "A lot of overlap", "Some overlap", "Little overlap", or "No overlap".

3.2 Participants

Study participants were recruited from undergraduate business courses at a large university in the Midwest United States. Given the research questions, the use of college students is appropriate since they are avid social media users, preparing to enter the job market, and their posting behavior can impact their employability. Participants were asked to complete a short online survey (Appendix I). All survey questions were evaluated and approved by the university's Institutional Review Board (IRB). Based on the nature of the questions, the students were assured that, if they chose to

participate, their responses would remain anonymous.

4. Results

In total, 150 students (56.0% male) participated in the study. The mean age was 21.09 years (SD = 3.36), with a range from 18 to 41. Of the 150 participants, 136 (90.7%) had Facebook accounts, 120 (80.0%) had Twitter accounts, 137 (91.9%) had Instagram accounts, and 139 (93.3%) had Snapchat accounts. A detailed gender breakdown by site is provided in Table 1.

	n	Male	%	Female	%
Facebook	136	73	54%	63	46%
Twitter	120	72	60%	48	40%
Instagram	137	74	54%	63	46%
Snapchat	139	77	55%	62	45%

Table 1. Gender breakdown by site

In addition to site usage, participants were also asked to report the privacy setting used on each account. Table 2 provides a breakdown of the privacy settings by site.

Facebook	n	%	Twitter	n	%	Instagram	n	%	Snapchat	n	%
Everyone	29	21%	Protected	42	35%	Private	83	69%	Everyone	20	14%
Friends of friends	11	8%	Public	78	65%	Public	54	45%	Friends only	119	86%
Friends only	94	69%									
Me only	2	1%									

Table 2. Privacy settings by site

Table 3 provides the mean Faux Pas score for each site along with the significance of paired T-tests used to compare scores between sites. The results indicate that all site-pairs had significantly different Faux Pas scores except Facebook-Instagram. Based on the responses, participants believe their Facebook and Instagram accounts contain similar amounts of inappropriate content.

		Significance			
	M	Facebook	Twitter	Instagram	Snapchat
Facebook	1.613	-			
Twitter	2.415	.000	-		
Instagram	1.583	.565	.000	-	
Snapchat	2.137	.000	.036	.000	-

Table 3. Significance of Faux Pas score comparisons between sites

A review of Table 3's mean scores, indicates that the Twitter score was highest, followed by Snapchat, Facebook, and Instagram. Essentially, Twitter accounts contained the most inappropriate content, while Facebook and Instagram contained the least. Snapchat accounts contained less inappropriate content than Twitter but more than Facebook or Instagram. This finding supports previous research that showed Twitter accounts contained more inappropriate content than Facebook accounts. Further, it shows that Twitter accounts also contain more inappropriate content than Instagram and Snapchat.

Descriptive statistics and reliabilities for the Revised Faux Pas Scale, across social media sites, are shown in Table 4.

	M	SD	α
1. Facebook Faux Pas	1.613	.885	.878
2. Twitter Faux Pas	2.415	1.407	.911
3. Instagram Faux Pas	1.583	.812	.856

4. Snapchat Faux Pas	2.137	1.212	.867
5. Friends' Facebook Faux Pas	2.929	1.430	.917
6. Friends' Twitter Faux Pas	3.778	1.591	.920
7. Friends' Instagram Faux Pas	2.793	1.408	.902
8. Friends' Snapchat Faux Pas	3.321	1.374	.875

Table 4. Descriptive Statistics and Reliability of Measures

A review of the results in Table 4 indicates that Faux Pas scores for friend accounts are all higher than the respondent's scores for their own accounts on the same site. The results also indicate that the Revised Faux Pas scale is highly reliable ($\alpha > .850$) regardless of site.

Table 5 breaks down the overall Faux Pas score by presenting the mean of each item by site. Again, Twitter has the highest mean score for all items except alcohol.

	Facebook	Twitter	Instagram	Snapchat
Alcohol	1.80	2.94	2.09	**3.38**
Drugs	1.35	**2.56**	1.49	2.36
Sexist	1.27	**1.68**	1.33	1.50
Racial	1.21	**1.59**	1.31	1.35
Gun	1.68	**1.78**	1.36	1.52
Profanity	1.98	**3.18**	1.97	3.12
Sexual	1.41	**2.62**	1.60	2.14
Political	2.18	**2.97**	1.53	1.72

Table 5. Mean Faux Pas scores by item (participant)

Based on the means, political comments were the most common inappropriate item on Facebook (2.18), while profanity was the most common inappropriate content on Twitter (3.18). References to alcohol were the most common type of inappropriate content on both Snapchat (3.38) and Instagram (2.09). Racial comments were the least common inappropriate content across all four sites (Facebook = 1.21, Twitter = 1.59, Instagram = 1.33, Snapchat = 1.35).

Table 6 shows the degree of friend group overlap between site-pairs. Participants reported that their friend groups overlap the most between Twitter and Instagram. Nineteen percent of participants reported that their friend groups were the same on Twitter and Instagram, while 49% reported there was a lot of overlap between the two sites. Participants reported that their friend groups overlap the least between Facebook and Instagram. Twenty-nine percent of participants reported some overlap, while 33% reported little or no overlap between the sites. Although not the lowest, there was also a noticeable lack of overlap in friends between Facebook and Twitter (some overlap - 28%, little or no overlap - 27%).

	Facebook-Twitter	Facebook-Instagram	Facebook-Snapchat	Twitter-Instagram	Twitter-Snapchat	Instagram-Snapchat
Same friends	10%	12%	10%	**19%**	18%	18%
A lot of overlap	22%	47%	26%	**49%**	38%	45%
Some overlap	28%	26%	**29%**	18%	26%	26%
Little overlap	23%	11%	**30%**	8%	15%	9%
No overlap	**4%**	1%	3%	3%	3%	1%
N/A	14%	4%	2%	3%	0%	1%

Table 6. Friend group overlap between sites

To assess the impact of friend group, overlap on inappropriate posting, the Faux Pas responses were segmented by degree of friend group overlap for each site-pair. As an example, to compare responses for Facebook and Twitter with a high degree of friend group overlap, a dataset was created with Faux Pas scores for Facebook and Twitter where the degree of friend group overlap between the sites was reported as high (i.e., same friends or a lot of overlap). Paired-T

tests were then conducted to compare the Faux Pas scores between the sites. This procedure was then repeated using Facebook and Twitter Faux Pas scores where the degree of friend group overlap was reported as low (i.e., some overlap, little overlap, or no overlap). This high degree/low degree segmentation and analysis was repeated for each site-pair. Table 7 shows the significance of comparing overall Faux Pas/component scores by site-pair using the high degree of friend group overlap data.

	Facebook-Twitter	Facebook-Instagram	Facebook-Snapchat	Twitter-Instagram	Twitter-Snapchat	Instagram-Snapchat
Overall Faux Pas Score	**.005**	.448	**.001**	**.000**	.120	**.000**
Alcohol	**.000**	.067	**.000**	**.000**	.135	**.000**
Drugs	**.000**	.237	**.000**	**.000**	.635	**.000**
Sexist	.298	.874	.204	**.007**	.500	.096
Racist	.139	.469	.229	**.007**	.066	.392
Guns	.770	**.005**	.135	**.001**	.182	.077
Profanity	**.001**	.784	**.003**	**.000**	.366	**.000**
Sexual	**.003**	.436	**.001**	**.000**	**.025**	**.005**
Political	.300	**.001**	**.010**	**.000**	**.000**	.094

Table 7. Significance of Faux Pas score comparisons - High friend group overlap

A review of Table 7 indicates no clear pattern. While all Faux Pas scores were significantly different between Twitter and Instagram, every other site-pair contains a mix of results – some significantly different, others not. The pattern of results is also unclear in Table 8. This table shows the significance of comparing overall Faux Pas/component scores by site-pair using the low degree of friend group overlap data.

	Facebook-Twitter	Facebook-Instagram	Facebook-Snapchat	Twitter-Instagram	Twitter-Snapchat	Instagram-Snapchat
Overall Faux Pas Score	**0.000**	0.991	**0.000**	**0.008**	0.155	**0.013**
Alcohol	**0.000**	0.435	**0.000**	0.427	**0.004**	**0.000**
Drugs	**0.000**	0.279	**0.000**	0.116	0.746	**0.003**
Sexist	**0.000**	0.335	0.054	0.054	**0.022**	0.584
Racist	**0.007**	0.204	0.180	0.292	**0.026**	0.743
Guns	0.857	0.135	0.424	0.073	0.360	0.351
Profanity	**0.000**	1.000	**0.000**	**0.012**	0.801	**0.005**
Sexual	**0.000**	0.140	**0.001**	0.057	0.130	0.266
Political	**0.000**	**0.034**	0.051	**0.001**	**0.000**	0.612

Table 8. Significance of Faux Pas score comparisons – Low friend group overlap

5. Discussion

In the current study, inappropriate posting behavior by college students is examined relative to three research questions. Each of these questions will be addressed, in turn, using the study results.

5.1 Inappropriate Posting Behavior Across Major Social Media Sites

This is the first study to use the Revised Faux Pas Scale to assess inappropriate posting across Facebook, Twitter, Instagram, and Snapchat. As such, it is important to note that the scale continues to demonstrate good to excellent reliability (range: 0.856 - 0.911) across all four social media sites. This consistency is important because the social media environment is ever-changing, with new sites coming on-line all the time and almost constant migration from older sites to newer ones. The sizable shift by college-aged young people away from Facebook is just one example of this dynamic environment. As new sites are developed and the migrations continue, the scale will need to be reassessed to ensure its reliability. Based on the results of this study, the scale provides a reliable means to measure inappropriate posting in the

current social media environment.

Confirming previous research (Miller and Melton, 2015), Twitter continues to have the most inappropriate content. Twitter accounts had an average Faux Pas score of 2.415, which was significantly higher than the other three sites. Twitter accounts also had higher scores for every Faux Pas item expect alcohol. Clearly Twitter remains in a league of its own – making it the obvious choice for recruiters when selecting sites to review during cybervetting. Students continue to aid recruiters by making their Twitter accounts easy to view. In-line with previous research, 65% of Twitter accounts in the present study were left open to the public.

After Twitter, Snapchat accounts contained the next most inappropriate content (2.137). Snapchat accounts even had a higher score for alcohol than Twitter. While Snapchat accounts may be nearly as inappropriate as Twitter, Snapchat users are more likely to make their accounts harder to view. In the current study, only 14% of Snapchat accounts were open to everyone.

There was no significant difference found between the Faux Pas scores for Facebook (1.613) and Instagram (1.583) and both sites had scores that were less than Twitter and Snapchat. While Facebook and Instagram accounts may have the least inappropriate content, they fall between Twitter and Snapchat on the access continuum. In the current study, 21% of Facebook accounts and 39% of Instagram accounts were open to the public.

Finally, it should be noted that participants reported significantly higher Faux Pas scores for the accounts of their close friends, as compared with their own, on every site. This result supports previous research showing students reported the Facebook and Twitter accounts of their friends contained more inappropriate content than their own (Miller, 2020). Twitter accounts had the highest Faux Pas scores for close friends, followed by Snapchat, Facebook and Instagram (in order).

5.2 Friend Group Overlap Among Major Social Media Sites

The results from this study indicate that friend groups vary significantly across social media sites. Participants who reported having the same friends on two sites ranged from a low of 10% (Facebook-Twitter) to a high of 19% (Twitter-Instagram). This is hardly surprising given that friends will not, necessarily, have accounts on all the same social media sites. That said, of the six site-pairs considered in this study, over half the participants reported a lot of friend overlap on four of them: Twitter-Instagram (68%), Instagram-Snapchat (63%), Facebook-Instagram (59%), and Instagram-Snapchat (56%). At the same time, however, there were site-pairs where friend group overlap was minimal: Facebook-Twitter (32%) and Facebook-Snapchat (36%).

In this study, Facebook friends overlapped the least with other sites. This could be explained, in part, by the fact that older adults are more likely to have Facebook accounts than other social media sites. According to a Pew study (Auxier and Anderson, 2021), while 77% of 30–49-year-olds have Facebook accounts, only 27% use Twitter, 48% use Instagram, and 24% use Snapchat. A college student could, therefore, be friends with their parents, aunts/uncles, grandparents, and/or teachers only on Facebook because these people don't have accounts on other sites.

While user demographics can be used to explain much of Facebook's lack of friend group overlap, it can't explain all the difference. Demographics, alone, also can't explain the variability in overlap for the other site-pairs. The differences in site function and format, along with differences in use motivation, may also play a part. Social media sites are not all the same. Each site has a specific function and format. Motivations for use will also differ by student. Since students will choose to use sites that provide the function/format that best satisfies their needs, it could be argued that friend group variability is a natural result. This is an area that deserves further investigation in future research.

5.3 Inappropriate Posting Behavior and the Friend Group

If friend groups are a significant influence on the posting behavior of college students, then it stands to reason that where friend groups overlap between sites, there should be similar levels of inappropriate content on each site. Said another way, if a student is influenced to post inappropriate content by friends on one site, and the student has the same friends on another site, then the student's level of inappropriate posting on the second site should be like that of the first site. Although this seems reasonable, the data collected in this study, do not show clear support. According to the data, there is a high degree of friend group overlap between Twitter and Instagram (the highest degree of overlap for any site-pair in the study). If friend groups influence student posting behavior, then there should then be similar levels of

inappropriate posting by students on Twitter and Instagram. Unfortunately, the data provide no support for this relationship. In fact, the Faux Pas scores for all items were significantly higher for Twitter. Having the same, or mostly the same, friends on Twitter and Instagram did not mean that a student would post similar levels of inappropriate content on both sites. Clearly there must be other factors beyond friend group that determine which sites have higher levels of inappropriate posting. It is possible that the function of the site, or its format, play a role. As an example, Twitter is a microblogging site which allows users to express themselves in short, pithy, messages. This format may lead students to make more direct statements with less filtering, resulting in more inappropriate content. At the same time, Instagram is mostly a photo-sharing site. This difference in format may make inappropriate content less likely on Instagram even when friend group overlap is high.

Excluding the Twitter-Instagram pair, the results were mixed. The Facebook-Instagram pair showed similar levels of inappropriate posting on all items except for guns and political comments. The Twitter-Snapchat pair showed similar levels on all items except sexual and political comments. The remaining site-pairs had as many differences by items as similarities. When reviewing the data with little, or no, friend overlap the results were just as mixed. Clearly there is something beyond the friend group that is motivating students to post inappropriate content. Whether it is site function/format, student use motivations, or factors yet to be identified, further research is warranted.

6. Conclusion

It is clear from this, and previous studies, that inappropriate posting is common on social media. What is less clear is why some sites (e.g., Twitter and Snapchat) contain more inappropriate content than others. In this study, the influence of friend groups was considered as a possible factor. Although significant friend group overlap was found for some site-pairs, there was no clear relationship between shared friend groups and the corresponding level of inappropriate posting between sites. While the influence of friends and the content they post may ultimately have an effect on a student's inappropriate posting behavior, the impact was too nuanced to be detected under the current research design. Modified research designs may bear more fruit. At the same time, there may be other factors involved that should be investigated. As an example, the differences in site format and function should be considered in future studies. Do the differences in site format/function affect the level of inappropriate posting? If so, which aspects of the sites affect posting behavior and why? Likewise, student use motivations should also be investigated. How do motivations affect posting? Do specific motivations lead to more inappropriate posting behavior?

Although the reasons behind inappropriate posting by college students may not be clear, the negative outcomes from this behavior are far more certain. As the use of cybervetting of candidates continues to grow, students engaging in this behavior are putting themselves at increased risk. Understanding the factors that motivate students to post inappropriate content is critical if we hope to change this risky behavior.

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Appendix I

1. What is your gender?
    - Male
    - Female

2. What is your age?

3. What is your academic classification?
    - Freshman
    - Sophomore
    - Junior
    - Senior

4. What is your major?

5. Do you have a Facebook account?
    - Yes
    - No

6. Who can view the contents of your Facebook account?
    - Me only
    - Friends only
    - Friends of friends
    - Everyone

7. Please think about **your Facebook account** and consider how much you agree with the following statement for each of the listed topics. My Facebook account contains a lot of_____.
    - alcohol references
    - drug references
    - sexist comments
    - racial comments
    - gun references
    - profanity
    - sexual references
    - political comments

8. Now think about the **Facebook accounts of your close friends** and consider how much you agree with the following statement for each of the listed topics. My close friends have Facebook accounts that contain a lot of_____.
    - alcohol references
    - drug references
    - sexist comments
    - racial comments
    - gun references
    - profanity
    - sexual references
    - political comments

9. Please think about **your Facebook friends**. How much do your Facebook friends overlap with the friends on your other social media accounts?
    - Twitter
    - Instagram
    - Snapchat

10. Do you have a Twitter account?
    - Yes
    - No

11. How many followers do you have on Twitter?

12. How many people are you following on Twitter?

13. Is your Twitter account public or protected?
    - Public
    - Protected

14. Please think about **your Twitter account** and consider how much you agree with the following statement for each of the listed topics. My Twitter account contains a lot of_____.
    - alcohol references
    - drug references
    - sexist comments
    - racial comments
    - gun references
    - profanity
    - sexual references
    - political comments

15. Now think about the **Twitter accounts of your close friends** and consider how much you agree with the following statement for each of the listed topics. My close friends have Twitter accounts that contain a lot of_____.
    - alcohol references
    - drug references
    - sexist comments
    - racial comments
    - gun references
    - profanity
    - sexual references
    - political comments

16. Please think about **your Twitter friends**. How much do your Twitter friends overlap with the friends on your other social media accounts?
    - Instagram
    - Snapchat

17. Do you have an Instagram account?
    - Yes
    - No

18. Is your Instagram account public or private?
    - Public
    - Private

19. Please think about **your Instagram account** and consider how much you agree with the following statement for each of the listed topics. My Instagram account contains a lot of_____.
    - alcohol references
    - drug references
    - sexist comments
    - racial comments
    - gun references
    - profanity
    - sexual references
    - political comments

20. Now think about the Instagram **accounts of your close friends** and consider how much you agree with the following statement for each of the listed topics. My close friends have Instagram accounts that contain a lot of_____.
    - alcohol references
    - drug references
    - sexist comments
    - racial comments
    - gun references
    - profanity
    - sexual references
    - political comments

21. Please think about **your Instagram friends**. How much do your Instagram friends overlap with the friends on your other social media accounts?
    - Snapchat

22. Do you have a Snapchat account?
    - Yes
    - No

23. Who can view the contents of your Snapchat account?
    - Friends-only
    - Everyone

24. Please think about **your Snapchat account** and consider how much you agree with the following statement for each of the listed topics. My Snapchat account contains a lot of_____.
    - alcohol references
    - drug references
    - sexist comments
    - racial comments
    - gun references
    - profanity
    - sexual references
    - political comments

25. Now think about the Snapchat **accounts of your close friends** and consider how much you agree with the following statement for each of the listed topics. My close friends have Snapchat accounts that contain a lot of_____.
    - alcohol references
    - drug references
    - sexist comments
    - racial comments
    - gun references
    - profanity
    - sexual references
    - political comments