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Toward a More Nuanced Understanding of the Generational Digital Divide in Virtual Teams

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TOWARD A MORE NUANCED UNDERSTANDING OF THE GENERATIONAL DIGITAL DIVIDE IN VIRTUAL TEAMS

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ABSTRACT

Virtual teams are widely used in the workplace to execute projects. These teams are geographically distributed and use information and communication technologies (ICTs) to enact their collaborative work. However, there may be generational differences in preferences towards specific ICTs that can exacerbate the complexity of distributed virtual teamwork. This study analyzes survey data collected by Construction Industry Institute Research Team 326 to determine how different generations (specifically Millennials and Baby Boomers) prefer 27 specific ICT tools and features when working in virtual teams. The results show that Millennials have significantly different preferences toward roughly a third of the ICTs examined when compared to Baby Boomers. Hence, although the results of this study support the notion of a generational digital divide between the Millennials and the Baby Boomers, this divide is not as uniform as it has been characterized in previous research. This paper contributes a more nuanced understanding of the generational digital divide in the context of engineering and construction workforce virtual teams by attending to specific similarities and differences in preferences for ICTs. The findings of this study will enable virtual team leaders to consider generational preferences when selecting ICT tools and features for their teams in an attempt to improve virtual team performance.

KEYWORDS: Baby Boomers, Digital Divide, Generational Differences, Information and Communication Technologies, Millennials, Virtual Teams

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INTRODUCTION

The world is becoming more interconnected. This is due, in part, to the increased availability of the internet and the ease of access to multiple types of information and communication channels that are possible through the internet. In the United States, the number of households with access to the internet rose from 58.1% in 2005 to 79.6% by 2014 (World Bank 2016). A similar growth in access to digital technology has also taken place in the workplace. And, with the growth of technology, virtual teams are no longer a prediction for the distant future but an everyday reality. These virtual teams, which are defined as "a group of people with complementary competencies executing simultaneous, collaborative work processes through electronic media without regard to geographic location" (Chinowsky and Rojas 2003, p. 98), frequently employ information and communication technology (ICT) to collaborate and execute their work.

ICT research has been examined in the architecture, engineering and construction (AEC) industry since the 1970's (Lu et al. 2015). This research is continually evolving to match the dynamic nature of the technology it examines. Communication, which used to be limited to face-to-face (FtF) interactions, can now be facilitated using ICTs in virtual teams. In a sense, some ICTs are attempting to mimic these FtF interactions (e.g., videoconferencing). Research has examined, for example, the use of telepresence on construction sites through the use of technology (e.g., Jaselskis et al. 2015). ICTs have been suggested to be the "core mechanisms for interactions" in virtual teams (Thomas and Bostrom 2010, p.116). However, research has found different usage patterns and adoptions for ICTs in virtual teams depending on several factors such as simplicity of the ICT, the potential of the ICT in stimulating group cohesion, emergent need for the ICT, etc.

(Iorio et al. 2011). A lower preference for adopting and using ICTs among team members may limit communication and, therefore, could reduce the performance of a virtual team.

Furthermore, a team member's age could play a role in their perceptions of ICTs, affecting both use and performance. In today's workplace, there are often four generations working simultaneously (Bennett et al. 2012; Downing 2006). Specifically, it has been argued that the youngest of these generations (often referred to as Millennials) may have different views regarding ICTs than older generational cohorts because they are "digital natives" who have grown up using these technologies and are more comfortable using them (Hershatter and Epstein 2010, p. 212). The characterization that the youngest generational cohort in the workforce is more technologically competent suggests that there could be a generational divide among virtual team members with regards to ICT preferences that could affect team performance. However, studies often limit their analysis to only a few specific ICTs, and, therefore, fail to examine the full extent of the digital divide between older and younger cohorts in the workplace. Thus, the aim of this study is to identify and contrast generational views on multiple, specific ICTs that are used in virtual team communication. Identifying generational views on specific ICTs will aid virtual team leaders when deploying employees to tasks that require certain ICTs, as well as aid in their selection of ICTs for their teams. Thus, this study strives to provide clarification and a more nuanced understanding of the generational digital divide to better inform virtual team leaders and improve the performance of virtual teams.

BACKGROUND

Information and communication technologies (ICTs) can "consist of hardware, software, networks, and media for collection, storage, processing, transmission, and presentation of

information (voice, data, text, images)" (World Bank Group 2002, p. 3). ICTs range from e-mail to video conferencing and may be either asynchronous (e-mail) or synchronous (video conferencing) in nature. ICTs help bridge the cultural, geographic, and temporal barriers that are often experienced in virtual teams. It has been claimed that a virtual team's demographic makeup can serve as a prompt for the team to change their ICT usage (Thomas and Bostrom 2010). However, changing technology usage in the middle of a project may lead to confusion among members and could possibly lower performance. Therefore, it is important that we understand how team demographics, as described by Thomas and Bostrom (2010), will influence preferences of ICT abilities, and thus ICT use in virtual teams. We add to this proposition by suggesting that demographic information, specifically age or generation, will impact ICT preferences in virtual teams. This section will examine different types of ICTs reviewed in the literature and how generations (specifically the Millennials and the Baby Boomers) view them.

ICT Types, Features, and Aspects

The ICT types, features, and aspects that virtual teams use cover a vast range; the sheer number of ICTs that have been developed for use in virtual teams makes it a daunting task to categorize them into a concise list of groupings. Nevertheless, researchers such as Malhotra and Majchrzak (2012) and Mittleman et al. (2008) have categorized ICTs in their studies. Malhotra and Majchrzak (2012) categorized ICTs depending on whether they were exchanging "boundary objects or tacit knowledge" (p. 6:10) while Mittleman et al. (2008) divided their collaboration technologies into four categories – Jointly Authored Pages, Streaming Technologies, Information Access Tools, and Aggregated Systems (p. 311).

We carried out this research in collaboration with Construction Industry Institute (CII). CII is a consortium of over 130 owner, engineer, contractor, and supplier organizations that have joined together to conduct research through research teams comprised of academics and industry members. This research developed and distributed a survey questionnaire regarding virtual teams in the engineering and construction industries in collaboration with CII Research Team 326 (RT 326). The survey was randomly distributed to over 1000 individuals across CII member companies in the engineering and construction industry with prior experience working in virtual teams. Among the over 200 questions and sub-questions in the survey were questions regarding 27 specific ICTs. After the survey was distributed, our analysis affinity grouped specific ICTs from this survey questionnaire into four categories – (1) Meeting/collaborating, (2) Tracking/documenting, (3) Information sharing, and (4) Other. These specific technologies are listed in Table 1. We note that some ICTs fit into multiple categories. For example, email is often used for formal correspondence (Vartiainen and Jahkola 2013). However, email is also used for sending documents/files in virtual teams (Vartiainen and Jahkola 2013). Therefore, email has features that relate to both the *Meeting/collaborating* and *Information sharing* categories. Another ICT that fits into multiple categories is instant messaging. Instant messaging can be used in virtual teams for informal communication, and it can be used to inform team members when they are online (Vartiainen and Jahkola 2013). Thus, instant messaging exhibits features that fit into both the *Meeting/collaborating* and *Tracking/documenting* categories. Other researchers have also noted that some ICTs may fit into multiple categories, such as Mittleman et al.'s (2008) Aggregated Systems category. For this study, we affinity grouped ICTs based on their primary intended functions rather than their sub-functions or sub-features, as shown in Table 1, thus enabling us to assign a single category for each ICT.

Table 1 - ICT abilities identified in the CII RT 326 Survey

Meeting/Collaboration	*Collaborate through web-based project workspace software*
	Use the same collaboration technology across projects (e.g., all team members have equal access to technology)
	Use a project email system (e.g. Aconex)
	Send instant messages to virtual teammates
	See virtual teammates
	Notify virtual teammates when you wish to speak (e.g., virtually raise your hand)
	Simultaneously collaborate virtually on documents
	Virtually collaborate using mobile devices
	Tag key components during presentations (e.g., to come back with questions)
	Tell a virtual collaborator they have done a good job (e.g., virtual thumbs up)
	Access multiple communication modes
	Hold impromptu conversations/meetings
Tracking/Documenting	*Record/track/publish conversations*
	Provide transcripts from conversations
	Know which of your virtual teammates are currently online
	Know how long your virtual teammates have been off-line
	Check virtual teammate meeting availability
	Monitor and communicate project progress
Information Sharing	*Share screens with annotation capability (e.g., for document/model reviews)*
	Share screens
	Share files
	Share folders (e.g., Google Drive or ProjectWise or Dropbox)
	Remotely control another teammate's shared screen
	Simultaneously point to different elements when screen sharing
Other	*Make social media connections/postings*
	Reliably connect (e.g., bandwidth)
	Use encryption when transferring files over the Internet

Category Definitions

- *Meeting/collaborating ICTs*: This category contains technologies and features that allow real-time collaboration among team members, which broadly relates to Malhotra and Majchrzak's (2012) categorization of ICTs that share tacit knowledge. Simultaneous collaboration allows team members to communicate information that cannot be quantitatively or explicitly

recorded. ICTs in this category include project email systems and those designed to facilitate instant messaging and virtual collaboration on mobile devices.

- o *Specific Examples*: Gmail, IPhones, Instant Messaging (IM)

- *Tracking/documenting ICTs*: This category contains technologies and features that allow virtual team members to record information or observe teammate activity. This category includes ICTs that would be used to help team members decide if they want to initiate communication with other team members by checking their availability (tracking team members). This category also includes documentation of previous conversations.

  - o *Specific Examples*: Outlook Calendar, Gmail chat availability window

- *Information sharing ICTs*: This category contains any technology or feature that allows virtual team members to share boundary objects through screen or file sharing. Earlier usage of boundary objects has been shown to reduce conflict length in virtual teams (Iorio & Taylor, 2014). This category is similar to both Malhotra and Majchrzak's (2012) boundary objects and Mittleman et al.'s (2008) Information Access Tools categories. Our category is comparable with these prior studies as they both include file sharing; however, unlike Mittleman et al. (2008), we also include screen sharing in this category.

  - o *Specific Examples: Dropbox, Google Drive, Skype & Zoom screen sharing option*

- *Other ICTs*: There were three ICTs that did not fit into any of the above categories. Therefore, we have developed a miscellaneous (or 'Other') category to address these ICTs. A notable ICT in this category relates to social media. Social media is particularly important in the context of the present study as it is often a major topic in generational studies on technology use. It has been found to be a highly favored mode of communication among students of various ages and cultural backgrounds (Omari 2012).

The Millennial Point of View

The Millennials (born 1980-2001) are the youngest generation in the workforce today. They are often characterized as being more proficient with modern technology and have been shown to value ICTs such as instant messaging and email (Glass 2007). They are sometimes referred to as "digital natives" (e.g., Hershatter and Epstein 2010, p. 212) because they have been exposed to technology for their whole lives (Simoneaux and Stroud 2010). It has been reported that being exposed to ICTs contributes to more successful ICT innovation while managing construction sites (Usman and Said 2012. Relating to innovation, this youngest cohort has also been described as being early adopters of new technology (Kumar and Lim 2008). Millennials are characterized as a cohort that is particularly well-suited to work in a dynamic environment that depends on ICTs for team collaboration.

The Baby Boomer Point of View

The other generational cohort examined in this study includes many of the older workers currently active in the workforce, the Baby Boomers (born between 1946 and 1964), many of whom have now risen to hold leadership positions (Gibson et al. 2011). Simoneaux and Stroud (2010) have noted that the technological environment in the high-tech workplace of today is very different to the environment experienced by Baby Boomers outside the workplace. Baby Boomers grew up in a time before many of the common ICTs of today were a part of the workplace, and it has been argued that, as a result, Baby Boomers place a greater importance on face-to-face communication (Glass 2007). However, Baby Boomers are generally characterized as being more accepting of technology compared to the generation that preceded them (Kumar and Lim 2008). Still, there appears to be a dearth of evidence that demonstrates that Baby Boomers have a relative

strength with technology usage when compared to the Millennials. When considering the reviewed literature, it would appear that the Baby Boomers are likely to lag behind the Millennials in technological ability.

The Generational Digital Divide

Much of the academic and popular literature characterizes the Millennials as 'digital natives' because, as previously noted, they have been exposed to digital technologies throughout their lives and, therefore, characterizes them as being more proficient with ICTs in comparison to older cohorts. Still, the notion of digital natives being more proficient with technology is not fully agreed upon in the literature. Some researchers have observed that this perceived divide with regard to technology use and preferences between the younger and older cohorts may not be either severe or even noticeable. Waycott et al. (2010) found no support for the notion of a technological divide between students and teachers in an Australian university due to participants' differing experience with technology. Bennett et al. (2008) reached similar conclusions on this debate and contended that the younger cohort should not be considered as being different from other cohorts. Likewise, Rothe et al. (2012) found only small differences when views were compared between age cohorts on virtual and mobility preferences in the workplace. Yet, Sanaei et al (2013) found that Millennials used instant messaging technologies significantly more than Baby Boomers or Generation X to receive knowledge.

Thus, the literature we reviewed for this study exhibited no clear consensus on the existence or lack of a digital divide in the workplace. In addition, much of the reviewed literature failed to analyze generational views across multiple technologies. Our study aims to explore a range of ICTs to examine whether there are significant generational differences in use and preference. This

will allow us to develop a more nuanced understanding of the generational digital divide and identify the specific ICTs that are contributing to such a divide, if we find it to exist.

HYPOTHESIS

We examined two generational cohorts in our study – Millennials and Baby Boomers. The Millennials are relatively new to the workplace, while the Baby Boomers have now progressed to the point in their careers where they hold leadership positions (Gibson et al. 2011). These two generations, therefore, provide a good point of comparison. Analyzing these two generations also limits potential crossover effects that would be observed if two consecutive generations are analyzed (i.e., Millennials / Generation X or Generation X / Baby Boomers).

Much of the reviewed literature suggests that there is a generational divide with regard to viewpoints on ICTs. However, some critics contend that this divide may not be as severe as it is often perceived to be. Still, there appears to be scant evidence that would suggest that the older cohort has stronger preferences for ICTs in the workplace when compared to their younger counterparts. The CII RT 326 data set allows us to explore generational preferences towards specific ICTs (favorable or unfavorable). The academic and popular literature that supports the notion of a digital divide appears to be more prevalent than the critiques of it. This leads us to hypothesize: *Millennials view ICTs more favorably than Baby Boomers in the context of a virtual team*. Favorability is defined in this study in relation to use and desire to use specific ICTs and will be further discussed in the next section.

METHODOLOGY

CII RT 326 conducted a survey of virtual teams in the construction and engineering sectors. This survey was conducted as part of a research project to understand and enhance the performance of virtual teams that work on construction and engineering projects. A total of 207 responses were gathered from the survey, which was originally randomly distributed to 1,386 industry professionals that were members of the Construction Industry Institute. The survey asked a series of questions, including respondents' assessment of ICT abilities and their generation. We used chi-squared tests to test our hypothesis using responses to these questions. Major assumptions of the chi-squared test include independence of the observations and sufficient expected values (>5) in the chi-squared cells. P-values were calculated using the chi-squared test for each of the 27 ICTs in question. Under the assumption of the null hypothesis, there is no association between generation and ICT preferences.

Participants identified their generation from among four choices – Millennials, Generation X, Baby Boomers, and the Silent Generation. The generational distribution of the survey participants is provided in Table 2.

Although the Baby Boomer and Millennial generation characterizations are commonly used in the United States to describe certain age cohorts, these designations do not necessarily apply outside of the United States. Therefore, participants who were working outside of the United States were removed from the sample prior to analysis. The remaining 84 Baby Boomer and 40 Millennial responses were selected for analysis (n=124). Table 3 provides demographic details of the Millennials and Baby Boomers analyzed in this study. This data set contains 112 multinational companies with a large number of employees. These types of companies lend themselves to the utilization of virtual teams more readily when compared to more local, smaller companies.

Table 2 - Generation Distribution (n = 207)

Generation	Participants
Silent Generation (born before 1946)	3
Baby Boomers (born 1946-1964)	88
Gen X (born 1965-1980)	75
Millennials (born 1980-2001)	41

Note: The survey read "before 1946." However, the Silent Generation has been defined as having birth years ranging from 1928-1945 (Pew Research Center 2015)

Table 3 - Company Information for Domestic Millenials and Baby Boomers (n = 124)

Category	Demographic	Count	%
Company Type	*Engineer/Contractor*	65	52%
	Private Owner	29	23%
	Public Owner	30	24%
Company Reach	*Local (in-state)*	1	1%
	Regional	4	3%
	National	7	6%
	Multinational	112	90%
Number of Employees	*<100*	3	2%
	100-500	4	3%
	501-1,000	15	12%
	1,001-5,000	21	17%
	50,001-10,000	19	15%
	10,001-50,000	20	16%
	>50,000	42	34%
Participants' Positions	*Project Engineer*	29	23%
	Project Management	36	29%
	Upper Management	19	15%
	None of the Above	40	32%

With regards to the 27 ICT abilities listed in Table 1, participants were asked to select one of five options to represent their assessment of the ICTs that may or may not be available in their organization:

a) Available and you use it

b) Available and you don't use it

c) Unavailable and you want to use it

d) Unavailable and you are not interested in using it

e) I don't understand what this is

Participants who selected option (e) were removed prior to the analysis of each ICT to ensure that the responses analyzed came from individuals who were knowledgeable about the specific ICT in question. Therefore, the sample size considered for each individual ICT varied. The remaining responses were then grouped into "Favorable" and "Unfavorable" categories, with options (a) and (c) being considered "Favorable" and options (b) and (d) being considered "Unfavorable." Chi-squared tests were run on each of the ICTs to determine whether there were significant differences between the Millennial and Baby Boomer responses.

RESULTS

The results for the analysis are displayed in Table 4. Two of the ICTs examined had expected values that were less than 5 in their chi-squared cells and are labeled accordingly. Roughly a third of the ICTs had significant differences in Millennial and Baby Boomer preferences. All of the significant relationships that were found were for instances where

Millennials had a more favorable opinion of the ICT in question (Figures 1-4). Favorability was defined as the participant's current use or their desire to use the ICT in question. The results in Table 4 are sorted by p-value within each category with the lowest p-values being listed first. The p-values were calculated using the chi-squared test to examine the association between generation and ICT preferences. P-values less than 0.05 are considered to be significant, and those between 0.05 and 0.1 are considered to be approaching significance.
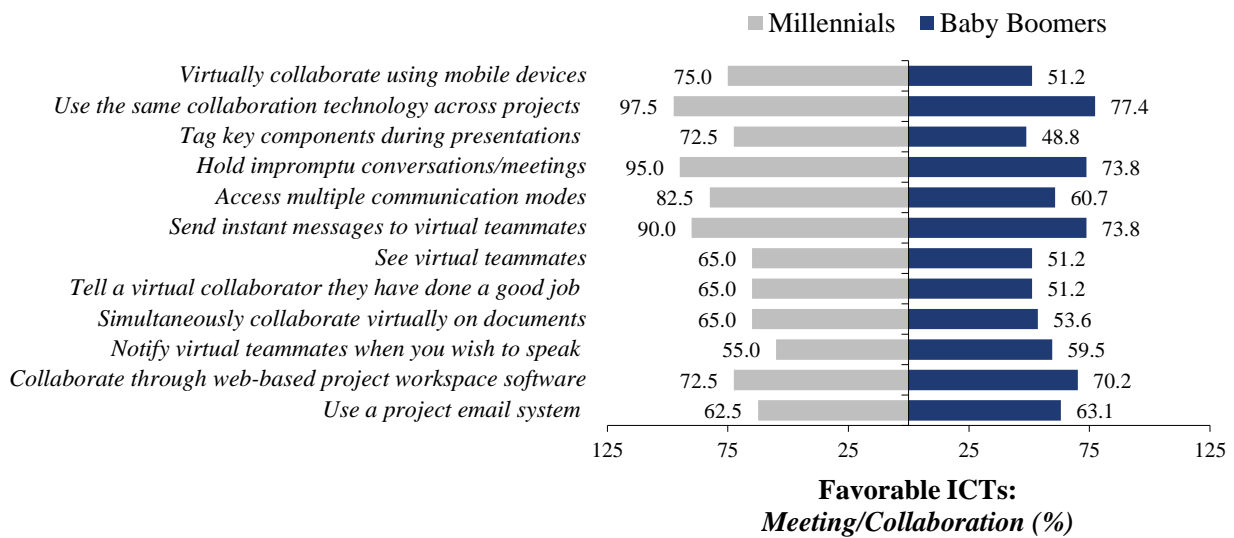
■ Millennials ■ Baby Boomers

ICT	Millennials	Baby Boomers
Virtually collaborate using mobile devices	75.0	51.2
Use the same collaboration technology across projects	97.5	77.4
Tag key components during presentations	72.5	48.8
Hold impromptu conversations/meetings	95.0	73.8
Access multiple communication modes	82.5	60.7
Send instant messages to virtual teammates	90.0	73.8
See virtual teammates	65.0	51.2
Tell a virtual collaborator they have done a good job	65.0	51.2
Simultaneously collaborate virtually on documents	65.0	53.6
Notify virtual teammates when you wish to speak	55.0	59.5
Collaborate through web-based project workspace software	72.5	70.2
Use a project email system	62.5	63.1

125 75 25 25 75 125

Favorable ICTs:
Meeting/Collaboration (%)

Figure 1 – Favorable ICTs, Millennials vs. Baby Boomers: Meeting/Collaboration

■ Millennials ■ Baby Boomers

ICT	Millennials	Baby Boomers
Provide transcripts from conversations	70.0	36.9
Record/track/publish conversations	72.5	45.2
Check virtual teammate meeting availability	95.0	75
Know which of your virtual teammates are currently online	82.5	67.9
Monitor and communicate project progress	92.5	73.8
Know how long your virtual teammates have been off-line	67.5	56

125 75 25 25 75 125

Favorable ICTs:
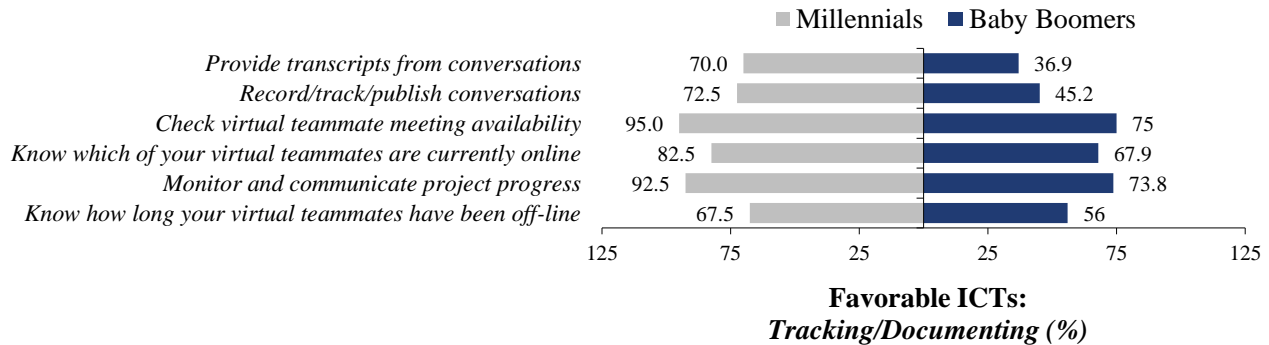*Tracking/Documenting (%)*

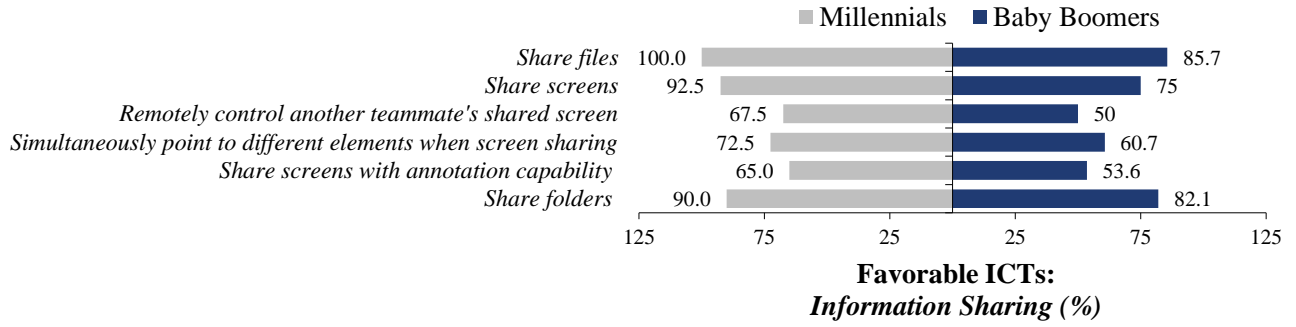**Figure 2 – Favorable ICTs, Millennials vs. Baby Boomers: Tracking/Documenting**

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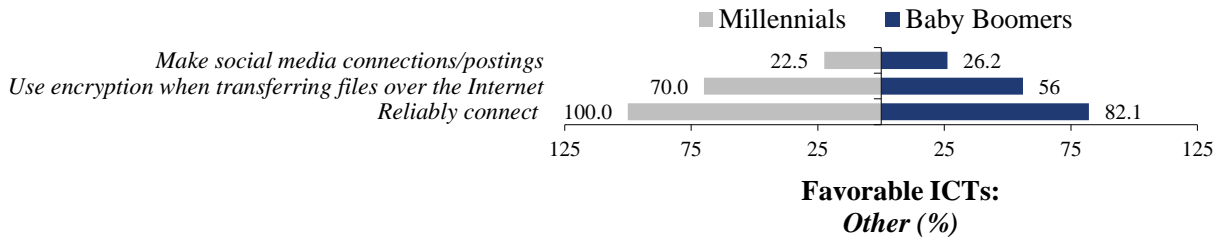**Figure 3 – Favorable ICTs, Millennials vs. Baby Boomers: Information Sharing**

Figure 4 – Favorable ICTs, Millennials vs. Baby Boomers: Other

**Table 4 - ** Summary of Results

	ICT Ability	Millennials			Baby Boomers			
		Favorable	Unfavorable	Removed	Favorable	Unfavorable	Removed	p-value
Meeting/ Collaboration	*Virtually collaborate using mobile devices*	75.0%	17.5%	7.5%	51.2%	44.0%	4.8%	0.0045**
	Use the same collaboration technology across projects (e.g., all team members have equal access to technology)	97.5%	2.5%	0.0%	77.4%	16.7%	6.0%	0.0181*
	Tag key components during presentations (e.g., to come back with questions)	72.5%	22.5%	5.0%	48.8%	40.5%	10.7%	0.0251*
	Hold impromptu conversations/meetings	95.0%	5.0%	0.0%	73.8%	19.0%	7.1%	0.0265*
	Access multiple communication modes	82.5%	7.5%	10.0%	60.7%	21.4%	17.9%	0.0309*
	Send instant messages to virtual teammates	90.0%	10.0%	0.0%	73.8%	26.2%	0.0%	0.0384*
	See virtual teammates	65.0%	30.0%	5.0%	51.2%	46.4%	2.4%	0.0995+
	Tell a virtual collaborator they have done a good job (e.g., virtual thumbs up)	65.0%	30.0%	5.0%	51.2%	38.1%	10.7%	0.2535
	Simultaneously collaborate virtually on documents	65.0%	27.5%	7.5%	53.6%	36.9%	9.5%	0.2536
	Notify virtual teammates when you wish to speak (e.g., virtually raise your hand)	55.0%	37.5%	7.5%	59.5%	29.8%	10.7%	0.4540
	Collaborate through web-based project workspace software	72.5%	17.5%	10.0%	70.2%	20.2%	9.5%	0.7247
	Use a project email system (e.g. Aconex)	62.5%	30.0%	7.5%	63.1%	27.4%	9.5%	0.8150
Tracking/ Documenting	*Provide transcripts from conversations*	70.0%	27.5%	2.5%	36.9%	48.8%	14.3%	0.0038**
	Record/track/publish conversations	72.5%	27.5%	0.0%	45.2%	47.6%	7.1%	0.0136*
	Check virtual teammate meeting availability	95.0%	5.0%	0.0%	75.0%	19.0%	6.0%	0.0283*
	Know which of your virtual teammates are currently online	82.5%	17.5%	0.0%	67.9%	32.1%	0.0%	0.0875+
	Monitor and communicate project progress	92.5%	7.5%	0.0%	73.8%	17.9%	8.3%	0.0884+
	Know how long your virtual teammates have been off-line	67.5%	32.5%	0.0%	56.0%	44.0%	0.0%	0.2204
Information Sharing	*Share files*	100.0%	0.0%	0.0%	85.7%	13.1%	1.2%	0.0158§
	Share screens	92.5%	7.5%	0.0%	75.0%	25.0%	0.0%	0.0211*
	Remotely control another teammate's shared screen	67.5%	32.5%	0.0%	50.0%	48.8%	1.2%	0.0769+
	Simultaneously point to different elements when screen sharing	72.5%	22.5%	5.0%	60.7%	34.5%	4.8%	0.1723
	Share screens with annotation capability (e.g., for document/model reviews)	65.0%	32.5%	2.5%	53.6%	42.9%	3.6%	0.2461
	Share folders (e.g., Google Drive or ProjectWise or Dropbox)	90.0%	10.0%	0.0%	82.1%	14.3%	3.6%	0.4620
Other	*Reliably connect (e.g., bandwidth)*	100.0%	0.0%	0.0%	82.1%	13.1%	4.8%	0.0139§
	Use encryption when transferring files over the Internet	70.0%	25.0%	5.0%	56.0%	32.1%	11.9%	0.2786
	Make social media connections/postings	22.5%	77.5%	0.0%	26.2%	66.7%	7.1%	0.5050

*+p<0.1(approaching significance), *p<0.05, **p<0.01, § expected value(s) < 5*

DISCUSSION

The results of this study reveal that roughly a third of the ICTs from the CII RT 326 survey are viewed distinctly more favorably by the Millennials than by the Baby Boomers. However, many of the ICTs analyzed showed that these two generations were not distinctly different in their views on the ICT in question. The results of this study suggest that a generational digital divide between the older and younger generation is a function of specific ICT abilities. The findings of this study provide a more nuanced understanding of the generational digital divide and may foster discussion of this divide at the specific ICT level. This section explores this finding further and discusses key points from the study results.

Meeting/Collaborating ICTs

This category included both insignificant and significant relationships. It appears that the Millennial participants valued the ability to hold impromptu meetings and conversations as well as the ability to send instant messages more favorably than the Baby Boomers. Interestingly, both these types of technologies are more informal and 'spur of the moment' in nature. Another ICT that relates to this informality is the ability to use mobile devices; mobile devices allow for text messaging (which can be considered a form of instant messaging). The younger generation is sometimes characterized as having an affinity for mobile phones, and this characterization is further supported by these results. The Millennials are often said to be more collaborative (Ferri-Reed 2014), and this desire for collaboration may explain why many of the ICTs examined in this category exhibited significant differences. The results from this category of ICTs show that Millennials have a stronger preference for using ICTs for informal types of collaboration compared to their older counterparts.

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Tracking/Documenting ICTs

This category of ICTs had, by proportion, the highest amount of distinct differences between the generations in their views of the technologies. Only one of the six ICTs in this category had a p-value greater than 0.1, suggesting that these types of ICTs contribute to the digital divide. The Millennials viewed the ability to record/track/publish conversations as well as the ability to receive transcripts of these conversations more favorably than the older cohort. This may be because the Millennials are newer members of the workforce and may lack the background knowledge and experience needed to follow complex, work-related conversations. Therefore, they may prefer to reread meeting notes in order to gain a better understanding. This generation tends to look for feedback (Hershatter and Epstein 2010), and this desire for feedback may also contribute to their desire to check teammate meeting availability, as suggested in the results. Clearer feedback can also be gained by reading transcripts of conversations.

Information Sharing ICTs

The desire for higher levels of collaboration and feedback may make the Millennials more willing to share information (such as in the forms of files or folders). However, there was no distinct difference observed in generational views on the ability to share folders. This ICT capability was deemed essential by the majority of respondents in both cohorts. This supports the findings of Vartiainen and Jahkola (2013), who reported that there were no complaints about FTP sites in their study. Both generations, by and large, agree that the ability to share files is a necessity in the context of a virtual team. Still, 13% of the Baby Boomer participants expressed unfavorable views regarding the ability to share files. This category of ICTs relates more to "information" rather than "communication." So it is possible that each generation has a similar need for

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information in the context of a virtual team even if their preferred communication channels are not the same.

Other

Less substantial differences between the Millennials and the Baby Boomers were observed in this category. Of the statistically insignificant ICTs in this category, the ability to make social media connections/postings is possibly the most surprising. This youngest generation is often associated with social media and their willingness to share issues with their "social networks" (Downing 2006, p. 5). However, the CII RT 326 survey is concerned specifically with workplace use of these ICTs, and the results suggest that Millennials do not care about social media capabilities in a work environment any more than Baby Boomers. This may imply that the Millennials have a clear separation between work and leisure and supports suggestions by previous researchers that Millennials seek a good work-life balance (Baldonado 2013; Downing 2006).

Informal Communication and Tracking Conversations

The results of this study make it hard to make generalizations about the categories of the ICTs that different generations prefer. At first glance, there appears to be no pattern among the significant and insignificant relationships, but further examination reveals a theme running through a number of the significant relationships – informality. The Millennials tend to have distinctly more favorable views than the Baby Boomers regarding collaborating via more informal means with teammates as it was found they have higher preferences for instant messaging, the ability to have impromptu meetings, and mobile phones. These three ICTs tend to allow for more 'spur of the moment' communication that is oftentimes more informal in nature. These 'spur of the

moment' ICTs enable virtual team members to quickly communicate with each other and do not require them to go through the typical formal conduits that are often experienced in the workplace (i.e., memos, emails, etc.). It has been noted that more informal means of communication (e.g., 'Messy Talk') can better lead to conflict resolution (Dossick et al. 2015). Another theme that is present in the results relates to the tracking of conversations. Millennials appear to value tracking and recording conversations more than the Baby Boomers. Millennials may prefer to keep better documentation of meetings since they may lack experience and need to refer back to notes later to gain a better understanding of what was discussed during the meeting; or, Baby Boomers may prefer not to have their conversations documented for legal reasons. Further research into the precise reason for the different generational views on meeting transcripts is clearly required.

Implications

Hamburg (2011) has noted that "the best software to use is the one the team/community is most familiar with and is most prepared to use" (p. 26). Along these lines, Malhotra and Majchrzak (2012) found that virtual teams will benefit from working in a virtual workplace created by "virtual workspace tools" if more of these tools are provided to the team (p. 6:6). The results from our study can inform the decisions of virtual team leaders concerning both the quantity and quality of ICT tools that should be provided to their team. Our results, in combination with Hamburg's (2011) proposition, will inform virtual team leaders which ICTs generational cohorts view most favorably, and thus allow them to select the ICTs that are most favored by the generations within their teams.. Using more favorably viewed ICTs in the context of a virtual team will allow for participants to communicate more effectively and, thus, may increase performance.

This research has shown that future discussions in the literature regarding the generational digital divide should take a more holistic approach by considering many ICTs in each study. Considering a single ICT in a study cannot represent the entirety of the digital divide. In addition to adopting this holistic approach, future research should consider analyzing additional ICTs that were not included in this study.

LIMITATIONS

This study categorized both the ICTs and response options after an existing survey was distributed; the survey was not developed with these explicit categorizations in mind. This may limit the confidence level of the conclusions that can be drawn from each category. However, since the data used in this study is discrete, arising from a counting process of strongly distinct response options (e.g., available vs. unavailable ICTs), the loss of information is minimal. In addition, this study was able to analyze only 124 responses; a larger sample size would increase the confidence level of these results. The survey responses were all from professionals in the engineering and construction industry. The conclusions drawn in this paper are therefore representative of this population and may not hold true for other industries.

CONCLUSION

This study has contributed a clearer and more nuanced understanding of the generational digital divide and identified the ICTs for which this divide is present. Although ICTs, such as mobile phones, appear to contribute to this divide, our results show that not all ICTs contribute equally to this divide. This demonstrates that both those that agree and oppose the notion that a generational digital divide exists may be justified in their views, depending on the ICTs being

considered. This study also contributes to the literature by revealing which types of ICTs (e.g., use of mobile phones) suffer from substantial differences in preferences and usage. This may help inform companies as to which ICTs should be included in virtual teams, and which ICTs should be the focus of training sessions to align generational differences. This study also provides a more complete picture of the digital divide in virtual teams when compared to studies that focused on a single ICT. This helps reveal certain generational strengths that can be capitalized upon by efficiently distributing certain generations to specific tasks and/or teams.

The results of this study reveal that the Millennials did not have distinctly more unfavorable views than the Baby Boomers for any of the ICTs analyzed. Therefore, Millennials appear to have a relative strength related to ICT use when compared to their Baby Boomer counterparts when a broad range of ICTs are employed. Understanding these relative strengths will help better inform virtual team leaders, helping them to make decisions about virtual team generational composition and ICT use that improve performance. This study has helped quantify the generational digital divide and has also demonstrated that this divide cannot be completely understood by examining a small number of ICTs. Future research on the generational digital divide needs to explore a wide range of ICTs so that we may better understand and improve virtual team performance.

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