

# Learning Preferences of Millennials in a Knowledge-Based Environment

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**Abstract:** This paper discusses how understanding intergenerational knowledge transfer can improve knowledge transfer in large organizations. The U.S. Federal Aviation Administration (FAA) risks significant loss of institutional human capital as huge numbers of senior controllers retire. To perform their job, air traffic controllers must develop in-depth knowledge, including tacit knowledge typically acquired over many years, so they can quickly make accurate decisions while dealing with the many air traffic control (ATC) situations that arise. The only pool available to replace the retiring controllers is the Millennials. This group, the best educated ever, has its own attitudes toward life, work, and training as well as technology use. Because knowledge transfer and training involve both technology and human interaction, this paper explores not only the role of technology but also that of intergenerational communications in both the training and operational environments of a highly technical workplace.

**Keywords:** knowledge transfer, training, tacit knowledge, mentoring, mobile smart devices, communications

## 1. Introduction

Intergenerational knowledge transfer, especially in a highly technical environment, has not been thoroughly studied by the academic community. This research was undertaken to further understanding of the impact of generational differences on learning and knowledge transfer in such an environment to add fundamental knowledge and create actionable knowledge for complex organizations. By improving understanding of the preferences of younger workers for knowledge transfer approaches, this study has the potential to add new knowledge to knowledge management (KM) and related fields and give organizations insights into how to design knowledge transfer and learning programs for their younger workers.

## 2. Addressing the problem of knowledge loss

Between now and 2021, the FAA risks significant institutional knowledge loss as senior employees retire, a situation particularly acute for air traffic controllers. By October 2015, FAA expects approximately one-third of controllers to reach mandatory retirement age, as depicted in Figure 1 (FAA 2012). As these controllers retire, the agency must quickly hire, train, and integrate new hires into ATC facilities. The need to pass operational knowledge from veteran controllers to the new hires is critical to maintaining the safety of the U.S. airspace.

Transferring knowledge from one generation to another can be difficult since younger people acquire knowledge and skills differently from older people and have different attitudes on authority, job stability, and learning. Research has shown that knowledge sharing requires trust, which can be compromised when worldviews differ. Further compounding those issues are the different communication styles of each generation. Table 1 shows the communication styles of each group (Hannam & Yordi, 2011).

**Table 1:** Personal communication

Generation	Preferred method of communication
Boomers	Face-to-face Phone calls Personal interaction Structured networking
Gen Xers	Voicemail Email Casual Direct and immediate
Millennials	Text messages Collaborative interaction

Organizations such as FAA are now looking at solutions to deal with these knowledge loss and knowledge transfer issues. For example, to efficiently accomplish knowledge transfer, organizations may benefit from changing their traditional means of training to accommodate the preferences of their new employees. In ATC,

the new hires belong to the Millennial age group. These younger people who grew up in a digital world have been shown to prefer digital technologies to the more static teaching methods used to train their predecessors.

In addition to technology solutions, knowledge transfer and communications issues are also important to address. Once classroom training is completed and the new hires move into FAA facilities for on-the-job training (OJT), generational and age differences can pose challenges, as communications preferences and worldviews vary among the generations.

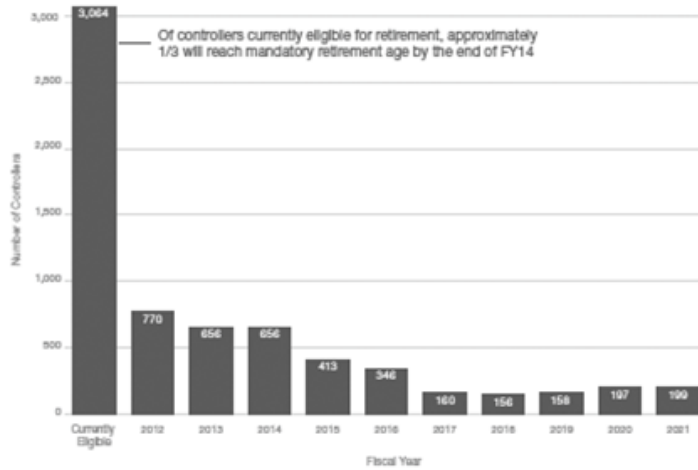


Figure 1: Controller retirement eligibility

2.1 Background

In 1981, the FAA hired thousands of air traffic controllers to replace those U.S. President Ronald Reagan fired after they had gone on an illegal strike. This move created the large cohort of controllers that is now retiring. The agency started hiring Gen Xers in 1992 and Millennials in 2005, creating a younger and multigenerational workforce. Lancaster & Stillman (2002) identify these age groups as follows: Boomers, born between 1946 and 1964; Gen Xers, born between 1965 and 1980; and Millennials, born between 1981 and 1999.

Because of mandatory age limits for incoming controllers, Millennials are the only pool now available for hiring new workers. Their status as the first generation born into a wired world affects their attitudes at work (Smola & Sutton, 2002). Also called Digital Natives (Prensky, 2001) or the Net (N-) Generation (Tapscott, 1998), Millennials tend to work well in groups and be self-confident and technologically astute, whereas, Gen Xers tend toward independence and a hands-off style.

Oblinger & Oblinger (2005) and Reynolds, et al. (2009) describe the three generations in the workplace in Table 2.

Table 2: Attributes of the generations

Description	Boomers	Gen Xers	Millennials
	Me generation	Latchkey generation	Net generation
Attributes	Optimistic Workaholic	Independent Skeptical	Hopeful Determined
Likes	Responsibility Work ethic Can-do attitude	Freedom Multitasking Work-life balance	Public activism Latest technology Parents
Dislikes	Laziness Turning 50	Red tape Hype	Anything slow Negativity

Culturally, Millennials have been a focal point throughout their lives, as youth-oriented media became a major market force in the 1990s (Howe & Strauss, 2000). Although Millennials were catered to from an early age, the authors state, they are cooperative team players, feel close to their parents, respect authority and rules, and

are confident and smart, with aptitude test scores that have risen for every racial and ethnic group. Millennials believe in themselves and the future. Their being pampered has created the belief they are special and a drive to achieve, following their parents' advice to study, avoid risk, and take advantage of opportunities.

According to Schooley, et al. (2009), Millennials stress the importance of work-life balance as a result of seeing their parents work long hours and miss school events. Millennials tend to have less loyalty toward employers than their parents and grandparents did. With important implications for the workplace, Schooley, et al. (2005) find that most Millennials have an "innate" ability to use information technology, are comfortable multitasking while using multiple digital media, and demand interactivity as they construct knowledge. While Millennials often lack a workaholic drive, they compensate by taking advantage of many technologies – often simultaneously – to efficiently perform work.

Many of these younger employees have expertise in media, tools, and technology their older colleagues do not (Lancaster & Stillman, 2002). While older employees have access to these tools, it is the younger employees who understand and make use of them to their full potential and regard them as more effective than traditional forms of communicating. This generational difference may profoundly shape workplace knowledge sharing.

## **2.2 A knowledge transfer challenge**

One way for FAA to meet its knowledge transfer challenges is to train members of the new cohort in ways they prefer and work best for them. This research supports that concept both in terms of technology use and communications and collaboration strategies. As digital natives who grew up online, Millennials expect to see the technologies they use in their daily lives at work. Their proclivity toward adopting the latest technologies and expertise in playing electronic games affords them skills that can be used advantageously in the workplace and in training.

While describing generational preferences for receiving and processing information, Hannam & Yordi (2011) describe the predominant learning style of Millennials as: (1) seeing context and value, (2) searching and exploring with others online in their time and place, (3) connecting to anything, and (4) being tech-savvy. These authors suggest a growing consensus among employers that Millennials need mentoring, which does not mean they have nothing to offer, as they tend to be collaborative, respectful of authority, and eager to learn.

## **3. Why study ATC?**

An FAA executive described the seriousness of the agency's wave of retirements noting, "The institutional knowledge of our employees is the foundation of a healthy organization. People do not show up with it, and it's not something they find in a book or at orientation, or even during formal OJT. It's something they acquire after spending many years, maybe decades, with an organization."

ATC's size, complexity, and culture complicate knowledge transfer. However, this unique work environment is an appropriate study focus because: (1) the need for knowledge transfer is acute due to the large influx of new hires; (2) the operational environment is highly exacting, exacerbating communications issues; (3) training new air traffic controllers is highly intensive and knowledge-based; (4) dependency between mentor and mentee amplifies the significance of intergenerational differences; and (5) known barriers to knowledge transfer exist, for example, OJT instructors and mentors may expect trainees to follow instructions without a rationale or explanation, or they may be reluctant to mentor them at all.

### **3.1 ATC: A knowledge centric environment**

An impending knowledge loss is a major concern in a highly knowledge-centric environment. Thus, this research studied the methods used to train new controllers and to create, capture, and transfer knowledge.

Controllers must have sufficient tacit knowledge to safely manage air traffic as they gain independence on the job. Operationally, controllers apply only the knowledge required by each situation, referred to as "just-in-time knowledge." This knowledge subset is shared with aircraft crews and controllers in airport traffic control towers (ATCT), terminal radar control (TRACON) facilities, and en route centers, ensuring a shared understanding of processes and events that is critical, as all controllers must coordinate their work. For example, after takeoff, an

ATCT controller transfers control of the flight to a TRACON controller, who transfers it to potentially multiple en route center controllers until the process is reversed for landing.

O'Dell & Hubert's (2011) assertion that passing tacit knowledge from one person to another is difficult is especially relevant for ATC, which requires controllers to create tacit knowledge through their shared experiences with coworkers, articulate this knowledge, continually acquire new tacit knowledge, and systematize this knowledge so it eventually becomes explicit and available to others.

### 3.2 ATC and tacit knowledge

Because developing tacit knowledge is so important, training new controllers is intensive. Air traffic controllers go through many years of training, mentoring, and experience during which they gain the explicit and tacit knowledge that will lead to the development of expert judgment. A significant amount of knowledge transfer takes place during OJT, involving close interpersonal (and intergenerational) interactions that rely on trust. During this phase, intergenerational differences in communication styles and preferences can affect trust. Senior controllers must trust that the younger controllers are ready to receive their knowledge and use it appropriately. However, anecdotal reports suggest that older OJT instructors may consider the new hires to be unready to fit into their culture and, as a result, may either fail them or demand additional training. On the other hand, communications differences can also impede trust of older controllers by the younger trainees.

## 4. Central role of communications

Communications is central to this research, as ATC involves a high degree of communication to execute the work, train new controllers, and capture and transfer knowledge. In ATC, communications covers many areas, including sharing rules of behavior, regulations, and instructions on how to accomplish the work. Communications is extremely important in both face-to-face and non-face-to-face situations. Controllers usually work in teams in adjacent positions. As they converse with each other, they must be able to communicate clearly with both colleagues and supervisors as well as the pilots of aircraft under their control in diverse situations. Controllers also must learn the proper terminology when conversing with pilots to ensure their instructions are carried out correctly.

In addition to mastering two-way communication, controllers must be able to speak English clearly and coherently. They must be able to transmit information to the pilot or their colleagues as well as understand the incoming feedback to make sure their message was understood.

Controllers and pilots routinely communicate about the status of flights. This is highly important in situations when unknown variables may be present, such as traffic delays or abruptly changing weather. Sometimes controllers and pilots fail to communicate properly due to the existence of asymmetric information. That situation can lead to a traffic accident such as Asiana Airline flight 214, which crashed at San Francisco International Airport on 6 July 2013. During an investigation by the U.S. National Transportation Safety Board, it was revealed that "the pilot harbored fears about landing safely while relying on manual controls and a visual approach, but did not express them to his fellow crew members because he did not want to fail his training mission and embarrass himself." See <http://www.theguardian.com/world/2013/dec/12/asiana-pilot-feared-landing-safely-ntsb-report>. Also complicating communications is the reality of different self-interests and perceptions. Controllers must take into account all aircraft in their airspace while pilots are focused mainly on one plane. Both parties develop perceptions based on rapidly evolving information on which they bring to bear their expert knowledge, especially tacit knowledge, and communication skills.

In Table 3, Hannam & Yordi (2011) provide insight into the communications preferences of each generation.

**Table 3:** Communication in the multi-generational workplace

Generation	Suggested ways to communicate
Boomers	Conversations should be more formal, perhaps over coffee or lunch. Boomers tend to see relationship and business results as intertwined. Ask about mutual interests, e.g., "How is your son doing in college?" Make the conversation participative by getting the other's input, and link your message to the individual or team vision, mission, and values.
Gen Xers	Do not waste the person's time. Be direct and straightforward. Avoid corporate-speak. Send an email or leave a voicemail that states clearly what you want, how it will serve you, and when you want it.

Millennials	Be positive. Send a text message or meet face-to-face. Tie the message to your personal goals or the goals the team is working toward. Do not be condescending. Avoid criticism and sarcasm.
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## 5. Workplace learning approaches

Controllers need a high level of tacit knowledge to be able to form expert judgments (FAA, 2010). FAA’s three-prong approach to ATC training can be related to the work of de Jong & Ferguson-Hessler (1996), who described four facets of tacit knowledge relevant to controller training: situational, conceptual, procedural, and strategic.

Trainee controllers obtain procedural and some strategic knowledge from classroom instruction (which includes reading manuals, procedures, and textbooks) at the FAA academy. Using a simulator hones this classroom learning and helps develop conceptual knowledge. Generally, once controllers complete training at the Academy, they acquire and build knowledge by daily on-the-job practice, through mentoring and by working with more experienced controllers over the long-term in their assigned facilities through OJT. OJT is analogous to the relationship between a master craftsman and apprentice in a European guild during the Middle Ages and therefore involves a high degree of mentoring.

OJT develops situational knowledge, which new controllers combine with the other three types of tacit knowledge to prepare for working in ATC.

## 6. Research in the ATC environment

Following an extensive literature review, this research identified some assumptions regarding the three generations in the workplace. These assumptions led to the development of the hypotheses, followed by the development of the conceptual model. Following the development of the conceptual model, a survey was developed comprising four sections: the modes (technologies) the three generations use to communicate with their colleagues, each generation’s preferences for methods to gain access to and transfer knowledge, each age group’s preferences for ATC training methods, and demographics. The collected data were analyzed using a modified hypothetical-deductive method, following the cycle of empirical scientific inquiry (de Groot, 1969).

Figure 2 shows the conceptual model. In this model, gaining knowledge is the dependent variable. Age groups, communications behavior within groups, learning preferences, and knowledge principles are the independent variables. The moderator is the external influences affecting implementation of KM, namely, U.S. government policies. The independent variables influence the mediator, namely KM, which affects the success of KM implementation.

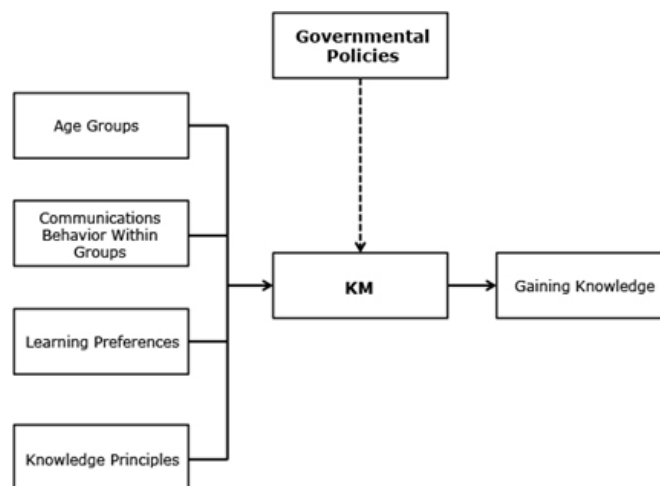


Figure 2: Conceptual model

### 6.1 Hypotheses and development of the survey questionnaire

The research hypothesized that members of the younger generations prefer to use the technologies they rely on in their private lives, such as social media and mobile smart devices, to collaborate and to capture, retrieve, and transfer knowledge in the workplace.

The survey addressed participants' preferences in three areas — communications, solving a task, and learning — in addition to identifying their demographics. Seven hypotheses were tested:

*H1. Older air traffic controllers prefer fewer modes of communications and use them less frequently than do younger controllers.*

*H2. Older air traffic controllers search longer for and share less information than do younger controllers.*

*H3. Older air traffic controllers find classroom instruction, instruction materials, and computer simulation less effective than do younger controllers.*

*H4. Older air traffic controllers find laboratory simulation and online databases less effective than do younger controllers.*

*H5. To transfer mission-critical knowledge in the FAA, older air traffic controllers use KM principles less than do younger controllers.*

*H6. Older air traffic controllers catalog and store information about tasks more than do younger controllers.*

*H7. Older controllers disseminate information about tasks less readily than do younger controllers.*

H1 and H2 were associated with communications behavior within groups. H3 and H4 were associated with learning preferences. H5 through H7 were associated with knowledge principles. All hypotheses were associated with the age groups.

The research studied two groups: (1) 208 operational controllers in the agency and (2) 246 instructors and students in four academic institutions conducting ATC education.

## **6.2 Results of the data analysis**

The data suggest that Millennials embrace new technologies more strongly than do the older cohorts. In this study, members of the younger generations preferred to use technologies such as social media and mobile smart devices in the workplace and for training.

The data also showed that Millennials rely more on knowledge resources (such as expertise locators and knowledge bases) and use them more frequently than do their older colleagues. It also revealed that Millennials exhibit more knowledge-related behaviors compared to Boomers for some activities but not for others.

Some of these results are consistent with other academic findings about Millennials' preferences and behaviors while others are not. Somewhat surprisingly, Millennials rated some traditional training methods (such as face-to-face time with mentors or OJT instructors and classroom training) more highly than did the Boomers. That result raises questions about the cause of these discrepancies that may be worthy of future study. One possible explanation is that such preferences and behaviors are environment-dependent, for example, they may differ from the norm in a highly technical environment where the mastery of tacit knowledge is essential.

## **7. Conclusions and recommendations**

### **7.1 Conclusions**

The survey data confirmed most of the hypotheses. Millennials are more open to new technologies and wish to use mobile smart devices as a part of both life and work. Gen Xers, the transitional generation, show some traits of both Boomers and Millennials. Boomers are the most traditional age group and the slowest to embrace technological changes. The research also confirms that Millennials like to work in teams and share their knowledge. The data analysis led to the following conclusions:

- Millennials prefer to use newer technologies, including social media and mobile smart devices.
- Millennials show more knowledge-related behaviors (e.g., locating experts and identifying lessons learned) compared to Boomers in some cases, but for others (e.g., searching for and sharing information) there were no generational differences.

- Millennials use more knowledge resources (such as expertise locators and knowledge bases) and do so more frequently than do their older colleagues.
- Millennials rate some traditional training methods (such as face-to-face time with mentors or OJT instructors and classroom training) more highly than do Boomers.

## **7.2 Recommendations**

As a result of this research, organizations should be able to answer the following question:

*“How should we augment technical training for new employees in ways that appeal to the lifestyle and needs of Millennials?”*

Because the three generations bring different ideas, challenges, and opportunities to the workplace, executives can benefit from taking these attributes and preferences into account and acknowledging the strength of the diversity they bring to the workplace.

This research suggests that organizations consider the following approaches to meet the knowledge sharing, mentoring, and training needs of their incoming Millennial employees:

(1) *Incorporate interactive serious games into operational training, using mobile smart devices.* The deep lessons Millennials have learned from video games may carry enormous value. If managed and reinforced correctly, these lessons have the potential to deliver that value to the workplace. One challenge is finding ways to exploit the unique aspects of serious games to enhance workplace learning.

(2) *Create communities of practice (COP).* Creating COPs would be vital for helping new hires adapt to and quickly learn the needs of the workplace as well as interact with peers and experts.

(3) *Implement social networks, including microblogging.* There is a strong connection between KM and social media. Yates & Paquette (2011) describe how the low- or no-cost social networks that proved a key part of the disaster response in the aftermath of 2010 Haiti earthquake could be of high value to organizations in the areas of lessons learned and best practices through the use of video and photo-sharing Websites.

(4) *Introduce cross-generational mentoring.* Organizations should consider implementing formal mentoring programs that match leaders and managers with the organization’s best employees. This approach would enable new hires to gain valuable face time with the leaders and managers of their choice. Three types of mentoring are recommended: soft-skills, cross-generational, and reverse mentoring.

## **7.3 The impact of this research**

This research should have an impact on both the development of organizational KM and training programs and approaches as well as future research in the field. Many of the issues addressed are not specific to the FAA but apply to almost every complex public and private sector organization. Aging populations are changing demographics worldwide in developed countries, with profound effects on the workplace environment. As older employees retire, organizations hire younger employees, creating a multigenerational workplace that faces intergenerational issues as well as potential knowledge loss. Younger employees entering the workplace need to learn organizational culture and their individual jobs as expeditiously as possible to become efficient and effective workers.

As the recommendations outlined above show, organizations would benefit from catering to the preferences of their incoming Millennial workers to facilitate their training and integration into the workplace. Designing training and KM programs with these technology preferences in mind will increase efficiency and effectiveness as well as worker morale. Further, Millennials’ strong preferences for KM resources and approaches provide a strong rationale for their implementation in the workplace.

The finding of both generational differences and similarities in KM behaviors suggests that further research is warranted to better understand these behaviors and assess their implications in different workplace environments. Follow-on studies could conduct a comparative analysis of organizations with cultural and KM environments that differ from the highly technical ATC environment where the transfer of tacit knowledge is particularly critical. In addition, follow-on studies could use these and subsequent findings about generational

behaviors to study the effectiveness of implementing workplace technology- and knowledge-based programs and approaches in multigenerational workforces.

Similarly, Millennials' preferences for KM resources provide another area for further study. There is a need to better understand these preferences and how to exploit them in work and training environments. Further findings of support for such preferences in various other work environments would support the case for the expansion of KM resources among complex organizations in general as a productive approach to enhancing knowledge transfer for the incoming Millennials.

#### 7.4 Contributions to the KM field

The findings of this research create important additions to the field of KM. The younger generations' preference for using social media and social technologies for work and in training creates a potential for greater ease of knowledge creation, retention, and transfer for those groups. The possibility and likely willingness of Millennials to reverse mentor their older colleagues by sharing their expertise with the newer social media technologies could likewise enhance the ability of Boomers to share their tacit knowledge with their younger colleagues. Thus, while these findings highlight intergenerational differences, newer technologies also have the potential to enhance knowledge transfer in the workplace among all the generations.

Cultural shifts caused by the advent of emerging social media and related disruptive technologies will likely continue to have an impact on knowledge transfer, communication, and training in the workplace. As new generations become early adopters of the latest technologies, generational differences will continue to be an area that organizations will need to address. This research provides insights into these differences, practical advice for organizations for dealing with generational issues, as well as potential areas for future study for KM investigators.

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