Six Steps to Improving Acceptance and Adoption of Augmented Reality Technology in the Workplace Through Communication

BY: CARLY KROLL

The AREA © 2018. All rights reserved.

This is a proprietary report prepared by Carly Kroll under contract with the AREA.

As part of the AREA's support of the development of sound information and best practices for the introduction and adoption of AR, access to and use of this proprietary report is provided to all members of the enterprise AR ecosystem. If you wish to make your partners, suppliers and customers aware of this AREA research report, you may share this resource provided that this information and the content of the report are not edited.

The entire content of this proprietary report is protected by copyright. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any electronic, mechanical, photocopying and recording means or otherwise, without the prior written permission of the AREA.

TABLE OF CONTENTS

Six Steps to Improving Acceptance and Adoption of Augmented Reality Technology in the Workplace Through Communication

SUMMARY

In recent years accelerating changes in technology have required that more new technology-based tools be introduced to workers while conducting their daily tasks. Although the technologies which managers seek to introduce may be helpful to improve safety, increase efficiency, and are easy to use, workers may not have that perception of the new tools. However, resistance to new technology usage in the workplace is not new and there are steps that have been proven helpful. In order to improve worker adoption of technology-based tools, like Augmented Reality (AR)-enabled devices, employers and manufacturers can apply principles of communication theory and pedagogy. This white paper, based on Communicating Augmented Reality Devices: Improving Technology Acceptance Among Electric Utility Field Workers, outlines six simple steps: (1) inform, (2) simplify, (3) visualize, (4) influence, (5) demonstrate, and (6) encourage. Where used while introducing Augmented Reality, these steps will likely improve acceptance and adoption of the technology.

INTRODUCTION

AR-assisted procedures and tools promise to significantly improve safety and efficiency of many industries where people move, modify and work with real world materials. As AR technology infiltrates the workplace, workers may be reluctant to adopt the new tools and devices. Developing procedures and tools designed to improve technology acceptance and adoption will help employers and AR manufacturers ensure a smooth rollout and higher positive impacts of their products and tools.

One way to encourage AR adoption is through use of communication skills and theories to effectively translate existing research and information about AR into palatable and comprehensible "chunks" for workers (Agwa-Ejon & Batchelor, 2016). The following is a set of communication steps and advice useful to employers and manufacturers to inform, simplify, visualize, influence, demonstrate, and encourage the adoption of the new technology in the workplace.

IMPROVING TECHNOLOGY ACCEPTANCE
AND ADOPTION OF
AUGMENTED REALITY
THROUGH COMMUNICATION

INFORM

Define AR, teach what it is. Provide examples of it in their daily lives. Explain how it will help them in their job.

SIMPLIFY

Summarize research and articles that discuss the safety and efficiency improvement with AR in the workplace.

VISUALIZE

Provide Photos
Show Videos
Create Infographics

INFLUENCE

Target the influencers of the workers. If they get on board others will follow suit.

DEMONSTRATE

Allow hands on training, or a demo day early on to get feed back and allow workers to experience the new tool.

ENCOURAGE

Be patient with workers, and support their training process

Infographic By: Carly Kroll 2018

Six Steps to Improving Acceptance and Adoption of Augmented Reality Technology in the Workplace Through Communication

INFORM

For many people change is a challenge, whether it is moving, starting a new job, or changing the way a task is completed every day (Disalvo, 2017). Technology implementation is one of these changes that may be met with resistance, especially when the technology is considered very new. One way to help encourage technology adoption is through educating target audiences. The more informed an individual is on a topic, the less unfamiliar it is. Providing a concise definition of the new technology and explaining clearly how the employee will use it may increase technology acceptance.

The Technology Acceptance Model (TAM) is a simple and widely-adopted tool for employers to understand the sources and reduce resistance to the new technology. TAM provides insight about why people accept or reject new technology (Davis, 1989; Davis, Bagozzi & Warshaw, 1989; Venkatesh & Davis, 2000). Much of the early research usint the TAM focused on early computers, and email in the workplace (Bagozzi, Davis, & Warshaw, 1992; Davis, 1989; Venkatesh & Davis, 2000). Specifically, earlier TAM studies asked participants if they thought email would make their jobs easier, was useful at work, and would improve efficiency at work. The perceived usefulness and ease of use are the main factors regarding whether or not an individual will accept new technology, whether or not it is actually more efficient (Bagozzi, Davis, & Warshaw, 1992; Davis, Bagozzi & Warshaw, 1989). Those who thought email was a waste of time and it would not help them, rejected email; even though it is now clear that email can be very effective at crafting messages and sending information without waiting for the traditional post. Perceived usefulness is the "degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). Whereas perceived ease of use is "the degree to which a person believes that using a particular system would be free of effort," (Davis, 1989, p. 320). The cost-benefit and cognitive tradeoff of use are important in the adoption of the new technology (Davis, 1989). Numerous studies have shown how TAM explains why individuals choose to use technology based on the aforementioned usefulness and ease of use (Venkatesh & Davis, 2000).

TAM can be applied to better understand resistance other technological disrupters, including AR. Research has shown that AR can make workers safer and more efficient for many fields of employment, however, the research does not equate to complete acceptance from workers, but an improvement (Judson, 2017; Schmalstieg & Höllerer, 2016; Syberfeldt, et al., 2016). Workers may be hesitant to adoption of AR on the job as it would be a major change to their daily routine and procedures. Additional steps must be taken to help increase acceptance and adoption.

Six Steps to Improving Acceptance and Adoption of Augmented Reality Technology in the Workplace Through Communication

SIMPLIFY

Another step for accelerating an understanding of AR's value to workers is by simplifying information. There is ample research that helps to satisfy the TAM model for how AR is useful and easy to use, but it is not easily accessible to the general population. Summaries of research and articles must be presented in concise and interesting ways.

Researchers in the science, technology, engineering and math (STEM) fields have found it challenging to present their findings to the general public (Bizony, 2009; Fahnestock, 1986; Giagante, 2012). Often, authors of technology research results use academic jargon that requires prior knowledge to understand (Popan, 2016). One way to bridge the divide of understanding is to adapt (or "accommodate") the communication style to fit the audience (Bizony, 2009; Popan, 2016). Communication accommodation theory (CAT) has typically been used in the past to increase understanding in cross- and co-cultural, and organizational settings (Popan, 2016; Rogerson-Revell, 2010).

CAT is used by many disciplines and is useful for many areas of study. Health professionals, for example, use CAT principles to speak with patients (Giles, 2016). But there are also risks. Over accommodating by the nurses or doctors can come off as patronizing and demeaning. If they under-accommodate they tend to use challenging jargon and confusing terms that will seem pretentious and may cause confusion on the part of the patient (Giles, 2016). However, there is a possibility in CAT to simultaneously converge and diverge, such as diverging to keep authority and converging to ensure that the vocabulary is understandable to the target audiences (Giles, 2016). Although simplifying research results may seem common sense to some, it is not applied sufficiently when introducing AR to the workforce. Research and information surrounding AR could be considered scientific communication.

Several fields outside of communication have looked at the idea of accommodating scientific language to meet the general population's needs, using the methods of CAT, but terminology separate from the communication field (Bizony, 2009; Fahnestock, 1986; Giagante, 2012; Rice & Giles, 2017). When converting results of scientific studies to fit into magazine articles, information can be lost, or misinterpreted (Bizony, 2009; Fahnestock, 1986; Giagante, 2012). In order to do so, interdisciplinary writing and collaboration between professionals of different fields (both scientific and communication fields) are found to be useful, when accommodating communication to the general public (Fahnestock, 1986; Rice & Giles, 2017). Journalists may not have a scientific background, and scientists may only want to use an academic style of

Six Steps to Improving Acceptance and Adoption of Augmented Reality Technology in the Workplace Through Communication

writing, therefore collaboration between disciplines can allow for the generation of ideas, tactics and quality writing that presents science accurately and in a comprehensible way (Fahnestock, 1986). Similarly, interdisciplinary collaboration to communicate about AR can be very helpful in balancing the scientific knowledge for the general public.

Communication Accommodation Theory will be useful in translating research about AR use into clear and interesting messages. A challenge for employers will be to ensure that the information is not over accommodating and potentially offending their readers (Giles, 2016). The uncertainties in the role of the worker can be reduced through information dissemination (Lewis, 2011). Through increasing access to relevant information about the changes they can expect, workers will feel more at ease, and employers can be more confident of a smooth change (DeWine, 2001; Downs & Adrian, 2004; Lewis, 2011).

VISUALIZE

Engineering and technology terminology surrounding AR can be daunting for those unfamiliar with the field, so translating accurately or even defining terms can be a useful tool. Although information and summarized written material is helpful to further assist in improving technology acceptance, visual aids can also be powerful tools. Photos, videos and infographics all have benefits for demonstrating how a new tool can be useful and easy to use in the workplace.

Our brains can process images faster than text. Informational graphic, or "infographics," can be simple or complicated, presenting graphs, charts, icons, images, and information (Krauss, 2012; Lankow, Ritchie, & Crooks, 2012). Infographics help to "concisely communicate messages to an audience," (Smiciklas, 2012, 3). Infographics communicate research in a visually simpler way to audiences (George-Palilonis, 2006; Krauss, 2012; Lankow, Ritchie, & Crooks, 2012). Infographics are an effective way to communicate statistics or research findings. Using infographics to present information on new technology tools simplifies the complex and potentially intimidating aspects that can accompany any new technology to show its usefulness and ease of use to workers. The visuals and limited text present challenging information in creative and useful ways. Infographics present a great deal of information in a quick, visually aesthetic format (Ajmi, 2016; Krauss, 2012; Lankow, Ritchie, & Crooks, 2012; Smiciklas, 2012). In the case of AR, infographics can pinpoint and present data that is important to specific audience of workers whose jobs may require using AR on a daily basis.

Infographics also assist when language is challenging because they make use of both words and visuals. Well designed infographics balance both "linguistic and non-linguistic systems coverage," (Krauss, 2012, 11). Infographics also help to decode jargon specific to the topic and match the audience's needs (Smiciklas, 2012).

Infographics have been shown to support robust learning (Lyra, Isotani, Reis, Marques, Pedro, Jaques, Bitencourt, & Ibert, 2016). Studies have indicated that infographics help the retention of information and the comprehension of materials (Agwa-Ejon & Batchelor, 2016; Lyra, et al., 2016). Therefore, using infographics as a tool in addition to other training processes, workers may remember specific terms, and ideas surrounding AR. Moreover, infographics aid in acceptance of new information and aide in employee knowledge (Agwa-Ejon & Batchelor, 2016).

Furthermore, infographics attract more attention than other text or visuals due to the brain's attraction to new information. An infographic stands out in comparison with text and traditional formats (Heller & Landers, 2014; Yikun & Zhao, 2015). Finally, infographics are able to guide faster decision-making and tactical implementation due to the concise and clear information (Smiciklas, 2012), which ensures that employees find the ease of use and usefulness of AR in their workplace.

Infographics also have some drawbacks particularly in the area of effectiveness. Successful use depends upon the formatting, information, and visuals used (Pittman, 2017). Infographics are useful if they target audiences with relevant content, they cannot be a one size fits all (Heller & Landers, 2014; Pittman, 2017; Yikun & Zhao, 2015). Some critics of infographics feel that they are dumbing down readers and make complex things appear too simple, or do not show the whole aspect of a topic by minimizing it down too much (Smiciklas, 2015). Much of the concerns for infographics appeared during their first push in print media in the 1980's. However, in recent years infographics have gained more support from scholars as an effective and useful tool (George-Palionis, 2006; Heller & Landers, 2014).

Using infographics to present information on new technology tools helps to simplify the complex and potentially intimidating aspects that can accompany any new technology to show its usefulness and ease of use to workers.

Augmented Reality
Future tools for the electric utility industry

Augmented Reality: (AR) Augmented reality is a digital graphics overlay on the real world. It allows a person to see, but adds images that present information.

Safe

- Identifies obstacles and dangers such as charged wires and objects or minimum approach distance.
- Hands-free technology.
- Can find breaks in the lines.

Fast

- Allows workers to keep their eyes on the task.
- Can provide real-time information like phasing.
- Access to internet database can recall manuals and other information.
- Simple to use technology for the wearer.

Smart

- Able to relay information through video and sound.
- Can contact experts in the field to get feedback on situations or advice on legacy hardware.
- Can be programmed for many tasks such as viewing underground wires and lines.

The Future Is Here

- AR is expected to be a daily tool in the next 5 years.
- You currently use AR when using a backup camera in your car.
- Current research is being done to improve user comfort & accuracy in all weather conditions.

Six Steps to Improving Acceptance and Adoption of Augmented Reality Technology in the Workplace Through Communication

INFLUENCE

Diffusion of Innovations (DOI) is a concept that aligns with TAM (Rogers, 2003). DOI "details the process by which a new innovation or product diffuses through a social system," (Vishwanath & Barnett, 2011, 2). The process by which information is shared between individuals about the innovation is extremely important in allowing the spread of technology (Vishwanath, & Barnette, 2011). In the theory Diffusion of Innovations, influencers are discussed as catalysts that encourages adoption (Rogers, 2003). Influencers are people who begin a trend in new technology in different social circles. When influencers are willing to adopt a new technology, many others in their social group will be far more likely to follow suit.

Research about DOI looks at how new technology is spread throughout the community (Rogers, 2003; Van Slyke, Ilie, Lou, & Stafford, 2007). The current body of research focuses on topics such as DOI of environmentally friendly innovation, health care practices as innovation, the role of early adopters and the stages of DOI (Dearing & Cox, 2018; Dedehayir, Ortt, Riverola, & Miralles, 2017; Door, Cohen, Adler-Milstein, 2018; Rice, 2017; Sukanya, Noppol, Xu & Yu, 2017; Zhai, Ding, & Wang, 2018). With more and more innovations and disruptors such as Amazon, Uber and Airbnb, researchers have many areas for which DOI can be seen in action and studied (Dedehayir, et al., 2017).

There is a pro-innovation bias, that most research using DOI holds, where there is an assumption by researchers that the innovation should be "diffused and adopted by all members of society," and diffused quickly (Dearing & Cox, 2018; Rogers, 2003; Vishwanath & Barnette, 2011). DOI also identifies the uncertainties of individuals with adopting a new and unknown innovation, because of the unknown outcomes (Dearing & Cox, 2018; Valente, 1994). In order to reduce this uncertainty, individuals seek information about the innovation from friends, peers, and colleagues (Dedehayir, et al., 2017; Valente, 1994). This process of information seeking from peers may be useful for employers to consider when rolling out a new technology in their organization.

Different stages, such as an acquisition of knowledge, being persuaded, making a decision, implementing the innovation, and confirming the benefits and use of the innovation, take place during the innovation-decision process (Rogers, 2003; Van Slyke, et al., 2007; Zhai et al., 2018).

DOI is important for identifying why employees may choose to adopt AR or not. The decision process of innovation is what many workers will experience when provided

information about AR by employers. During the learning process about the AR tools, workers will begin to form attitudes towards AR, resulting in a decision to either accept or reject AR (Rogers, 2003; Van Slyke, et al., 2007).

In a recent pilot study on encouraging technology acceptance among electric utility workers participants interviewed stressed how they will be more willing to start using a new tool or technology if a person or group of people they admire in the workplace begins to use it (Kroll, 2018). The interviews suggested that the use of influencers was important for helping to create a diffusion of innovations and improved technology acceptance. The participants explained that there are some staff members who are respected, and their opinions are valued by many: "I think that there are some people who are respected, or that are liked more. If they see the future and possibilities of this new technology and they get it out to their coworkers, it might be more accepted rather than the company pushing it or someone they don't know pushing it," (Kroll, 2018). If the influencers are willing to adopt a new technology, others will be more likely to follow suit.

In some cases, influencers are supervisors and/or part of the general line mechanic team. The communication between the influencers and their colleagues on the inclusion of new tools in daily tasks is something to be considered when communicating new tools such as AR to workers. Furthermore, as AR becomes more used, workers may be more willing to adopt it as they see other workplaces, and colleagues in the field adopt AR as a standard tool (Lin & Ha, 2010). Similarly, if major companies adopt AR, other smaller or independently-owned companies will follow suit.

Considering specific organizational cultures, employers should note the influencers, and seek to understand why they are respected. This knowledge is helpful not only for technology acceptance of AR, but for other organizational changes as well (DeWine, 2001).

DEMONSTRATE

Considering the previous steps, which are all needed and useful towards communicating AR tools and devices to workers, it should also be noted that it is equally important to have a hands-on training, or demo prior to starting AR's use in the workplace. Using this method workers not only have the information and visualization, but they also may experience the kinesthetic learning to understand how it can be used and to judge for themselves if it is easy to use.

Technology like AR can be challenging to fathom if one has never experienced it first hand before. Experiencing head-mounted AR display devices, heads up devices or mobile devices may spark memories of using something similar: perhaps an app on their smartphone, or using the backup camera in their car. Connecting personal examples and prior experiences to the physical tool will help make the transition for use of AR in the workplace easier and less intimidating. Prior experience often equates to more acceptance with technology. Considering prior experience as a variable in technology acceptance has been studied by multiple researchers as an element of an enabler and motivator for adopting the new technology (Klein & Lee, 2006; Lee, 2008; Martins & Kellermanns, 2004). Novelty ideas and concepts that are pricor experience, give individuals a "basis for believing in their capacity to handle the uncertainties inherent in learning something new," (Tabak & Nguyen, 2013, p. 120). By viewing the tool as worthwhile the individuals may be more likely to view it as useful, increasing the likelihood of technology adoption, (Klein & Lee, 2006; Tabak & Nguyen, 2013). Showing tools and having demo days before deciding to implement AR will help to introduce it as an option and get workers excited about its possibilities in the workplace, as well as provide the prior experience to workers.

During hands-on demonstrations employers can also make note of the concerns of workers, in order to address those concerns when the roll-out of the AR technology occurs. Considering the needs of the employees using the tools, and anticipating what support may be required, technical, training or otherwise, may help to reduce anxieties amongst workers. Taking measures to introduce the support tools available at the same time as the demonstration of a new tool is likely to benefit the actual introduction and adoption process.

ENCOURAGE

Finally, after communicating about AR use cases, benefits and risks to workers, employers must set up internal systems to encourage their employees to use and provide feedback or share suggestions based on their experiences with the new technology with trusted professionals. Not all individuals will pick up the new AR-assisted techniques quickly, as prior experience with technology may make it easier for some, while those with limited technology exposure in their backgrounds may be overwhelmed and slow to accept the new technology.

Just as workers provided feedback during the demonstration, it is imperative to continue listening to worker input, and to follow up on their comments. Listening to feedback in many work circumstances can be helpful, but it is especially needed when

Six Steps to Improving Acceptance and Adoption of Augmented Reality Technology in the Workplace Through Communication

working with an emerging tool in the workforce such as AR. The feedback throughout the use of the devices may be helpful to AR manufacturers, designers and engineers. In addition, keeping track of issues, and/ or achievements will be helpful when considering renewing leases with devices, or buying the upgraded version. From a business transformation point of view, documenting worker comments on the use of the AR tool will be useful when planning the purchase of future devices or solutions.

Documenting employee feedback can be helpful to the business and is even more meaningful when it also makes employees feel valued. Employees may find that certain tasks are challenging due to environmental conditions not previously considered or may think of other useful ways AR could be used in their daily tasks. Taking their comments and concerns seriously may improve upward organizational communication in the future, thus enhancing the organizational climate (DeWine, 2001, Downs & Adrian, 2004).

Finally, celebrating achievements is something employers can do to improve technology adoption in the workplace. As in any work environment, employee recognition is a way to make workers feel valued (Downs & Adrian, 2004). Celebrating achievements with the new AR devices or procedures, on completed projects, a reduction of accidents or errors in the workplace or an improvement of accuracy in work tasks is worthy of praise. Patience and support in the training process are also important to ensure that the technology adoption is followed through, and workers feel safe and confident with their new AR-assisted procedures.

CONCLUSION

Information is helpful for improving technology acceptance. Describing what AR is, explaining it in the jargon of the audience using Communication Accommodation Theory, and aiding understanding with visuals, such as infographics, make the benefits of AR clearer and increases worker interest and confidence. In addition to considering the Technology Acceptance Model, targeting those who are considered influencers in the workplace may help the dissemination of AR acceptance and use by taking into consideration social cues with Diffusion of Innovations. Furthermore, allowing hands-on-experiences, prior to the rollout in the organization, may help to create a more positive understanding of the use of AR thus improving the acceptance later. Finally, being patient with employees as well as listening to their feedback, may not only encourage technology adoption but may move the organizational culture forward towards innovation.

REFERENCES

Agwa-Ejon, J. F., & Batchelor, V. (2016). Improved productivity and customer satisfaction in manufacturing through sustainable quality system. *2016 Portland International Conference on Management of Engineering and Technology (PICMET), 2188.*

Ajmi, A. (2016). Using infographics to report research results. *Computers in Libraries, 36(6),* 11-15.

Bagozzi, R. P., Davis, F. D., & Warshaw, P. R. (1992). Development and test of a theory of technological learning and usage.

Bizony, P. (2009). The great divide. *Engineering & Technology, 4(1),* 41.

Davis, F.D, Bagozzi, P R, Warshaw P. (1989). "User acceptance of computer technology: A comparison of two theoretical models, Management Science. 35 pp. 982-1003.

Davis, F. D. (1989). "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," MIS Quarterly (13:3), pp. 319-339.

Dearing, J. W., & Cox, J. G. (2018). Diffusion of innovations theory, principles, and practice. *Health Affairs, 37(2),* 1.

Dedehayir, O., Ortt, R. J., Riverola, C., & Miralles, F. (2017). Innovators and early adopters in the diffusion of innovations: a literature review. *International Journal of Innovation Management, 21(8),* 1.

DeWine, S. (2001). The consultant's craft: Improving organizational communication (2nd ed.). Boston: Bedford / St. Martin's.

Disalvo, D. (2017). Eight reasons why it's so hard to really change your behavior. *Forbes.* Retrieved from https://www.forbes.com/forbes/welcome/?toURL=https ://www.forbes.com/sites/daviddisalvo/2017/05/28/eight-reasons-why-its-so-hard-to-really-change-your-behavior/&refURL=https://www.google.com/&referrer=https://www.google.com/

Downs, C. W., & Adrian, A. D. (2004). *Assessing organizational communication: Strategic communication audits.* New York: Guilford Press.

Fahnestock, J. (1986). Accommodating Science: The Rhetorical Life of Scientific Facts. *Written Communication*, 3(3), pp. 275-96.

Giles, H. (2016). *Communication accommodation theory*: *negotiating personal relationships and social identities across contexts.* Cambridge.

George-Palonis, J. (2006). *A practical guide to graphics reporting: information graphics for print, web & broadcast.* Burlington, MA: Focal/Elsevier.

Giagante, M. E. (2012). Accommodating scientific illiteracy: Award-winning visualizations on the covers of "science". *Journal of Technical Writing and Communication, 42(1),* 21-38.

Heller, S., & Landers, R. (2014). *Infographic designers' sketchbooks.* New York, NY: Princeton Architectural Press.

Judson, J. (2017). Augmented Reality: A New Reality for Utilities. Retrieved from https://blogs.cisco.com/energy/augmented-reality-a-new-reality-for-utilities

Klein, H. J., & Lee, S. (2006). The effects of personality on learning: The mediating role of goal setting. *Human Performance, 19(1),* 43-66.

Krauss, J. (2012). Infographics: More than Words Can Say. *Learning & Leading With Technology, 39(5),* pp. 10-14.

Kroll, C. (2018) Communicating augmented reality devices improving technology acceptance among electric utility field workers. *Marquette University Proquest.*

Lankow, J., Ritchie, J., & Crooks, R. (2012). *Infographics: the power of visual storytelling.* Hoboken, N.J.: John Wiley & Sons, Inc., 2012.

Lee, Y. C. (2008). The role of perceived resources in online learning adoption. *Computers & Education, 50(4),* 1432-1438.

Lewis, L. K. (2011). Organizational change: *Creating change through strategic communication.* Chichester, West Sussex: Wiley-Blackwell.

Lin, C., & Ha, L. (2008). Subculture, critical mass, and technology use. *The Journal of Computer Information Systems.* 50(3) pp. 72-80.

Lyra, K. T., Isotani, S., Reis, R. C. D., Marques, L. B., Pedro, L. Z., Jaques, P. A., & Bitencourt, I. (2016). Infographics or Graphics+Text: Which Material is Best for Robust Learning? (2016). *2016 IEEE 16th International Conference on Advanced Learning Technologies (ICALT), Advanced Learning Technologies (ICALT), 2016 IEEE 16th International Conference on, Advanced Learning Technologies (ICALT), 2014 IEEE 14th International Conference on, 366.*

Martins, L. L., & Kellermanns, F. W. (2004). A model of business school student' acceptance of a web-based course management system. *Academy of Management Learning and Education, 3(1),* 7-26.

Pittman, Brian. (2017). 3 writing lessons from infographics. *PR Daily.* Retrieved from https://www.prdaily.com/Main/Articles/3_writing_lessons_from_infographics_22100.aspx

Popan, E. (2016). Communication accommodation theory (CAT). *Salem Press Encyclopedia.*

Rice, R. E., & Giles, H. (2017). The Contexts and Dynamics of Science Communication and Language. *Journal Of Language & Social Psychology, 36(1),* pp. 127-139.

Rogers, E. M. (2003). *Diffusion of innovations.* New York: Free Press

Rogerson-Revell, P. (2010). Can you spell that for us non native speakers? *Journal Of Business Communication, 47(4),* pp. 431-454.

Schmalstieg, D., & Höllerer, T. (2016). Augmented reality: Principles and practice.

Smiciklas, M. (2012). *The power of infographics: using pictures to communicate and connect with your audiences.* Indianapolis, Ind.: Que Pub.

Sukanya, S., Noppol, A., Xu, P., & Yu, X. (2017). Diffusion and adoption behavior of environmentally friendly innovation: sharing from Chinese society. *International Journal of Behavioral Science, 12 (2),* 90-109.

Syberfeldt, A., Holm, M., Danielsson, L., Wang, L., & Brewster, R. L. (2016). Support Systems on the Industrial Shop-floors of the Future – Operators' Perspective on Augmented Reality. *Procedia CIRP 44,* pp 108-113.

Tabak, F. & Nguyen, N. T. (2013). Technology acceptance and performance in online learning environments: impacts of self-regulation. *Merlot Journal of Online Learning and Teaching, 9(1)* 116-130.

Valente, T. W. (1994). *Network models of the diffusion of innovations.* Cresskill, NJ: Hampton.

Van Slyke, C., Ilie, V., Lou, H., & Stafford, T. (2007). Perceived critical mass and the adoption of a communication technology. *European Journal of Information Systems, 16(3)* 1, 270-283.

Venkatesh, Viswanath & Davis, Fred D., (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science, (2),* 186.

Vishwanath, A., & Barnett, G. A. (2011). T*he diffusion of innovations: A communication science perspective.* New York: Peter Lang.

Yikun, L., & Zhao, D., (2015). *Visual storytelling: infographic design in news.* Mulgrave, Victoria, Australia: The Images Publishing Group.

Zhai, Y., Ding, Y., & Wang, F. (2018). Measuring the diffusion of an innovation: A citation analysis. *Journal of the Association for Information Science and technology. 69(3),* 368-379.