XR Training and Confidence Levels in Undergraduate Logistics Management Programs †

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Abstract: With extended reality (XR) technology on the rise in logistics education, we evaluated the perceptions of undergraduate Logistics Management students and faculty members from an international aviation academy in Ladkrabang, Thailand on XR training and confidence levels. The XR training and confidence framework used was adapted from NMC Horizon Project's digital literacy framework, the previous XR for logistics research work of Pehlivanis, Papagianni, and Styliadi, and DHL's Key Developments and Implications. As critical points on training and confidence levels were perceived as low, we recommend further study utilizing the framework adaptations in this study along with methods of improving and evaluating XR training and confidence levels in undergraduate logistics management programs in Ladkrabang, Thailand, Southeast Asia, Asia-Pacific, and beyond.

Keywords: logistics; education; extended reality; virtual reality; augmented reality, mixed reality

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1. Introduction

XR technologies such as virtual reality (VR), augmented reality (AR), and mixed reality (MR) are classified by the World Economic Forum [1] as breakthrough technologies of The Fourth Industrial Revolution. This study aims to understand XR training and confidence levels as perceived by undergraduate logistics management students and faculty members in Ladkrabang, Thailand. Data was collected from online respondents and analyzed in terms of XR literacy, primarily adapted from NMC Horizon Project's Digital Literacy Impact Study framework [2].

1.1 Extended Reality Technologies

Extended reality (XR) is an umbrella term encompassing VR, AR, MR and related technologies. VR immerses the user in a fully simulated environment, AR brings virtual elements into the real world, and MR allows for interaction between real-world and virtual-world aspects [3].

1.2 XR Principles of Logistics

The researchers considered the work of Pehlivanis, Papagianni, and Styliadi [4] which identified four key areas of focus for XR for logistics; layout planning and concept creation, product simulation, operator training, and operational use (day-to-day operation simulation). These concepts will be merged with DHL's Key Developments & Implications; virtual training, virtual concept creation, and digital twins or virtual representations of real-world assets [5]. Thus, five principal dimensions of logistics management XR informed the research design; XR Concept Creation (Planning): logistics work area and workflow design; XR Product Simulation: support for iterative project engineering design; XR Representations (Digital Twins): real-time informative visualizations of physical assets; XR Training: supporting faster, more in-depth knowledge acquisition and reduced costs; and XR Operations Simulation: clarification and visualization of day-to-day logistics operations.

1.3 XR in Education

The five principal dimensions were additionally informed by XR educational technology literature, which has demonstrated that digital transformation can lead to greater learning [6] and that XR technology is suited for a broad range of educational areas, especially those that benefit from immersive simulation [7].

Perceptions of educators on the use of educational technology and the levels of satisfaction with innovations available for classroom use have been increasing [8]. With only 42% of employers reporting that new hires are adequately prepared to enter the workforce [9]. Based on the literature reviewed and cited, the researchers hypothesize the following:

Ho$_1$: XR training levels in undergraduate logistics management programs are sufficient
Ho$_2$: Confidence in applying XR technology to logistics-related career activity is sufficient

2. Methods

The researchers used a mixed method approach in order to develop a comprehensive picture of XR training and confidence levels with input from multiple stakeholders. The researchers utilized semi-structured questionnaires to collect qualitative and quantitative data. Respondents were given the opportunity to provide feedback beyond the initial research design. In addition to the questionnaires, the researchers conducted interviews with experts in fields of XR, logistics management, and post-secondary education.

Questions focused on XR training and confidence perspectives in logistics management undergraduate programs in Ladkrabang, Bangkok, Thailand. The online questionnaire included five principal concepts including; virtual concept creation, virtual product simulation, virtual representations, virtual training, and virtual operations. Research constructs were measured using multiple-item 5-point Likert scales. Scales ran from 5 (strongly agree) to 1 (strongly disagree). Target respondents were evaluated in terms of familiarity with XR for logistics management (ranging from very familiar to not at all familiar). The data was collected from a judgment sample of respondents on a voluntary basis and analyzed with SPSS software. A single t-test survey with a test value of zero and a 95% confidence interval of the difference was performed.

3. Results

According to the survey and hypotheses expression this study, the researchers have analyzed the data from SPSS program to evaluate the results as follows:

Table 1. XR Training Levels Sample T-Test (One-Sample)

XR training level question	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
13	5.209	14	.000	1.93333	1.1372	2.7294
14	5.172	14	.000	2.13333	1.2486	3.0181
15	4.882	14	.000	1.93333	1.0840	2.7827

As shown in table 1, the highest mean of 2.13333 belongs to #14 “My training level for producing XR content for the following platforms is: [F. Unity Game Engine:]”, followed by “My training level for producing XR content for the following platforms is: [E. Apple/iOS/ARKit:]”and “My training level for producing XR content for the following platforms is: [G. Unreal Game Engine:]" with matching means of 1.93333.

Table 2. Confidence in applying XR Sample T-Test Statistics (One-Sample)

Confidence in applying XR question	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
4	8.635	14	.000	2.33333	1.7538	2.9129
5	6.578	14	.000	2.26667	1.5276	3.0057
7	7.483	14	.000	2.40000	1.7121	3.0879

As shown in table 2, the highest mean of 2.4000 belongs to #7 "How confident are you in using XR technology to create content that uniquely communicate ideas, narratives, or stories (teaching a class in XR, creating an XR presentation/report, etc.)?", followed by #4 "How confident are you using XR technology to generate ideas, content, or products that are imaginative and innovative?" with a mean of 2.3333, and #5 "How confident are you applying your current XR skills to new contexts and environments?" with a mean of 2.26667.

Table 3. XR Training Levels Sample T-Test Statistics (One-Sample)

	N	Mean	Std. Deviation	Std. Error Mean
XR training level	15	1.5263	.77070	.19899

Table 4. XR Training Levels Sample T-Test Statistics (One-sample)

	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
XR training level	7.670	14	.000	1.52632	1.0995	1.9531

Participants who are trained regularly received statistically significantly higher level scores in XR (M = [1.52], SD = [.77]) than the general population, t (14) = [7.670], p = [0.000].

Table 5. XR Training Levels Sample T-Test Statistics (One-Sample)

	N	**Mean**	**Std. Deviation**	**Std. Error Mean**
Confidence in applying XR mean	15	2.0545	.86093	.22229

Table 6. XR Training Levels Sample T-Test Statistics (One-Sample)

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Confidence in applying XR mean	9.243	14	.000	2.05455	1.5778	2.5313

Participants who are trained regularly received statistically significantly higher Confidence in applying XR technology (M = [2.05], SD = [.86]) than the general population, t (14) = [9.243], p = [0.000].

Table 7. **Hypothesis Testing**

Hypothesis		Sig. (2-tailed)	Acceptance
Ho1	XR training levels in undergraduate logistics management programs are sufficient	.000	Null Hypothesis rejected
Ho2	Confidence in applying XR technology to logistics-related career activity is sufficient	.000	Null Hypothesis rejected

4. Discussion

The data gives insight into the current landscape of XR training and confidence levels specific to undergraduate logistics management programs in Ladkrabang, Bangkok, Thailand. However, the data is limited to the judgment sample; further study would need to be conducted to promote generalizability at the provincial, state, or regional levels.

Future research is also recommended to utilize and refine XR literacy and level assessment frameworks. These tools will aid logistics management professionals in evaluation and development of methods for improving XR training and confidence levels within the rapidly-changing emerging technology environment.

5. Conclusion

Considering the data analysis and rejection of the null hypotheses, we can deduce that XR training and confidence levels in undergraduate logistics management programs are insufficient.

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6. References

1. World Economic Forum. Impact of the Fourth Industrial Revolution on Supply Chains: System Initiative on Shaping the Future of Production. Retrieved from http://www3.weforum.org/docs/WEF_Impact_of_the_Fourth_Industrial_Revolution_on_Supply_Chains_.pdf (accessed February 13th, 2021).
2. Adams-Becker, S., Pasquini, L.A., and Zentner, A. 2017 Digital Literacy Impact Study: An NMC Horizon Project Strategic Brief. Volume 3.5, September 2017. Austin, Texas: The New Media Consortium.
3. Intel. Virtual Reality vs. Augmented Reality vs. Mixed Reality: Demystifying the Virtual Reality Landscape. Retrieved from: https://www.intel.com/content/www/us/en/tech-tips-and-tricks/virtual-reality-vs-augmented-reality.html (accessed December 3rd, 2019).
4. Pehlivanis, K.; Papagianni, M.; and Styliadi, A. Virtual Reality & Logistics. Acta Universitatis Apulensis. Retrieved from https://www.researchgate.net/publication/265405399_VIRTUAL_REALITY_LOGISTICS (accessed February 13th, 2021).
5. DHL. Virtual Reality & Digital Twins. Retrieved from https://www.logistics.dhl/global-en/home/insights-and-innovation/thought-leadership/trend-reports/virtual-reality-digital-twins.html (accessed December 3rd, 2019).
6. Bailenson, J.N.; Yee, N. Blascovich, J.; Beall, A.C., Lundblad, N.; and Jin, M. The Use of Immersive Virtual Reality in the Learning Sciences: Digital Transformations of Teachers, Students, and Social Context. Journal of the Learning Sciences, 2008, 17:1, 102-141. DOI: 10.1080/10508400701793141
7. Hussein, M. and Natterdal, C. The Benefits of Virtual Reality in Education: A Comparison Study, 2015, University of Gothenberg, Göteborg, Sweden.
8. One Digital Consulting. Reimagining the Schools of the Future. Innovation Education Report/BETT 2019. VRARA Education Committee. Madrid, Spain.
9. Microsoft. Preparing the Class of 2030: New research offers insight on the future of learning. Microsoft Education. Retrieved from: http://edudownloads.azureedge.net/msdownloads/Microsoft_Education_Classof2030.pdf (accessed December 4th, 2019).