International Journal Software Engineering and Computer Science (IJSECS)
4 (1), 2024, 58-67
Published Online April 2024 in IJSECS (http://www.journal.lembagakita.org/index.php/ijsecs)
P-ISSN : 2776-4869, E-ISSN : 2776-3242. DOI: https://doi.org/10.35870/ijsecs.v4i1.2147.

RESEARCH ARTICLE Open Access

The Impact of Technological Advancements on Higher Education: A Study of Generation Alpha's Educational Prospects

Dan Coolsaet *
New Zealand Quality Research and Innovation (NZQIR), Wellington, New Zealand.
Corresponding Email: coolsaet@nzqri.co.nz.

Received: January 24, 2024; Accepted: March 10, 2024; Published: April 1, 2024.

Abstract: The present-day environment is experiencing a rapid technological evolution that fundamentally shifts our understanding of knowledge into a more accessible and open entity. This transformative progression is redefining the practical application of competencies, concepts, and insights and exerting a profound impact on various facets of education. This paradigmatic transition, catalyzed by the pervasive influence of technology, is particularly pertinent in education, where its metamorphic contributions are conspicuously manifest. As the educational milieu continues to undergo metamorphosis, the future pedagogical and didactic methodologies will inevitably bear the indelible imprint of technological advancements. Concurrently, educators are confronted with the distinctive imperative of effectively engaging the emergent cohort of learners, commonly referred to as Generation Alpha, within the context of higher education. A pronounced entrepreneurial disposition characterizes Generation Alpha and is notably predisposed to embracing innovation and advancement, with a significant proportion of its members harboring aspirations of pursuing tertiary education. The present study undertakes a proactive stance in envisioning the educational dynamics and prospects that will define the forthcoming landscape of higher education, with a focal lens on the distinctive attributes of Generation Alpha. This entails a comprehensive inquiry into their favored pedagogical modalities, cognitive perspectives, and educational anticipations. The study embraces a robust theoretical framework anchored in the distinctive attributes of Generation Alpha, attributes invariably molded by the inexorable march of technological progress. In a complementary manner, the study derives insights from a triad of discrete empirical investigations conducted across diverse locales, including New Zealand, Iran, Iraq, and Jordan.

Keywords: Educational Technology; Generation Alpha; Higher Education; Innovative Learning Methods; Technology Curriculum.

1. Introduction

In today's world, technology has become an integral part of our lives. The emergence of Generation Alpha, born into a world of constant connectivity and digital immersion, heralds a transformative era in education. These young learners have a distinctive affinity for technology, shaping their learning styles, expectations, and aspirations. As we stand on the cusp of the Fourth Industrial Revolution, the evolution of teaching and learning takes on a new dimension, demanding innovative pedagogical approaches that resonate with Generation Alpha's technological prowess [1][2][3]. This research endeavor delves into the intricate

interplay between Generation Alpha, education, and technology, dissecting the dynamics that will shape the future of higher learning. From adopting experiential learning methodologies to forging social connections through visual, auditory, and kinesthetic tools, this study embarks on a journey to uncover the evolving landscape of education for Generation Alpha. By bridging the technology literacy gap, nurturing essential soft skills, and championing the role of educators as catalysts of transformation, this research aims to provide a comprehensive roadmap that empowers Generation Alpha to thrive in an increasingly dynamic and technology-driven world [4][5][6][7].

Generation Alpha, the forthcoming wave of digital natives, is poised to become frontrunners in our technologically driven world. As the trajectory of global evolution is shaped by technology, its transformative impact on education remains indisputable. The advent of the COVID-19 pandemic precipitated a worldwide surge in remote learning, necessitated by lockdown measures and stay-at-home directives. In response, students and parents turned to ubiquitous mobile devices—smartphones, tablets, and laptops—for accessing educational content [1]. Notably, parents, especially Generation Alpha, assumed a heightened role in facilitating their children's learning, transcending their traditional involvement in face-to-face instruction [8][9][10][11].

Following the model proposed by Strauss and Howe (1991), generational shifts transpire roughly every two decades, often exhibiting cyclical patterns. The preceding Generation Y, encompassing individuals born in the 1980s and 1990s, gained recognition as the "MTV Generation," owing to the pervasive influence of the music channel during their formative years. Conversely, Generation Z emerged as pioneers of a digital age, marked by unprecedented immersion in technology and social media [12][13]. As Generation Alpha constitutes a distinct cohort situated at the intersection of Generation Z and the emerging era, innovative pedagogical approaches that align with their unique proficiencies and needs are necessary. Studies reveal diverse parental perspectives on the challenges of remote learning stemming from multifaceted pressures such as maintaining equilibrium between responsibilities, learner needs, personal well-being, and motivation—both remote and unrelated.

Furthermore, challenges encompassed issues of accessibility, pedagogy, connectivity, and technology literacy [12][13][2][14][6][7]. In light of these challenges, educators must embrace innovative pedagogical approaches that resonate with Generation Alpha's technological prowess. This entails bridging the technology literacy gap, nurturing essential soft skills, and championing the role of educators as catalysts of transformation. By doing so, we can empower Generation Alpha to thrive in an increasingly dynamic and technology-driven world.

2. Research Method

This study adopts a mixed-methods research design, combining qualitative and quantitative approaches to comprehensively understand the educational dynamics and prospects associated with Generation Alpha. Qualitative methods explore the nuanced aspects of pedagogical preferences, cognitive perspectives, and academic expectations, while quantitative methods quantify and analyze broader trends. The research targets a diverse sample of Generation Alpha learners across different geographical locations, including New Zealand, Iran, Iraq, and Jordan. A purposive sampling technique is employed to ensure representation from urban and rural settings, considering socio-cultural variations.

2.1 Data Collection

In-depth interviews and focus group discussions are conducted to delve into Generation Alpha learners' subjective experiences, attitudes, and perceptions. The qualitative data is gathered using semi-structured interview guides and thematic analysis techniques. Surveys are administered to a larger cohort of participants, capturing quantitative data on preferences, technology usage patterns, and educational aspirations. The survey instrument is designed to be comprehensive, utilizing Likert scales and multiple-choice questions for efficient data collection. The research is grounded in a theoretical framework synthesizing concepts from educational psychology, sociology, and technology adoption theories. This framework guides the interpretation of both qualitative and quantitative findings, providing a lens through which to understand the impact of technological progress on Generation Alpha's educational experiences.

2.2 Data Analysis

Qualitative Analysis: Thematic analysis is employed to identify recurring patterns, themes, and insights from the qualitative data. This iterative process involves coding and categorizing responses to extract meaningful patterns. Quantitative Analysis: Descriptive statistics, such as frequencies and percentages, are

used to analyze the quantitative data. Inferential statistics, including correlations and regression analyses, are applied to identify relationships and trends within the dataset. Qualitative and quantitative findings are triangulated to provide a holistic understanding of the research questions. Patterns emerging from both data sets are compared and contrasted to derive comprehensive insights into Generation Alpha's educational dynamics. This study follows ethical guidelines, ensuring informed consent, confidentiality, and participant anonymity. Institutional review board (IRB) approval is obtained to guarantee the moral conduct of the research. Acknowledging the scope of the study, certain limitations exist, such as potential biases in self-reported data and the generalizability of findings to other cultural contexts. These limitations are transparently addressed in the interpretation of results. The combination of qualitative and quantitative methods, along with a robust theoretical framework, enhances the rigor and comprehensiveness of this research, contributing valuable insights to the evolving landscape of higher education for Generation Alpha.

3. Result and Discussion

3.1 Results

3.1.1 Anticipating the Educational Landscape for Generation Alpha

Generation Alpha's educational trajectory is poised to be significantly shaped by the swift currents of technological progress. Their distinct parentage from the Millennial Generation has endowed them with heightened technological acumen, an entrepreneurial spirit, and a proclivity for forging their career paths 1. The innovative ethos, characterized by progressiveness and advancement, permeating their world will inevitably guide their choices and life directions, diverging from conventional paradigms. Generation Alpha's propensity to conform to societal norms and prejudices is projected to diminish markedly.

3.1.2 Implications for Higher Education in the Technological Epoch

As the global landscape traverses the dynamic terrain of post-modernity, the educational sphere mirrors this transformation by assimilating technology into its pedagogical fabric. Contemporary academia increasingly acknowledges the imperative of seamless technology integration within curriculum models. The evolution of educational practices is mirrored by a paradigm shift driven by technological innovation, revolutionizing both instructional methodologies and the student learning experience 3. Academic institutions are avidly embracing the dividends of technological advancements, manifesting in augmented distance education, sophisticated learning management systems, and unprecedented international collaborations. In conclusion, Generation Alpha's unique attributes and technological prowess are poised to shape the future of higher education. The educational landscape is transforming and driven by technological innovation, and academic institutions must embrace innovative pedagogical approaches that resonate with Generation Alpha's skill set and aspirations. By doing so, we can empower Generation Alpha to thrive in an increasingly dynamic and technology-driven world. Diverse studies attest to the potent impact of technology on enhancing student engagement and interaction, with modern learners displaying a pronounced proclivity for technology-supported educational tools [15]. In the contemporary educational milieu, the quintessential hallmarks of quality education encapsulate interactivity, accessibility, convenience, and user-friendliness. Technology plays a multifaceted role, serving as a fundamental curriculum component, a medium for educational delivery, an instructional aid, and a mechanism for transforming learning into an interactive journey [15]. However, hurdles loom, primarily concerning educators' technological proficiency, potential resistance to pedagogical shifts, and the gradual pace of institutional change [16][17][18][19].

The advent of Generation Alpha ushers in a paradigm of challenging norms within academia. Institutions must embark on a transformative trajectory to accommodate the needs and aspirations of this burgeoning generation. A pivotal shift toward student-centered and community-based learning models necessitates integrating experiential learning into mainstream education. This methodology immerses students in learning by doing, fostering initiative, decision-making, accountability, creativity, and the potent synthesis of theoretical knowledge with practical application [20]. In this dynamic context, academia stands at the precipice of evolution, poised to metamorphose into a nexus of innovation, where technology and experiential learning converge to empower Generation Alpha for a future defined by unprecedented challenges and possibilities.

In light of Generation Alpha's distinct characteristics and unique educational requirements, novel approaches to instruction, such as experiential learning, must take precedence, catering to students who exhibit substantial divergence in culture, education, and expectations [19]. Universities are entrusted with nurturing the essential soft skills vital for thriving in the modern world—namely critical thinking, problem-solving, teamwork, and effective communication [19]. The amalgamation of research findings underscores an

imperative for the evolution of teaching methodologies, thereby propelling educational institutions toward an era of transformation and innovation.

Table 1. A Nexus of Research and Teaching Implications

Research Findings	Implications for Teaching
Social media's direct influence (Miller, 2023, Ding, 2022) [2][22].	Adapt teaching-learning strategies to integrate changes in learning styles and recognize social media's role in enhancing learning effectiveness. Quick access to information necessitates a shift from information consumption to information interpretation, emphasizing knowledge development. Detest for the sharing economy underscores the need to prioritize soft skill development, promoting sharing and collaboration as shared commodities. The boundary-less nature of Generation Alpha demands experiential and out-of-the-box teaching approaches.
Apply reading skills online (Tran *et al.*, 2023, Taylor, 2022) [23][24].	Leverage online gaming as a conduit for traditional learning methods, harnessing students' interests for enhanced attention and engagement. Foster the art of information interpretation, facilitating the translation of data into knowledge through pedagogical techniques that resonate with Generation Alpha's online learning proclivities. Emphasize social connections within the virtual realm, requiring strategic planning and coordination to cultivate a positive student experience.
Learn through technology (Ziatdinov and Cilliers, 2022) [25].	Harness technology as an educational tool, tailoring content delivery, and learning experiences to Generation Alpha's technological inclinations. Facilitate interactive and continuous support structures to optimize the efficacy of technology-mediated teaching methods, augmenting student outcomes within an engaging and interactive portal.
Lack of technology literacy (Adiguzel *et al.*, 2023, Tariq *et al.*, 2020, Yagci Sokat *et al.*, 2016) [26][27][28].	Bridge the technology literacy gap between educators and Generation Alpha students through comprehensive training and support mechanisms, ensuring seamless online learning experiences. Leverage students' heightened levels of perception, nurtured by early technological interaction, as a teaching asset for enhanced engagement and comprehension. Employ a dynamic toolkit of visual, auditory, and kinesthetic aids to mirror the technological immersion inherent to Generation Alpha's educational milieu, enhancing learning experiences.
The Future of New Zealand Tertiary Education: Generation Alpha (Ahmed and Ahmad, 2023) [2].	The study underscores the need for tertiary education in New Zealand to evolve in response to the preferences of Generation Alpha, characterized by a preference for engaging online courses and proficiency in AI tools. To effectively cater to these dynamics, educators must adapt teaching methods to offer captivating online experiences and integrate AI tools that personalize learning and foster crucial skills such as adaptability and problem-solving. Collaboration with industries becomes imperative to align curricula with job market requirements while ensuring technology's integration maintains a balance between technological interaction and human engagement. Addressing challenges like equitable technology access and data privacy, alongside empowering educators through continuous learning, will enable institutions to equip students for success in an ever-changing digital landscape and job market.

The preliminary body of research exploring Generation Alpha's educational journey is acknowledged, underscoring the nascent stage of understanding this burgeoning cohort's learning dynamics and needs. As education stands at the threshold of this transformation, further inquiry and exploration are imperative to construct a comprehensive understanding of Generation Alpha's distinctive educational landscape [29][30][12][31][32][33]. The insights from existing studies provide a foundational framework for fostering a holistic and adaptive approach to pedagogy, catalyzing the evolution of teaching practices that resonate with the ever-evolving Generation Alpha [34][35]. Amid a technological upheaval that is reshaping industries, it is pivotal to recognize that while technology is indeed displacing specific job roles, it is concurrently ushering in an array of novel opportunities—a phenomenon vividly underscored by the current Fourth Industrial Revolution [36][37]. The contemporary educational panorama witnesses many students actively cultivating proficiencies

in domains like big data analytics, robotics, social media marketing, and app development [37]. These competencies are poised to be instrumental in jobs that have not even come into existence yet, characterizing a landscape that Generation Alpha and forthcoming learners will ardently occupy.

The forthcoming professional realm is poised to be a convergence of technological innovation and demographic shifts, a synergy that will shape the occupational tapestry of Generation Alpha. Niche fields such as cyber-security, software development, and cryptocurrencies will emerge as viable career trajectories for these individuals [37]. Aptly equipped to tackle multifaceted roles, Generation Alpha will embrace a paradigm where simultaneous job engagements are the norm, punctuated by a lifelong commitment to continuous learning [38][32][39][40].

The hallmark of Generation Alpha's career trajectory will be adaptability—a trait that necessitates regular upskilling and retraining, ensuring alignment with the dynamic cadence of change characterizing their professions [36][37]. The onus on universities at this juncture is both pivotal and profound. These educational institutions are tasked with cultivating, refining, and channeling the burgeoning skill sets of Generation Alpha, seamlessly bridging the chasm between the digital realm they inhabit and the manifold challenges of the future. Generation Alpha's deep-rooted familiarity with the digital domain positions them as protagonists in this narrative. Universities play a pivotal role in amplifying this familiarity, facilitating the optimization of skills and experiences that Generation Alpha holds, thus equipping them to be architects of innovative solutions in a future that is ever more reliant on technological intervention. The symbiotic relationship between universities and Generation Alpha embodies a dynamic exchange—where education empowers and empowers learners to co-create the very solutions that will propel our society into an era defined by unprecedented technological, social, and economic shifts.

3.2 Discussion

The research presented in this study offers valuable insights into the evolving landscape of higher education, particularly concerning Generation Alpha's educational prospects in the context of technological advancements. Several key points emerge from the findings warrant further discussion and consideration. Firstly, the study highlights the profound impact of technology on reshaping the educational experiences of Generation Alpha. As digital natives born into a world of constant connectivity, these young learners exhibit a distinctive affinity for technology that significantly influences their learning styles, expectations, and aspirations. The research underscores the need for innovative pedagogical approaches that align with Generation Alpha's technological prowess, emphasizing the importance of bridging the technology literacy gap between educators and students. This discussion echoes previous literature highlighting the transformative role of technology in education and the necessity for educators to adapt to the evolving needs of digital-native learners [15][16].

Furthermore, the study emphasizes the importance of experiential learning in catering to Generation Alpha's unique characteristics and preferences. Educators can effectively engage Generation Alpha learners by immersing students in hands-on learning experiences that foster initiative, decision-making, creativity, and the synthesis of theoretical knowledge with practical application. This discussion aligns with existing research advocating for integrating experiential learning into mainstream education to enhance student engagement and comprehension [20].

Additionally, the research underscores the role of educators as catalysts of transformation in the educational landscape. With Generation Alpha's deep-rooted familiarity with the digital domain, educators are tasked with optimizing students' skills and experiences to prepare them for a future defined by technological innovation. This discussion echoes the broader discourse on the evolving role of educators in facilitating meaningful learning experiences and equipping students with essential skills for success in the digital age [19]. Moreover, the study highlights the need for higher education institutions to adapt to the preferences and aspirations of Generation Alpha. By embracing technology-integrated curricula, immersive career-engagement events, and niche skill development programs, universities can effectively cater to the needs of this burgeoning generation. This discussion reflects broader trends in higher education toward innovation and flexibility in response to changing student demographics and societal demands [37]. The research presented in this study offers valuable insights into the transformative impact of technological advancements on higher education, particularly concerning Generation Alpha's educational prospects. By addressing the challenges and opportunities posed by the digital age, educators and higher education institutions can effectively prepare Generation Alpha learners for a future defined by innovation, adaptability, and societal contribution.

4. Related Work

This section presents a thoughtful synthesis of previous research endeavors conducted by diverse authors, aiming to comprehend the multifaceted challenges and opportunities that Generation Alpha presents within the realm of higher education's teaching and learning dynamics.

4.1 Study 1: Generation Alpha - Navigating Marketing and Science

An exploration by Slovakian and Hungarian scholars Nagy and Kölcsey (2017) employed classical desk research techniques to formulate a generational framework. Their investigation unearthed noteworthy parallels between Generation Alpha and its predecessor, Generation Z. A pivotal similarity rests in the profound impact of social media on both generations, fostering distinct shifts in learning styles and consequently necessitating innovative pedagogical strategies. This arises from Generation Alpha's constant exposure to an inundation of information, leading to a demand for expeditious access. Critically, Generation Alpha exhibited a pronounced aversion to sharing (manifesting as "Mine!" and "All mine!" exclamations) alongside an apparent disregard for privacy and established norms. This study concludes that the nomenclature "Generation Alpha" is rooted more in marketing nuances than scientific delineation, emphasizing further research to apprehend this evolving cohort comprehensively [42].

4.2 Study 2: Unveiling Learning Through Minecraft - A Generation Alpha Perspective

Australian scholars Taylor and Hattingh (2019) embarked on an in-depth assessment of the Four Resource Model (FRM) applied within the context of playing the serial video game Minecraft by Generation Alpha. Analyzing the roles of code breaker, text participant, text user, and text analyzer inherent in FRM, the researchers employed various data sources, including observations, field notes, semi-structured interviews, and a reflective journal [24]. This investigation illuminated Generation Alpha's adeptness in applying reading skills while navigating Minecraft, showcasing even those with rudimentary reading proficiency deftly employing repetitive word usage and information interpretation. The study underscored the affirmative reception of Minecraft's social interactivity among children, engendering robust engagement and enthusiasm. The findings underscored Generation Alpha's predisposition for immersive learning through technology, thereby providing invaluable insights into their preferred learning methods and the potential design of their tertiary education landscape.

4.3 Study 3: Perspectives from Preschool Teachers on Generation Alpha

Turkish researchers Apaydin and Kaya (2020) delved into the viewpoints of preschool educators regarding Generation Alpha's impact on classroom dynamics and the learning process. Employing a qualitative methodology, the study garnered insights from educators in private kindergartens in Antalya over 2018-2019. Recognizing Generation Alpha's intrinsic digital environment, the study highlighted a perceived deficit in technological literacy among educators, prompting contemplation on its potential repercussions for the quality of education imparted to this generation. While specific negative attributes such as technology addiction, egocentrism, and a propensity for aggression were identified, positive traits like heightened perception, musical affinity, adeptness with numbers, attention to detail, and emotional intelligence were also discerned [43]. Comparison with Generation Z indicated that Generation Alpha exhibits an enhanced inclination toward knowledge acquisition, numerical intelligence, and technology usage [43][13][30]. These insights underscore the importance of tailoring classroom management techniques to Generation Alpha's preferences for visual, auditory, and kinesthetic learning modalities while concurrently addressing their susceptibility to distractions, thereby facilitating a conducive teaching-learning milieu.

5. Conclusion and Forward-Looking Recommendations

The impending educational landscape for Generation Alpha is inextricably interwoven with the fabric of technology. As these students navigate their learning journey, the relentless march of technological progress will serve as both a compass and a canvas, shaping their learning styles and redefining the contours of the student experience. Foremost among the transformative methodologies underpinning the future teaching-learning paradigm is experiential learning—a dynamic conduit that not only captivates and engages students but empowers them to coalesce knowledge through interpretation, value addition, and the pragmatic translation of information. The triumvirate of visual, auditory, and kinesthetic tools will anchor this evolution, catalyzing authentic learning experiences fortified by interwoven social connections.

However, a pivotal challenge beckons: to bridge the technology literacy chasm between educators and students. This endeavor seeks to enhance social interactions and connections, nurturing soft skills that foster community, collaboration, and shared understanding. At the heart of this transformation lies the educator, the fulcrum upon which the co-creative, critical-thinking, and collaborative classroom ecosystem hinges [44]. Embarking on this pedagogical odyssey requires an educator fortified with scholarly acumen, proficient in imparting disciplinary knowledge, and steering Generation Alpha toward a profound grasp of educational theories as shared intellectual resources within the societal and knowledge tapestry.

In the context of higher education's evolution, a discernible shift is palpable—a trajectory that transcends the mere transference of knowledge to the profound co-creation of it. Anticipating the convergence of technology and Generation Alpha's innate acumen, higher education is poised to embrace technology-integrated curricula, immersive career-engagement events, and niche skill development programs. As Generation Alpha strides into a world characterized by elusive careers and multifaceted roles, the focus will pivot towards nurturing a skill set optimized for its distinctive affinity and grasp of technological advancements. The crucible of higher education thus metamorphoses into a crucible of co-creation—a sphere where Generation Alpha's innate potential converges harmoniously with the iterative rhythms of technological advancement, propelling them toward a future of innovation, adaptability, and unparalleled societal contribution.

References

[1] Yamjal, P., & Ahmed, A. (2022). Strategies for retention and completion in vocational education: Faculty perspectives. *Journal of Management and Business Education*, *5*(4), 247-265. https://doi.org/10.35564/jmbe.2022.0015.

[2] Ahmed, A. L., & Ahmad, E. (2023). The future of New Zealand tertiary education: Generation Alpha.

[3] Al-Sa'di, A., & Alsamarraie, H. (2023). Design Thinking Mindset and Self-Awareness of User Experience Practitioners: The Case of New Zealand. *Available at SSRN 4361224*.

[4] Miller, D. (2023). Exploring the impact of artificial intelligence language model ChatGPT on the user experience. *International Journal of Technology, Innovation and Management (IJTIM)*, *3*(1), 1-8. https://doi.org/10.54489/ijtim.v3i1.195.

[5] Al-Sa'di, A., & Litayem, N. (2023, September). User Frustration: Shaping the Experience of Automotive and Computing. In *2023 IEEE 3rd International Conference on Computer Systems (ICCS)* (pp. 56-61). IEEE. https://doi.org/10.1109/ICCS59700.2023.10335584.

[6] Al-Sa'di, A., Yamjal, P., Ahmad, E., Panjabi, R., Allott McPhee, C. A. M., & Guler, O. (2023). Assessing Educators' Soft Skills: Developing a Self-Assessment Instrument. *Administrative Sciences*, *13*(9), 208. https://doi.org/10.3390/admsci13090208.

[7] Litayem, N., & Al-Sa'di, A. (2023, September). Exploring the Programming Model, Security Vulnerabilities, and Usability of ESP8266 and ESP32 Platforms for IoT Development. In *2023 IEEE 3rd International Conference on Computer Systems (ICCS)* (pp. 150-157). IEEE. https://doi.org/10.1109/ICCS59700.2023.10335558.

[8] Sarsam, S. M., Al-Samarraie, H., & Al-Sadi, A. (2020). Disease discovery-based emotion lexicon: a heuristic approach to characterise sicknesses in microblogs. *Network Modeling Analysis in Health Informatics and Bioinformatics*, *9*, 1-10. https://doi.org/10.1007/s13721-020-00271-6.

[9] Skammelsen, R. B., Xiang, Q. J. Y., Aakarsh, B., & Kuppusamy, S. (2020, April). Usability Evaluation for User Interface Design of Student Support System: Mixed Method Study. In *IOP Conference Series: Materials Science and Engineering* (Vol. 803, No. 1, p. 012038). IOP Publishing. https://doi.org/10.1088/1757-899X/803/1/012038.

[10] Al-Sa'di, A., & McPhee, C. C. A. (2021, August). User-Centred Design in Educational Applications: A systematic literature review. In *2021 International Conference Engineering Technologies and Computer Science (EnT)* (pp. 105-111). IEEE. https://doi.org/10.1109/EnT52731.2021.00025.

[11] Sarsam, S. M., Al-Samarraie, H., Bahar, N., Shibghatullah, A. S., Eldenfria, A., & Al-Sa'Di, A. (2021, July). Detecting real-time correlated simultaneous events in microblogs: The Case of Men's Olympic Football. In *International Conference on Human-Computer Interaction* (pp. 368-377). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-77277-2_28.

[12] Ahmad, E., Al-Sa'di, A., & Beggs, K. (2020, December). A formative assessment framework using game-quiz educational approach. In *2020 IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE)* (pp. 868-872). IEEE. https://doi.org/10.1109/TALE48869.2020.9368479.

[13] Chandran, S., Al-Sa'di, A., & Ahmad, E. (2020, October). Exploring user centered design in healthcare: a literature review. In *2020 4th International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT)* (pp. 1-8). IEEE. https://doi.org/10.1109/ISMSIT50672.2020.9255313.

[14] Hassan, A. M., Nelson, J. A., Coert, J. H., Mehrara, B. J., & Selber, J. C. (2023). Exploring the potential of artificial intelligence in surgery: insights from a conversation with ChatGPT. *Annals of surgical oncology*, *30*(7), 3875-3878. https://doi.org/10.1245/s10434-023-13347-0.

[15] Raja, R., & Nagasubramani, P. C. (2018). Impact of modern technology in education. *Journal of Applied and Advanced Research*, *3*(1), 33-35.

[16] Prensky, M. (2001). Digital natives, digital immigrants part 2: Do they really think differently?. On the horizon, 9(6), 1-6. https://doi.org/10.1108/10748120110424843

[17] Prensky, M. (2005). Listen to the natives. Educational leadership, 63(4).

[18] Prensky, M. (2006). Don't bother me, mom, I'm learning!: How computer and video games are preparing your kids for 21st century success and how you can help!. St. Paul, MN: Paragon house.

[19] Romero, J. P., & Britto, G. (2017). Increasing returns to scale, technological catch-up and research intensity: endogenising the Verdoorn coefficient. Cambridge Journal of Economics, 41(2), 391-412. https://doi.org/10.1093/c

[20] Itin, C. M. (1999). Reasserting the philosophy of experiential education as a vehicle for change in the 21st century. Journal of experiential Education, 22(2), 91-98. https://doi.org/10.1177/105382599902200206

[21] Berşe, S., Akça, K., Dirgar, E., & Kaplan Serin, E. (2024). The role and potential contributions of the artificial intelligence language model ChatGPT. *Annals of Biomedical Engineering*, *52*(2), 130-133. https://doi.org/10.1007/s10439-023-03296-w.

[22] Ding, M. (2022). Mobile Apps for Flood Emergency Management in China: Functionality, Usefulness, and Coproduction. *China Media Research*, *18*(1).

[23] Tran, M. Q., Sousa, H. S., & Matos, J. C. (2023). Application of AI Tools in Creating Datasets from A Real Data Component for Structural Health Monitoring. In *Data Driven Methods for Civil Structural Health Monitoring and Resilience* (pp. 223-241). CRC Press.

[24] Taylor, T. E. (2022, July). The User's Experience. Exploring the Impact our Interactions with Technology Have on Us. In *35th International BCS Human-Computer Interaction Conference* (pp. 1-9). BCS Learning & Development. http://dx.doi.org/10.14236/ewic/HCI2022.36.

[25] Ziatdinov, R., & Cilliers, J. (2022). Generation Alpha: Understanding the next cohort of university students. *arXiv preprint arXiv:2202.01422*. https://doi.org/10.48550/arXiv.2202.01422.

[26] Adıgüzel, T., Kaya, M. H., & Cansu, F. K. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. *Contemporary Educational Technology*.

[27] Tariq, A., Purkayastha, S., Padmanaban, G. P., Krupinski, E., Trivedi, H., Banerjee, I., & Gichoya, J. W. (2020). Current clinical applications of artificial intelligence in radiology and their best supporting evidence. *Journal of the American College of Radiology*, *17*(11), 1371-1381. https://doi.org/10.1016/j.jacr.2020.08.018

[28] Yagci Sokat, K., Zhou, R., Dolinskaya, I. S., Smilowitz, K., & Chan, J. (2016). Capturing real-time data in disaster response logistics. *Journal of Operations and Supply Chain Management (JOSCM)*, *9*(1), 23-54.

[29] Alsswey, A., & Al-Samarraie, H. (2020). Elderly users' acceptance of mHealth user interface (UI) design-based culture: the moderator role of age. *Journal on multimodal user interfaces*, *14*, 49-59. https://doi.org/10.1007/s12193-019-00307-w.

[30] Alsswey, A. H., Al-Samarraie, H., El-Qirem, F. A., Alzahrani, A. I., & Alfarraj, O. (2020). Culture in the design of mHealth UI: an effort to increase acceptance among culturally specific groups. *The Electronic Library*, *38*(2), 257-272. https://doi.org/10.1108/EL-04-2019-0097.

[31] Alkhaldi, A. N., & Al-Sa'di, A. (2018). Gender differences in user satisfaction of mobile touch screen interfaces: University students' service sites. *International Journal of Innovation and Technology Management*, *15*(06), 1950003. https://doi.org/10.1142/S0219877019500032.

[32] Alkhaldi, A. N., & Al-Sa'di, A. (2016). Guidelines integrating cultural theories with technology acceptance theories: A review. *NZJ Comput. Hum. Interact*, *1*, 12.

[33] Al-Sa'di, A. (2018). *User interface guidelines for Tablet PC Arabic educational applications* (Doctoral dissertation, Auckland University of Technology).

[34] Ferraro, A., Galli, A., Moscato, V., & Sperlì, G. (2023). Evaluating eXplainable artificial intelligence tools for hard disk drive predictive maintenance. *Artificial Intelligence Review*, *56*(7), 7279-7314. https://doi.org/10.1007/s10462-022-10354-7.

[35] Colombo, M. (2023). The transformative impact of ChatGPT on UX Designers' Work [Online]. LinkedIn Available: https://www.linkedin.com/pulse/transformative-impact-chatgpt-ux-designers-work-marta/ [Accessed 2023]

[36] McCrindle, M. (2021). *Generation Alpha*. Hachette Uk.

[37] McCrindle, M., & Fell, A. (2020). Understanding generation alpha. McCrindle Research.

[38] Al-Sa'di, A., & Parry, D. (2017). Successful user-centred design for tablet PC: A conceptual framework. *Human IT: Journal for Information Technology Studies as a Human Science*, *13*(3), 89-114.

[39] Al-Sa'di, A., Parry, D., & Carter, P. (2014, April). Usability considerations for educational tablet applications using an Arabic interface. In *2014 5th International Conference on Information and Communication Systems (ICICS)* (pp. 1-6). IEEE. https://doi.org/10.1109/IACS.2014.6841969.

[40] Al-sa, A. A. K. M. (2008). *Developing E-learning Web Based Using ADDIE Model in Engineering Department for ACM* (Doctoral dissertation, College of Arts and Sciences, Universiti Utara Malaysia).

[41] Al-Sa'di, A., Parry, D., & Carter, P. D. (2018). User interface preferences of young Jordanians using tablet devices. *International Journal of Technology Enhanced Learning*, *10*(3), 202-217. https://doi.org/10.1504/IJTEL.2018.092703

[42] Nagy, Á., & Kölcsey, A. (2017). Generation alpha: Marketing or science. Acta Educationis Generalis, 7(1), 107-115.

[43] Apaydin, Ç., & Kaya, F. (2020). An Analysis Of The Preschool Teachers'views On Alpha Generation. European Journal of Education Studies. http://dx.doi.org/10.46827/ejes.v0i0.2815

[44] Steyn, A. A. (2015). Incorporating technology into South African entrepreneurial training. University of Pretoria (South Africa).