NAVIGATING ORGANIZATIONAL CRISES AND UNCERTAINTIES THROUGH WEB AUGMENTED REALITY (WebAR)

NAWIGOWANIE PO KRYZYSACH I NIEPEWNOŚCIACH ORGANIZACYJNYCH ZA POMOCĄ ROZSZERZONEJ RZECZYWISTOŚCI W SIECI (WebAR)

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Abstract: Web Augmented Reality (WebAR) has emerged as a pivotal component within the paradigm of Industry 4.0 technologies. Its proliferation across diverse sectors underscores its potential as a transformative tool, particularly in the context of organizational micro-environments. Unlike traditional Augmented Reality (AR) platforms, which often necessitate substantial financial and technical investments, WebAR offers a more cost-effective and accessible alternative. Despite its apparent advantages, the adoption rate of WebAR remains relatively subdued. This article aims to undertake a rigorous theoretical examination of WebAR's capacity to address and mitigate crises and uncertainties inherent within organizational micro-environments. To this end, the paper will review WebAR, engage in a comparative analysis between WebAR and its traditional AR counterparts, highlighting the distinctive attributes and potential advantages of the former, and delve into the theoretical implications of WebAR's utility in navigating organizational crises and uncertainties, drawing from relevant academic literature and theoretical frameworks. By adopting a more abstract and theoretical lens, this paper seeks to contribute to the body of knowledge surrounding WebAR. It aspires to foster a deeper academic understanding of its potential applications and implications, eschewing a more pragmatic approach in favor of a comprehensive theoretical exploration.
Keywords: WebAR, literature analysis, organizational uncertainty, organizational crisis

Abstrakt: Web Augmented Reality (WebAR) wyłoniła się jako kluczowy składnik w paradygmacie technologii Przemysłu 4.0. Jej rozprzestrzenianie się w różnych sektorach podkreśla jej potencjał jako narzędzia transformacyjnego, szczególnie w kontekście mikrośrodowisk organizacyjnych. W przeciwieństwie do tradycyjnych platform Augmented Reality (AR), które często wymagają znacznych inwestycji finansowych i technicznych, WebAR oferuje bardziej opłacalną i dostępną alternatywę. Pomimo pozornych zalet, tempo przyjęcia WebAR pozostaje stosunkowo umiarkowane. Niniejszy artykuł ma na celu przeprowadzenie rygorystycznej teoretycznej analizy zdolności WebAR do adresowania i łagodzenia kryzysów i niepewności nieodłącznie związanych z mikrośrodowiskami organizacyjnymi. W tym celu praca dokładnie przeanalizuje WebAR, przeprowadzi analizę porównawczą między WebAR a jego tradycyjnymi odpowiednikami AR, podkreślając odrębne cechy i potencjalne zalety tego pierwszego, oraz zagłębi się w teoretyczne implikacje użyteczności WebAR w nawigacji po kryzysach i niepewnościach organizacyjnych, czerpiąc z odpowiedniej literatury akademickiej i teoretycznych ram. Przyjmując bardziej abstrakcyjne i teoretyczne podejście, niniejsza praca stara się przyczynić do wiedzy na temat WebAR. Aspiruje do głębszego akademickiego zrozumienia jego potencjalnych zastosowań i implikacji, odrzucając bardziej pragmatyczne podejście na rzecz wszechstronnej teoretycznej eksploracji.
Słowa kluczowe: WebAR, analiza literatury, niepewność organizacyjna, kryzys organizacyjny

Introduction

Organizations often grapple with external crises and uncertainties stemming from their micro-environment, from shifts in consumer behaviour to sudden changes in regulatory norms (Camilleri, 2018). The importance of adeptly navigating organizational crises and uncertainties in the micro-environment cannot be overstated. The micro-environment comprises immediate factors such as suppliers, customers, competitors, marketing intermediaries, and internal organizational variables, all of which can profoundly influence an organization's success or failure (Armstrong, et al., 2014; Craig & Campbell, 2012). In an era characterized by rapid technological changes, globalization, and socio-

political shifts, crises and uncertainties are becoming increasingly frequent and complex (Ahlstrom, et al., 2020). The capacity to mitigate such uncertainties through proactive and adaptive strategies is thus crucial for organizational resilience and sustainability. Failure to adequately address crises in the micro-environment can have immediate and far-reaching implications, affecting everything from supply chain continuity to customer loyalty and market positioning. It can result in a cascading effect of operational disruptions, reduced stakeholder trust, and ultimately, diminished competitive advantage. Therefore, the skillful navigation of crises and uncertainties within the micro-environment is not just a tactical necessity but a strategic imperative (Chanyasak, et al., 2022).

In today's rapidly evolving technological landscape, Augmented Reality (AR) stands out as a transformative tool, shaping various facets of business, education, entertainment, and more (Riar, et al., 2022). At its core, AR overlays digital content onto the real world, providing users with an enhanced and interactive experience (Heller, et al., 2019). A more recent development within this domain is WebAR, a web-based approach to AR, which eliminates the need for specialized applications and harnesses the ubiquity and accessibility of internet browsers (Graves, 2020). While AR has been the subject of extensive research and application, WebAR emerges as a potent iteration, particularly in the context of organizational challenges. In navigating these turbulent waters, the real-time, accessible, and flexible nature of WebAR might offer advantages over traditional AR (Klavins, 2022).

The literature (Frangoudis, 2020; Klavins, 2022) paints a promising picture of WebAR's potential, particularly in assisting organizations to adapt to and navigate the intricate and often tumultuous nuances of their micro-environment. While traditional mobile app AR certainly has its merits, there's an increasing discourse suggesting that WebAR could offer superior tools to organizations wrestling with crises and uncertainties. Yet, a conspicuous gap remains: the extant literature on the practical applications of WebAR in this context, raising the research question on how WebAR can be applied by businesses today, so as to minimise threats and crises. Recognizing this, this paper's research aim therefore is to elucidate the foundational tenets of WebAR, to embark on a rigorous comparative analysis comparing WebAR against its traditional AR counterparts, and to shed light on the potential of WebAR in aiding organizations as they traverse the unpredictable terrain of crises and uncertainties in their micro-environment. In doing so, we aim to provide more insight into how organisations can navigate crisis and uncertainties, pertaining to: internal

operations, supp-liers, competitors, marketing intermediaries, customers and publics with WebAR.

In doing so, we expect to both contribute to and expand upon the current academic dialog on how novel technologies such as WebAR can help organisations. Undertaking research on navigating organizational crises and uncertainties through WebAR holds immense potential not just for advancing scientific understanding but also for revolutionizing organizational practices. From a scientific perspective, such research could pioneer new methodologies and frameworks for studying the interplay between cutting-edge technology and organizational behavior, offering invaluable insights into the future of digital-human interactions. For organizations, discerning the capabilities of WebAR in crisis management can lead to more agile, responsive, and resilient operations. In an era where uncertainties are becoming the norm rather than the exception, tools like WebAR could be instrumental in helping organizations anticipate, adapt to, and mitigate challenges, ensuring not just survival but also competitive advantage in a dynamic marketplace.

1. Rethinking WebAR's utility in navigating organizational crises and uncertainties

An organization's micro-environment encompasses the immediate factors and forces that influence its operational and strategic decisions. Central to understanding this micro-environment are six critical aspects: the company's internal environment, suppliers, marketing intermediaries, customers, competitors, and publics (Armstrong, et al., 2014). Firstly, the company's internal environment includes all internal sectors, such as research and development, finance, and human resources, each playing a pivotal role in shaping organizational output. Suppliers, the second element, are entities that furnish the organization with essential inputs, making supply chain stability imperative. The third aspect, marketing intermediaries, assists the firm in promoting, selling, and distributing its goods or services, thereby directly influencing market reach. Customers, undeniably at the heart of any organization's micro-environment, determine its market position through their purchasing behaviour. Competitors, another critical dimension, shape the competitive landscape and dictate strategic differentiation. Lastly, publics "externals", encompassing diverse groups with a stake in the organization, can significantly sway its reputation and operational latitude. Addressing crises within this micro-environment is paramount for several reasons. Rapid and effective resolution ensures organizational resilience, maintaining or restoring equili-brium in the

face of disruptions (Ahlstrom et al., 2020; Cha-nyasak, et al., 2022). As these elements are closely interrelated, a crisis in one can cascade, impacting others, potentially amplifying the organizational challenges.

Augmented Reality (AR) has carved its niche as one of the most transformative technologies of the 21st century. By superimposing digital data onto the real world, AR provides an immersive experience that blurs the boundary between the physical and the virtual, thereby enhancing users' perception and interaction with their surroundings (Hilken, et al., 2017). From gaming and entertainment to healthcare and education, AR has found multifaceted applications, reshaping the way we understand and interact with technology (Gatter, et al., 2022). A noteworthy iteration of this technology is WebAR, which brings the wonders of augmented reality directly to web browsers without the need for dedicated applications (Frangoudis, 2020). WebAR democratizes the AR experience, eliminating the barriers of app installations and downloads. It leverages the ubiquity of internet browsers, making AR experiences instantly accessible to a larger audience across various devices (Jeganathan & Szymkowiak, 2023).

When comparing traditional AR with WebAR, several key differences emerge. Firstly, while traditional AR often requires users to download specific apps or software, WebAR operates within a browser, sidestepping the need for installation (Frangoudis, 2020). This immediate accessibility offers brands and developers a wider reach. Secondly, updates to WebAR experiences can be made in real-time without requiring users to download updates, as is often the case with standalone AR apps (Klavins, 2022). However, it is worth noting that the depth and complexity of WebAR experiences might currently be limited compared to dedicated AR apps due to browser and internet limitations. Yet, with the rapid advancements in web technologies, this gap is expected to narrow, making WebAR an increasingly attractive medium for delivering augmented experiences.

WebAR, despite its nascent stage in technological discourse, holds transformative potential for organizations confronting crises and uncertainties in their micro-environments. Its under-investigation in academic and practical spheres belies the wealth of opportunities it presents for organizational adaptability and resilience. In essence, WebAR – by virtue of its web-based interface – provides instant, uni-versally accessible augmented reality experiences without the constraints of application installations. For organizations, this translates to a dynamic tool that can rapidly respond to changing circumstances. The following sections delve into the existing literature to elucidate how WebAR can aid organizations in responding to and managing the unpredictable vicissitudes of their micro-environment.
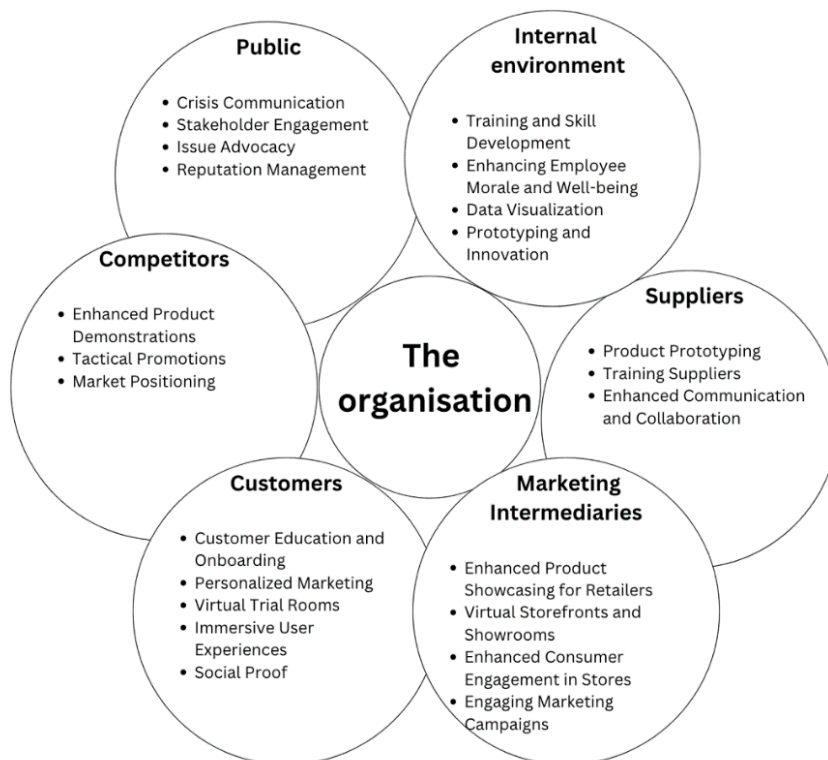

Figure 1. A summary of proposed use of WebAR for navigating organizational crisis and uncertainties
Source: own research.

1.1. Equipping organisations for success with WebAR

In an age of instant information dissemination, effectively managing and mitigating crises not only prevents operational and financial pitfalls (López Peláez, et al., 2021) but also safeguards the organization's reputation. In essence, understanding and adeptly navigating the complexities of the operating environment particularly during crises, is foundational to an organization's longevity and success (Campagnolo, et al., 2022; Chanyasak, et al., 2022). Provided in the upcoming subsections are a review of how the authors envision WebAR being used to navigate crises and uncertainties in the organisational micro environment. Produced below in Figure 1 is an overview of how WebAR can be harnessed across microeconomic segments to offer organizations a robust toolkit to navigate the multifaceted challenges of today's dynamic business landscape.

A company's internal environment

In the formulation of business strategies, it is imperative for the management teams to collaboratively engage with other organizational divisions, including senior management, financial services, research and development, procurement, manufacturing, and accounting (Armstrong et al., 2014). Each of these functional areas exerts a significant influence on the decision-making processes and subsequent initiatives undertaken by the marketing department. In alignment with the customer-centric ethos embedded in contemporary marketing paradigms, it is essential for all these operational units to adopt a customer-oriented mindset. By doing so, they collectively contribute to the enhancement of customer value and satisfaction, thereby reinforcing the efficacy of the organization's overall marketing endeavors. Several key areas that WebAR can assist in navigating crises in the organization is via skill development, enhancing employee wellbeing, data visualization, and in prototyping and innovation.

WebAR offers a transformative and flexible solution for training and skill development within organizations, fundamentally altering how employees engage with educational content. Unlike traditional instructional methods, which may involve videos, manuals, or classroom settings, WebAR creates an interactive and immersive learning environment. This feature greatly enhances the retention of information and the practical application of new skills. WebAR's hands-on approach to training allows employees to interact with realistic 3D simulations of their work environment, equipment, or processes. This aspect is particularly beneficial in sectors where real-world training can be risky or cost-prohibitive, such as healthcare, engineering, and manufacturing. Another advantage is the ease of remote training. WebAR's browser-based technology ensures that geographically dispersed teams can have the same high-quality, interactive training experience as those who are physically present, thereby maintaining a uniform skill set across the organization. Moreover, the real-time feedback provided during WebAR training sessions allows for immediate correction and reinforcement, making the learning process more effective. The technology also captures valuable metrics that can assess performance, aiding in ongoing skill development and evaluation. The scalability of WebAR is another key advantage. As organizational needs change or new technologies are adopted, WebAR training modules can be easily updated, ensuring that content remains current. This adaptability is crucial for organizations that need to stay ahead in rapidly changing industries. Another related area WebAR can be used for is in creating interactive wellness sessions, team-building exercises, or even virtual recreational activities. For instance, a virtual art therapy session using WebAR or a virtual office tour for new employees can foster a sense of unity and belonging.

Data-driven decision-making becomes paramount in crisis situations. WebAR significantly enhances real-time data visualization by providing an immersive, three-dimensional platform that allows for more intuitive and interactive data interpretation. Unlike traditional 2D charts, WebAR's 3D spatial context aids in understanding complex relationships within data sets. The technology fosters user interactivity, allowing manipulation of visual data for deeper insights. Additionally, it facilitates multi-layered analysis and real-time updates, making it invaluable for quick decision-making in various sectors like logistics, healthcare, finance, and retail. WebAR's browser-based nature also simplifies the sharing of these real-time visualizations, thereby boosting collaborative efforts. Overall, WebAR revolutionizes the way industries approach data analysis by making it more interactive, collaborative, and effective.

Lastly, in times of crisis, rapid innovation might be required. If a product line becomes obsolete or if there's an urgent need to pivot, WebAR can assist R&D teams in prototyping new products or solutions in an augmented space. This not only speeds up the innovation process but also reduces costs associated with physical prototyping.

Suppliers

Suppliers serve as a pivotal component in an organization's comprehensive customer value delivery system, furnishing the requisite resources for the production of goods and services. Developments within the supplier network possess the potential to substantially impact strategies and outcomes. Consequently, managers are obliged to vigilantly monitor supply chain factors, including but not limited to, supply availability. Unanticipated disruptions such as supply shortages, logistical delays, or labor strikes may not only result in immediate revenue loss but also jeopardize long-term customer satisfaction (Armstrong et al., 2014). This paper observes 3 key areas through which WebAR can help circumvent or address crises and uncertainties in the organization's supplier environment: interactive product prototyping, training suppliers, and enhancing communication and collaboration.

WebAR offers means of interactive product prototyping by offering a cost-effective, rapid, and highly engaging method for design and testing. Through a browser-based interface, WebAR enables the creation of virtual prototypes that stakeholders can interact with in real-world scenarios, eliminating the need for specialized software or hardware. This technology accelerates the feedback loop, facilitates stakeholder engagement, and streamlines the design iteration process. By allowing for real-time user experience testing, cross-location collaboration, and market validation, WebAR serves as a disruptive tool that significantly enhances the efficiency and effectiveness of product development cycles. In some scenarios, organizations might need to ensure that suppliers' staff are trained as per certain standards or processes. Instead of in-person training sessions, WebAR can deliver immersive, interactive training modules that can be accessed by the supplier's team, ensuring that they are aligned with the organization's expectations. Another area that benefits from WebAR is communication as WebAR can foster deeper collaboration between organizations and their suppliers. Through augmented spaces, both parties can discuss challenges, share insights, and co-create solutions in an interactive manner, transcending geographical and linguistic barriers.

Marketing intermediaries

Marketing intermediaries constitute organizations that facilitate the promotion, sales, and distribution of a company's products to end-users. This category encompasses resellers, logistical and physical distribution firms, marketing service agencies, and financial intermediaries. Specifically, resellers operate within the distribution channel to assist the company in identifying prospective consumers or in executing sales transactions. Such resellers typically comprise wholesalers and retailers who acquire and subsequently resell the merchandise (Armstrong, et al., 2014). WebAR can assist in these functions and help navigate organization's clear of crises and uncertainties via enhancing product showcasing's, increasing consumer engagement, and creating engaging marketing campaigns.

Traditional marketing materials, like brochures or static digital ads, have their limitations. Whether it is clothing, accessories, or furniture, WebAR allows consumers to virtually "try on" or place items in their actual environment before making a purchase. For example, a customer can see how a sofa looks in their living room or how a pair of glasses suits their face, significantly reducing purchase hesitations and potential returns. Retailers can also use WebAR to offer interactive product demos that showcase different features, usage scenarios, or even assembly instructions. This can be particularly useful for technical products or gadgets where customers often seek a deeper understanding of functionalities before purchasing. Another positive is for products that come in different sizes, colors, or configurations, WebAR can allow real-time customization. Customers can virtually modify product attributes and see immediate results, which can be a significant differentiator in terms of user experience and customer satisfaction. WebAR can also create interactive virtual storefronts for retailers or wholesalers. In times when physical visits have become challenging (e.g., during pandemics), these virtual spaces can still attract and engage potential buyers, ensuring continuous business operations and reducing economic uncertainties.

For retailers, WebAR enables contextual product information, allowing customers to make more informed choices. Virtual try-ons facilitated by WebAR can significantly improve customer satisfaction and reduce the frequency of product returns. The technology also offers personalized product recommendations, increasing cross-selling and upselling opportunities for retailers. Interactive promotions like virtual treasure hunts can amplify engagement and time spent in-store. WebAR's in-store navigation simplifies the shopping experience, guiding customers directly to their desired items. It even enables real-time feedback mechanisms and social sharing, providing valuable insights for retailers and promoting organic marketing. Overall, WebAR significantly enriches

the in-store experience, offering both consumers and retailers an enhanced, interactive, and optimized shopping environment.

Traditional marketing strategies often rely on passive consumer interaction, such as watching a commercial or scrolling past a banner advertisement. WebAR, however, enables immersive and interactive experiences that can be accessed directly from a web browser, circumventing the need for application downloads. This significantly reduces the barriers to entry, encouraging a higher rate of user engagement. Furthermore, WebAR facilitates multi-sensory experiences, such as visual and auditory stimuli, that can heighten emotional connections to a brand or product. This technological affordance is particularly salient in an era characterized by diminished attention spans and information overload; it empowers marketers to create memorable experiences that not only capture attention but also encourage longer periods of engagement, thereby enhancing the likelihood of successful message transmission and customer conversion.

Customers

An organization is obliged to conduct rigorous analyses of its target customer markets of which there are six distinct types of customer markets, each necessitating specialized scrutiny (Armstrong et al., 2014). Consumer markets comprise individual consumers and households who procure goods and services for personal use. In contrast, business markets acquire goods and services for either further refinement or incorporation into their own production cycles. Reseller markets consist of entities that purchase goods and services with the intent of reselling them at a profit. Institutional markets encompass organizations such as educational institutions, healthcare facilities, and penal systems, which procure goods and services for the welfare of their respective constituencies. Government markets include various governmental agencies that acquire goods and services either for public service provision or for redistribution to other beneficiaries. Lastly, international markets comprise buyers situated in foreign countries, including but not limited to individual consumers, producers, resellers, and governmental bodies. Each of these market categories possesses unique characteristics that warrant meticulous examination by the vendor. This paper identifies that there exists 5 ways through which WebAR can assist organizations to overcome crises and uncertainties: customer onboarding, personalized marketing,

virtual trial rooms, personalized user experiences and creating social proof.

WebAR revolutionizes customer education and onboarding by offering an interactive, intuitive, and personalized experience. Through features like step-by-step tutorials superimposed over real products, interactive demos, and visual highlighting of product features, WebAR simplifies the learning process. It is particularly useful for troubleshooting and assembly guidance, providing real-time visual aids to customers. WebAR also enables adaptive, personalized learning paths and can capture engagement metrics to refine educational strategies. Moreover, the technology can be employed for compliance and safety training in relevant sectors, making it an effective tool for a wide range of educational purposes. With easy social sharing options, satisfied customers can also amplify the brand's visibility and credibility. Overall, WebAR enhances the effectiveness and engagement level of customer education and onboarding processes, improving both customer satisfaction and long-term loyalty.

WebAR also offers a transformative approach to personalized marketing by enabling real-time, interactive experiences that are tailored to individual user behaviour and preferences. Leveraging capabilities like machine learning and geo-localization, It can provide highly customized product recommendations, time-sensitive offers, and engaging narratives, all accessible directly from a web browser. Furthermore, the technology allows for the collection of precise behavioural analytics, giving marketers valuable insights into consumer engagement and preferences. The result is a symbiotic relationship where consumers enjoy a more personalized and immersive brand experience, while organizations benefit from higher engagement metrics, improved customer satisfaction, and increased revenue potential.

Traditional online shopping platforms have long grappled with high return rates and cart abandonment, often attributed to the inability of consumers to try products before purchasing. WebAR addresses this limitation by providing a hyper-realistic, interactive interface where consumers can virtually 'try on' clothing, accessories, or even view how furniture would fit in their personal spaces, all via a web browser. This not only mimics the sensory experience of a physical trial room but also significantly reduces the friction in the decision-making process, leading to increased conversion rates. Moreover, the technology allows for real-time analytics, capturing data points such as the amount of time spent interacting with specific items, which

can provide retailers with actionable insights into consumer preferences and behaviours.

Creating unique and memorable user experiences leads to higher customer satisfaction. WebAR significantly elevates the quality of user experiences by offering an immersive, interactive, and emotionally engaging environment. It blends digital and real-world elements to provide contextual experiences, enhances navigation and accessibility, and allows for user customization. WebAR also incorporates gamification elements to encourage repeated engagement and supports real-time social interactions, making the user experience more dynamic and fulfilling. Overall, WebAR transforms traditional digital interactions into rich, immersive experiences that are more engaging, memorable, and meaningful for the user. WebAR can also help in creating testimonials or user reviews into interactive experiences. Potential customers can see real-world applications of a product or service in an augmented space, instilling more confidence in their purchasing decision and mitigating potential post-purchase dissonance.

Competitors

The marketing concept posits that organizational success is predicated on the provision of superior customer value and satisfaction relative to that of competitors (Armstrong et al., 2014). Consequently, marketing practitioners are tasked with responsibilities that extend beyond mere adaptation to the needs of their target consumer base. They are also mandated to establish a strategic advantage by distinctly positioning their product or service offerings in juxtaposition to those of competitors within the consumer's cognitive framework. This involves not only meeting but exceeding customer expectations, while also differentiating their offerings in a manner that is both meaningful and salient to the consumer. Areas that WebAR can help here is via enhancing product demonstrations. Tactical promotions, talent acquisition and retention, and market positioning.

Instead of traditional presentations or whitepapers that competitors may use, WebAR offers a competitive advantage in product demonstrations by providing a more interactive and immersive experience for customers. Unlike traditional demos, WebAR allows for 3D product views, real-time customization, and the ability to place products in a contextual environment, offering a deeper understanding of the product's features. Moreover, WebAR captures valuable real-time data on customer behavior, helping refine both the product and marketing strategies. Its shareable

nature amplifies reach and credibility, and integrated calls-to-action can guide the customer seamlessly toward conversion. Overall, WebAR's rich, engaging demonstrations set products apart in a competitive market, offering superior customer engagement and valuable insights.

WebAR also revolutionizes tactical promotions by offering an interactive and immersive platform that significantly enhances short-term marketing initiatives. Incorporating real-time, browser-based experiences, WebAR elevates traditional promotional campaigns by adding elements of urgency, interactivity, and engagement. From flash sales that allow consumers to "grab" virtual coupons to gamified experiences offering exclusive discounts, WebAR provides an emotionally resonant and engaging medium for consumers. Additionally, the technology's robust analytics capabilities enable real-time evaluation and adjustment of promotional strategies, facilitating more targeted and effective campaigns. Overall, WebAR represents a powerful tool for modernizing and optimizing tactical promotions, delivering both increased user engagement and invaluable data-driven insights.

WebAR serves as a revolutionary tool in market positioning strategies, offering a sophisticated, experiential approach to establishing a brand's unique value proposition and differentiation in a saturated market. By providing interactive, immersive experiences directly through web browsers, WebAR transcends traditional marketing limitations to create compelling narratives, vividly articulate product features, and offer targeted customer engagement. The technology not only sets brands apart competitively but also fosters deeper emotional connections, enhancing a brand's position in the marketplace. Additionally, WebAR's robust data analytics capabilities offer invaluable insights into consumer behaviour, enabling iterative refinements to positioning strategies. Consequently, WebAR provides a multi-dimensional framework for market positioning, uniquely combining experiential engagement with data-driven insights for a more effective and nuanced brand strategy.

Public

The organizational environment is further influenced by a range of publics, defined as any collective entity possessing either an extant or prospective interest in, or exerting an impact on, the organization's capacity to fulfill its objectives. These publics serve as critical external factors that can either facilitate or inhibit the attainment of organizational goals (Armstrong et al., 2014), and this papers observes four key areas WebAR can assist

organization's in to navigate crises and uncertainties: crisis communication, stakeholder engagement, issue advocacy and reputation management.

Traditional press releases or static announcements might not be adequate to convey the gravity or complexity of a situation. WebAR can offer an immersive narrative that virtually walks the public through the crisis, the steps taken to address it, and the resolution, thereby building a more transparent relationship. Web Augmented Reality (WebAR) also offers a multifaceted approach to enhance stakeholder engagement across various channels. From transforming virtual meetings with interactive 3D visuals to offering real-time project visualizations, WebAR engages stakeholders in a more compelling manner. It also modernizes traditional reports by turning them into interactive experiences, allows for engaging community input in public projects, and facilitates clearer communication during crises. Internally, it can be used for employee onboarding and training, while externally it can enrich shareholder relations and customer feedback processes. Furthermore, WebAR can effectively illustrate a company's Environmental and Social Governance (ESG) efforts, building greater trust among stakeholders.

For organizations involved in social, environmental, or political issues, WebAR can help in creating persuasive advocacy campaigns. These campaigns can simulate the challenges being addressed, thereby generating public empathy and support. By providing a more nuanced and interactive story, WebAR can help organizations rebuild their image post-crisis. Through visual storytelling, companies can shed light on the corrective actions they've undertaken, reassuring the public and stakeholders alike.

2. Comparative analysis of WebAR against its traditional AR counterparts

One of the most compelling advantages of WebAR over traditional AR (Augmented Reality) is its ease of setup and accessibility. Unlike AR, which often requires users to download a specific application to their devices, WebAR operates directly through a web browser. This eliminates the barriers to entry commonly associated with app downloads, such as device compatibility, storage limitations, and data usage concerns. Users can simply click on a link or scan a QR code to instantly engage with the WebAR experience. For organizations, this ease of deployment means quicker time-to-market and the ability to reach a broader audience without the complexities of app development, distribution, and maintenance. This streamlined access makes WebAR a more practical choice for rapidly addressing organizational crises and uncertainties, allowing for agile responses that can be easily scaled. Provided in the table below are step-by-step instructions on how one may publish a WebAR product presentation online. We have opted to present the example of a product presentation one might use for e-commerce due its simplicity.

Table 1. Comparison of WebAR against the traditional AR

Factor	Traditional mobile app AR	WebAR
Cost of development for organizations	High as the mobile app needs to be deployed across both iOS and Android operating systems and this requires specialized engineers	Low as there are software as a service (SAAS) model organization's that allow businesses to create custom AR experiences at a fraction of the cost of a traditional AR app
Download requirements	Requires users to download the app, taking up storage space on the device	Users do not need to download an app as the AR experience is via the web. All that is required is to visit a website
Device compatibility issues	Developers need to be concerned with releasing a mobile app functioning well on both iOS and Android operating systems across many devices.	Less reliance on device compatibility as the AR experience is served via the web
Storage limitations	Downloading the app requires users to expend storage space	No storage demands
Ease of accessibility for users	Requires users to download an app onto a mobile device, which increase barriers to entry	High accessibility as a user only needs to access a website
Ease of maintenance and pushing content updates for organization's	Organizations would be required to expend resources for maintenance as these updates would need to be released and the users would need to download said update. Such updates can end up taking more storage space.	Pushing updates is a convenient process as the user would only see the most up to date content as they are accessing the AR experience via the web.

Source: own research.

3. State of current research

WebAR has seen use in studies of how AR drives cognitive, affective and behavioural consumer responses (Jeganathan & Szymkowiak, 2023), in creating educational tools (Cortés Rodríguez, et al., 2022), for Scene Text Recognition, Visualization and Reading to Assist Visually Impaired People (Ouali, et al., 2022) as well for Development of career guidance quests (Shepiliev, et al., 2021). It also seems to have been used for assistance in learning intangible cultural heritage (Tan, et al., 2019 as well for bridging knowledge between craftsman and learner). The technology also appears to have been used in creating Information Visual Tool (Tan et al., 2019), creating a traditional kite art platform based on human-computer interaction (Li et al., 2021) and even for the development of training system for dental treatment (Kudo & Okada, 2021). Other learning related uses of WebAR include creating platforms for traditional handicraft learning (Ji, et al., 2020; Ji, Zhou, et al., 2019). Practical usage of WebAR is also visible in campaigns such #BringHalloweenHome from McDonalds (Williams, 2020), #Refreshwherevs from Coca-Cola (Murphy, 2023) and Jumanji (Bäkvall, 2022).

4. Further research

In concluding an article on utilizing WebAR for navigating organizational crises, there are multiple avenues for further research. Among these is the need for longitudinal studies that will delve into the long-term sustainability and impacts of WebAR solutions in the sphere of crisis management. Extending the research to cover multiple industries, especially those less acquainted with advanced technologies, could provide a comprehensive view of WebAR's versatility. Another fertile ground for research lies in the psychological ramifications of deploying WebAR in crisis situations. Understanding the mental and emotional toll or relief it provides to employees and other stakeholders could be instrumental in refining the technology's implementation. This unites with an examination of human-computer interaction (HCI), focusing on how the user experience in WebAR applications can be tailored for the high-stakes scenarios often found in crises. Another area of research that could be beneficial is to undertake research on how WebAR delivered product presentations alongside HCI can impact consumer purchasing behaviours. Furthermore, ethical and social considerations should be considered. As WebAR becomes more prevalent, concerns about data privacy, security, and potential social divides due to unequal access to technology become increasingly relevant. Additionally, the financial aspects, including a thorough cost-benefit analysis, can offer organizations pragmatic insights into whether WebAR solutions are economically viable compared to traditional methods. Finally, the technological landscape is not static; therefore, investigating how WebAR interfaces with other emergent technologies like AI, IoT, and blockchain could produce a holistic crisis management tool. Scalability issues, especially for small and medium-sized enterprises (SMEs), could also be a significant focus, understanding how these organizations can leverage WebAR without the resources of larger corporations.

5. Conclusion

In conclusion, this research endeavoured to add a new dimension to the ongoing academic discourse surrounding the role of emerging technologies like WebAR in organizational contexts. By understanding and harnessing the capabilities of WebAR in crisis management, organizations can aspire to become more agile, adaptable, and resilient. In a time when uncertainties and crises are more a rule than an exception, a tool like WebAR stands as a promising ally for organizations. It offers the possibility of not merely navigating through challenges but transforming them into opportunities for growth and competitive advantage. Therefore, the implications of this research extend beyond academic curiosity; specifically, they offer a pragmatic guide for organizations striving for excellence in a volatile market. Overall, this work serves as a nexus between technological innovation and organizational efficacy, striving to push the boundaries of both scientific inquiry and real-world applications. By exploring how WebAR can be leveraged for crisis management, this research not only illuminates the path for future academic studies but also offers a lifeline to organizations looking to thrive in an era of constant change and unpredictability.

Project funding

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