OPPORTUNITY 40

SCOPE TRANSITIONAL

UNCERTAINTIES

Technology, Values

MEGATRENDS

Digital Realities

TRENDS

Advanced Computing
Advanced Connectivity
Artificial Intelligence
Extended Reality (XR)
Human–Machine

SECTORS IMPACTED

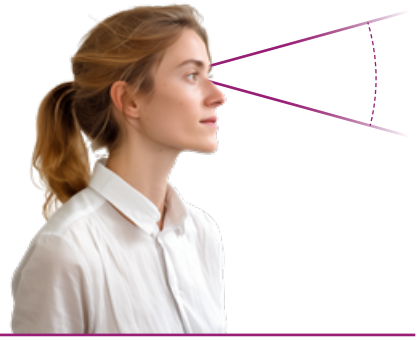
Communication Technologies & Systems
Consumer Goods, Services & Retail
Data Science, AI & Machine Learning
Digital Goods & Services
Education
Government Services
Health & Healthcare
Immersive Technologies
Infrastructure & Construction
Manufacturing
Materials & Biotechnology
Art, Media & Entertainment
Travel & Tourism

What if contactless haptics transformed gaming and healthcare?

SEEING IS FEELING

GenAI

Contactless haptic technology enhance gaming, digital realities, healthcare, and everyday life, offering immersive, wearable-free experiences for both sighted and visually impaired individuals.



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WHY IT MATTERS TODAY

Over 2.2 billion people have near or distance sight impairment.[801] This represents a significant global economic burden, with annual productivity losses estimated at over $410 billion.[802] Over 75% of blind and partially sighted individuals of working age are unemployed.[803] As populations age globally, eye care needs will grow rapidly.[804] By 2050, up to 895 million people could have severe distance vision impairment, of whom 61 million will be blind.[805]

Skin tactile receptors are crucial for sensing and movement[806] and to replicate them various artificial tactile sensors – for example, capacitive, piezoresistive, and magnetic – are used in wearables, prosthetics, and robotics, enhancing dexterity and monitoring.[807] A variety of wearable devices (e.g. gloves, shirts, hats) ultrasonically transmit mid-air haptics to the wearer's skin, instantly 'reading' close and distant visual information (e.g. text, lines, shapes) as Braille.[808]

However, besides wear and tear and reliance on wireless communication, wearables today are not complete for tactile sensing in all parts of the hands like the palm and fingertips.[809] Skin devices face longevity issues from skin renewal and external factors. Wearables disrupt the tactile experience, and bulky gloves strain muscles.[810] Haptic technology in the case of vibrotactile technologies uses over 200 unique vibrations or motions to provide people with an artificial sense of touch.[811] Although minimally invasive surgery, such as laparoscopic procedures, has increased more than four and half times since its introduction in 1980,[812] with some 310 million major surgeries occurring worldwide annually,[813] no tactile sensing product has yet achieved commercial success.[814] This lack of tactile feedback risks tissue damage[815] resulting from more force in tissue handling and less sensitivity.[816]

Haptic technology consists of systems and devices that simulate touch, providing tactile feedback in various forms like vibrations, pressure, or temperature changes.[817] Haptic technology is crucial in gaming, virtual reality, healthcare,[818] and automotive industries. The haptic technology market, valued at $16.8 billion in 2022, is expected to reach $47 billion by 2030, growing at a CAGR of 13.7%.[819]

OPPORTUNITY

Advanced machine intelligence and advances in contactless haptic technologies transform experiences from gaming, digital realities, and amusement rides to surgeries, engineering, manufacturing, education, and everyday life for the visually impaired. Without the need for wearables, this could make interacting with our real and virtual surroundings more engaging and seamless.[820]

Advanced haptic technologies, also called mid-air haptics, use ultrasound, electrostatic forces, light-induced heat, or electric plasma, and even all four, for touch sensations without direct contact. They are contactless as the technology can project feedback onto the user's body, adapting to their movements without physical contact.[821] Like contact-based haptics such as vibrotactile devices, contactless haptics have more complex challenges including varying intensity, rapid updates, and the need to align patterns with moving body parts.[822] Algorithms are improved for optimised user perception and integration of multimodal inputs, identifying effective patterns beyond trial and error.[823]

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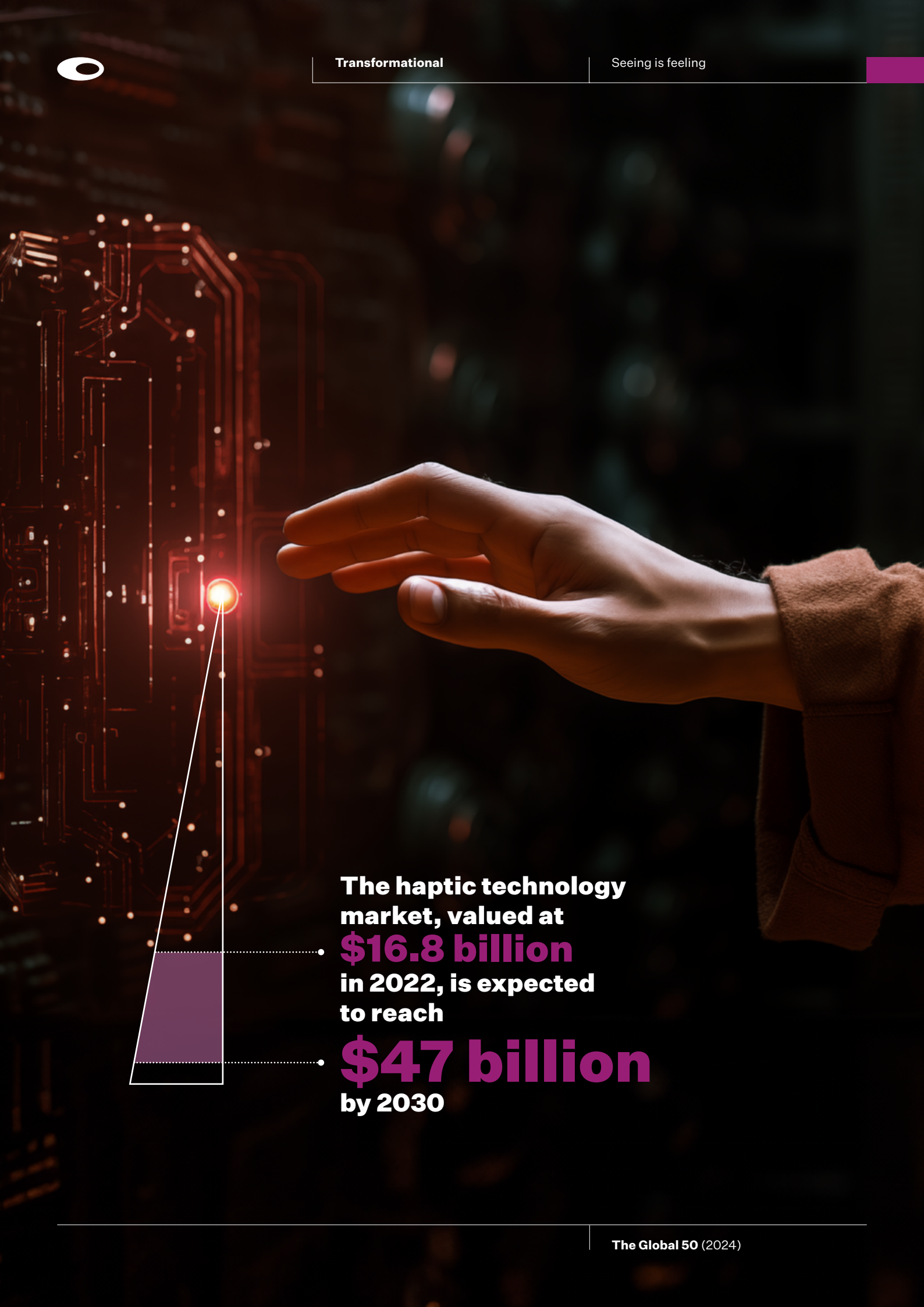
BENEFITS

Enables people with vision impairment or blindness to fully engage with their surroundings, ensuring their independence, quality of life, and productivity. Navigating public transport, watching television, and other everyday tasks involving visual information become much more accessible. Public space hygiene[824] and surgical precision avoiding inadvertent tissue damage[825] also improves.

RISKS

Data privacy, ethics, and potential misuse leading to false user perceptions. Connectivity disruptions could severely impact on services using contactless haptics, increasing the risk of causing inadvertent harm.



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