

How people find their way in 2035

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APPENDIX A:

FULL LIST OF 150 CONTEXT FACTORS

Biological

- 1** There is substantial skill decay with non-practice or nonuse. Physical, natural, and speed-based tasks are less susceptible to skill loss than cognitive, artificial, and accuracy-based tasks. (principle) (W. Arthur Jr et al., 1998)
- 2** Traditional navigation methods often rely on deep understanding of patterns in the environment combined with physical artefacts that aid learning and spreading knowledge. (principle) (Fernandez-Velasco & Spiers, 2023)
- 3** London taxi drivers, who undergo extensive navigation training, exhibit increased gray matter volume in the posterior hippocampus. This suggests that intensive navigational experience can lead to structural changes in the brain. (principle) (Maguire et al., 2006)
- 4** People with disabilities are not only wheelchair users with reduced mobility, but also visually impaired, blind, hearing impaired, people with all disabilities, visible or hidden. (state) (Maciejko & Czajka, 2019)
- 5** At least 1 in 5 people in the UK have a long term illness, impairment or disability. This includes people with impaired vision, motor difficulties, cognitive impairments or learning disabilities and deafness or impaired hearing. Many more have a temporary disability. (state) (Government Digital Service, 2018)
- 6** Children experience problems due to screens, every screen-hour raises the chance of myopia (short-sightedness) for children. (development) (Davis, 2025)
- 7** Intuitive wayfinding using the sun differs based on someone's position in the world. At noon the Sun is always due south in the northern hemisphere and due north in the southern hemisphere. (principle) (Nuffield Foundation, n.d.)
- 8** People depend on various environmental cues, such as landmarks, signage, and spatial layouts, to orient themselves and make navigation decisions. (state) (Boon, 2022)
- 9** Healthy air and low-pollution materials within built environments reduce cognitive stress, directly supporting better spatial orientation. (principle) (Bonenberg, 2019)
- 10** Those who take more shortcuts show greater activation in the hippocampus during encoding (principle) (Marchette et al., 2011) (Hegarty et al., 2022)
- 11** Aging affects navigational strategy, such that older adults shift to an increased reliance on the response strategy while younger adults show less preference between place and response strategies. (principle) (Rodgers et al., 2010)

Cultural

- 145** Escape rooms are increasingly popular. They can foster a significant sense of fulfillment. To successfully escape an escape game, you must cooperate as a team, solve problems, and think critically. (trend) (Nicholson, 2015)
- 13** People read less every year. (development) (Iyengar, 2024)
- 21** Between 2003 and 2020, there was a noted decrease of 20 hours per month in the time individuals spent with friends, indicating a trend toward reduced in-person social interactions. In the same period, time spent alone increased by 24 hours per month. (trend) (Murthy, 2023)
- 16** Social perception of airports is changing: rather than just being waypoints to destinations, they're becoming attractions in their own right – places for business, leisure, retail and culture. (trend) (Gurovich & Kalkman, 2025)
- 24** 'Radical transparency' arises as reaction on decreasing levels of trust and social capital, and the availability of unmanageably large amount of information. This concept refers to a transformation towards transparency in public administration, modifying traditional approaches to confidentiality. It involves being explicit about values, and making processes open. (development) (European Strategy and Policy Analysis System (ESPAS), 2024)
- 20** In the digital age, personalized experiences are created in different ways: content personalization, format personalization, interaction personalization, and delivery personalization. The types of information are individual-level, social-level and situation-based. (trend) (Aksoy et al., 2021)
- 15** Men and women don't significantly differ in orientation tasks performance, they only show somewhat different strategies in carrying out the orientation tasks. (principle) (Bosco et al., 2004)
- 23** Wayfinding is universal to all cultures. It is involved in a myriad of daily and longer-term episodic activities ranging from a search of local areas for food sources to the large-scale and long-term international migrations that first populated the world. (principle) (Golledge, 2003)
- 18** People are using social media to find places of interest (state) (Van Canneyt et al., 2012)
- 19** Cognitive abilities for spatial navigation are influenced by economic wealth and gender inequality. Economic wealth was predictive of the average navigation ability of its inhabitants, and gender inequality was predictive of the size of performance difference between males and females. (principle) (Coutrot et al., 2018)

- 14** The blending of different cultures makes culture and the organization of physical spaces more hybrid. (development) (Thussu et al., 2007)
- 22** Services strive to become more personal, more human and more experiential. (trend) (Gurovich & Kalkman, 2025)
- 17** Traditional stories may collapse: The narratives (religion, nationalism, etc.) that helped people find meaning may lose their power. (trend) (Harari, 2017)
- 150** Back to basics: the return to analog living in a digital world. Digital fatigue starts a trend in reclaiming authenticity in an increasingly simulated world. Analog practices offer something intangible: a soulful connection, a tangible link to the world, and a break from the ephemeral nature of digital content. (trend) (Bowin, 2023)
- 147** In a post-digital society, where digital technologies are ubiquitous, the lines between analogue and digital, and between user and non-user, are increasingly blurred. Voluntary digital disconnection and the revival of analogue technologies is not merely a nostalgic trend but reflects deeper desires for authenticity, control, and meaningful engagement. (trend) (Thorén et al., 2017)

Demographical

- 25** The continuing increase in ageing population implicates older people in the public space with different needs. People are also living up to two decades longer compared to previous generations. (development) (European Strategy and Policy Analysis System (ESPAS), 2024)
- 26** Public literacy in data interpretation is growing, especially following global events like the COVID-19 pandemic, increasing the expectation for clarity and usability in data communication. (trend) (Kuonen & Tennison, 2021)
- 27** People are increasingly living in cities and are more exposed to the negative impacts of climate change. (development) (European Strategy and Policy Analysis System (ESPAS), 2024)
- 28** 68% of the world population projected to live in urban areas by 2050, says UN. A fast growth from 751 million in 1950 to 4.2 billion in 2018. Europe is home for 13% of the world's urban population. By 2030, there will be 43 megacities with more than 10 million inhabitants around the world. (development) (United Nations, 2018)
- 29** Population in The Netherlands grew till 18 million people in 2024, mainly due to foreign migration, leading to a more diverse population. The biggest growth was in 'de randstad'. (development) (CBS, 2024)
- 30** Democracies are experiencing sustained attacks on their freedoms and way of life including efforts to undermine elections, freedom of the media and of expression, freedom of association, and the independence of the judiciary. (state) (European Strategy and Policy Analysis System (ESPAS), 2024)

Economical

- 31** Harari warns that as AI and automation replace human labor, many people may become economically irrelevant. A new class of people may emerge who are no longer needed for the economy, posing massive challenges to capitalism/welfare. (trend) (Harari, 2017)
- 32** 'Slowbalisation' following the 2008 financial crisis may be turning into deglobalisation. (development) (Keller & Marold, 2023)
- 33** “Dataism” sees data flows as the most valuable resource, potentially more important than land, labor, or capital. Who owns the data controls the economy. Tech giants might become more powerful than governments. (development) (Harari, 2017)

- 34** There is a growing wealth gap between the world's richest and poorest, with 685 million people in extreme poverty, living on less than USD 2.15 per day. At the same time, the share held by low-income countries of global wealth remains below 1 %, even though they represent around 8 % of the population. (development) (European Strategy and Policy Analysis System (ESPAS), 2024)

Ecological

- 35** A great number of plastics are involved in the production of wayfinding signage. Acrylic, polycarbonate, aluminum composites, expanded PVC, and foam sheet are just a few common substrates used. (state) (Piedmont Plastics, n.d.)
- 36** New UN Climate change report shows that progress in national climate policy efforts remains insufficient to achieve 2030 targets. (development) (United Nations Climate Statement, 2024)

- 37** Public services will often be on the frontline of responding to extreme weather in communities, identify local priorities and invest in resilient infrastructure accordingly. (development) (Garrett & Clemence, 2023)

Spatial geographical

- 38** Cities are using urban planning strategies to redesign how people physically access and experience public services. (development) (Transnational Institute, 2025)
- 39** The environmental/spatial context impacts how experiences are imprinted in memory. Experiences occurring in the same environment are memorized better than in different contexts. This suggests that changes environments can impact memory. (principle) (Van Ast, 2022)
- 40** People are better at navigating in environments that were topologically similar to where they grew up. This navigation ability is linked to the entropy of (city) street networks. (principle) (Coutrot et al., 2022)
- 41** Increasing privatization of urban design challenges democratic access to public space and reshapes how wayfinding is controlled. (trend) (Cresswell, 2012)

149 Yi-Fu Tuan's idea of topophilia (love of place) and his humanistic geography emphasize subjective, experiential connections to place. He highlights how place becomes meaningful through experience, memory, and attachment. (state) (Cresswell, 2012)

42 Of all architectural components, the presence and layout of paths contribute the most to an effective terminal design for navigation. (principle) (Farr et al., 2014)

43 In our rapidly evolving technological landscape, we're witnessing a fundamental shift in how we interact with spaces and services, balancing between digital efficiency and human connection. (trend) (Gurovich & Kalkman, 2025)

44 In mobility and urbanization development, as people move more frequently and cities become denser, places become nodes in networks rather than fixed destinations. (development) (Cresswell, 2012)

45 Heidegger saw place as a fundamental part of being, not just a setting or container, but integral to existence itself. "Being and place are inextricably bound together in Heidegger's thinking. Place is not where we are, but rather how we are." Heidegger's work leads to a view of place not just as location but as a mode of dwelling, where humans authentically engage with their surroundings. (state) (Cresswell, 2012)

46 For new projects, wayfinding can be enhanced by aiding collaboration between architects, wayfinding experts, interior designers, and others in order to create an environment that is understandable, easy to navigate, and inviting to explore. (state) (Mijksenaar, 2020)

47 For enhancing wayfinding in existing projects, interventions in the space focus on keeping flows and sight lines clear, using light to steer movement, and placing landmarks as reference points. Signage supplements with only the necessary information needed at key points along the journey. (state) (Mijksenaar, 2020)

48 Spatial zoning is the organization of information, to prevent elements from competing for space, effect and attention. Consistently placing similar information in predictable locations helps build an understanding of the airport environment, allowing users to more easily perceive the space and find information. (principle) (Mijksenaar, 2020)

49 Since the inclusion of GPS in 'smart phones' users view spaces they are moving through in new ways, changing our relationship with local spaces and places. (trend) (Gazzard, 2011)

Political

50 The recent UN Sustainable Development Goals Progress Report revealed that we are on track to meet only 12% of targets by 2030. Progress on 50% of the targets is weak, and 30% have either stalled or actually gotten worse. (state) (United Nations, 2023)

51 The public has a growing perception of unaccountability and unresponsiveness of public services. (trend) (Ipsos, 2024)

52 Kaczynski's manifest 'Industrial Society and Its Future' states that the industrial-technological society is fundamentally incompatible with human freedom and psychological well-being. (principle) (Kaczynski, 1995)

53 Reshaping of global governance by new alliances as BRICS (Brazil, Russia, India, China, South Africa) that collaborate with countires in the Global South to diversify their economic and political alliances, reducing Western dependency. (development) (Upadhyay & Saha, 2023)

54 It is not clear who should pay the costs associated with climate change and how the responsibility should be divided. (state) (Vanderheiden, 2011)

55 As public space is increasingly privatized or otherwise brought under greater control, possibilities for democratic action are minimized. (development) (Mitchell, 1995)

56 A growing number of cities and regions worldwide are shifting from privatized to publicly owned service models, resulting in an increase in public ownership and management of services. (trend) (Transnational Institute, 2025)

57 Kaczynski writes in his manifesto that real decision-making power shifts away from individuals and small communities to abstract institutions and algorithms. (trend) (Kaczynski, 1995)

58 Right-wing populist parties are gaining more popularity in economically prosperous countries. (state) (Mols & Jetten, 2015)

59 The Belt and Road Initiative is a massive China-led infrastructure project that aims to stretch around the globe. Some analysts see the project as a disturbing expansion of Chinese power, and the United States has struggled to offer a competing vision. (development) (McBride, 2023)

148 Good governance has 8 major characteristics. It is participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive and follows the rule of law. It assures that corruption is minimized, the views of minorities are taken into account and that the voices of the most vulnerable in society are heard in decision-making. (principle) (United Nations Economic and Social Commission for Asia and the Pacific,1977)

60 In the current media system, it is not always possible to determine the origin and correctness of information, and the motives that drive the production and distribution. Also, with personalizing, it is not sure that everyone consumes the same information. (state) (Wetenschappelijke Raad voor het Regeringsbeleid, 2023)

61 The European Accessibility Act (EAA) requires that products and services are accessible to persons with disabilities. It sets minimum standards for accessibility. (development) (European Accessibility Act, 2025)

62 Following the Fire Safety Regulations 2022, new safety standards have been enforced, especially for high buildings. (principle) (Ventro Group, 2025)

63 Human rights are intrinsic to everyone without considering sex, nationality, gender, race, etc. In 1948, the United Nations proclaimed The Universal Declaration of Human. (principle) (United Nations, n.d.)

64 Recent studies (Muis, 2022) show a surprising trend: Generation Z, now the youngest voters, have more conservative attitudes than expected. (trend) (Muis, 2024)

Philosophical

65 Maurice Merleau-Ponty, building on Husserl's ideas, focuses on embodiment and perception, arguing that space is understood through bodily engagement with the world. Space is depending on physical experience of a bodily connection. (state) (Elden, 2003) (Merleau-Ponty, 2013)

66 According to neuroscientist Victor Lamme, all our actions are caused by cognitive processes that, like for a frog, leave no room for freedom (of choice). All reasons we give for our actions are rationalizations, produced after the fact. (state) (Lamme, 2011)

67 Fear for the unknown is one of the biggest certainties that you can have, because things will always remain unknown. (principle) (interview quote - John Körmeling, 2025)

68 Edmund Husserl emphasizes the lived experience of space, introducing the distinction between the lived body (Leib) and the physical body (Körper), highlighting the subjective experience of spatiality. (state) (Elden, 2003)

69 The story about Diogenes and Alexander the Great, when Alexander came up to him and offered to grant him any request. Diogenes replied "Stand out of my light" - an example of ethical principles regarding power and fundamental needs. (state) (Kuin, 2022)

70 Docility, in Foucault's sense, is the condition in which people unreluctantly accept being used, and do so because they have been trained to do. (state) (Foucault, 1920)

71 Immanuel Kant posits space as an a priori form of intuition, structuring all human experience. (state) (Elden, 2003)

72 Luce Irigaray critiques the phallogentric structuring of space, advocating for a rethinking of spatial relations that acknowledge sexual difference. (state) (Elden, 2003)

73 John Stuart Mill's core ethical idea is his Utilitarianism (1863): moral decisions should aim to maximize happiness (or minimize suffering) for the greatest number of people. (state) (De Mey, 2014)

74 George Bereley reacts to Locke's indirect realism that it is impossible to distinguish primary and secondary qualities based on perception. All characteristics can only exist in perception: esse est percipi. (state) (De Mey, 2014)

75 John Locke as classical empirist states that all knowledge can be traced back to emperical perception. When people get born, they have no knowledge, their soul is a tabula rasa ('No innate ideas!' (state) (De Mey, 2014)

76 Kuhn analyzes that scientific revolutions develop through the paradigm of 'normal science', to mistakes/anomalies inside this paradigm, to a scientific revoluton towards a new paradigma of 'normal science'. (state) (De Mey, 2014)

77 Foucault sees humans as functional part of a dominant system (structuralism): who you are is no choice, you are shaped by patterns in which you grow up. (state) (De Mey, 2014)

78 Technology manipulates people, they can not act upon their free will. People get totally passive. (interview quote - John Körmeling, 2025)

Psychological

79 Mental wellbeing of young people is impacted by loneliness, performance pressure and addiction. (state) (Groen & Manders, 2025)

80 Users might experience a decline in task-based cognitive abilities, such as decision-making and problem-solving, as they increasingly depend on AI for decision-making. (development) (Macnamara et al., 2024)

81 Individuals have different strategies for navigation, some rely more on landmark-based navigation and others on route-based strategies. (principle) (Maguire et al., 2006)

82 The human brain's spatial representation is adaptable and can be refined through experience. (principle) (Maguire et al., 2006)

83 The role and importance of expertise in wayfinding is highlighted by research with experienced taxi drivers that demonstrated a high level of detail and structure in their navigational thought processes. (principle) (Spiers & Maguire, 2008)

84 Emotional arousal leads to better remembering experiences than experiences that do not evoke an emotional response. (principle) (Kensinger, 2009)

85 Local belonging remains a persistent desire. (state) (Cresswell, 2012)

86 Loss of individualism: As algorithms become better at understanding us than we are, people may defer decision-making to machines, eroding the sense of free will. "When we come to make the most important decisions of our lives... we will ask Google. 'Who should I marry?' Google will know the answer better than we do." (development) (Harari, 2017)

87 Gestalt principles apply to wayfinding because they explain how humans naturally perceive visual information and spatial arrangements. (principle) (Wagemans et al., 2012)

88 While the demand for psychological care is increasing, critique grows about the 'overuse' of therapy for everyday issues that could be 'solved' with tolerating discomfort better. (trend) (Berger, 2025)

89 Ken Wilber's theory of consciousness development: individuals and societies evolve through stages from egocentric ("Me"), to ethnocentric ("Us"), to worldcentric ("All of Us") perspectives, where knowledge and awareness build upon what came before. (principle) (Wilber, 2018)

90 There is an increasing demand for data visualizations that communicate complex information in emotionally resonant and human-centered ways. (trend) (Ong, 2025)

91 Individuals utilize internal mental representations, or cognitive maps, to understand spatial relationships and navigate their surroundings. (state) (Boon, 2022)

92 Time available to the traveler and the urgency to reach a destination affect the stress level, potentially influencing wayfinding behavior. (principle) (Farr et al., 2014)

93 Younger travelers are less likely to seek assistance from staffed booths and more likely to rely on digital tools. (state) (Powell et al., 2023)

94 Escape route signage is essential for ensuring that any occupants of a building can quickly identify the nearest escape route to them. Size and visibility in whole area are important. (principle) (Ventro Group, 2025)

95 Francis Fukuyama emphasizes thymos (the part of the soul that desires recognition) as a core driver of human behavior: both isothymia (desire for equal respect) and megalothymia (desire for superiority) shape societal dynamics and political movements. (state) (Fukuyama, 2018)

96 Social relations within a space and the group(s) who control that space socially have a greater influence on how safe women feel than the design of the space. (state) (Valentine, 1990)

97 Temporary altered states (as peak or “aha” moments) contribute to individuals’ evolving awareness and capacity to perceive and interpret their environment. (state) (Wilber, 2018)

98 The integration of green zones and natural light helps reduce disorientation and supports psychophysical well-being. (principle) (Bonenberg, 2019)

99 Cognitive and emotional states, especially spatial anxiety and cognitive and spatial skills, have a stronger impact on wayfinding success than environmental factors as terminal design or navigation pathways. (state) (Farr et al., 2014)

100 Travellers experiencing high spatial anxiety are less likely to navigate effectively (principle) (Farr et al., 2014)

101 Higher spatial reasoning and memory capabilities directly correlate with increased wayfinding success. (principle) (Farr et al., 2014)

102 Spatial decisions processes include the stages of generating the decision alternatives by: retrieving information about the environment which is externally accessible or is accessible in a cognitive map, representing the decision alternatives in memory, evaluating the decision alternatives, applying a decision strategy or rule, and implementing the decision. (principle) (Kitchin & Freundschuh, 2000)

103 People fear change because of the inability to predict the outcome and the uncertainty it brings, in order to avoid it, they look for security. The fear of change is based on real and imaginary stories that people tell to themselves. (state) (Razzetti, 2018)

104 When users anticipate unengaging content, their attention to digital signage diminishes, leading to decreased effectiveness of the displays. (state) (Müller et al., 2009)

105 Habits and expectation significantly influence visual perception and attention. (principle) (Summerfield & Egner, 2009) (Riccio et al., 2013) (Salovich et al., 2017)

106 More and more wayfinding design prioritizes user needs, preferences, and feedback to improve usability and satisfaction. (trend) (Mullen et al., 2016)

107 Wayfinding technologies improve accessibility by addressing different senses: visual (graphical signs and text), auditory (e.g., voice-guided GPS) and tactile (e.g., vibration cues). (development) (Mullen et al., 2016)

108 Reliance on turn-by-turn instructions can lead to reduced engagement with the environment. (principle) (Ben-Elia, 2020)

109 Social connectedness is key to well-being and healthy development across the lifespan. (principle) (Smallen, 2021)

110 Cognitive maps are formed through visual, auditory, haptic, olfactory, and even linguistic cues, due to the limited perceptual reach of the human senses in large environments. (principle) (Portugali, 1996)

111 People don’t like to be told what to do. (principle) (Cleveland Clinic, 2025)

Sociological

112 Starting as a necessity in the COVID-19 pandemic, virtual meetings are now being a widely accepted alternative to tradional face-to-face meetings. (state) (Standaert et al., 2021)

113 People become more anxious when physical or virtually disconnected from others and it puts us all in a state of mutual surveillance. (state) (CCA, 2020)

114 The increase of global media has led to wide-spreading cultural narratives and representations, influencing individuals' perceptions of spaces and places. (trend) (Thussu et al., 2007)

115 People interact with ‘Little Free Libraries’ (Dutch: mini-bieb) as a localized, citizen-driven effort to enhance public spaces and community participation. People even make trips (to other cities) especially for visiting these Little Free Libraries. (trend) (Sarmiento et al., 2017)

116 Cultural influence is no longer a one-way flow from the West to the rest of the world. The contra-flow is media and cultural content that exports from the Global South to the Global North or from non-Western to Western contexts. (development) (Thussu et al., 2007)

117 Low literacy rates are increasing in the Netherlands, despite policies by the Dutch Government to tackle the problem. Around two and a half million Dutch people currently have literacy and numeracy difficulties. (state) (Cedefop, 2016)

118 The Data Loop perpetuates a “default male” world, because so much data fails to take into account gender. It treats men as the default and women as atypical, bias and discrimination are baked into our systems. (state) (Perez, 2019)

119 With social media, individuals can customize and optimize their information environments, such that they can easily avoid information and people they don't want to see online. (state) (CCA, 2020)

120 People anticipate the behavior of other people in the public space. (principle) (Murakami et al., 2021)

121 The public is cautious about technological solutions, as the criticism aimed at public services is not being good at using new technology to change the way they deliver public services. (state) (Ipsos, 2024)

122 Ipsos Global Trends data shows the proportion who fear that technical progress is destroying their lives has risen from 44% in 1999 to 58% - a twenty-year high – in 2023. (development) (Garrett & Clemence, 2023)

123 Public services are increasingly being designed and managed with input from local communities and citizens. (development) (Transnational Institute, 2025)

124 The book Data Feminism (D'Ignazio & Klein, 2020) emphasizes the importance of considering that power is not distributed equally in the world. Data science is not neutral and needs more fair approaches that challenge existing hierarchies. (trend) (D'Ignazio & Klein, 2020)

125 The world is built by and designed for men. (state) (Ely, 2018)

12 People feel more lonely in our “always online society”, where people isolate themselves in order to ‘connect’ to the world through media technologies. (trend) (CCA, 2020)

Technological

126 Increasing push toward data collection, automation, and technological innovation to manage the growing complexity and scale of operations. (development) (Gurovich & Kalkman, 2025)

127 The human readiness level (HRL) supplements the existing technology readiness level (TRL) to support a systematic evaluation of human-system aspects to ensure humans can use a fielded technology or system as intended, safe and effective. (trend) (See, 2021)

128 Human development is increasingly driven by technology, particularly AI, biotechnology, and data science. (trend) (Harari, 2017)

129 Individuals are granted little control or oversight over how their personal data is used to draw inferences about them. (state) (Wachter & Mittelstadt, 2018)

130 Homo Deus, Chapter 11 "The Data Religion": AI and biotech will allow external systems to go under the skin, monitor biological processes, and understand people better than they understand themselves." (development) (Harari, 2017)

131 Technology creating winners and losers. Skilled workers and workers who can upgrade their skills. But it has also taken a toll on low-skilled and medium-skilled workers in routine-intensive labor, whose jobs are increasingly being phased out or lost as technologies are being captured by a small number of dominant companies. (trend) (United Nations, 2020)

132 About 87 per cent of people in developed countries have internet access, compared to 19 per cent in developing countries. (trend) (United Nations, 2020)

133 Smartphones, watches, and other devices that you use for navigation are energy dependent. (principe) (Liao, 2018)

134 The widespread use of GPS and digital navigation tools has altered traditional navigation practices, potentially affecting individuals' innate wayfinding abilities. (trend) (Boon, 2022)

135 Kaczynski sees technology as self-perpetuating system, evolving beyond individual or societal control, which makes that social systems must continually adapt to technology. (trend) (Kaczynski, 1995)

136 Legal and data privacy issues are critical for digital wayfinding, as tracking via mobile apps and biometric data collection raises concerns about personal data security and ownership. (state) (Powell et al., 2023)

137 Turn-by-turn (TBT) route guidance technology installed on mobile phones is very popular among car drivers for wayfinding purposes. (state) (Ben-Elia, 2020)

138 Drivers using paper maps demonstrated better spatial understanding of the routes they navigated compared to those using turn-by-turn navigation systems. (principle) (Ben-Elia, 2020)

146 Digital technology now shapes every stage of travel experience, from inspiration, to booking, navigation and sharing memories. It has become more personalized, immersive and seamless. (trend) (Nortal, 2024)

139 GPS allows people to know precisely where they are at any given moment in time. (principle) (National Coordination Office for Space-Based Positioning, Navigation, and Timing, 2021)

140 AI assistants are increasingly being incorporated into complex domains, such as medicine and aviation, to support decision-making processes. (development) (Macnamara et al., 2024)

141 Wayfinding evolved from static signage to digital and personalized technologies. Early airport navigation relied on static signs and human staff. Over the years it progressed to include digital kiosks, interactive maps, mobile applications, indoor positioning, and biometric and AR-based systems. (trend) (Powell et al., 2023)

142 Mobile applications are central to modern wayfinding. (state) (Powell et al., 2023)

143 New indoor positioning technology solutions as BLE (Bluetooth Low Energy) and UWB (Ultra-Wideband) beacons are in development to have navigation support inside buildings. (trend) (Powell et al., 2023)

144 Biometric technology is expanding beyond security. Facial recognition is being tested for boarding, personalized signage, and even hands-free navigation, though privacy and equity issues remain. (trend) (Powell et al., 2023)

APPENDIX B: INPUT WORKSHOP CONTEXT FACTOR AT MIJKSENAAR

Workshop theme outcomes

From the post-its and clusters of the context factor workshop with the colleagues at Mijksenaar, a list of themes emerged that they considered relevant for the future of how people find their way. These themes were compared with the already existing collection of context factors, and supplemented where still things were missing.

In the workshop the themes were not categorized in technological, economical, political, etc. to reduce the complexity of the VIP method, and the categorization was done outside the workshop. As can be seen in the numbers, the distribution of themes is not the same as the distribution of context factors (figure 13). This is due to the knowledge background of the people working at Mijksenaar. Their input was used as expertise

Technological (6) - tech influence, power, data & personalization, transport, analogue, strategy in design.

Economical (2) - new transport and infrastructure, but less availability of resources and materials.

Political (4) - polarization, controlled movements vs freedom, regulations and power.

Demographical (3) - aging population will result in differences in skills, growing population requires space and crowd management, cultural influences through mixed cultures.

Sociological (3) - polarization through wealth inequality, polarization through technology related to tech literacy, de-globalization.

Cultural (4) - polarization through wealth inequality, online & convenience, digital natives in the tech era, authenticity and luxury.

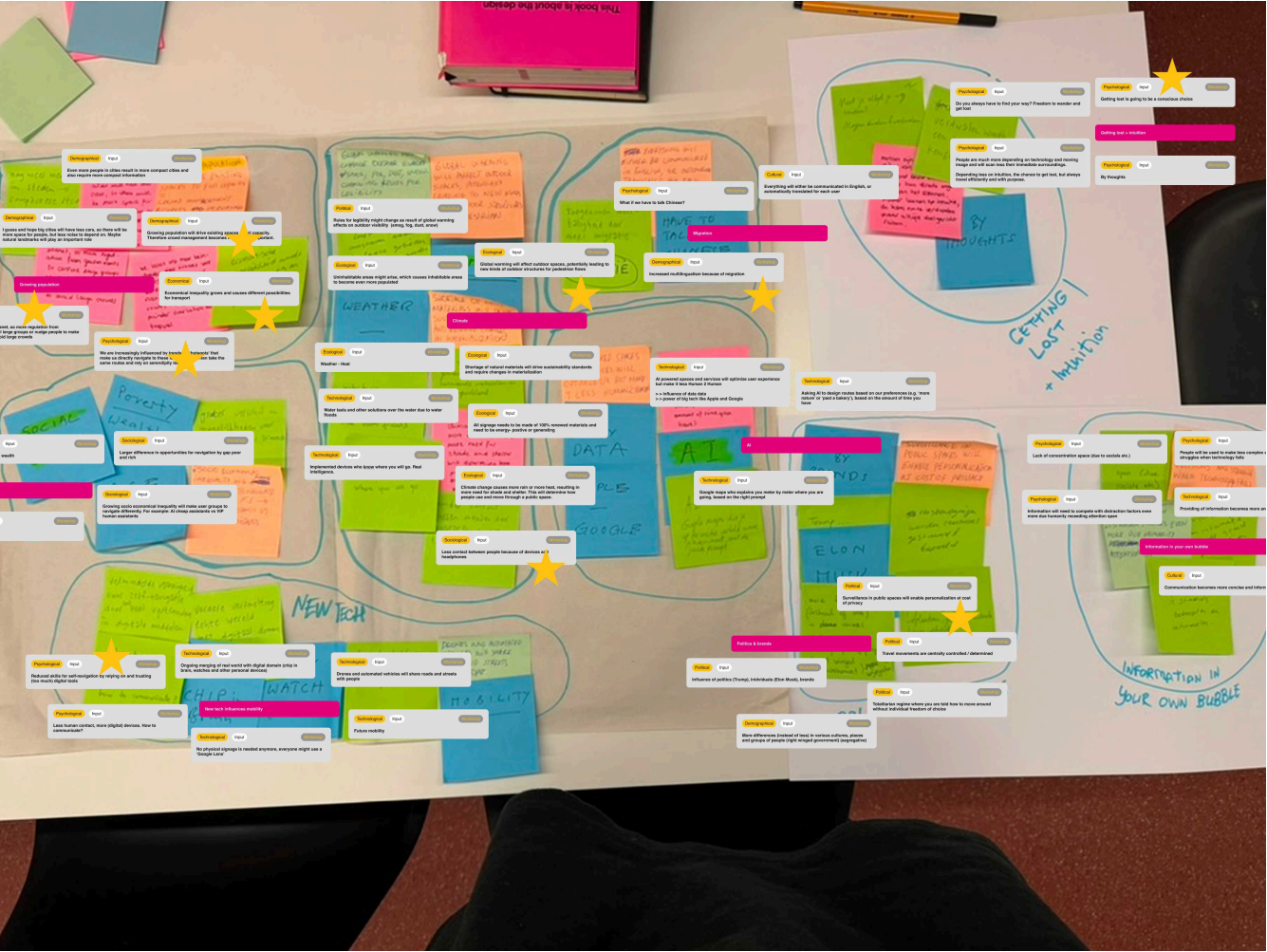
Psychological (10) - cognitive processing, distraction and attention 'less human', efficient and with purpose, navigation skills decrease, embracing tech?, experience based, openness for the unexpected, conscious choice & relying on intuition, we get directed, relying on various senses.

Biological (2) - physical disabilities, natural recognition.

Ecological (2) - signage 100% sustainable, changing climate changes needs and behaviour

Philosophical (0)

Spatial geographical (0)



APPENDIX C: PATTERNS AND AXES DIMENSIONS

Sense-making of space

6 efficiency harnesses complexity

Efficiency in complex environments impacts operations through system optimization, human cognitive strategies and the user's readiness to new technologies.

2 governance: invisible management of behavior

As technological systems, privatized spaces and controlled information increasingly shape human behavior invisibly, individuals lose autonomy. While the need for participatory and accountable governance grows more urgent in facing global challenges like climate change, the actual mechanisms of power become more hidden and fragmented.

3 changing global power

Growing global inequalities are driving a reorganization of political and economic governance, while at the same time, cultural hybridization reflects a shift in societal structures and power balances beyond traditional Western frameworks.

**7 decentralized emotional narratives
create own information bubbles**

As traditional narratives lose their influence, people turn to personal experiences and emotions to make sense of the world. Shared meaning breaks down into personal information bubbles, where people find and share stories that correspond to how they feel.

10 acknowledging the world's growing complexity

Accepting and engaging with an increasingly interconnected, uncertain, and dynamic world, while acknowledging past and current injustices, inequalities and power imbalances. With this open mindset and adaptability we can engage with and navigate - not simplify - complexity.

systemic

Systemic sense making is based on orientation through data, algorithms and external systems that dictate behavior.

social

Social sense making is based on meaning through interactions and cultural narratives.

intrinsic

Internal sense making is based on meaning derived from personal intuition, embodied experience and reflection.

Authenticity in place

physical

Physical authenticity is how people relate to and experience the world through their embodied, sensory presence — tangible connections are changing in the digital world, but more awareness about diverse spatial and navigational strategies support to keep engaging in the physical space.

cognitive

Cognitive authenticity is shifting as natural thinking is replaced by technical support skills. Governance now shapes behavior through subtle, invisible mechanisms, making freedom more fictional than reality—autonomy appears intact but is guided by external systems.

emotional

Emotional authenticity is reflecting a movement where people are tired of the over engineered and efficient system and look for a more human connection and rhythm. The resilience built in complex society also enables people to overcome more frictional challenges in the 'human dimension' world.

1 paradox of authentic human dwelling

Changes in the physical human connection with place. Technology flattens human experience of place, replacing Heideggerian dwelling with abstract systems, and fragmenting sense of place and presence. As sensory and intuitive ways of being fade, the human longing for embodied experience through the lived body persists - offering a path to restore deeper, conscious engagement with the world.

4 problem solving decay

People are losing some of their natural problem-solving skills, as they are increasingly relying on digital tools and support. It does not mean that people are becoming less intelligent - our skills are just changing. We gain new digital abilities, but at the same time, we become more dependent on technology. This dependency impact self-sufficiency and reduce the capacity for independent problem-solving, especially in complex or unfamiliar contexts.

5 longing for the human dimension

In a fast, digital, and efficiency-driven world, where life becomes more controlled by data and technology, many people start to miss real connection, recognition, and a natural rhythm. They long for a more human way of living.

9 recognition of differences through nature and nurture (new design4all)

The is a growing awareness that individual and group differences arise from both biological and environmental factors.

8 fictive human freedom

Our choices and actions are driven by unconscious processes and external systems, while our feeling of control is a story we tell ourselves afterward. In a world shaped by technology and systems of control, the idea of true human freedom becomes something we believe in, but may not actually have.

11 resilience & tolerating discomfort

The harsh modern world requires the human capacity to adapt, endure, and grow through adversity. It focuses on the role of emotional strength, tolerance for uncertainty, and the ability to navigate discomfort as essential traits in a changing and often challenging world.

APPENDIX D:
NOTES
VAN ABBEDEBAT

- Technology results in that people don't think anymore for themselves.
Why does technology hinder the development of humankind?
- Does it give more or less time for the important things in life? Technology will take over jobs, will make things easier and faster. *Does technology give us more time?*

What is the importance of getting lost?
- Getting lost is the opportunity to get away from everything, and to further discover. *How can we get an open mind to get lost again?*
- If the possibility of getting lost is decreasing, people get to know themselves less.
To what extent does technology interfere with finding yourself?
- For some people it is interfering. Also, people don't dare to get lost anymore. *Could technology also help getting lost?*
- Everyone lives in their own bubble and on the internet you can get lost in bubbles. There is a risk that you only find similar information and the same way of thinking. A hive mind.
Is this at the expense of identity and self-being?
- People are thinking less and less for themselves and as a result there is less diversity in society. Our diversity is disappearing.

How do you get lost?

Drift point
Getting lost helps exploring: exploring the way, and also of personality and identity. The fear in this, is that everything can be found through the influence of social media and technology, but at the same time there is hope that people find more time to get lost through technology.



Figure 30: Pictures Van Abbedebat (Van der Wegen, 2025)

- We like finding the way. Getting lost is different in the context of long ways that go far way. Our society is less open to discovery. I once went for a walk with my mother without phones, and it made me wonder if we don't know the city as well as wel think.
Would we live better if we got lost more quickly?
- Signs have been around for a long time. In the past, people used to get lost too. Getting lost was maybe different then. *To what extent is getting lost still really getting lost?*
- Getting lost can now maybe almost be seen as a luxury, an intention. Now people would get lost to find new places. Going without direction. Let curiosity run wild. *Is curiosity still appreciated in this society?*
- Technology can make it easier through the internet, but also on the internet you cdan get lost. *Can you compare getting lost on the internet with getting lost in the woods.*
- The forest is a place that changes. The internet is knowledge and social interaction. *Does technology cause us to get lost? Aren't we all lost?*
- What could be the effect if people develop on the internet instead of real life?*
- The connection with sense of community changes, for example the connection with our neighbors. *Does the sense of community create trust or more or less unhappiness?*

Drift point
The meaning of getting lost has changes. The hope is that people will find their way better in the physical world, and the fear is that we get lost too much in the 'smart' world.

APPENDIX E: OUTCOME VAN ABBEDEBAT

Summary

This summary is made by ChatGPT from the notes of the Van Abbedebat (appendix C)

Participants reflected that technology increasingly reduces the need for independent thinking. It potentially narrows the diversity of thought and weakens our capacity to truly get lost. While technology promises to save time by making tasks easier and faster, there is concern that it also diminishes opportunities for spontaneous discovery and reflection. Getting lost, traditionally seen as a way to explore both the world and also your own identity, now risks to become a special experience or even a luxury.

At the same time, technology presents paradoxes: it can trap us in “bubbles” of similar ideas online, limiting authentic exploration, yet it may also offer new ways to “get lost” in information or virtual spaces. The evolving meaning of getting lost prompts reflection on how society values curiosity, openness, and connection (both in physical environments and in increasingly digital lives).

Ultimately, there is hope that people will regain a deeper sense of place and self through more intentional encounters with the physical world, even as they navigate the complexities of the ‘smart’ world.



Reflection lotje

Many situations of the framework can be recognized in the Van Abbedebat dialogue, as indicated with yellow highlighted blocks left of the dialogue notes. I liked that they related the impact of technology on people to the concept of a ‘hive mind’, I didn’t think about this yet, and it is very similar to the ‘meaning through shared stories’ cell.

Initially, I didn’t realize that this question was quite tough for high school students. They could not prepare for the question and were introduced to it on the spot. Nevertheless, I was surprised by their perspectives, thoughts and answers. People in this age can communicate well their thoughts, but are at the same time still uninhibited. On the other side, these people, born between 2007 and 2010, have never lived in a world without devices and optimized systems. Their idea of losing your way is very different than someone who lived in 1970.

I agree that the meaning of ‘getting lost’ has changed over time and in the future it could become something that people intentionally seek rather than experience accidentally. Whereas getting lost used to be a traumatizing experience, it can become something ‘real’ people want to feel. However, the students used ‘getting lost’ in the meaning of ‘wandering’ or ‘roaming’, which is a different experience. When people are unfamiliar with the possibility of being lost, they can become anxious and panic because normally they are always ‘safe’ in this sense.

What I actually realized from the dialogues in the Van Abbedebat is that even when systems in the future move to a larger societal control, people would still want to ‘escape’ and take the freedom to ‘get lost from the system’. This can both be through the dimension of time (stepping back from efficiency and planning) and space (going somewhere without GPS, without optimized routes and just explore).



Figure 31: Jury Van Abbedebat: me, Marjolijn van Heemstra & Mare Roelfsema (Van der Wegen, 2025)

APPENDIX F:

PROJECT BRIEF

DESIGN
FOR our
future

TU Delft

Personal Project Brief – IDE Master Graduation Project

Name student

Lotje van den Burg

Student number

5100305

PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT

Complete all fields, keep information clear, specific and concise

Project title

The future of wayfinding systems

Please state the title of your graduation project (above). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

Introduction

Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)

Wayfinding is an essential part of how people navigate and experience the world around them. As society evolves, so do the needs and expectations of travelers, commuters, and visitors in public spaces. This graduation project, in collaboration with Studio Mijksenaar, explores the future of wayfinding systems over the next ten years, applying the Vision in Product Design (ViP) method by Hekkert & Van Dijk. By examining not only how people move from A to B but also how people want to experience their journey, this project reframes how wayfinding should align with societal needs.

The project operates within the domain of public space, including airports, hospitals, museums, and cities—places where intuitive navigation is crucial. The key stakeholders include Studio Mijksenaar and their innovation Mijksenaar Lab, who design innovative solutions for future wayfinding challenges, as well as society and public space owners, whose interests revolve around accessibility, efficiency, and user experience.

This project presents an opportunity to rethink wayfinding beyond traditional signage, integrating technology, philosophy, personalization, and emotional engagement. However, it also faces challenges such as urban complexity, inclusivity, and sustainability. Through design and strategic foresight, this project aims to explore how in the future wayfinding is an integral part of how people experience their environment.

→ space available for images / figures on next page

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DESIGN
FOR our
future

TU Delft

Personal Project Brief – IDE Master Graduation Project

Problem Definition

What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice. (max 200 words)

Wayfinding is more than navigation; it shapes how people experience their surroundings. As urban environments grow more complex and digital integration expands, traditional wayfinding systems may no longer meet future societal needs. This requires rethinking and reshaping the role and purpose of wayfinding, by following the steps of the Vision in Product Design (ViP) method. This approach offers Studio Mijksenaar insights into user-centered, adaptive wayfinding solutions, ensuring they remain at the forefront of innovation in public navigation.

Mijksenaar recognizes the importance of innovation as they have also started Mijksenaar Lab, a research environment to expand knowledge and innovate on topics like inclusiveness and accessibility. This is important, because the implementation of the EU Accessibility Act 2025, will also have an effect on usability of the public space. For Mijksenaar, this thesis project provides them insights from a broad research in their domain and is valuable to get familiar with the ViP method, as this method is never used yet in their company.

Assignment

This is the most important part of the project brief because it will give a clear direction of what you are heading for. Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence) As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the green text format:

Investigate the interaction of people and the public space in 2035, decide - based on a set of societal values - which wayfinding principles will be meaningful to people navigating public spaces for Studio Mijksenaar in the context of future mobility, accessibility, and digital integration, design interventions for future wayfinding and create a roadmap connecting the present with the envisioned future.

Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)

This project follows the Vision in Product Design (ViP) method, which starts by analyzing contextual factors—technological, social, and behavioral trends—to envision how wayfinding will evolve in the next 10 years. Through literature research, expert interviews, and observational studies, I will explore user needs and the changing role of wayfinding in public spaces. Using insights from this research, I will develop a future vision of wayfinding, defining key interaction qualities and system characteristics. Ideation and concept development will follow, using speculative design and scenario-based prototyping to translate insights into tangible solutions. The final phase includes validation through expert feedback and potential user testing to refine the design. The result will be a roadmap, prototype, or strategy that provides Mijksenaar with a forward-thinking approach to future wayfinding challenges.

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Project planning and key moments

To make visible how you plan to spend your time, you must make a planning for the full project. You are advised to use a Gantt chart format to show the different phases of your project, deliverables you have in mind, meetings and in-between deadlines. Keep in mind that all activities should fit within the given run time of 100 working days. Your planning should include a **kick-off meeting**, **mid-term evaluation meeting**, **green light meeting** and **graduation ceremony**. Please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any (for instance because of holidays or parallel course activities).

Make sure to attach the full plan to this project brief. The four key moment dates must be filled in below

Kick off meeting

25 februari 2025

Mid-term evaluation

24 april 2025

Green light meeting

3 juli 2025

Graduation ceremony

31 juli 2025

In exceptional cases (part of) the Graduation Project may need to be scheduled part-time. Indicate here if such applies to your project

Part of project scheduled part-time	<input checked="" type="checkbox"/>
For how many project weeks	18
Number of project days per week	4,5

Comments:
Due to activities outside Graduation Project, as Teaching Assistant, side job and language course in Q3+Q4 (4 EC)

Motivation and personal ambitions

Explain why you wish to start this project, what competencies you want to prove or develop (e.g. competencies acquired in your MSc programme, electives, extra-curricular activities or other).

Optionally, describe whether you have some personal learning ambitions which you explicitly want to address in this project, on top of the learning objectives of the Graduation Project itself. You might think of e.g. acquiring in depth knowledge on a specific subject, broadening your competencies or experimenting with a specific tool or methodology. Personal learning ambitions are limited to a maximum number of five. (200 words max)

I am excited to start this project, particularly because I am drawn to the field of UX in the public space, that I came into contact with during my UX Design internship at Fabrique. The public space is a field that deals with a lot of complexity as it is 'design for all', requiring intuitive, inclusive and accessible design. It combines multiple disciplines including architecture, user experience, psychology and policy-making. I like how wayfinding is a great solution to make complex matters easy.

The complex field and continuously changing society, make wayfinding a good fit with the Vision in Product Design (ViP) method. Mijksenaar has been a leading company in wayfinding with many years of expertise. Yet, I think applying ViP will be meaningful to explore innovative future scenarios and work on meaningful and tangible design solutions to connect their current practise. From a personal perspective I am also really happy to apply ViP because I think this method really reflects my way of working in the design process, and in many companies you rarely have all the time to follow a process like ViP.

This project in collaboration with Mijksenaar is also a great opportunity to learn from current and past projects at Mijksenaar. I am very eager to acquire in-depth knowledge of usability and accessibility in public spaces to create inclusive wayfinding.

