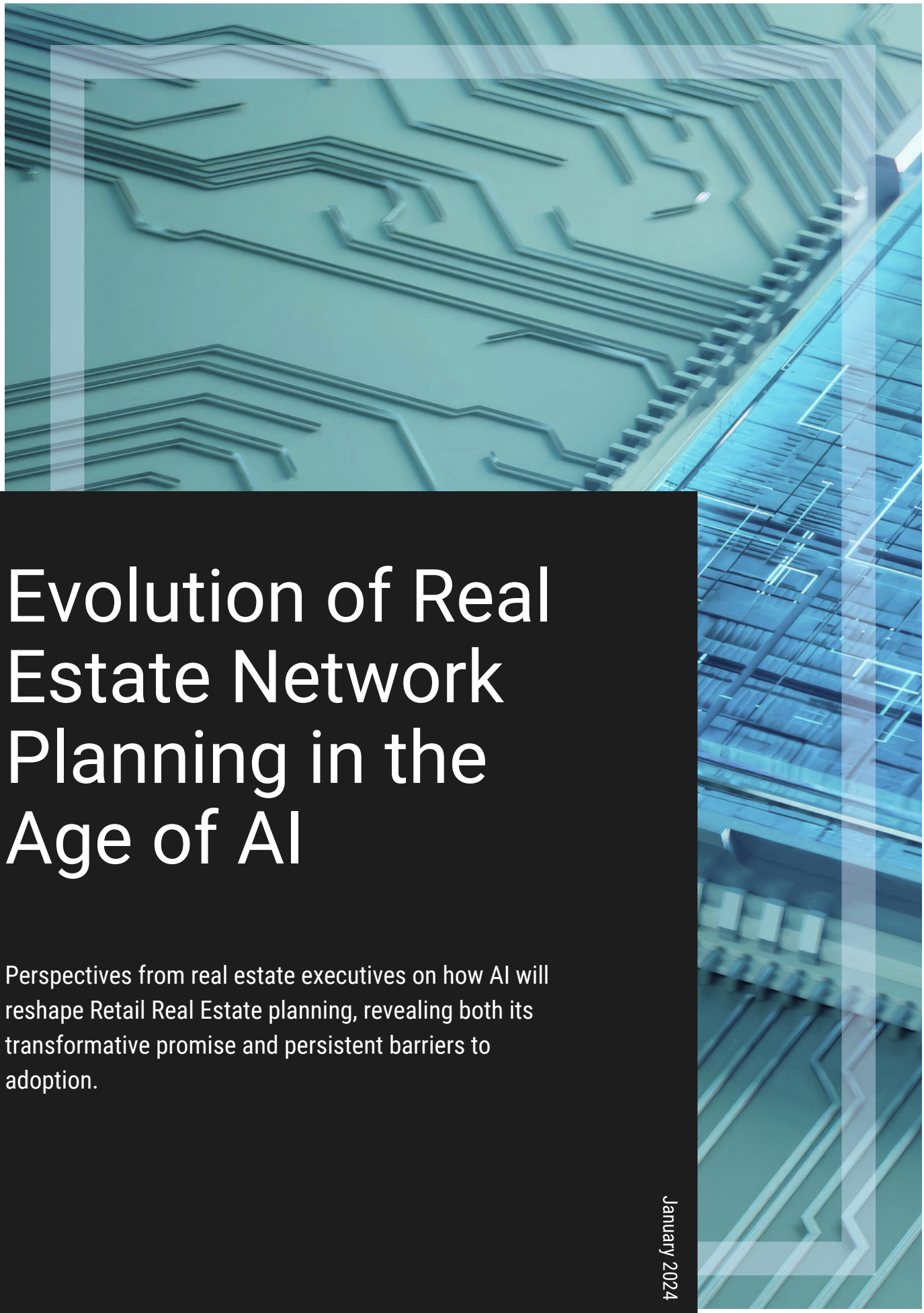
PiinPoint



Evolution of Real Estate Network Planning in the Age of AI

Perspectives from real estate executives on how AI will reshape Retail Real Estate planning, revealing both its transformative promise and persistent barriers to adoption.

January 2024

Table of Contents

01 Summary

So much has been written about Artificial Intelligence (AI) in recent months and years, that it's almost bold of us to add our two cents to this discussion. However, comparatively little has been written about the impact of AI - both Generative (GenAI) and Analytical AI/Machine Learning (AI/ML) - on Retail Real Estate planning and the use of Geographic Information Systems (GIS) and location intelligence tools. We set out to provide some perspective by interviewing a group of real estate executives across a range of sectors - Retail, Financial Services, Quick Service Restaurants (QSR), and Fast Casual Restaurants, as well as Commercial Real Estate (CRE) Brokers and Consultants - about the potential disruption that AI may or may not bring to the broad field of location analytics and GIS.

In today's post-COVID world, the retail landscape in terms of brick-and-mortar investments has changed forever. Some household name brand retailers have shut their doors completely and re-emerged in a different form[1]. The latest example is Bed, Bath & Beyond[2]. They declared bankruptcy and shuttered all brick-and-mortar stores early this year. However, opportunity knocks as Overstock.com (now Beyond.com), an online furniture retailer in the US has purchased all digital assets and will rebrand Bed, Bath & Beyond as an online-only play. On the flip side, TJX is shutting down its e-commerce business for its HomeGoods brand and doubling down on the brick-and-mortar shopping experience[3].

Clearly, this is just the evolution of business strategy. Those who have adapted are building a Real Estate strategy process that is flexible, sustainable, reliable, and sensitive to the ever-changing retail and consumer trends. But how do you stay nimble, future-looking, and data-driven at the same time? The nature of data–driven is that it is historical - backward-looking. While this is important, sometimes the data misleads or is missing (e.g. the pandemic was not predicted and it had a profound effect on retail as we knew it). So how do we account for future potential shifts in the market to complement a data-driven retail strategy function? The answer is through network simulations or scenario planning; the domain of GeoAI.

GeoAI is the integration of two well-known technologies - Geospatial Data Analysis (or GIS) and Analytical Artificial Intelligence. Using GeoAI, predictions can be built about new situations, such as the potential for a new store or a renovation and their impact on the overall profitability of the store network or at the macro level, the impact of immigration on market holding capacity and the impact of a competitor relocating closer to you[4]. Few - what McKinsey calls AI High Performers - have taken up the challenge and invested in GeoAI-type capabilities thereby having the ability to automate site reports, pre-approve sites, and execute complex future scenario predictions. Many others rely on using traditional GIS and Excel-based tools for the workflows that have been created and maintained

[1] Insights into the Impacts of the COVID Pandemic on Retail Brick and Mortar. (n.d.). https://www.piinpoint.com/blog/insights-into-the-impacts-of-the-covid-pandemic-on-retail-brick-and-mortar
[2] Beyond - Investor Relations. (n.d.). https://investors.beyond.com/overview/default.aspx
[3] Dawkins, J. O. (2023, October 19). HomeGoods is abruptly shutting down its online shopping site. Business Insider. https://www.businessinsider.com/homegoods-shuts-online-shopping-store-tjx-gift-cards-10-2023
[4] GeoAI: spatially explicit artificial intelligence techniques for geographic knowledge discovery and beyond. (30 Oct 2019) https://www.tandfonline.com/doi/full/10.1080/13658816.2019.1684500?scroll=top&needAccess=true

in-house, but admit that a move to more automation and GeoAI capabilities is on their radar.

As we find out in our discussions and our desk research, the value is there. Every one of our interviewees acknowledges that the benefits of predictive accuracy, automation, team productivity, and minimizing mistakes translate into value through shortening Real Estate approval and deal cycles, increasing speed to market, and de-risking site selection to provide higher top-line performance.

On the flip side, we heard that there are several key barriers to overcome in order to realize the value of AI investments with respect to location intelligence. The list begins with a lack of leadership structure and knowledge at the helm. Those organizations that are further along tend to have AI investments driven by C-suite tailored appointments (Chief Strategy or Data Officer). Other key barriers mentioned were the absence of a cohesive AI strategy, no comprehensive data strategy or execution roadmap, and a lack of collaboration across Data Science and GIS analytics talent and tools that seamlessly communicate and evolve together. Finally, and most importantly, most organizations cite a lack of trust and transparency in AI's models and outcomes (the "black box" syndrome). Overcoming the trust issue is critical to getting the buy-in from Real Estate Executives.

There is no shortage of ideas and use cases the Executives we talked to are thinking about. The trick is to overcome the barriers to reap the value of investing in AI and, in particular, GeoAI. The future is bright for those who have already made the commitment to build new tools and "think different" (thanks Steve Jobs) about Real Estate planning. The march toward the development of new tools and processes for Real Estate network planning has begun.

02 Introduction: The Promise and the Challenge

In a recent McKinsey article, their research suggests "**...about 75 percent of the value generative-AI could deliver falls across four areas: customer operations, marketing and sales, software engineering, and R&D**"[5] (Chui et al., 2023).

That is why we sought the opinions of a range of different executives directly or indirectly related to Real Estate planning function across consumer retail goods and services, restaurants, retail banks, and Commercial Real Estate Consultancies (big and small) to dig a bit deeper into the discussions and thinking around AI investments and applications behind the scenes in their organizations.

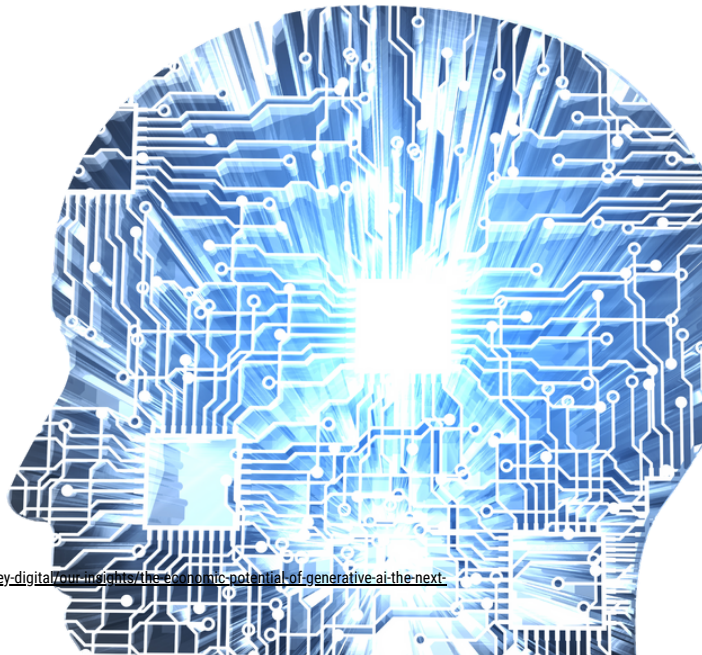
About our research

We conducted a series of in-depth executive interviews over the months of September and October 2023. In our interviews, we set a broad definition of AI including the latest Generative AI tools, such as Large Language Models like ChatGPT, as well as analytical forms of AI/Machine Learning and other Advanced Modeling methodologies for prediction, forecasting, and scenario analysis. Our goal was to listen to our Real Estate and GIS executives on how they are thinking about AI and its impact on their business and, in particular, its application to Real Estate Network Planning.

There are many quantitative surveys out there that we also tapped into, but primarily our objective with using qualitative interviews was so that we could dig deeper into the thinking of our executives in a less structured format. We did hear some consistencies across sectors, some not so surprising, but some were new to us, and we hope, to our readers.

For our analysis of the interview data, we found interviewees could be loosely defined by three segments (See Table 1 on Page 6) based on their sophistication and organizational structure around AI as it applies to Real Estate network strategy and planning.

Our Executives represented several different sectors (See Table 2 on Pages 7 and 8), each with their own sectoral-specific situations and challenges within which to place the AI discussion in context. It is of course not full coverage, but the specifics here will provide further context to the content of this article.



[5] The economic potential of generative AI: The next productivity frontier. (14 June 2023) https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier#key-insights

Table 1

Segment	Company Size & AI Mindset	AI Strategy	Data Science & GIS Depth	Real Estate Tools and Approach
AI High Performers	• Large enterprise focus • Full commitment to AI innovation and investment	• Advanced AI Strategy in both Generative and Analytical areas, including Real Estate	• Data Science and GIS Experts centralized in a common leadership (Center of Excellence) under Strategy, not Real Estate	• Utilization of advanced cloud-based data integration and proprietary Python libraries for in-house data products and model building, avoiding third-party SaaS software
AI Newcomers	• Focus on Enterprise and Mid-Market • Early consideration of AI applications	• Lack of comprehensive AI Strategy organization-wide, including Real Estate; sporadic experimentation for value identification	• Data Science and GIS Experts led separately, occasional collaboration based on use cases, with Real Estate housing GIS expertise	• Use of in-house forecasting models and data marts alongside third-party SaaS software for mapping, dashboards, and site reports
Traditionalists	• Focus on Small and Mid-Market businesses • Skepticism regarding its business value and ROI	• Absence of AI Strategy organization-wide, viewed as a luxury, not essential	• Scarce dedicated Data Science roles; GIS experts usually within Real Estate and in small teams	• Limited resources for in-house development, often relying on third-party SaaS software for mapping, dashboards, and site reports

Table 2

QSR
and Fast Casual Restaurants

Challenges:
Rebounded from COVID and now the strong have survived and the growth of new units, infill and optimization strategies are paramount. In the US and Canada, the biggest challenge is “speed-to-market”.

Long lead times for entitlements and permitting for development means new development discussions and franchisee discussions have to be done early.

Priorities:
Planning and internal Real Estate approval lead times need to shrink to keep the pipeline full for new units.

Focus

Reducing the time to develop models and forecasts to identify new markets and sites with accuracy.

CRE

Challenges:
Leading CRE firms embraced AI, incorporating Generative AI and Machine Learning, aligning with a 2022 Foursquare study emphasizing data-driven location intelligence for growth.

Meanwhile, smaller CRE firms, primarily transaction-focused, seek efficiency in contracts and client guidance for site selection.

Priorities:
For Larger CRE, the priority is to bring new consulting revenue and thereby generating "products or solutions" for clients leveraging their vast historical spatial and Real Estate databases. Their investments in AI Strategy, People, Process and Data have already started in a big way.

Focus

Larger CRE firms assist clients in optimizing post-COVID Real Estate for hybrid work preferences, while smaller firms prioritize automating approval processes to expedite site selection and improve speed to market.

Table 2

Retail Banking

Challenges:
Struggling with the traditional branch model due to the penetration and growth of digital banking and the massive changes to the work/life balance and work location preferences of customers.

Priorities:
Increase efficiency ratios and profitability through reducing physical footprint. We heard that there is a priority in many banks in Canada and the US to reduce their physical footprint by as much as 30% in the coming years.

Focus

The savings from that are being reinvested in improving customer and employee experience, so banks are rewiring the entire bank.

Retail Goods

Grocery, General Merchandise

Challenges:
Post-COVID, significant immigration has reshaped demographics in Canada and the US, impacting consumer preferences, store locations, and merchandising strategies.

E-commerce's rise has shifted consumer shopping habits and locations. Additionally, urban planners now demand mixed-use buildings, prompting retailers to innovate store layouts and concepts.

Priorities:
Understanding the demographic and consumer preference and shopping behaviour changes are key to knowing how to optimize the omnichannel network to meet these needs.

Focus

Nimbly adapt models and analytical capabilities that are more forward looking to account for development requirement changes by store location, store layout and box sizes..

Retail Services

Health & Wellness, Professional Services

Challenges:
Health and Wellness retail services, driven by baby boomers' demand for paramedical services, are evolving from the traditional co-location near doctor's offices.

Similarly, other professional services like accountants, lawyers, and dentists are prioritizing consumer-professional relationships over mere convenience.

Priorities:
Finding a good concentration of customers within a market who fit their ICP (Ideal Customer Profile) - demographic, financially resourced, medical modalities

Building a marketing strategy at the local level to drive demand.

Focus

New unique sources of data are critical to developing AI/ML models that provide a more forward looking path to growing market share.

04 The Value of AI Adoption in Real Estate

"The first instinct is to leverage new technologies such as AI for cost reduction, space reduction, etc. However, true value generation comes from how we use the power of these technologies to build engagement.

People visit the store, bank branches or offices for a variety of reasons, and use cases are constantly evolving. How do we make their time in physical premises valuable? How do we make them feel valued? How do we engage, create frictionless experience, and deliver that "wow factor?"

Artificial intelligence and machine learning are powered by quality data can unlock these core business outcomes."

(Ram Srinivasan, Managing Director, Future of Work, JLL)

In the business of CRE, the winds of transformation are stirring, and at the heart of this storm is AI. The industry is on the cusp of a paradigm shift, where decisions, once solely within the purview of human expertise, are increasingly being influenced by the capabilities of AI. This evolution, though subtle to most, is already making an impact according to industry executives, but the best is yet to come.

Our discussions with industry leaders started with a fundamental question: "In your view, what is the value of leveraging AI technologies in your organization?" The insights gleaned revolve around productivity and efficiency gains, cost reduction, speed through automation, reduced error, and risk reduction as the proverbial "low-hanging fruit". Yet, intriguingly, not all executives are fixated solely on this easily attainable fruit. More progressive organizations - AI High Performers - agree that the real value will emerge when use cases around value-generating innovations like better customer and employee engagement, job creation and market share growth become part of their strategy.

Increasing the efficiency of the Real Estate analysis and approvals process

Our industry executives were very consistent. There is a lot of benefit to an organization in streamlining and automating as much of the standard Real Estate analysis and approvals process as possible. Think about a large organization that is looking at multiple site acquisitions, relocations and consolidations in one year. The deal cycles including manual site vetting, real estate approvals and externally for all the permitting make them unbearably long.

There is real value in using AI to accelerate the deal cycle through the application of AI/ML modelling to develop “pre-approved” site-packages complete with forecasts and ROI analysis. This would speed up the internal real estate approval process and shorten the time to decision and market. This can be coupled with transforming the entire approval lifecycle through automation. GenAI's ability to automate contract creation, site approval plans, and document processing saves time and reduces errors that can address the evolving needs of the Real Estate approvals process.

What’s more, why not go all the way to construction contracting and project management; executives see a seismic transformation potentially on its way. In large organizations with massive brick-and-mortar networks, GIS and Real Estate Teams are managing multiple files at once - sometimes hundreds - and when something needs to be updated in a spreadsheet or a document, it has to be done hundreds of times. Although necessary, doing this manually now is a huge waste of professional time. Furthermore, manual processes are prone to mistakes. By automating routine tasks, AI liberates professionals to focus on high-level strategy while reducing manual mistakes concurrently.

AI can be a catalyst in a journey from repetitive tasks to standardized, automated efficiency, unlocking new levels of productivity and accelerating speed-to-market for Real Estate teams.

“Our timelines are getting to be a bigger challenge all the time. By the time we approve something in our real estate committee, until we can get it turned over to operations and open, our timelines are stretching every year and the biggest time lag is in entitlements in permitting. An example is in California. From the time our Real Estate Committee approves until the time we turn it over to operations is over a thousand days.”

(VP Real Estate, US Fast Casual Restaurant)

Improving the accuracy of predictions thereby reducing the risk of site selection mistakes

AI's role transcends mere prediction; it's about creating a shield against costly mistakes. By automating and refining models on the most up-to-date data, AI ensures that site selection decisions are not just based on a training data set from some defined period in history but are future-proofed against evolving market dynamics by updating with the most recent data and the market changes dynamically.

Our interviews revealed that there is a huge value and an expectation that a shift towards automated model updates is about staying current, future-proofing predictions and increasing ongoing accuracy. AI/ML capabilities ensure that models evolve in real-time, capturing the nuances of ever-changing market dynamics embodied in real-time data updates. In addition, the models can be tested and refreshed in the presence of new sources of data that include new attributes or characteristics of the market not previously known. The traditional annual or quarterly model update is replaced by a dynamic, adaptive system that consistently and continuously refines itself.

"The automation part has real value because now our models can be updated overnight as opposed to weeks or months like third party systems. This allows both speed to decision making and keeps the models accurate and up to date."

(Dave Chipman, Head of Retail Strategy, The Aspen Group)

Coupled with continuous updates, GIS experts are expecting huge value in using Generative AI to generate code and identify model bugs and fixes. Essentially, the role of AI as a modelling assistant will be about empowering analysts with tools that go beyond automation, aiding in complex model vetting decision-making processes. The emphasis on standardization will create a collaborative environment where analysts can trust in the uniformity of methodology and accuracy of the output. AI becomes a collaborator, a partner in the analytical journey, ensuring that the human touch and AI synergy produce insights that are not just accurate but robust, reliable and explainable.

The integration of AI/Machine Learning to automate prediction and forecasting models will both streamline operations and inject a level of dynamism in the fiercely competitive arena of CRE. It's a strategic play where accuracy and relevancy become the armor against financial pitfalls.

Capturing Evolving Customer Behaviour and Identifying Growth Markets

Predicting customer behaviour has been the domain of marketers and marketing research professionals since time began and it's hard. The data is captured using time-boxed surveys akin to looking through the rearview mirror. AI is expected to bring more real-time analysis, uncovering subtle shifts and identifying untapped or emerging markets.

Although some of our Retail and QSR executives say this is being done somewhat now (albeit not at the local trade area level), the analysis of customer feedback and purchase behaviour - enabled by loyalty programs, online ordering, and customer-centric business models (professional services) - in "real-time" from diverse datasets help to predict trends and uncover untapped potentials in the market. AI High Performers and AI Newcomers believe AI tools that automate the inputs to behavioral KPI tracking dashboards at the local trade area level have real value, allowing decision-makers to focus on the strategic network needs of an organization as they evolve.

Tracking KPI's is necessary for recognizing shifts in the business. However, harnessing the predictive capabilities of AI in anticipating market needs into the future provides an understanding of how demographic and behavioural shifts will influence demand. In the Health and Wellness sector, for instance, AI becomes a strategic ally in not just meeting current needs but in positioning services to align with the evolving health needs of a changing population.

As demographics change due to an aging boomer population and/or increased immigration in the coming 5 years[7] , predicting the dominant health needs will be of huge value to help leadership plan how they can prepare for attending to those needs. The modelling and prediction capabilities of AI applications can sift through vast amounts of third- and first-party data to help predict those trends and inform the strategic discussions on what services to deliver in which markets!

This applies to international businesses entering new markets as well. AI becomes the engine by which organizations navigate unfamiliar territory, identifying not just similar markets to ones they already operate in, but optimal markets for expansion. AI's potential here is to predict "look-a-like" territories to minimize risks associated with unknown population dynamics and ensure a market entry strategy that is not just safe but strategically sound.

Optimizing Operations for Customer and Employee Engagement

The Pandemic changed everything: how and where we work, shop, and socialize. All organizations are adapting to this new world, some more than others. Our Insiders made some critical observations about where AI can be of value in supporting this shift. Both Gen AI and AI/ML are seen as a potential silent orchestrator behind the scenes, optimizing staffing decisions, reconciling inventory tracking due to omnichannel growth, and redefining the very spaces we engage with. AI has the potential to guide executives on how to create environments that resonate with employees and customers alike. AI's role here is experiential.

Executives across all sectors agreed that the optimization of staffing a location goes beyond cost-effectiveness; it's about creating an optimal customer experience. AI analyzes historical sales and staffing data and integrates nuanced factors specific to each market - such as changes in retail density, types of transactions, and traffic counts. The goal is to ensure that staffing decisions align with financial considerations and the unique demands of each market, creating a tailored approach that optimizes costs, profit margins and customer experience through innovation to deliver smart services to employees and customers.

Further to customer experience, the transformation of retail malls into omnichannel hubs has been happening and is driven by the consumer's online growth. This demands strategic orchestration and AI's role here is to create a holistic view of inventory data and where it's spatially located. By connecting disparate data points across distribution points and providing a comprehensive picture of in-store and online demand, companies can ensure that inventory is strategically positioned to meet the demands of a modern omnichannel retail consumer.

CRE Executives are looking at another area of opportunity for AI in Real Estate planning - space optimization for both office and retail spaces. In banking for example, as they are rethinking their branch model some organizations have already experienced a large reduction in retail and corporate space. Further, the return to in-person work has been slower than first expected as the pandemic had a profound effect on employee work location preferences and as a result large corporate office buildings are under-utilized. The challenge for employers now is to create a space where employees and customers want to come to -something different that they cannot get at home or online.

[7] Seale, A. (2023, November 1). How the baby boomer exodus will imbalance the Canadian workplace. The Globe and Mail. https://www.theglobeandmail.com/business/article-how-the-baby-boomer-exodus-will-imbalance-the-canadian-workplace/

CRE consulting firms, leveraging their vast amount of historical Real Estate and building asset data, are seeing AI as an opportunity to help clients design and optimize a smaller Real Estate footprint, and increase employee and customer engagement.

Creating new jobs for long-term employment expansion

The narrative of AI disrupting jobs is met with a counter-narrative—AI as a creator of opportunities. AI becomes the harbinger of a workforce transformation, necessitating not just reskilling but envisioning entirely new roles that align with the demands of a rapidly evolving industry.

Everyone knows AI is going to disrupt the workforce, but perhaps not how we think. McKinsey finds in their *State of AI, 2023* publication that most companies are thinking of AI as a productivity enabler in support of the employee, rather than instead of the employee. Furthermore, most respondents in their research suggested that AI will require job re-tooling as well as new job creation for specialized areas such as prompt engineering. Even as we speak, there is a scarcity of talent needed to fill key new roles in employers' innovation teams such as robotics, data engineering, deep learning and ML experts to name a few.

“Looking ahead to the next three years, respondents predict that the adoption of AI will reshape many roles in the workforce. Generally, they expect more employees to be reskilled than to be separated.” (Chui et al., 2023)

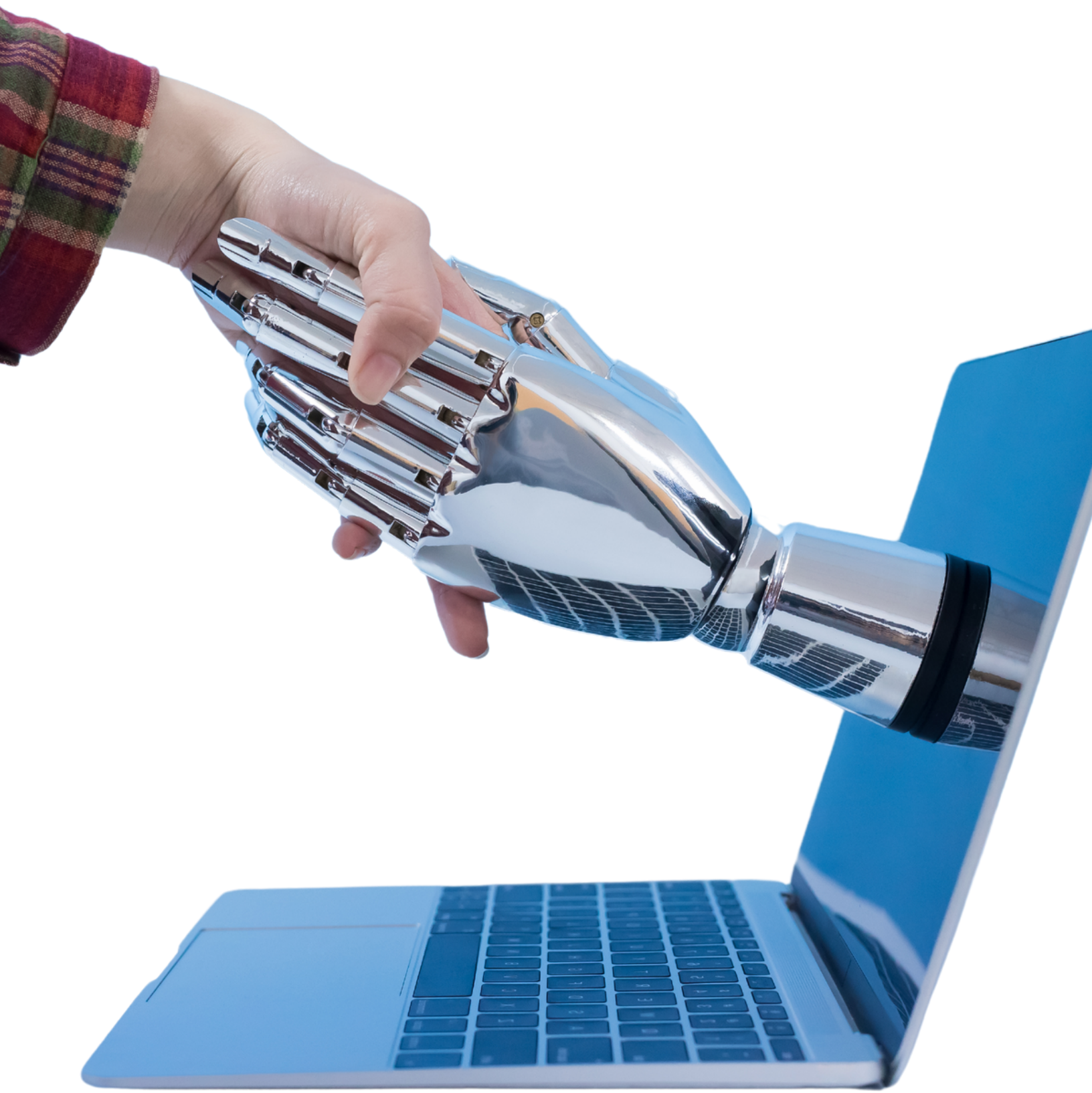
Our research finds a similar sentiment. In the Real Estate Planning areas, the automation and AI/ML capabilities will likely reduce the need for more hands to do very repetitive tasks, but most do not see headcount reductions immediately, simply a reduction in the need for future hiring of traditional tasks as they use and implement automation technologies to do things faster with more accuracy.

We also heard from a couple of our executive interviews, that they are predicting that more new jobs will be created due to AI adoption than destroyed. One cited research in the book "Exponential Organizations 2.0"[8] by Peter Diamandis and Salim Ismael (a followup to the first book Exponential Organizations, by Salim Ishmail) suggests automation and robotics are just getting started and if you look at Sweden, South Korea and Germany, they have the highest level of automation and robotics together with the lowest level of unemployment.

“An Exponential Organization is one whose impact (or output) is disproportionately large - at least 10X larger - compared to its peers because of the use of new organizational techniques that leverage accelerating Technologies.”

(Ismail, 2014)

AI is one of the 11 enabling technologies and capabilities of an Exponential Organization. As these organizations emerge and dominate our economies, AI will create jobs not destroy them - like a new industrial revolution. AI, viewed through the lens of Exponential Organizations, is a tool that propels economies forward and reshapes economies in ways that are more productive and prosperous.



[8] Ismail, S. (2014, October 14). Exponential Organizations. Diversion Books.

05 Barriers to AI Adoption in Real Estate

McKinsey's study, *State of AI 2023: Generative AI's Breakout Year*[3] revealed critical impediments to the adoption of AI capabilities among respondents. A significant majority cited key challenges in their AI implementation journey, emphasizing the absence of a structured AI Strategy, a shortage of talent, and difficulties in managing data. Interestingly, AI High Performers similarly acknowledged talent scarcity and the absence of a cohesive Data Science (Machine Learning Operations - MLOps) team as pivotal barriers and enablers in their AI endeavours.

We too heard these articulated during our interviews with Real Estate and GIS executives, but with the important addition of Trust.

1. AI Strategy is fundamental
2. Data, Data, Data: Go Figure!
3. GIS and Data Science Don't Speak the Same Language
4. Trust and transparency: Explain Thyself!

AI Strategy is Fundamental

Tom Davenport, a renowned figure in IT and Management at Babson College, shared insights from a survey involving 334 Global Chief Data Officers in a recent Forbes article. Astonishingly, nearly half of these professionals stated that despite their designated roles, they weren't accountable for the AI Strategy—an unexpected revelation within their usual job scope[9] (Davenport, 2023).

During our interviews, only the Real Estate Executives in the AI Hgh Performers segment had a cohesive AI strategy, and the rest did not. Those who did were primarily larger entities, particularly in Enterprise Retail, Services and CRE. They are making great strides in establishing dedicated innovation divisions or what one called "Centers of Excellence in AI". The development of these initiatives, having started several years ago, are just now starting to show tangible outcomes. Early investments in AI strategy for these organizations included a focus on data harvesting, data integration and MLOps investments using cloud technologies. Today these organizations are now experimenting with proprietary Large Language Models (LLMs) for harnessing the vast amounts of internal data and working through use cases to drive value, yet most remain largely experimental.

AI High Performer organizations realize the strategic value of "location" and "spatial analysis" to growing market share and have begun to build and implement an AI Center of Excellence that reports to the Chief Strategy Officer or the Chief Data Officer, not to Real Estate leadership.

[9] Davenport, T. (2023, October 17). *A New Survey Of Generative AI Shows Lots Of Work To Do*. Forbes. https://www-forbes-com.cdn.ampproject.org/c/s/www.forbes.com/sites/tomdavenport/2023/10/17/a-new-survey-of-generative-ai-shows-lots-of-work-to-do/amp/

In contrast, AI Newcomers are sophisticated in their use of data and AI/ML across the company, but the structure is more traditionally siloed. As heard from a few of our executives in AI High Performer and Newcomer companies, this is slowly starting to change from the old world where Real Estate Departments and their GIS counterparts often remain relegated in priority and still sit in a data and analytical silo. The catalyst from Newcomer to High Performer will be the realization that as competitors begin to secure prime locations faster, Real Estate teams will be clamoring for accelerated turnaround times and market plans that span years not months, potentially spurring a shift towards AI-powered, real-time analytics. This is a strategic investment, not a tactical one.

In contrast, the smaller and mid-market organizations we call Traditionalists, are unconvinced of the merits of an AI Strategy, particularly in the context of Real Estate decision-making and the investment required to make it a reality. They are often lacking dedicated GIS or Data Science personnel, these entities relied heavily on business analysts, third party SaaS Location Intelligence software and CRE Brokers for Real Estate-related tasks. For them, site selection seemed straightforward—focusing on major population centers and retail anchors (ie. consumer traffic). As they grow, this will become a disadvantage as speed to market will be fueled by those who see the value in AI investments.

Data, Data, Data: Go Figure!

It comes as no surprise that the absence of a focused data strategy centered on location intelligence is a significant hurdle to the practical application of AI to Real Estate planning. Drawing insights from industry stalwarts such as McKinsey, and Davenport's analyses, it's evident that harnessing and refining data form the cornerstone for any meaningful advancements in AI and is obviously part of an overall AI Strategy.

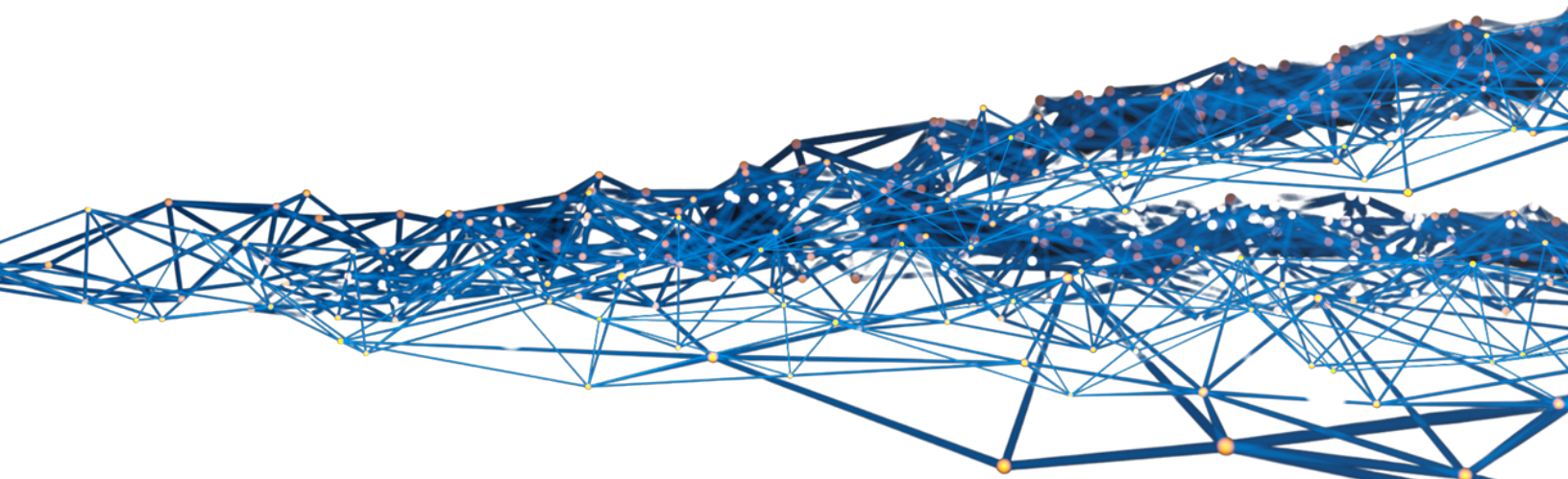
In our research, we heard this loud and clear. Real Estate executives and GIS Experts that we interviewed cited three main areas where not having a data strategy was a constraint: 1) data silos with the organization, 2) missing data, 3) acquiring unique sources of new data for modelling.

For those with a stated AI strategy in place - Centers of Excellence established - developing and integrating internal data “silos” from across the organization was the first major initiative. Most of these executives have employed cloud solutions to bring together disconnected data stores from across the organization - spatial Real Estate data, sales data, customer data, competitive intelligence, and the vast amount of other organizational data. Those who have not done this continue to struggle with siloed data marts reducing their ability to leverage AI technologies fully and creating the value written about earlier. Furthermore, siloed data marts impede access by other Data Science (DS) teams, leading to operational bottlenecks, inefficient Real Estate processes, and perpetuating the traditional role of the GIS team as a spatial data servant to the rest of the organization. Here the lack of collaboration with other Data Science teams means cross-fertilization of methodologies cannot be realized.

Another critical obstacle that emerges in Real Estate is what some have called “Missing Data”. As one of our interviewees put it, approximately 30% of market intelligence remains unreported, residing within the realm of brokers, landlords, and developers. Decisions regarding availability, although pivotal, are often hidden from the public domain, resulting in AI/ML models biased toward visible data. Furthermore, official statistics from government bodies are typically delayed and do not incorporate recent or upcoming developments (eg. immigration policy that alters the fabric of neighbourhoods, housing policy changes, etc.) and are therefore unaccounted for in official data sets that significantly impact local demographics. This gap underscores the necessity for local market knowledge complementing AI's speed, with boots-on-the-ground expertise remaining irreplaceable.

Finally, most of our executives believed that having “unique to them” sources of data for use in modelling and prediction was the holy grail! For example, in certain retail sectors, health and wellness and tax and financial planning (retail professional services), the importance of understanding the depth and of the client-professional relationship is critical to creating demand. Harnessing detailed consumer (customers and prospects) information - beyond basic demographics - is a rich source of data and if gathered strategically through proprietary market research, can provide new custom attributes to feed into market share prediction models. This will enhance site selection, forecasting and real estate scenario planning and enabling the development and deployment of targeted local marketing strategies. What’s more, it's not just about consumers. The more data you can “scrape” about competitors’ such as competitor sales share or leveraging third-party delivery data, the richer your data model becomes in terms of positioning against competitors and finding the best locations to grow.

Those that have not started the data discovery and integration journey, are typically using traditional GIS analyses with basic demographics and household spending to inform Real Estate teams. Those that have started and have “the data” as one of their core pillars of the AI strategy, will win the day!



GIS and Data Science Don’t Speak the Same Language

The lack of collaborative synergy among Analytical Teams - particularly between GIS and DS teams - separates organizations that have an AI strategy and have invested in “Centers of Excellence” around data and MLOps from the rest. Other than AI High Performers, this emerges as a pronounced gap in most organizations we spoke with pertaining to their AI and Advanced Analytics capabilities and is recognized as a significant hurdle to progress.

Analytical teams, even within some enterprise setups with a stated AI Strategy, often function in isolation when a Center of Excellence is absent. DS teams concentrate on optimizing temporal (time series or cross-sectional) data like loyalty or online orders for customer insights, marketing strategy, supply chain and inventory optimization while GIS teams predominantly supply site reports and trade area analyses leveraging spatial data to Real Estate teams. The collaboration between the two remains limited by most, primarily triggered by specific data needs rather than holistic problem-solving partnerships.

This may in part be due to the fact that GIS Teams are specialized and typically don't speak the same language as MLOps analysts. They have been working with geospatial data for years sustained by specialized tools (e.g. ESRI/ArcGIS and a host of others), and have not evoked a sense of urgency for AI integration. The business case has not been made! Nonetheless, indications are there that things are starting to change.

One crucial factor contributing to this dysfunction is the fierce competition for talent possessing the intersecting skills necessary for utilizing spatial and time-series data within AI/ML, DS, and GIS domains. A source of that dysfunction stems from universities and colleges that traditionally compartmentalize education in these fields, hindering the cross-pollination of technical proficiencies. This educational gap leads to challenges in recruiting fresh talent equipped with the amalgamated skill sets demanded by the industry. The organizational silos further exacerbate this by separating the functions of GIS and DS, prolonging the learning curve and necessitating deliberate investments in on-the-job training and interdisciplinary knowledge transfer. Furthermore, educational institutions predominantly focus on GIS training in sectors like urban planning, environmental studies, and government sectors, neglecting its applications in retail goods and services or Quick Service Restaurants (QSRs) where the necessary business acumen would be acquired. Consequently, graduates often lack the business knowledge required for these sectors, necessitating extended on-the-job learning periods and further complicating the bridge-building required to succeed.

"...the problem is the lack of education of GIS professionals on the retail business. We recruit some of these students for our GIS team and they understand the traditional sectors where GIS is <traditionally> used - utilities, government, environment, but they didn't know how to apply to retail real estate. So the collaboration of traditional DS and GIS teams is missing to cross fertilize talent and reduce the risk of talent attrition, and slowing innovation."

(Gregg Katz, Head of Product, Innovation & Marketing, RetailStat)

This divide is also rooted in the methodologies employed— traditional GIS leans on structural regression models, while the new wave of DS practitioners rely on Machine Learning tools for leveraging temporal or cross-sectional datasets. Some have admitted that even the language used within the two teams is unique, adding to the communication divide. In the QSR sector, we found the internal investment in dedicated DS teams remains minimal. It is typical in this sector for GIS practitioners to report to and engage with Real Estate Managers directly for site selection and network optimization, and as such, the absence of dedicated DS teams limits the internal capacity for GeoAI innovation.

Trust and Transparency: Explain Thyself!

Much has been written about "trust" in the AI field these days, particularly as it pertains to Generative AI. The changes are coming at light speed. The concern came up in our research interviews from two sources; Real Estate Leadership and GIS Practitioners.

From Real Estate leadership, the "trust" issue stems not from the technical point of view but more from a traditional bias to exercise their own judgment, relationships with brokers, and the always present "I have always done things this way" attitude. The switch to data/model driven predictions about which markets are good or even what the potential mature sales could be at a net new location is a hard one, especially when the data-driven predictions are counter to their own experience.

Only time will tell of course, but there is movement here when the analytical teams are able to explain "the why" in their models. This barrier has been significantly beaten down among AI High Performers with an AI strategy and a Center of Excellence already in place.

The absence of trust and transparency in AI/ML-based models emerges as a significant concern on the technical side among GIS practitioners as well. Professionals in this domain often view AI/ML models as opaque "black boxes," lacking clarity on their construction and key driving factors. These models, sometimes developed externally by contractors or vendors, are generated from complex algorithms with thousands of variables where the only maximizing metric is prediction accuracy. Accuracy is good of course, but sometimes Executives want to know what is driving the prediction. Without a clear understanding of the underlying variables or critical predictive characteristics, real estate executives and traditional GIS practitioners lose faith. This contrasts with the traditional training of GIS professionals accustomed to building structured regression (Gravity) models with tunable and explicable parameters. The lack of insight into what propels these AI/ML models creates skepticism, questioning their reliability and usability.

The pathway to mitigating this issue lies in fostering consistent collaboration between GIS and Data Science (DS) teams (Center of Excellence), aligning their objectives toward building AI/ML models for Real Estate. A concerted joint effort would enable the articulation and comprehension of these models, addressing the "black box" syndrome by instilling transparency, parsimony and a clear understanding of the model's mechanics by establishing standardized protocols and frameworks for AI/ML model development that can enhance transparency and trust.

06 Where to from here?

To realize the value promised by AI, the barriers have to shrink and eventually come down altogether. Real Estate Executives and GIS Professionals all agree that having more AI/ML technologies to leverage is coming, but slowly. For GIS professionals, it is about having the right data and the right tools to enhance their ability to build prediction capabilities, data cleansing and code development capabilities, and to improve the accuracy, transparency and explainability of analytical outcomes. For Real Estate teams, it is about self-service and speed to market to beat the competition to the punch. They too see AI/ML technologies as a foil for them to get better and faster at their jobs.

From our humble perspective and the input outlined herein, the two most important areas for innovation and development are to 1) address the talent and methodological divide between GIS Analysis and Data Science, and 2) address the trust and transparency issue. One cannot be had without the other.

Building Next-Generation Location Intelligence Tools

GeoAI as a concept has been around for a while, but is really just emerging as a deliberate area of development. Technically, it is the integration of two well-known capabilities - Geospatial Data Analysis (or GIS) and Artificial Intelligence technologies. An editorial published in 2019 in the International Journal of Geographical Information Sciences (Janowicz et al., 2019) explains that GeoAI is emerging because of advances in computing power, vast data availability, and new analytical methodologies are all key ingredients, the change in the "culture of sharing" is even more important.

"...there may be something even more important than the pure availability of data and advanced methods combined, namely a change in culture.

(I) As with open-source before, open-content makes data available to the masses.<>…industry perceives the risk of somebody stealing their data as less impactful than their data remaining disconnected from the new data economy.
(II) Reusing data is the new normal. This may seem like a trivial point from today's perspective, but data reuse at scale is a new concept for many scientific domains.
(III) A new paradigm joins the empirical, theoretical, and computational paradigms that have characterized research before. This paradigm <...> of data-intensive exploration highlights the increasing role of data synthesis alongside analysis.

While none of these three identified aspects alone is necessarily new, the arising data culture certainly is."

(Janowicz et al., 2019)

Further to the methodological advances, an interview with *Dr. Wendy Keyes Weniger, Principal Data Scientist: Spatial Science and Big Data Analytics Team at ESRI*[10], highlights the point that GeoAI is the product of these paradigm shifts mentioned above. In its pure form, GeoAI gives us the capability to predict and simulate real estate scenarios based on historical and AI generated data - transcending the historical data anchor and integrating with "generative" data will enable "what-if" type simulations and business case analysis.

In this interview, Dr. Keyes Weniger defines GeoAI as:
"GeoAI is geospatial artificial intelligence, and it's a kind of artificial intelligence or machine learning that's used to simulate future outcomes. It runs on GIS technology [a geographic information system], and it often draws on statistical modelling, computer vision, and simulation tools."

The challenge is that most retail Real Estate organizations are still using traditional GIS applications (ESRI, or other commercial mapping applications) as well as MS Excel tools to run demographic reports to do site selection. AI High Performers have taken it to the next level which is to have the ability to quickly perform future scenario prediction, but this is infrequently mentioned by others in our interviews.

The majority of enterprise executives acknowledge the prevalence of scenario analysis, which involves simulating future outcomes. However, this process often involves utilizing a multitude of tools, all of which feed into an extensive Excel spreadsheet.

The absence of automation in this practice leads to increased risks of errors and unknown accuracy levels, posing significant barriers to its broader adoption and effectiveness.

As such, scenario planning and AI SImulation in Real Estate Planning have wide appeal - but most think it is too hard and again, trust will be hard to gain, data is missing, and brokers need to be in the loop or on the ground as the sniff test. But if AI/ML models can get you 80% of the way there within minutes, this has real value. AI will never replace brokers, they have too much local knowledge about Real Estate markets that is not "in the data". They will always be necessary, but can be supported by an Intelligent system (a co-pilot) to get them most of the way there, enhancing their value, not hurting it.

Sounds great right? But here is where Dr. Keyes Weniger highlights another challenge that we heard over and over in our interviews:

"....the lack of intersection <DS and GIS> tends to be the problem. GIS professionals now have access to analytical tools well beyond the classic capabilities they trained on. And most data scientists haven't been trained to understand spatial analysis. To make things more challenging, each group uses a different language, and even when their vocabulary overlaps, the words often mean different things."

This is where the talent barrier mentioned earlier really comes into play. As GeoAI gains traction, GIS and Data Science teams will be forced to work together more directly and invest in technologies, cross-education within a business context to build and enable network scenario planning to inform strategy. Building the Center of Excellence for GeoAI will become part of the AI strategic imperative to support growth oriented omni-channel retailers to optimize their brick and mortar networks.

[10] Think Tank: GeoAI Reveals a Glimpse of the Future. (2023, July 14). Esri. https://www.esri.com/about/newsroom/publications/wherenext/think-tank-on-geoai-simulation/

Building Trust Among Real Estate Executives

The concern that AI models are often seen as "black boxes" was mentioned several times in our interviews. It also has been a subject of debate and research in the field of artificial intelligence and machine learning. There are formal initiatives and general discussions ongoing in the AI community on how organizations can address the “trust” and “transparency” issues.

Explainable AI (XAI) Movement:
The field of Explainable AI (XAI) focuses on developing models and methods that provide insights into why a particular decision was made. XAI aims to make AI models more transparent and interpretable, reducing the "black box" problem. Techniques like LIME (Local Interpretable Model-agnostic Explanations) and SHAP (SHapley Additive exPlanations) are examples of approaches that can help explain AI model predictions[11].

The AI community recognizes the importance of model transparency and interpretability. Researchers are actively working on techniques and tools to make AI models more understandable. This includes methods for visualizing what the model has learned, like feature importance, attention mechanisms, and saliency maps.

Education and “Have a Human” in the Loop:
AI models' complexity often stems from their ability to handle vast and intricate datasets - a benefit - but can be challenging to interpret in isolation - the downside. However, working in collaboration with human experts like GIS professionals, can help validate and contextualize AI model outputs, reducing the opacity of the "black box." As a result, part of the solution to the "black box" issue is educating GIS professionals and users about the capabilities and limitations of AI models. Understanding the types of data and tasks where AI is most effective, as well as the potential biases and limitations, is essential.

We heard several times in our AI High Performer interviews that building simpler models is a mandate, not an option, making them more interpretable even at the expense of model performance. Striking a balance between interpretability and performance depends on the specific application and the level of transparency required.

These points further validate the need to bring GIS and DS teams together under the umbrella of an AI Strategy, data strategy and talent strategy more generally.

[11] What is explainable AI? | IBM. (n.d.). https://www.ibm.com/topics/explainable-ai

07 Epilogue

The integration of AI concepts into retail real estate organizations is in its nascent stages, unlike other operational domains such as finance, customer operations, marketing, and sales, where the emphasis and momentum for AI adoption resonate more prominently. Our research shows that real estate executives see the value in investing in some form of AI innovation to apply to their particular use case. The trick is organizing around a strategy, data and methodology integration, talent integration and most importantly, developing the process and procedures that build trust in the outcomes to achieve leadership buy-in.

Those we have called AI High Performers have already built a strategy and a center of excellence to build new tools and address use cases important to the organization including real estate. They have addressed the barriers and begun to experiment with new tools, data and automation technologies that enable value capture and market growth. This is an expensive investment, which is why we find the AI High Performers to be larger enterprise organizations where the investment and scale can be marshalled. Those that have not started will be behind their peers.

Newcomers to AI who don't transition from isolated GIS and Data Science operational models to a unified collaborative approach focusing on GeoAI applications will risk falling behind. Without this shift, their ability to adapt quickly in the market will plateau, hindering their progress and competitiveness. Without a strategy and data integration and the motivation to build a center of excellence, it will be business as usual.

Traditionalists are what might be called “laggards”. They are typically smaller and less able to make large investments in technology that might be a luxury at this point until such time as their growth trajectory makes this a necessary investment.

Both AI Newcomers and Traditionalists are using different forms of third party SaaS GIS solutions for market analysis. We heard from our interviews there are many third-party SaaS solutions in the market that have GeoAI capabilities, some of which can be customized to fill the gap and provide real estate leadership with predictive solutions to support site selection, forecasting, scenario planning and network strategy simulations.

After all this, we are left with a few lingering questions about the future impact on constituencies involved and dependent on the location intelligence industry.

1. **Will AI Technologies reduce the need for brokers?**

So far, not likely according to current thinking and practices. In fact, large brokerages are doubling down on AI investments and building tools and products not related to site selection or transactions, but to expand their business relationship with their most trusted clients. On the flip side, it was loud and clear that brokers are required for transactions and the boots-on-the-ground intelligence by most organizations today. However, as data gaps are filled with Generative prediction machines and data scraping capabilities, brokers who do not embrace AI capabilities to help clients automate the approvals process and shorten deal cycles, their role will transform or even shrink!

2. **Will AI Technologies reduce the need for dedicated GIS departments within retail organizations?**

We think that over time, GeoAI will develop and emerge as the new “must-have” discipline within a growth-oriented retail organization, with trained GeoAI scientists at the helm. Educational institutions will need to integrate the curriculums for Data Science and GIS to build the experts of the future.

3. **Will internal Real Estate Teams be disrupted by GeoAI capabilities**?

It's likely the answer is yes, but not the way you think. GeoAI will increase their productivity by providing data and intelligence that can reduce the need for on-site visits to prospective properties, reduce the cycle time of documentation and financial projections around the real estate approvals process, and allow real estate departments to do more with less. The key to getting to this state is to ensure the proper attention is paid to the transparency and trust barrier mentioned herein.

4. **Will the third-party SaaS GIS solution market be disrupted by internal GeoAI investments?**

Anything is possible here. But from our vantage point, there already has been a consolidation of vendors and the future is bright as GeoAI becomes the main focus of these solutions to present new tools for network strategy simulations. Even these solutions will be required to jump the barriers and deliver the value we heard herein, most importantly real-time updating, data strategy, seamless data integration capability, model transparency, model trust, accuracy, and a capability to work with internal teams “as one”! Those that do not comply, will get displaced as internal centers of excellence emerge.

Join us in revolutionizing the way we approach real estate network planning. Let's not just witness the change but drive it. Together, let's chart a future as AI reshapes how we build, manage, and grow your real estate assets.

Contact us today to discover how our AI-powered solutions can evaluate and simulate your real estate strategies and propel your business toward this transformative future.

Acknowledgments

This e-book is a collaborative effort by:

Tom Peters, Strategic Advisor to PiinPoint,

Jim Robeson CEO and **Adam Saunders** CTO and Co-founders of PiinPoint,

Onie Tam, Marketing Coordinator at PiinPoint

We extend our heartfelt gratitude to the insightful and dedicated real estate executives representing diverse sectors —Retail, Financial Services, Quick Service Restaurants (QSR), Fast Casual Restaurants, Commercial Real Estate (CRE) Brokers, and Consultants—for their invaluable contributions and candid insights.

Their expertise and willingness to share perspectives have been instrumental in shaping this research. Their commitment to exploring the potential of AI in Retail Real Estate planning has immensely enriched our understanding and the broader industry's outlook. Many thanks for their time, expertise, and invaluable contributions to this endeavor.

PiinPoint
151 Charles St W. Unit 100,
Kitchener, ON,
N2G 1H6, Canada
1-866-594-6909
www.PiinPoint.com
info@piinpoint.com

References

Beyond - Investor Relations. (n.d.). https://investors.beyond.com/overview/default.aspx

Business Decisions at the Edge | AI, Artificial Intelligence, Location Intelligence. (2021, December 17). Esri. https://www.esri.com/about/newsroom/publications/wherenext/artificial-intelligence-improves-business-decisions/

Catalano, D. (n.d.). Artificial Intelligence in Real Estate: The Future of CRE? https://www.ioptimizerealty.com/blog/artificial-intelligence-in-real-estate-the-future-of-cre

Chan, C., Moore, J., Chan, C., & Moore, J. (2023, September 3). Generative AI: The Next Consumer Platform. Andreessen

Horowitz. https://a16z.com/2023/02/07/everyday-ai-consumer/

Chui, M., Hazan, E., Roberts, R., Singla, A., Smaje, K., Sukharevsky, A., Yee, L., & Zemmel, R. (2023, June 14). The economic potential of generative AI: The next productivity frontier. McKinsey & Company. https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier#introduction

Databricks Lakehouse. (2023). 2023 State of Data + AI. Databricks. Retrieved 2023, from https://www.databricks.com/sites/default/files/2023-06/databricks-2023-state-of-data-report-06072023-v2_0.pdf

Davenport, T. (2023, July 13). How to Train Generative AI Using Your Company's Data. Harvard Business Review. https://hbr.org/2023/07/how-to-train-generative-ai-using-your-companys-data

Davenport, T. (2023, October 17). A New Survey Of Generative AI Shows Lots Of Work To Do. Forbes. https://www-forbes-com.cdn.ampproject.org/c/s/www.forbes.com/sites/tomdavenport/2023/10/17/a-new-survey-of-generative-ai-shows-lots-of-work-to-do/amp/

Dawkins, J. O. (2023, October 19). HomeGoods is abruptly shutting down its online shopping site. Business Insider. https://www.businessinsider.com/homegoods-shuts-online-shopping-store-tjx-gift-cards-10-2023
de Morsier. (2023). Top 3 geoAI & machine learning trends in 2023. Picterra. Retrieved 2023, from https://discover.picterra.ch/hubfs/Top%203%20geoAI%20&%20machine%20learning%20trends%20in%202023.pdf

Esri Technical paper. (2021, November). The Value of a Geospatial Strategy. Esri. Retrieved 2023, from https://www.esri.com/content/dam/esrisites/en-us/media/technical-papers/the-value-of-a-geospatial-strategy-guide.pdf

Explainable AI | Google Cloud. (n.d.). Google Cloud. https://cloud.google.com/explainable-ai#:~:text=Explainable%20AI%20is%20a%20set,others%20understand%20your%20models%27%20behavior

Fitzpatrick, M., Gujral, V., Kapoor, A., & Wolkomir, A. (2023, November 14). Generative AI can change real estate, but the industry must change to reap the benefits. McKinsey & Company. https://www.mckinsey.com/industries/real-estate/our-insights/generative-ai-can-change-real-estate-but-the-industry-must-change-to-reap-the-benefits

Fitzpatrick, M., Gujral, V., Kapoor, A., & Wolkomir, A. (2023, November 14). Generative AI can change Real Estate, but the industry must change to reap the benefits. McKinsey & Company. https://www.mckinsey.com/industries/real-estate/our-insights/generative-ai-can-change-real-estate-but-the-industry-must-change-to-reap-the-benefits
GIS, Artificial Intelligence, and Automation in the Workplace. (2021, January 12). Esri Community. https://community.esri.com/t5/national-geospatial-mapping-charting-authorities/gis-artificial-intelligence-and-automation-in-the/ba-p/1016030

Halo Forecasting for Retailers Combines AI and Geospatial Cloud | GIS. (2021, November 19). Esri. https://www.esri.com/about/newsroom/publications/wherenext/halo-forecasting-with-ai/

Harris, D., Bornstein, M., Appenzeller, G., Harris, D., Bornstein, M., & Appenzeller, G. (2023, September 4). AI Canon. Andreessen Horowitz. https://a16z.com/2023/05/25/ai-canon/

Heneghan, L., & Henninger, P. (2023, April 17). Generative AI models – the risks and potential rewards in business. KPMG. https://kpmg.com/xx/en/home/insights/2023/04/generative-ai-models-the-risks-and-potential-rewards-in-business.html

References

Insights into the Impacts of the COVID Pandemic on Retail Brick and Mortar. (n.d.). https://www.piinpoint.com/blog/insights-into-the-impacts-of-the-covid-pandemic-on-retail-brick-and-mortar

Ismail, S. (2014, October 14). Exponential Organizations. Diversion Books.

Janowicz, Gao, McKenzie, Hu, & Bhaduri. (2019, October 30). GeoAI: spatially explicit artificial intelligence techniques for geographic knowledge discovery and beyond. Taylor & Francis Online. Retrieved October 1, 2023, from https://doi.org/10.1080/13658816.2019.1684500

Kingstone. (2022, April). Transforming Commercial Real Estate With Location Intelligence. Foursquare, S&P Global Market Intelligence. Retrieved October 1, 2023, from https://location.foursquare.com/wp-content/uploads/sites/2/2022/05/11342_Foursquare_Advisory_451R_BW_CommercialRealEstate_2022.pdf

Leswing, K. (2023, April 13). Bloomberg plans to integrate GPT-style A.I. into its terminal. CNBC. https://www.cnbc.com/2023/04/13/bloomberg-plans-to-integrate-gpt-style-ai-into-its-terminal.html

Lo Leung, H. (2023, June 14). What is GeoAI? Bootcamp GIS. https://bootcampgis.com/what-is-geoai/
MIT Technology Review Insights. (2023). The great acceleration: CIO perspectives on generative AI. Databricks. Retrieved 2023, from https://www.databricks.com/resources/ebook/mit-cio-generative-ai-report?scid=7018Y000001Fi1CQAS&utm_medium=paid+search&utm_source=google&utm_campaign=17102589780&utm_adgroup=153315909961&utm_content=ebook&utm_offer=mit-cio-generative-ai-report&utm_ad=678308677436&utm_term=artificial%20intelligence&gad_source=1&gclid=Cj0KCQiA6vaqBhCbARIsACF9M6nhAf-jrtAJK4aWVQrXnvr7vzCeRFchITRQIlaeij0SX8iIHbY3OdoaAuqkEALw_wcB

O. (2023, March 15). GPT-4 Technical Report. arXiv.org. https://arxiv.org/abs/2303.08774
Ready for Launch: How Gen AI Is Already Transforming Marketing. (2023, October 23). Bain. https://www.bain.com/insights/ready-for-launch-how-gen-ai-is-already-transforming-marketing/

Seale, A. (2023, November 1). How the baby boomer exodus will imbalance the Canadian workplace. The Globe and Mail. https://www.theglobeandmail.com/business/article-how-the-baby-boomer-exodus-will-imbalance-the-canadian-workplace/

Strange, A., Acharya, A., Singh, S., Rampell, A., Andrusko, M., Schmidt, J., Haber, D., Amble, S., Strange, A., Acharya, A., Singh, S., Rampell, A., Andrusko, M.,

Schmidt, J., Haber, D., & Amble, S. (2023, September 3). Financial Services Will Embrace Generative AI Faster Than You Think. Andreessen Horowitz. https://a16z.com/2023/04/19/financial-services-will-embrace-generative-ai-faster-than-you-think/

The 10 Biggest Mistakes in AI Strategies. (2023, August 8). Insurance Thought Leadership. https://www.insurancethoughtleadership.com/six-things-commentary/10-biggest-mistakes-ai-strategies

The art of AI maturity: Advancing from practice to performance. (n.d.). Retrieved 2023, from https://www.accenture.com/ca-en/insights/artificial-intelligence/ai-maturity-and-transformation

The state of AI in 2023: Generative AI’s breakout year. (2023, August 1). McKinsey & Company. https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2023-generative-ais-breakout-year

Think Tank: GeoAI Reveals a Glimpse of the Future. (2023, July 14). Esri. https://www.esri.com/about/newsroom/publications/wherenext/think-tank-on-geoai-simulation/

Vittorioso. (2023, February 16). ZoomInfo Will Integrate GPT into Its Go-to-Market Platform. Businesswire. Retrieved 2023, from https://www.businesswire.com/news/home/20230216005530/en/ZoomInfo-Will-Integrate-GPT-into-Its-Go-to-Market-Platform

What Is ChatGPT Doing . . . and Why Does It Work?—Stephen Wolfram Writings. (2023, February 14). https://writings.stephenwolfram.com/2023/02/what-is-chatgpt-doing-and-why-does-it-work/

What is explainable AI? | IBM. (n.d.). https://www.ibm.com/topics/explainable-ai?utm_content=SRCWW&p1=Search&p4=43700074359379421&p5=e&gclid=Cj0KCQjwy4KqBhD0ARIsAEbCt6jJA3IXUyth0Dw_JOLOgXmiemi1z9MtKGbgC9gg2IsYzT6KUuSvRvoaAnmDEALw_wcB&gclsrc=aw.ds

Yang, Z., Shen, K., Yang, Z., & Shen, K. (2023, September 3). For B2B Generative AI Apps, Is Less More? Andreessen Horowitz. https://a16z.com/2023/03/30/b2b-generative-ai-synthai/