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ADOPTING ARTIFICIAL INTELLIGENCE WITHIN AN ARCHITECTURE FIRM: A CASE STUDY

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ABSTRACT: The rapid advancement and accessibility of artificial intelligence (AI) have led to increased interest in its applications across various professional domains, including architecture. AI presents significant opportunities for architectural firms, enhancing efficiency, automating tasks, and improving decision-making processes. However, its adoption requires a structured and strategic approach to maximize benefits while addressing challenges such as data security, transparency, and integration with existing workflows. This study presents the development of a strategic plan and roadmap for AI adoption within a large architectural firm, employing a participatory methodology involving workshops, surveys, and stakeholder engagement. The research identifies key AI applications in design automation, compliance checking, and workflow optimization while also addressing challenges related to organizational change, digital transformation, and AI governance. The findings highlight the importance of aligning AI initiatives with business objectives, ensuring proper change management, and mitigating risks associated with AI implementation. The roadmap developed in this study provides a phased approach to AI integration, balancing short-term efficiency gains with long-term innovation goals. While AI holds great potential for reshaping architectural practice, its successful adoption depends on thoughtful planning, ongoing evaluation, and continuous adaptation to evolving technologies. This study contributes to the broader discourse on AI-driven digital transformation in the built environment industry.

1. INTRODUCTION

The rapid democratization of artificial intelligence (AI), supported through access to cloud-based tools, such as OpenAI's ChatGPT, Google's Gemini and Anthropic's Claude, has prompted a significant spike in interest in the general population as well as professional domains for such tools and capabilities. Through their pervasiveness, AI enabled tools have captured the attention of a wide range of professionals due to the promise of automation and streamlining of certain business functions and processes. Within the built asset industry, applications of AI and research into this topic, while not necessarily new, has grown significantly in the past few years (Castro Pena et al., 2021). To a certain extent, AI fits into a global and overarching trend of digital transformation of the built asset industry. Initiated in the 1980's with the passage from hand drawings and paper-based documentation to computer aided design and drafting (CADD), and then the passage to building information modeling (BIM) in the 2000's, AI is a continuation of this rapid digitalization and transition to digital ways of working. However, compared to other digital trends, AI can potentially have a broader impact on an organization, being multi-faceted and far reaching in its application (Bölek et al., 2023; Ceylan, 2021).

Architectural firms have been at the forefront of certain digital transformation trends in the built asset industry. This is due to the fact that, as the main professionals responsible for coordination and management of the design process

as well as main information producers, they can benefit from more streamlined and facilitated data and information production methods, achieved through digitalization (Mance, 2025). The increasing availability of AI tools only supports this trend, whereby architects can be assisted in a number of tasks across a range of their services and business functions, in effect transforming these functions and services and how they are delivered by architecture firms. As with any transformation initiatives, however, the adoption and implementation of AI within architectural firms need to be well structured and approached strategically, lest there be significant disruptions to the firms and their personnel. Indeed, the past two decades have given rise to cautionary tales of digital transformation initiatives within the built asset industry, namely BIM adoption and implementation, that have failed to meet their intended outcomes for a number of reasons, such as lack of change management, maladapted digital transformation strategies and lack of leadership or vision (Manzoor et al., 2021). With the pervasiveness of AI and the accessibility of AI-enabled tools, the consequences of lack of clear strategy within an organization to guide and prioritize the implementation process could be more dire, as individuals within the company adopt tools in an ad-hoc manner and use them with little to no structure or framing. Indeed, the lack of understanding of AI and its limits in the context of professional practice, and the lack of guidance could cause issues with individual initiatives prompting the use of tools supporting decision making that aren't vetted or well understood with dire consequences (Rajeev et al., 2024). To overcome this challenge, AI adoption within architectural firms should be addressed as any other digital transformation initiative, with a structured implementation strategy and roadmap, underscored with a robust change management strategy. Given the relative novelty of this field of work, there exist little empirical work addressing this particular topic.

The research presented in this paper described the development of a strategic plan and roadmap for the adoption of AI within a large architectural firm. The roadmap was developed through a series of workshops and supported through surveys and interactions with the firm's key personnel. The result of this exercise was a strategic plan and an implementation roadmap that considers the different technologies behind AI and how they can benefit the firm. Past work on the topic of AI adoption for organizations operating in the built asset is first discussed. The methodology undertaken in the research project is then presented. The results are discussed, including the approach taken, the roadmap itself and its structuration. Finally, the development process is reflected upon and contrasted with current work in this field.

2. BACKGROUND

The past two decades have seen the acceleration of digital transformation in the architectural domain. This digital transformation, led by the adoption and implementation of BIM and now transitioning towards digital twins and advanced digitalization tools and techniques, has been structured and prompted around the promises of increased performance and productivity, better quality, reduced costs and timelines and overall, more efficient and effective practice (Poirier et al., 2022). Essentially, digital transformation is a response to the industry's inefficiencies and lackluster performance. It is important to note though that digital transformation can be conceptualized as a range of strategies and approaches, as well as tools, processes and workflows, all underpinned by digital data and information (Rachinger et al., 2019). Digital transformation in the built asset industry has come as waves, with the most recent ones being brought forward by BIM, DT and now AI.

2.1 Artificial intelligence for architectural firms

AI in construction has been researched for the last four decades, with early works appearing in the early 1980's (Dixon et al., 1984). In the architectural domain, a growing body of work is showing that there are many opportunities and promises for the use of AI (Bölek et al., 2023). More recently, a range of technologies and tools have been developed, that harness the principles of AI to advance architectural practice. Applications of AI in the field of architecture include a wide, and growing variety of uses such as design support and automation, optimisation, generative design and compliance checking (Bölek et al., 2023; Sacks et al., 2020). AI can also help architects with building performance simulations and analysis (Banihashemi et al., 2017). It can enable fast, effective and alternative methods for visualisation and prototype production, as well as produce high quality visuals (Ceylan, 2021). AI has also been seen to provide support in building renovations, material selection, form finding, and optimization (Bernstein, 2022; Bölek et al., 2023; Çelik, 2023; Ceylan, 2021).

On the other hand, architectural firms face several technical, operational and ethical challenges in adopting AI. Technical challenges include data acquisition and storage, namely capturing, processing, producing, and storing data and subsequently labelling data and training models. Indeed, developing AI systems that are suitable for use within architectural firms is complex and costly and requires large and diverse data-sets (Bécue et al., 2021). Operational challenges include data scarcity, due to reluctance to share data and process fragmentation. The need for expertise to identify, develop, train and test models and AI applications. Unsurprisingly, the high costs associated to the development and maintenance of a firm's applications and its specific models, without counting training, upskilling, purchasing and maintaining tools and technologies within the firm are a challenge (Bécue et al., 2021; Regona et al., 2022). In addition, as with BIM adoption and other digital transformation initiatives, AI and of its underlying processes may be incompatible with existing processes and practices (Regona et al., 2022). Ethical, moral, and legal Issues are still being investigated. Questions such as the impact of AI on the labor market in the field of architecture remain to be fully understood. (Regona et al., 2022)

Additional challenges include transparency of AI tools and models, preventing practitioners from tracing an AI's functions and inner workings, aka the black box issue, can lead to a lack of trust in AI. In line with the question around data availability, the large amount of different data sources available in architectural firms are largely analog or unstructured. The general misunderstanding of AI can also be a significant challenge to its implementation. (Reim et al., 2020). When digitized, information can often be incomplete or inaccessible, only cover partial information or lack formalization (Sacks et al., 2020). Overcoming these challenges requires addressing corporate structure, prioritizing research and development investment, and recognizing areas where AI can have the most impact. This is paramount if architectural firms wish to fully benefit from AI.

2.2 Planning for artificial intelligence implementation

Any organizational digital transformation effort requires careful planning and a structured approach to be successful: Managing expectations, progress and change is key. Indeed, past research has shown that this undertaking faces significant challenges from technical, operational, organizational, human and financial perspectives, among others (Zaoui and Souissi, 2020). One key concern is the readiness of an organization to implement AI. Understanding AI and assessing organisational capabilities involves evaluating potential risks and opportunities as well as evaluating the firm's capabilities. In parallel, assessing the current business model, the potential for business model innovation, and the business ecosystem, which means understanding how value is currently created, captured and delivered is paramount. Once these aspects are addressed, it then becomes a question of developing and refining the capabilities needed to implement AI within the organization, while also working towards organisational acceptance and developing internal competencies (Reim et al., 2020).

More specifically, as with any change initiative, allocating resources to develop, guide and manage the implementation process is crucial. Understanding the current market trends and how others in the ecosystem are evolving is important. From a technical perspective, understanding computing resources, such as cloud resources and connectivity as well as current technological compatibility with the organization's existing systems will be critical. Operationally, establishing technology risk management guidelines and deploying management structures ensuring the proper support of the initiative is to be considered (Nortje and Grobbelaar, 2020). Essentially, the key in successful AI adoption is consistent with the literature on other organizational digital transformation efforts in the past: it relies on careful planning and execution of an encompassing strategy (Reim et al., 2020). The key difference lies in the fact that AI has a potentially far broader reach across the organization and touches on all of its business domains, contrarily to specific technologies which addressed specific business processes. Architectural firms implementing AI must take this into account before moving forward with their adoption plans.

3. METHODOLOGY

The objective of the research project undertaken with the partner organization was to develop its strategic plan and roadmap for the adoption of AI. The partner organization is a large-sized design consultancy based in Montreal, Quebec, Canada. The firm is recognized for its expertise in innovative, sustainable architectural design in the institutional, commercial and multi-residential sectors. It employs over 400 people in three business locations in the Province of Quebec. The firm has experience with digital transformation having been adopting and implementing BIM since 2010. The planning and road mapping process was undertaken following a participatory approach

involving key stakeholders within the organization in a bid to co-construct the plan and roadmap. Involving these key stakeholders is widely acknowledged as a critical step in the successful strategic planning and road mapping process as well as in the overall transformation process (Cronholm and Göbel, 2022). The exercise was conducted over a 6-month period and consisted in two workshops and a series of interviews and surveys to complete the data collection process. Several prototyping activities of AI-based tools were held in parallel to investigate potential avenues for implementation. The research team was directly involved throughout, providing guidance and intervening at key decision points. An Action-Design Research (ADR) approach, as described by Sein et al. (2011), was adopted to structure the intervention. The targeted artifact to be developed is an organizational intervention rather than a technology centric artifact. The results are described across the four ADR stages and the various tasks supporting each step.

The core of the intervention was articulated around a series of workshops that served to co-construct the strategic plan and the roadmap. The first workshop was designed to foster a common understanding and identify opportunities for AI within the organization. The second workshop was designed to prioritize the outcomes from the first workshop and serve as the input for the strategic plan and roadmap. A survey was conducted to consolidate and complete the data collection, making sure that all participants could provide their input in an equitable manner and allowing the research team to delve into specifics. The same key stakeholders from the organization were involved throughout the road mapping process with a total of 19 unique participants identified (table 1). This was important to ensure continuity and consistency in the co-construction process. A smaller working session with some of the firm’s designers was held to focus on AI for design in parallel. The participants were selected based on their role and experience in the organization. Associates, who act as directors across certain sectors, management and technical personnel were targeted given their responsibilities and because they would be responsible for enacting the roadmap within their business lines. Lastly, an morphological analysis of AI-based tools for the architectural domain was performed to begin the reflection on the technological aspects of the potential artefact(s).

Table 1: Project Participants (n=19)

Role		Discipline		Domain	
Type	%	Type	%	Type	%
Associate	42	Architecture	63	Service	42
Manager	32	Service	26	Primary/secondary school	16
Technical	26	Landscaping	5	Institutional public buildings	16
				Federal government	16
		Interior design	5	Private	5
				Hospitals	5

4. RESULTS

4.1 Problem formulation

The results are articulated around the development of the artifact, which consists in the strategic plan and roadmap for AI implementation within the firm. The formulation of the problem was the first stage undertaken as part of the ADR approach. Sein et al. (2011) indicate that this stage must be framed by a Practice-inspired Research while being developing a Theory-Ingrained artifact. The first task at this stage consisted in identifying and conceptualizing the research opportunity, which entailed identifying the opportunities for AI and structuring the implementation process within the firm. This research opportunity was brought to the research team by the partner organization, based on a long-standing partnership between the researchers and the partner. The second task at this stage was to formulate the initial research questions, which was posed as : how can an architectural firm structure its AI adoption process to maximise its benefits ? The third task at this stage was to cast the problem as an instance of a class of problems. In this case, the problem space is the overall digital transformation of the firm and the class of problems pertaining to AI adoption within the architectural domain. As discussed in the background section, this particular class of problems has not been thoroughly researched in the literature due to the relative novelty and emergence of commercially viable AI. The fourth task at this stage was to identify contributing theoretical bases and prior technology advances. The overarching theoretical perspective adopted in this research project is the structuring of digital transformation within architectural firms as can be conceptualized through the diffusion of innovation theory (Rogers and Adhikarya, 1979) , dynamic capabilities theory (Tece et al., 1997) and the Resource-Based View of

the firm (Wernerfelt, 1984). The fifth task at this stage was to secure long-term organizational commitment, which was contingent on the development of the roadmap and strategic plan. Lastly, the sixth and final task was to set up roles and responsibilities.

4.2 Building, Intervention, and Evaluation of the artefact

The Building, Intervention, and Evaluation (BIE) Stage within the ADR process is guided by Reciprocal Shaping of the artifact, meaning that the artifact is shaped by the organization which in turn is shaped by the artifact. In the case of a strategic plan and roadmap, the reciprocal shaping is quite literal as the outcome of the roadmap aims to structure the transformation process. This stage is also framed by Mutually Influential Roles, and Authentic and Concurrent Evaluation, which highlights close collaboration between researchers and practitioners and dynamic adaptability to the evolving context of the project. The first task within this stage was to clarify and define the purpose and scope of the specific knowledge to be created through the research project, which is important to ensure clear direction for the intervention while guaranteeing the rigor of the artefact developed. The second tasks consisted in selecting the form of the BIE process. This task consists in deciding if the primary innovation focus is on technology or organizational intervention. In this case, the focus of the first cycle of the BIE stage was on the development of an organizational intervention in the form of the roadmap, with the adoption or development of AI tools being based on the firm's needs. The third task in this stage consists in executing the BIE cycle, whereby the artifact was developed in collaboration with the partner organization. The workshops and survey were designed to target, build and validate the needs, orientations and requirements for the roadmap.

The first workshop was designed to align concepts and terminology around AI, develop a critical stance on AI, raise awareness on the opportunities but also on the risks and dispel myths, engage with a group of core personnel to form a leadership group within the organization, mobilize this group around common objectives that support the firm's practical and operational needs, and educate stakeholders about this emerging, complex field including its ethical and commercial issues. The project's objective pertaining to the development of a corporate roadmap for AI were confirmed with the participants and served to further engagement and mobilization. The roles of the contributors, the reasons that lead to their inclusion and expectations around their participation were discussed. The participants were selected based on their role within the firm and their potential for championing AI and facilitating the roadmap within their respective departments and not on their knowledge of AI. Indeed, 82% of workshop participants ranked their knowledge of AI 1 or 2 on a scale from 1 to 5, 1 being non-existent and 5 being proficient. On the other hand, 64% of participants indicated having used an AI-enabled tool and 27% indicated that they didn't know if they had used such a tool in the past (or in other words, if the tools they had used had any AI capabilities). Moreover, as described, the participants represented a wide array of expertise and application domains enabling a broad spectrum of perspectives to be presented, which was crucial to building a comprehensive roadmap that would be suitable across the firm. The workshop included a number of presentations and interactions with the participants in the form of structured discussions and real-time surveys. A general presentation of AI and its potential in the field of architecture and interior design was given by the research team to first get people on the same page and provide definitions for core concepts of AI, allowing them to frame the discussion.

Throughout the workshop, the participants were engaged to provide feedback on the different topics that were being addressed. For instance, they were asked what AI meant to them. The results showed a diversity of perspectives with some participants noting positive aspects, highlighting how AI can augment human abilities by enhancing creativity, improving quality, optimizing practices, and analyzing vast amounts of data to find optimal solutions. On the negative side, the participants described risks such as creating deceptive, dehumanizing content, unpredictability in their behavior, and the potential for humans to lose control over these technologies. In this vein, participants were asked to identify their apprehensions about AI. They warned against over-reliance on AI and automation, which could lead to errors, reduced human collaboration, and a decline in critical thinking. Other concerns raised included unethical use, data loss, misinformation, and potential economic impacts. A key theme that emerged was the danger of blindly trusting technology without oversight, which could result in misuse and loss of control over information. Participants were also asked in which areas AI could help in their day-to-day practice. They listed the potential benefits of automating repetitive tasks, quickly finding information, and improving overall efficiency for activities such as estimations, research, and reporting. Finally, priorities were discussed in preparation of the 2nd workshop. These included improving compliance, quality control, and process optimization, supporting advanced visualization techniques, automation for repetitive tasks, improving efficiency in clash detection and reducing non-value-added activities.

The second workshop was designed to prioritize the outcomes from the first workshop and serve as the input for the strategic plan and roadmap. To guide this exercise, two questions were posed: (1) AI can help us achieve _____ and (2) the daily tasks that can be improved by AI are _____. For the first question, each participant was asked to write the specific benefits they expected from AI. A total of 73 expected benefits were identified by the participants. These were subsequently categorized into six areas by the research team. Table 2 shows the percentage of expected benefits of AI across these six general categories as well as the rank given to each category from the survey. As illustrated, participants indicated that they expected AI to mostly improve productivity, by reducing lead times, reducing time spent on non-value-added tasks and optimizing data analysis processes. Benefits pertaining to improving the quality of the firm’s projects, by reducing errors for instance, and supporting innovation, namely through rapid prototyping, were the second most cited benefit areas by the participants. Ensuring strategic development, through the development of new expertise areas and adding value to the firm’s data, by optimizing the use and sharing of knowledge, were identified in third. Lastly, certain benefits pertaining to enhancing the collective well-being of the firm’s employees were identified, namely freeing up time for more interesting tasks.

Table 2: Expected benefits of AI (n=73)

Goal	% of expected benefits	Rank (from survey)
Improve our productivity	41%	1
Improve the quality of our projects	15%	2
Innovate	15%	3
Ensure strategic development	12%	4
Add value to our data	12%	5
Enhance our collective well-being	4%	6

For the second question, the full lifecycle of a project was mapped horizontally, and the firm’s business domains were mapped vertically on the conference room’s wall to form a matrix. Participants were asked to place their ideas on colored notes in the appropriate cell of the matrix. Seven lifecycle phases were identified: Business Development, which involves identifying opportunities, feasibility studies, and proposal development, Pre-Project, where project objectives, constraints, and feasibility are assessed, Design, where the firm develops the project through schematic design, design development, and project specifications, Documentation, where detailed construction documents, technical specifications, and models are prepared, Realization, which consists in the construction phase, Delivery and Follow-Up, which includes commissioning, inspections, client handover, and post-construction support and finally, All Phases, which refers to activities that span all stages. Three of the firms five business domains were prioritized: Architecture functions, which are the firm’s primary business area, Support functions, which consists in the firm’s ancillary functions, and Transversal functions, which consist in functions that exist across the firm’s different business areas. Participants identified 79 different tasks that could be improved including tasks such as analysing proposals and functional programs, finding precedents, generating and evaluating design options, developing and logging reports and meeting minutes, among many others. Table 3 illustrates the distribution of the participants suggestions for daily tasks that could be improved through AI per project stage and business domain.

Table 3: Distribution of participant suggestions for improvement of daily tasks through AI per project stage and business domain

	A. Business development	B. Pre-project	C. Design	D. Documentation	E. Realization	F. Delivery and follow-up	G. All phases
Architecture		4%	14%	10%	3%	5%	
Support	5%	1%	4%			1%	6%
Transversal	9%	3%	3%	8%			25%

Based on the input obtained from the workshops, a survey was conducted to consolidate and prioritize the findings, namely in terms of expected benefits and prioritization of AI adoption per project phase. In this regard, survey respondents prioritized benefits including reduced time spent on non-value-added tasks, reduced errors, ensuring capability development, optimization of the use and sharing of knowledge and freeing up time for more interesting tasks. The survey confirmed the priorities for AI identified through the workshops.

In parallel, targeted workshops with designers focused on better understanding of how AI could help the firm support design-related tasks that were seen as non-value added, yet necessary. This workshop allowed for a more detailed discussion around the adoption of AI to support the firm’s primary business line. Three key areas where AI could help with the design process were identified: improved compliance, better context setting and enhanced problem solving. Within each key area, several business processes that could be improved were identified as shown in Table 4. Supporting these business processes could be achieved through one or many AI types or technologies.

Table 4: Impacted business processes per key areas

Compliance	Context setting	Problem solving
Respect codes and standards	Configure rooms and spaces	Reconfigure rooms to suit evolving constraints
Manage engineering constraints	Configuring emergency exits	Reconfiguring partitions
Manage structural constraint	Configure bathrooms	Reconfiguring ceiling heights
Respecting formulas and ratios in the residential sector	Provide project references	
Call in code experts due to constant code changes	Expand their knowledge of new projects to learn about potential issues	
Keep up to date with code changes		

Finally, the research team performed a morphological analysis of different AI-enabled tools available in the market that could support the identified business processes and tasks and offer the expected benefits. A total of 20 tools, ranging in type and application domain, were identified, analyzed and tested. The first step was to identify the key functions offered by these tools. These key functions were divided into general functions and specialized functions. General functions include integrations, whereby tools include add-ins and APIs to popular modeling software, IFC model compatibility, and standardization for efficient design workflows, import and export capabilities, which ensures compatibility with multiple file formats and enables contextual data import from sources like OpenStreetMap, data security and intellectual property protection, whereby tools implement encryption, protects proprietary designs, and ensures AI tools respect user data privacy, and collaboration functions, whereby tools support multi-user collaboration, cloud-based access, and controlled project sharing. Specialized functions relate to specific use cases supported through the tools, namely conceptual design and feasibility, whereby tools can automate site planning, evaluate site potential, compare design options, and analyze environmental factors like sunlight, wind, and noise, parking and site organization, whereby tools can automate parking layout generation, ensure zoning compliance, and integrate mixed-use developments, zoning and code compliance, whereby tools can analyze zoning regulations, verify building code compliance, and provide property data access, cost estimation and sustainability, whereby tools can help forecast construction costs, evaluate energy efficiency, and optimize designs for sustainability, and automation, where tools support design optimization, chatbot-based project assistance, and automated 3D rendering. A detailed list per tool was provided to the partner organization for consideration.

On the other hand, these tools have, sometimes severe, limitations. These limitations include lack of “creativity”, limited integrations, and region-specific constraints, lack of direct modeling tool integration and real-time synchronization, limited customization for advanced parking systems, regional restrictions and outdated or limited databases for code and by-law compliance, limited regional adaptability and incomplete sustainability data for cost estimations and sustainability evaluations, user limits, lack of private APIs, and subscription barriers, lack of real-time AI adjustments and transparency and limited file compatibility and manual adjustments needed for importing and exporting, and unclear data policies and privacy concerns. As with the functionalities, a detailed list per tool was provided to the partner organization for consideration.

Finally, the roadmap was developed by integrating the findings from the workshops, survey and morphological analysis (figure 1). The roadmap was pragmatic in that it aimed for a two-staged deployment, a first short-term goal over an 18-24 month period and a longer-term goal over a 3 to 5 year period. The roadmap activities were developed in direct response to the expected benefits and business processes and tasks identified through the process. For instance, document processing and analysis by project for bids and proposals, as part of the business development

phase, through the deployment of corporate NLP-based tools was one of the first activities identified. Automated note taking, transcription and summarization for meeting minutes and reporting was also prioritized as a transversal element. For the design process and stage, generative design tools and image processing and rendering tools were targeted. On a longer term, automated code compliance checking and general quality control tools to improve documentation were targeted among others. The general approach to identify the roadmap actions per phase and business domain was seen as useful to enable a mapping and assessment of scale, scope and potential impact of the intervention on the short- and longer-term timeframes.

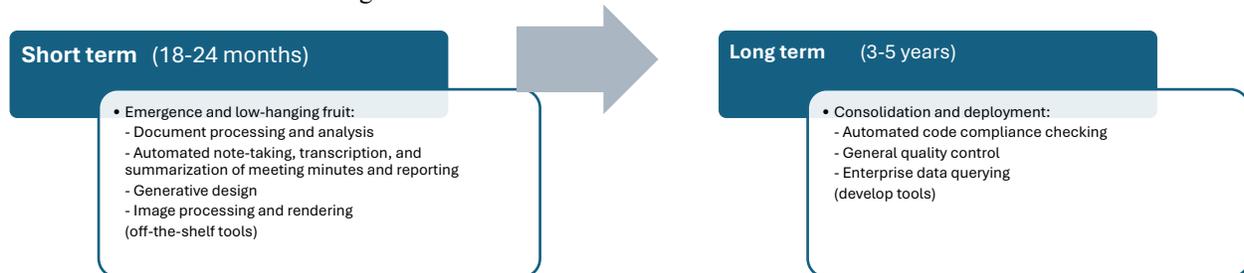


Figure 1 Summary AI deployment roadmap

Lastly, the fourth task in the BIE stage consists in assessing the need for additional cycles and repeat. In the context of this project, additional cycles will be required to deploy the AI roadmap and assess its progression and impact. These cycles are beyond the scope of the current paper.

4.3 Reflection and Learning and Formalization of Learning

The third stage in the development process is the Reflection and Learning Stage, which is framed through Guided Emergence. The first task in this stage consists in reflecting on the design and redesign during the project, whereas the second task includes evaluating adherence to principles of the project. The survey that was conducted during this first cycle was used to validate the accuracy and relevance of the exercise surrounding the development of the AI roadmap. In this regard, a strong majority of participants found the exercise both very accurate and very relevant, with 84% of participants scoring the exercise more than 4 out of 5 in terms of accuracy and 80% of participants scoring the exercise more than 4 out of 5 in terms of relevance. Moreover, the engagement and mobilization of the key personnel throughout the process was also a testament to the validity of the exercise within the firm. The third task includes analyzing intervention results according to stated goals. The main goal of the first BIE cycle was to develop and present the strategic plan and roadmap for AI implementation within the firm. This was achieved with the presentation of the roadmap to the firm's board of directors in the fall of 2024.

The final stage in the ADR process is the Formalization of Learning. It includes the following tasks: (1) Abstract the learning into concepts for a class of field problems, (2) Share outcomes and assessment with practitioners, (3) Articulate outcomes as design principles, (4) Articulate learning in light of theories selected, and (5) Formalize results for dissemination.

5. DISCUSSION

The growing interest in AI within the construction sector, and within the architectural and design domain, is based on the great promises and potential that these technologies show in improving the industry's bottom line. For the organization, AI shows great promise in optimizing tasks and enabling automation and advanced analysis. More specifically, for the architectural business line, AI can enhance initial design, project planning, spatial organization, and site supervision, it can generate 3D models, analyze sites, and estimate costs. For the firm's interior designers, AI can automate space planning, material research, regulatory compliance, and project scheduling. For the firm's urban planners, AI can assist in spatial organization, urban redevelopment, environmental analysis, and energy efficiency optimization. For their landscape architects, AI supports site studies, project planning, landscape choices, and environmental impact reports. Beyond these disciplinary perspectives, AI was also seen as a way to transform the organization's transversal and supporting business processes, namely proposal development, sustainability analysis, cost estimating, risk analysis, and value engineering.

However, several issues and constraints were raised during this first cycle of the research project. These issues are related to intellectual property, data security, information quality and structuring, and software accessibility, among others. Additionally, ensuring the reliability of AI-generated data, traceability and transparency were identified as critical constraints. These elements must be taken into account in the firm's strategic plan and a deeper understanding of how these elements interact and affect the strategic plan is necessary. The firm's history with digital transformation initiatives, namely their BIM adoption and implementation process initiated in 2010, does contribute to its readiness and maturity to undertake the process. On the other hand, the broader scope of AI adoption and its implications on the firm's business processes must be considered. Through the road mapping process, two key aspects of AI adoption in the firm emerged: (1) sifting through the noise and the hype, and (2) focusing on value generation. Sifting through the noise is related to the challenge of developing awareness around AI and its application within the architectural domain. Indeed, during the problem formulation stage, participants gave a broad array of views and understanding of AI which could lead to confusion in the planning and deployment processes. The second aspect relates to the identification of non-value-added tasks that could benefit from digitalization and AI. Focusing on these tasks, namely identifying, obtaining consensus and prioritizing them is a useful exercise undertaken in the context of the road mapping exercise.

6. CONCLUSIONS

This paper presents the process and the results of the first stages of an ADR project undertaken with an architecture firm aimed at developing their strategic plan and roadmap to provide a structured approach for integrating AI into its practice. Although preliminary, the results show the necessity of aligning AI implementation with organizational goals, addressing operational challenges, and ensuring a smooth transition through effective change management. Much like previous digital transformation initiatives such as BIM, AI has the potential to significantly reshape business processes, optimize efficiency, and enhance the quality of architectural services. However, its successful integration is contingent on thoughtful planning, stakeholder engagement, and the ability to navigate both technical and ethical considerations. Specifically, AI can have a broad impact across the firm's various business functions, through automation, generative design, and compliance checking, while also supporting transversal business functions such as proposal development, cost estimation, and risk analysis. AI shows great potential to reduce time spent on non-value-added or repetitive tasks, improve decision-making, and enable more data-driven design solutions, allowing professionals to focus on more creative and valuable aspects of their work. The study also highlights challenges with AI adoption for the firm, namely issues with data security, intellectual property, transparency, and ethics. The "black box" nature of many AI models poses challenges for trust and accountability, particularly in a domain where precision and compliance with regulations are paramount. Furthermore, the need for continuous education and training to ensure that personnel within the firm understand AI capabilities, limitations, and identify appropriate use cases was highlighted. Without proper guidance and governance, ad-hoc AI adoption could lead to inefficiencies, inconsistencies, and potential risks in decision-making processes. Finally, the study discusses the importance of distinguishing between hype and practical applications of AI in architecture, whereas AI is being portrayed as a revolutionary force capable of transforming industries overnight, its actual implementation requires a phased and strategic approach.

The two-stage roadmap developed in this study focuses on short-term gains, such as automating documentation and streamlining workflows, while preparing for more advanced AI-driven processes in the long term. This step-by-step integration ensures that AI adoption is sustainable, scalable, and aligned with the firm's evolving needs. In addition, the participatory approach taken in this research, engaging key stakeholders through workshops, surveys, and structured discussions, proved instrumental in fostering a shared understanding of AI's role within the firm. By incorporating diverse perspectives from architects, designers, and managers, the roadmap reflects real-world challenges and opportunities, making it more actionable and relevant. This collaborative methodology also ensures greater buy-in from employees, increasing the likelihood of successful implementation. This study contributes to a growing body of knowledge on AI adoption strategies. While architectural firms have historically been at the forefront of digital innovation, AI introduces new dimensions of complexity that require leadership, investment in research and development, and continuous evaluation. Moving forward, further research will be needed to assess the long-term impact of AI on architectural practice, refine AI-driven workflows, and explore new opportunities for integration. Next steps in this research include performing the next ADR cycles to structure and follow the AI deployment process.

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