AI: The Catalyst for Building Transformation

Leadership

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Stefan Schwab, an expert in intelligent lighting control and smart IoT buildings, and Dr. Paul Baumann, a leader in data analytics for buildings, discuss how Artificial Intelligence (AI) is set to revolutionize the way we look at buildings, turning them into sustainable, productive, and human-centered environments.

Introduction

In a continuously evolving business environment, the post-pandemic landscape has forced companies to rethink and reevaluate how they operate. The focus has now shifted to hybrid work environments, protecting supply chains against disruption and devising ways to operate more efficiently though uncertain economic cycles. AI, machine learning (ML), and analytic solutions are playing a critical role in enabling this transformation, particularly in building management and optimization.

Current state and actions

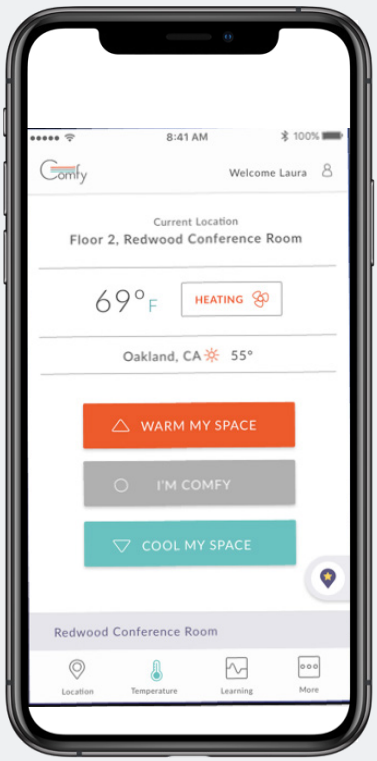
Stefan: AI is not just a buzzword anymore. It is driving the transformation of buildings into intelligent and efficient ecosystems. With AI, we can analyze vast volumes of building data to derive actionable insights, enabling us to optimize energy usage, improve occupant comfort, and predict maintenance needs for commercial real estate, hospitals, schools, manufacturing sites, and for just about every industry out there.

I marvel at how far we've come in the last 10 years, with escalations in AI technology innovations stepping up to address some of the most pressing needs of business operators globally. As you probably know, Siemens has been at the forefront of much of this technology, with the development of Building X, digital twins, and machine learning applications. But now we are observing an exponential investment in AI companies, with 2023 already a record year for investment in generative AI startups and equity funding topping $14.1B across 86 deals, as of Q2, 2023.[1]

Paul: Well, that's a clear indication that at least the venture market believes that AI is here to stay. AI allows us to make buildings smarter and more autonomous. As you stated, it all begins with data. Even in the planning and construction phases, building data can now be captured and digitized in ways that can help in later decision making. Once buildings are in the operations phase, this data is extended with sensors, actuators, controllers, wireless network logs, access control logs, maintenance data, and much more.

In the past, this data used to be stored separately and isolated with limited access and, therefore, a substantial hurdle to utilize it beyond the original purpose. However, with the rise of the internet of things (IoT), internet connectivity, and open standards, these hurdles began to disappear while also unlocking substantial opportunities. With this information we can even start optimizing energy usage based on occupancy and other external factors, and even autonomously adjust building parameters like temperature and lighting, based on learned occupant preferences. Isn't that where Enlighted has focused some of its AI research over the last years?

Stefan: That's right, Paul. At Enlighted, we have been focusing on leveraging AI to enhance the functionality of our IoT solutions. One of the first AI-based applications we launched was a mobile app solution that allowed employees to self-adjust temperatures in their immediate work areas. Behind the scenes, an AI model continuously tracks and adjusts building setpoints to accommodate the majority votes from the system. A simple concept, but effective in driving down energy costs while granting occupants control of their environment.



Our newest AI-driven Real Time Location System (RTLS) boosts location accuracy to nearly 98 percent, dramatically improving asset and personnel tracking. By using this

1 CB Insights, *The state of generative AI in 7 charts*, August 2023.

kind of machine learning techniques, we can accurately "tell" healthcare workers where they can find the closest pieces of equipment, like intraveous pumps and wheelchairs. With this new, more accurate technology, we can also pinpoint when patients at risk are entering area that are not conducive to their health and we can accurately measure their journey through their healthcare visit, helping healthcare administrators improve patient experiences overall.

AI and sustainability

Paul: One of the key areas where AI can have a transformative impact is in driving sustainability. In the domain of efficient energy management and decarbonization, 40 percent of global energy consumption can be linked directly to buildings.[2] With increasing regulatory and societal pressure to improve, business and cost-saving opportunities arise. By benefiting from unlocked data, AI-driven algorithms can detect inefficiently running equipment and optimize energy usage based on occupancy and other external factors, eventually reducing overall CO2 emissions. AI can also optimize operations costs by automatically deciding when to purchase energy from utility providers based on demand and price predictions.

Stefan: Paul, so many of our customers have made commitments to be carbon neutral by 2030 that it's become a board-level priority to understand the practical steps they can take to meet those objectives. They can accomplish this by effectively managing the consumption of energy by refined lighting and HVAC control systems, but they can also manage spaces more effectively by understanding exactly how their spaces are being used, how people are interacting with those spaces, and how workflows are impacting productivity and safety. This is where data and AI can help deliver descriptive and predictive analytics that help understand space trends, predict usage, and guide more refined space-planning decisions.

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DR PAUL BAUMANN
Head of Data Analytics, Siemens Digital Business

The future of AI in buildings

Paul: Looking ahead, we can expect AI to play an even more significant role in the built environment. From predictive maintenance and energy optimization to enhancing occupant comfort and safety, the possibilities are endless. Siemens Building X includes several intuitive applications that speed up the process of connecting and digitizing buildings with a sophisticated user experience (UX) design, bulk operations, and AI-driven

2 International Energy Agency, *2019 Global Status Report for Buildings and Construction*, December 2019.

semantic enrichment capabilities. Once buildings are connected and digitized, another challenge needs to be addressed: generating insights from data.

Today, highly trained experts crunch the numbers from dozens of graphs. In the future, as more and more buildings will become smarter, the ratio of these highly trained experts will decline,[3] causing a bottleneck in getting the most out of smart buildings. Building X addresses this challenge in multiple ways. It starts with domain-tailored, user-facing applications that allow people to focus on what matters to them by hiding complexity and automating actions. Then, by enriching these applications with AI-driven algorithms, such as forecasting or anomaly detection, insights are generated automatically and presented clearly.

Stefan: It's a great point about the need for different kinds of talent moving forward because of AI-driven applications. While new analytics can take the place of more of the routine work, more interesting analytic positions will be created – ones where new skills of interpretation and data manipulation will be required. According to the World Economic Forum, there will be a 40-percent jump in the number of AI and machine learning specialists and other related jobs by 2027, with a combined addition of 2.6 million jobs.[4]

Paul: The shifting labor force is one consideration for AI in the built environment. Another one I hear of often from our customers is the need for control and greater security – especially around sensitive building data. We're seeing strict security standards and technologies being put in place, primarily because of the move to cloud to accommodate vast quantities of data. With that, companies are asking themselves if their reliance on IoT data and devices is safe and well-placed. Ironically, the field of AIoT (artificial intelligence of things) data security is providing some of the answers.[5] The ability of AI, though deep machine learning algorithms, to rapidly identify security breaches is envisioned to alleviate some of the security concerns in the built environment. An example of this is rapid anomaly detection across data streams with embedded alerting mechanisms.

Stefan: Those challenges are real and we're just at the beginning of negotiating our way through them as we work to improve our customers' experiences with their spaces. However, I believe that by embracing AI, we can create smarter buildings that are not just efficient and sustainable but also enhance the quality of life for occupants. We're only at the beginning of the journey with our customers and it's exciting to see how Enlighted and Siemens are investing in new AI solutions and partnerships for change.

Conclusion

As we move toward a future where buildings are not just physical structures but intelligent and dynamic entities, the role of AI cannot be overstated. By analyzing vast volumes of data and generating actionable insights, AI empowers us to create buildings that are sustainable, efficient, and human-centered. It is indeed on the verge of transforming buildings forever.

3 Siemens, *Building Meets Artificial Intelligence*, 2023.
4 World Economic Forum, *The Future of Jobs Report, 2023*, April 2023.
5 Security Intelligence, *How AIoT Will Reshape the Security Industry in 2023*, April 2023.