

Strategic Imperatives

Frost & Sullivan identifies three key strategic imperatives that impact the building services and technologies industry: disruptive technologies, new business models, and transformative mega trends. Every company that is competing in the building services and technologies space is obligated to address these imperatives proactively; failing to do so will almost certainly lead to stagnation or decline. Successful companies overcome the challenges posed by these imperatives and leverage them to drive innovation and growth. Frost & Sullivan’s recognition of Cognitive System Corp. is a reflection of how well it is performing against the backdrop of these imperatives.



Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Cognitive System Corp. excels in many of the criteria in the smart homes space.

AWARD CRITERIA	
<i>Technology Leverage</i>	<i>Business Impact</i>
Commitment to Innovation	Financial Performance
Commitment to Creativity	Customer Acquisition
Technology Incubation	Operational Efficiency
Commercialization Success	Growth Potential
Application Diversity	Human Capital

Market Overview

The dynamic smart homes market continues on its robust growth trajectory, recovering from the COVID-19 related slowdown in 2021 with the home safety & security and health & wellness market segments, partially offsetting the dearth in demand for smart homes solutions. Frost & Sullivan's research estimates the global smart homes market to reach \$263 billion in 2025, growing at a compound annual growth rate of 7.5% between 2018 and 2025.¹ The rising acceptance of new products coupled with the consumer demand for improved energy/cost savings and enhanced safety and personal comfort drive the overall market growth. Moreover, the global smart homes market is witnessing the growing adoption of connected devices along with the increasing prevalence of wireless technologies. Globally, the number of connected devices is likely to exceed 792 million units by 2025.² Wireless Fidelity (WiFi) sensing, the emerging application utilizing this ubiquity of WiFi and connected devices for motion sensing, opens up new avenues for disrupting the smart homes market.

¹ *Future of Smart and Connected Homes, Forecast to 2025* (Frost & Sullivan, September 2019).

² *Ibid.*

WiFi Motion™: Disrupting Motion Sensing with Groundbreaking Technology

Founded in 2014 in Waterloo, Canada, Cognitive Systems Corp. (Cognitive) is a pioneer in leveraging the untapped potential of wireless signals for motion sensing to deliver truly smart home ecosystems. Drawing on its founders' expertise in silicon design, radio frequency (RF) technology, and cryptography, the company developed a novel way of interpreting and using wireless signals to detect and localize motion in customers' homes. Cognitive produced its custom R10 chipset in 2015 and launched Aura Home, the first home monitoring solution of its kind, in 2017. The company intended its Aura Home product release to demonstrate the capabilities and validate the mass market adoptability of WiFi sensing technology. The market uptake challenges faced by Aura Home, owing to consumer reluctance to pay for dedicated hardware, led Cognitive to develop its innovative WiFi sensing technology offering as a software solution, giving rise to WiFi Motion™.

Cognitive's flagship WiFi Motion™ offering is a complete software stack solution that detects motion by measuring and interpreting changes in RF signals transmitted between WiFi devices. The company's technology identifies these signal disruptions as motion and determines when and where the movements occurred. Moreover, WiFi Motion™ employs advanced algorithms to accurately differentiate between different types of movement, such as pet motion, fan motion, and human motion. Developed with its customers in mind, Cognitive's innovative technology easily enables motion sensing in any home with a WiFi connection. The software comes with a complete set of application programming interfaces supported by a cost-efficient and scalable backend infrastructure.

Cognitive layers its patented WiFi sensing software into the router/gateway and detects motion using the home's existing WiFi environment and connected devices. It works with a single access point or mesh configurations. Furthermore, WiFi Motion™ utilizes the home's gateway and connected devices as motion sensors without compromising their original functions, impacting data usage, or slowing down the network. This capability provides the company a distinct competitive advantage by eliminating the need for any additional hardware. Moreover, customers can easily upgrade WiFi Motion™ with over-the-air software updates. As a result, Cognitive's unique WiFi sensing solution is more affordable, easier to integrate, and provides broader coverage than conventional motion sensing technologies that utilize passive infrared sensors and close circuit television cameras.

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- Anirudh Bhaskaran, Senior Industry Analyst

Cognitive’s WiFi Motion™ is designed for ultimate privacy and offers a compelling and non-intrusive alternative to the contemporary motion detection technologies heavily dependent on cameras, sensors, and microphones. In addition to meeting and exceeding privacy regulations, Cognitive’s technology is inherently secure. WiFi Motion™ does not need to ‘see,’ ‘hear,’ or identify entities to sense motion. Moreover, the company randomizes and encrypts any motion data it collects and stores. Privacy is a key differentiator for WiFi Motion™, positioning it as the ideal solution for discrete motion detection and monitoring.

In addition to identifying and localizing motion, WiFi Motion™ uses artificial intelligence and predictive analytics to establish a baseline of the ‘motionless’

home environment, learn motion patterns over time, provide behavioral insights, and generate contextual awareness. This capability enables the technology to detect unusual motion patterns with unprecedented accuracy while decreasing costly false alert incidences. Once it identifies and interprets motion, WiFi Motion™ sends custom notifications to customers via its user-friendly mobile application (app). Customers can also view motion in their homes in real-time through the app. More importantly, Cognitive’s technology can trigger connected devices to take specific actions based on detected motion, such as turning on lights or adjusting the thermostat, thereby enhancing smart home automation. Additionally, WiFi Motion™ can integrate its triggers with Google Assistant, Apple HomeKit, Amazon Alexa, IFTTT, and other proprietary interfaces.

Frost & Sullivan applauds Cognitive for its innovative WiFi Motion™ solution that transforms its customers’ wireless networks into highly accurate, very affordable, and completely secure motion sensing systems, contributing to the delivery of a truly smart home ecosystem.

Industry Collaboration Key to Driving Mass-market Adoption

Despite considerable popularity and widespread market adoption spanning two decades, leveraging WiFi (primarily used as a communication service) for motion sensing is an entirely novel usage for this wireless technology.³ As a result, there is a significant market gap in terms of knowledge, procedures, and tools for testing WiFi sensing features. Moreover, a lack of standards governing WiFi sensing significantly impedes the mass adoption of this technology. Cognitive addresses these limitations by leading WiFi sensing technology development and standardization through its collaborations with various industry groups, including the Wireless Broadband Alliance Ltd. CO. (WBA), Wi-Fi Alliance, and Institute of Electrical and Electronics Engineers (IEEE).

³ https://en.wikipedia.org/wiki/WiFi_Sensing

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- Sama Suwal, Best Practices Research Analyst

Cognitive’s work with the WBA has been crucial in driving the formation of the IEEE 802.11bf taskforce, which is working towards formulating the standard support for WiFi sensing. The development of an industry-standard is an important step forward for the advancement of the entire industry. The IEEE 802.11bf standard will enhance the efficiency and reliability of WiFi sensing while establishing the interoperability of wireless devices, thus enabling a broad range of exciting applications including home automation & control and home energy

management. Moreover, the company’s work with the WBA has facilitated its collaboration with Cable Television Laboratories, Inc. (CableLabs). CableLabs opened its Denver facility as a test setup to evaluate multiple sensing solutions. This facility is accessible to all market participants and helps foster overall market growth.

Another major hurdle in achieving mass-market adoption for WiFi Motion™ is convincing chipset vendors to enable motion sensing on their chipsets. Cognitive is already pre-integrated on most WiFi 6 access points and is working with nearly all active chipset vendors to facilitate its compatibility with all types of connected devices and support enhanced market uptake. Cognitive's continued focus on building ongoing partnerships with chipset manufacturers will enable affordable, accurate motion sensing in more homes.

Cognitive places a strong emphasis on building collaborative relationships with industry stakeholders such as telecommunication providers, original design manufacturers, and smart home technology providers to encourage the widespread market adoption of its WiFi sensing technology. The company maintains partnerships with industry giants such as Qualcomm, Broadcom, Plume, Quantenna, CommScope, and Airties.

Cognitive offers several go-to-market opportunities to its partners, including WiFi Motion™ as a bundled broadband package, a standalone value-added service, or a bundled premium WiFi solution. For instance, in February 2020, Cognitive launched WiFi Motion™’s first commercial offering in partnership with Plume, the United States-based smart home-as-a-service provider. WiFi Motion™, marketed as Plume Sense™, was layered into Plume’s existing hardware and smart home devices, creating a network of motion sensors throughout customers’ homes; managed conveniently through the Plume app. In October 2020, Qualcomm Technologies recognized Cognitive as a motion partner in the announcement of its new WiFi 6E mesh Immersive Home Platform. Moreover, in March 2021, Cognitive announced the availability of its WiFi Motion™ technology as a standard for customers developing products using Broadcom’s new WiFi 6 mesh and access point solutions. In March 2021, the company also announced a co-sell relationship with original design manufacturer Airties. These developments testify to WiFi sensing technology gaining momentum in WiFi 6 deployments, which is opening up a multitude of opportunities in the growing market. Moreover, Cognitive’s partnership with these global technology leaders, with a

robust product and clear roadmap for next-generation WiFi, supports the company's global expansion aspirations.

Cognitive is currently deploying WiFi Motion™ to 40 home broadband internet service providers globally, including Atlantic Broadband, Armstrong, Comporium, and Astrea. Cognitive's technology offers the benefits of increased average price per user, reduced churn, improved net promoter score, and enhanced mobile app engagement to its partners. For instance, WiFi Motion™ reports app engagement more than 8 times higher at 17% compared to less than 2% for a typical communication service provider (CSP) and app retention of 61% compared to less than 35% for a typical CSP. Furthermore, Tier 1 service providers have benchmarked and validated WiFi Motion™ as the industry's most reliable WiFi sensing solution.

Cognitive's collaborators and partners acknowledge the company's leadership in the WiFi sensing space and appreciate the value added by its technology to their offerings:

"Cognitive Systems have been working with the WBA for several years and have been instrumental in leading the Wi-Fi Sensing work within the Wireless Broadband Alliance. Their drive to help define the standard for Wi-Fi Sensing and its subsequent standardization has been exciting and we look forward to seeing Wi-Fi Sensing continue to expand and be a true success story over the coming years"

-Tiago Rodrigues, Chief Executive Officer, Wireless Broadband Alliance

"Qualcomm Technologies and Cognitive Systems share a passion for delivering innovative technology for future-ready experiences. For years, our collaboration has delivered multiple generations of solutions. With Qualcomm's advanced intelligence and powerful computing capabilities on board, Wi-Fi Sensing has become a reality, delivering safety, advanced monitoring and peace of mind to consumers."

-Nick Kucharewski, Vice President and General Manager, Wireless & Infrastructure Networking at Qualcomm Technologies, Inc.

"Working with Cognitive Systems as our strategic Wi-Fi sensing partner was a natural fit. There is so much value yet to be derived from Wi-Fi networks, and we share a common interest in bringing that value to the forefront. Extensible technologies like WiFi Motion are the foundation of next-gen smart homes. It's an exciting time for Wi-Fi."

-Manny Patel, Senior Director of Product Marketing, Broadband Carrier Access Products Division at Broadcom.

"As a pioneer and leader in Wi-Fi sensing, we are pleased to be working with Cognitive Systems on new Wi-Fi 6 solutions. Cognitive's product roadmap has a realistic game plan for both implementation and longevity. The integration of WiFi Motion™ and Airties can enable service providers to offer innovative value-add Wi-Fi services to their customers."

- Metin Taskin, Co-Founder and Chief Technology Officer, Airties

Frost & Sullivan expects the total costs, time-to-market, and market deployments of WiFi Motion™ to improve substantially once Cognitive successfully removes the barrier to entry through ongoing industry collaborations fostering the continued development and standardization of the industry.

Unraveling Boundless Possibilities in Novel Applications

A culture of innovation is at the core of Cognitive's operations. The company fosters innovative and creative ideas through its patent rewards program that incentivizes employees to create patentable ideas. In addition to introducing a compensation component, Cognitive allows its research and development (R&D) team the creative leeway to focus on complex problems by nurturing a work environment that enables employees to test the limits of technology. Cognitive's focus on generating innovative ideas is evident in its more than 260 awarded patents and pending applications globally, positioning the company as the undisputed leader in intellectual property ownership in the WiFi sensing space. This technological leadership will enable the company to drive the industry for the foreseeable future.

Cognitive is very transparent with its employees and external partners/customers regarding what it can bring to the market today as opposed to what is possible in a lab environment. The company is exceptionally cognizant about never over-promising technical capabilities and works closely with its business-to-business customers on ensuring they leverage the full potential of its offerings. Additionally, Cognitive maintains exceedingly stringent quality assurance and testing processes to ensure that its solutions are 100% scalable and ready for use in customers' homes before releasing them into the market. For instance, though the company is conducting extensive R&D into several advanced capabilities for its WiFi sensing technology, it has only released its 'Home Aware' robust home monitoring application to the market. Cognitive plans to launch its 'Family Aware' and 'Caregiver Aware' solutions in the first quarter and second half of 2021, respectively. Family Aware aims to provide contextual awareness about what is happening in a customer's home through advanced customizable alerts by understanding the family's activity patterns. Caregiver Aware is an offering centered on health technology and aging in place, functioning as a proactive health tool to track customers' health and well-being through behavioral monitoring.

Cognitive's WiFi Motion™ is a unique solution that is not solely focused on home security but is developed as a foundation for leveraging wireless technology in all smart home applications and delivering value-based outcomes to end consumers. The company intends to utilize its home monitoring solution to familiarize customers with WiFi sensing then add advanced capabilities as the industry grows out of its infancy, truly differentiating from its contemporaries. The company is building on its Home Aware and Family Aware solutions to offer holistic smart home applications such as energy management, assisted living, and elderly care. Moreover, Cognitive identifies significant growth opportunities and new applications for its technology in the enterprise space, especially the hospitality industry.

With the release of the first commercial WiFi Motion™ offering in early 2020, Cognitive successfully transitioned from an R&D-focused company to a revenue-generating firm. Despite still being in a scale-up phase, the company has secured consistent month-over-month revenue since the release. Cognitive witnessed growth in the fourth quarter with several signed agreements with service providers and specific beta plans with two large Tier 1 operators. The company recorded an average growth of 15.7% of its subscriber base month over month since July 2020 and currently has over 700,000 connected devices in its network. Cognitive foresees its licensing revenue growing steadily through 2021 and 2022 as it completes its technology integration with prominent service provider partners. Furthermore, the Government of Canada honored Cognitive with \$7.3 million from the Strategic Innovation Fund in 2019 to advance its WiFi Motion™ technology development.

Cognitive is witnessing increasing interest in its WiFi sensing technology globally, with several prominent service providers deploying WiFi Motion™ in key geographic regions. The company is well on its mission to ‘Realize the incredible potential of wireless signals to enhance our quality of life at home’ and aims to establish its technology as a standard part of WiFi in the near future.

Conclusion

Cognitive, with innovation and creativity in its DNA, developed a groundbreaking and price competitive WiFi motion sensing technology enabling new capabilities and creating new revenue opportunities in the smart home ecosystem.

WiFi Motion™, an artificial intelligence-based software stack solution, is inherently secure and generates contextual awareness and behavioral insights for end customers without requiring any additional hardware to detect, localize, and interpret motion inside a home. Cognitive drives WiFi Motion™’s market adoption by supporting the development and standardization of WiFi sensing technology through its collaborations with various industry stakeholders. In addition to maintaining an undisputed technological leadership with more than 260 awarded patents and pending applications, Cognitive successfully transitioned into a revenue-generating company with the first commercial release of WiFi Motion™ in 2020. With an increasing global interest in its WiFi sensing technology, Cognitive will lead the market in the foreseeable future.

For its strong overall performance, Cognitive Systems Corp. earns Frost & Sullivan’s 2021 Global Technology Innovation Leadership Award in the smart homes market.

What You Need to Know about the Technology Innovation Leadership Recognition

Frost & Sullivan's Technology Innovation Award recognizes the company that has introduced the best underlying technology for achieving remarkable product and customer success while driving future business value.

Best Practices Award Analysis

For the Technology Innovation Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Technology Leverage

Commitment to Innovation: Continuous emerging technology adoption and creation enables new product development and enhances product performance

Commitment to Creativity: Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

Stage Gate Efficiency: Technology adoption enhances the stage gate process for launching new products and solutions

Commercialization Success: Company displays a proven track record of taking new technologies to market with a high success rate

Application Diversity: Company develops and/or integrates technology that serves multiple applications and multiple environments

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

