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Pitchcom and edge command technology in diamond sports: A systematic literature review of play-calling digital technology, data-based game changes, and digital security efforts in modern sport

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Abstract

Professional sports organizations increasingly function as dynamic, highly capitalized environments for enterprise information systems to deploy innovation, infrastructure deployment, and data-driven operational control. Over the past four decades, athletic administration and sports sciences have undergone a paradigm shift, evolving from legacy manual reactive monitoring and after-game data aggregation and collection to widespread deployment of advanced computational modeling, cloud-based performance prediction systems, and stadium-wide big data architecture. While an expansive body of literature and popular cultural hallmarks like the movie, *Moneyball*, focus on predictive analytics, administrative roster building and sustainment, player valuation, and long-term asset management and forecasting, a critical structural research gap exists in real-time operational digital information systems during live high velocity gameplay at every level, children's games to high-stakes professional softball and baseball. This systematic literature review directly addresses this gap by exploring the rapid on-field utilization of encrypted edge-signaling hardware, specifically Pitchcom, a system proliferating in professional, collegiate, and amateur diamond sports in less than a decade. By investigating how live on-field communication infrastructures are deployed to protect critical competitive data vulnerabilities, prevent digital espionage through end-to-end encryption, and enforce strict regulatory compliance with compressed pace of play mandates, this exploration will highlight how edge tools actively reshape real-time human decision-making, cognitive workload distribution, and human-machine collaboration in traditional pastimes turned into high-stakes multi-million dollar enterprises.

Keywords: Pitchcom, baseball, edge technology, data-based game changes, digital security

Introduction

Baseball, a sport deeply rooted in American culture, has been marred by scandal repeatedly throughout its history (Kepner, 2019, p. 4). For over a century, baseball has been culturally romanticized as a game of pastoral tradition, unbroken historical lineages, and human intuition. Yet, beneath this veneer of timelessness, the sport has always been fundamentally defined by structural measurement with scandals of game fixing and tampering throughout the game's legacy. Underlying principles of physics, material science, and data-driven observation have never been foreign to the sport; rather, they are embedded within its very blueprint with statistics being collected formally first in the 1910s and then expected beginning in the 1920s in Major League Baseball (Carroll, 2022). Science and technology have been in the background of bat, ball, and glove sport since its inception. Rather than emerging from a single moment of invention, baseball evolved gradually over time into the structured revenue-generating, multi-generational

conglomerate and simple bat-and-ball based game in which two teams of nine players alternate between batting and fielding across a series of innings played on a diamond-shaped field and each generation's experience in baseball has brought about more infusion of technology whether through scorekeeping and individual statistics or game operations like scoreboards (Carroll, 2022, p. 22; Thorn, 2011, p. 9). This historical evolution in technology integration, regulations, rules, and traditions reflects not only the sport's broader cultural development; but also, baseball is growing in entanglement with technology, data, and institutional governance (Mizels et al., 2022). One major change resulted after a cheating scandal, but the edge technology of Pitchcom is being used in Major League Baseball and throughout diamond sports in North America (Ranhawa, 2023).

Literature Review

Over the past forty years, the operational landscape of professional baseball has undergone an unprecedented paradigm shift, evolving from a tradition-bound sport into a highly capitalized ecosystem driven by enterprise information systems. Professional baseball organizations, once reliant on manual record-keeping, instinct-driven decision-making, and downright traditions and superstitions now operate as data-intensive enterprises deploying advanced computational modeling, real-time performance tracking, and stadium-wide analytics infrastructure (Mizels et al., 2022). Existing scholarship examined extensively how predictive analytics and machine learning have reshaped off-field functions such as player valuation and roster construction (Judge & Moore, 2025). However, a significant gap remains in understanding how digital information systems operate during live gameplay itself. Decisions now unfold in seconds and communication between players must be both instantaneous and secure.

This gap was made visible by the Major League Baseball 2017 Houston Astros sign-stealing scandal, in which the organization systematically exploited the analog vulnerabilities of traditional on-field communication using a center-field closed-circuit camera feed and a trash can as a low-technology signal interception and relay system (Spackman et al., 2023). The team used these two tool sets to decode and transmit opposing catchers' pitch signals to batters in real time (Karfinkel, 2023). The scandal exposed a fundamental institutional failure (Downs et al., 2025). Despite the systematic quantification of nearly every other dimension of the stadium environment with tracking of all aspects of hitting, pitching, catching, base running, and more, on-field communication protocols, specifically pitch type determination, remained stubbornly analog, creating an exploitable intelligence gap (Spackman et al., 2023). Anyone on the field or in the stands could possibly determine the next pitch by watching the catcher and the pitcher and sometimes the outfield or dugout exchange cryptic but deducible hand signs (Downs et al., 2025). Major League Baseball's subsequent investigation and rule enforcement drew widespread attention to the structural inadequacy of legacy sign systems and generated institutional pressure for a technological solution. That solution arrived in the form of Pitchcom, an encrypted, wearable edge-signaling device allowing catchers to transmit pitch calls directly to pitchers and select fielders via a button-based input system and discrete in-ear audio receivers, eliminating the need for visible hand signals entirely and setting up a dynamic to have the catcher or the dugout interchangeable or exclusively be the pitch callers (Donahue, 2022). Pitchcom is the creation of two Las Vegas, Nevada illusionists, John Hankin and Craig Fillicetti, who first shared their technology to Major League Baseball in 2020 (Pitchcom, 2025). First deployed at the major league level in 2022, Pitchcom represented a decisive institutionalization of encrypted digital communication within live gameplay, a direct organizational response to the demonstrated vulnerabilities of the analog era. The device was first used in minor league baseball, and now it proliferates in collegiate play, on the softball fields at all levels, and even at the amateur levels for recreational and travel ball (Shipman, 2026). Competing technologies such as GoRout Diamond are becoming commonplace on amateur, high school, and collegiate baseball and softball fields (Shipman, 2026).

This systematic literature review addresses the empirical gap in existing scholarship by examining the rapid on-field institutionalization of encrypted edge-signaling hardware, specifically the Pitchcom system within modern professional, collegiate, and amateur diamond sports environments, situating this technological transition within the broader sociotechnical evolution of baseball as an information-intensive enterprise.

To provide a structured and transparent analysis of this edge technology and its impact on diamond sports, this systematic literature review is guided by a central primary research question:

RQ: What themes emerge within contemporary academic literature regarding the deployment, technical infrastructure, and multi-tier organizational impacts of end-to-end encrypted electronic signaling technology, Pitchcom, within the modern diamond sport ecosystem?

Methodology

This rapid institutionalization of live technology tools creates a unique operational environment where human expertise must continuously collaborate with, adjust to, and navigate automated systems in high-pressure, real-time scenarios. While a massive body of academic literature exists regarding the predictive power of baseball data for scouting and roster construction, there is a clear scholarly gap concerning the operational, behavioral, and structural impacts of communication technology explicitly deployed during live gameplay. To construct a repeatable, transparent, and rigorous review of contemporary academic landscape of sports research, this study adhered to operational parameters mandated by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework (Page et al., 2022). As outlined in Page et al., a rigid, four-phase protocol (Identification, Screening, Eligibility, and Inclusion) was established so the methodology strictly eliminated arbitrary study selection and focused entirely on the specified research question. Literature was systematically extracted from comprehensive cross-discipline research databases including Google Scholar and Galileo. To isolate relevant studies exploring the intersection of diamond sports and electronic real-time communication infrastructures, a formal search strategy was executed across Google Scholar and the GALILEO meta-database platform. The exact Boolean search string utilized was structured as follows: ("Pitchcom" OR "electronic signaling" OR "digital signaling") AND ("baseball" OR "softball" OR "diamond sports") AND ("operational efficiency" OR "information guidance" OR "data security" OR "encrypted communications"). Bibliographic filters were strictly restricted to English-language results, a publication window of 2017–2026, and a geographic focus on the United States. To ensure full reproducibility in alignment with PRISMA standards, the screening workflow proceeded through a rigorous four-tier dropdown, moving from initial keyword identification (n = 198,365) to final full-text evaluation, resulting in a finalized peer-reviewed systematic corpus (n = 14).

To anchor academic findings in real-world application, the primary literature search was augmented by a targeted secondary screening. This step integrated professional media and empirical field data, specifically utilizing coach and player commentary, news articles, and televised technical demonstrations from professional broadcasting networks. This methodological expansion allowed for vital information not yet available in formal journal settings. Articles and content focused purely on off-field financial marketing or high-level merchandising promotions were explicitly excused to preserve a strict focus on the Pitchcom system, its usage, its information security, and related operational workflows in diamond sports. This methodological expansion was necessary to extract the precise physical form-factors, component configurations, and tactile interface layouts of the hardware, which are frequently omitted from high-level sports medicine or macro-level economic reviews but remain vital to a complete systems analysis of this technology and its integration into the sport.

To explicitly bound the scope of the study around "accepted and in-use" technology, strict boundaries were established. Inclusion Criteria: (1) Peer-reviewed journal articles, conference proceedings, or book chapters published between 2017 and 2026 were included in the review; (2) Studies evaluating technologies centrally regulated and universally provided by Major League Baseball (MLB) to ensure competitive parity were reviewed; (3) Research explicitly focusing on the operational, behavioral, or strategic impacts of technology tools during live regular-season or championship game play.

Inclusion and Exclusion Criteria: (1) Journalistic-style articles in for-profit platforms, or non-peer-reviewed blog posts were not considered initially; however the lack of empirical research in this area resulted in the need to utilize journalistic and non-peer reviewed articles in this review; (2) Literature examining off-field predictive statistics, fantasy sports modeling, or retrospective front-office sabermetrics were not considered; (3) Studies evaluating individual, un-sanctioned training wearables (e.g., Blast Motion bat sensors, Motus/Driveline biomechanical sleeves, or StatSports GPS vests) legally barred from regular-season game transmission under collective bargaining agreements were not considered. Journalistic-style articles, for-profit media platforms, and industry materials were excluded from the primary formal review corpus analyzed for academic themes; however, they were retained as a secondary grey literature corpus explicitly bound to real-world implementation context, physical form-factor analysis, and market deployment timelines.

The systematic search of databases yielded an initial pool of 198,365 records related to diamond sports, including baseball, softball, cricket, and rounders. Records were then filtered to include only peer-reviewed sources, reducing the pool to 179,328 articles. Subsequent screening limited results to publications from the past five years ($n = 29,682$), English-language sources ($n = 29,164$), and studies with a specific focus on the United States ($n = 177$). A final topical screening identified 22 records exclusively addressing the study's subject matter, which were then assessed for full-text eligibility. Of those 22, eight were excluded due to the unavailability of full-text versions, yielding a final corpus of 14 peer-reviewed, full-text articles included in this systematic literature review. To preserve strict empirical validity while addressing an emerging technology, this study utilizes a dual-tier framework. The primary review corpus ($n = 14$) consists exclusively of peer-reviewed academic literature and filed patent documentation, serving as the sole basis for the thematic synthesis. Concurrently, a supplementary grey literature corpus—consisting of validated sports journalism, professional broadcast demonstrations, and industry data—was integrated exclusively to provide essential technical specifications (e.g., the 915 MHz frequency architecture) and institutional context omitted by the lack of peer-reviewed materials.

This work is grounded in the foundational work of Smith and Humphries (2017) which declared objects, including wearable and transmittable technologies, are fundamental to the game process and the interaction with those tools cannot be separated from the play and processes of the sport. This is rooted in sociomateriality theory espoused by Orlikowski (2007). As noted in the sociomateriality framework, the technology is intertwined with human actions, so these are as one mandating processes, regulations, and accepted protocols based on human use of the technology. In fact, those processes, when mandated by the regulations of the game or diamond sport, are infused in the fundamental actions, reactions, and outcomes of the games despite the inanimate nature of the objects. In this case, Pitchcom, a widely adopted technology was introduced in Major League Baseball in 2022, and it has become a fundamental part of play at all levels with a signed contract with MLB through 2031 and contracts with collegiate teams at softball and baseball (Pitchcom, 2025). Due to the contemporary nature of electronic signaling mandates, direct empirical literature is emerging; therefore, this study synthesizes early operational data with established socio-technical frameworks from information systems and established diamond sports governance in the American play of fields at the professional, collegiate, and amateur levels.

Results/Findings

The systematic analysis indicates Pitchcom exemplifies edge computing architecture within sports IT infrastructures by decentralizing data processing and moving command execution directly to the field of play (Pitchcom, 2025). By utilizing a localized, encrypted radio frequency mesh network among on-field physical nodes (the catcher's transmitter and the pitcher/fielder receivers), the system completely bypasses cloud latency and external network vulnerabilities. This localized processing ensures the data transaction, the pitch signal, is generated, transmitted, and decrypted entirely at the network edge within milliseconds. This is edge computing technology as another technology type could have been institutionalized in Major League Baseball which would have been cloud-based or more traditionally network bound (Buchanan, 2021).

Additionally, the systematic analysis of literature showcases edge technologies such as Pitchcom change the baseball game experience for the individual player (Ranhawa, 2023). At the individual level, the implementation of Pitchcom shifts the human-technology interaction from visual-spatial decoding to auditory cognitive processing. Rather than mentally cross-referencing complex visual finger sequences against dynamic sign-stealing matrices, athletes receive direct, synthesized audio outputs. This dramatic reduction in cognitive friction optimizes working memory capacity under high-stress conditions, allowing the athlete to reallocate mental resources toward mechanical execution rather than data decryption (Spackman et al., 2023)

Finally, the analysis shows individual cognitive adjustments, this human-technology integration drives systemic changes across macro-level organizational operations (Smith & Humphries, 2017). Institutionally, Pitchcom re-engineers the operational velocity of the game, formalizing pace-of-play mandates into technical constraints. Structurally, it redefines team governance and the tactical decision-making workflow: command structures become flat as multiple defensive nodes receive identical, instantaneous data simultaneously. Batters have less time to adjust, and the defensive advantage goes to the pitcher and catcher as the process for batter to ball interaction changes fundamentally with this technology in place (Pitchcom, 2025). Furthermore, by structurally eliminating the systemic vulnerability of sign-stealing, the organization effectively mitigates corporate-level strategic risk, shifting the competitive paradigm from information security to pure execution speed and professionalism in executing the fundamental operations of the game which are hitting, catching, running, and pitching (Buchanan, 2021).

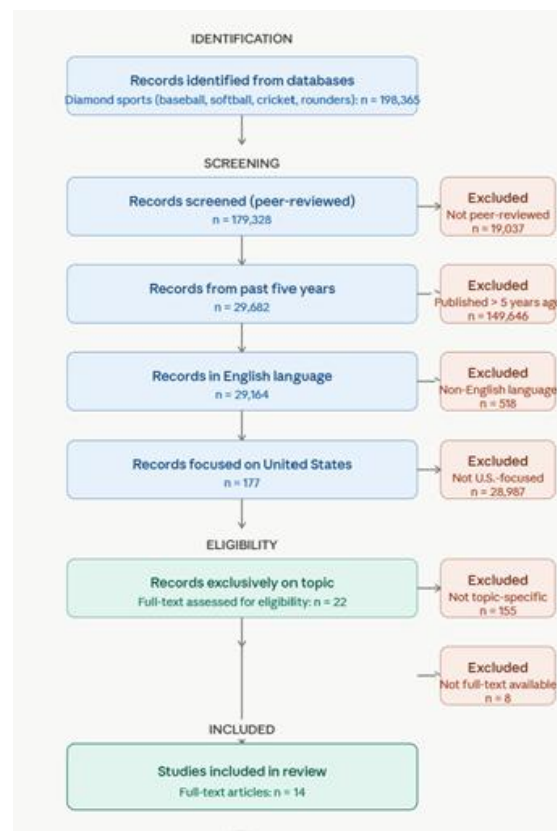


Figure 1: PRISMA Diagram

Three themes emerged from the literature. These three themes show a convergence of technology and baseball traditions.

Theme 1: Network security, sign protection, and corporate compliance governance

The primary baseline vulnerability driving the rapid, universal adoption of Pitchcom across professional sports environment was the systemic security liability inherent in traditional passing of signals visually. For over a century, baseball insiders accommodated traditional, unassisted sign-stealing tactics (Carroll, 2022). For instance, the base runner on second base could easily see the catcher's finger placements and gestures to the batter. That action series was an accepted form of traditional play, an informal, acknowledged element of the game's institutional culture (Beck, 2024). However, the Houston Astros 2017 team which utilized closed-circuit television and made noises using trash cans to indicate an upcoming pitch to the batter was a new level of cheating or one that came to light in the age of digital surveillance (Brandt, 2021). The Houston Astros organization surreptitiously placed a closed-circuit camera zooming in on the opposing team's catcher's hand signs. The closed-circuit footage was then broadcast to a receiving monitor, which was viewable by players. The players then shared the upcoming pitch information via a series of sounds made on trash cans in the dugout. For instance, no bang on the trash can meant an off-speed or slow pitch was coming. A bang on the trash can indicated the next pitch would be a fastball (Donahue, 2022). The teamwide conspiracy was reported in 2019 by former pitcher, Mike Fiers, and an MLB formal investigation was conducted (Hartman & Woods, 2021). Despite this teamwide effort, no individuals were punished, and the franchise was hit with MLB's maximum allowed fine of \$5 million dollars (Downs et al., 2025). The team also had to forfeit top draft picks for two years, and both manager A.J. Hinch and general manager Jeff Luhnow were suspended and subsequently fired (Parlow, 2024). The public exposure of technology-assisted sign-stealing networks, most notably exemplified by the Houston

Astros franchise-wide initiative in the 2016-2017 regular game series, the 2017 playoffs, and the 2017 World Series, directly exposed the volatile boundaries separating standard information systems optimization, knowledge of what pitch was coming next by an opposing team member on a base, versus active data misappropriation by an entire team's involvement. This severely threatened the competitive equity of the multi-million dollar sports industry (Spackman et al., 2023).

Despite the investigation's results and other investigations denoting sign stealing (Downs et al., 2025), visual pitching signs present an extraordinary legal paradox. Legal scholars such as Donahue (2022) note because traditional pitch calling involves the catcher required to display finger signals or other maneuvers such as mask adjustment in plain sight of fans and broadcasters, sports franchises are not structurally able to protect signs as assets under trade secrets or legal frameworks. Open exposure in a public forum like a sports stadium implies a waiver of confidentiality and permits acquisition via proper means, if the proper means are outlined in the sport's rules (Tarver, 2023). However, when a team installs hidden centerfield camera feeds, routes live video footage into a private monitor, and uses a decoding communication system (though it was traditional), then this directly crossed the threshold of improper means (Donahue, 2022). The breakdown demonstrated when deceptive technological practices are used, these compromise organizational integrity which can erode public trust, fan engagement, consumer broadcast revenue, and the legal authority of the sport's private governing body (Vanwersch et al., 2022).

In its first reactionary effort, Major League Baseball's governing authority enacted immediate, top-down technical and regulatory compliance interventions. The league's initial regulatory effort focused on compliance (Brandt 2021). They banned all non-broadcast outfield cameras from foul pole to foul pole, and they forced all clubhouse television feeds to a mandatory eight-second delay (Karfinkel, 2023). All clubs were required to submit verified architectural maps of their in-house stadium wiring. Two years later, when approached by John Hankin and Craig Fillicetti, MLB governing authority introduced Pitchcom which was rapidly brought into the minor leagues for testing (Pitchcom, 2025). By replacing public hand signals with encrypted radio packets transmitted directly to on-field receivers, the Pitchcom technology eliminated the need for visible data stream of traditional finger signals almost immediately (Downs et al., 2025). In addition to provide audio connections for the pitcher and catcher, the system can have up to five outfield players receiving the calls as well. Dugout officials can also listen to the calls. The system can be programmed so the dugout calls the pitches as well (Shipman, 2026). Therefore, MLB declared they were successfully mitigating the threat of electronic intercept or interference while preserving equity across the franchises with a single edge-based technology adoption (MLB Network, 2022). In 2023, the league expanded pitcher autonomy by providing the pitcher with his own Pitchcom wearable unit (Ranhawa, 2023). To introduce the technology, MLB made it optional in the major leagues and used it as compliance protocol in the minors. With the addition of the equipment, for various players on the field and officials in the dugout the interaction between pitches changed dramatically, and players generally received the technology well (MLB Network, 2022).

Each of these measures, the reaction of policing closed-circuit, in-stadium game footage capture and the introduction of Pitchcom showed MLB's efforts to create a compliance atmosphere while shuttering the century old tradition of the pitcher casting fingers between legs to show only the pitcher what the next pitch should be (Spackman et al., 2023). Additionally, MLB chose a technology which is not wifi-based nor is it Bluetooth enabled. The technology runs on a classic 915 MHz range of technology which enables the team to operate without need of internet connection and without the need for ongoing authentication (Buchanan, 2021).

Theme 2: Operational efficiency, cognitive offloading, and edge-driven pacing

Beyond resolving traditional security liabilities inherent to the diamond sport since its inception, the integration of Pitchcom, or automated edge signaling fundamentally restructures the human cognitive interactions in the game (Toto, 2022). Pitchcom, as noted by commentators on MLB Network in 2022, sped up the game, an effort owners and broadcasts have attempted to do to bring in more fans based on pacing engagement optimization (MLB Network, 2022). Prior to the introduction of edge technology play calling like Pitchcom, pitchers and catchers as well as their coaches were tasked with cultivating, memorizing, and sustaining elaborate sign algorithms using body language and hand and finger signals (Yue et al., 2025). These sign systems, in addition to managing their roles in the games, required players to maintain memories of elaborate play systems. Many catchers had large, text-dense wristband written matrices containing randomized, grid-based multi-digit number keys. At the pitcher's mound, the pitcher not only had to understand the visual cues, but he had to agree to the visual cue to be the best one for him to throw based on his athletic state and his ability to follow through in timing and skill (Mizels et al., 2022). To communicate a single pitch, a catcher had to look down at his arm, parse a complex grid to locate the active code and then share finger motions. This meant significant operational delay, friction between teammates, and cognitive demands (Migliaccio et al., 2024; Passmore & Woodward, 2023).

Transitioning to Pitchcom meant automated tactile keypad usage could drastically reduce “between pitch” delays as the pitcher could receive a voice notification of the next pitch being called before he returns to the mound (MLB Network, 2022). The almost instantaneous conversion of the digital pitch command into direct auditory instruction which could also be heard by the team's outfielders and coaching staff meant the team played more seamlessly since they all were given notification of what the next pitch would be, and the team could anticipate the defensive needs (Shipman, 2026). This rapid data transmission directly drives efficiencies by allowing defensive players to maximize control over the field environment. For instance, the players on the field can move in or out in anticipation of the next type of pitch, and the pitcher can reset for a pitch eliminating time the batter might have used to figure out the next pitch (Buchanan, 2021; Shipman, 2026).

Pitchcom operates in an on-field infrastructure which is a closed-loop, localized wireless personal area network completely bypassing with no need for public cellular infrastructure or traditional networking (Pitchcom, 2025). By creating and sustaining its own network, Pitchcom eliminates possible latency and external intercept vulnerabilities (Joyce, 2025). The system, because of the frequency that it uses, the 915 MHz frequency spectrum, does not require special radio frequency licensing or usage notification (Hankin & Fillicetti, 2025). Despite being a “classic” frequency, this frequency is superior for transmission in dense physical obstructions like weather or wet clay pitching mounds, thick catcher armor, or other possible impediments (Hankin & Fillicetti, 2025; Pitchcom, 2025).

Pitchcom, according to its patent, engages cryptographic block packet structure which is encrypted using the Advanced Encryption Standard (AES-128). This indicates, according to the filed patent, an unauthorized sensor cannot interpret the data even if intercepted due to neutralization that happens through the end-to-end encryption process (Hankin & Fillicetti, 2025). Through its transmitter edge device and a low-profile receiver node, the pitches are called using buttons which are then translated into pronouncements in the receivers in the ball caps near the ears of the players (Buchanan, 2021). The raised physical buttons correspond to pre-mapped pitch types programmed before a game or even modified during a game by authorized personnel (Buchanan, 2021). This technology, according to the inventors, is used for easy access in sunny or rainy weather (Hankin & Fillicetti, 2025). The inventors, in their patent, denote this protects proprietary team strategy while allow for “just in time” communications (Hankin & Fillicetti, 2025). Users have noted the Pitchcom system transmissions could be improved as some data packet loss, and transmission delays happen when the edge interface is used in stadiums in which there are other digital

devices crowding RF signals making for degradation (Shipman, 2026). Users also share the mechanical environmental stress can be severe for the Pitchcom system (Judge & Moore, 2025). Sweat, rain, dirt, and mud are all possible contaminants of polymer housing resulting in degraded responsiveness and transmission execution (Shipman, 2026).

Coaches denote Pitchcom's system's ability to speed play, but the system also creates a new system of autonomy for both catchers, pitchers, and dugout play callers. By sharing the duties with others, the MLB catcher has a "cognitive offload" which is not the norm in baseball of traditional play (Judge & Moore, 2025). This aligns with Madsen & Glebova's (2025) declaration sport is changing so technology works in tandem with human decision making. In edge-based technology, the orchestration of the next play is a more automated and more automatic process.

Theme 3: Subsystem adaptation and multi-tier organizational utilization

The operational diffusion of Pitchcom in amateur settings, collegiate play, and minor leagues reveals a trajectory of use of the edge technology, Pitchcom, as a teaching tool set in addition to being an operational supporting tool (Shipman, 2026). At the elite professional level of Major League Baseball, Pitchcom was deployed to react to a communication need while also benefiting the pace of the game (Buchanan, 2021). At the NCAA level, the National Collegiate Athletic Association and various international, junior, and amateur sports authorized the technology to resolve operational strains and improve proficiency and efficiency (Seckin et al., 2023). In these leagues, pitch timer mandates are often more strict than professional ball, the players are using the edge technology to meet the timing demands, and the coaches are using the tool to encourage pitchers to try different pitches or utilize the most effective pitches versus the most comfortable pitches for pitchers (Shipman, 2026). In contrast to the professional league setting in which the catcher and the pitcher work together to call and execute the plays, collegiate and youth environments are heavily top-down, centralized dugout workflow environments with the coaches calling the plays (Shipman, 2026). Pitchcom can be set up for this easily (Pitchcom, 2025). In these settings, coaching staffs maintain physical control of the Pitchcom transmitter interface, broadcasting specific pitch and defensive tracking sequences which offloads cognitive burden from the catcher and the pitcher so they, along with the outfield, can focus on physical execution and basic mechanics rather than real-time data management through a series of intricate hand motions (Pitchcom, 2025).

Pitchcom has rapidly changed the American diamond sport enterprise. The themes extracted from the literature show the technology has produced sign protection, security, and corporate compliance governance while maintaining and even improving operational efficiencies. By being edge-driven, the technology provides allowance for shared governance of the game operations, and cognitive offloading is happening as catchers are no longer memorizing intricate play calling patterns. These rapid adoptions suggest a projected shift in the sub-systemic structures of youth and amateur diamond sports. While empirical long-term data remains constrained by the technology's infancy, this deployment points to a future paradigm where a new generation of athletes may enter professional ecosystems having trained exclusively under electronic signaling regimes. Consequently, this posits a critical horizon for future inquiry regarding how the structural acceleration of gameplay alters early-stage player development and tactical autonomy. This rapid technological shift extends far beyond simple operational adjustments; it fundamentally alters the strategic autonomy of the pitcher-catcher relationship, shifts the cognitive dynamics of real-time play-calling, and permanently accelerates the overall structural pace of the game. In addition to taking hand signaling out of the game operations equations, coaches have a new tool set for pitching variability training (Shipman 2026). Utilizing electronic signaling systems for real-time dugout intervention enables coaches to introduce high levels of training variability. Consequently, this allows coaching staff to foster a new generation of players characterized by highly adaptable pitching and catching styles, shifting the battery away from rigid, predictable mechanics toward greater operational versatility.

Discussion

The rapid integration of localized edge-signaling technology like Pitchcom must be understood in the broader trajectory of modern sports, an enterprise steeped in data collection on the game, the players of the game, the coaches, the fans, and the legacy that is American baseball and related diamond sports (Yue et al., 2025). This trajectory demonstrates the transition toward automated process control and a move away from some game traditions like finger signaling of pitching commands and this may change diamond sports in the long-term of American sports. The institutionalization of Pitchcom, first as a reactionary measure, and now as a proactive coaching and game changing tool, brings about a change in the sport (Parlow, 2024). Execution is done as a tactical digital process rather than a performance of ritual in signaling (Buchanan, 2021). With pre-programmed pitches, this means the players may have limited autonomy in some respects. What if a gyroball, a Japanese event special kind of cutting fast ball legal in American baseball is known by the pitcher, but is not programmed as a command in Pitchcom? (Nagami et al., 2013) Will the lack of that play possibility make a difference in the game? Pitchcom, along with the MLB game clock and the ABS strike challenge system, is changing the game (Kamino et al., 2026; MLB Network, 2026). The game is speeding up and finishing quicker. What does this structure of play calling versus the autonomy of the old days mean for the future of baseball? The automation of the athletic workspace with successfully secured data transmission will compress time requirements and replace sign stealing possibilities with more secure game operations (Spackman et al., 2023).

This rapid transition of Pitchcom has been received by most players, coaches, and even fans. Questions remain, and the introduction of this new technology has raised additional questions. Major League Baseball has not answered the critical question of who owns the intellectual property rights of real-time on-field data. Does it belong to the individual athlete who physically generates the metrics or does it belong to the corporate franchise which provided the platform for the generation of the output/actions of the athlete? What about adaptive decision-making opportunities falling outside the rigid baselines of the Pitchcom model? Even with changes implemented in 2023 to allow pitchers to call their own pitches via their personal Pitchcom supplementary device, will a secondary device be enough for game play autonomy? As Ranhawa (2023) reported, this is one of the changes Pitchcom has made based on player input. If the pitcher wants to throw a gyroball, does it have to be programmed in Pitchcom, or will there be a way for him to signal this unique, rare, legal pitch? Some players are not receptive to Pitchcom technology. For instance, Max Scherzer, pitcher of the New York Mets declared “stealing signs is part of the game. For me, I've always taken pride in having a complex system of signs and having that advantage over other pitchers (Ragazzo, 2022).”

Additionally, there is opportunity for enhancement. What are other ways Pitchcom can be used in baseball in alignment with the strategic goals of the sport? Can this edge-based technology serve as a safety tool for coaches and players? Has it been institutionalized as a tool for player health tracking and feedback to be used in tandem with athlete viable monitoring (Migliaccio et al., 2024)? Dugout-mediated signaling technology theoretically introduces a platform for coaching staff to implement dynamic training variability. If supported by future empirical tracking, this intervention could yield a generation of pitchers and catchers optimized for highly diverse tactical styles. However, a competing hypothesis remains: the technology may inadvertently restrict pitch selections to rigid, pre-programmed system baselines, presenting a vital tension that future behavioral research must monitor. This systemic intervention directly enhances the strategic flexibility and stylistic variety of live-game execution, or does it? Could the technology restrict the types of pitches to those standardized as programmed into the edge technology units? Could artificial intelligence be integrated into the unit to predict the next best pitch call based on pitcher and catcher performance as well as batter capabilities and hitting history? In the last several versions of the hardware, the audio transmissions have been enhanced so transmissions can still be heard in high-stakes post-season loud

environments, and coaches have figured out the signals can be used for other means besides play calling, but those special means may or may not be sanctioned or in compliance with the rules of the governing organization (Shipman, 2026). Despite its ability to broadcast pitches in various languages, has the Pitchcom system been vetted or tailored for use for those with hearing disabilities? Extreme ambient noise is no longer an issue as the software and hardware have been advanced, but has the software and hardware been modified for those with no hearing abilities (Hankin & Fillicetti, 2025)? As noted this is not screen-based but button-based technology, so the enhancement of screens could be an improvement for the Pitchcom system. With a contract with MLB through 2031, the technology will be interesting to watch as it evolves in the age of artificial intelligence in sports (Joyce, 2025; Toto, 2022).

Limitations and Future Research

The principal limitation of this systematic review stems from the infancy of the specialized literature base on Pitchcom, the system. Because universally sanctioned on-field electronic signaling hardware was only institutionalized at the Major League Baseball level in 2022, the academic publishing cycle has not yet generated an expansive volume of long-term empirical data regarding the Pitchcom systems multi-year utilization in MLB and other diamond sports. More study needs to be conducted to determine the Pitchcom system's psychological and behavioral impacts on player autonomy, player performance, coaching influence, and other game impacts. More study needs to be conducted to codify fan acceptance and views of this technology. This review concentrated extensively on top-tier American professional and collegiate environments which may limit generalizability to international leagues with distinct and different cultural views or sports governance differences. Additionally, this review did not focus on children's league use of the technology.

Further investigation should focus on the upstream player, the amateur, the child who is being introduced to baseball without traditional pitch signaling via hands. How will the Pitchcom system influence future players and their actions? With a contract extended in 2031, Pitchcom is now entrenched in Major League Baseball, and the technology is expanding with a recent contract signed with the Canadian Football League to provide communication edge technology to that league (Joyce, 2025). Additionally, edge-based technology is being used in the diamond sports, and these units should be investigated (Abeza et al., 2023). Motus pitching sleeves, Blast Motion bat sensors, and StatSports GPS tracking vest along with biometric tracking should be investigated also. Examining how data extracted from these tool sets will be aggregated and how these data sets will follow the player from amateur to collegiate and minors to the majors will be an important study course of future research.

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