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Code review is a process through which a source code is systematically assessed to verify its compliance with specific standards. Such compliance allows the software product to remain with a reduced amount of bugs or flaws (it'll be free of them once in a blue moon) that are many times the result of a slapdash approach by developers. Code review can focus on the software's architecture, functionality and style, but it can also deal with its security. Hence the term secure code review. (Take as implicit the fact that, when here we talk merely about "code review," we refer to the analysis that involves security because a review without considering it ends up being insufficient).Code review is based on coding standards and requirements that, in fact, are what developers should bear in mind from the outset. Errors arising from non-compliance, no matter how small, can take a heavy toll on the organization owning the code and related individuals and entities, especially when criminals exploit them. Today, mainly within the DevSecOps approach, it's recommended that code review be carried out early in the software development cycle (SDLC) before deploying the software into production. The idea is to make this a constant operation so that issues are reported to developers asap and to avoid high costs in the future.Manual code review vs. automatedBoth savvy humans and automated tools can perform code reviews. Currently, there's a whole raft of tools for code review. And although these may vary in their features, such as ease of use, appearance and capabilities, here we make a comparison in general terms. Automated code review is less expensive and can cover much more code in less time than manual review. Indeed, when a reviewer is tasked with reading and reviewing code manually, line by line, they are usually assigned only a particular piece or segment of code. In the case of large products, it would take a lot of time and effort to review all the code manually. So, this form of review generally has less scope than that performed by intelligent machines, but, as we'll see, it's an indispensable procedure given the limitations of the tools.Automated tools have a database of predefined standards and requirements for compliance review and error detection. Organizations that purchase the tools can configure them to follow specific rules and ignore others and to work according to one or more specific programming languages. The point is that whatever is outside the predefined capabilities of the tool escapes its detection radar. Additionally, not everything a tool reports truly represents an issue or flaw in the code. We refer to these last two hurdles as false negatives (omissions) and false positives (lies), respectively. Preventing these from being present when making code review reports is then in the hands of the experts and their manual work.One of the biggest shortcomings of code review tools is their inability to detect so-called business logic flaws. Automated tools do not understand the human intentions and business logic behind a particular system. Business logic refers to the part of the software that codifies business rules that determine processes such as data creation, modification and storage. Business logic describes multiple series of activities or steps in which relationships are established between the end user interface and the database. More often than not, business logic flaws are peculiar to the application in question and its functionality. They are miscellaneous and do not follow defined or similar risk patterns for all cases. Moreover, they are not located in a specific line of code but involve several areas of the overall architecture.The business rules dictate the software's responses or reactions (e.g., prevention actions) to the different possible scenarios. Vulnerabilities in business logic often mean the inability of the software to detect and correctly handle some scenarios, certain strange or unexpected user behaviors that the developers didn't take into account or anticipate. That's where attackers capitalize on their cunning. For example, let's say the logic in a money transfer application is not restricting user input according to what might have been determined in the business rules. Instead, it allows the entry of negative values, which may lead to an unforeseen procedure such as, let's imagine something, extracting money from, rather than depositing it to, the supposed recipient of the transfer. These types of vulnerabilities are often rated with very high severity because of the potential impacts of their exploitation. It is a task of the manual code review to detect and report these enormously dangerous security issues.Nevertheless, on balance, rather than considering substituting or replacing one method with the other, we should speak of complementation. Ideally, we should use both methods, not just one. The automated code review, with its scope and speed, allows the time and effort invested in manual code review to be reduced. It enables the expert to concentrate on pieces of code that may have more complex and severe vulnerabilities than those the machine can identify. Unfortunately, there are many who, in their ignorance, continue to believe that one or more automated tools running in their organizations is good enough. They have not heeded comments like those made in communities such as OWASP: "manual code review should be a component of a company's secure lifecycle, as in many cases it is as good, or better, than other methods of detecting security issues."Zeroed in on manual code reviewWho can perform manual code review?The manual code review can be carried out by colleagues of the developers, senior engineers or other professionals, including external providers such as Fluid Attacks with its Secure Code Review. The people in charge of a thorough code review should have extensive knowledge of software development, programming languages, secure coding practices, security standards, requirements and vulnerabilities, among other things. They should be able to think and act like threat actors and have the virtue of patience and vast review experience. However, some reviewers may be just beginning to gain experience and should not be excluded but may simply be assisted by other, more seasoned individuals. This decision, in any case, may vary according to the needs and characteristics of the code of the organization requesting the service. Keep in mind, as it's commented in the OWASP Code Review Guide, for instance, that "a new single sign-on authentication module in a multi-billion dollar company will not be secure code reviewed by a person who once read an article on secure coding."How to do manual code review?It's always recommended that a single person doesn't do a manual code review. What initially escaped the developer's eyes, in some cases, may also elude the reviewer's eyes. Although with the inclusion of a second individual, the same thing can also happen, the probabilities would certainly be reduced. Additionally, work performed by several individuals promotes the creation of a collaborative environment between the members of the development and review teams. Cooperation can occur when the reviewer is not seen as a patrolman but as an advisor that positively affects the efficiency of the developers with relevant feedback. Reviewers should ask developers to send small code changes to them for a better workflow. And they can do reviews in environments isolated from those in which the developers may be working so they don't act as obstacles.To conduct comprehensive and effective reviews, experts must be in context, knowing what they are assessing. They must learn about and broadly understand the software's functions, purposes and features to be evaluated, including the programming languages and libraries and other components used and their interactions. From there, reviewers should ask questions such as what might happen if some operation of the code fails. They must know what types of users are allowed and which are their privileges. They must understand what kinds of data are being processed and in what way and ask what would happen if they were compromised. In addition, they must model potential threats, in part recognizing threat agents and their possible purposes, and, depending on the type of software, anticipate what security vulnerabilities they may find.The amount of information to be gathered in a code review will depend on the organization's size, the reviewers' skills and the potential risks of the code. A good way to start this collection may be to establish contact and conversation with the application developers to receive at least some basic information. Automated tools also come into play to provide general data before the manual review is implemented on specific areas of the code (prioritized, for example, by risk) to assess style, interpretation and security. Tools such as linters can even be used in advance by developers to get support in identifying simple formatting errors such as typos.In the code review, keeping as support and guide the standards set or requested by the organization, including, of course, the business rules, the reviewers will first learn about the architecture and style of the code and hence its errors. Concerning the standards, the reviewers can handle checklists of security requirements adapted to the software design that cannot be overlooked, such as the following: input validation, authentication and password management, access control and session management, cryptography and data protection, error handling and logging, system configuration and control, among others. The reviewers will mark out the attack surface and possible attack vectors, the security controls implemented so far (how well are assets and operations being protected?), the vulnerabilities present, the estimated risks and possible impacts, etc. The categorization and qualification of vulnerabilities are pretty useful as they allow their prioritization for the subsequent remediation by the team of developers.For each error or security issue detected in the code, the reviewers must recommend a modification to comply with the previously defined requirements. If necessary, they establish contact again with the development team to initiate discussions (e.g., about the feasibility of the suggested changes) or to resolve doubts and difficulties. Subsequently, if required, the reviewers propose alternative recommendations or solutions and define exceptions to reach an agreement. After incorporations or modifications by developers, a new review may take place to verify that they took suggestions on board and that their product is now of better quality and security.Code review with Fluid AttacksAt Fluid Attacks, we offer you our Secure Code Review (for more details, read this post), with automated and manual code review, within an integral service called Continuous Hacking. This service is not limited to static application security testing and software composition analysis. Beyond the intervention of our automated tools (we invite you to use them for 21 days for free), which also perform dynamic application security testing, we employ methods such as manual penetration testing and reverse engineering with our highly certified ethical hackers. For more information on how we can help you prevent your organization from falling victim to cyberattacks, do not hesitate to contact us.In a Manual Code Review (MCR), the source code is read line by line to check for possible vulnerabilities. This involves a lot of skills, experience, and patience. The issues or errors discovered in this review will greatly help to increase the efficiency of the firm.With an Automated Code Review (ACR), there is a set of predefined rules that are determined for the code to comply with. Software tools provide assistance in ACR that displays a list of warnings that are in violation of programming standards.So how to decide which works best for you? Heres a comparison that we thought would help you make this decision.Differences Between Manual & Automated Code Review1) Time:MCR Because the user reads every single line of the code, it is easy to gather the intentions of the developer. But even if that is the strength, it takes a lot of time to look and read these codes line by line.ACR No wonders its fast! Automation software can read thousands of lines of code very swiftly. But these lack the skills of identifying the business logic and the intentions of the developer.2) Examination:MCR This method is very useful in crossing the rarely visited code paths. Few techniques such as penetration testing examine paths that have inputs fed, but lesser-traveled paths or hidden paths can be missed. But a rigorous manual code review is better in identifying these paths that are misunderstood by automated tools.ACR These intentionally hidden paths can also be easily explored by automation tools that are much more sophisticated but the automated code review can miss the intentions behind these.3) Subtle Mistakes:MCR Because the reviews are done by reviewers on an individual basis, it is very possible that the human eye can miss a few vulnerabilities that are related to integration or other isolated problem.ACR These mistakes and small errors that are missed in manual reviewing are easily caught by automated systems. However, this automation cannot go beyond a particular limit of reviewing which can be done by manual code review.4) Costs:MCR Having trained and skilled engineers to handle an efficient manual code review comes attached to its obvious costs. It takes years of experience before a reviewer is able to adequately able to manage reviews.ACR It isnt necessary for reviewers to have the entire knowledge and skills of reviewing. The automation software is programmed to issue warnings of potential errors.Conclusion:Both these methods of review have their own pros and cons. Thus we understand the difficulty in choosing which one to go ahead with. Generally, the trend is now shifting towards automated code review because of time, cost and effort but still, many companies prefer to have a human touch to it. Ensuring our code is secure is a critical part of protecting our applications and we should strive to build applications that are both secure by design and in practice. Many organizations use different approaches to achieve this. Today were going to take a look at the differences between SAST and manual code review and some of the pros and cons surrounding both approaches. Manual Code ReviewManual code review is the process of inspecting source code line by line to identify potential security vulnerabilities, coding errors, and other issues. It sounds like a lot of effort but in reality, many agile development teams carry out code review on commit, and therefore were not evaluating large code-bases at any one time. Pros of Manual Code ReviewIn-Depth Understanding: Manual code review allows the reviewer to gain a deep understanding of the code and its inner workings. This is particularly useful in identifying complex vulnerabilities that automated tools may not detect. Reviewers are also able to analyze the context and logic behind the code, which can lead to more accurate assessments of potential security risks.Customized Solutions: When a vulnerability is identified during a manual code review, developers can work together to create tailored solutions that fit the specific needs of the application. This collaborative approach can result in more robust and effective fixes compared to those offered by automated tools.Identification of Weaknesses: We dont always find critical vulnerabilities when reading code, but there may be particular practices or coding patterns that could lead to a vulnerability in the future.Training: Manual code review provides an excellent opportunity for developers to learn from one another, share knowledge about secure coding practices, and improve their skills. This ongoing education can lead to better overall code security and a stronger development team.Cons of Manual Code ReviewTime-Consuming: One of the biggest drawbacks of manual code review is the time it takes to review the code.Subjectivity: Manual code review can be subjective, as it relies on the expertise and experience of the reviewer. This can lead to inconsistencies..Scalability: Manual code review is not easily scalable, as it requires a significant amount of human resources. This can be a challenge for organizations with limited resources or rapidly growing codebases. Static Application Security Testing (SAST) scanners are automated tools that analyze source code to identify potential security vulnerabilities. These tools use predefined rules and heuristics to scan for common security issues. Pros of Automated ScanningSpeed and Efficiency: SAST scanners can quickly scan large volumes of code, making them much faster and more efficient than manual code reviews. For organizations with large codebases or tight deadlines this could be a deciding factor.Consistency: Automated tools like SAST scanners are designed to be consistent in their results. This means that, unlike manual code reviews, they do not suffer from subjectivity or inconsistencies based on the reviewers knowledge or experience.Coverage: SAST scanners can analyze every line of code in an application, this can also extend to third party libraries and dependencies that would usually be out of scope for manual code review. Cons of Automated ScanningFalse Positives: Automated tools like SAST scanners are prone to producing false positives, which can lead to wasted time and effort in fixing non-existent vulnerabilities.Lack of Context: SAST scanners are only able to analyze the code itself and cannot take into account the context or logic behind it. This means that they may miss complex vulnerabilities that require an understanding of the applications inner workings.Limited Scope: SAST scanners can only detect vulnerabilities that are already known to the tool. This means that they may miss new or unknown vulnerabilities that have not been added to the tools database. ConclusionWhile manual code review allows for a deep understanding of the code and the ability to create tailored solutions, it can be time-consuming, subjective, and not easily scalable. On the other hand, SAST scanners are faster, more consistent, and have a more comprehensive scope, but they may produce false positives, lack context, and have a limited scope.Ultimately, the best approach to code security is a combination of both manual and automated tools, leveraging the strengths of each to create a more robust and secure application. If this is impossible for your organization due to budget, time, other constraints then consider which approach would yield the highest return on investment. Alex is a Web Application Security specialist with experience working across multiple sectors, from single-developer applications all the way up to enterprise web apps with tens of millions of users. He enjoys building applications almost as much as breaking them and has spent many years supporting the shift-left movement by teaching developers, infrastructure engineers, architects, and anyone who would listen about cybersecurity. He created many of the web hacking courses in TCM Security Academy, as well as the PWPA and PWPP certifications.Alex holds a Masters Degree in Computing, as well as the PNPT, CEH, and OSCP certifications. TCM Security is a veteran-owned, cybersecurity services and education company founded inCharlotte, NC. Our services division has the mission of protecting people, sensitive data, and systems. With decades of combined experience, thousands of hours of practice, and core values from our time in service, we use our skill set to secure your environment. The TCM Security Academy is an educational platform dedicated to providing affordable, top-notch cybersecurity training to our individual students and corporate clients including both self-paced and instructor-led online courses as well as custom training solutions. We also provide several vendor-agnostic, practical hands-on certification exams to ensure proven job-ready skills to prospective employers.Pentest Services: Us:Blog|LinkedIn|YouTube|Twitter|Facebook|InstagramContact Us: Lets talk about how TCM Security can solve your cybersecurity needs. Give us a call, send us an e-mail, or fill out the contact form below to get started. tel: (877) 771-8911 | email: Try GraphiteCode reviews are a critical component of modern software development, serving as a quality gate and a collaborative learning opportunity. With the advent of AI-driven tools, teams now have access to automated code review solutions that promise speed and consistency. However, the human touch in manual code reviews remains invaluable for nuanced understanding and mentorship. This article looks into the pros and cons of both approaches and illustrates how combining them can lead to optimal results, highlighting tools like Diamond and Graphite that facilitate this integration.Comparing automated and manual code reviewsCode reviews generally fall into two categories: automated and manual. Automated code reviews leverage tools and algorithms to analyze code against predefined rules, while manual reviews involve human developers examining code line by line. Each approach brings unique advantages to the table. Here is a comparison of automated and manual code reviews side-by-side:AspectAutomated code reviewManual code reviewSpeedRapid analysis of code changes, providing immediate feedbackSlower process, dependent on reviewer availability and workloadConsistencyUniform application of predefined rules and checksSubject to individual reviewer's knowledge and attention to detailScope of analysisExcels at detecting syntax errors, code style violations, and known security issuesAdept at understanding business logic, architectural decisions, and code readabilityLearning opportunityLimited educational value for developersFosters knowledge sharing and mentorship among team membersFalse positivesMay generate irrelevant or low-priority warningsBetter at discerning the significance of issues within contextScalabilityEasily scales with codebase size and team growthScalability can be challenging due to reliance on human resourcesThe case for automated code reviewsAutomated code review tools have evolved significantly in recent years. They can now detect a wide range of issues, and understanding how AI code review works can help teams leverage them effectively:Syntax errors and code style violations: Ensuring consistency across the codebase.Security vulnerabilities: Identifying potential security risks like SQL injection, XSS, etc.Performance bottlenecks: Flagging inefficient code patterns.Code duplication: Detecting repeated code that could be refactored.Complexity metrics: Highlighting overly complex functions or classes.The advantages of automation are compelling:Consistency: Rules are applied uniformly across the entire codebase.Speed: Analysis can be performed in seconds rather than hours.Integration with CI/CD: Issues can be caught early in the development process.Objectivity: Feedback is based on predefined rules rather than personal preferences.However, automated tools can't understand context or business requirements, sometimes leading to false positives or missing subtle logical errors.The enduring value of manual code reviewsDespite advances in automation, manual code reviews remain irreplaceable for several reasons:Business logic validation: Humans understand requirements and can verify that code actually solves the intended problem.Architectural considerations: Experienced developers can identify design flaws that automated tools might miss.Knowledge transfer: Reviews create opportunities for mentoring and sharing best practices.Nuanced improvements: Humans can suggest more readable or maintainable approaches beyond what tools can detect.Contextual understanding: Reviewers consider the broader system impact of changes.The human element brings critical judgment and creativity that automation simply cannot replicate.Finding the optimal balanceThe most effective code review strategy combines both approaches, leveraging the strengths of each while mitigating their weaknesses. Learning how to use AI for code reviews effectively is key to this balance. Here's how to implement a balanced approach:1. Establish a multi-layered review processStart with automated tools to catch obvious issues before human reviewers get involved. Tools like Diamond or Graphite can automatically identify syntax errors, style violations, and potential bugs, allowing human reviewers to focus on higher-level concerns.2. Define clear roles for each layerAutomated review: Style consistency, basic error detection, security scanning, performance metricsManual review: Architecture assessment, business logic validation, readability, maintainability3. Use automation to guide manual reviewsTools like Diamond can highlight potential issues for human reviewers to investigate further, making manual reviews more efficient and focused. This collaboration between automated tools and human judgment creates a more thorough review process. For more on this, see our guide on integrating AI into your code review workflow.4. Choose the right toolsSelect automated code review tools that integrate seamlessly with your workflow. Graphite, for example, offers powerful automation while preserving the collaborative nature of code reviews, making it easier to implement a balanced approach. Understanding the landscape of open-source vs paid AI code review tools can also inform this decision.5. Adjust the balance based on project phaseEarly development: Heavier emphasis on manual reviews to establish patterns and conventionsMature codebase: Greater reliance on automation with targeted manual reviewsCritical security features: Increased manual scrutiny despite automation coverageImplementing tools for balanced code reviewsModern tools can help bridge the gap between automated and manual reviews. For example:Diamond is an AI-driven tool that provides immediate, context-aware feedback on pull requests. It goes beyond surface-level analysis by understanding the entire codebase, enabling it to catch logic errors, security vulnerabilities, and performance issues. Diamond offers actionable suggestions with one-click fixes, reducing the review cycle time and improving code quality. Its integration with GitHub ensures a seamless workflow for development teams.Graphite complements Diamond by offering a comprehensive platform that streamlines the code review process. It introduces features like stacked pull requests, allowing developers to manage and review smaller, incremental changes efficiently. Graphite also provides tools for reviewer assignment, merge queues, and insightful analytics, facilitating better collaboration and faster code delivery.Best practices for combined code review approachesAutomate early, review deeply: Run automated checks before manual reviews begin.Customize automated rules: Tailor automated tools to your project's specific needs.Rotate reviewers: Ensure different perspectives in manual reviews.Time-box manual reviews: Keep reviews focused by limiting their duration.Track metrics: Monitor both automated and manual findings to improve your process.Continuous learning: Use insights from manual reviews to improve automated rules.ConclusionBy combining the consistency and efficiency of automation with the insight and creativity of human review, development teams can create a comprehensive review process that catches more issues while making better use of developers' time and expertise. Tools like Diamond and Graphite are making this balanced approach more accessible than ever, allowing teams to implement sophisticated review processes regardless of size or resources. By thoughtfully integrating both automated code review and manual code review practices, teams can achieve the best of both worlds: the efficiency and consistency of automation with the contextual understanding and creative problem-solving of human reviewers. In software development, code reviews are essential for making sure the final product is strong and secure. They help catch potential problems early on, which means fewer bugs slip through to production. But when companies set up their review process, they often wonder: should they stick with experienced developers to review the code manually, or should they use automated tools to speed things up? Code review services play a critical role in helping organizations make the right decision, aligning with their development needs and industry standards. Companies like DevCom provide expert guidance, ensuring that both manual expertise and automation are leveraged effectively to maximize code quality and efficiency. A code review is a systematic analysis of source code before it is merged into a repository or deployed. The goal is to find flaws, enforce best practices, assure code compliance, and enhance overall code maintainability. Code reviews can be conducted using two main approaches: Manual Code Review: Performed by developers or dedicated reviewers who analyze the code for logic, readability, and adherence to best practices. Automated Code Review: Uses specialized tools to scan the code for errors, security vulnerabilities, and deviations from predefined coding standards. Also Read Display Over Other Apps and Fix If Not Available - Possible FixesEach method has various benefits and downsides, thus it is critical to select the appropriate mix based on the projects requirements. Automated code review examines code quality, detects common problems, and enforces best practices without requiring human intervention. These technologies are especially useful in large-scale development environments where consistency and efficiency are essential. Automated tools are designed to perform the following tasks: Syntax Checking: Detects syntax errors and malformed code structures. Static Code Analysis: Identifies security vulnerabilities, unused code, and performance bottlenecks. Code Style Enforcement: Ensures adherence to style guidelines and best practices. Integration with CI/CD Pipelines: Enables real-time feedback and automated compliance verification.Speed and Efficiency: Quickly process large codebases, reducing manual effort. Consistency: Applies uniform standards across all code submissions. Early Issue Detection: Catches common errors before they impact the development process. Scalability: Easily integrates into agile workflows and continuous integration pipelines.Lack of Context Awareness: Automated tools cannot fully understand business logic or intent. False Positives and Negatives: Some errors may be flagged incorrectly, requiring human intervention. Limited Maintainability Insights: Cannot assess code readability or suggest optimal refactoring strategies. Manual code reviews involve developers thoroughly examining the code to ensure it meets quality standards. This process requires expertise, collaboration, and critical thinking. A manual code review typically includes: Logical Validation: Ensuring the code functions as intended and aligns with business objectives. Readability & Maintainability Checks: Evaluating how easily other developers can understand and modify the code. Security Assessments: Identifying vulnerabilities that automated tools might miss. Best Practices Compliance: Enforcing team- or industry-specific coding standards. Also Read The Role of Maid Services in a Busy Lifestyle Deeper Context Understanding: Human reviewers can interpret business logic and intent more accurately than automated tools. Improved Code Maintainability: Developers can provide suggestions for better readability and structure. Knowledge Sharing & Team Collaboration: Encourages learning and development within the team. Better Detection of Complex Issues: Human expertise can identify architectural flaws and inefficient logic that automation may overlook.Time-Consuming: This can slow down development cycles, especially for large projects. Subject to Human Bias: Quality varies depending on the reviewers experience and attention to detail. Scalability Challenges: Reviewing large volumes of code manually may not be feasible in fast-paced environments. When selecting the most suitable code review methodology, teams should consider: Project Size & Complexity: Large-scale projects may benefit more from automation, while smaller or critical applications require manual oversight. Development Speed Requirements: Teams following continuous deployment models may need automation to keep up with rapid iterations. Security Considerations: High-risk applications, such as fintech and healthcare solutions, often require manual security assessments in addition to automated scans. Resource Availability: A balance must be struck between automation efficiency and manual expertise.Large-scale projects requiring rapid code analysis. Ensuring compliance with standardized coding guidelines. Integrating with DevOps pipelines for continuous integration. Reducing manual workload by handling repetitive tasks.Validating business logic and architectural decisions. Reviewing complex algorithms and security-sensitive code. Improving readability and maintainability through peer feedback. Ensuring adherence to best practices beyond syntax checks. A hybrid model that integrates both manual and automated code review processes often delivers the best results. Automated tools can handle repetitive tasks, while manual reviews provide the necessary expertise for complex evaluations. Use Automation for Early Detection: Leverage automated tools for quick bug detection before manual reviews. Implement Peer Reviews: Allow developers to assess each others code for deeper insights. Define Clear Review Guidelines: Establish coding standards to ensure consistency across manual and automated checks. Leverage AI-Driven Analysis: Advanced AI-powered tools can complement manual efforts by identifying patterns and recommending improvements. As a provider of code review services, DevCom offers tailored solutions that integrate automated tools with expert manual reviews. Our approach ensures: Faster detection and resolution of issues. Enhanced security through manual vulnerability assessments. Optimized workflows to balance speed and accuracy. Scalable solutions that fit diverse business needs. Our team of experienced developers and analysts helps businesses implement structured code review methodologies, ensuring high-quality and maintainable software. The decision between automatic and manual code review is influenced by a variety of factors such as project complexity, security requirements, and development speed. While automated technologies improve speed and scalability, manual assessments offer priceless insights into maintainability and business logic. A well-balanced, hybrid strategy guarantees that enterprises achieve the highest degree of software quality. Businesses can choose a trustworthy supplier to build a tailored code review strategy that corresponds with their development goals, resulting in secure, high-performing, and maintainable software solutions. Night vision technology has rapidly burst into the lives of every modern person. It has opened up new opportunities for using the dark time of day and created favorable conditions for developing many areas. This became possible thanks to the availability of modern optics. Its development, design and improvement helped change the idea of NV technologies and integrate them into everyday life. However, the role of modern optics is not limited to this. Its influence extends to many other aspects of the functioning and development of night vision technologies. More details about all this are presented in this article. Modern night optics are perfect devices with several features. They all support standard types of night vision, are used for specific tasks, and provide users with certain advantages. Modern optics use three types of night vision. Each gives the device certain advantages and makes it suitable for performing specific tasks. Image amplification is the most common option. Optics that support this technology use starlight and moonlight to form a picture. It goes through many stages of transformation, after which it becomes amplified several times. This makes the image brighter, clearer, and more detailed. This type of night vision is used mainly in cloudless weather under favorable environmental conditions. The next type of night vision is digital. It uses the same technology as most gadgets around a person. In them, special sensors capture light, which is processed in a digital format, making it possible to obtain an image. Also, night vision of this type often uses IR lighting to ensure the ability to create a good-quality picture even in complete darkness. Also Read The Role of Maid Services in a Busy LifestyleThermal imaging is another type of night vision. It uses a different technology that allows you to capture thermal radiation, not light. This technology forms a thermal image that visualizes the temperature difference between cold and heated objects. Due to this feature, thermal imaging effectively copes with its tasks even in complete darkness and under unfavorable environmental conditions (fog, smoke, rain, snow). Today, you can buy thermal clip-on systems, night vision goggles, or any other NV technology product anywhere. Such availability makes these devices popular with ordinary users, employees of various enterprises, law enforcement officers, rescuers, and representatives of dozens of other professions. Each direction has its favorites. Specific devices are selected depending on the tasks capabilities, functionality, and features they should help cope with. Binoculars and monoculars that support NV technology are often called the most popular devices. They received this status due to their versatility, multifunctionality and ease of use. Modern versions of these devices always provide good visibility, allow you to adjust the settings depending on lighting conditions, and guarantee the presence of many valuable additions (for example, measuring distance, video shooting, etc.). At the same time, even a child can handle them. NV goggles are another popular type of night optics. They are compact, easy to set up, and comfortable for long-term use. Their advantages have long been appreciated by military and civilians who need to see well in the dark and have their hands free. Night vision cameras and scopes are no less popular. The former allows shooting in low light (most often used for round-the-clock video surveillance), and the latter provides accurate shooting in the dark, even when the target is several hundred meters away from the shooter. Also Read What is The Most Expensive Comic Book Ever The development of NV technologies is a natural process that has been going on for many years. It continues today. In this matter, modern optics plays a key role. It forms specific trends and becomes a catalyst for the emergence of new ideas. Modern optics is an object that sets the direction for the development of NV technologies. It has played this role since the first days of its existence and continues to do so today. Because night optics have a wide range of applications, scientists, engineers, and manufacturers have vast information to improve NV technologies. They develop new ways to adapt devices to specific conditions, making the product more high-quality, reliable, efficient, and helpful in performing in-demand tasks. For example, the need for military personnel for a clearer image led to the emergence of more sensitive sensors capable of capturing more light and improving the result. This became a new stage in the development of NV technologies. NV technologies are not perfect. They will continue to develop for a long time, and modern optics will play a key role in this process. Regular use for various purposes allows you to collect much information about the advantages and disadvantages. This data will become the basis for making changes to individual components, the entire design, or even the operating principle of night optics. For example, the emergence of more compact devices resulted from numerous negative reviews about the difficulty of using large optics in certain conditions. Also Read Display Over Other Apps and Fix If Not Available - Possible Fixes Night vision is developing because new technologies are successfully integrated into this area. Modern night optics play an essential role in this process. They become a platform for the implementation and testing of new developments. For example, in the current decade, thanks to modern optics, NV technologies have widely used digital sensors, artificial intelligence and other advanced innovations. Their implementation has increased the efficiency of various devices and opened up unlimited opportunities for further improvement of NV technologies. Immediately after their appearance, NV technologies were used exclusively in the military sphere. However, over time, they became available outside the army. The trend towards constant expansion of areas of application is still observed today. Modern optics play a huge role in this process. Increasing its availability helps to successfully implement NV technologies in medicine, industry, sports and other areas. This makes night vision even more popular, and the devices that support it are indispensable in many areas of activity. Night vision is an advanced technology that significantly impacts peoples lives in the 21st century. It opens up new opportunities for using the dark time of day and makes hundreds of tasks available. Modern optics play a huge role in the functioning and improvement of NV technology. With its help, it is possible to choose priority areas for the development of the industry, identify existing shortcomings of night vision, integrate new developments into everyday life, and expand the scope of application of this technology. Modern optics is indispensable in various activities and helps NV technologies improve when performing such tasks. These days, the use of AI apps for all types of things are commonplace. Everything from medicine to retail to logistics is using it to make their work smoother, more efficient, and more productive. There are risks involved with the use of AI apps, though. We shouldnt make the assumption that AI is always correct or doesnt pose any data exposure risks. In fact, if you arent careful in the way you go about using them, unknown apps can pose very serious risks. So how can we manage this? It is surely getting to the point where we basically need AI to function in our jobs, so we cant simply abandon it. It turns out that there are distinct things we can do to ensure the safe usage of AI apps. Whether you are looking to automate banking functions or find an AI anime girlfriend through a companionship app, you should be able to do it with confidence that you wont fall victim to cybercrime. Again, there are several things that you can do to ensure your online safety. We will cover the major ones in the sections below. As with all things in life, you should be selective about the types of things you choose. The online world can be tricky because hackers get smarter and smarter about mimicking legitimate apps, and it can be difficult to distinguish real from fake. To determine which apps are real, keep the following rules in mind: Read app descriptions and claims carefully. If there are odd spellings or unprofessional writing in an apps description, it is likely a fake. Real apps use correct English. Also, if an app promises you some kind of miracle solution, you should stay away from it. Professional companies know how to use reasonable language. Vague language. If an app description doesnt provide exact and logical sounding information on how it works, you should be cautious about using it. Read permissions carefully. If an app asks for odd permissions that are not relevant to an apps core functioning, it is likely fake. Requests might include things like access to sensitive data, or a photo library. Also Read Display Over Other Apps and Fix If Not Available - Possible Fixes Before using any app AI or not you should take the time to read user reviews thoroughly. Keep in mind the following points: If an app has almost all positive reviews, especially if they are unnaturally glowing in nature this is a likely sign that the app is fake. You should look through different review sites and compare what the ratings are like on each of them. If there is a huge discrepancy, this could be a red flag. If possible, find discussion forums related to the particular subject matter of the app you are considering using. This is where real devotees tend to gather. You should always be careful about the amount of personal data that you provide online. Cybercriminals are very good at figuring out ways to break into websites. You should generally make it a rule to only provide the minimum required information to use a site (and sometimes you dont even have to use your real name). A related point is that you should be careful about the use of payment systems. If an app doesnt use the maximum level of security in its payment system, you shouldnt trust it. Again, cybercriminals are very good at breaking into systems, so you should only use your banking information on the most secure sites. If you are using AI for research, you should be very careful about believing information that is presented as factual. Facts can sometimes take on very realistic-looking forms, especially if they are presented in the right looking format. Also Read Why Node.js Development Companies Are in DemandThere are a number of ways in which information that is AI-produced can be off: The data that is pulled together can be old and outdated. Particularly if you are looking for information on rapidly-developing current events, it is quite possible that AI might be off. There is often a major risk of bias. If the amount of information available online is largely in favor of one group over others, you wont get a very equitable result. Sites can be hacked, of course, and this can result in more than just data leaks. Results can be malicious and even harmful if you arent careful. There are several other particular points you should keep in mind when navigating AI sites and apps. Use checkers. There are tools available like Google Transparency Report Safe Browsing that will help you distinguish between legitimate AI sites and fake ones. Beware of plagiarized content. It happens often that AI will directly plagiarize content from other websites. Therefore, if you take this information and use it irresponsibly, you could face copyright issues yourself. Always turn off the chat saving function when you use ChatGPT. If you allow your personal interactions to be saved, they could later be hacked into and used for nefarious purposes. The bottom line is that you should always keep an eye out for anything suspicious that might be a red flag on AI apps. The points mentioned here are general ones, but anything else that might jump out at you that seems odd is probably an indicator of a bad app. AI can be an extremely useful tool if it is used responsibly and correctly. Just make sure that you are doing it right. When trust fades within a group, communication slows down. Silence grows. But what if there was a safe way to speak up? Anonymous Slack bots offer that safe space. They let colleagues share openly without worry. By hiding names, individuals feel free to discuss problems honestly. This freedom rebuilds lost trust. The workplace becomes more connected and productive as confidence returns. With the help of Slack bots, silence can turn into helpful conversation, and with custom solutions from Fivewalls, creating that safe space becomes even more natural. Source Trust keeps groups strong and productive. When teammates trust each other, they share ideas freely, solve problems faster, and support each other without blame. Without trust, team members fear speaking up, causing ideas to stay hidden and problems to remain unsolved. Silence grows, motivation drops, and productivity falls. Strong trust boosts confidence, encouraging open communication and teamwork. Mistakes become chances to learn. Teams that trust each other succeed more often, communicate clearly, and achieve their goals quickly, making trust essential for effective teamwork. Anonymous Slack bots let team members share messages privately without revealing their names. Members simply type messages into a special channel or form, and the bot posts them anonymously. This easy process creates a safe space for discussing sensitive issues openly and honestly. Anonymous bots help shy or hesitant individuals express their concerns without fear. Leaders can respond directly, building understanding and solving problems quicker. Teams choose these bots to improve communication, quickly resolve issues, and increase overall trust and openness within the group. Many organizations already use anonymous Slack bots to solve real problems quickly. For example, some deploy them during high-pressure projects to catch issues early, while others rely on them to regularly check in on morale. In practice, these tools have proven effective for improving communication and resolving challenges. Theyve also helped distributed or remote groups stay connected despite the distance. By enabling anonymous feedback, companies have overcome major barriers to trust and openness. Success stories continue to highlight the clear value these bots bring to modern workplaces. Meetings often need honest feedback. Bots help team members say whats on their minds. Feedback becomes more truthful. Meetings improve right away. Instead of vague answers, team leaders receive clear and direct information. Team members no longer hide concerns. This honest feedback leads to productive discussions and actionable changes. Meetings become more valuable, engaging, and effective for everyone involved. Problems are tackled directly, and solutions appear faster. Anonymous bots clearly make meetings more meaningful. Groups sometimes face hidden issues. Anonymous bots bring these problems to light quickly, allowing leaders to address them early and prevent escalation. These tools give individuals a safe way to report concerns without fear. Challenges like conflict or misunderstanding become visible sooner, enabling faster intervention. Organizations that adopt anonymous bots report fewer disputes and more efficient problem-solving. Hidden obstacles no longer drag down collaboration. Its clear these bots help maintain a healthy and productive work environment. Also Read The Role of Maid Services in a Busy Lifestyle Teams can get the best results from anonymous bots by following simple, effective steps. Good preparation and clear communication help everyone understand and benefit from anonymous feedback. Heres how teams can successfully use confidential Slack bots: Clearly explain the bots purpose to all team members, so everyone knows why and how to use it. Set easy-to-follow rules, like no blaming, being respectful, and offering solutions instead of only pointing out problems. Regularly remind team members to use the bot, especially during busy or difficult times. Check and respond to anonymous messages quickly, showing team members their voices matter. Celebrate positive changes resulting from anonymous feedback to encourage more open sharing. Regularly review and adjust the bots use to continuously improve team communication and trust. By following these steps, organizations can ensure that anonymous bots truly benefit everyone. Clear guidelines and timely responses build trust, helping individuals feel valued, safe, and motivated to share openly. Anonymous Slack bots help groups communicate more effectively, but certain common mistakes can reduce their impact. Understanding these pitfalls allows organizations to avoid issues and preserve trust. Heres what teams should avoid when using anonymous bots: Ignoring anonymous feedback: Always respond promptly, even briefly, to show messages are valued. Focusing only on negative feedback: Include positive messages to balance conversations and keep morale high. Using complicated instructions: Provide clear, simple guidelines so everyone can participate easily. Overusing anonymous bots: Maintain a healthy balance between anonymous feedback and direct conversations to strengthen relationships. Also Read What is The Most Expensive Comic Book EverAvoiding these mistakes helps teams benefit fully from anonymous bots. Teams that balance feedback, respond quickly, and keep things simple enjoy stronger communication, higher trust, and improved teamwork overall. Creating an effective anonymous Slack bot tailored specifically for your teams needs can be tricky. This is where Fivewalls comes in. As experts in custom Slack integrations, Fivewalls designs unique anonymous bots perfectly suited to your teams communication style and goals. They carefully listen to your requirements, build easy-to-use solutions, and ensure smooth integration with your existing workflows. With a custom bot from Fivewalls, your organization gets targeted tools that maximize trust, openness, and productivity. Choosing Fivewalls means choosing clear communication and stronger teamwork, customized exactly the way your team needs it. To see if confidential Slack bots are working well, teams should track clear improvements. Heres how to easily measure success: Watch for more open and frequent team conversations. Check if problems are getting solved quicker. Conduct short surveys about team comfort, trust, and satisfaction. Track productivity, such as faster project completion and fewer mistakes. Regularly review data to keep improving how the bot helps the team. Following these points helps ensure your anonymous bot continues improving teamwork and communication. Anonymous Slack bots offer a friendly way to boost trust and enhance communication within any group. They create a safe space for honest conversations, helping uncover hidden issues and increasing overall productivity. With the right approach and perhaps some expert help your team can strengthen its bonds and work better together. Why not give anonymous bots a chance to transform your team into a happier, more connected group? After all, every great team starts with open communication. Greetings! As a seasoned attorney in the U.S., I have been given the opportunity to shed light on the intricate topic of Understanding the Manual Code Review Process: A Step-by-Step Guide. In this article, we will delve into the essential steps involved in this process, providing you with a comprehensive understanding of how it works. So without further ado, lets jump right in!Understanding the 7 Steps to Code Review: A Comprehensive GuideUnderstanding the Manual Code Review Process: A Step-by-Step Guide When it comes to developing software, ensuring high-quality code is of utmost importance. One way to achieve this is through a manual code review process. In this article, we will explore the steps involved in conducting a successful manual code review.1. Preparation: Before starting the code review, it is essential to gather all the necessary materials. This includes the code to be reviewed, any relevant documentation, and a clear understanding of the project requirements. It is also important to establish a clear objective for the code review. 2. Planning: Once you have gathered all the materials, its time to plan the review. Determine who will be involved in the code review process, such as developers, team leads, or external experts. Establish a timeline for the review and allocate sufficient time for each participant to thoroughly analyze the code.3. Code Examination: The actual code examination is the core of the manual code review process. Each reviewer should carefully analyze the code, looking for any potential issues or areas that could be improved. It is crucial to follow coding standards and best practices during this step.4. Issue Identification: As reviewers examine the code, they should document any issues they come across. This could include bugs, security

vulnerabilities, performance bottlenecks, or violations of coding standards. It is important to provide detailed explanations and suggestions for improvement alongside each identified issue. 5. Discussion and Collaboration: After completing their individual examination, reviewers should come together to discuss their findings. This collaborative session allows for knowledge sharing and ensures a comprehensive review. During these discussions, reviewers can provide feedback, ask questions, and propose alternative solutions.6. Resolution: Once all issues have been identified and discussed, its time to address them. The development team should prioritize and resolve the identified issues. It is important to track the progress of issue resolution to ensure that all problems are adequately addressed.7. Follow-up: After the code review process is complete, it is essential to follow up to gauge its effectiveness. This may involve tracking metrics such as the number of issues identified, the time taken for issue resolution, and any improvements in code quality. This feedback will help refine future code review processes and improve overall development practices.By following these seven steps to manual code review, you can significantly enhance the quality of your code and reduce the risk of bugs or vulnerabilities in your software. An effective code review process promotes collaboration among team members and ensures that the final product meets the required standards. Remember, a thorough and well-executed manual code review process is an essential component of software development, contributing to the overall success and reliability of your project.Understanding the Manual Code Review Process: A Comprehensive OverviewUnderstanding the Manual Code Review Process: A Comprehensive OverviewIn todays technology-driven world, software development is an integral part of many businesses. As software becomes more complex, it is crucial to ensure that it is secure, reliable, and efficient. One way to achieve this is through a manual code review process.What is a manual code review?A manual code review is a systematic examination of software source code by a human reviewer. It involves analyzing the code line by line to identify any vulnerabilities, bugs, or performance issues. This process aims to improve the quality and reliability of the software.Why is manual code review important? Manual code review plays a vital role in ensuring the overall quality and security of software. It helps identify potential vulnerabilities, such as injection attacks or insecure data handling, which may not be easily detected through automated testing tools. Additionally, manual code review allows for a deeper understanding of the codebase, leading to improved maintainability and readability.The steps involved in a manual code review process:1. Planning: The first step in the manual code review process is to plan the review. This includes defining the scope of the review, setting objectives, and allocating resources. It is essential to determine the specific goals and areas of focus for the review.2. Preparation: Before diving into the actual review, thorough preparation is necessary. This involves gathering necessary documentation, such as design specifications or requirements, and becoming familiar with the projects context and purpose.3. Review: The core of the manual code review process is the actual examination of the source code. The reviewer carefully inspects each line of code, looking for potential issues like logical errors, security vulnerabilities, or scalability problems. This step may involve using specialized tools or manual techniques to aid in identifying issues.4. Communication: Effective communication is crucial throughout the manual code review process. The reviewer needs to provide clear and concise feedback to the development team. This feedback should highlight identified issues, suggest improvements, and provide explanations where necessary.5. Resolution: Once the review is complete, the development team addresses the identified issues. This may involve making necessary code changes, fixing bugs, or implementing security measures. The resolution phase ensures that the software is improved based on the reviewers feedback.6. Verification: After the issues have been addressed, it is essential to verify that the necessary changes were implemented correctly. The reviewer should re-evaluate the code to ensure that the identified issues have been resolved and that new problems have not been introduced in the process.7. Documentation: Finally, documenting the manual code review process and its outcomes is vital. This documentation serves as a reference for future reviews and helps maintain consistency and accountability within the development team.Benefits of a manual code review:Performing a manual code review offers several benefits. It helps identify and fix potential security vulnerabilities, reducing the risk of data breaches or unauthorized access. It improves software quality by identifying bugs, logic errors, or performance issues that may impact user experience. It enhances maintainability and readability of the codebase, making it easier for developers to understand and update the software in the future. It promotes knowledge sharing among team members, as reviewers gain insights into different parts of the codebase.

Manual code review. Manual source code review. Compared to automated code analysis manual code review generally produce.