NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY
[IJIERT] ISSN: 2394-3696 Website: ijiert.org
VOLUME 8, ISSUE 2, Feb.-2021

SOFTWARE ENGINEERING AUTOMATION IN IT

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ABSTRACT
Software automation is the procedure employed to create software and systems to minimize redundancies and manual interventions in the IT field. Software automation in the IT environment plays an influential role in business scaling through substantial cost-saving and helps the IT staff refocus more on strategic activities than administrative functions. Software automation is based on three principles: the power source, feedback regulation, and computer programming. DevOps continue implementing new software automation mechanisms in various industries; the process has substantially progressed in different sectors. One notable application of software automation is the SICAM, the flexible regulation, and monitoring system. With the ongoing advancements in software automation in various industries and work areas, integration, software, and technology offer businesses and organizations the capacity to meet both present and future demand in their operation area.

Keywords: Automation, DevOps, Information Technology, Rigid, Mechatronic and Autonomous.

INTRODUCTION
Software automation is the procedure employed to create software and systems to minimize redundancies and manual interventions in the IT field (VMWare, 2021). The process helps accelerate the IT infrastructure and application delivery through automation of manual activities that require human interventions. Automation is enhanced through software that sets up and repeats guidelines, procedures, policies, and standards for time-saving and staff-free within the IT environment. Once the staff is freed, they indulge in more strategic and productive activities. With the increased adoption of the cloud services and virtualized networks that call for complex but rapid provisioning, automation plays a central role in assisting the It groups in delivering high consistency, security, and speed (Testim, 2019).
Software automation in the IT environment plays a decisive role in business scaling through substantial cost-saving and helps the IT staff refocus more on strategic activities than administrative functions. For faster operations, the data centers and cloud services provided within the IT spectrum can be automated for effective and efficient results. With few or no errors, the IT field can scale up quickly, providing a fast response to business needs and wants (VMWare, 2021). A fully automated industry, business, or any other involvement could reduce delivery time and output perfection.
When optimizing the IT environment and promoting digital transformation, automation plays a crucial part. Theoretically, any IT task at one point may require automation for brilliant delivery. Therefore, automation may be applied and integrated with other critical structures ranging from network to infrastructure, cloud services, and Standard Operation surroundings. Moreover, it can cover the process of application deployment and configuration sustenance. Automation's applicability surpasses various technologies such as DevOps, containers, methodologies, testing, cloud, edge computing, and security.

RISE OF THE SOFTWARE AUTOMATION
The technology of software automation has risen from the new mechanization field, whose starters date back to the industrial revolution times (RedHat, 2019). Mechanization revolves around industrial restructuring, where human efforts are replaced with mechanical power in whatever form. The original propensity for humankind to create industrialization tools acted as the driving force behind the whole spectrum of mechanization. Historically, some of the ancient states of mechanization and automation have led to modern systems within the IT environment.
The regulation of human intelligence, which surrounds mechanization and automation, is represented by the first developed tools from stones. For evolution to today's automated and mechanized software systems, more time has been required to shape technology and industries (Cagen, 2020). This software rises for the

extended giant machine that called less human effort. Along the path of development from human to steam-propelled systems, every advanced powered machine has resulted in an increased need for regulatory devices to harness machine power. Some of the human effort-controlled machines are automated to accomplish their preferred tasks automatically.

In every system engineered through automation, its negative feedback has been employed to automatically regulate processes and achieve a continuous operational level in the entire system. In the history of software automation, the Jacquard loom presents a programmable machine concept. The inventor Joseph Marie came up with an automated loom that could produce textile-based complex patterns. The patterns were altered by regulating the motion of the shuttles present in different colors. The system ran using a program that selected designs currently in the steel cards with punched holes (Limbachiya, 2020). The cards play a crucial role in modern automation through moderation and regulation. Since then, the automation system was advanced through a programmed system with an analytical engine essential for data processing and arithmetic functionalities.

MODERN SOFTWARE AUTOMATION

Throughout the 20th century, the IT environment has been a massive improvement and development. That is through the introduction of digital computers, improved data storage capabilities, and diverse software for writing computer programs. Further, the period has seen the opening of sensors, mathematical regulatory theories, and smart devices through the internet of things. These developments have led to massive progress in automation capabilities or technology.

By introducing and developing digital computers, ENIAC and UNIVAC in the 1940s have allowed the regulatory capability in automation to be more complex, and the related calculations get executed faster than the previous methods (Testim, 2019). The onset of the 1960s further led to the introduction of integrated circuits that are tinier and cost-effective but still capable of performing complex arithmetic. These complex but competent devices have been integrated with various programs that contain the programming commands. The commands help in instructing the devices on the multiple functions and capabilities to undertake. Some media programmed storage devices are optical data storage through lasers, magnetic tapes, electron beam-based memory, and videodisks. Today, more improvements have been actualized on modes of programming computers and other technical devices. Some of these languages are simple to apply and more potent in performing logical functions and data processing (Testim, 2019).

Software automation has spanned the smart devices implemented through sensors. Advanced sensors have offered the capability of measuring a vast dimension of devices used in automation and feedback regulatory systems. These components entail electromechanical probes, machine visions, electrical field techniques, and scanning laser beams. A massive chunk of these devices requires software and other integrated computer technologies to implement them. The automation process in sensors has indicated that various industrial capabilities such as robot guidance, identification, and quality inspection are feasible.

PRINCIPLES OF SOFTWARE AUTOMATION

Software automation is based on three principles: the power source, feedback regulation, and computer programming. Every automated system usually exhibits these components without exception. The power source plays the critical function of actualizing some actions through power provision. Primarily, the head of power in automated systems is electricity. The original is quite versatile due to its high availability in various components and is convertible. The energy or power given out usually help in data processing, transfer, and positioning (RedHat, 2019). Control is essential in the conversion of entities from one form to another, which is exceptionally valuable. The automated software is meant for communication and information systems. The data moves various units to produce the preferred output.

The feedback-controlled systems are widely applied in modern IT systems. The integrated software help in inputting, controlling processing, outputting, sensing, and actuating components. The system output plays the role of referencing the input. Finally, the programmed instructions embedded in the system help determine the suitable actions to be undertaken (RedHat, 2019). The program declares the system functionalities and the essence of the system components. The program contents typically vary from one

system to another. These functions are performed constantly and repeatedly in a sequential manner. Depending on the complexity of a system, a program may contain huge commands that are detailed. The systems design the mode of response to distinct alterations in the system.

SOFTWARE AUTOMATION TOOLS

One of the main techniques in software automation in the computer science field is artificial intelligence. The technique programs help the computer display various features related to human intelligence (Guru99, 2021). These attributes entail learning capabilities, problem-solving, reasoning, language comprehension, and other expert diagnoses. The artificial intelligence capabilities are meant to provide various physical devices with the ability to hear and respond to humans by accepting high-profile guidelines instead of programmed statements. Some of these devices can execute commands automatically instead of being directed physically (Limbachiya, 2020).

During the software development lifecycle, tests are generally run for the operation of different scenarios. At some point, a breakdown may occur and impact a particular web leading to the expansion of effort and time applied by the team for software furnishing. However, with AI's introduction in the development process, it can handle the breakdowns and barriers related to image recognition. Further, the AI algorithm helps capture and analyze data that relate to DOM functionalities (Limbachiya, 2020).

AUTOMATION TESTS

When the DevOps teams are coming up with new systems, they focus more on the testing phase as it's critical to ensure a software system functions as per the user requirements. Most developers prefer automated testing as the manual one is regressive and invaluable. These manual tests have introduced the idea of an automation test, which is the advanced criterion for testing (ISTQB, 2020).

Test automation is the process of initializing tests automatically, managing the training and test data sets, and output utilizing software quality improvement. The tests are typically meant for measuring the quality assurance of software with an inclusive of the entire software development team. However, to score the most out of the testing process, the DevOps engineers, business analysts, and developers must integrate their knowledge and success skills.

THE AUTOMATION CRITERIA

When creating an automated software system, some test criteria need to be met to avoid more costs than profitability. Majorly, automation focuses and aims at saving money, time and effort. Various tests are used in the maintenance of the general efficiency of the system. However, these test methods must meet multiple conditions for the entire software system's suitability and assurance. First, the test must be repeatable; that is, it should not be used for single run-ups (Worksoft, 2019). A repeatable test must be set up appropriately, considering the data and environment of the application. Secondly, the test results must be functional and measurable. Finally, the data and territory of operation must be cleaned for effective iteration.

The second factor of consideration is the system's determinant for output evaluation (Uzialko, 2019). When automating software, it's essential to determine the number of variables that form the input and prevent a similar output every time one runs the system. The selected variable may be random to avoid the production of a known or particular outcome. Finally, the automated matters must not be based on opinions for better projection of the beta testing and usability testing (Uzialko, 2019).

TYPES OF SOFTWARE AUTOMATION TESTS

There are various software automation tests available to DevOps and developers: code analysis, unit tests, integration tests, acceptance tests, regression tests, and performance tests (Francino, 2020). The code analysis test aims at identifying the flaws and errors as well as software form. The unit tests are also automated, where single software functionalities are tested in isolation. Even though the test is automated, it does require databases, servers, APIs, or storage facilities for operation. The mechanical, integrated tests check on the connectivity to the end-to-end external dependencies.

Today, developers employ various practices to automate acceptance tests. They may use the Automated Acceptance Test (AAT) and Behavior-driven development (BDD) before developing essential software features. Upon completion, these tests can be run repeatedly through automation to enhance the software system's quality (Francino, 2020). once a software performance has been approved and deployed into the area of use, an automated smoke test is run to ensure that system dependencies and services are working in-line with system requirements. After successful tests, the test automation takes the route of preparation, action-taking, result compilation, and reporting.

When creating automated software, DevOps aims at enhancing its speed in-line with its quality. However, not all tests are usually automated since the whole process acts as an investment. When advancing the software automation criteria, the developers opt for mixed automated tests from the test pyramid for quality assurance (Francino, 2020).

LITERATURE REVIEW

DevOps continue implementing new software automation mechanisms in various industries; the process has attained substantial progress in different sectors. One notable application of software automation is the SICAM, the flexible regulation, and monitoring system. The SICAM platform offers developers and network operators every application aspect they require for future automation of substations (SIEMEN, 2019). SICAM has offered an all-time energy flow through creative and innovative Tele-control and power-grid automation tools, such as configuration scalability for saving space and modular designs. The system also offers high stability of the EMC and long-lasting resistance to challenging ambient situations. It has powerful and stable CPUs and intelligent memory, which promote the high performance of the automated processes and communication capabilities. Further, the system is secured automatically through cybersecurity functionalities that are effective throughout the product lifecycle. These features are widely spread, making SICAM A8000 a diverse and universal space for the flow of energy and software activities (SIEMEN, 2019).

The SICAM automated system also has an HMI system where everything under view and performance is under regulation. Whenever transmitting and distributing energy flow in a network operation, visualization and control processes play a central role. The HMI system, a subset and component of SICAM provides exponential control and monitoring solutions to software requirements. SICAM SCC typically connects with the software environment and protects devices that actualize communication. The HMI system oversees the overall SICAM activities.

MANUFACTURING

The manufacturing industry has highly absorbed modern software automation and continued to advance as new capabilities and technologies arise. The manufacturing field has absorbed software automation in three different spaces: rigid automation, flexible automation, and programmable automation.

RIGID AUTOMATED SOFTWARE

The rigid or the fixed automation is an automated production component where processing is actualized in sequential operations, designated by tools configuration. These components contain the programmed commands installed in the machines as wiring, gears, and other forms fixed in nature. When manufacturing industries indulge in these software automation models, they invest heavily and suffer high operation and production costs (Britannica, 2019). The system, therefore, suits only production levels of huge quantities and volumes. The automotive industry and assemblies are the perfect example of enterprises investing in the fixed software automation. Further, some chemical processes in various industries follow the methodology.

PROGRAMMABLE AUTOMATED SOFTWARE

The programmable automation software in the application in industries helps in producing products in units. The system gets automated to deliver goods in defined volumes that range from small to thousands of dozens. The software receives programmed to make product batches and change alternatively to manage products' form and style (Britannica, 2019). To accomplish the overall activity, it takes time as the

reprogramming process may delay. Compared with fixed automated software, the programmable automated software is slower as the production rate is usually low. Most production tools are programmed to offer changeover of products instead of their specialization. The numerical-regulatory machine tool is the best equipment that applies programmable automation software. The machine memory has a memory that regulates the different styles in which products to be produced and controls the program running the computers. Industrial robots also employ programmable automated software. These systems have been advanced from manually controlled robots and other industrial equipment.

FLEXIBLE AUTOMATED SOFTWARE

Programmable automated software houses the flexible automated software, while the programmable requires more time for reprogramming and alternate product tools for the product batches. That simply lost time is quite expensive in the production cycle, thus disadvantaging the programmable automated software. The flexible automated software varies with the programmable software because it operates on limited product varieties to allow room for quick and automatic equipment changeover. The flexibility of the software chips is through the offline conversion of equipment. The programming process takes place in an external computer terminal that does not rely on the production tools. Therefore, there is never a need for producing identical products as a mix of the product can be created.

MECHATRONIC

Mechatronic is a gradual evolution of systems and machinery in the market to enhance simulation, modeling, and prototyping regulatory systems. The idea focuses on moving control systems. DevOps have advanced the applicability of automated software in consumer products, automotive, medical field, defense systems, material and data processing, and aerospace, among other areas (Koenig, 2019). The software is centralized on control systems, electronic systems, computers, digital controls, control electronics, mechanical systems, electro-mechanics, among other techniques. The software-controlled systems are mainly applicable in robotics, research, bio-mechatronics, and industrial automation. Most of these systems have been integrated to enhance their performance and quality of service rendering.

The smart tech introduced by C-TECH through advanced automated software has promoted innovative production, service delivery, and energy consumption (C-TECH, 2019). The developed automated technologies have created an integration between components available in production units, operating tools, and machines. The new advanced IT infrastructure and integrated control systems are used to monitor industry and machine maintenance. Further, the innovative machine continuously regulates energy consumption by the device for effective management and reduced wastage. C-TECH as an organization has harnessed automated software for the performance of various functions. These include the automation of the tightening stations, process traceability, and objectivation (C-TECH, 2019). They run complete automatic test plants for fluidic features, electrical features, and dynamic tests. The press-fit systems in the application are also automated and integrated with stroke controls.

ENHANCING AUTOMATION

Various tools are currently helping in the advancement of automation as the volume of test data generated increases. The test and software automation is constantly scaling, and its management is becoming a vital issue to the DevOps teams. However, these tools act as a solution to the uprising issues. The development teams realize the essence of machine learning in test automation platforms and implementation phases (IE, 2019). The technique also has significant importance in post-implementation test analysis that entails realizing insights, trends, and effects to businesses.

In some instances, the failure to utilize machine learning in software automation has resulted in various instabilities. The causes of these instabilities include; the instability of the web applications and mobile applications resulting from internal dynamics and alteration by DevOps teams. They may also arise from data alteration whose test is relied on and the non-ML test scripts' static nature, resulting in poor adaptability of changes.

Machine learning has enhanced organizations implementing regular tests using agile and development teams to run multiple tests using APIs, units, integration, functional, and accessibility. DevOps undertake the test execution, the amount of data generated grows significantly, making it hard to make informative decisions (Gislam, 2021). However, through visualization, machine learning attributes that analyze and report on tests make the process easier to manage. Once an organization invests in AI or ML integrated systems, the strategic management assumes the ability to gain insight from actual volume data. Further, they can understand the patterns and trends of data, calculate the extent of business risk, and make fast and straightforward decisions. Without implementing or integrating these techniques during the automation process, the entire work is bound to attract flaws and difficulty analysis. The AI or ML-enabled systems provide more security defects, specified platform defects, constant test failure patterns, and test environment defects.

DevOps are developing and delivering current code pieces and ensuring value to the customers (Cagen, 2020). For the developers' benefit, they have understood the importance of code quality and usability in every system feature. ML and AI have been employed in scanning the current code automatically, conduct security analysis, and realize testing gaps. The realization of these factors has advanced the development teams' maturity and speed for code delivery. Further, the teams employ the feature flag method to expose new attributes and conceal them while issues arise.

Traditionally, the developers and DevOps engineers had issues with script maintenance every time a new feature got delivered or added for testing. Most of these events breakdown the scripts following the introduction of new ID components that interferes with execution testing. In some mobile applications, current versions of the operating system alter the system's user interface and include foreign alerts in the application (Cagen, 2020). These foreign events usually tamper with the usual test process of automated software. However, with the introduction of AI and ML-aided software, a computerized test can automatically realize any changes made to an element ID and fix it or raise alerts to the developers for fixation. The CI or CD scheduler scripts can run smoothly without many interventions by the DevOps with such functionalities.

Besides, when realizing the essence of ML in the pipeline DevOps, it’s vital to understand the analysis and screen the CI structures, which is a trend within the automated software trends. Machine learning can identify broken CI builds, their extent, and inefficiency. That promotes immediate-short but quick and reliable builds, which in turn results to fast feedback to DevOps. The entire process is cost-effective and beneficial for the whole development team.

TRENDS IN SOFTWARE AUTOMATION

When analyzing software automation advancements, the IT and industrial parks are facing constant transformation with vital improvements to software and technology. Among the many industries, the automotive industry has harnessed the massive change in software automation. These trends have not only enriched the sectors but also the DevOps. With the influx of technologies and software in the industry, the developers have been equipped to handle and manage them effectively.

The modern automotive software has been developed with a combination of a million codes to ensure that performance is consistent and secure. However, the recent advancements have also brought in new challenges to the DevOps in various work areas. In circumstances where the developers are poorly trained on the workability of the latest software and gadget in the industry, the entire development teams may be negatively impacted by effort and quality-wise and excessive time wastage (Alfred, 2020). If well explored by DevOps, various software automation trends could be ready to handle the industry's latest software and technology.

ADVANCED CONNECTIVITY

The modern enhanced form of connection has formed the basis of operability for the electronic equipment, which also encompasses the automotive. For instance, today's drivers demand an easy but smart way of accessing various applications such as music wirelessly while on a journey (Deloitte, 2019). That forces the developments to embed and convey most applications in a vehicle to be Wi-Fi, cellular, or Bluetooth

enabled. In some instances, the connectivity offers cybercriminals a loophole to hack the embedded devices. Therefore, automotive software developers must ensure that the connected devices are secured to prevent cyber insecurities.

SWIFTER DATA MOBILITY

Currently, the developers have included supercomputers on wheels in every automotive component in every industry. These supercomputers on the reel are advanced models and applicability in every moving machine designed in a precise manner. Most of these devices are software-enabled and embedded with sensors to offer more opportunities and solutions to the users (Alfred, 2020). A sensor-enabled device usually provides smart and intelligent data management derived from auto-advanced devices such as vehicles. Further, the constant and gradual shift to the 5G network has provided a new automotive autonomy approach. They enable device-to-device communication, especially if they are IoT-enabled.

AUTONOMOUS DEVICES

The new technology and automated software have made machines in the industries to be autonomous. Even though the technology is already applicable in the market and industries, it may take a while for the operators and automotive drivers to learn and adapt to the technological changes. The main issue with autonomous machinery is the DevOps' ability to convince the corporate, operators, and drivers that these self-driven machines are accurate and safe to ride on or operate (Dilmegani, 2021). The process may be procedural, like following up the SOTIF guidelines. SOTIF offers a set of rules on design, validation, and verification of devices' practical operation. The constant adherence to these guidelines ensures complete security of the self-driven components in various application industries.

HUMAN ADAPTABILITY

Every developer and manufacturer's final goal is to ensure that every automated software device has complete human functionality. However, they yearn to accomplish each of these trends may never be of utmost to the DevOps. At some point, it's vital to summon the skills and knowledge available to the operators (Bahl, 2018). Therefore, the developers must only align their development designs with public or customer requirements for organization strength enhancement. Therefore, AI and ML techniques must be accustomed to human interactions and better human experience and adaptability.

CONCLUSION

With the ongoing advancements in software automation in various industries and work areas, integration, software, and technology offer businesses and organizations the capacity to meet both present and future demand in their operation area. The process modernization of operations primarily in the automotive industry provides improved efficiency and enhances a business's productivity and profitability. ML/AI integrated software provides quick value addition and operation stability (Deloitte, 2019). That translates to fast feedback provision to DevOps hence more time dedicated to other productive activities.

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