47. SOFTWARE MAINTENANCE AND SUPPORT: METHODS AND TOOLS

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This paper is devoted to the topic of common explanation of the terms "software support" and "software maintenance", their structure, tools, values and benefits.

In the modern world the question of the necessity of using software in various areas of life is becoming increasingly urgent. For the successful development and implementation of a software product it is essential to standardise and conduct work in accordance with certain rules.

The organisation of work on IT projects is governed by a set of principles, approaches, and tools – methodologies. It is considered that one of the most common and widespread ones is SDLC, according to which the software product development process is divided into five consistent steps: planning phase, analysis phase, design phase, implementation phase and maintenance phase.

The fifth one makes up an important part of the cycle as it ensures the present and future of the product. Software maintenance is a complex concept.

The last SDLC phase has a specific classification. There are four sub-sectors which are corrective maintenance, adaptive maintenance, preventive maintenance and perfective maintenance.

Corrective maintenance is aimed at fixing bugs related to any part of the product, while not only the code could be improved, but also the system's logic.

Adaptive maintenance is directed at the flexibility of the program. Such maintenance gives the ability to adapt to work on different operating systems and hardware types. It also affects software dependencies.

Modifications of preventive maintenance support stable performance and protect the product from the threats that have not happened yet.

Perfective maintenance is tied with a user feedback, which helps to enhance the product. There are nine main methods of this sub-sector, which is also often called 'customer support' or 'software support'.

Phone-based customer support enables customers to receive immediate answers to requests and resolve their issues. Email-based customer support uses automated mailing systems for feedback. Live chat customer support allows customers to communicate directly with company representatives for quick problem solving. It is not a popular option, but it provides more efficient information and has more answers than technical documentation. Self-help customer support provides customers with access to resources and guides

to resolve their issues by themselves. Social media customer support enables companies to engage with customers through popular platforms making information accessible for large amounts of users. Omnichannel customer support provides a consistent customer assistance using various channels, including phone, email, and social media. Automated customer support uses technologies like chatbots and AI to quickly respond to frequently asked questions. Dedicated customer support provides customers with access to specialised representatives who better understand their needs. It provides strong, long term relationships between customers and dedicated support agents. Business process outsourcing allows companies to delegate customer support to third-party organisations for increased efficiency [1].

System maintenance and support guarantee accuracy, security and performance of the IT infrastructure. There is a classification of tools, which are used to enhance productivity, avoid human mistakes, reduce time costs and optimise the process.

1. Automation tools

Automation tools are software applications that can perform complex tasks independently. They are useful for reducing paper work avoiding errors and for taking care of routine tasks efficiently. Most common functions are schedule backups, patch updates, configuration changes, or security checking. Ansible, Chef, Puppet, and PowerShell are popular automation tools for system maintenance and support.

2. Monitoring tools

Monitoring tools are applications that can collect, process and evaluate data about the status of different systems. They are great in optimisation issues and detecting errors. For example, metrics of the state of CPU and memory characteristics could be autonomously measured and displayed as generated reports. Nagios, Zabbix, Grafana and Splunk are the most popular monitoring software applications.

3. Ticketing tools

Ticketing tools are software applications that can operate with requests that are sent by system users or customers. Those tools are useful for communication development and improving feedback connections. Popular ticketing tools for system maintenance and support are Jira, Zendesk, ServiceNow, and Freshdesk.

4. Documentation tools

Documentation tools are applications that can create and store data and give guidance that you need to maintain different systems. Those tools can help you improve knowledge, consistency, and compliance. For example, you can use documentation tools to write manuals, guides, policies, procedures, organise and share documents, or enforce standards. Most of the popular documentation tools for system maintenance and support are Confluence, Google Docs, and Markdown.

5. Testing tools

Testing tools are software applications that can verify and inspect the functionality and quality of the system. They can help you prevent and fix bugs, errors, or vulnerabilities before they become serious weaknesses of the product. Some of the popular testing tools for system maintenance and support are Selenium, Postman, JMeter, and Nmap.

6. Collaboration tools

Collaboration tools are applications that can enhance the communication and improve coordination among system team members. The tools can help you improve teamwork and efficiency. For example, you can use collaboration tools to chat, call, create video conferences, share files, or manage projects. The most popular collaboration tools for system maintenance and support are Slack, Teams, Zoom, and Trello [2].

Although software maintenance and support are themselves parts of the methodology due to the complexity of these concepts their workplans could be organised using the methods and approaches of other methodologies. The options for providing maintenance using paradigms of different methodologies are presented in Table 1.

Table 1 – Methodologies and their usage in software maintenance

Name of methodology	Short description	Methods and benefits for software maintenance
V-Model	It divides the entire project process into phases that are firmly defined from the outset and has additional test phases that are opposed to the development phases.	It provides testing at the same time as the design stage, the software is improved and checked during development which makes it easier to provide maintenance after implementation as the product is error-free.
Agile Model	It breaks projects down into several dynamic phases, known as sprints. After every sprint, teams reflect and look back to see if there was anything that could be improved so they can	By constant team cooperation it allows companies to adapt their software product to changing market conditions, ensuring that software product remains in demand at all times.

	adjust their strategy for the next sprint.	
Spiral Model	It involves iterative development cycles, with each spiral producing a working version of the software for user evaluation, starting from a baseline spiral and adding functionality in subsequent iterations. Risk analysis and management are provided.	By its definition, during each iteration documentation is created. The doumentation can be used to train new users and developers, as well as to create more simple instructions. It will be easier to maintain a well-documented product.

Software maintenance is therefore an important set of measures to keep the software in proper conditions and provide opportunities for the development of the software product. According to Forester's research, every dollar spent on maintenance saves four dollars in possible losses due to system failures, loss of competitiveness, and fines due to data leaks [3]. For qualitative support, there is a set of methods and tools described in this paper.

References:

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