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Development of document management technology in the railway automation and telemechanics system

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Abstract:

Traditional paper-based systems have given way to contemporary centralized electronic solutions in the development of document management technology in railway automation and telemechanics. The handwritten documentation used in railway operations was labor-intensive, prone to mistakes, and ineffective when managing massive amounts of data. These antiquated systems frequently resulted in misunderstandings, longer decision-making times, and higher functional risks.

By guaranteeing real-time data transmission, increased accuracy, and greater protection, the application of a new centralized electronic document operation system has completely transformed railway automation. By combining digital documents, electronic signatures, and automated methods, this process drastically cuts down on paperwork and the need for human intervention. Operational efficiency is increased by the centralized approach, which enables smooth coordination between control systems, dispatch centers, and railroad stations. The monitoring and regulate capabilities of contemporary telemechanics systems also improve maintenance scheduling and accident avoidance. In addition to improving railway management, this shift follows worldwide trends in digital transformation, making the railway network more reliable and cutting edge.

Keywords:

Document management, digital documents, electronic document operation system, signaling and communications, project documentation

1. Introduction

A big step toward efficiency and contemporaneity is the switch from paper-based technologies to electronic document management. The importance of this change is maintained by the Law of the Republic of Uzbekistan “On electronic document management” which encourages the use of digital documentation to improve workflow automation, security, and accessibility. Organizations can increase data accuracy, expedite transmission and streamline methods by minimizing their dependence on paper.

The authenticity and legal acknowledgment of electronic documents are confirmed by this law, which creates a framework for their creation, storage, and exchange. In order to create a more open and effective administrative environment, it also elevates the use of secure information systems and digital signs. The change helps Uzbekistan become part of the contemporary digital economy and is in line with worldwide trends in digital transformation.

2. Research methodology

JSC “Uzbekistan Railways” signaling and communications department is responsible for organizing work interconnected to automation, telemechanics, and communications. There are eleven distances (SCD) in the signaling and communications department: ten for signaling, centralization, and blocking (SCB), and one for communication. In figure 1, the signaling and communications department’s detailed directorial construction is displayed. The territorial distribution feature, which is evident in figure 2, determines the signaling and communications department’s structure individually.

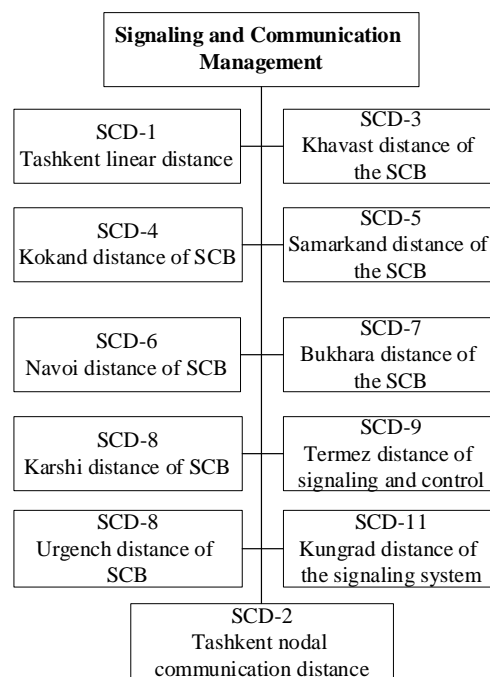



Fig. 1. JSC “Uzbekistan Railways” signaling and communication management structure

Instructions on technical documentation for signaling and interlocking devices and wired communications, as well as radio communications and recording of devices for rolling stock monitoring, closely restrict documents pertaining to automation and telemechanics installation (NSh-02) [3,6,7].

Priorities in the improvement of the aforementioned forms include: ensuring railway transport safety; introducing cutting-edge machinery and technologies; improving the

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technical and financial performance of railway rolling stock and infrastructure facilities; and raising the standard of services offered.

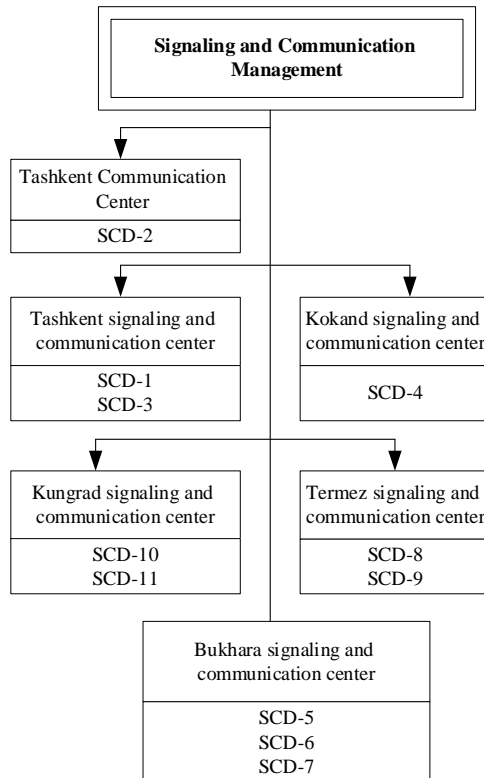


Fig. 2. Signaling and communication sector territorial division formation

All technical documentation is divided into three categories: design, operational, and archival, per the guidelines above. Figure 3 illustrates how technical documentation is organized [4-9].

Document flow is organized by design organizations, signaling and communications departments (SCD), signaling and communication departments, and building and installation organizations (Figure 4).

Projects are issued in five copies by the design organization. When the construction and installation train (SMP-406) receives a copy of the project, it is utilized for both commissioning and construction and installation. The project is sent to the signaling and communications department's technical documentation department in three copies. Two copies of these are moved to the appropriate signaling and communication distance, while one copy is kept in the archive. In turn, one copy is moved to the appropriate station, while the other copy is kept in the technical documentation group's archive (Figure 5).

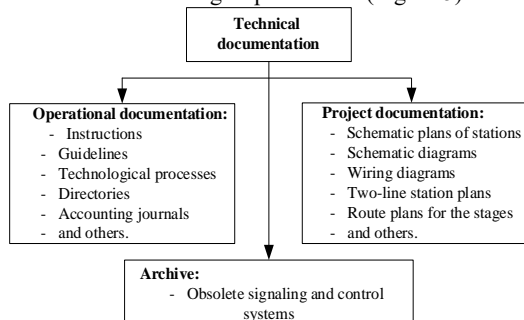


Fig. 3. Structure of technical documentation

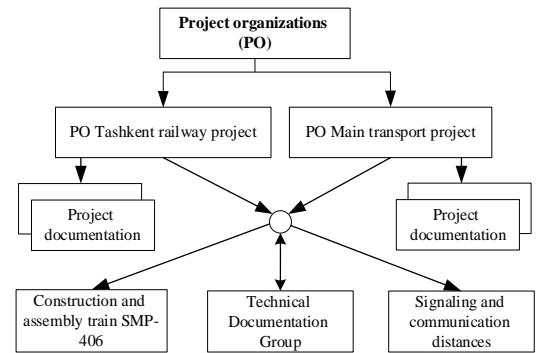


Fig. 4. Simplified structure of document flow

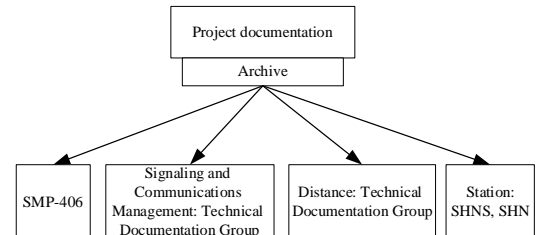


Fig. 5. Principle of distribution of design documentation

ISC "Uzbekistan Railways" occasionally has large quantities of technical documentation completed by several departments, which raises the cost of ineffective work and, as a result, operator errors. These tasks are entirely done by hand using paper material. Over 250 thousand copies of paper media are produced by each business. This technology's search speed and technical documentation accessibility are poor, and it does not allow multiple employees who are located far apart to examine the material at the same time [5,7,8].

When it comes to organizing and editing papers, paper technology is quite labor-intensive and complicated. These documents take up a lot of room when stored, are hard to account for, and cause loss and damage as well as confusion in the archive.

3. Conclusion

It is evident from an analysis of contemporary document management systems that automated electronic management systems are necessary. Electronic technical documentation maintenance technology will guarantee industrial competitiveness and boost overall transportation sector efficiency. It is necessary to create specialist software packages for developing information interchange and communication amongst railway design groups in order for electronic document management to function. It is necessary to update "Paper" technology by introducing contemporary computer systems with specialized software that will automate work environments and make it easier for employees who analyze technical documentation.

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