

In 1801, the Jacquard loom could produce entirely different weaves by changing the "program" – a series of pasteboard cards with holes punched in them. It affects the aspects of quality above, including portability, usability and most importantly maintainability. The first computer program is generally dated to 1843, when mathematician Ada Lovelace published an algorithm to calculate a sequence of Bernoulli numbers, intended to be carried out by Charles Babbage's Analytical Engine. Various visual programming languages have also been developed with the intent to resolve readability concerns by adopting non-traditional approaches to code structure and display. However, with the concept of the stored-program computer introduced in 1949, both programs and data were stored and manipulated in the same way in computer memory. A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it. Techniques like Code refactoring can enhance readability. Programmable devices have existed for centuries. Readability is important because programmers spend the majority of their time reading, trying to understand, reusing and modifying existing source code, rather than writing new source code. Trade-offs from this ideal involve finding enough programmers who know the language to build a team, the availability of compilers for that language, and the efficiency with which programs written in a given language execute. Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix notation. Programs were mostly entered using punched cards or paper tape. Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. Also, specific user environment and usage history can make it difficult to reproduce the problem. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. Normally the first step in debugging is to attempt to reproduce the problem. It affects the aspects of quality above, including portability, usability and most importantly maintainability. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. Various visual programming languages have also been developed with the intent to resolve readability concerns by adopting non-traditional approaches to code structure and display. Their jobs usually involve: Although programming has been presented in the media as a somewhat mathematical subject, some research shows that good programmers have strong skills in natural human languages, and that learning to code is similar to learning a foreign language. It is usually easier to code in "high-level" languages than in "low-level" ones. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. Expert programmers are familiar with a variety of well-established algorithms and their respective complexities and use this knowledge to choose algorithms that are best suited to the circumstances. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards.