

This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. Debugging is often done with IDEs. Standalone debuggers like GDB are also used, and these often provide less of a visual environment, usually using a command line. Code-breaking algorithms have also existed for centuries. The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. Assembly languages were soon developed that let the programmer specify instruction in a text format (e.g., ADD X, TOTAL), with abbreviations for each operation code and meaningful names for specifying addresses. Many applications use a mix of several languages in their construction and use. Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix notation. Scripting and breakpointing is also part of this process. 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. The following properties are among the most important: In computer programming, readability refers to the ease with which a human reader can comprehend the purpose, control flow, and operation of source code. 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. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). Programs were mostly entered using punched cards or paper tape. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. 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. In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it. They are the building blocks for all software, from the simplest applications to the most sophisticated ones. It affects the aspects of quality above, including portability, usability and most importantly maintainability. 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. As early as the 9th century, a programmable music sequencer was invented by the Persian Banu Musa brothers, who described an automated mechanical flute player in the Book of Ingenious Devices. 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.