

HISTORICAL NOTE 1 PREDETERMINED MOTION TIME SYSTEMS

The notion that manual work consists of basic motion elements is attributed to Frank B. Gilbreth, who was a pioneer in the subject of motion study. His studies resulted in the first methodical classification of motion elements, which he called *therbligs* (Gilbreth spelled backwards—well, almost). The 17 therbligs consist mostly of arm and hand motions.

Asa B. Segur is credited with developing the first commercial predetermined motion time system, called Motion-Time Analysis (MTA). Segur was aware of Gilbreth's classification scheme for basic motion elements, and MTA's 17 basic motion elements agree closely with Gilbreth's 17 therbligs. Segur began the development of MTA in 1922 by analyzing motion picture films taken during World War I of operators performing factory tasks. The films were originally intended for use as training materials for blind and otherwise handicapped workers, but Segur constructed his system of motions and times from them. Supposedly for commercial reasons, he limited public access to MTA, and this is one of the reasons why his system is no longer used. However, his work influenced those who followed him in developing other predetermined motion time systems.

One of these analysts was Joseph H. Quick, who developed the Work-Factor system between 1934 and 1938. The system was based on the analysis of large numbers of motion picture films, snapshots, stroboscopic lighting techniques, and stopwatch studies taken of many different kinds of industrial operations. Among Quick's contributions in PMTS research were his studies involving cognitive work, such as visual inspection and similar technical labor.

Harold B. Maynard stands as one of the more important figures in the development of predetermined motion time systems. He is largely responsible for the Methods-Time Measurement (MTM) system, and the Pittsburgh-based consulting firm of H. B. Maynard and Company bears his name. In 1946, Maynard began development of MTM with colleagues G. J. Stegemerten and J. L. Schwab under the sponsorship of the Westinghouse Electric Company. Their study began by analyzing movies of drilling operations and relating the work patterns to therbligs. The therblig classification was found to be wanting in some respects, and many of the basic motion elements were revised, renamed, or removed. MTM became the most successful and widely used first level PMTS after its release in 1948. The MTM database of motion elements was used

in the development of many higher-level systems, including those in the MTM family (see Table 5 later in this chapter).

Other individuals who should be mentioned for their efforts in developing PMT systems include G. B. Bailey and R. Presgrave, who developed Basic Motion Timestudy in 1950; R. M. Crossan and H. W. Nance, who developed Master Standard Data in the late 1950s; and G. C. Heyde, who developed the Modular Arrangement of Predetermined Time Standards (MODAPT) in the mid 1960s.

Kjell B. Zandin is largely responsible for the development of the Maynard Operation Sequence Technique (MOST). Starting in the late 1960s, he led a group at the Swedish Division of H. B. Maynard & Company in studying applications of MTM. It was observed that there were similarities in the motion patterns and MTM sequences of many manual operations. This ultimately resulted in the definition of three principal motion groups, which were called sequence models in the MOST system. MOST was first introduced in Sweden in 1972 and in the United States in 1974. Today, it is one of the most widely used PMT systems.

Subsequent further development of predetermined motion time systems has been in the computerization of several of these systems as commercial products. Examples include MOST for Windows and MTM-LINK.