SWS NEWS

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President: Larry Aft Newsletter Editor: Patrick Patterson

Applying MODAPTS Standards

by James R Stewart, PhD
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Introduction

MODAPTS, the predetermined time system authored by Chris Heyde in 1966, provides a system that is easy to learn and easy apply. The addition of Office MODAPTS 1969 and of Transit MODAPTS in 1976 showed the applicability of the system to Standard Data. A computer program for application of the system called MODAPTS plus was provided in 1981. The death of Chris Heyde left an enormous gap in the lives of those who knew him. However, the system remains in the hands of a number of individuals who intend to continue the effort of teaching and researching the vision left to us by this innovator.
This year, a group of Australian researchers, Paul Carey, Judith Farrell, Michael Hui, and Brian Sullivan edited a book called Heyde's MODAPTS. This is the most comprehensive text on MODAPTS application and use. The International MODAPTS Association, with membership in North America, has contributed a revised certification test and a system of standard data for janitorial services.

It is not difficult, therefore, to find applications of standard data built from MODAPTS standard. It is not particularly difficult to develop specialized standard data systems to measure any manual activity. The selection of a technique for time measurement is independent of the standard data system. There are decisions that must be made for the selection of a measurement system and then decisions about the standard data system.

History

The concept of standard data is at least as old as the development of Time Study by Taylor or Motion Study by Gilbreth. Taylor used standard data in much of his work and published considerable data with Barth as to speeds and feeds of machines. They developed slide rules to ease the application of the data, published the values in tabular and graphical format, and incorporated machine time into manual time study values.
The Gilbreths developed standard data based upon the application of laboratory analysis of methods. Frank Gilbreth developed and published such data for various building trades from 1905-1915. He also used such data for the World War I mobilization. Later, after his death, Standard Data was used by Lillian to design the modern kitchen. Prior to the Second World War, Standard Data became commonplace in industry. It was in the major work measurement textbooks. Indeed, many books were simply compilations of machine speeds and manual time study data. Such books contained a pocket of cards containing the speeds, feeds, and manual activities for common shop machines. What later became MTM was started by a modest project to build drill press standard data for a group of drill presses by Lowry, Maynard, and Stegemerten. The full title of their book is "Time and Motion Studies and Formulas for Wage Incentives" Since 1927, therefore they had been concerned with standard data.

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Inside this issue...

President's Column

by Larry Aft
SWS President, 2002-03

Since it's been a while since our last newsletter let me use my space to fill you in on a number of short items.

- First of all, I want to express our official sympathy and best wishes to the family of Carl Lindenmeyer. As you are probably already aware, Carl passed away unexpectedly several weeks ago. As an SWS Board member Carl definitely had an impact on our organization.
- Spurred on by Carl's passing the SWS Board adopted a policy to honor an individual by dedicating each year's SWS conference to someone. This year's conference was dedicated to Carl's memory. A plaque indicating this will be kept at IIE Headquarters.
- Speaking of the Annual SWS conference, those of us who attended this year had an outstanding conference. The technical program was among the best we ever had. A special thanks to our exhibitors, Divilbiss Electronics and H.B. Maynard Company.
- Make your plans now to attend the 2003 SWS Conference. The 7th Conference will be held on the campus of Northern Illinois University in DeKalb, Illinois, just west of Chicago. Watch our web site for additional details and call for papers.
- SWS is planning a significant role in the 2003 Solutions Conference in Portland this coming May. We will sponsor a track focusing on *Integrating Ergonomics and Work Measurement.*
- Finally, let me encourage you to use our SWS web site. There is lots of good information out there for you to access. http://sws.iienet.org

SWS Annual Conference Highlights

Monday and Tuesday, November 5-6, 2002, the 6th Annual SWS Conference commenced with IIE President Don Milligan, giving the opening address. James Stewart, Northern Illinois University was awarded the 2002 Phil Carroll Award and Steven Thompson was presented with the 2002 M.M. Ayoub Award.

On Monday, Dr. Andris Freivalds, Penn State University, gave a presentation entitled "Integration of Ergonomics and Work Measurement". This PowerPoint presentation is posted on SWS's website, http://sws.iienet.org/public/articles/index.cfm?cat=2, along with picures from the conference.

Discussion Center

During the Annual SWS Conference, members made comments comparing the Discussion Center on the IIENET Web Site and the old listserve. Many members wanted the email contact we used to have with the listserve. *Well, did you know it has never really gone away?*

The IIE Discussion Center is designed so that each user can choose the way he/she prefers to participate. You can read and post messages on the website (for those who don't want to receive emails, or are away from their email but have access to the web) or you can select the Mailing List option to have the SWS conference operate just like a listserve (for those who want to post and receive messages via email instead of having to go to the website).

If you prefer email notification, go to http://www.iienet.org/discussion and login. Once inside the Discussion Center, go to "More" (button along top of screen), then click "Email Notify". Check off the "Society for Work Science" box and you will be set. Be sure to save the changes before logging off.

If you have any problems or questions, contact Susan Dunster, IIE Member Benefits Coordinator, at 770-4490-0461, ext. 120 or sdunster@iienet.org.

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Elements and Measurements

The issue of measurement technique must be settled before any contemplation of the nature of standard data can be begun. Marvin Mundel, who worked with the problems of measurement and application of data as much as any person, found measurement techniques. These techniques can be arranged into 5 categories.

Implicit in the nature of work
Time standards by fiat.

Using past performance records
Simple mathematical techniques
Complex mathematical techniques.

Involving the worker in data collection
Fractioned professional estimates
Self-reporting

Requiring direct observation
Direct time study- intensive sampling
Direct time study – extensive sampling

Using previous time study data
Predetermined time systems
Standard data systems

Depending on the use of the standard data, any one of these may be appropriate for cost and benefits desired. However in much of industry the data collection cost, and application repeatability of time study is appropriate. Past records, self collected data, and establishment of standards by definition all have fundamental and potentially serious sources of variation.

Time study thus becomes the most common approach and data is usually confirmable with a time study. From the time of Taylor, one of the steps of time study involved in time study is the division of work into elements. Large elements are easier (in some cases possible) to time. Small elements are convenient to use as building blocks in standard data. Elements can also be separated into constants and variables. Each of these dichotomies are dependent on the particular study. It should be easy to see that without considerable planning, many hours of effort may need to be discarded as one goes from individual standards into standard data.

Predetermined Time Standards, categorized by Mundel into the fifth type of standard, are the result of a number of standards that measure basic motions rather than elements. These basic motions can not be clocked with a stopwatch and are established by analysis of video or motion picture frames.

This leaves the last category, Standard Data. Actually, defining standard data is some what like defining a library. The ideal library has the books you want to need in an easy to find order. Too many books is a waste, two few is also a waste of a different type, and having the wrong books is a third kind of waste. It is the same with standard data.

What is Standard Data?

Marvin Mundel describes standard data as: Rather than determine the standard time for each job on the basis of an individual study, standard times from a number of studies of related jobs may be organized into a database. Using this database, the standard times for related jobs may be constructed or synthesized. Such databases are called *Standard Data*.

Levels of Data

In designing a productivity measurement system for the United States Federal Government, he set eight orders or levels of measurement. The largest four are based on the measurement of product, program, plant, and organizational output. The smallest four involve motions, elements and standard data. These lesser four are:

Motions	Predetermined time systems	Smallest practical units.
Elements	Time Studies PDTS standard data	Building block
Tasks	Standard data	Unit of assignment for crew, or individual.
Subassembly	Standard data May require many stds.	Lowest level for costing

Usually, standard data is on level 2, 3, or both.

MODAPTS Standards

MODAPTS divides manual work into three classes: Transports, Terminal, and other motions. When used for manual assembly work, transports and terminal motions take virtually all of the task time. In each case, the number represents a MOD, or .129 seconds.

- M1 to M5 represent moves with the various parts of the upper arm from finger to shoulder.
- G0, G1, G3 represent gets with various levels of difficulty in grasping.
- P0, P2, P5 represent puts with various levels of difficulty in grasping

M1G0 M1P0	A small object is slid with the fingers. It is easy to pick up and easy to place.
M3G3 M3P0	A small object is picked out of jumbled bin and placed on a work surface. The lower arm is moved.
M5G2 M5P2	An object is moved requiring all body members to the shoulder. It is grasped with a simple finger closure and put to a defined location. (requires feedback).

In each case , the sum of the numbers is the time in MODs. (2, 9, 14).

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Other Motions, such as Walk, Crank, Foot Motion, Bend and Arise complete the motions. As long as the rules are followed, a consistent standard will be developed.
The standard is usually written as a level 2 or elemental data.

Available 2 Level MODAPTS Standard Data

Clerical
Developed by Chris Heyde in 1969, the data is coded with a separate alphanumeric code.

HE12 is the code for opening an envelope. It includes moving the opener to the envelope, inserting and slitting the seam, and removing the opener. It does not include getting or setting down the opener, nor any further action on the envelope or its contents. Other codes must be used.

T18 is the code for typing a word read from clear data.
T24 is the code typing a word on a complex layout.
T36 is the code for a word in a difficult layout
T13 is the code for data processing.

Codes for Keyboard data of touch input are also included. Codes for data processing of keystrokes are also provided. It is important that one using the data be familiar which element is appropriate for the current study and what additional elements are needed.

Transit
The standard data was developed specifically for warehouse elements. It includes codes for handling heavy weights and large boxes with two hands. (an addition to the original MODAPTS codes), elements for getting and using manual trucks, and elements for forklift operation.

A major consideration is that the work was studied with persons used to lifting heavy loads and operating specialized equipment. This work could not be done by the range of people measured with MODAPTS.

Janitorial
MODAPTS janitorial data, developed by William Pritchard, was gathered to permit estimating of the costs of janitorial servicing a facility by sheltered workshop employees.
In this case, there are motions, such as mopping, that are done with a different stroke than normal moves with terminations. Care must be taken that the elements actually represent the movements being done and that these are at the skill and capacity level of the employee performing the task.

Sewing
MODAPTS sewing data includes many motions that are done at the same time as machine operation. Many of these are the motions to align pockets, sleeves, etc. while operating the machine. This is different from the more common machine shop data because the sewing machine operates at variable speeds.

Standard Data Development Problems
The data developed from the various studies or predetermined time synthesis must be usable by many other employees. That means the name must be appropriate for a search, the beginning and end points are defined, and any similar elements are evaluated for a better fit.

The data must be constructed so that it covers a large number of similar elements or tasks in a consistent way. Although it may be tempting to include an item as a constant in a standard, control of the variable from the beginning of studies may reduce effort.

Data should be compiled first into elements and then into task standards because the various elemental units may be useful in other areas.

Standard Data Output
The almost universal availability of computers suggest standard data be developed in a computer file format. Lists of element titles, the ability to combine elements into a standard, and the ease in naming and storing the subsequent standard are issues. The standard is then accessed by programs that calculate current performance and future scheduling of work. Other formats include tables, graphs, elemental lists, and task standards

Upcoming Events Spring 2003

All seminars to held at IIE's Center for Continuing Education Norcross Georgia

Six Sigma Green Belt (Session 1)
January 13-15, 2003

Principles & Practices of Industrial Engineering
February 19-21, 2003

Six Sigma Black Belt Training
February 24-28, 2003
April 7-11, 2003
June 2-6, 2003

Lean: TOC & Six Sigma Integration and Improvement
March 3-5, 2003

Professional Ethics: The New Challenges
March 19, 2003

P.E. Exam Review for Industrial Engineers
March 20-23, 2003

Applied Ergonomics For Operational Improvement
April 14-15, 2003

Six Sigma Green Belt (Session 2)
June 9-11, 2003

For class description, go to:
http://www.iienet.org/public/articles/index.cfm?cat=40#seminars
To register contact IIE at 800-494-0460, 770-449-0460 or go to
http://www.iienet.org/public/articles/regonly.pdf

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