THE INDEX AS A FACTOR IN INDUSTRY[1]

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With the development of industry, both in the vastness of the individual organizations and in complexity of products, the need for adequate means of designation, necessary to the recording of information and methods has increased, and with the advent of Scientific Management, this need has become a necessity.

To meet these demands, an index constructed of symbols, which serves not alone as an index, but also co-ordinates every material thing and function with which the business involved is concerned, and known as the Mnemonic Index, was devised.

The idea of mnemonic symbolization goes back to the first efforts of men to record thought and events. These records were wholly pictorial, and were both mnemonic and symbolic. This simple beginning has gradually developed into a method of literal designation, through the use of our present-day alphabet and numerals.

In the mnemonic index, we return to the early principle that the symbol shall suggest a thing or thought, rather than define it. In the place of pictures, we use letters which are given added significance according to their position in the symbol.

Mr. Taylor in "Shop Management," in giving credit for suggestions of which he availed himself in building up his method of industrial control, in paragraph 459, refers to:

> The Mnemonic system of order numbers invented by Oberlin Smith and amplified by Henry R. Towne of Yale and Towne Co., Stamford, Conn.

Mr. Smith's method is described by him in a paper entitled "Nomenclature of Machine Details," read before the second regular meeting of the American Society of Mechanical Engineers, held in Altoona, Pa., in 1881. The principal feature in this method, outside of the effort to make the symbol mnemonic, was the use of symbols in such a way as to suggest the grouping of the several machine parts.

Mr. Towne, writing concerning his method, in a letter dated June 30, 1903, says:

> . . . the system of symbols for shop accounts which I devised many years ago, and which I still use.—The essence of this consists in using letters in the same manner in which figures are used in the decimal system, i.e., by making the value of the symbol depend on the "column" or position it occupies relative to a base.

These methods have been further elaborated by Mr. Taylor and Mr. Barth and others of this group in the intervening years, so that there has been built up for the classification of the products of the industries in which Scientific Management has been introduced a philosophy which is quite remarkable in its adaptability and significance.

In so-called tonnage work, where the product is prepared raw material, the symbolization of the product is a simple matter, and one without much industrial utility. Before one has gone very far, however, in the symbolizing of an automobile and its parts, and the materials and operations necessary to produce them, or a ten-inch disappearing gun carriage, such as is manufactured at the Watertown Arsenal, in which there may be over 4,000 individual parts, manufactured out of perhaps fifty different kinds of material, the difficulties become apparent, and in the absence of a comprehensive system of symbols very little in the way of Scientific Management can be accomplished.

[1]A paper to be presented at the Boston meeting, May 22, 1915.

The idea of a comprehensive classification and complete index was inherent in Mr. Taylor's conception of industrial control. He has always held that every industry could be reduced to a definite number of functions and things. Over twenty years ago, he had worked out a classification and a mnemonic system of symbols for stores, tools, products and charges.

With the growing mass of material gathered by Mr. Taylor and his associates, the necessity for classifying and symbolizing instructions became apparent, and several definite and fairly successful efforts to bring all of the instructions of a business together into one co-ordinate whole were made. The standing order files of the American Society of Mechanical Engineers, and the Plimpton Press of Norwood, and the Code Book of Day and Zimmerman of Philadelphia, are the best examples of such indexing. The date of these ranges from 1908 to 1911.

While there has been a vast amount of time spent in the making of mnemonic indexes, so far as I am able to find, no rules have as yet been compiled for their construction. In the recent making of a mnemonic index, I found it necessary for my guidance to codify such rules. The purpose of this paper is to present my conclusions as a result of this work, with the hope that, whether or not you agree with them, they may provoke discussion, which will lead to further developments of what I believe to be the next logical step in the development of Scientific Management.

That I may be fully understood, I should explain that the work from which my conclusions are drawn was in connection with the intended introduction of Scientific Management into several concerns in the same industry at the same time, with a view to eventually having an unlimited number of concerns in the same industry operating under the same methods and instructors.

Also, that my purpose was the devising of an index, not alone for the usual purpose of indexing and designating stores, functions, products, etc., but with a view to, or I should say hope of, its usefulness as a medium through which to visualize management, as a chemist visualizes his formulas through symbols.

I have had in mind an ideal for Scientific Management, wherein a means will be devised of working out and visualizing management as separate and apart from actual management, as is the working out and visualizing of a machine separate and apart from its construction.

I believe the Mnemonic Index is the first step to this means, and, as far as possible, I have sought to make it applicable, even where its use has not been fully developed.

Imagine an architect making plans for a building without drawings, or a chemist expressing a formula without symbols; yet this is what we are trying to do in management.

It has not been many years since a large part of all experimenting was through empirical tests and actual practice. The present ability to experiment on a drawing-board means not alone the elimination of the excessive cost, but also the demoralizing effect of this method of development.

Development in management has and must continue to be through experiments "in the metal," so to speak, until we devise adequate means of expressing management on paper, comparable to symbols for chemists, drawings for engineers and notes for musicians. All who have tried to express management in written words or to improve or to experiment with purely word instructions must realize this fact.

There has probably been more waste in management than in any other form of human endeavor. It has until recently been considered as intangible a thing as personality. The familiarity of the phrase "a born manager" illustrates this.

In no other form of endeavor has there been so much transient achievement. Vast businesses and enterprises of every description have risen within one generation, only to fall within the next, chiefly because the principles, as expressed in the methods used, could not be visualized and understood, so as to be maintained, and yet at the same time modified, to meet changing conditions.

This has to some extent been overcome in our large organizations, because habits established among larger groups are more permanent, and through subdivision of management into small units, so that only one unit is put in jeopardy at a time by the death or displacement of a single man. Yet, because the separate losses are minimized as compared with the whole, they are no less in the aggregate.

As an objective toward which to work, I have assumed that:

A Mnemonic Index should indicate the subdivisions of accounts, both for accounting and statistical work, and it should co-ordinate every material thing and every function with which the business involved is concerned.

It should serve as a Standard Classification for Accounting and an Index for the main subdivision of files. It should also designate all equipment and materials, down to the smallest tool and most insignificant article of sotres, and all products and functions with which the business is concerned.

It should be easy of reference, and the symbols should be strongly suggestive, easily remembered, and susceptible to use as shorthand in writing instructions.

Turning first to physical characteristics, I suggest that a 1½-inch Standard Ring Book, No. S372, be used during the period of making, when the changes will be frequent. I also suggest that one thousand sheets of good, strong bond paper, 16 pounds to folio, be cut, say, 50 sheets to 8½ x 11, 200 to 8 x 11, 300 to 7½ x 11, 300 to 7 x 11, and 150 to 6½ x 11, and punched and furnished with index tabs.

The most general practice in structure is to divide the alphabet, omitting I, O and Q, into three groups:

A to D to represent Expense Symbols,

E to W to represent Product Symbols,

K to Z to represent Construction Symbols.

A sub-index representing every desired qualification of each designation is then developed from each root letter in each group. The Expense Symbols are constructed so that they indicate the method of accounting, and the Product Symbols an analysis of production.

The best results, however, are obtained through: the use of the entire alphabet without regard to groups to designate every root from which there may be occasion to construct a symbol; the confining of the symbols developed from each root to the qualifications of the root proper, and the use of these symbols in series.

This gives a series of small indexes, which together constitute the master index, from which separate codes for use of departments and individuals are made. It insures a minimum of diversity in the meaning and uniform significance of letters, and while giving the same fixed code for working indexes as the first-mentioned method, it at the same time offers a scope of designation, flexibility, adaptability and utility never before obtained.

The symbols under this method, being made of a combination of the same smaller symbols, used over and over again, in different combinations, are very easily remembered; whereas with the first-mentioned method, each symbol is built up independently, and must be remembered independently of every other symbol.

A	Auxiliary Departments	"Expense"
B	Business Departments	
C	Selling and Administrative Departments	
D	Manufacturing Departments	
E		"Product"
F		
G		
H	Sketches	
J		
K	Bindery Work	
L	Special Tools	
M	Merchandise shipped direct and Stores sold	
N	Packing	
P	Printed Matter	
R		
S		
T	Type Setting and Plate making	
U	Publishing	
V	Worked Material for various uses	
W		
X		"Construction"
Y	Construction, Equipment and Machinery	
Z	Real Estate and Buildings	

LIMITED NUMBER OF ROOTS WITH UNLIMITED MODIFICATIONS

ROOT LETTERS

A	
B	BUSINESS—Managerial divisions, subdivisions, and employees, pertaining to administration and selling, as distinguished from producing.
C	COST—Outlay incurred, irrespective of time or form of payment.
D	DIRECT PURCHASE—Purchases made specially for a given product.
E	EQUIPMENT—Real estate, buildings, machinery, apparatus, furniture, and fixtures of all kinds.
F	FUNCTION—Duties and performances.
G	GENERAL—Managerial divisions, subdivisions, and employees, auxiliary or subsidiary to other divisions.
H	
J	INSTRUCTORS—Written information and instructions.
K	OUTSIDE PROPERTY—Material and supplies, which are not the property of the company.
L	
M	MANUFACTURING—Managerial divisions, subdivisions, and employees, pertaining to producing.
N	
P	PRODUCT—Separate parts, groups of parts, and completed articles, representing the definite stages through which materials and labor pass during the process of production.
R	REVENUE—Income accrued, irrespective of time or form in which now standing.
S	STANDARDIZED STORES—Materials and supplies, regularly carried in stock.
T	TOOLS—Hand implements, including small hand machines.
U	UNSTANDARDIZED STORES—Materials and supplies, not to be re-ordered when used, other than Direct Purchases, overruns, cuttings, etc.
V	
W	WORK PLACE—A subdivision of the premises, representing a definable section, for the purpose of designation in writing instructions and for distributing overhead expense.
X	
Y	BY-PRODUCT—Things of value, incidentally produced in the conduct of the business.

UNLIMITED NUMBER OF ROOTS WITH LIMITED MODIFICATIONS

There is no apparent difference in the symbols as they