

THE NATIONAL MEASUREMENT SYSTEM - A HIDDEN GIANT

I'd like to have you picture in your mind's eye a very large friendly elephant. Next picture a lot of small boys with blindfolds on, milling around the elephant. Finally picture a small fellow mounted up on the elephant's head with one of those elephant-trainer hooks. Do you have that picture?

I came up with this picture because I needed some sort of analogy to represent the National Measurement System. The elephant is the National Measurement System because it's very, very large. It is slow moving in it's own way. You could even call it ponderous. Finally, it is very powerful; especially when it's headed the right direction. But I want to emphasize also that it's very friendly, it gets very good work done.

The small boys with the blindfolds are all of us with an interest and stake in measurement science. We're trying to determine what this elephant is all about by feeling around the kneecaps in the dark. The measurement system is so large and obscure that we can't see it in it's totality. But it's all there and it's working for us all the time. We're trying to get it to move in the right direction to help us out in our own jobs, in our company's jobs.

To finally finish my analogy, the little guy up on top with the training hook is the National Bureau of Standards. I don't think it means NBS is in control of this behemoth, but they are riding at the head of it, and if anyone can and should direct it, they are it.

What is the National Measurement System? Is it so obscure and hard to understand that it can only be approached as blindfolded observers? In some ways, yes! But the purpose of this article is to call attention to the existence of the system, the role of NBS in the scheme of things, and point out how the system interacts with various sectors of our society.

The National Measurement System consists of all the national activities and mechanisms that provide physical measurement data to allow creation of the objective, quantitative knowledge required by our society.

The concept was developed at the Institute for Basic Standards at the National Bureau of Standards and has been discussed by NBS authors for a number of years. Dr. R. D. Huntoon in the October 6, 1967 issue of Science focused on the concept in an article entitled, "Concept of a National Measurement System".

The opening paragraph spells it out, "concurrently with the growth and industrialization of this nation, there has developed within it a vast, complex system of measurement which has made possible the very growth that brought the system into being. This National Measurement System (NMS) stands today as one of the key elements in a worldwide measurement system that links all major nations together in a consistent, compatible network for communications and trade".

An exciting concept! Especially because the infrastructure of the NMS was so invisible and widespread, but still so important to our increasingly technological society.

In 1972 the Assistant Secretary of Commerce directed the preparation of a study of "The NBS Standards of Measurement to Determine if Their Accuracy is Sufficient for the Needs of U.S. Industry". This request led to initiation of a three year study of the National Measurement System.

The study was a massive effort involving many people at NBS in all divisions of IBS. The results are an equally massive series of reports which comprise an impressive "snapshot" of a very complex and pervasive system. This system underpins the technological economic structure of our country and its relation to the world.

For all organizations and individuals who have a stake in the technical and economic progress in our country, a reading of "The Final Summary Report Study of the National Measurement System" dated March 1977 is highly recommended.

The summary references 151 separate studies and offers 27 different documents including detailed microstudies in a variety of specific measurement areas such as pressure, far-UV radiometry, surface properties, etc.

Most impressive in demonstrating the all-encompassing nature of NMS is a direct measurement transaction matrix shown in Figure _____.

In one seemingly cluttered model, this chart relates vast economic and technical sectors of our country to each other in terms of their measurement transactions. Very elegant indeed!

At each intersection, the code numbers model the measurement transactions for importance, rate of change, adequacy, and magnitude of measurements. Naturally these numbers in the model are weighted judgments by knowledgeable people. The important thing to realize is that this single table is compiled from over 70 pages of other tables, each of which came out of detailed microstudies of specific measurement disciplines. A massive study!! Those summaries are included in report NBSIR 75-943 "Transactions Matrix Description of the National System of Physical Measurements".

The impact to a business or scientific person who has a feeling for the massive trade movements between sectors of our economy should be sobering. It's important to realize that such transactions depend so critically on measurements not just for simple equity in trade, but for all manner of regulatory and safety considerations. In so many cases there could be no transaction at all if there were no measurement system. Hundreds of billions of dollars. The study shows that measurements alone cost an estimated 6% of the gross

national product, not a surprising number.

All 78 major industrial sectors, all levels of government, and consumers buy measurement equipment or labor. Federal, state, and local governments are the largest user sector, about 35% of the total. Other service industries, principally trade, utilities, transportation, and communication account for about 25%. "High technology" manufacturing industries spend a large share of their value-added but relatively few actual dollars. The studies have shown preliminary correlations of measurement intensity with economic growth and productivity for major industrial sectors.

NBSIR 75-947, "Collected Executive Summaries Studies of the National Measurement System 1972-75" goes a long way to describing the elephant of the analogy. An open-minded person is soon impressed with the pervasiveness of the National Measurement System, its absolute crucial importance to the nation, but at the same time the clear lack of anyone in control.

The notion that such a massive system is running along, doing a job, without being well understood is a little frightening. Perhaps more threatening, is the fact that if the direction of such a system must change to meet new imperatives from Congress or the people, some agency must be in charge.

There is little question that the fine operation of the National Bureau of Standards is in back of (somewhere) each of the transaction matrices. Further, there is little doubt that the laws requiring equity in commerce and other founding legislation requires NBS to be in charge. Specifically, the Institute for Basic Standards within NBS carries the major responsibility for physical measurement standardization. IBS is the primary underpinning for not just our nation's high technology/aerospace business and trade - but most other trade as well.

This is a terribly important responsibility - one which is only beginning to be revealed by the NMS study. In some ways measurement science is more important than energy strategy, or other national priorities. It supports the others, the technology attack as it were.

It is critical for all scientific personnel with an interest and concern about measurements to familiarize themselves with the National Measurement System and the pivotal role of the Institute for Basic Standards at NBS. They should explore their own organization's role in the system and their interactions with NBS, both for past transactions as well as future requirements.

Someone said, "If you don't know where you're going, you may end up somewhere else". The National Measurement System needs input. NBS needs input and support in its crucial role to guide our national measurement technology into the 21st century.

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