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CONSIDER THIS:

#54 All Standards are Created Equal (but some are more equal than others)

Andrew Updegrove

Standards are rather authoritarian creatures, gaining their value by bullying their way around the physical or virtual landscape, telling every other part of a design what it has to do, and sometimes even how. Just about everything in the world must kowtow before their insistence, whether it be a wine bottle conforming its shape to match the provenance of its contents, a light bulb limiting its appetite to a specified amount of power, or a WiFi chip petitioning a router for attention.

In a sense, such subservience is counter intuitive. Why would one company want to give up its freedom to design its products as it wishes, and (worse yet) agree to do something the same way as its competitor, thereby decreasing the distinctiveness of its own products? The answer, of course, is that the same company expects to gain more than it gives up when it agrees to cede a few parameters to a standard, while remaining free to differentiate its offerings in all other ways.

The result is an army of fascistic specifications that rules much of just about every discipline, from product design to professional certification to ensuring our safety and health. Most often, the power of these requirements derives simply from market forces, rather than any underlying force of law. We should all be so powerful, but rarely find ourselves so, even in our own homes.

Thus it may come as some small comfort that there are standards, and then there are, well *Standards*. Put another way, there is a pecking order among some types of standards, just as there seems to be in just about everything else in life. The fact is, some standards enjoy more clout than others.

How can that be? After all, if standards have value only to the extent that they are unassailable, how can one be "more assailable" than another?

The answer is actually rather simple. Consider, for example, what the following common objects have in common:

A 4′ X 8′ sheet of plywood

A cargo container

The distance traveled by light in an absolute vacuum in $^{1}/_{299,792,458}$ of a second

A 45 RPM single record (assuming you're old enough to know what I'm talking about)

Got it? No? The answer is that each is an example of what I'll call an "Alpha Standard."

What makes a plain, ordinary, garden variety standard an Alpha Standard? In fact, the answer to that question is often "nothing," other than the fact that many standards are derivative, or based upon, other standards to some extent, and you need to start somewhere. Sometimes that "somewhere" has an empirical reason for being what it is or has historical antecedents that lend logic to the selection. But in others, the choice can simply suit the whim of the person (or more likely committee, this being standards we're talking about) making the decision.

Once the decision has been made, however, the standard at the hub of the wheel becomes more powerful with the addition of each new standards spoke. As this occurs, the Alpha Standard becomes more entrenched, and the marketplace becomes increasingly locked in through the adoption of the spider like webs of related standards that grow up around the might Alpha Standard at the center.

Let's take a look at each one of the examples noted to see how this dynamic takes shape:

Plywood: Why 4 X 8? For starters, it's a size that's manageable to carry, but large enough to fill up a large space quickly with a minimum number of sheets. It's also about the right size, when placed on edge, to sheathe one story of a building. We'll also pause to note that both its width and length are a multiple of the same number – 2. But let's stop there and just say "why not," and focus instead on the influence that these gross dimensions have on design.

The first thing that we'll notice is that the less unique a building may be, the more likely it will be to have as many of its overall dimensions, as well as internal room sizes, expressed in multiples of 2 feet. If the building in question is a prefabricated house or one of hundreds of "tract houses" built to a limited number of designs in the same development, you'll be surprised how true to form this observation will be. The reason of course is that each is built to the lowest price possible, which means that the designer wants it to be built in the smallest amount of time possible, and with the least wastage of materials.

Obviously, the more you can lay that plywood down and nail it without cutting it off at the edges, the better you'll do on both scores. As a result, simply changing from the traditional practice of using planks to sheath walls and nailing slate to lathe applied to rafters to finish off a roof resulted in housing becoming more uniform in shape and dimensions.

So now we have the dimensions of house, and as many of the rooms as possible, fixed. What next? Well, obviously we'll want all other sheet materials to be the same dimensions, whether we're talking about sheetrock or faux wood paneling for the interior walls, foam panels for the drop ceilings, or flakeboard for the floors. And let's also think about the size of that tile, and the width of that roll of linoleum as well. They all cost money and take time to cut as well. And so it goes, until changing the dimensions of a stock sheet of plywood is about as likely to happen in our lifetimes as George W. Bush and Donald Rumsfeld are to share the Nobel Peace Prize in theirs.

Cargo containers: While the dimensions of a sheet of plywood have helped reshape our houses, cargo containers have literally reshaped the global transportation of goods. In this case, the dimensions of the box approximate the requirements of two pre-existing elements: rail cars and the trailers attached to the cabs of 18 wheel tractor trailer rigs (articulated lorries, to those on the other side of the pond). Once these dimensions had been fixed (at 20 feet in length, 8 in width, and 8 1/2 in height) and "containerization" caught on, every other element of the end to end process of shipping conformed itself to those dimensions – including other standards.

Even standards that had given long and useful lives of service were callously felled by this nouveau Alpha Standard upstart. Let us therefore pause to remember the faithful and timeless ton, now put to pasture in much of global commerce by the TEU, a new kid on the block with an acronymic name deriving from "20 foot [container] Equivalent Unit." And this is just the tip of the iceberg (for the rest of the ice, consult an earlier *Consider This* piece, titled Thinking About Standards Inside of the Box, occasioned by the 50th anniversary of the Birth of the Box).

Light: MIT and Stanford graduates will, of course, have immediately recognized this as the internationally recognized method of establishing the basic unit of length in the metric system: the metre (or meter, on *this* side of the pond). But this method is not the original formulation for determining the exact length of this Alpha Standard. That honor belongs to a 90% platinum, 10% iridium bar upon which were etched marks at a distance established at a conference titled, appropriately enough, the Convention du Mètre. A limited number of "prototype metre" bars were later fabricated for distribution to appropriate repositories around the world for reference purposes. These reference bars were etched while stabilized in temperature at "the melting point of ice."

But how was the distance between those two marks determined? To answer this, one must know that it was the French government that first adopted a metric system, and not a Royalist government, but a Republican government, in 1799. The distance selected to serve as the determinant of the metre was therefore intended to approximate, in true rationalist fashion, 1 millionth of the length of an imaginary line drawn between the North Pole and the equator, passing through (of

course) Paris. Once that distance had been determined to the greatest precision enabled by the science and mechanical means of the times, the exact length of the meter could be assigned, a new Alpha Standard sprang into being, from which all other decimalar extensions, both great and small, could be derived.

Still, even platinum-iridium bars can become tarnished, and they do insist on expanding and contracting. As early as 1893, almost before the new prototype bars had settled in to their new homes, efforts commenced to find some invariable natural phenomenon that could serve as a reference point. Not until 1960, however, was such a natural measure agreed upon, with the laurel wreath being awarded to 1,650,763.73 wavelengths of the orange-red emission line in the electromagnetic spectrum of the krypton-86 atom (yes, of course, in a vacuum!)

Well done! But not, of course, well done enough. Why, after all, settle for less than the ultimate invariable, as discovered by Albert Einstein in his own relativistic way? Why not base the metre *upon the very speed of light itself?* The Wikipedia entry for the metre provides the last bit of explanatory precision on how this was conceived as follows:

> Note that this definition had the effect of fixing the speed of light in a vacuum at precisely 299,792,458 metres per second. Although the metre is now *defined* in terms of time-of-flight, actual laboratory realizations of the metre are still *delineated* by counting the required number of wavelengths of light along the distance. An intended byproduct of the 17th CGPM's definition was that it enabled scientists to measure the wavelength of their lasers with one-fifth the uncertainty. To further facilitate reproducibility from lab to lab, the 17th CGPM also made the iodine-stabilised helium-neon laser "a recommended radiation" for realising the metre. For purposes of delineating the metre, the BIPM currently considers the HeNe laser wavelength to be as follows: λ_{HeNe} = 632.99139822 nm with an estimated relative standard uncertainty *(U)* of 2.5×10^{-11}.[3] This uncertainty is currently the limiting factor in laboratory realisations of the metre as it is several orders of magnitude poorer than that of the second ($U = 5 \times 10^{-16}$).[4] Consequently, a practical realisation of the metre is usually delineated (not defined) today in labs as 1,579,800.298728(39) wavelengths of helium-neon laser light in a vacuum.

Pretty impressive stuff, huh? Query, though, whether something may not be missing from this picture of precision, for while the speed of light is absolute, the passage of time is relative. Should our determination of the metre not therefore take place at sea level, given that time passes more slowly at altitude?

Be that as it may, the Mighty Metre, however established, remains the Alpha Standard of length, and the mother of all measurements from here to there, a living legacy of the Age of Reason.

45s: Once upon a time, few bedrooms inhabited by teenage girls lacked a cheap portable "record player," next to which would sit a stack of 7" diameter vinyl "records," each in a paper sleeve, and upon which two songs had been recorded,

one on the "A" side and one on the other, or (yes, that's right) "B" side (these were not very imaginative times). These records were also referred to as "singles," to distinguish them from the larger vinyl records, called "albums," "LPs" (for "long play," comparatively speaking), and sometimes "33s" (because they spun at 33 1/3 revolutions per minute on the "turntable" found within the "record player" (45's spun at a faster speed – 45 RPMs, and hence the name). Are those of you under 45 (that's age, now) still with me?

Singles could be about three minutes long, because that's about what a 45 could hold under then-available technology. Each 45 (on its A side) held a song that a band or performer hoped DJs would play on the radio, thereby creating demand primarily for the more profitable albums. Albums played for about 45 minutes to an hour, and were made up of singles, B side tracks, and previously unreleased material.

With that as background for those not alive during prehistory, we can now get back into the Alpha Standard business.

The first and foremost impact of the 45 RPM vinyl format was the enshrinement of the Three Minute Single Standard, the moral authority of which might best be illustrated by paraphrasing the introduction to the Killer Rabbit vignette in Spamalot:

> ***Station Owner*** (Examining the first new 45 single, turning it over in his hands.) Why is it....Why is it this size?
> ***DJ:*** I know not, boss.
> ***Station Owner:*** Consult the book of Payola!
> (Record Agent steps in)
> ***DJ:*** Payola Chapter One, verses nine through twenty-seven:
> ***Record Agent:*** And Saint Phillip Spector raised the 45 up on high saying, "Oh RCA, Bless us this Single, and with its Wall of Sound smash my competitors in MoTown to tiny bits."
> And the Chairman of RCA did grin, and the people did feast upon the lambs, and stoats, and orangutans, and breakfast cereals, and lima bean-
> ***DJ:*** Skip a bit, brother.
> ***Record Agent:*** And then did David Sarnoff spake, saying: "First, shalt thou place a plastic spider on thy 33 spindle.
> Then shalt thou place upon it and record a single, which shall be three minutes in length. No more, no less.
> *Three* shall be the length of the single, and the length of the single shall be three.
> *Four* shalt thou not record, and neither record thou two, excepting that thou then goest on to three.
> Five is RIGHT OUT.
> Once the number three, being the third number, be reached, then lobbest thou the single at the record stations of the land, who, being in my pay, shall play it. Amen.
> ***All:*** Amen.
> ***DJ:*** Right! (finally gets to put single on turntable)

All right, maybe that's a bit over the top. But suffice it to say that for years, singles were required to be within seconds of three minutes in length in order to make it on the air. For years, the reality of popular music, whether A side, B side, or other, conformed to this norm until the musicians of the late 'Sixties began to rebel against the three minute single standard (just as they, and their listeners, did everything else), at least on albums. The final act of rebellion was committed by the Beatles, who finally broke the three-minute standard rule decisively with the release of their hit "Hey Jude" in August of 1968. As if to rub it in, a good portion of the over 7 minutes of air play is a repetition of that most timeless of all derisive sentiments, "Na, na na, na-na-na-na."

All of which, to be sure, does not in the least disprove the existence of Alpha Standards. Why? Because as everyone knows (or at least those old enough to remembers 45s), the Beatles in their prime provided the Alpha Standard by which all else was judged.

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