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→ **QUANTUM CONSIDERATIONS AND NEUROSCIENCE FOR BRAND RESPONSE MARKETING**

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Is thinking of Marketing as a quantum mechanical process useful? It is when you are seeking to attribute consumer response to media impressions, and when you're crafting and testing effective messaging. This white paper explores a few selected topics within this theme under active research, development, and use in marketing and advertising campaigns.

Exactly why someone buys or not, and why they buy one brand over another, will always have some aspect of the mysterious unknown, and therefore marketing will always have a magical component requiring art and inspired creative initiative. Even when directly asked, most people are unaware themselves of all the influences motivating them to buy and value brands. However, there are aspects of marketing that are scientifically measurable and predictable.

Max Planck's quantum hypothesis in 1900 and Einstein's explanation of the photoelectric effect in 1905, launched physics into an exciting phase locating a fundamentally unmeasurable, unpredictable, mysterious, magical quantum world deep within the rigid determinism of classical physics. The parallels cannot be coincidental. It's certain that how marketing channels the mysterious, magical flow of free will into the macroscopic, deterministic, measurable world of response is a common sense, human perspective on the arcane physics of quantum mechanics.

MARKETERS: WHY YOUR WORK LOOKS SIMILAR TO QUANTUM PHYSICS

While the exact mechanics and brain physiology of phosphorus, Posner molecules, or microtubules that amplifies quantum fluctuations of subtle thought, intention, bias and belief into concrete action in the observable world are endlessly debated, it is happening and can be applied to anything we do, including marketing. Marketers have always taken bold, inspired action to broadcast a clear, compelling and coherent creative message that powerfully impacts the foundational neurophysiological quantum probabilities of collective consciousness. In other words, all the marketer's tools—product design to messaging, media choice and delivery—are used to increase the probability of engagement and sales, similar to a catalyst increasing the quantum probability of a chemical reaction. In the marketer's world, modern, data-driven technology has dramatically increased our ability to practically use known principles to rigorously, repeatably and statistically quantify observable metrics. This technology enables effective evaluation of the return on investment over different dimensions of advertising media.

A good analogy is an atom transitioning from an excited state by emitting a photon. It is impossible to know exactly when, and especially why, any one atom will transition. Observing the transition of only a few atoms will not give a good representation. However, measuring the statistics of a very large number of atoms leads to a precise probability distribution of the process. Similarly, while individual consumer behavior may not reveal reliably scalable insight, statistics of large numbers of responses does. The yes/no, 1/0 nature of a response is the essence of what the word quantum means. Reliably measuring statistics of large numbers of responses enables quantifying the impact on the probability for individuals to respond to marketing campaigns/stimuli.

Statistically quantifying marketing efforts is similar to a wave function or hidden variables interpretation of quantum mechanics. In multi-touch marketing analysis, the branching probabilities of all possible customer journeys resembles the many-worlds interpretation of quantum mechanics.

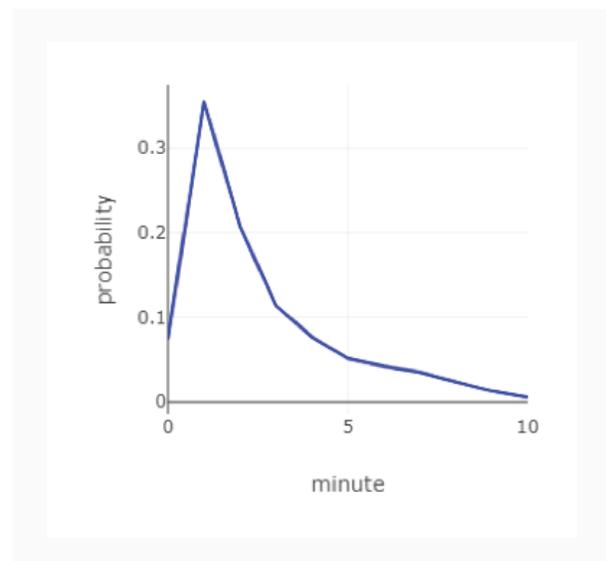
TAPPING INTO WHAT'S ALREADY IN THE BRAIN

Marketers know that resonance with powerful existing tendencies and stories in the individual and collective mind inspires product design and powerfully amplifies the brand message. Beliefs, memes and cognitive biases continually drive human desire and action. These can be thought of as existing latent quantum probabilities or hidden variables contributing to future collapses of the quantum wave function into actual response. Messaging that attaches your brand to existing tendencies to respond, can be radically more effective than creating an entirely new desire to respond from nothing, and almost all advertising makes use of this. It's like tipping a ball already at the top of a hill rather than pushing the ball from the bottom of the hill. An obvious start identifies and uses messaging to target population segments that already resonate strongly with your product.

Significant expansion beyond existing strong response segments can be achieved by identifying and leveraging deeper universal human desires and themes. In practice, resonance and response to universal messaging varies in detail with culture, demographics, psychographics and time because the logistics of embodying messaging in creative uses specific language, settings, actors, etc. Targeting and microtargeting attempt to craft the details of the embodiment of universal messaging in creative unique to each segment or individual to resonate most strongly.

TV'S IMPACT ON WEB TRAFFIC

This connection between probabilistic individual response and measurable large statistic response is clearly seen and applied by measuring impact of TV airings on web traffic and conversions. Without additional information, it's impossible to know which individual web visits were driven by TV. However, aggregating over many TV airings reliably reveals clear impulse response curves that can be interpreted and used as a TV web response probability function like the one shown to the right.

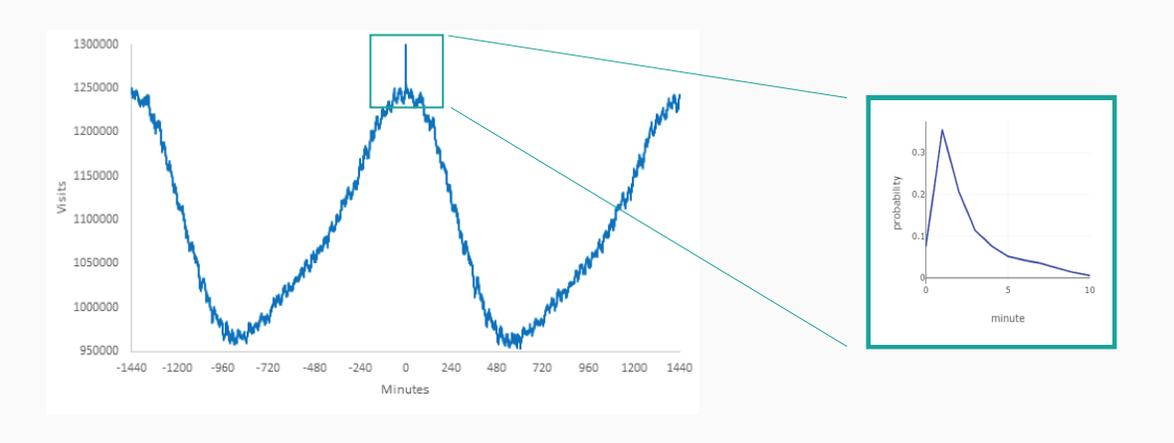


*Figure A

Techniques for instrumenting provide additional information. TV-only URL's and smart TV impression data can significantly improve the precision of these measurements and reduce the statistics needed for reliable, actionable insight. They do not however, negate the fundamental quantum, probabilistic nature of individual response. Both techniques give a deterministic tag over a sample population which must then be statistically extrapolated to the total population. Measurements show that TV-only URL's are only used by the minority of responders: most people initiate a web search in response to TV airings, especially for businesses that offer their goods/services predominately or entirely online. Even in the currently unrealistic ideal of complete deterministic data of TV impressions over the whole population, TV impressions are only one type of touchpoint among many other brand touches contributing to a response. This again requires a probabilistic, statistical approach to attribute credit for response over multiple contributing touchpoints.

ATTRIBUTING WEB RESPONSE TO LINEAR TV AIRINGS AND QUANTUM PATTERNS

In calculating response and attribution, one can observe wavelike patterns in an attribution correlation function between web visits and airing times. In addition to the impulse response spike after the airing time zero, a long-range view of the correlation function, Figure B, shows daily 1440 minute, cycles due to the daily spend pattern and 30 minute cycles due to the 30 minute spacings many stations program between airings for flights with lots of spots. The 10-minute impulse response curve in Figure A is a close in view of the middle spike in Figure B. A physicist would note that the TV response patterns resemble quantum diffraction experiments. Both patterns are due to a fundamental ambiguity or lack of knowledge: which slit the particle went through is unknown and which airing generated a particular visit is unknown. The ambiguity would disappear if we could uniquely tag which TV airing produced each specific response. The tagging approach is similar to how "tagging" which slit a particle passes through destroys a quantum interference pattern. The pattern in both figures is produced by a correlation function between a time series with ones at airing times and zeros elsewhere, and the visits time series. This airing time series may be thought of as the diffraction grating through which the individual visits pass through without knowledge of which slit (or airing) each visit comes through.



*Figure B

PRACTICAL APPLICATION OF PHYSICS IN MARKETING

Fortunately, one can take practical advantage of these principles to encode powerful brand messaging within impactful media, and effectively measure and optimize response without knowing the details of quantum physics. Below are six key points, derived from data science and quantum considerations, that can be used to develop strategic campaigns and measure their efficacy:

- Start with deep knowledge of your product, company, current and potential customers backed with quantified demographic and psychographic information.
- Craft messaging and creative rooted in a selected few of the deepest themes resonating most with your brand, product and customers, i.e. base brand messaging and creative on deep neuroscience.
- Set up and instrument your media and response channels, especially digital response channels, for as complete, organized, and rich information as practical. Use TV only URLs and smart TV impression data where appropriate and affordable.
- Aspire to an ideal for each touch to each individual consumer as the most memorable, positively impactful representation of your brand, and scale this messaging by optimizing to measures over many responses.
- Keep optimizing over every appropriate relevant dimension – i.e. media type, media outlet, time, creative – but especially dig into testing the deep neuroscience principles messaging is based on. Optimizing media spend from one media type or station to another gives good incremental campaign improvements. Aligning on messaging that powerfully impacts and resonates with people on a deep level can produce order of magnitude campaign improvements. Advertising history can and has been made with messaging that literally creates or transforms a whole industry.
- Pay attention to the statistics of response attribution and be wary of measurements with small statistics, especially for making major campaign changes. A result for web response for one \$50 airing is very unlikely to be reliably accurate. Results for a \$5000 airing or a hundred \$50 airings can be taken more seriously.

For more details on the neuroscience of marketing see Jessica Hawthorne-Castro's articles: *The Use Of Neuroscience In Marketing: The Brain Tells No Lies* and *The Use Of Neuroscience In Marketing: Mixing Creativity And Science To Boost Campaign Impact*. To apply these and other powerful principles to maximize your campaign performance, contact us.