Mathematical model based on psychology predicts who will buy trendy products

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It's often risky to introduce new products to the market. In fact, statistics show that between 40 to 90 percent of new products fail. A key component of product adoption is consumer psychology. While there are

a few theories that attempt to explain why certain people are not likely to accept novelties, a new study takes a slightly different approach.

Florida Atlantic University and collaborators developed and introduced a new mathematical innovation model, grounded in psychology, to provide both qualitative and quantitative predictions of adoption trends for new products.

The objective of the study was to test the researchers' hypothesis that the most innovative people are making purchasing decisions independently of others, highly innovative people are more likely to adopt when the adoption trend has an increasing rate of growth (accelerating trend), moderately innovative people are more likely to adopt when the adoption trend has a positive rate of growth (increasing trend), and the least innovative people pay attention only to the total number of adoptions when making the purchasing decision.

Researchers divided people/adopters into four categories: innovator, early adopter, majority and laggard. They applied their innovation model to predict sales data of 200 products of a supermarket chain over four years. They assigned particular preferences for various adoption trends based on the adopters' psychological profiles and generated forecasts for retail sales. They then compared the performance of their innovation model in predicting sales with two other commonly used innovation models and one financial time series model.

Results of the study, published in the journal *Physica A: Statistical Mechanics and its Applications*, offer a new psychological interpretation of probably the most popular, existing adoption model used widely in marketing today.

Key findings reveal that different adopter groups are looking for particular properties of adoption trends to inform their purchasing

decisions and that those properties can be formulated mathematically with testable predictions. Importantly, their innovation adoption model outperformed two behavioral models, and the BASS model, which has become the standard model in business innovation forecasts.

Findings point to the evidence of customers' behavior based by these four groups, but more importantly, illustrate the usefulness in quantifying psychological behavior in a general social context, especially with respect to innovation.

"We assumed that individuals' decisions regarding the purchase of a new product are driven by the perceived type of adoption trend," said Andrzej Nowak, Ph.D., co-author and a professor of psychology in FAU's Charles E. Schmidt College of Science.

"Innovators look for new products and try them out first, regardless of what anyone else is doing. Early adopters, who look for new future successful products, try to get them early. They react to the value of the second derivative of cumulative sales when making decisions. The majority are interested in products quickly gaining popularity and are more likely to buy when the first derivative of cumulative sales is high. The laggards see only the total number of adopters, which is cumulative sales, as a convincing reason to buy."

The authors say that companies that want to survive and flourish in today's fast-changing market need to constantly innovate and adapt to the changing conditions, customers' sentiment, and emerging trends.

"Further research in the area of retail product sales forecasting is extremely important since accurate models of product adoption can help companies reduce waste from unsold products, which in many cases also can affect the environment and decrease storage costs," said Nowak.

Provided by Florida Atlantic University