New business model may help curb fashion's fierce environmental impacts

September 22 2023, by Matt Swayne

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Clothes that are produced quickly and just as quickly go out of style and into the trash bin can have dire effects on the environment, polluting the air with carbon and choking landfills with chemicals that can seep into

the water supply.

A Penn State Smeal College of Business-led team of researchers found a new business model may address the issue of overconsumption without burdening companies operating within the fiercely competitive fashion industry.

The researchers found that consumers are willing to pay more money for clothes they can customize and keep the items longer. The findings, published in the *Journal of Operations Management*, suggest that clothing companies that adopt a mass customization model can remain profitable while decreasing the fashion industry's environmental impacts.

"What we were asking is: How do we find a way to provide product variety while not suffering significant cost on initial manufacturing expenses?" said corresponding author Dan Guide, Smeal Chaired Professor of Operations and Supply Chain Management. "The big idea is that we'd like for people to stop disposing of stuff as fast as they do."

Aydin Alptekinoglu, professor of operations and supply chain management and Robert G. Schwartz University Endowed Fellow in Business Administration, served as first author on the paper.

"We hypothesized and showed that providing customization to cater for individual consumer tastes but at a mass scale—the idea of mass customization applied to fashion—might help delay the eventual disposal," Alptekinoglu said. "In fact, we think mass customization can be the basis for a new business model in fashion that is more sustainable and more profitable."

According to Guide, fast fashion refers to how the fashion industry often produces clothes made of inexpensive, plastic-based synthetic materials called polymers. Because the clothes are cheap and tend to wear out

quickly, consumers are more likely to throw them out and buy new instead of attempting to repair them. The clothes typically end up in landfills and the chemicals that make up these cheap polymers can infiltrate the water supply.

"The big problem with these artificial fibers is that they are a complex blend of polymers," Guide said. "They're really many different types of plastic, which we tend to do a lousy job of sorting, so these polymers become too complicated to recycle and the plastics can, for example, end up seeping into the water supply."

Recycling is often not an option either because the polymers are often too complex to efficiently recover, added Guide.

Making business sense

According to Guide, by proving people will pay more for their personalized clothes, businesses can compensate by selling fewer clothes for more money, rather than selling more units of disposable clothing for less money.

No business will adopt a practice that will hurt its ability to compete, or hurt their investors, said Guide.

"Our business school and, in particular, my supply chain department does a lot of work with companies," Guide said. "So, when we talk to managers and engineers, I would feel very comfortable going into those businesses and those plants and telling them this is a way that you can make money while still doing good. I love that message for companies."

According to the researchers, the solution is also practical because the technology currently exists to allow many people to personalize their products online. For example, customers can upload their pictures to a

website to review different sunglass styles, or virtually try on clothes.

Equally important, flexible manufacturing technologies exist to support such product customization at a mass scale. For example, 3D printing and various other automation technologies make one-of-a-kind, serial production possible. Alptekinoglu said he expects that the economics of such technologies, which are constantly improving, will naturally point the fashion industry toward mass customization.

Studies

To test the business model, the researchers conducted a pre-test, followed by two studies to investigate consumers' reactions to varying degrees of the mass customization of T-shirts.

In the first study, 237 undergraduate students were randomly assigned to participate in person, where the team examined the effects of four customers' involvement points—design, fabrication and use—on their willingness to pay for and hold onto the T-shirts. The customers could opt for ready-made T-shirts produced by the firm, or what the researchers termed "use."

Alternatively, they could personalize their T-shirt by selecting from a range of existing colors and images provided by the firm, or "assembly." For more extensive customization, customers could create their own custom color and select from the firm's library of pre-existing images, or "fabrication." For the ultimate level of personalization, called "design," customers had the freedom to design a completely unique T-shirt by crafting their own custom color and image.

In the second study, the focus shifted to exploring different approaches to a single point of customer involvement in mass customization. The team recruited 501 U.S. participants, randomly assigning them to five

different groups representing distinct customization conditions. The researchers specifically investigated the influence of providing sample images in the design condition on how much the participants would pay for and how long they would keep the customized products.

By randomly assigning participants to one of these conditions, the researchers were able to test how different aspects of customer involvement affect the overall mass customization experience and its consequences.

Future work

According to the researchers, there is still more work to be done.

"While the basic idea is applicable to many other industries with significant interest in mass customization, like auto and furniture, the current supply chain structures and consumer behavioral dynamics in those industries can be vastly different," Alptekinoglu said. "So, expanding to other product categories while respecting those differences might be very useful."

One of the limitations of the study is that the researchers recruited mostly students from western cultures, so a next research step would be to investigate if there are similar customer behaviors in other countries and cultures.

Guide said another action step would be more outreach to move this research from the laboratory and into real life.

"I'm used to taking what I'm doing and bringing it to a company to get them to tell me what they think about the concept," Guide said. "I'd like to see us make an effort to get this information out to these managers."

Guide said that the research team's unique interdisciplinary approach—in this case, joining supply chain with marketing scientists together—will be helpful in investigating solutions to fast fashion's environmental impact.

"We have a team who are used to working with each other," Guide said. "And each member knows an area—such as behavioral marketing and analytical modeling—and that interdisciplinary approach helps us look at the question of sustainability that is solution-based, that businesses will be willing to adopt."

More information: Aydin Alptekinoglu et al, Can mass customization slow fast fashion down? The impact on time-to-disposal and willingness-to-pay, *Journal of Operations Management* (2023). DOI: 10.1002/joom.1255

Provided by Pennsylvania State University