

“What have you been studying lately?”

Overview my research 2022-24

Balazs Kovacs

Yale University

Prepared for the PhD admission day meeting, 2024

Substantive interests

My research lies in the intersection of strategy, innovation, entrepreneurship, and social networks. Connections to marketing and IS.

I study how socially structured information such as categories, awards, online reviews, and networks shape audiences' perceptions and evaluations in creative domains such as music, literature, dining, or innovation.

In creative domains quality and relevance are often difficult to discern, making social evaluations particularly critical.

Methodological interests

Online reviews to capture audience dynamics and valuations

Natural Language Processing and Machine Learning / AI to understand review texts, innovativeness etc.

Methodological papers to understand/validate online reviews, star rating, text analysis, etc

Study the biases introduced by rating systems and AI.

Large-scale experiments

Research highlights from 2023-24



Uncovering the semantics of concepts using GPT-4

Gaël Le Mens^{a,1}, Balázs Kovács^b, Michael T. Hannan^c, and Guillem Pros^a

Edited by Kenneth Wachter, University of California, Berkeley, CA; received June 3, 2023; accepted October 13, 2023

The ability of recent Large Language Models (LLMs) such as GPT-3.5 and GPT-4 to generate human-like texts suggests that social scientists could use these LLMs to construct measures of semantic similarity that match human judgment. In this article, we provide an empirical test of this intuition. We use GPT-4 to construct a measure of typicality—the similarity of a text document to a concept. We evaluate its performance against other model-based typicality measures in terms of the correlation with human typicality ratings. We conduct this comparative analysis in two domains: the typicality of books in literary genres (using an existing dataset of book descriptions) and the typicality of tweets authored by US Congress members in the Democratic and Republican parties (using a novel dataset). The typicality measure produced with GPT-4 meets or exceeds the performance of the previous state-of-the-art typicality measure we introduced in a recent paper [G. Le Mens, B. Kovács, M. T. Hannan, G. Pros Rius, *Sociol. Sci.* 2023, 82–117 (2023)]. It accomplishes this without any training with the research data (it is zero-shot learning). This is a breakthrough because the previous state-of-the-art measure required fine-tuning an LLM on hundreds of thousands of text documents to achieve its performance.

categories | chatGPT | deep learning | typicality | LLM

Are politicians who express opinions that differ from the prevalent views of their political party penalized for doing so? Do consumers prefer cultural items that fall into an established genre or those that challenge established norms (1)? When companies seek to fill a position, do they hire job candidates with a career identity that is typical of the position or those with more atypical experiences (2, 3)? Do research articles which conform to the standards of specific fields have a larger impact on subsequent research (4)? Are patent applications that propose a technology that clearly fits within a technology class more likely to be approved by patent examiners?

Answering these questions requires, in part, determining the semantic similarity between objects and concepts (or categories). Research in social and behavioral science refers to such an assessment as “perceived typicality.” Typicality in a concept is the degree to which an object is perceived as representative or prototypical of that concept (5). For instance, a typical Mystery book might be thought of as a suspenseful and engaging piece of fiction that challenges readers to solve the puzzle with the protagonist. A book with

Significance

We use GPT-4 to create “typicality measures” that quantitatively assess how closely text documents align with a specific concept or category. Unlike previous methods that required extensive training on large text datasets, the GPT-4-based measures achieve state-of-the-art correlation with human judgments without such training. Because training data is not needed, this dramatically reduces the data requirements for obtaining high performing model-based typicality measures. Our analysis spans two domains: judging the typicality of books in literary genres and the typicality of tweets in the Democratic and Republican parties. Our results demonstrate that modern Large Language Models (LLMs) can be used for text analysis in the social sciences beyond simple classification or labelling.

Using Machine Learning to Uncover the Semantics of Concepts: How Well Do Typicality Measures Extracted from a BERT Text Classifier Match Human Judgments of Genre Typicality?

Gaël Le Mens,^{a,b,c} Balázs Kovács,^d Michael T. Hannan,^e Guillem Pros^a

a) Universitat Pompeu Fabra (UPF); b) Barcelona School of Economics; c) UPF Barcelona School of Management;

d) Yale University; e) Stanford University

Abstract: Social scientists have long been interested in understanding the extent to which the typicalities of an object in concepts relate to its valuations by social actors. Answering this question has proven to be challenging because precise measurement requires a feature-based description of objects. Yet, such descriptions are frequently unavailable. In this article, we introduce a method to measure typicality based on text data. Our approach involves training a deep-learning text classifier based on the BERT language representation and defining the typicality of an object in a concept in terms of the categorization probability produced by the trained classifier. Model training allows for the construction of a feature space adapted to the categorization task and of a mapping between feature combination and typicality that gives more weight to feature dimensions that matter more for categorization. We validate the approach by comparing the BERT-based typicality measure of book descriptions in literary genres with average human typicality ratings. The obtained correlation is higher than 0.85. Comparisons with other typicality measures used in prior research show that our BERT-based measure better reflects human typicality judgments.

Keywords: categories; concepts; deep learning; typicality; BERT; transformer models

Five Is the Brightest Star. But by how Much? Testing the Equidistance of Star Ratings in Online Reviews

Organizational Research Methods
1–27

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Balázs Kovács¹ 

Abstract

Organizational research increasingly relies on online review data to gauge perceived valuation and reputation of organizations and products. Online review platforms typically collect ordinal ratings (e.g., 1 to 5 stars); however, researchers often treat them as a cardinal data, calculating aggregate statistics such as the average, the median, or the variance of ratings. In calculating these statistics, ratings are implicitly assumed to be equidistant. We test whether star ratings are equidistant using reviews from two large-scale online review platforms: Amazon.com and Yelp.com. We develop a deep learning framework to analyze the text of the reviews in order to assess their overall valuation. We find that 4 and 5-star ratings, as well as 1 and 2-star ratings, are closer to each other than 3-star ratings are to 2 and 4-star ratings. An additional online experiment corroborates this pattern. Using simulations, we show that the distortion by non-equidistant ratings is especially harmful in cases when organizations receive only a few reviews and when researchers are interested in estimating variance effects. We discuss potential solutions to solve the issue with rating non-equidistance.

Keywords

online reviews, text analysis, deep learning, ratings, rankings, ordinal scales

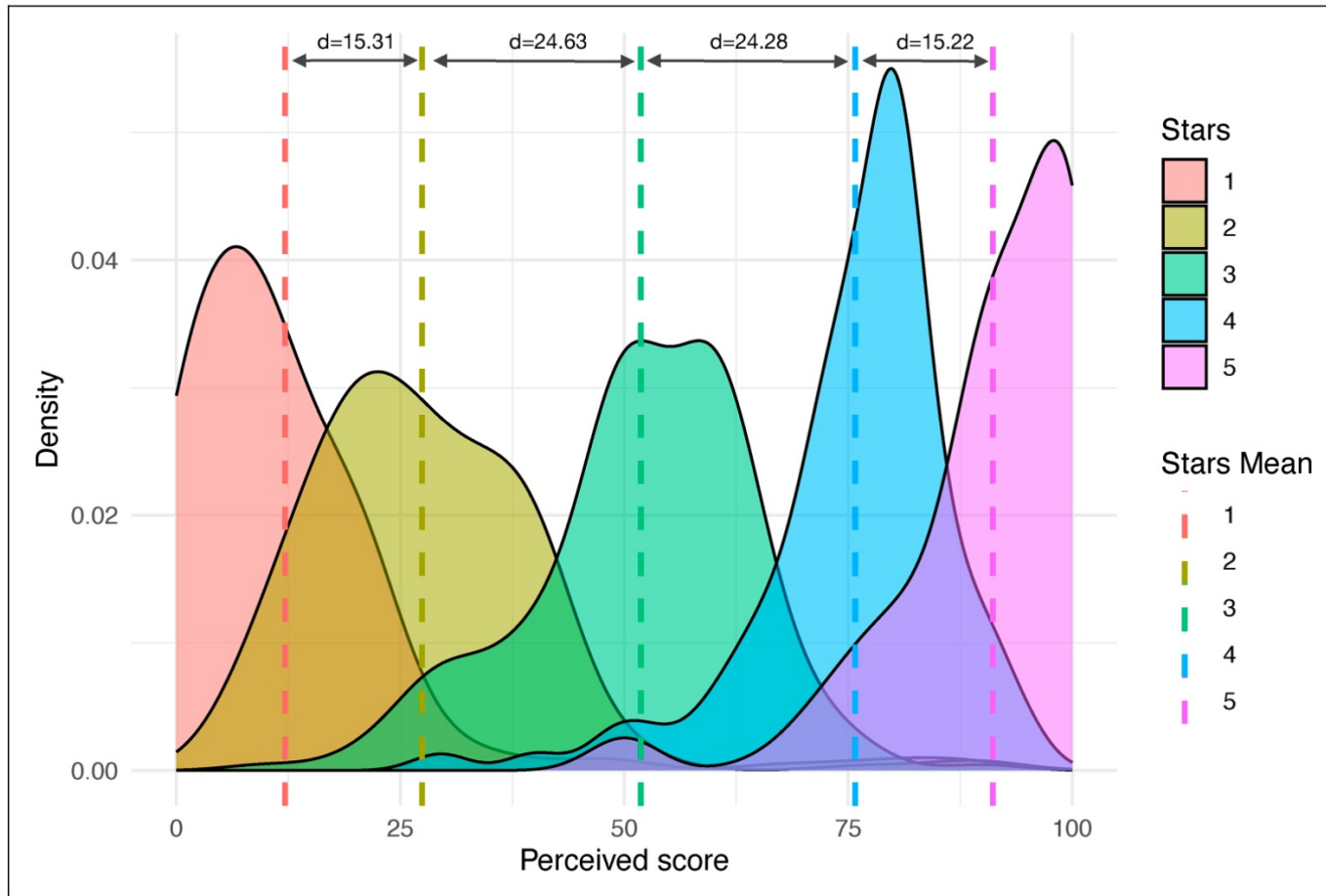


Figure 3. The distribution of perceived quality attributions by the star ratings of 1, 2, 3, 4, and 5 stars, respectively, from online respondents in study 2. The distributions are smoothed with geometrical smoothing with parameter 1.5. The vertical lines denote the mean value for each star rating. The distances (d) denote the gaps between the mean values of consecutive star ratings.

DISTINGUISHING BETWEEN COSMOPOLITANS AND OMNIVORES IN ORGANIZATIONAL AUDIENCES

BALÁZS KOVÁCS
Yale University

GLENN R. CARROLL
Stanford University

How do organizational audience members value products and services? We examine here consumers called “cosmopolitans” (individuals who think beyond a single geographical place) and those called “omnivores” (individuals who show a taste for variety in genres). We study this difference between audience members in exploratory analyses of dining, looking at consumption trajectories of specific diners from their reviews of restaurants, posted in a popular online platform. From this open-ended analysis, we discover that many omnivores are not cosmopolitans and vice versa, despite much theory suggesting otherwise. In further empirical analyses, we study a large sample of online restaurant reviews, allowing us to follow the dining behavior and attitudes of over 380,000 individuals from 2005 to 2019. We find that the effects of cosmopolitanism depend on being an omnivore; we also find both cosmopolitans and omnivores make authenticity attributions more frequently than other reviewers. In looking at neighborhoods and types of restaurants visited, we find that diversity (of both the organizations visited and the demography of neighborhoods visited) heightens a diner’s sensitivity to authenticity, suggesting intentional diversity-seeking behavior. These findings suggest avenues for future theory and empirical research.

Omnivore (Genre)			
		Low Genre Diversity	High Genre Diversity
Cosmopolitan (Geography)	Low Place Diversity	Embedded	Aficionado
		High Place Diversity	Habituated Explorer

The Stickiness of Category Labels: Audience Perception and Evaluation of Producer Repositioning in Creative Markets

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Abstract. Market producers often seek to position themselves in different categories over time. Successful repositioning is difficult, however, as audiences often devalue offerings that depart from a producer’s past creations. Prior research suggests that this penalty arises as evaluators withhold opportunities for producers to reposition because of presumptions of a lack of competence in different categories. In this paper, we develop understanding of a novel evaluator-driven challenge to producers’ repositioning efforts: evaluators are prone to “categorical stickiness,” by which the categories they have come to associate with a producer through its prior offerings shape their perceptions of the producer’s subsequent offerings. The result is a systematic mismatch between what producers claim and what evaluators perceive when a producer repositions. We further propose that audience members who have the greatest prior experience with a producer are the least likely to recognize its repositioning efforts. We examine evidence for our theory using data from Goodreads.com on authors within the book publishing industry, 2007–2017. We first build a novel deep-learning framework to predict categorization of a given book based solely on an author’s description of its content. We then use data on how Goodreads users categorize and evaluate books as well as their past reading behavior to test for evidence of our proposed mechanism. Overall, our results extend understanding of the evaluative processes that generate categorical constraints and how these may differ among various types of audience members.

History: Accepted by Isabel Fernandez-Mateo, organizations.

Supplemental Material: The online appendix and data are available at <https://doi.org/10.1287/mnsc.2021.02070>.

Keywords: repositioning • categorization • audiences • book publishing industry • reviews • deep learning • natural language processing

Earlier projects...



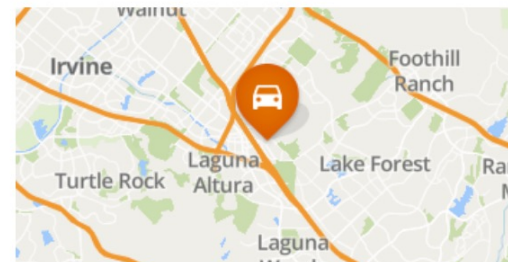
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	Indica Blackberry OG	1G \$9	2G \$15	4G 1/8 \$27
	Indica Blueberry OG Moon Rocks		1G \$10	2G \$20

Research questions

Paper #1

How do medical dispensaries react to the entry of recreational dispensaries? (Category competition)

Hsu, Kocak, Kovacs (2018)

Paper #2

How can dispensaries learn from their customers? How does the audience composition influence adaptation to the changing environment?







Hsu, Kovacs, Kocak (2019)

Why did we choose this setting?


- Large variance in regulation
- Quickly changing market


Data from Weedmaps, July 2014- June 2016

- **1st type:** basic info on dispensary's characteristics
 - Name, physical address, hours of operation, phone #, website, email current # of "hits", recreational or medical, storefront or delivery-based
- **2nd type:** dispensary self-descriptions
- **3rd type:** product menus, prices
- **4th type:** reviews of dispensary
 - Rating along 5 dimensions, text of review, timestamp, user ID, dispensary reply (optional)

Overall Rating		4.2
Price		3.0
Bud Quality		4.0
Atmosphere		5.0
Staff		5.0
Accessibility		4.0

Great Eastside Shop
Went to the IMAX and had stopped by these guys on our way there. Good thing we did, great staff and just wonderful shop all around. Thanks guys!

 Please [login](#) or [sign up](#) to comment.

 **Lester15378**
April 13th, 2015

Research questions

Paper #1

How do medical dispensaries react to the entry of recreational dispensaries? (Category competition)

Paper #2

How can dispensaries learn from their customers? How does the audience composition influence adaptation to the changing environment?

Paper #1

How do medical dispensaries react to the entry of recreational dispensaries? (Category competition)

We are looking at the **self-positioning** of dispensaries vis-à-vis other dispensaries.

Are medical dispensaries trying to be dissimilar from recreational dispensaries, or do they try to be similar to them and take over their markets?

Dispensary self-description excerpts

Dispensary A: ... Modern research suggests that cannabis is a valuable aid in the treatment of a wide range of clinical applications. These include pain relief particularly of neuropathic pain (pain from nerve damage), nausea, spasticity, glaucoma, and movement disorders....

Dispensary B: ...we offer exceptional service. Our knowledgeable staff is professional will assist you with any questions you may have...With wellbeing of our clients at heart and security in mind, you can feel safe when visiting our dispensary and relax in the comfort whilst we help you chose the best product for your needs.

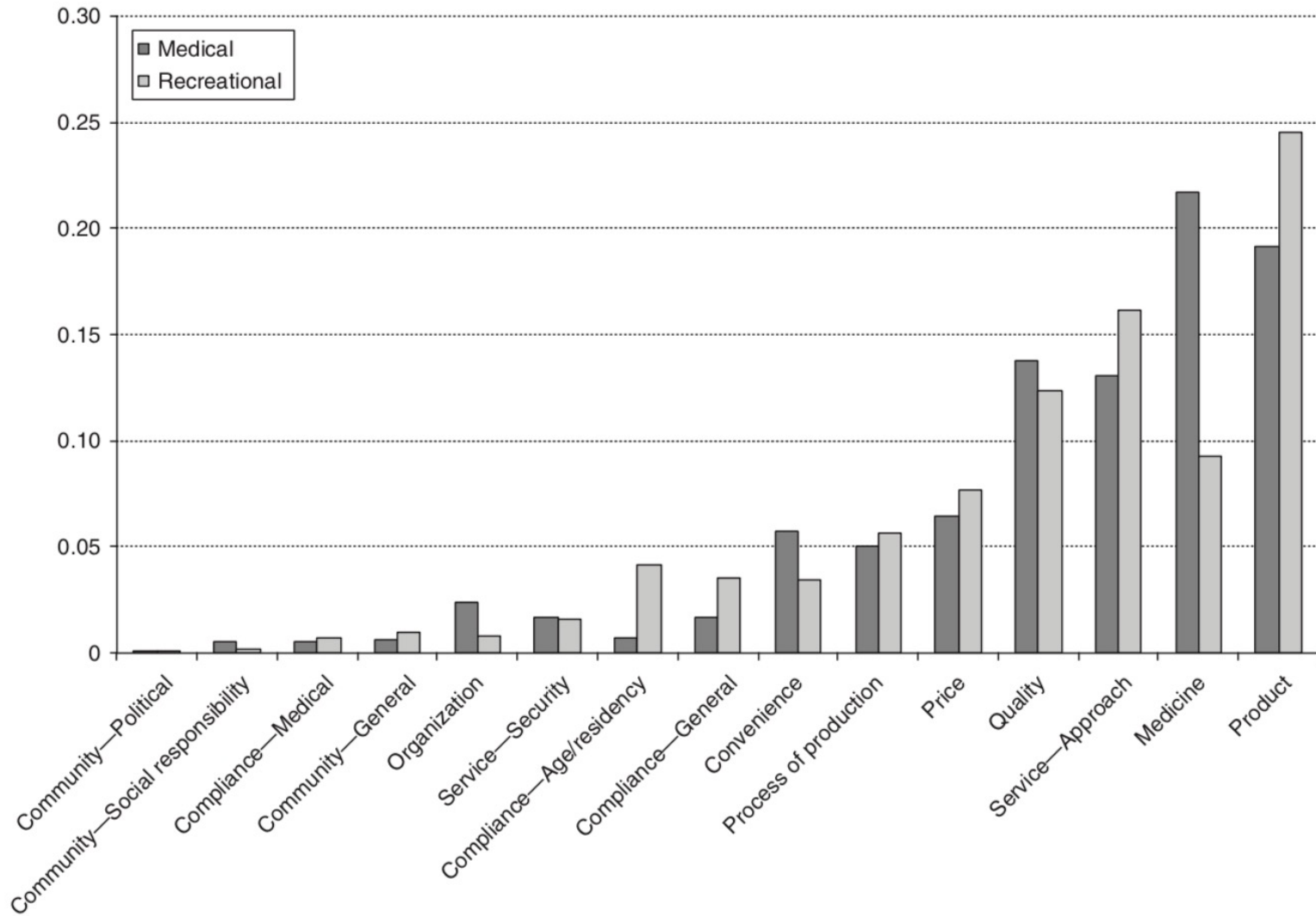
Dispensary C: <Dispensary name> provides small-batch craft cannabis for discerning cannabis patients... Clean cannabis matters! To experience the most pristine expression of the plant's medicine, to enjoy the entourage of cannabinoids, terpenes, and flavonoids and to know it is mindfully-grown and hand-watered with lots of TLC is the birthright of every Cannasseur!

Coding identity statements

Table 1. Dispensaries' Self-Description Themes and Example Features

Themes	Example Features
community - general	locally-owned, family, community
community - political	activist, patients' rights, NORML
community - social responsibility	charitable, citizen, earth friendly
compliance - general	application, background check, lawfully authorized
compliance - medical	doctor's rec, medical card, registered MMJ patient
compliance - age or residency	21+, age of 18, resident
convenience	easy, convenient, ATM on site
medicine	medication, insomnia, depression
organization	collective, nonprofit, private association
price	affordable, budget, pricing
product	edible, sativa, kush, strain
promotions	raffle, discount, refer a friend
quality	highest grade, top shelf, connoisseur
process of production	cold water extract, freshly farmed, greenhouse
service - approach	friendly, honest, professional
service - security / protection	privacy, unmarked cars, security

Figure 1. Thematic Content in Medical vs. Recreational Dispensaries' Self-Descriptions



Hypothesis 1A. *In locations where voter support for recreational cannabis legalization is weak, medical cannabis dispensaries' identity claims will emphasize their medical orientation as recreational cannabis dispensary density increases.*

Hypothesis 1B. *In locations where voter support for recreational cannabis legalization is strong, medical cannabis dispensaries' identity claims will de-emphasize their medical orientation as recreational cannabis dispensary density increases.*

Co-Opt or Coexist? A Study of Medical Cannabis Dispensaries' Identity-Based Responses to Recreational-Use Legalization in Colorado and Washington

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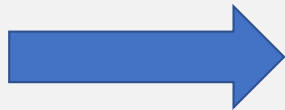
Published Online in Articles in Advance:
January 30, 2018

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Abstract. When recreational cannabis dispensaries first entered the U.S. market in 2014, how did incumbent medical cannabis dispensaries react? Did they emphasize their distinct identity as medical providers, distancing themselves from recreational dispensaries and those consumers who consume cannabis recreationally? Or did they downplay their medical orientation to compete directly for potential resources? In this study, we propose that how incumbent organizations position their identities in response to increasing competition from an emerging rival form depends on key audiences' acceptance of the new form. Using data on the evolving cannabis markets in the states of Colorado and Washington during the year following the initial emergence of the recreational category, we find a sharpening of identity among medical dispensaries in communities with low voter support for recreational-use legalization. Medical dispensaries accentuated the medical orientation of their identities as recreational dispensaries increasingly set up operations and as buyers inclined more toward recreational use. In contrast, we find a blurring of medical/recreational identity in communities where voters demonstrated support for recreational-use legalization in the state-level ballot. Overall, the theoretical framework we advance integrates cultural and strategic approaches by explicitly considering conflict in different audiences' beliefs about the legitimacy of products and its implications for market producers seeking to connect with and appeal to current/potential consumers.

More
details



Research questions

Paper #1

How do medical dispensaries react to the entry of recreational dispensaries? (Category competition)

Paper #2

How can dispensaries learn from their customers? How does the audience composition influence adaptation to the changing environment?

H1. Feedback from customers with diverse organizational experiences increases the congruence between an organization's market-positioning claims and the preferences held by consumers in its market.

H2. The positive effect of feedback from customers with diverse organizational experiences on the congruence between an organization's market-positioning claims and the preferences held by consumers in its market will be stronger for producers in markets with more quickly changing demand landscapes.

H3a. Organizations whose market-positioning claims are more congruent with the preferences held by consumers in their market will be more likely to survive.

H3b. Organizations whose market-positioning claims are more congruent with the preferences held by consumers in their market will attract and appeal more to new customers.

Review excerpts

Reviewer A: I was diagnosed with liver cancer. The staff was more than knowledgeable in not only top cancer fighting products as well as effective pain management.

Reviewer B: The staff here are compassionate, and truly care about us, the patients! Anyone in the area looking to find quality meds, compassion, and professionalism should come here.

Reviewer C: Untouchable quality! I would have to say that <dispensary name> is by far the best dispensary I have been to. From their flower to the concentrates it's all top quality and grown in house by some of the nicest guys in the business. I explicitly shop at <dispensary name> because it's hard to find a medical shop with finer medicine. Simply put amazing in their craft.

Using the same themes to code reviews

Table 1. Dispensaries' Self-Description Themes and Example Features

Themes	Example Features
community - general	locally-owned, family, community
community - political	activist, patients' rights, NORML
community - social responsibility	charitable, citizen, earth friendly
compliance - general	application, background check, lawfully authorized
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compliance - age or residency	21+, age of 18, resident
convenience	easy, convenient, ATM on site
medicine	medication, insomnia, depression
organization	collective, nonprofit, private association
price	affordable, budget, pricing
product	edible, sativa, kush, strain
promotions	raffle, discount, refer a friend
quality	highest grade, top shelf, connoisseur
process of production	cold water extract, freshly farmed, greenhouse
service - approach	friendly, honest, professional
service - security / protection	privacy, unmarked cars, security

Dispensary	Self-description	Theme Mentioned							Similarity Scores		
		convenience	medicine	price	product	process of production	quality	service - approach	service - security	with Disp. A	with Disp. B
A	Our mission is to preserve the art of artisan medicinal cannabis. All of our strains are grown organically, with the highest quality nutrients.		Yes		Yes	Yes	Yes				
B	Fast and friendly service! Open late, with a great product selection and helpful budtenders. Come check us out!	Yes			Yes			Yes			
Customer	Review text										
1	Good variety of product, but getting there was a hassle and long wait time.	Yes			Yes					1/5	2/3
2	Best budtenders. Super friendly and well informed. Ask for Judy!							Yes		0/5	1/3
3	Love the selection of strains. Fast service, amazing prices, great staff.	Yes		Yes				Yes		0/7	2/3
4	Shady place. Tried to push me into buying overpriced crap. Unprofessional--avoid this club!			Yes				Yes	Yes	0/7	1/5
5	Staff is nice and knowledgeable. Clean and comfortable atmosphere!							Yes		0/5	1/3
								Average Similarity with Reviewers		0.04	0.44

Zante Pizza & Indian

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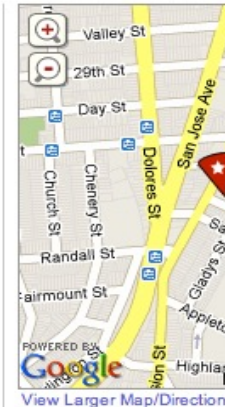
Hours:
 Mon-Sun 11 am - 3 pm
 Mon-Sun 5 pm - 11 pm
Attire: Casual
Accepts Credit Cards: Yes
Parking: Street

Price Range: \$\$
Good for Groups: Yes
Good for Kids: Yes
Takes Reservations: Yes
Delivery: Yes
Take-out: Yes

Waiter Service: Yes
Wheelchair Accessible: Yes
Outdoor Seating: No
Good For: Dinner
Alcohol: Beer & Wine Only

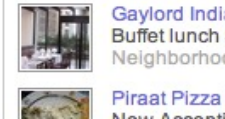


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 1
 31

 6/16/2010

I agree, you shouldn't really be writing a review about Indian pizza if you didn't try the Indian pizza. However, I did and, I can honestly say it was pretty terrible. My family is from India, I know Indian food really well and I'm a huge fan of fusion cuisine. This however, was just wrong. If you want food that looks like pizza but tastes like a hodgepodge of uncooked spices, try Zante's.

Main result:
 Restaurants that span multiple categories get lower ratings

Do people value authenticity?



👤 13
★ 11

Danny A.
South Gate, CA

★★★★★ 8/30/2010

You know, I'm not really sure if it mattered what they served me here.

The inside is beautiful. If you have good taste, you appreciate mid century modern design. This place is gorgeous, I cannot say it enough times. It looks so well kept that you'd have thought it was built last week. While some diners are pretty soulless, this place feels like you stepped back into 1963. This place is **authentic**.



👤 135
★ 2

Anthony T.
Los Angeles, CA

★★★★★ 12/15/2010 🌟 16 Check-ins Here

Definitely the go-to joint to experience the **authenticity** of a true Hollywood cafe/diner. It's just like in the movies, but everything is real life! Definitely a neighborhood favorite for that late night tip. Shop closes up at 3am. And try the Purple Haze milkshakes. It is exactly what it tastes like what it sounds like... HELLA GOOD!! YEE!

Main result:

Restaurants that are perceived authentic receive higher ratings



Main result:

Restaurants that self-claim authenticity are rated as less authentic and receive lower ratings.

United States Patent [19]

Hirth et al.

[11] Patent Number: 4,836,431

[45] Date of Patent: Jun. 6, 1989

[54] SEMI-AUTOMATIC LOADING PAPER FEED TRACTOR

[75] Inventors: Gregory F. Hirth, San Jose, Calif.;
Terry L. Branson, Plano, Tex.

[73] Assignee: Dataproducts Corporation,
Woodland Hills, Calif.

[21] Appl. No.: 148,883

[22] Filed: Jan. 27, 1988

Related U.S. Application Data

[62] Division of Ser. No. 863,704, May 15, 1986.

[51] Int. Cl.⁴ B65H 17/40; B41J 11/32

[52] U.S. Cl. 226/74; 400/616.1

[58] Field of Search 226/74, 75;
400/616-616.3; 16/298

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4,566,618 1/1986 Seitz et al. 226/74

Primary Examiner—David Werner

Attorney, Agent, or Firm—Spensley Horn Jubas &
Lubitz

[57] ABSTRACT

A tractor is provided with an endless belt which travels in a triangular path and a drive shaft located well below the level of the paper path. The tractor body has both an inner and outer body portion, each of which contains a journal bearing for support on the support shaft. An adjustable torsion spring lock is provided on the outer body portion and surrounds the support shaft to allow for easy locking adjustment of the axial location of the tractor on the support shaft. A front and rear closeable panel are provided along the document feed path. Only the front panel need be opened during feeding while both front and rear panels may be opened to clear the feed path during advancement jam. Two mirror image features are provided at the entrance of the feed path on either body portion such as to cover document pins located on the belt path and thereby decrease likelihood of injury to an operator during feeding operations. A unique configuration of belt teeth pitch, pin pitch, and number of drive sprocket teeth is provided to allow for easy adjustment of belts in each tractor located at opposite sides of a document.

6 Claims, 5 Drawing Sheets

Main results:

Innovations that belong to high-contrast technology category exhibit, on average, a higher impact than those classified in fuzzier technology categories.

The positive effect of category spanning on an innovation's impact is negatively moderated by the contrast of the technology category to which the innovation is assigned.

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