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Article

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Technological change in the wine market? The role of QR codes and wine apps in consumer wine purchases

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Abstract

As an experiential good, wine purchases in the absence of tastings are often challenging and information-laden decisions. Technology has shaped the way consumers negotiate this complex purchase process. Using a sample of 631 US wine consumers, this research aims to identify the role of mobile applications and QR codes in the wine purchase decision. Results suggest that wine consumers that consider themselves wine connoisseurs or experts, enjoy talking about wine, and are interested in wine that is produced locally, organically, or sustainably are more likely to employ technology in their wine purchase decision. While disruption appears to have occurred on the supply side (number of wine applications available and the number of wine labels with a QR code), this research suggests that relatively little change is occurring on the demand side (a relatively small segment of the population—those already interested in wine—are employing the technology to aid in their purchase decision). © 2014 UniCeSV, University of Florence. Production and hosting by Elsevier B.V. Open access under [CC BY-NC-ND license](http://creativecommons.org/licenses/by-nc-nd/4.0/).

Keywords: Consumer preferences; Technology; Information

1. Introduction

Wine is an experiential good that can not be fully experienced until it is consumed, thus in the absence of tastings or prior experience with the wine, the purchase decision is challenging for many wine consumers (Cooper-Martin, 1991). In addition to the experiential nature of wine, wine is also an information-laden product that can be overwhelming for the uneducated wine consumer (Drummond and Rule, 2005). Technology has changed the way consumers make purchase decisions and the

wine industry is no different. With technology, wine purchasing has become part of the information era (Halstead, 2013). The potential is there for consumers to make informed wine purchases with smartphones in their hands, wine apps running, and quality to price trade-offs with the help of online information applications such as Cellar Tracker. Now more than ever, consumers have access to a vast amount of information at their fingertips allowing them to make decisions that are informed by expert reviewers, quality to price measures, and social influencers. The internet, and more specifically mobile internet, has changed the way we go about our everyday lives (Qualman, 2009). Although research suggested that wineries themselves have lagged behind other industries in adopting web 2.0 technologies (Thach, 2009), recent research has shown that most wineries in the US have adopted social media (Bouquet, 2012). Have wine consumers moved into the technological age?

The primary objective of this research is to explore the current technological disruption in the wine industry and isolate the impact of these technologies on wine purchases. Specifically, the research focuses on two areas of potential

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disruption: mobile wine applications (apps) and QR codes. Consumer preferences and the role of each technology in the wine purchase decision will be explored. As a secondary objective, consumers most likely to respond to these technologies, based on wine consumption behavior, demographics, wine knowledge, and other sources of wine information will be isolated. Based on the segments, insight will be provided on potential market opportunities and gaps still existing in the research. While the popular press has talked about each of these technological tools extensively, there has been little peer-reviewed research on their role in the wine purchase decision. The timeliness of this research will help shape decisions for the wine industry in finding their market segments, as well as lay groundwork for further research.

1.1. Literature review

Technology has shaped the way consumers make purchases (Grewal et al., 2012). Nearly 55% of all American adults and two-thirds of all young adults own a smartphone (Smith, 2013). Smartphone owners are now more prevalent within the overall population than owners of more basic mobile phones and 50% of Americans download apps on their phones (Duggan, 2013; Smith, 2013). Mobile phone applications (“apps”) have generated substantial interest among marketers, primarily because of their high level of user engagement and the positive impact this engagement has on a user's attitude toward the sponsoring brand (Bellman et al., 2011). As an extension of apps in general, mobile purchasing applications are thought to be the future of the online consumer buying experience.

Bellman et al. (2011) found that the use of mobile apps can have a positive persuasive impact for a brand through increasing interest in the brand and the brand's product category. In fact, the relevance of the product category makes no difference. Apps with an information/user-centered style were the most effective at shifting purchasing intention (Bellman et al., 2011). Meanwhile, the plethora of wine apps continues to expand offering wine lovers the ability to learn more about wine, to purchase wine directly, to discover new wines, and to record their own tasting notes of wines they have tried. Wine.com recently partnered with a mobile payment provider, allowing consumers to purchase a wine from their mobile device using the official wine.com smartphone app. The app allows someone to taste the wine at an event or tasting room and immediately purchase the product from his or her smartphone instead of searching for the wine at a retailer. In addition, wine bottles with the wine.com QR code on the label make it simpler for the consumer to purchase the product; just scan the code and buy it with your mobile device (Bakas, 2012). The application Hello Vino by Drive Thru Interactive, offers the ability for users scan wine labels and to purchase wine within the application itself. In addition, Hello Vino, makes personalized wine recommendations for users. Vivino claims to be the number one wine app on the iTunes App Store and, upon snapping a photo of a wine label, will provide users with

information about the wine, including reviews from Vivino's online community and consumer purchasing options.

Quick Response (QR) codes have grown from a supply chain strategy tool to a marketing tool used for linking consumers to key product information at the point of purchase. There are numerous smartphone applications designed for scanning and reading QR codes, including RedLaser by eBay, Quick Scan by iHandy, QR Reader by TapMedia, and Bakodo by Dedoware. While most of the QR reader applications are free to the consumer, however some are priced in the \$1.99 to \$4.99 range. Comscore (2012) reported that the use of QR codes in Europe increased 96% between 2011 and 2012, reaching 17.4 million users in July of 2012, with the vast majority of these users scanning the QR code for product information (3 out of every 4). In October of 2011, 20.4 million Americans used their smartphone to scan a QR code for product information (Comscore, 2012). Okazaki and Barwise (2011) point to QR codes as an area of emerging research and growth in retailing.

The viability of QR codes has been called into question and some will go so far as to say that marketers may be more in love with the tool than consumers. However QR codes are generally believed to be leading marketers one step closer to interactive marketing (Shin et al., 2012). Product knowledge is a key concept in consumer decision-making and QR codes have the ability to deliver information at the point of need (Raju et al., 1993). This may be particularly relevant for the wine industry, given the experiential and information-laden nature of the product. Use of a QR code to provide product information is consistent with information search as the primary method of risk reduction in the wine purchase decision (Mitchell and Greatorex, 1989). With the concern over counterfeit and “fake” wines in China, Pernod Ricard announced that all of their products sold in China will have QR codes on their packaging by April 2014 (Morton, 2013). QR codes may be especially relevant for younger wine consumers that are making purchases out of convenience, who do not have a significant amount of wine knowledge, and are more likely to be engaged electronically when compared to the more traditional wine purchaser (Lecat and Pelet, 2011). Likewise, Atkin and Thach (2012) suggest the value of QR codes for reaching the relatively uninformed Millennial wine consumer.

Just like the technologies themselves, the academic research on mobile marketing is still in its early stages. Age appears to be the key differentiator between consumers that are responsive to digital media and those that are not (Barutcu, 2007; Persaud and Azhar, 2012). Persaud and Azhar's (2012) findings suggest that value creation is one of the keys to successful mobile marketing and that value creation may be unique for each group of consumers.

Recent research has begun the exploration between the intersections of wine and new, technologically based marketing strategies. In her 2009 research, Thach explored the adoption rates of web 2.0 strategies among wineries. Based on a survey of 208 US wineries, Thach (2009) found relatively limited adoption of web 2.0 strategies including podcasts, video blogs, and blogs and suggested that a lack of resources may be part of the cause for limited adoption. However, adoption accelerated and in 2012 Able Research conducted a survey

among 165 American wineries and 200 French wineries and found that 94% of American and 61% French Wineries were on Facebook. The wineries indicated the following benefits of using Facebook: creating winery awareness, promoting events, and maintaining relationships with customers (Bouquet, 2012). The wineries in the Able research appear to perceive that technology has potentially powerful implications on brand equity. Younger wine consumers' perceptions of a winery and the winery's brand are influenced by their use of technology, even after a tasting room visit (Nowak and Newton, 2008). While perceptions are influenced, the real question for many is whether or not use of these new technologies leads to purchase increases. Evidence from Wilson and Quinton (2012), found that a winery's use of Twitter produces “soft” value, but that the “hard” value of Twitter isn't entirely evident. In addition, Wilson and Quinton (2012) confirm that the use of Twitter is in its infancy with many opportunities for optimizing the technology for wine brand value creation still out there. Likewise, the use of mobile technologies for point of purchase marketing and mobile purchase appears to be in its infancy as well (Persaud and Azhar, 2012).

Whether technology used for wine purchases or any other purpose, technological adoption takes time. Davis (1989) formalized the prediction of technological adoption with the Technology Acceptance Model (TAM). The model was later revised by Venkatesh and Davis (2000), but is founded on a sociology model known as the Theory of Reasoned Action (Davis, 1989). The TAM model incorporates predictions of attitude and behavior into user's adoption and acceptance of technology (Chuttur, 2009).

Prior to a new technology being assimilated into a daily routine, users must first find that the new technology is useful and fulfills an unmet need. Behavioral intention, a precursor to technological adoption, is determined by the user's attitude and perceived usefulness (Perez et al., 2004). And to be considered useful, the technology must have an ease of use aspect to it (see Fig. 1 for a depiction by Perez et al. (2004)). TAM can be used to explain why some technologies are adopted and while others are ignored. These characteristics of TAM, as well as social norms, perceived cohesion, and perceived enjoyment, all factor into customer adoption of technology. Use of new technology is also influenced by both intrinsic and extrinsic motivation (Hsu and Lu, 2005).

2. Methodology

2.1. Survey design

The research design for this study consists of a consumer survey and a concept exposure. The survey was built from

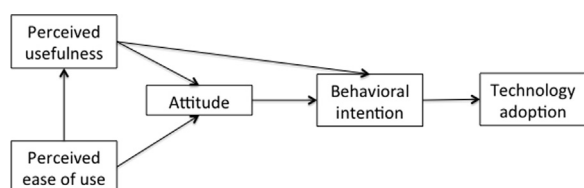


Fig. 1. Technology acceptance model (Perez et al., 2004).

prior research and consisted of 25 questions related to demographics, consumption behavior, purchasing behavior, and technology adoption, including two qualifying questions (that the respondent was of legal drinking age and had consumed wine or sparkling wine in the past year). Survey questions were developed based on a desire to isolate the consumers that are most likely to be using and influenced by technology, while at the same time determining the segment of consumers that may not yet be adopting the technology, but likely a potential group.

The survey questions used to explore wine consumer's technology habits were supplemented with a wine concept exposure. The concept exposure methodology is commonly used to test premarket releases of a new product or to test products in development phases. While not able to identify subconscious purchase influencers, concept exposure is a form of simulated test market methodology that has been employed very successfully to test new products and predict first year sales (Clancy et al., 2006; Lochshin and Corsi, 2012).

In this application, consumers were shown a concept board with pictures of two bottles of wine (a red and a white varietal) from an existing wine brand. Respondents were shown a full front shot of the wine bottle for both the red and white varietals. The wine brand was one that was not carried by retailers in the test market region and a brand that most respondents are unlikely to be familiar with. Price information was included below the wine images (\$11.99 and \$9.99, respectively). In addition, a close up single image of the wine's back label was shown to respondents (the same back label was used by both the red and white varietal so only one image of the back label was shown). The back label included a very apparent QR code in the midst of the information about the wine and the winery.

Following the exposure to the concept board, consumers were shown an additional board that had wine labels and brief information (vintage, varietal, price, region, and production practices) about six wine brands commonly purchased in the test market area. Similar to the approach used in a category appraisal, the additional wines were shown to consumers as a basis for comparison and for external preference analysis (Carroll, 1972). The wines shown for comparison purposes were priced slightly higher than the wines in the concept exposure to account for a familiarity bias.

Questions that followed the concept exposure included questions relating to the likelihood of purchase for the concept wine assuming it was available locally, perception of the wine's value, and reported influencers of the respondent's wine purchase decision. Purchase intent was measured using the Juster purchase probability scale in its standard 11-point form Juster (1966). Although the Juster Scale can lead to overstating of the purchase likelihood, the Juster Scale has been shown to be a more accurate predictor than other purchase intention scales (Clawson, 1971; Gabor and Granger, 1972; Wright et al., 2002). Verbal anchors were included with the 11 points and ranged from “Certain will buy, 99 chances in 100” to “No chance will buy, 0 chances in 100” (Juster, 1966).

2.2. Survey administration and sample

The survey was administered during the fall of 2012 to United States wine consumers in a nationally recognized test market location in central California using a mall intercept approach. Prior to the collection of data, researchers rehearsed the data collection process using the final survey design and were trained to avoid bias. Respondents were approached while departing grocery stores within the test market location and asked if they wanted to participate in a brief survey regarding their purchasing habits. After determining that the potential respondent was of legal drinking age and had consumed wine in the past year, respondents were asked to complete the 25-question survey (approximate response times were in the range of 5–7 min). Respondents were not compensated. Of the 644 responses collected, a sample of 631 usable wine consumer responses was obtained.

3. Theory

Acceptance and incorporation of the wine application technology (QR code reader or other type) into the purchase decision implies that users begin receiving richer content by being directed to a website, likely specifically catered to users that are on the brink of a purchase decision, creating a dynamic purchase environment. Wine applications, like most technologies, have to make their way through TAM's two major cognitive beliefs, perceived usefulness and perceived ease of use, prior to adoption. Shin et al. (2012) found that the perceived ease of use for QR codes would positively affect the perceived usefulness, which helps establish a person's intention to use, creating a domino effect. As further evidence of the ease of use requirement for QR codes, Okazaki et al. (2013) found that QR code loyalty campaigns that required low levels of involvement are more likely to result in greater product loyalty. Applications of the TAM to QR codes suggest that the behavioral antecedent to the adoption of QR codes is interactivity (Shin et al., 2012). The same can be implied for other more general applications.

This study builds on this prior research to isolate the consumers that have the necessary conditions to the behavioral intention needed to adopt QR codes and wine apps into their purchase decision. Isolation of the consumers that meet the perceived usefulness and perceived ease of use conditions will allow for segmenting the more technologically advanced consumer and information needs of the consumer using the features. Five of the questions incorporated into the survey were designed to measure perceived usefulness of the technologies.

4. Results

4.1. Demographic profile

A basic demographic profile of the respondents is provided in Table 1. The 631 usable responses formed a sample comparable to the average wine drinker in the United States. Approximately half of the sample was over the age of 40, female, and educated

with at least a college degree. The age range of respondents was distributed across the categories with around 1/3 of the respondents in each of the 20–29, 30–49, and 50 to 65+ ranges. Responses by gender were fairly equal throughout each of the age ranges, with a chi-squared test revealing no significant differences ($p = .371$). There were few gender differences in basic demographic and consumption information reported by the respondents, other than female respondents being more likely to consume sparkling wine ($p = .004$) and less likely to consume beer ($p = .000$). Respondents reported average purchases of 4.33 bottles of wine per month, with average monthly wine spending of \$50.75. An initial cluster analysis reveals two distinct groups in this sample. Approximately 41% of the sample fell into a consumer cluster that we labeled “enthusiasts.” Respondents in this enthusiast cluster are likely to associate themselves with the wine enthusiast term, enjoy talking about wine, spend more on wine, and consume more wine than the “non enthusiasts” consumer.

4.2. Extrinsic cues and wine purchasing

Consistent with prior research (Lockshin et al., 2006; Orth et al., 2005), respondents indicated that value, varietal, and personal recommendations are the most important extrinsic cues when purchasing wine, each with more than 70% of the sample indicating that those characteristics are extremely or very desirable. On the other extreme, just 7.4% of the sample indicated that a QR code is a desirable extrinsic cue. Given the number of wine brands that now have a QR code on their front or back label, it is interesting to note how few consumers find this feature desirable. Consumers appear to believe that a scan of the QR code will not give them additional information concerning the value and the varietal, the most important cues. Similarly, wines that have screw cap closures and grapes that are grown using biotechnology were viewed as largely undesirable characteristics. The negative association with screw cap closures is still apparent in the US wine consumer and has been confirmed by earlier research (Atkin et al., 2007).

Table 1
Demographics of the survey respondents.

Variables	Category	Percent of sample (%)	Average
Age	21–29	31.7	
	30–39	16.7	
	40–49	14.7	
	50–64	24.1	
	65+	12.8	
Male		52	
Married or Living with Partner		53.50	
Children living at home		23.40	
At least a college degree		60.70	
Current student		18.50	
Wine drinker		97	
Beer drinker		73	
Sparkling wine drinker		43	
Monthly wine bottles purchased			4.33
Monthly spending on wine			\$50.75

Prior research suggests that consumers often use origin as a proxy for quality in the purchase decision (Duhan, et al., 1999); consistent with expectations on the importance of origin, 52% of this sample indicated region a desirable feature in the wine purchase decision.

4.3. Wine apps

Nearly 20% of the sample indicated that they have and regularly use wine related apps on their phones or tablets to find information. This subset was selected as the target “wine techie” group. Those that use apps were likely to be younger ($p=.000$) and more likely to consume sparkling wine ($p=.064$), but otherwise there were no significant differences between the two groups in terms of gender, quantity of wine purchased, price range of a typical wine purchase, or consumption of beer. However, some additional differences were found in analyzing psychographic characteristics of the respondents. Table 3 shows the proportion of the sample that agreed (from a four point agreement scale) to psychographic statements broken down by their use of apps. App users were more likely to be those that consider themselves a wine enthusiast or connoisseur and enjoy talking about wine. Predictably, app users were more likely to indicate their interest in an app that allows you to instantly purchase wine. Respondents that fell into the “enthusiast” cluster were also more likely to use apps at 64.3% compared to the non-enthusiast cluster at just 34.2% ($p=.001$).

To reduce the dimensionality of the responses, the agreement statements and demographic characteristics were subjected to a principal component analysis (PCA) (Jolliffe, 2002). Suitability for PCA was determined based on Bartlett's Test of Sphericity ($p=.000$) suggesting the correlation matrix's factorability and based a Kaiser–Meyer–Oklin value of .74, which exceeds the .6 recommended value (Bartlett, 1954; Kaiser, 1974). Twelve variables were used in an initial PCA, however the variables were later reduced down to just seven variables based on low measures of sampling adequacy in the anti-image correlation matrix. Two components were found to have eigenvalues greater than one. The sum of squares loadings indicated that 66% of the cumulative variation could be explained through those two components. A scree plot confirmed the presence of two components.

A varimax rotation was employed to assist in the interpretation of the two resulting components. With the exception of education and possibly income, all variables load substantially on only one component. The first component, explaining 49% of the variance in app use, is highly correlated with spending and consumption of wine, and also self-identification with the label “wine enthusiast” and consistent with prior expectations of highly involved wine consumers. The second component is highly correlated with the ordinal variable representing career phase (student to early career and through retirement) and the variables income and education. The results of this PCA suggest that there may be two groups of “wine techies”: those that can be described by association with what many would consider typical wine enthusiast traits (frequently talking about wine and spends relatively liberally on wine) and those that can be

described by demographic characteristics (education, income, and career phase). Table 4 shows the component loadings for the rotated solution.

4.4. QR codes

Although just 7.4% of the complete sample indicated that QR codes were desirable extrinsic characteristics on wine bottles (as reported in Table 2), the concept exposure revealed interesting results about QR code preferences. After being exposed to the wine concept (visual depiction of the wine bottle, close-up image of the back label, and a reminder of locally available comparable wines), 50% of respondents said that there were at least 60 chances in 100 that they would purchase the concept wine. Respondents that, on average, had previously stated they were likely to purchase 11.33 bottles of wine in the next three months indicated that they would, on average, purchase 3.44 bottles of the concept wine. Of those interested in purchasing the concept wine, 38% of the sample indicated that the presence of the QR code on the back label definitely did not increase their purchase interest and 31.2% reported that the QR code probably did not increase their purchase interest.

The 11.7% of respondents that indicated a relationship between purchase interest of the concept wine and the presence of the QR code were isolated for comparisons with the group that did not. There were few demographic differences between the groups (nothing in terms of age, consumption, spending, education, and income) and no difference in the preference of wine closures. As expected the QR influenced group was more likely to report regular use of apps, however there were some more surprising and distinct differences between the wine technology users. Table 5 showcases key differences between the groups. Those that reported an influence by the QR code were more likely to be concerned about how the grapes were grown and how the wine was produced. Local, environmentally friendly production practices, organic, sustainable, biotechnology, and winery ownership

Table 2
Desirability of extrinsic cues.

Feature	Desirable (%)	Undesirable (%)
Good Value	85.6	2.4
Varietal I like	79.7	4.1
Recommended by Friends	73.2	7.6
Locally Produced	52.8	14.3
From a Family Owned Winery	47.2	17.6
Grown in an Environmentally Friendly Manner	47.1	19.1
Certified Sustainably Grown	33.9	27.4
Organically Grown	32.1	28.8
Grown with Biotechnology	12.0	53.1
Has Screw Cap	11.5	59.3
QR Code	7.4	70.4

Notes: Respondents were asked to indicate the level of desirability for all features using a 5 point scale, where 5=extremely desirable and 1=Not desirable at all. In the table above the desirable column includes respondents that scored the feature a 4 or 5, while the undesirable column includes the respondents that scored the feature a 1 or 2.

Table 3
Agreement statements and app users.

Statement	App user (%)	Non-app user (%)	Chi-squared
I consider myself a Wine Enthusiast	63.10	58.80	.021**
I like to talk about wine	69.10	57.70	.002***
I consider myself a Wine Connoisseur	34.20	26.30	.002***
I consider myself a Foodie	68.30	60.50	.212
An app that instantly purchases wine interests me	64.30	34.20	.001***

Notes: Respondents were asked to indicate the level of agreement with the listed statements using a 4 point scale, where 1 = strongly disagree and 4 = strongly agree. In the table above the respondents that answered a 3 or 4 are included as agreement.

**Significance levels are indicated at the .05 level.

***Significance levels are indicated at the .01 level.

Table 4
Varimax rotation of the two component solution.

Variable	Component 1	Component 2
Wine Enthusiast	.795	.122
Talk about wine	.648	.345
Education	.475	.506
Income	.442	.693
Monthly wine purchases	.848	.080
Monthly wine expenditures	.863	.126
Career phase	.081	-.886

structure were all more important to the group that was influenced by the presence of the QR code on the concept wine. Considering the limited real estate on a wine label, it is feasible to expect that a consumer interested in many of production characteristics would be interested in using the shortcut the QR code provides to obtain additional information about production practices used.

A closer look at the behavioral patterns of those influenced by the QR codes reveals that they are more versed with the intersection of wine and information technology all around. Respondents influenced by the QR code are more likely to use Google, Facebook, YouTube, Blogs, and even Facebook advertisements to seek out information about wine. In addition, they are more likely to consider themselves a wine enthusiast or connoisseur, enjoy talking about wine, and report an interest in using an app that lets them buy wine instantly. Tables 6 and 7 showcase the results of these comparisons.

5. Discussion

Perhaps the most powerful set of results from this research is the isolation of two segments of app using wine consumers. PCA suggests that wine app users fall into a group that can be described as being highly involvement (consider themselves wine enthusiasts, enjoy talking about wine, spending on wine, and wine expenditures) or fall into a group that suggests more resources (they are later in their career phase, have higher levels of income, and, possibly, higher levels of education). Often the characteristics of these two groups are lumped together into one segment, but this research suggests that there are some distinct differences among the wine consumers in the

groups. Application features and information deemed desirable by each of these two groups is likely to be different and can be used to directly target audiences. Likewise, as wine application developers seek to market their apps and increase downloads, marketing directly to the wine consumer segment of interest will increase the effectiveness of that marketing strategy.

Just 11.6% of respondents indicated that a QR code on a wine label would definitely or probably increase their purchase likelihood. In addition, very few demographic or behavioral differences could be identified between those that indicated a QR code would increase their likelihood of purchase and those that did not. However, the results also suggest that those impacted positively by the presence of a QR code (the segment that meets TAM's major cognitive beliefs) are those consumers interested in local and environmental factors related to the wine. Additionally, consumers that appear to consistently use technology for seeking information related to wine and wine purchases are more likely to be influenced by the QR code, which fits with their interest in talking about wine and fulfilling their identity as a wine enthusiast. Wine brands that are positioning themselves toward a technologically savvy consumer with a strong interest in production factors are likely going to see the most significant impact from the presence of a QR code. Brands targeting a less interested or less technological consumer may have to create some additional incentives to get the consumer to react to the QR code.

Rather than the uninvolved wine consumer suggested by Lecat and Pelet (2011), this research suggests that the targeted group for QR codes is the involved consumer that wants to learn more about wine, want to talk about wine, and are interested in the production characteristics of the wine. While there were very few differences in socio-demographic characteristics, there were distinct differences in behavioral characteristics between those influenced by the QR code and those not. A trip to a local wine shop suggests that far more wine labels are employing QR codes on their labels than consumers that fall into the segment most interested in the presence of the QR codes (and, by extension, those most likely to use the QR codes). While generating a QR code is relatively cheap, the limited space on a wine label is not and there may be additional costs associated with running a mobile friendly website that the QR code directs to. There are some strong

Table 5
QR influence segments and desirability of extrinsic wine cues..

Feature	QR influenced	QR did not influence	p-value
QR code	3.08	1.80	.000***
Locally produced	3.88	3.51	.004***
Produced in an environmentally friendly way	3.75	3.31	.001***
Organically grown grapes	3.45	2.96	.000***
Certified sustainable production	3.38	3.00	.005***
Biotechnology used	2.62	2.37	.042**
Family owned winery	3.71	3.34	.006***

Notes: Respondents were asked to indicate the level of desirability for all features using a 5 point scale, where 5 = extremely desirable and 1 = Not desirable at all. Average scores are reported.

**Significance levels are denoted at the .05 level.

***Significance levels are denoted at the .01 level.

Table 6
Sources of wine information by QR influence segments (reported as percentages).

Information source	QR influenced (%)	QR did not influence (%)	p-value
Google	56	35	.000***
Facebook	33	21	.024***
YouTube	14	5	.006***
Facebook ads	8	2	.002***
Blogs	16	7	.003***

Notes: Respondents were asked to select all of the sources they use for wine information.

***Significance levels are denoted at the .01 level.

Table 7
Agreement statements by QR code segments.

Feature	QR influenced	QR did not influence	p-value
Wine enthusiast	2.96	2.67	.006***
Talk wine	3.00	2.65	.000***
Wine Connoisseur	2.42	2.16	.008***
Instantly purchase wine app	2.71	2.24	.005***

Notes: Respondents were asked to indicate the level of agreement with the listed statements using a 4 point scale, where 1 = strongly disagree and 4 = strongly agree. Average scores are reported for each segment.

***Significance levels are indicated at the .01 level.

practical implications of this research for wine marketers. Using QR code technology has the potential to be an efficient and low-cost way to communicate additional information about the product to the consumer, while allowing for targeted messaging. This research suggests that QR code users are the ones that are highly involved and seeking deeper information about the product (e.g. vineyard production, wine making process, the wine's profile, pairing suggestions).

What technological disruption is occurring? In this case, has the wine industry moved faster than consumers? Or did consumers try a QR code once as a novelty and then quickly tire of the process, while wine marketers continued to fall in

love with the concept of providing information at the time of purchase? Many believe that the QR code lifecycle was relatively short and that they are reaching their decline. This research supports the theory that the disruption may just be in the labels that have been created, and not in the actual purchase process. What about disruption for Apps though? Apps have put power in the hands of consumers, but once again that power seems to be utilized by those that are already knowledgeable and invested in the wine purchase decision. Wine app users are more likely to consider themselves wine connoisseurs or wine enthusiasts and enjoy talking about wine. Interestingly though, there are differences within the wine techie group.

Two segments surfaced; one driven by demographic characteristics and one driven by spending and socializing about wine. Although relatively few consumers in our sample fit into the wine techie segment, this research suggests that there may be two very unique subsets of this group, each with their own set of values. Tapping into those consumer groups will depend on the relevance of the value creation in the application.

6. Conclusions

As an experiential good, wine purchases in the absence of tastings are often challenging and complex decisions. Using a sample of 631 US wine consumers, this research aims to identify the role of consumer's use of technology in the wine purchase decision. Results suggest that wine consumers that consider themselves wine connoisseurs or experts, enjoy talking about wine, and are interested in wine that is produced locally, organically, or sustainably are more likely to employ technology in their wine purchase decision.

TAM predicts that the adoption of QR codes and applications into the wine purchase decision is dependent on both the ease of use and the perceived usefulness of the technology (Perez et al., 2004). Less involved wine consumers and consumers that are not interested in production characteristics of wine are going to have a harder time finding the value and usefulness of the application and vice versa. The most desirable characteristic to the wine consumers examined here is value. Perhaps increasing the utility of the QR code by providing deals in the form of value to the QR code users would expand the user base.

Knowing the type of consumer that finds value in the technological tool and the characteristics the consumers desire will assist wine marketers in further targeting their information to the segment employing the tools. Wine is complex and so are wine consumers; and there are distinctions between segments of involved consumers. However, while disruption appears to have occurred on the supply side (number of wine applications available and the number of wine labels with a QR code), this research suggests that relatively little disruption is occurring on the demand side (a relatively small segment of the population—those already interested in wine—are employing the technology to aid in their purchase decision).

6.1. Limitations and future research

This research opens the doors to a clearer understanding of the way technology is shaping the wine purchase decision. Limitations of the research breed opportunities for further research. Although conducted in a nationally recognized test-market location, this survey was done in the US and the results may not be typical for wine consumers in other parts of the world. As pointed out by a reviewer, the survey used in this research did not directly ask respondents if they knew what a QR code was. This could have had an impact on the final results. Purchase intent was measured via a concept exposure, but further extensions of this foundation are encouraged to determine how technology-aided information influences a

simulated wine purchase through an experimental design. Extensions of this research that isolate the wine apps most frequently being used at the point of purchase, would be of value to both wine retailers and wine marketers. In addition, further refining a sample of just a particular subset of wine consumers (e.g. millennial wine consumers, wine connoisseurs) could be useful in gaining richer insight into the role of technology in the wine purchase decision.

As technologies change and purchase behaviors are altered, there will be increasing opportunities for research to better understand consumers, their adoption of technology, and how it impacts their purchase decisions. This research adds to the existing body of knowledge on the segmentation of wine consumers, providing evidence against two commonly held assumptions about consumers. The findings suggest that core wine consumers are not as homogenous as once believed, with wine app users falling into two distinct subsets. In addition, the research suggests that if QR codes are going to be used, marketers should realize that the few consumers that are influenced by the presence of the QR code are those that are already highly involved in the wine purchase.

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