I. Introduction:

In Berlin's Indian food scene, Amrit is a league on its own. Rated one of the biggest Indian restaurant chain in the city (Kheny, 2017), with four branches in the most vibrant neighborhoods, the restaurant is famous for its extensive menu and flexible food services - customers are not only provided with a wide range of authentic Indian food choices, but are also free to request customizations to their orders - from the spices to the cooking styles. The restaurant, however, is concerned about the threat of new entries, with many new players appear recently.

In this paper, I would discuss one suggestion to help Amrit maintain its prominence in the business landscape and establish a unique image of itself, from the lense of building a well-rounded marketing mix.

II. Discussion:

Having many vegetarian friends, I notice that while Amrit provides an extensive menu for meat eaters, its vegetarian menu is limited and not attractive (Amrit, 2018). This is understandable as many of the restaurant's specialties, such as the tandoor grills, could not be cooked with vegetables due to the prolonged exposure to fire[1]. With this shortcoming in mind, I suggest that the restaurant introduce meat alternatives, such as vegan meat and artificial meat, to their menu, thus allowing them to present their signature grill plates to the vegetarian segment. While Indian foods are not usually

[1] As explained by the waiter. The only alternative is potatoes, which are also not quite appealing.

associated with good health, the transition should not be difficult, or even surprising at all, considering its inherent mission and philosophy of being bold, unique, and trend-setting. The business founders, Bitu and Bunti Bans, shook the landscape up once in 1996, when they decorated their restaurants with iconic Buddha and Ganesha statues (image) that later on became the essentials for all other Indian restaurants in town (Tegta, 2010).

The restaurant's exotic decorations set a high bar for any newcomers. Pictures courtesy: Amrit Official website, 2018.

The addition of vegan meat and artificial meat would likely having a similar trend-setting impact, considering the rise of health- and environment- conscious food consumptions. In

fact, Germany tops the chart for the number of vegan product launches (Askew, 2018). Identity-wise, the addition of vegan meat adds the life-changing values (according to Almquist, Senior, & Bloch, 2016) of hope (in green and healthy consumerism even unlikely places) and affiliation (to a mutual cause - supporting the restaurant is also equivalent to supporting the transition from excessive red meat consumption to conscious meat consumption) while enhancing the functional value of variety (the flexibility for meal customization - allowing vegan customers to choose grill plates) that is already upheld by the business.The benefit is twofold. One, the strategy is both internally consistent with the restaurant chain's philosophy, and externally consistent with recent changes in consumer behaviors. Two, the financial impact is also considerable. First, the investment is also not very costly (as vegan meat does not need special treatment in storing or preparing), and thus is viable with the expected amount of cash the restaurant has on hand (which is expected to be low, given the industry average of 3.76% - Damodaran, 2018). Second, vegan meat is a premium product, and thus would achieve a higher net margin than the regular offerings. Paired with good operations (i.e. asset management, especially inventory management is efficient, so that inventory does not exceed demand), this move would also increase the ROA and the ROE of the restaurant (as discussed, we do not need to take additional leverage, so increased ROA implies increased ROE). This is not achievable by simply offering more variations of dishes (as the restaurant has been doing), due to cannibalization among the product mix. Third, being a premium offering, alternative meats would almost surely increase the restaurant's unlevered beta. The industry average beta for the restaurant/ dining industry is just 0.6

(Damodaran, 2018), which is too low. Increasing the beta would mean potentially more profit, without incurring excessive risks.

This change in product is expected to tap into a whole new segment but should not deter regular customers. To evaluate the effect of the suggestion, I design an experiment, discussed in the next section.

III. Experiment:

The experiment is based on Josiam & Monteiro (2004), which evaluates factors that influence customers to dine at a South Asian restaurant in America. The study would be aimed at answering the following two questions:

- Would the availability of vegetarian/ vegan/ vegan meat options strongly influence healthy eaters to dine at an Indian restaurant? (i.e. could Amrit tap into this new segment?)
- Would the availability of vegan meat alter the perception of the business? (i.e. would regular customers' perceive Amrit differently?)

While Josiam and Monteiro focuses on the impact of ethnicity on the perception of restaurants, I evaluate the impact of health consciousness. I have made decisions to replicate, reuse, or modify the research process as presented in the paper based on the analysis below:

Component	Analysis	Decision
Sample size: The research selects a sample size of 500 visitors to 5 Indian restaurants, during lunch and dinner services.	This selection is acceptable to identify "factors that influence patrons of Indian restaurants", but it is not necessarily telling of those who could be potential customers. The paper's result lists vegetarian options as one of the least important factor, but it could be because these participants already know, and are not concerned, about the limited vegetarian product offerings. Those who are concerned might not choose to dine there in the first place.	Conduct strategy on random by-passers on the street. This is more representative of the neighborhood (as Kreuzberg is mostly homogeneous, demographically). Due to it being an individual initiative and the time constraint, the sample size is likely much smaller.
Questionnaire: each participant is approached by the researcher, prompted to rate the	The selection of factors are well-researched and comprehensive. The Likert scale of 5 is scientific and does not leave much room for ambiguity	Reused the questionnaire methodology and factors. Add "availability of vegan meat options" as a factor. Also, add a question on

importance of factors on a scale from 1 to 5, and are asked open-ended questions at the end	(for example, a scale of 10 makes it harder to select one that best fits)	whether participant's perception of the company change if the Indian restaurant add vegan meat to their menu.
Analytics: the study uses ANOVA to measure the difference of the mean between two groups of interest - South Asian patrons and patrons of other ethnicity	The use of ANOVA is questionable, given that the study compares two groups only. The equation for ANOVA is $\frac{variance\ between\ groups}{variance\ within\ groups}$ (Kim, 2014). The variance between groups would not be robust as there are only two of them. ANOVA is often used for situations involving 3 groups or above.	Resort to two-tailed t-test for the difference of independent means instead.

Informed by the analysis, I approach 20 people around the Kottbusser Tor subway station to collect there responses[2].[3] We would then conduct analytical test to quantify the

[2] The questionnaire, responses, and full results are presented in the appendix.

[3] The samples are expected to be representative of the city. They are selected randomly from a public transport system widely used by people from all classes and backgrounds. However, they are also biased towards the English speaking community. The questionnaire also is biased towards people who know vegan meat. This is regarded as an assumption in the study. Fortunately, all 20 participants are familiar with vegan meat.

difference between the two groups. The process, similar to Josiam & Monteiro, is largely exploratory. There are no null and test hypotheses, but the analytical results are expected to provide insights to the proposed questions. The results are as follow:

Restaurant characteristics	Mean for total samples
Quality of Food	4.15
Hygiene and Cleanliness	3.95
Employee Friendliness	3.85
Efficient Service	3.6
Authentic cuisine	3.55
Menu variety	3.55
Atmosphere	3.5
Vegetarian Choices	3.45
Reputation	3.35
Cleanliness of Restrooms	3.3
Value for Money	3.1
Cannot Prepare at Home	3
Availability of New Items	2.95
Portion Size	2.9
Convenience of Location	2.8

Fig: The list of factors, sorted by the importance scores, rated by participants. The fact that many factors remain as important as found by Josiam & Monteiro give more certainty to our findings.

Most of the characteristics still maintain their ranking as in the Josiam & Monteiro, but the factor of vegetarian choices surge in importance (from being one of the least important to moderately important). There is a high correlation between vegetarian options and health consciousness (0.59), demonstrating that indeed many healthy eaters also favor vegetarian foods. Furthermore, both healthy eaters and non-healthy eaters do put a lot of weight to the variety of food[4], which qualitatively suggests that Amrit might attract more customers from the health-conscious segment by offering a more extensive vegetarian menu.

Restaurant characteristics	Healthy Eaters	Non Healthy Eaters	t-value	P-value
Quality of Food	4.17	4.13	0.15	0.88
Hygene and Cleanliness	4.00	3.88	0.44	0.66
Authentic cuisine	3.33	3.88	-1.27	0.21
Cleanliness of Restrooms	2.92	3.88	-2	0.06
Employee Friendliness	3.83	3.88	-0.12	0.91
Menu variety	3.75	3.25	1.05	0.3
Value for Money	3.08	3.13	-0.14	0.89
Atmosphere	3.50	3.50	0	1
Efficient Service	3.58	3.63	-0.12	0.91
Reputation	2.92	4.00	-2.31	0.03
Cannot Prepare at Home	3.08	2.88	0.37	0.72
Convenience of Location	2.92	2.63	0.46	0.65

[4] Healthy eaters are defined to be those who rate their health consciousness to be 3 or more.

Portion Size	2.83	3.00	-0.27	0.79
Vegetarian Choices	4.08	2.50	3.38	0
Availability of New Items	2.67	3.38	-1.15	0.26
Perception Change	4.64	4.00	2.35	0

Fig: T-test results between the two groups (healthy eaters = health consciousness >=3 and non-healthy eaters - health consciousness <3). Factors where the groups react statistically significantly differently are highlighted. The two groups are very homogeneous in perceptions of the factor. The healthy eaters are, seemingly, even more easy-going than the regular customers - they do not require the restaurant to be popular. Thus targeting the healthy eaters do not require the restaurant to change much in terms of business strategy or marketing message [5][6]

Interestingly, when prompted about the perception of the restaurant when it introduces vegan meat to its menu, the response is overwhelmingly positive in both groups (4.64 & 4.00), even though the healthy eaters, as expected, receive this much more positively (p-value < 0.05). Both groups cite reasons such as ethics and environment, while many healthy eaters also add that it allows them to try more variations of food, which relates strongly to the speculated benefit of adding vegan meat.

While the sample size of 20 is too small for robust inference, the preliminary research result shows supports for the strategy. Future research efforts could be extended to larger sample sizes, and to including more demographical, behavioral, and possibly more

[5] #studyreplication: Evaluate and replicate a previous study
[6] #descriptivestats: Infer from the statistics of data, in particular, the mean. Calculate t-test statistics to find the statistical significance of the mean difference

qualitative questions. They would be helpful in clearly defining market segments, in terms of not only demographics and purchasing patterns, but also deeper identities and values, hence facilitating marketing endeavors.[7]

IV. Model:

The change in product and price would stimulate the restaurant to establish a stronger online presence. First, many types of foods offered by the restaurant are in the €9-€11 price range, while online food delivery services require a minimum purchase of €12 (foodora, 2018). As vegan meat is €2-€4 more expensive than regular meat (Amazon Fresh, 2018), Amrit would become well suited for online delivery. But it would be no more than another alternative in a sea of choices, unless it finds a way to stand out. To that end, I recommend the restaurant run a promotional strategy by sponsoring hackathons (as food provider or as potential product adopters of hackathon winners). Identity-wise, the business projects itself as an advocate for innovation and creativity, which is consistent to the belief of its founders - "There's nothing creativity can't solve" (Kheny, 2017)[8]. Apart from avid Internet users, hackathons participants are likely recurrent (i.e. one would frequently and actively seek hackathons to join) and could potentially "grow up"with the product, thus being loyal customers. The events are just booming since the establishment of Major League Hacking in 2013 (Major League

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[7] **#consumerBehavior:** critique past research in customer behavior. Informed by the critique, replicate the research in a new setting, with various modifications in the data collection, data analysis, and inference.

[8] #**whyExist:** Motivate strategies (first the additional of vegan meat, and second the promotional strategy to hackathons) with a company's philosophy, mission, and belief.

Hacking, 2018) and are just starting to be popular in Europe, thus there would likely be demands for sponsorship.

To evaluate the strategy, I build a statistical model using Monte Carlo sampling to quantify the effect of investments in hackathons to the financial performance of ten prominent companies in the food industry. The data include the revenue of the company in 2017 (dependent variable), along with the other factors that I suspect would affect the company's financial performance, namely years since establishment, number of employees, website traffic, number of twitter followers, and whether it sponsors hackathons or not. The factors are selected to represent the driving forces for a company's profit - namely market experience (years since establishment), workforce (number of employees), customer interest (website traffic), and marketing efforts (number of twitter followers, hackathon sponsorship). Each of these variables, both dependent and independent, is normalized to the range [0,1]. Each independent variable is then assigned a coefficient indicating how much it affects the company's financial performance. As the goal is to evaluate whether sponsoring in hackathons incurs opportunity costs that deprive the company of some better investments, I add another counterfactual variable that indicates whether a company does NOT sponsor a hackathon, in addition to the variable that indicates whether a company sponsors a hackathon. The technique is similar to a multiple regression. However, by sampling values, our output is distributions of each of the coefficient, so we could compare the two counterfactual variables using t-test. Moreover, Bayesian statistics necessitate we specify our

assumptions explicitly, thus allowing more robust inference. The model data, more details, and code are presented in appendix.

	mean	se_mean	sd	2.5%	25%	50%	75%	97.5%
c[1]	-0.76	0.55	0.78	-2.03	-1.43	-0.53	-0.12	0.04
c[2]	1.22	3.36	4.76	-1.9	-1.89	-1.32	4.85	9.44
c[3]	0.65	0.72	1.02	-0.71	-0.3	0.64	1.6	2.05
c[4]	-0.84	0.97	1.37	-2.51	-2.19	-0.89	0.49	0.95
c[5]	1.33	1.47	2.08	-0.44	-0.14	0.45	2.98	4.88
c[6]	0.11	2.54	3.6	-3.34	-2.66	-1.16	3.16	6.09
sigma	2.2e8	2.6e7	3.6e7	1.8e8	1.9e8	2.2e8	2.5e8	2.8e8

Fig: Model results. The coefficients are as follow: c[1] - number of employees, c[2] - years since establishment, c[3] - website traffic, c[4] - twitter followers, c[5] - sponsorship for hackathons, c[6] - counterfactual for c[5]. The values are relative and do not have tangible/ realistic implications as we have normalized the data.

The result confirms our speculation: the two tailed t-test statistics show a clear profit-enhancement effect in companies with sponsorships in hackathons, compared to those which do not (p-value~0.00<0.05).

The result is not without shortcomings, however. First, the sampling chains did not converge well, which conveys a general lack of data. Second, the data gathered are mostly for US companies (with an exception of Red Bull, which is German, but has global presence). The hackathon scene in the US might be different from German's, thus provoking problems in generalizing the result. Third, we assume the distributions of the mean (but not the population distribution) c[5] and c[6] are normal, so that we could use

t-test statistics. This assumption could very well be wrong, but we could not test it as we do not have enough data. [9][10]

V. Conclusion:

In the current overcrowded market, Amrit could leave a mark on the landscape by being the first Indian restaurant to adopt vegan meat and artificial meat. The paper has supplied the suggestion with an experiment and a model to confirm its effects, both in customer relations and in financial performance. The paper also recommends strategic moves to ensure the business's consistency with its image and vision. [11]

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[9] #**marketAnalytics:** Design and build a model to estimate the effect of a promotion strategy. Provide sufficient analysis regarding its descriptive power and robustness.

[10] **#aboveTheRevenueLine:** Link marketing strategy to financial implications in two situations. One, link the effect of adding vegan meat to the business's financial metrics using publicly available data. Two, link the promotional strategy of sponsoring hackathons to financial performance through simulations.

[11] #organization: Clear organization of the whole paper as a whole

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APPENDIX A

Experiment Questionnaire:

1. Demographics: Gender (M/F/Undisclosed), Education (High School/ BA/ MA/ PhD/ Post-PhD), Profession. Demographics discarded eventually as many people do not prefer to disclose.
2. Health-consciousness: On a scale from 1 (Not at all/ Not care) to 5 (Pay close attention to/ frequently do extensive research), how do you rate your health consciousness?
3. Restaurant characteristics: On a scale from 1 to 5 (1=Not important, 2=somewhat important, 3=important, 4=more/very important, 5=extremely important), how do you rate each of these following factors in your dining experience?
4. On a scale from 1 to 5 (1=Very Negative, 5=Very Positive), what is your reaction when you are informed that the restaurant has adopted vegan meat?

The responses collected are here:

https://docs.google.com/spreadsheets/d/1iQPBP2VvvZunvCykD31nZ26Ezg73tgjSIO-WDZpvsD0/edit?usp=sharing

APPENDIX B

1. **Model Design:**

   - The model is built with Pystan, running Hamiltonian Monte Carlo.
   - The data is collected here, using Craft. The companies are selected by three methods: 1/ This guide, 2/ Personal experience, 3/ Craft recommendation.
   - The factors are selected to represent the driving forces for a company's profit - namely market experience, workforce, customer interest, and marketing efforts.
   - Priors: We start with setting a prior, encoding our understanding and assumptions, to each factor. The model would output a posterior, reflecting the distribution of each factor, having taken the data into account.
   - For simplicity, we allocate a Cauchy(0,1) prior to each factor. The distribution has a fat tail, thus allowing us to sample from a wide range of value without being very specific about our assumption.

2. **Code:**

```
import pandas as pd
import pystan
import time
import numpy as np
from scipy import stats

def normalize(lst):
    r = []
    for i in range(len(lst)):
        r.append((lst[i]-min(lst))/(max(lst)-min(lst)))
    return r
```

```
x = normalize([7.18,  0.076,     0.430,     2.8,  0.078,     1.1,
1.2,  4.5,  2.3,  1.8])
f1 = normalize([15762,     89,   7400, 310000,    1621, 23500,
12100,     70000,     39100,     22400])
f2 = normalize([40,   5,    41,   58,   17,   58,   49,   25,   40,
33])
f3 = normalize([13200000, 597200,     2600000,   28200000,  360000,
     497000,    4500000,   3200000,   1300000,   12000000])
f4 = normalize([2080000,    43000,     21000,     1260000,   138000,
     81,   2890000,   886000,    367000,    597000])
f5 = [1,   1,    1,    1,    1,    0,    0,    1,    0,    0]
f6 = [0,   0,    0,    0,    0,    1,    1,    0,    1,    1]

# prepare data from stan
data_stan = {
    'N': len(x),
    'x': [x[i]*10**9 for i in range (len(x))],
    'f1': f1,
    'f2': f2,
    'f3': f3,
    'f4': f4,
    'f5': f5,
    'f6': f6
}

stan_code = """
data {
    int <lower=1> N; //counter
    real<lower=0> x[N]; //revenue
    real<lower=0> f1[N]; //employees
    real<lower=0> f2[N]; //years
    real<lower=0> f3[N]; //website traffic
    real<lower=0> f4[N]; //twitter followers
    real<lower=0> f5[N]; //sponsorship
    real<lower=0> f6[N]; //counterfactual

    }
```

```
parameters {
    real<lower=0> base[N];
    real c[6];
    real<lower=0> sigma;
}


model {
    for (i in 1:6){
      c[i] ~ cauchy(0,1);
    }
    sigma ~ cauchy(0,1);
    for (i in 1:N){
      base[N] ~ cauchy(0,1);
      x[N] ~ normal(base[N] + c[1]*f1[i] + c[2]*f2[i] + c[3]*f3[i] +
c[4]*f4[i] + c[5]*f5[i] + c[6]*f6[i], sigma);
    }
}


"""
stan_model = pystan.StanModel (model_code = stan_code)

st = time.time()

parameters = ['c', 'sigma']
result = stan_model.sampling(data=data_stan)
print(result.stansummary(pars=parameters))
print('Elapsed time: {}'.format(time.time()-st))

first = np.random.normal(1.33,2.08,1000) # generate samples for c5
second = np.random.normal(0.11,2.54,1000) # generate samples for c6
stats.ttest_ind(first, second, axis=0, equal_var=True)
```