Voice Engagement Leading to Business Intelligence:

A Systematic Review and Agenda for Future Research

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ABSTRACT

There are multiple studies establishing the importance of business intelligence (BI) in the big data analytics context. Voice is yet to be seen as a contributing channel. Voice-enabled assistants are at the forefront of conversational AI advancement. As humans speak to devices, brands and business are investing in engagement through voice channel. This voice engagement is resulting in both intangible and tangible benefits and generating voice commerce. The resultant voice data should be integral to BI, leading to Voice BI. This paper proposes a conceptual framework from engagement to intelligence, with support of five propositions to realise voice business intelligence. Type of applications and their engagement characterisation is segregated to create better understanding using cross-cases observation technique. Along with future research agenda to strengthen the propositions, this investigation observes building voice business intelligence by tracking relevant metrics which enable informed decisions.

KEYWORDS

Alexa, Business Intelligence, Conversational AI, E-Commerce, Engagement, Human-Computer Interaction, Metrics, OK Google Consumer Behaviour, Smart Speakers, Voice Assistants

INTRODUCTION

Voice Enabled Assistants (VEA) are entering human lives in every possible way, both in-home (mobiles, smart speakers, thermostats, lights et al.) and out-of-home (cars, work places, hotels, schools et al.). *VEA are personal digital assistants present in devices that are enabled for voice interaction* (to perform specific tasks for the users)*,* could be the simplest definition[1]. Very high potential is predicted for voice assistants' usage by Google[2] (estimates: 50% Voice Search by 2020, USD 18.3 B by 2023) as well as by Gartner[3]. Smart speakers are far exceeding these estimates[4], near 38Bn units by 2026.

Using only their voice, users are now able to ask (search) and hear (access) flight options, banking details etc., as well as make purchases in some cases. 80% of the respondents believe, "voice control will soon become part of daily life", reducing dependence on touch or type (Bing and eConsultancy, 2019). With the emerging **voice interactions**, several services and applications i.e., Skills on Amazon

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Alexa, Actions on Google Home et al. (coining term ***Vapps*** for Voice applications) hitherto available on websites and mobile have started to engage their consumers on voice platforms as well, leading to **Voice engagement (VE)**. With strong literature support, (Moriuchi, 2019) inferenced that (customer) engagement is above involvement or participation and studied that it impacts loyalty positively. Businesses are starting to observe initial contribution through VE (i.e., business transaction OR monetary transaction) which is to be termed as **Voice Commerce (V-Com)**.

Organizations collate data emanating from their digital initiatives (social media, e-commerce, content et al.) & devices (mobiles, pc, speakers, IoT devices et al.) to create actionable information, feeding their **business intelligence (BI)** initiatives. **Big Data Analytics (BDA)** is offering transformative benefits in real-time customer service, dynamic pricing, personalization etc., resulting in higher conversion rates and better productivity (Akter & Wamba, 2016). For an overview on critical factors that are at play in BDA, see (Sivarajah, Kamal, Irani, & Weerakkody, 2017). All this is leading to the brighter perspective of improved service innovation models which are reflecting at firms like Google, Amazon, Netflix and a lot more.

It is important to note that in the proposed 3 tiers of BI&A (Business Intelligence and Analytics), voice analytics was not listed as a part of the emerging research analytics [list included: Big Data, Text, Web, Network and Mobile Analytics] though sensor-based content was included in BI **3.0** (Chen, Chiang, & Storey, 2012, p. 1169). In accordance, voice analytics should not be mixed up with speech analytics applying linguistic and semantic analysis to understand context, sentiment of the speaker. A sound case was built for improving customer service by (Scheidt & Chung, 2019). Similar posit should be developed for voice customer experience (Voice-CX) with voice as The engagement channel.

BDA context will be arrogated to Voice commerce as another channel of e-commerce. Here the data will be captured from sources as voice, voice notes, speech recognition, voice-ID and TTS-STT (text-to-speech & speech-to-text) et al. when observing V-Com in the ubiquitous commerce or U-commerce (Kumar, Joshi, & Saquib, 2015).

The primary objective of this paper is to establish linkage between voice engagement and business intelligence. The outlined route is to understand how voice as a channel is being leveraged and if that engagement and resultant data will help add to **voice business intelligence (VBI)**.

With the understanding of the customer engagement (CE), context of e-commerce and BI (business intelligence), this work works the foundation for voice business intelligence (VBI). This paper presents the case for Voice, as voice engagement in both commercial and non-commercial forms, in both direct and indirect ways, will lead to generating behavioural data, feeding VBI.

The authors present their voice business intelligence initiation in the following structure: Conduct extensive literature review to understand this nascent category of VEA and identify relevant gaps, as a first step. Second, derive a robust methodology powering qualitative technique(s) using secondary research. To suit the task of addressing the research gap i.e., Voice engagement (VE) & Voice commerce (V-Com) powering Voice BI, design of a conceptual framework is requisite. To enhance VE, V-Com & VBI, it is imperative to develop robust propositions that are applicable across wide variety of voice engagement routes. Further, evaluate the suitability of the findings of this study to build VBI and develop actionable implications for academia and industry alike.

LITERATURE REVIEW

Academic literature on voice enabled assistants (VEA) is available, however, specific literature on voice engagement (VE) or voice commerce (V-Com) is very limited due to the recency of the topic. This is true even for the corporates, start-ups and well-established businesses which are implementing voice solutions.

There are content documents in the form of research reports published by consulting firms, research firms, research agencies as well as corporate houses. These reports publish market trends addressing 5WH (Who, what, where, when, sometimes why and how) helping with periodic updates

viz smart speakers sold in 2020 were over 150[5] million units globally and 1[6] million units in India and the overall voice searches monthly exceed 1 billion.

From an academic literature view, there are many journal articles and conference proceedings, although the entire voice stream effectively started as late as 2014. Voice commerce took shape only after smart speakers have gained critical numbers in 2017-18. Search across key research databases, led to around 50+ literature papers on Voice specifically, by mid-2021. Below are top line observations from key research papers on VEA & smart speakers, elucidating the spectrum of topics and directions:

Acceptance of VEA

Consumer behaviour and adoption models were studied by (McLean & Osei-Frimpong, 2019; Kowalczuk, 2018; Moriuchi, 2019; Park, Kwak, Lee, & Ahn, 2018; Smith, 2018) developing conceptual frameworks built on the similar lines of technology acceptance model (TAM) (Davis, 1989) and (UTAUT) unified theory of acceptance and use of technology (Venkatesh et al, 2012). Perceived Risk, impediments to adoption et al., were critical factors that were included in their designs.

The study of users' privacy perceptions, applying General Data Protection Regulation (GDPR[7]) in the context of voice et al., were researched by (VimalKumar, Sharma, Singh, & Dwivedi, 2021; Loideain, 2020; Cho, 2019). These studies highlight antecedent characteristic of Privacy calculus[8] behaviour demonstrated, explores mediated influence of privacy risk & role of Trust in provider (technology or service). Malware induced misinterpretation (aka fake content) and counter measures were proposed in a study (Sharevski, et al., 2021).

Experience with VEA

Literature by (Hasan, 2020; Pitardi, 2021; Bawack, Wamba, & Carillo, 2021) explored the role of personality, trust, and privacy in customer experience during voice shopping endorsing agreeableness positively affects trust and conscientiousness positively affects trust. Emotional instability negatively affects privacy concerns has also been documented.

Customer Satisfaction is another area where few studies by (McLean & Osei-Frimpong, 2019; Hwang, 2018; Kraus, Reibenspiess, & Eckhardt, 2019; Mari, 2019; Moriuchi, 2019; Son & Oh, 2018) have put efforts to get a better understanding of the factors helping or factors that could improve consumer delight.

With impending high frequency of VEA usage, (Li & Rau, 2019) looked to establish affinity (Intimacy – term used in research) with the conversational agent. Research confirms self-disclosure does induce closeness with VEA and people may start accepting VEA imperfection. People attribute success to VEA and failure to themselves, which is not in line with general human-to-human interactions.

Research has focused on the adoption and intention. Usage and how voice as a channel could be leveraged to engage with customers and if it will translate in voice commerce has not been an active part of these studies.

VEA in Action

Impact of voice on commerce was reviewed by (Kraus, Reibenspiess, & Eckhardt, 2019) to observe consumers having higher expectations in convenience for voice commerce than they have for e-commerce. Further, (Mari, 2019) construct was focus group interviews to understand role of voice as an influencing agent or a mediator with ability to increase brand awareness metric.

There has been limited documentation on actual usage by consumers even by the platforms or service providers. (Smith, 2018) took an interesting take on what smart speakers should say and how marketing messages should add more flexibility for the VEA users.

Comparison of users ordering video-on-demand pre and post adopting smart speakers was key to a study by (Son & Oh, 2018) supported by NRF & Min. of Studies, Republic of Korea. The segregation based on default Vapps (information-seeking) asking about weather, traffic et al. and

(emotion-seeking) say jokes, play songs et al. helped define characteristic and usage references. Since V-Com was dabbled and experimented with in 2018, this approach was justifiable.

More research initiatives (Terzopoulos & Satratzemi, 2020; Serban, 2020; Masina, 2020) have started to document VEA usage in daily life *viz* Usage in everyday life and education, technical integration with other cloud platforms in schools, aiding physically impaired users in hospital environment and observed their influence. None of these studies have actually documented any evidence of data, trend or any other metric oriented observations, with exception of (Butler, 2020). Butler (2020) study recruited 99 students to explore usage of smart speakers and the available Vapps, in senior primary classroom (socio-material approach in a control environment), and did not include measuring impact on learning (of VEA), in the study scope.

Infancy of the category being the key, most studies have focussed on acceptance, drivers, impediments and other factors, in line with the (Rogers, 1995) diffusion stages of early adopters across markets and some cases of early majority. Fewer studies have focused on the usage and the impact. No studies have established any semblance of VBI for a firm, so far.

RESEARCH METHODOLOGY

This study undertook two-step approach:

Step 1: Case Study Approach to Build Theory
- Build Theory (conceptual framework) for Voice Business Intelligence (VBI)
- Propositions to strengthen each element of VBI i.e., engagement, commerce ability et al.
- Proposition's robustness to be adaptable to variety of applications and withstand challenges overtime

Step 2: Cross-Cases Observation Technique using Secondary Research
- Case Studies that are globally relevant from authentic sources
- Evaluation framework to put each case through to understand and evolve set of factors
- Analyse the observations & derive findings

Step 1: Case Study Approach to Build Theory

Guided by (Eisenhardt, 1989) process, authors undertake building of theory from case studies following an elaborate flow outlined. The authors adapted steps as required for this paper. This process was further consolidated with inputs from (Eisenhardt & Graebner, 2007) such as relying on observations, archives, books and qualitative inputs from interviews where available. More recent work by (Ridder, 2017) helped outline research design(s) and their underlying differences viz. theory building, gaps in theory and anomalies.

With the literature review (*Table 1*), the researchers have conducted an extensive study to gain in-depth understanding to present broad directions, to identify gaps in theory for voice as a channel of engagement and voice contributing to business intelligence. It brings up several topics up for research *viz* (a) how brands are connecting with consumers using VEA (b) engagement level consumers have with such initiatives i.e., characteristics (emotion based, promotion based, quick fun et al.) (c) how voice is aiding in generation of commerce (d) how business intelligence is being strengthened (e) How BI inputs are strengthening the offer or service et al. This will help test if VE is leading to business intelligence to include Voice.

Voice Commerce will be a sub-set of e-commerce or commerce in general (Galanxhi-Janaqy & Nah, 2004) observed adopting their model. V-Com will be a result of VE via voice interactions made possible with Smart speakers, mobiles and all other VEA devices at home, on the move or at work place.

Table 1. Literature review to identify gaps in theory for Voice in Business Intelligence

Authors	Direction	Broad output of the Research
(Kowalczuk, 2018); (Moriuchi, 2019); (Park, Kwak, Lee, & Ahn, 2018); (Smith, 2018)	Consumer behaviour and Adoption models	Conceptual frameworks viz. TAM/UTAUT Perceived Risk, Impediments to adoption
(McLean & Osei-Frimpong, 2019); (Hwang, 2018); (Moriuchi, 2019); (Son & Oh, 2018)	Customer Satisfaction	To get a better understanding of factors helping or that could improve consumer delight
(VimalKumar, Sharma, Singh, & Dwivedi, 2021) Abstract only	Users Privacy Perceptions	• Trust in provider (technology/service) • Privacy calculus behaviour • Mediated influence of privacy risk
(Sharevski, et al., 2021) Abstract only	"Malware-induced misperception" – making false interpretations of true facts	Malware works irrespective of segment including frequency of VEA usage. Counter measures are proposed in light of scale of content (social media)
(Bawack, Wamba, & Carillo, 2021) Abstract only	Role of personality, trust, and privacy in customer experience during voice shopping	• Agreeableness positively affects trust • Conscientiousness positively affects trust • Emotional instability negatively affects privacy concerns.
(Li & Rau, 2019)	Affinity (Intimacy – is the term used in research)	Research confirms self-disclosure does induce closeness with VEA and people may start accepting VEA imperfection.
(Kraus, Reibenspiess, & Eckhardt, 2019);	How Voice Can Change Customer Satisfaction: E-Commerce Vs Voice Commerce	Transaction process efficiency significantly influences satisfaction in voice commerce.
(Mari, 2019)	Focus Group interviews to understand the agency role of VEA and voice commerce	VEA as a market mediator
(Terzopoulos & Satratzemi, 2020) (Serban & Todericiu, 2020) (Masina, et al., 2020) (Butler, 2020)	Voice Enabled Assistants in action	Usage in everyday life and education Education – technical integration Users with disability in hospital environment Primary schools – NZ
(Smith, 2018)	Marketing via Smart Speakers	What should Alexa say?

As the data gets captured from voice channel specifically, it is imperative to track the effectiveness and efficiency of the channel separately & together with rest of the commerce channels in the larger frame of business intelligence. This thinking helped conceptualize below framework (*Figure 1*):

This article efforts in providing a conceptual foundation for further theoretical and empirical research to include voice as a channel of engagement, commerce generated using voice and the outputs into business intelligence to create a niche for Voice Business Intelligence (VBI). Helpful starter guide for BI has been developed by (Kasemsap, 2016) for quick reference. Voice **must** get included in all such studies, documents, research & literature for both academic and industry view.

In the context of VEA, given there is no existing theory for VBI, the above framework proposes emerging constructs and developing relationships. Using Voice as an engagement channel generating (where applicable) commerce could lead to VBI, by collating behavioural metrics.

Figure 1. Conceptual Framework – from engagement to intelligence (Authors visualization)
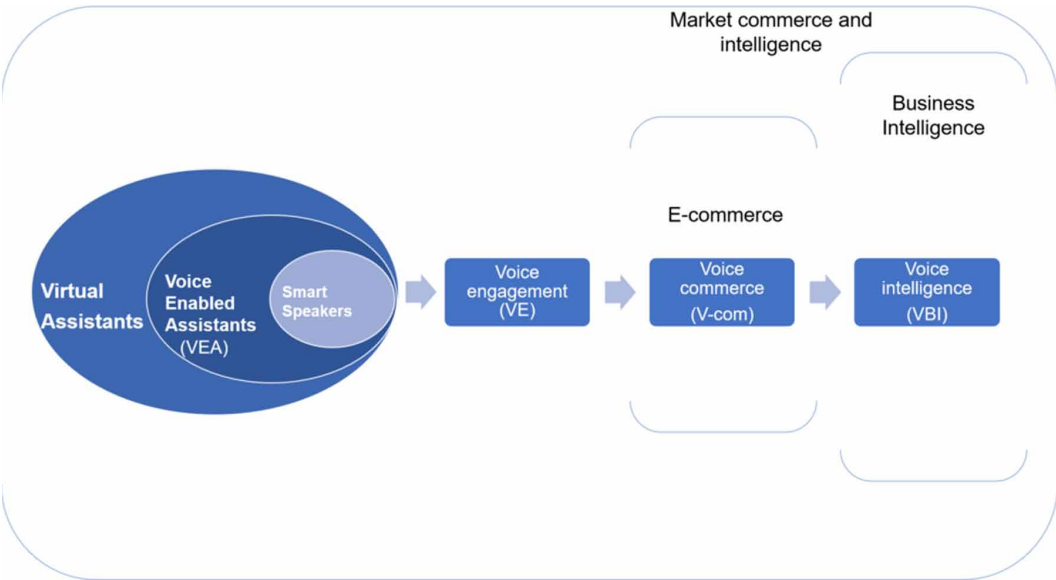
VEA (available in smart speakers, car in-dash, IoT devices, Smart Phones et al.) enable users to use voice as an engagement channel, respond to pre-programmed wake word(s) e.g., "*Alexa*", "*Hey Google*" "*TMall Genie* (in Mandarin)", "*Hi Bixby*" et al., followed by interaction on the task.

Proposition P#1

Voice as a Channel of Engagement

VEA allow users to interact with services & brands through Vapps deriving both intangible (improved efficiency, multi-tasking ability, quick access to information etc.) and tangible benefits (shopping, banking, premium services etc.) either by using libraries embedded or web scraping relevant information, based on the keywords either as spoken by the users or as identified by the device (in some cases due to accent, language, dialect etc.).

Propositions of Customer Engagement & Customer Brand Engagement (Hollebeek, 2011) apply to voice engagement as well, since it is the same customer and only the channel of engagement is voice. However, nuances of voice need to be captured clearly. *Specific study for this research topic is a big opportunity*.

Proposition P#2

Voice Engagement Routes to be of Three Types

Default Vapps: Set alarm, call, weather, traffic et al., features and related information that is available immediately within the embedded resources of the service provider (e.g., Google Assistant)

Custom Vapps: Free downloadable voice applications e.g., banking, e-commerce et al. and can be put to use only by registering requisite information prior to accessing specific data or conducting a task. Many applications on mobile have started offering voice interaction (e.g., Alexa on Amazon Shopping). Mobile Voice engagement should also be considered as a part of voice engagement.

E.g., Dominos Vapp can be downloaded free. To place order, the Vapp goes through the process of recording person's name, address details, payment details et al. the first time. The menu option

allows for making choices each time the order is placed. It also allows saving favourite(s) or most often ordered food. The payment amount, route of payment (credit card, digital wallet et al.) options have to be confirmed for each order enabling higher security for user information.

Similar process is seen in the case of other food, tickets, travel et al., Vapps which are helping work the V-Com (revenue, value) into action for those businesses.

While the above is positive side of business, it is equally or more important to keep track of users dropping out in the overall process i.e., placing an order (purchase). The dropouts could occur after hearing the menu options, price, delivery time et al. and due to compelling competitive offers sometimes. User experience also plays a role in this.

Not all Vapps are working toward only revenue generation. For e.g., KLM bot for an instance helps with information on the destination, planned trip, weather, events, distances, et al., which helps passengers plan and pack accordingly.

Such voice initiatives amplify the overall engagement with the brand offering & contribute to consequences such as commitment, loyalty et al. (Hollebeek, Glynn, & Brodie, 2014).

Speciality Vapps: Businesses offering specific solutions make the downloads available. Case studies discussed later in this paper demonstrate the width of customization these applications offer. To provide a quick understanding, these Vapps are putting words in speech impaired vocals (e.g., Voiceitt[9]), reading out labels for the blind and helping users follow a regimen of meditation to improve mental health. These Vapps are provided for specific users by businesses either in partnership with or sponsorship of NGOs, government authorities or social start-ups & funded initiatives. The speciality Vapps do attract premium due to the type of service offered. The format of premium could be pay-per-use, one-time pay, pay-for-upgrades et al.

It is imperative to keep track of a user experience via Vapps since the Vapp may be abandoned by the users if it is cumbersome and not meeting user need and requirement or if the experience of the Vapp offer is not in line with their expectations.

More types for consideration, few corporates are creating their own[10] VEA with the long-term in view e.g., Walmart – Sam; Bank of America – Erica; Domino's – Dom; BBC – Beeb. Some businesses have actually developed their own speaker not just the app e.g., Deutsch Telecom & Orange[11]. While the form factors may be different, the route to engagement is adequately covered as **Custom Vapps**.

Proposition P#3

Voice Commerce is Integral Part of Voice Engagement

The above engagement routes imply and define that commerce generated by voice (Voice Commerce or V-Com) is integral part of Voice Engagement.

Continuing with the example of Dominos' Vapp in P#2, users could make their choice from the menu options and confirm order after agreeing to the amount payable and mode of payment. This effectively is revenue generated using voice. Repeat orders (stored as favourites) are usually resorted to as that saves a lot of effort leading to habitual routine. Starbucks specific case is discussed later to elucidate the revenue or commerce ability.

In case of **Speciality Vapps:**

Bravo Tango Brain Training is developed by Google Assistant + National Geographic T.V. Channel + 360i digital marketing agency in partnership with US Military for the benefit of war veterans' mental health. For Voiceitt, individuals buy the premium Vapp including some customization to suit individual's needs. Similarly, Vapp helping the blind read out product labels & VEA integrated into hearing aids is worked with sponsors and service providers. The development is tuned to the solution provider's requirement and hence Commerce here may not be trackable per usage or Vapp activation, like in the case of commercial Vapps.

Proposition P#4

Customer Voice Engagement Behaviour Will Vary with the VAPP Offering

Differential usage leading to different behaviour patterns by the users to be observed for each type and routes of voice engagement. Hence different data metrics are likely to emanate for tracking, as elucidated in *Figure 2*.

For e.g., Usage frequency & Dependence

Default Vapps: Few tasks could be scheduled i.e., delegated (e.g., set alarm, weather report, play

Figure 2. Voice Engagement usage emanating data feeding VBI (Authors visualization)
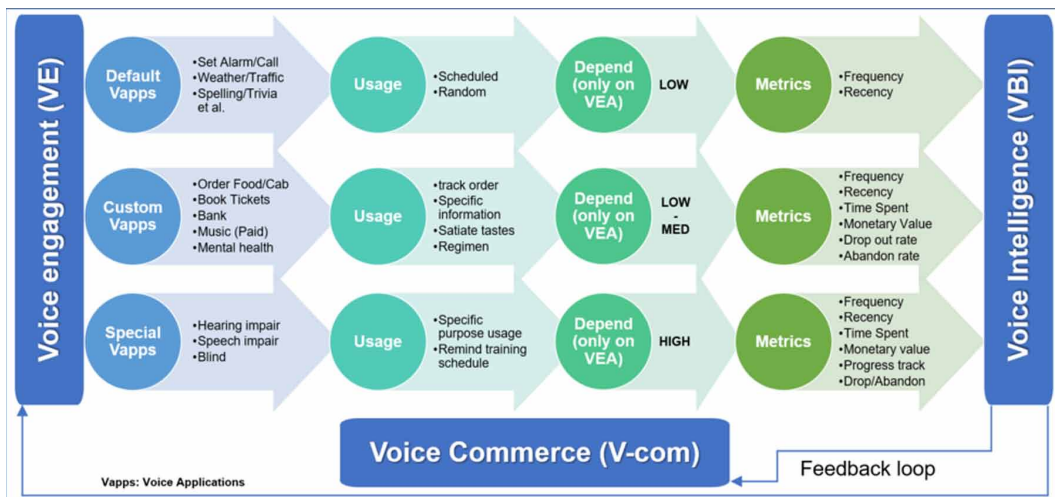
morning-music list) and many other Vapps could be evoked at random (spelling, trivia, news headlines, call Home et al.) depending on need or the situation. All these tasks could be achieved with or without VEA or smart speaker. However, VEA provide the incremental benefit of "multi-task". Hence the dependence on default Vapps could be classified as Low.

Custom Vapps: Placing food order, booking cab or banking information et al., These Vapps are used when specific need arises. Even for these Vapps, VEA may not be the only source. Again, dependence on Custom Vapps could be Low-Medium.

Speciality Vapps: Further, dependence could be High for a few Vapp services (e.g., VOICEITT) since users need this Vapp every time. Some Vapps that are recommended for mental health could be accessed for a treatment period. Some Vapps that help fill-in for physical challenges may become Vapps for life.

It also proposed that there will be multiple customer behavioural traits that will crop up depending on the nuances and idiosyncrasies of product/service, life-stage of the category, market dynamics, market maturity and many more such factors. Staying focused on Voice and its impact will be the key & minimizing duplication with the larger BDA and BI is be highly recommended.

When specific items and variables are being defined, the query must revolve around voice & its emanating direction(s).

Contextual relevance to be considered for inclusion within this proposition#4, in line with FP#5 (Brodie, Hollebeek, Juric, & Ilic, 2011). This inclusion demands the framework to define VE in a much

sharper context clearly defining stimuli, behavioural traits as well as outcomes or consequences and the related items. Since this paper's focus is exploring VE leading to VBI, design of VE framework is *proposed as big opportunity for further research*.

Proposition P#5

Voice Business Intelligence is a Consequence of VE Including V-Com

VBI will be an output of mining the data emanating from voice initiatives as (i) VE behavioural metrics (ii) V-Com metrics. This implies activity and usage are being performed in a specific context that customers believe as "relevant to me" environment.

Attribution modelling[12] will start to become important as voice usage grows[13] in significance, as was in the case of search or social media. Again, it is important to note support on Google analytics homepage does not have topics specific to smart speaker, voice analytics, voice attribution, voice funnel metrics et al. So, even for Google Home, Amazon Alexa, TMall Genie, Samsung Bixby et al., Voice analytics should be on top priority.

Feedback Loop

VBI feeds back to enhance engagement and commerce ability. These inputs for improvement could be channelised into improving voice experience i.e., product/service nuances for voice, marketing communication initiatives specific to voice, plausible antecedents (satisfaction, value et al.) and consequences (trust, loyalty et al.) focused on voice engagement.

Data Access Recommendation (Limitation of this Paper)

During development of this paper, the authors did not have access to any internal real-time data from any business, given this is conceptual framework and also confidentiality and sensitivities attached to such data.

Further in-depth and/or longitudinal research is recommended with access to information after non-disclosure agreements. The possible routes are (a) funded by relevant authorities (Son & Oh, 2018) (b) sponsored by established businesses who are keen to understand their own engagement routes (c) Controlled environment approach where the data can be recorded manually real-time (Butler, 2020).

Step 2: Cross-Cases Observation Technique Using Secondary Research

Bank of relevant key words were used for searching the internet. This effort helped find initiatives shared by brands, corporates which mainly focused on voice engagement as a sales channel and few purpose-driven solutions by few conscious organizations, NGOs, few start-ups and few individuals who impacted society in a positive way.

Limiting the searches to scholarly databases OR scholars Directory (google scholar) OR scholars' social network (Research Gate) may not have augured well for this exercise. The case studies collated are not only papers but also in the formats of videos, blogs, podcasts, infographics et al., posted on niche speciality sources alongside some stories in main stream general media.

The Study included use cases that were discussed at global marketing forums (e.g., Cannes, Google day et al), published case studies, white papers and other professional, niche content published by client businesses and marketing agencies. Google and Amazon teams have documented such efforts to establish how e-commerce in general and VE and commerce is performing in the market place, albeit not disclosing or sharing details in their complete form.

Building Theory from Cross-Case studies is representing the logic of replication or inductive as stated in (Eisenhardt, 1989) work. Segregating patterns & bucketing into logical segments, idiosyncrasy, uniqueness of each case allows it to "*shine on its own*", helping serve the purpose of developing framework.

Like a series of related laboratory experiments, multiple cases are discrete experiments that serve as replications, contrasts, and extensions to the emerging theory (Yin, 1994) as observed in (Eisenhardt & Graebner, 2007).

This is reconfirmed by (Ridder, 2017): "Research strategy → Observation and description of a case; understanding by researcher and reader" to build theory. Ridder (2017) extended the research by describing Constructivist (describe, aggregate and interpret) and Positivist (new constructs and new relationships) attributes to develop and observe real-life cases using replication logic.

Case Studies Evaluation Framework

This exploration is studying characteristics of the voice initiatives using the following framework, taking the cross-cases observation technique forward:

Voice as an engagement channel will be a mandatory requirement. **P#1** will be met with the above requirement. When collecting data via Mobile Apps, websites et al., businesses must ensure data for voice in those respective channels should be collected and curated specifically to feed into VBI.

Custom Vapps will be observed through this framework with the available data and information, as collated in *Table 2, Table 3* and Speciality Vapps as detailed in *Table 4.* Frequency, Recency and Duration (time spent) are basic metrics observed in the consumption of internet, social media. Frequency to be defined as how many times an individual will use VEA (e.g., smart speaker, IoT device et al.) or the voice application (Vapp), in line with internet (Phillips & Shipps, 2012) or social networking sites (Cha, 2010) & duration be defined as amount of time spent on the site, using app & in this case Vapp.

The tracking metric for Vapp should be specific & should not mis-attributed (as the data of the device). Similar stringent measures should apply to recency (i.e., last visit or the most recent visit, for the device and for the Vapp separately), Time spent (i.e., duration of time spent, for the device and for the Vapp separately).

Vapp can be accessed only through a device and not independent of it. In case of smart speakers, mobiles et al., including IoT devices like Smart Home appliances accessed through them where VEA are used, rule of thumb should be that the usage of device will be more than that of Vapp usage (frequency) since users could use device for a variety of Vapps and other purposes.

This methodology will strengthen the **P#2.** Evaluation of Default Vapps is not considered as a part of this exercise since it will need specific behavioural data from the platform/service providers.

Commerce generation (plausibility) using voice (V-Com) has been demonstrated in few case studies. Some have published top line findings of the impact of voice. The process of engagement is similar in most Vapps allowing commerce. Few key examples discussed demonstrate the same. **P#3** requirement will be met with this collation. Research conducted in partnership or sponsorship of a Vapp owner will lead us to specific understanding of the monetary value dynamics. This will be integral to VE.

Level of Engagement (type, depth et al.), for **P#4,** will be observed on a scale of High/Medium/Low scale looking at the involvement users had with the initiative or application (Vapp). This is in addition to metrics discussed in **P#2**. Level of engagement could also pave ways to both antecedents as well as consequences, depending on current userbase and new userbase.

P#5 Tracking data metrics to feed voice BI (VBI) i.e., VE (including V-com) = VBI

Compilation of examples of Voice Applications reviewed through this framework is as demonstrated below.

To develop and deliver a more accountable tracking of case studies (for current and longitudinal purpose), this study initiates them under developed markets (mainly US, UK, Spain et al.) listed as

Table 2 and India Specific as in *Table 3* (and this could be categorized as emerging markets in the future like in (Kumar, Rajan, Gupta, & Pozza, 2017)) & for Speciality Vapps in *Table 4*.

With the qualitative inputs and the understanding gathered from the source, route (the way activity is conducted) is observed. **Engagement Level** is observed looking at the purpose and the criticality of the activity for the users as well for the firm conducting the activity. While (Zaichkowsky, 1994) PII could be initiated, for this exercise it is kept at higher level of High/Medium/Low for this record. Voice Engagement definition here needs to be defined in a concrete manner, as stated in P#4 and Voice Commerce generation is as explained above.

Tracking metrics to feed BI is essentially looking for data. As discussed earlier, there is less data available in public domain. This tabulation includes all data that was made available, for those case studies, in public domain.

Results From the Study

OBSERVATIONS

Whilst there are more recorded Case studies[26], this list captured in *Table 2, Table 3* & *Table 4 below* encapsulate the variety of engagement & plausible commerce outcome using voice. Taking this cross-case observations further, VE has seen multi-tiered approach. Some going deep into human psyche to make the connect, some gimmicky and many leveraging repeatable actions. These are all in addition the regular run of play music, find weather, locate phone, add to shopping list, turn-off lights et al.

In general, people like their coffee or tea exactly the same way every time they consume. **Starbucks** leveraged this insight to create "reorder" option (Alexa, order my Starbucks) for preferred drink, after storing specific choice. It was also observed that since people love take-aways, they can pre-order, "reorder"[27] and just walk in and pick their cup and walk away. Ford made news when they announced Starbucks could be ordered when they are driving, in 2017. Mobile orders contributed 7% of transactions (3% up YoY). Adding Alexa is likely to combat lowered footfalls due to "Amazon effect". It is this intelligence that makes businesses more effective, efficient and make their customers happier.

We can only imagine, due to dearth of documented case studies, the positive impact such initiatives have on usage behaviour during the last 18 months, during the social distancing phase.

Selection of Speciality Vapps Examples

Illustrating the use case is Boston children hospital's **KidsMD** is aiming to be the most trusted source of paediatric education with specific skills e.g., flu doctor, My Children's ERAS (Enhanced Recovery after surgery) et al. and both these Alexa skills are HIPAA 1996 compliant (Health Insurance). 6 companies[32] (pharma, insurance, hospital chains et al.) are now accessing Alexa service for healthcare.

Emotional Connection with VEA

Voice revolution has now reached a place where users are looking for emotional connect with VEA. In May 2018 (revealed at a google conference in Jun 2018), 1,000,000[33] people said the term "I Love you" to the google assistant, in the US. Humans talk to each other and are expecting to talk to machines the same way & VEA are enabling this.

VEA in Education and Mental Health Initiatives, India

Indian jugaad has taken it one step further, making it accessible to the less privileged and in developing rural, semi-urban areas. While these are all individual, independent efforts in disparate places, they all have worked towards making learning fun[34].

Table 2. Voice Enabled Assistants engagement: Developed Markets examples

Vapp (P#1)	Voice engagement Route (P#2)	Voice engagement Levels (P#4)	Commerce (P#3)	Metrics to aid BI (P#5)
Google Assistant + NatGeo + 360i *"OK Google, talk to Tango"*	**Bravo Tango Brain Training**[14] the first-ever voice app that democratizes military veterans' access to mental health care (when they are looking to merge back into main stream)	**HIGH** Recognizes moods (e.g., anxiety, loneliness) and then pairs users to an appropriate exercise (e.g., meditation, breathing et al.) and assists them through the exercise(s).	**Medium to Low** Long tail conversions for training exercises et al.	Not presented* **Possibility** #people engaged, type of exercises, services used after interaction are possible directions
Hi *BlueBot* (Any VEA)	**KLM Blue Bot**[15] Service Bot for Better, Quicker and more Efficient services to customers, using AI	**HIGH** **Google Home** guides thru the packing for traveller combining variety of information such as weather, tourism et al.	**Low** Long tail possibility e.g., suitable clothes for destination	Not presented* #people engaged, #destinations #requirements et al.
"Aeden" (Any VEA)	**Aeden**[16] One-to-one chatbot experience offering additional information on the show WestWorld on HBO	**MEDIUM** Creating intrigue to keep the viewers engaged beyond just the TV Show.	**NO** Maybe TV show merchandize if any	250,000 users, the bot monitored fan sentiment, theories and enquiries et al., providing insights
"OK google… what is a whopper burger"	**BurgerKing TV ad**[17] To Activate Speakers at viewers home via TV Ad	**LOW** TV ad wakes speaker with wake word (searches the phrase and narrates whopper ingredients from Wikipedia)	**NO**	Not presented* This prank was stopped within hours of airing
Alexa Why not now?	**Why not now?**[18] To create close personal connection aligning with brand's offering during launch (SEAT Tarraco – SUV)	**MEDIUM** VEA asks battery of questions on what is stopping the user from doing what they want right now and drive home "Why not now?" message	**NO** Limited to the event (Auto Show)	Not presented* #people engaged et al.
Alexa Order my **Starbucks**	**Order my Starbucks**[19] Order favourite drink/snack from Speaker, Phone and Ford Cars with Alexa	**MEDIUM to HIGH** Save favourites on Starbucks app. Linked to payment "REORDER" before reaching the outlet	**YES**	Not available** Sales value, volume, flavours, repeats et al. and many other details (date, time, location et al.) to feed BI tool
Domino's (Any VEA)	**Pizza Home Delivery**[20]	**MEDIUM to HIGH** Pre-defined e.g. easy order (saved)/recent, track et al. Confirms price before "place the order" (Saved details – address, payment et al.)	**YES**	Not available** As above
Ticket Master (Any VEA)	**Ticket Master**[21]	**MEDIUM to HIGH** Find events (celebrity, location, date et al.) and book tickets (Details pre-furnished – payment)	**YES**	Not available** All e-commerce details

*Not presented: Metrics data of the VE were not made available in the case study
**Not available: BI data will be available internally only. Corporate Partnership to get a block of data for analyses will help address this information gap.

Table 3. Voice enabled assistants engagement: India specific (Emerging Markets) examples

Vapp (P#1)	Voice engagement Route (P#2)	Voice engagement Level (P#4)	Commerce (P#3)	Metrics to aid BI (P#5)
Alexa	**'Alexa' turns teacher**[22] Warud School, Marathi Medium, 170 km from Nagpur, Mr. Amol Bhoyar, School teacher (36 students) - fitted Amazon Echo dot into a mannequin dressed in smart clothes and glasses	**HIGH** **Supervised self-learning** - Students interact asking trivia, news, relevant questions to their class, society et al	**NO**	Not presented*
Instagram	***SwiggyVoiceofHunger***[23] Instagram Voice-post Swiggy asked users to recreate voice graphs like food shapes	**MEDIUM – LOW** User Generated content Short-term promotion	**NO**	0.15 M entries in 10 days Insta followers increased to 30K+
OK google, talk to Maruti-Suzuki assistant	Maruti-Suzuki Assistant[24] Drive brand awareness at AutoExpo2018	**LOW** AI powered tour guide at the AutoExpo2018	**NO**	Not presented*
Alexa, open UrbanClap	***UrbanClap***[25] Book services (e.g., electrician, plumber et al.)	**MEDIUM** "Choose" Pre-saved Address (location e.g., address) "Confirm" or "reject" (Payment in person, at location)	**YES**	Not available**
OK Google, Talk to Domino's	Pizza Home Delivery Order New/favourite; track Confirms price, size, crust, sides et al. before "place the order" (saved details – address) **No** Cancellation	**MEDIUM** Makes repeat order easier (if it's the similar choice)	**YES**	Not available**
Alexa, open PVR cinemas	Explore and book tickets/ snacks at PVR Cinema Reminders for the show Payment Wallet (pre-saved) or link **No** cancellation	**MEDIUM** Favourite movies, snacks	**YES**	Not available**
Alexa, open Cleartrip	Travel plan / recommendation Flight/hotel search based on Destination locations, dates, present lowest-fare option (travel time, price and airline)	**LOW** Holiday, travel, tourism related Details only	**NO**	Not available**

   *Not presented: Metrics data of the VE were not made available in the case study
   **Not available: BI data will be available internally only. Corporate Partnership to get a block of data for analyses will help address this information gap.

   Mr. Amol Bhoyar, School teacher, Warud (Amaravati in Maharashtra) fitted Amazon Echo dot into a mannequin dressed in smart clothes and glasses. Adding to the first case on *Table 3*, Alexa is English teacher at Cheriyyakkara (Kasaragod in Kerala) stuffed into a teddy bear. A school in Mumbai uses Alexa mannequin to teach English.

Table 4. Speciality Vapps examples

Vapp	Engagement Route
KidsMD Alexa skills e.g., flu doctor	Boston children hospital[28] ERAS (Enhanced Recovery after surgery) et al.
Alexa Show and Tell "What am I holding?"	Accessible Alexa Echo Show[29] New Alexa Skill (UK) identifies Groceries/items enabling the **blind**
Hearing-Aids with Bluetooth & Voice Assistants	Voice assistant enabled **hearing** aids[30] Nearly hearing aid from the five major manufacturers is Bluetooth compatible & VEA enabled
VOICEITT From mumbles to "I Love You"	VOICEITT[31] APP Voiceitt debuts direct Alexa control for People with **Speech** Disabilities Must Watch: https://www.youtube.com/watch?v=hmVCzeXPeWU&t=65s

Bengaluru's Learning Matters built "Tara" on smart speakers that is being used to teach English in 2 schools in Tamil Nadu & they would like to penetrate Tier-2 & Tier-3 towns. They are also looking to develop more subjects. One of the key reasons why students are very enthused about learning from machine is "it corrects them in a very soft tone. The kids are able to hear correct pronunciation (not "pronounciation" as Indians generally tend to say), without feeling judged for getting something wrong" says Padma V, Headmistress, Thanjavur.

Wysa[35], a custom VEA developed by Indian AI-based start-up providing Mental health solutions, assists users in undergoing early-stage supportive therapy (but not severe conditions as of now). Indian clinical psychologists & therapists address ~3 million users from across 65 countries.

In sum, Voice is feeding Intelligence in two ways, as is the case with any service, product. It is generating immense data sets to feed the business metrics. Even more important is the way it is feeding insights, without mining, as customers and consumers have started to utilise VEA services making it relevant and suitable in their own specific way. Technology is democratized to enable customization by users.

DISCUSSION AND DIRECTION

Partnering with corporates and business houses where first party data (permission based) could be accessed will be a mega stride, from an academic research view point. This will aid both near term (trends to observe and identify opportunities) and long term (longitudinal study to observe overarching trends including macro impact).

The Vapps are now forging ahead in adding value (satisfaction) in addition to entertainment (enjoyment). How business intelligence can take advantage of VE including V-com is covered in this discussion.

The authors put an effort to code the plausible ABC (antecedent, behavior, consequence) variables as each of the below sectional opportunities are discussed. Further, every future research direction is bucketed (*P#_*, indicative only) to focus on strengthening a certain proposition.

Overcoming Hesitation (Subjective Norm)

"People tend to speak to devices in private more comfortably than public (due to hesitation, disturbances et al.)", observed GlobalData[36] Q3 2016 consumer survey. Smart Speakers have effectively addressed this since speakers are indoors and in-cars and in devices which are generally in private areas.

The presence of VEA on mobiles is probably limiting the current appeal of smart speakers questioning the overall value. From India point of view, the Vapps are deepening VE including

commerce. Initial experiences have pushed the smart speaker providers to localize[37] the content, experience and third-party partnerships.

More Alexa users in India wake up to Mr. Amitabh Bachchan's hugely celebrated voice[38] every day, in line with global initiation of Samuel L Jackson, Melissa McCarthy, Shaq O'Neal et al. Such initiatives are likely to drive smart speaker penetration into the deeper strata, into early and late majority segments. Ability to follow local 'English accent' and vernacular languages are likely to be key success drivers.

Research opportunity (P#1): Impact of (a) Celebrity inclusion (b) Inclusion of Vernacular languages

Understands Well (Ease of use)

Voice assistant "often does not understand me (on Speaker: 26%, on mobile: 35%)" is one of the observations by PwC[39] Consumer Intelligence Series – Voice Assistants survey 2018 (US), even though overall satisfaction was high (93% satisfied & 50% very satisfied). "Does not understand" numbers are likely to be much higher in non-English speaking markets since people tend to use spellings as sounds and not phonetics. Vernaculars will take the lead in those markets.

Research opportunity (P#2): Impact of understanding accent

Language dynamics have started to play a huge role with Google Home promising 14 languages including 8 Indian languages[40] and Alexa having similar abilities. IIT Patna's indigenous Indian Voice Assistant is likely to have the ability of speaking 18 languages[41]. Soon, VEA will penetrate the social classes and town classes with ease and the customised content will expand to suit their needs.

The languages and depth are likely to address the Value equation.

Research opportunity(P#2,4): (a) if the VEA responding correctly to language questions? (b.i) if VEA are bringing forth relevant content to address those questions (b.ii) is there adequate availability of language content (c) is it just the language? What about the dialects? Given that each Indian official language has at least 3 socio-cultural regional dialects.

Such challenges will be part of every language that will be on-boarded on VEA, generating ample opportunity for research and understanding.

Amazon's[42] claim of 40000+ features, skills & partnerships adding to its fold is to customize the content for greater appeal and so is the case with Google Home actions. Smart Speakers access all applications from cloud data. For a seamless interaction, it will be dependent on data bandwidth availability.

Research opportunity (P#2,4): A Longitudinal study of performance of smart speakers and VEA will deliver excellent insights into how bandwidth adds voice to this niche.

Privacy and Security (Risk)

Privacy and Security concerns in the digital worlds is a vast subject. Specific focus on Voice is equally challenging.

(Hwang, 2018), (Park, Kwak, Lee, & Ahn, 2018), (Kowalczuk, 2018) all have included their privacy and security as one of the variables (leading to perceived risk) that is impacting adoption of smart speakers. (McLean & Osei-Frimpong, 2019) summarized concerns of always listening, probably loss of stored personal and payment data et al., do increase risk perception.

38% as per PwC report confirm this challenge. Users do not want something or someone listening to them all the time. Several independent experiments also demonstrated that VEA while they may not look "ON" all the time, but wake up with wake-word instantly, only to show they have been listening all the time[43]. Not just this, till recently Amazon and Google kept record of the conversations' users had with their VEA, with the intention of training machines to become better at NLP and make the conversations as human as possible. And they can be hacked[44].

(Moriuchi, 2019) studied that the consumers could engage to get more information or to reduce their risk anxiety and it may not necessarily lead to loyalty.

Research opportunity (P#2,3,4): Risk will have differential role play depending on what type of engagement users have with the service/product. Another avenue for research.

The Spoken Word (NLP)

There is more possibility when we step back and take a look at what is being spoken (to VEA).

Key words *asked* **(voice search)** becomes one of the most important data that could be analysed. From BI point of view, the most frequently asked (*feeding voice search*) terms, queries that went unanswered (*fill in the gaps in the available information bank*), words that weren't legible, words that are most often used (*NLP (Natural Language processing) training*), Language, dialect, terminology, lingo, urban dictionary entries and other variety of variations that VEA should train on.

At the same time, what is being **fed into VEA** is also likely to have huge impact. Lookup this example[45] of custom Q&A and it will instantly tempt you to include a question for which the answer is something dear to you. While it may be fun (and very localized) to start with, this really will be a route to generate a lot of illegitimate information (aka fake content), unless multiple checks and controls are established.

Research opportunity (P#1): For the service providers, to get deeper understanding

Analytics Opportunity (Feeding BI)

VEA may power TTS-STT to much greater pace than what it is currently as users get comfortable with speaking to devices. Few websites have started offering voice playback of the content on their pages. While this will enable more convenient and probably efficient way to produce and consume content, it also feeds analytical tools for mining big load of data i.e., Voice data or voice converted to text data.

Advanced text analytics capabilities with e-commerce firms are allowing them analyse text as well as calls (converting them to text). (Akter & Wamba, 2016, p. 174) defined voice data in the context of data from phone calls (call centres, Customer service et al.).

Voice is now a far more sophisticated channel delivered over multiple platforms in a seamless way i.e., of Voice over internet in various forms (i.e., VoIP replacing the traditional phone calls gradually), as voice notes on chat engines *viz* WhatsApp, Signal, FB Messenger et al., teleconference platforms *viz* zoom, Google meet, Microsoft teams et al., in addition to the VEA in discussion. Given VEA will be generating data that will all be voice or audio, voice analytics will also emerge as another key focus area, for organizations.

All this is part of Big Data as (Davenport, Barth, & Bean, 2012) have described when defining how Big Data is different. Not just collecting it, firms will also need demonstrate the "value" (Wixom, Yen, & Relich, 2013) by mining actionable insights that are business implementation worthy. VEA providers (Google, Amazon, Apple, Microsoft, Samsung, Alibaba et al.) are not new to this. Amazon[46] has seen contribution benefit upwards of 30%, using recommendation engine mining data, noted Economist (2011).

Research Opportunity(P#5): Focus on generating more voice insights to develop higher contribution from V-Com and better Voice Experience

MANAGERIAL IMPLICATIONS

Going forward, Voice as a channel has shown an impressive promise in a very short timeframe. Few directions, as discussed above, for further study though all the topics are interlaced:

- For academics and for businesses:
  - Ease in following Emerging Markets English accent (non-speaking)

Table 5. Future Research opportunities identified to strengthen the propositions

	Proposition Enhancement	**Research Opportunities recommended**
P#1	Voice as a Channel of Engagement	Voice Engagement Framework
		Impact of Celebrity inclusion
		Inclusion of Vernacular languages
		NLP training - its Progress and shifts in user experience (For Service Providers)
P#2	Voice Engagement routes to be of three types	Impact of understanding accent
		Relevant response
		Relevant content support
		Language/dialect nuances
P#3	Voice Commerce is integral part of VE	Role of Risk on type of engagement
P#4	Customer Voice Engagement behaviour will vary with the Vapp offering	VEA Longitudinal study - how bandwidth helps voice (Technical research)
P#5	Voice Business Intelligence is a consequence of VE including V-Com	Focus on generating voice insights to develop higher contribution from V-Com & experience

  - Ease in following Regional, Vernacular languages & dialects
  - Ease in responding with relevant regional language content
- For Service providers
  - Availability of relevant regional language content and the challenges
  - Risk factors that are becoming impediments to buying and usage of VEA (smart speakers et al.) and how to overcome the challenges
- For businesses intelligence
  - Keep track of development overtime (longitudinal) while tracking short term trends, making it more customer friendly
  - Voice Engagement, Voice Commerce, Voice Intelligence: Trends overtime

The use cases in this study are by the brands and players who took the early plunge and hence very disparate. Moving forward, as market matures and more players initiate VE, sectoral or vertical specific understanding needs to be developed.

VEA providers have recently revised their user agreements to allow users to delete their conversations[47]. This is addressing one of the many factors contributing to risk perception.

"…for more information…" is audible on VEA indicating content banks have started making voice content available. As marketers warm up to engaging on VEA, customers will look for options to control (i.e., skip option) with their experience on tv, podcasts and then video everywhere.

VBI will be a clear winner. Routes to engage via voice, innovative monetary streams using voice, building customer loyalty, brands trying build their own affinity on this channel and engage consumers et al., all will be a part of this journey as observed (Bing and eConsultancy, 2019):

Voice will start conversations, but won't always finish them.

CONCLUSION

This Study contributes a conceptual framework that addresses an emphatic gap in the current academic literature. Developing framework for Voice Engagement, tracking V-Com, and building VBI are outright opportunities for research community to build on.

This study contributes a new term, **Vapps**, an intuitive, convenient term to address all voice applications. Amazon calls them *skills*, Google Assistant terms them *Actions*, Siri continues with *applications* et al. Hopefully, Vapps will find favour with the world in addressing any and every voice application in smart speakers, mobiles, IoT devices et al. This is also in line with the efforts to collaborate for a common voice tech standard[48] to improve customer experience.

This study put forth 5 robust Propositions to help Voice feed into Business Intelligence. The suggested framework performed 3-layers of theory-building (i) How VEA fit into the larger context of Conversational AI and Human-machine interaction (ii) VE routes based on different types of applications & the emanating opportunity of tangible and intangible benefits to users. Tracking the engagement and commerce behaviour eventually leading to VBI (iii) Inputs to evolve elements of engagement i.e., Involvement, commerce, behavioural metrics et al.

These elements would become clear once data from voice (walled) gardens will start to emerge into the research domain for more specific analysis, observation and learning, which is a huge limitation of this paper (besides others noted above).

This key contribution highlights the necessity of tracking one more very important channel of engagement, Voice. As voice interactions increase, touch & click may well start to diminish in significance albeit at slow pace, since voice job can be done, with eyes[49] closed.

REFERENCES

Adamopoulou, E., & Moussiades, L. (2020). Chatbots: History, technology, and applications. *Machine Learning with Applications*, *2*, 100006. Advance online publication. doi:10.1016/j.mlwa.2020.100006

Akter, S., & Wamba, S. F. (2016). Big data analytics in E-commerce: A systematic review and agenda. *Electronic Markets*, *26*(2), 173–194. doi:10.1007/s12525-016-0219-0

Bawack, R. E., Wamba, S. F., & Carillo, K. D. (2021). Exploring the role of personality, trust, and privacy in customer experience performance during voice shopping: Evidence from SEM and fuzzy set qualitative comparative analysis. *International Journal of Information Management*, *58*, 102309. Advance online publication. doi:10.1016/j.ijinfomgt.2021.102309

Bing and eConsultancy. (2019). *Future of Marketing: ERA of Digital Assistants.* Bing (Microsoft Corp.) and eConsultancy.

Brodie, R. J., Hollebeek, L. D., Juric, B., & Ilic, A. (2011). Customer Engagement : Conceptual Domain, Fundamental Propositions, and Implications for Research. *Journal of Service Research*, *14*(3), 252–271. doi:10.1177/1094670511411703

Butler, L. R. (2020). *"HEY GOOGLE, HELP ME LEARN" Voice Assistant Devices in the New Zealand Primary School* [Master's thesis]. Victoria University of Wellington. Retrieved from http://researcharchive.vuw.ac.nz/handle/10063/9164

Cha, J. (2010). Factors affecting the frequency and amount of social networking site use: Motivations, Perceptions and Privacy Concerns. *First Monday*, *15*(12). Advance online publication. doi:10.5210/fm.v15i12.2889

Chen, H., Chiang, R. H., & Storey, V. C. (2012). Business Intelligence and Analytics: From Big Data to Big Impact. *Management Information Systems Quarterly*, *36*(4), 1165–1188. doi:10.2307/41703503

Davenport, T. H., Barth, P., & Bean, R. (2012). How 'Big Data' is different? *MIT Sloan Management Review*, 43–46. https://www.hbs.edu/ris/Publication%20Files/SMR-How-Big-Data-Is-Different_782ad61f-8e5f-4b1e-b79f-83f33c903455.pdf

Davis, F. D. (1989). A Technology Acceptance Model for Empirically Testing New End-User Information Systems. *MIS Quarterly*. Retrieved from https://www.researchgate.net/publication/35465050

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review*, *14*(4), 532–550. doi:10.2307/258557

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory Building from Cases: Opportunities and Challenges. *Academy of Management Journal*, *50*(1), 25–32. doi:10.5465/amj.2007.24160888

Galanxhi-Janaqy, H., & Nah, F.-H. (2004). Ucommerce: Emerging trends and research issues. *Industrial Management & Data Systems*, *104*(9), 744–755. doi:10.1108/02635570410567739

McLean, G., & Osei-Frimpong, K. (2019). Hey Alexa … examine the variables influencing the use of artificial intelligent in-home voice assistants. *Computers in Human Behavior*, ●●●, 28–37.

Hollebeek, L. D. (2011). Demystifying customer brand engagement: Exploring the loyalty nexus. *Journal of Marketing Management*, *27*(7-8), 785–807. doi:10.1080/0267257X.2010.500132

Hwang. (2018). Would satisfaction with smart speakers transfer into loyalty towards the smart speaker provider? *The 22nd Biennial Conference of the International Telecommunications Society (EconStar.EU).* Retrieved from http://hdl.handle.net/10419/190336

Kasemsap, K. (2016). The Fundamentals of Business Intelligence. *International Journal of Organizational and Collective Intelligence*, *6*(2), 12–25. doi:10.4018/IJOCI.2016040102

Kowalczuk. (2018). Consumer acceptance of smart speakers - a mixed methods approach. *Journal of Research in Interactive Marketing, 12*(4), 418-431. 10.1108/JRIM-01-2018-0022

Kraus, D., Reibenspiess, V., & Eckhardt, A. (2019). How Voice Can Change Customer Satisfaction: A Comparative Analysis between E-Commerce and Voice Commerce. *14th International Conference on Wirtschaftsinformatik*. Retrieved from https://www.researchgate.net/publication/331357421

Kumar, S., Joshi, P., & Saquib, Z. (2015). Ubiquitous Commerce: The New World of technologies. *International Journal of Life Science and Engineering*, *1*(2), 50–55. http://files.aiscience.org/journal/article/pdf/70080018.pdf

Kumar, V., Rajan, B., Gupta, S., & Pozza, I. D. (2017). Customer engagement in service. *Journal of the Academy of Marketing Science*. Advance online publication. doi:10.1007/s11747-017-0565-2

Li, Z., & Rau, P.-L. P. (2019). Effects of Self-Disclosure on Attributions in Human–IoT Conversational Agent Interaction. *Interacting With Computers, 2019*. 10.1093/iwc/iwz002

Mari, A. (2019). *Voice Commerce: Understanding shopping-related voice assistants and their effect on brands. In IMMAA Annual Conference*. Northwestern University in Qatar. Retrieved from https://www.researchgate.net/publication/336363485

Masina, F., Orso, V., Pluchino, P., Dainese, G., Volpato, S., Nelini, C., Mapelli, D., Spagnolli, A., & Gamberini, L. (2020). Investigating the Accessibility of Voice Assistants With Impaired Users: Mixed Methods Study. *Journal of Medical Internet Research*, *22*(9), e18431. Advance online publication. doi:10.2196/18431 PMID:32975525

Moriuchi, E. (2019). Okay, Google! An empirical study on voice assistants on consumer engagement and loyalty. *Psychology & Marketing, 36*(5), 1-13. 10.1002/mar.21192

Park, K., Kwak, C., Lee, J., & Ahn, J.-H. (2018). The effect of platform characteristics on the adoption of smart speakers: Empirical evidence in South Korea. *Telematics and Informatics*, *35*(8), 2118–2132. doi:10.1016/j.tele.2018.07.013

Phillips, B., & Shipps, B. (2012). Frequency of Usage: The Impact of Technology Acceptance Factors Versus Social Factors. *International Journal of Virtual Communities and Social Networking*, *4*(2), 30–45. doi:10.4018/jvcsn.2012040103

Ridder, H.-G. (2017). The theory contribution of case study research designs. *Business Research*, *10*(2), 281–305. doi:10.1007/s40685-017-0045-z

Rogers, E. M. (1995). Diffusion of Innovations (4th ed.). The Free Press.

Scheidt, S., & Chung, Q. (2019). Making a case for speech analytics to improve customer service quality: Vision, implementation, and evaluation. *International Journal of Information Management*, *45*, 223–232. doi:10.1016/j.ijinfomgt.2018.01.002

Serban, C., & Todericiu, I.-A. (2020). Alexa, What classes do I have today? The use of Artificial Intelligence via Smart Speakers in Education. *24th International Conference on Knowledge-Based and Intelligent Information & Engineering,* 176, 2849–2857. doi:10.1016/j.procs.2020.09.269

Sharevski, F., Jachim, P., Treebridge, P., Li, A., Babin, A., & Adadevoh, C. (2021). Meet Malexa, Alexa's malicious twin: Malware-induced misperception through intelligent voice assistants. *International Journal of Human-Computer Studies*, *149*, 102604. Advance online publication. doi:10.1016/j.ijhcs.2021.102604

Sivarajah, U., Kamal, M. M., Irani, Z., & Weerakkody, V. (2017). Critical analysis of Big Data challenges and analytical methods. *Journal of Business Research*, *70*, 263–286. doi:10.1016/j.jbusres.2016.08.001

Smith, K. T. (2018). Marketing via smart speakers: What should Alexa say? *Journal of Strategic Marketing*, *28*(4), 350–365. doi:10.1080/0965254X.2018.1541924

Son, Y., & Oh, W. (2018). "Alexa Buy Me a Movie!": How AI Speakers Reshape Digital Content Consumption and Preference. *Thirty Ninth International Conference on Information Systems*. Retrieved from https://www.researchgate.net/publication/328797087_Marketing_via_smart_speakers_what_should_Alexa_say

Terzopoulos, G., & Satratzemi, M. (2020). Voice Assistants and Smart Speakers in Everyday Life and in Education. *Informatics in Education*, *19*(3), 473–490. doi:10.15388/infedu.2020.21

Venkatesh, J. T. (2012). *Consumer acceptance and use of it - Extending the UTAUT.* Academic Press.

Vimalkumar, M., Sharma, S. K., Singh, J. B., & Dwivedi, Y. K. (2021, July). 'Okay google, what about my privacy?': User's privacy perceptions and acceptance of voice based digital assistants. *Computers in Human Behavior*, *120*, 106763. Advance online publication. doi:10.1016/j.chb.2021.106763

Wixom, B. H., Yen, B., & Relich, M. (2013). Maximizing value from business analytics. *MIS Quarterly Executive*, *12*(2), 111–123. https://aisel.aisnet.org/misqe/vol12/iss2/6

Zaichkowsky, J. L. (1994). The Personal Involvement Inventory: Reduction, Revision, and Application to Advertising. *Journal of Advertising*, *23*(4), 59–70. Advance online publication. doi:10.1080/00913367.1943.10673459

ENDNOTES

1   https://alan.app/blog/voiceassistant-2/

2   https://go.invoca.com/ebook-lp-the-rise-of-voice.html

3   https://www.gartner.com/en/newsroom/press-releases/2016-12-21-gartner-says-by-2019-20-percent-of-user-interactions-with-smartphones-will-take-place-via-vpas

4   https://www.prnewswire.com/news-releases/global-37-8-billion-smart-speaker-market-to-2026-with-google-assistant-dominating-301289057.html

5   https://www.businesswire.com/news/home/20210303005852/en/Strategy-Analytics-Global-Smart-Speaker-Sales-Cross-150-Million-Units-for-2020-Following-Robust-Q4-Demand

6   https://www.livemint.com/technology/tech-news/india-saw-over-1-mln-smart-speaker-shipments-for-the-first-time-in-2020-11613562109895.html

7   https://en.wikipedia.org/wiki/General_Data_Protection_Regulation

8   https://www.igi-global.com/dictionary/privacy-calculus-theory/39143

9   https://voicebot.ai/2020/12/03/voiceitt-debuts-direct-alexa-control-for-people-with-speech-disabilities/

10   https://www.youtube.com/watch?v=6uXweFTTifg (VOICE Talks | S1E5 | How Brands Are Using Voice | Presented by Google Assistant)

11   https://voicebot.ai/2020/06/10/deutsche-telekom-is-launching-an-entry-level-smart-speaker-with-both-magenta-and-alexa/; https://voicebot.ai/2019/11/28/french-telecom-firm-orange-debuts-new-djingo-smart-speaker/

12   https://support.google.com/analytics/answer/1662518

13   https://www.dbswebsite.com/blog/trends-in-voice-search/

14   https://blog.360i.com/web-design/360i-national-geographic-launch-first-ever-voice-powered-meditation-app-veterans

15   https://codedazur.com/work/klm-bb; https://dialogflow.com/case-studies/klm

16   https://www.rehabagency.ai/work/aeden

17   https://www.nytimes.com/2017/04/12/business/burger-king-tv-ad-google-home.html?_r=0

18   https://www.mediamonks.com/blog/2019/01/why-voice-should-be-your-employee-of-the-month

19   https://voicebot.ai/2017/02/01/starbucks-launches-voice-ordering-via-amazon-alexa/

20   https://dialogflow.com/case-studies/dominos

21   https://blog.ticketmaster.com/ticketmaster-amazon-alexa/

22   https://timesofindia.indiatimes.com/india/miss-alexa-and-tara-are-helping-civic-school-kids-bridge-learning-gap/articleshow/70070607.cms;
https://mumbaimirror.indiatimes.com/news/india/watch-alexa-turns-teacher-for-school-kids-in-rural-areas/articleshow/70175182.cms;
https://www.newindianexpress.com/states/kerala/2019/dec/29/amazon-alexa-turns-english-teachers-for-schoolchildren-in-this-remote-kerala-village-2082211.html;
https://yourstory.com/2019/02/alexa-teaching-village-school-maharashtra

23   https://learningcatalyst.in/social-media-cases-studies-in-india-2020/#SwiggyVoiceOfHunger

24   https://www.grapesdigital.com/case-studies/maruti-suzuki-google-voice-assistant

25   https://www.amazon.in/UrbanClap/dp/B0758DJ6B9; https://www.amazon.in/gp/product/B0758B356F?ref=skillrw_dsk_pnps__2
https://www.amazon.in/gp/product/B07KQDGWSG?ref=skillrw_dsk_pnps__4
https://www.amazon.in/gp/product/B07NBGPBQY?ref=skillrw_dsk_pnps__0

26   https://voicebot.ai/the-top-20-brand-leaders-in-voice-2019/; https://voicebot.ai/2019/05/06/the-2019-webby-award-winning-voice-applications/;
https://voicebot.ai/top-25-brand-leaders-in-voice-for-2020/

27   https://voicebot.ai/2017/02/01/starbucks-launches-voice-ordering-via-amazon-alexa/

28   https://voicebot.ai/2019/04/04/amazon-roles-out-hipaa-compliant-alexa-service-with-boston-childrens-swedish-and-atrium-hospital-systems-cigna-and-express-scripts/

29   https://voicebot.ai/2019/09/24/new-alexa-skill-identifies-groceries-for-blind-people/

30   https://voicebot.ai/2019/05/24/empowering-our-aging-population-with-voice-assistant-enabled-hearing-aids/; https://www.amazon.com/Witlingo-Future-Ear-Radio/dp/B07PL9X5WK/ref=sr_1_1?keywords=future+ear+radio&qid=1552337687&s=digital-skills&sr=1-1-catcorr

31   https://voicebot.ai/2020/12/03/voiceitt-debuts-direct-alexa-control-for-people-with-speech-disabilities/

32   https://voicebot.ai/2019/04/04/amazon-roles-out-hipaa-compliant-alexa-service-with-boston-childrens-swedish-and-atrium-hospital-systems-cigna-and-express-scripts/

33   https://www.thinkwithgoogle.com/marketing-resources/brand-building-age-of-assistance/ (00:04:50)

34   https://mumbaimirror.indiatimes.com/news/india/watch-alexa-turns-teacher-for-school-kids-in-rural-areas/articleshow/70175182.cms

35   https://analyticsindiamag.com/indian-ai-based-mental-health-app-wysa-receives-funding-from-google-assistant/
36   https://retail.economictimes.indiatimes.com/news/food-entertainment/personal-care-pet-supplies-liquor/fmcgs-companies-experiment-with-voice-recognition-technologies/63741502
37   https://yourstory.com/2019/02/alexa-india-amazon-desi-version
38   https://www.moneycontrol.com/news/india/amitabh-bachchans-voice-on-amazon-alexa-price-features-more-7378581.html
39   https://www.pwc.com/us/en/services/consulting/library/consumer-intelligence-series/voice-assistants.html
40   https://www.digit.in/news/machine-learning-and-ai/google-assistant-may-soon-support-14-new-languages-report-44807.html
41   https://beebom.com/indian-voice-assistant-18-languages/
42   https://yourstory.com/2018/10/one-year-on-alexa-is-the-new-desi-girl
43   https://www.washingtonpost.com/technology/2019/05/06/alexa-has-been-eavesdropping-you-this-whole-time/
44   https://www.theweek.co.uk/93869/is-amazon-alexa-listening-to-me-all-the-time-can-it-be-hacked
45   https://blueprints.amazon.com/bp/amzn.ask.bp.9ed9e4f7-b8bb-4cd5-b1db-57c5aa3e1092/en-US?ref_=ask_bp_home_1; https://support.google.com/googlenest/answer/7194656?hl=en&co=GENIE.Platform%3DDesktop
46   https://www.economist.com/business/2011/05/26/building-with-big-data
47   https://www.theverge.com/2019/5/29/18644027/amazon-alexa-delete-voice-recordings-command-privacy-hub
48   https://techxplore.com/news/2019-12-apple-google-amazon-eye-common.html
49   https://voicebot.ai/2019/09/24/new-alexa-skill-identifies-groceries-for-blind-people/

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