

## Transforming Retail Bank Branches in Digital Era

### Reimagining customer engagement for in-person branch banking with voice and digital human interface

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#### Introduction

With the advancement of technology in all spheres, chatbots today have become a familiar feature in many company websites and social media sites. Many organizations have started using it to enhance their customer service experience, especially on their online interface. Most of the current chatbot usage revolves around text-based chatbot on messaging applications or conversational chatbot for customer service call centers. However, the AI- powered conversational chatbot/Virtual Assistant or Digital Human technology, is a level above the common chatbots.

Normally, a conversational chatbot is a robot that is capable of chatting or simulating a human conversation in text or natural voice. While the main objective of the chatbot is to automate the interactions with customers through a live chat interface, it is often found lacking the human touch. Sometimes, it also fails to understand customer queries and generate relevant responses. With the current advancement of AI-powered chatbot, the void is now filled. Together with the digital human interface, they offer bigger capacity to engage, affect, and stimulate emotional and cognitive responses. The “AI Virtual Assistant” can converse with customers on relatively complex and multiple topics, using advanced deep learning technology and Natural Language Processing. It is also equipped with the capability to understand the customer needs better and provide more relevant responses.

In the banking industry, the introduction of AI-powered Virtual Assistant, also known as the AI Virtual Assistant, has enriched the customer experience for banking services delivered across the banks’ physical and digital channels such as branch networks, website and mobile application. The AI Virtual Assistant provides the bank with ability to service the customers with good experience; the technology also lowers the barrier for the banks to access the untapped

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markets such as the unbanked population, thus providing a better Total Cost of Ownership (TCO) model to the bank.

In this White Paper, we first look at challenges the banks face in branch transformation, and then dive into how Intel®-powered AI Virtual Assistant can be employed to increase bank branch operation efficiency, act as a new channel for the bank branch to interact with their customers, and provide personalized customer experience that can drive lead generation and qualification.

## Acronyms

NLP	Natural Language Processing
ASR	Automatic Speech Recognition
TTS	Text to Speech
FHD	Full High Definition
UHD	Ultra-High Definition
NLU	Natural Language Understanding
VPU	Vision Processing Unit

## Retail Bank Industry Challenges

*"Despite such systemic changes, branches remain an essential part of banks' operations and customer-advisory functions. Brick-and-mortar locations are still one of the leading sales channels. Even in digitally advanced European nations, between 30 and 60 percent of customers prefer doing at least some of their banking at branches, according to McKinsey research."*

Klaus Dallerup, Sheinal Jayantilal, Georgi Konov, Akos Legradi & Hans-Martin Stockmeier (2018). *A bank branch for the digital age*. McKinsey & Company, Financial Services, Our Insights.

<https://www.mckinsey.com/industries/financial-services/our-insights/a-bank-branch-for-the-digital-age>

Incumbent banks have been facing a multitude of challenges in recent years, ranging from increased competition, new entrants such as Fintech and digibank, rapidly changing consumer preferences and demands, operational silos due to legacy IT infrastructures, and last but not the least, the complex and ever-expanding scope of regulatory focus. All the afore mentioned challenges are reinforcing the needs for the banks to develop omni-channel delivery of banking services across both physical and online channel.

In the context of the retail banking industry that caters to the physical space to attend customers, the following criteria is important to the bank:

- **Operation Efficiency** - Use of self-service (i.e. Kiosks, Queue Ticketing, Mobile banking) and operational technology (i.e. sensors, smart building) to allow day-to-

day transactions to be conducted with low waiting time, high efficiency, and improved customer experience.

- **Modern Technology** - Adoption of modern technology can help banks rebuild or improve their brand equity and in-turn increase chances to acquire better leads.
- **Business Intelligence and Management** - Collecting data that could be valuable for business intelligence and management.
- **Security** - Preventing security problems and fraud issues while staying in-compliance with banking policies.
- **Customer Engagement** - Presenting customized offers and services to customers to sell up, or retention. Increase customer satisfaction levels through personalized engagement.
- **Contactless Technology** - Scaling business despite the pandemic situation and maintaining contactless and hygienic interaction.

## AI Virtual Assistant Accelerated Digital Transformation

Here we present a case study of how a leading bank in India leveraged the "AI Virtual Assistant" solution into their digital transformation strategy for improving its retail banking experience. In the current pandemic situation, the bank is not performing too well in terms of expanding footprint with retail banks. Hence while juggling with the task to reduce branch sizes for operation costing, it also required to maintain the existing customer experience/ satisfaction levels, if not increase it. Often, the implementation of a promising solution was delivered in a silo manner. It lacked a holistic view of the essential metrics and was unable to harness the full potential of the technology to collect and synthesize data from the front end to the backend operations.

To address the needs, the bank implemented an Intel®-powered AI Virtual Assistant to meet the current challenges.

The AI Virtual Assistant solution featured the following components:

- **Conversational Agent** - The speech recognition and understanding technology component. It brings opportunity for the bank to engage with their customers in a new way and reduce operational costs without compromising on the customer experience.
- **Digital Avatar** - The non-verbal component of the AI Virtual Assistant that enables users' interaction with the Kiosk visually and allows for customer experience measurement.

- **Recommender System** - A component in the core banking system that is powered by machine learning/artificial Intelligence to receive and process data feed, use it in real time with the goal to deliver a personalized service experience across the banking service delivery channels.

- Camera - This device functions as the eyes of the avatar to help the machine capture visual cue of the customer interaction effectively by leveraging Intel® Distribution of OpenVINO™ toolkit.
- Other peripheral - based on the total use case (Example: Card Reader, Receipt Printer, Secure Pin Pad, etc.)

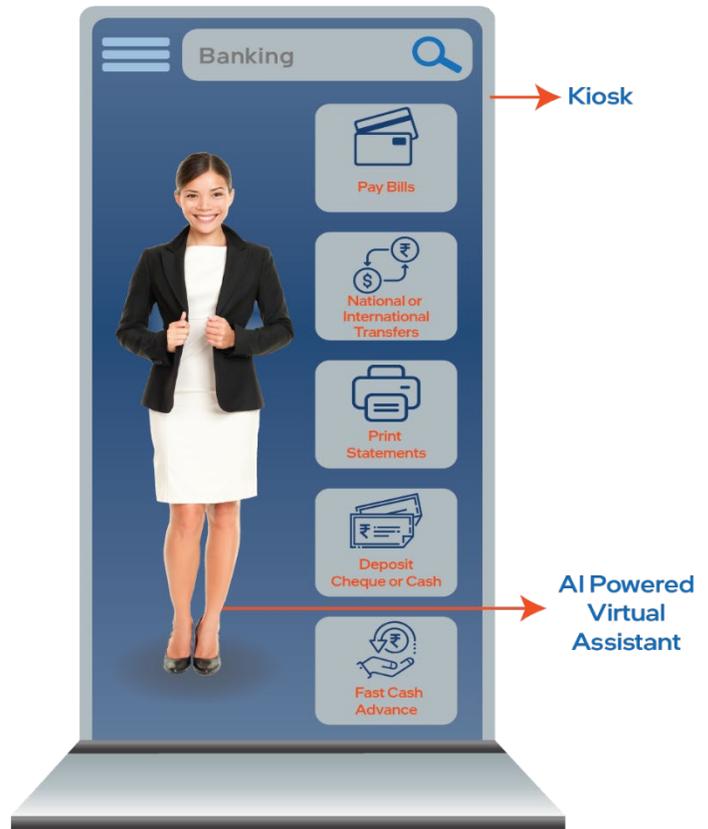
### e-Lobby Bank Manager

The AI-powered Virtual Assistant is implemented in a self-service Kiosk and placed at the bank's lobby area as the first point of contact for the customers visiting the bank. Refer to [Figure 1](#).

This AI-powered Virtual Assistant is an extension to the messenger based chatbots, used on their websites, to engage with customers in natural language albeit text only.

Although these chatbots can arguably understand customers' queries and respond accordingly, they fall short in creating a personalized effect, as they are often unable to understand complex queries, and generate false responses.

The AI-powered Virtual Assistant is much more intelligent and visually engaging, with bigger capacity of holding longer conversations and higher emotional expressiveness with the customers. It is designed to improve customer engagement and generate leads in the bank branch. Using advanced deep neural network sequence-to-sequence based ASR, TTS, and NLP technology, it can connect in a more intelligible and meaningful manner with its customers, giving a more personalized touch. The objective is to become the customer service ambassador for the bank, in the long term.



**Figure 1: Conceptual Visual of AI Virtual Assistant in Kiosk/ e-Lobby of Bank**

### Kiosk - Hardware Specification

As Kiosk comes in a variety of form-factor and peripheral specifications, the Kiosk hardware must be thoroughly considered for the target use-case.

For example, given that the Kiosk is placed at the lobby area for customers as the first point of contact for customer service, it is recommended to have the following specifications:

- Base Compute - Intel® MECA/Industrial PC (IPC) powered by Intel® Core™ Processor based platform with vPro® technology.
- Microphone Array - A USB based multi-microphone elements system for speech signal ingestion and audio enhancement capabilities for better recognition accuracy.
- Display Panel - FHD/UHD (4K) IPS LCD Display on HDMI/DP connection, 400-500cd/m2 brightness.

### Digital Avatar Solution Description

The Digital Avatar, as mentioned earlier, is the non-verbal component of the AI Virtual Assistant that enables users' interaction with the Kiosk visually. It includes the following components and features:

- **AI Vision Technology** - When the AI Virtual Assistant is currently serving a customer, the camera feed will be used to perform digital onboarding, face authentication, and customer emotion detection. When it is not currently engaged in a conversation, the camera feed will be used to determine demographics and engagement attributes of the people in range, and deliver the right content on the Kiosk screen that can best resonate with the viewers. The objective is to educate the audience and increase sales for the bank's products and services.

- **Reinforcement Learning** - Collate engagement attributes (i.e. emotion, attention span), use it to continuously optimize the recommender engine, and to adapt better to the serving environment. The AI Vision technology can identify and classify people, their individual attributes, emotions, objects, and handwritings, among other things. The technology can also accurately recognize an action - regardless if the subject is stationary or moving.
- **Digital Human Interface** - A digitally created visual representation of human character designed to facilitate interactions. It can be combined with one or more communication modalities (i.e. conversational chatbot) to enhance customer engagement.
- **Business Agility** - Support Cloud-native and affinity-aware (i.e. location, hardware/software-constraints) deployment model.
- **Recommender System** - A system consuming both static information (i.e. demographics, location) and dynamic information (i.e. engagement attributes, user intent) to suggest products or product features, which may be of interest to consumer.

real-estate to maximize profitability, minimize operation costs, and do so while giving customers a comfortable banking experience with the use of modern digital capabilities. For example, migrating transactions to low-touch digital channel like the AI Virtual Assistant. In addition, the use of technology can eventually help the bank to reorganize themselves around customers. For example, using artificial intelligence, the bank can build a 360-degree customer view through learning customer behavior, preferences, and sentiments.

Figure 2 represents a customer journey map.

Amanda, a 27-year-old accountant, walks into the bank. She does not have to look around for assistance anymore nor wait in any queue. She walks to the Kiosk placed at the entrance of the bank. The Virtual Assistant in the Kiosk greets her, answers her queries, and leads her to the relevant banking personnel. Further on, it also guides her through the process of investment banking, per request. At the same time, the camera at the Kiosk, with the help of the Digital Avatar at the backend, captures and analyzes her mood and non-ID information. After Amanda has decided what she wants, the Digital Avatar helps with instantaneous identity verification. Amanda has been able to save time that was earlier spent on filling in applications and documents manually. She is happy to sign a deal, the overall service has been good, especially during pandemic times where minimum human contact is preferred.

## AI Virtual Assistant Influence on Branch Banking Customer Journey

The goal of the bank is to optimize the branch network and

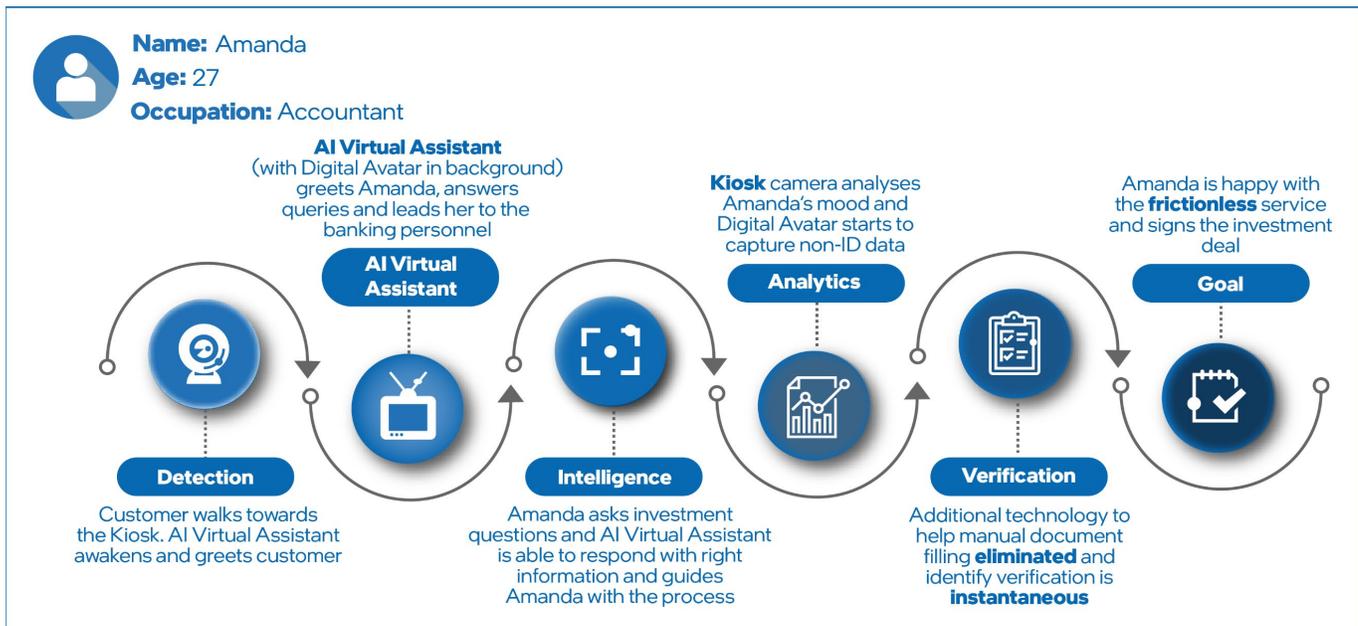


Figure 2: Customer Journey Map

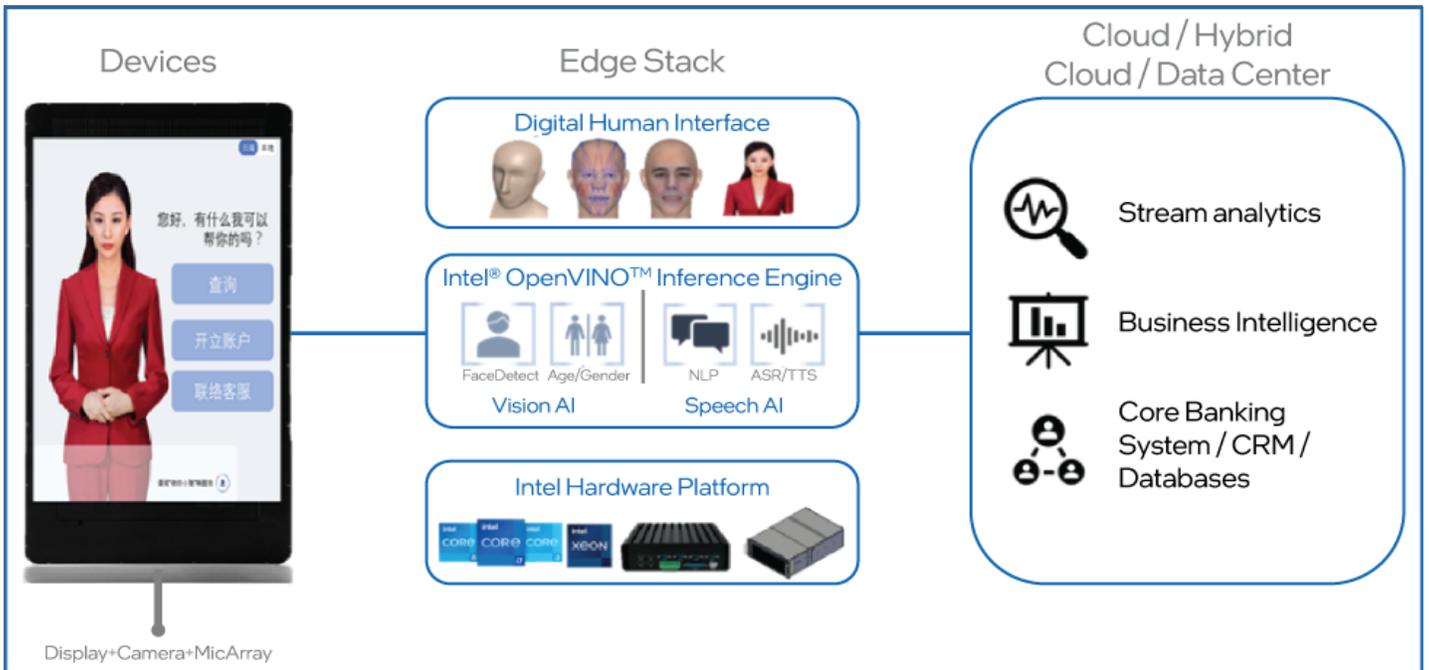


Figure 3: AI Virtual Assistant Solution Architecture

### Building successful AI Virtual Assistant with Intel® Technology

The implementation of AI-powered Virtual Assistant is often complex and requires implementors to make hardware and software decisions, such as choosing the right hardware platform, and on the software side, choosing the right developer tools, software frameworks, and analytics and platforms.

Figure 3 represents the proposed AI Virtual Assistant solution architecture that features hardware and software components based on Intel® technologies. For example, Intel® offers a wide range of computing platform with integrated or discrete deep learning capabilities, such as CPU, iGPU, VPU, GNA, and FPGA. This provides the foundation to attain computational speedup of various workloads, for example, general computation, speech and vision analytic workloads, 3D avatar rendering, and media workloads that are targeted to be deployed at the Edge or Cloud. Complementing it are the software – where Intel® is committed to provide best-in-class developer tools, software frameworks, and inference toolkit to improve the developer journey. The outcome of this is a modern software architecture that can work cohesively with private Datacenter, hybrid/public Cloud enabled workload manager and orchestrator.

For the end-to-end view of the solution architecture, the full stack shall include a CRM to manage customers data, system to provide view of business insights and time series analytics in a single pane of glass. It also includes a speech AI dialog management and knowledge database to manage dialog states, intents and entities, and response generation.

Table 1 highlights technical areas of concern and the associated Intel® technologies that can be useful in the development and deployment of an AI-powered Virtual Assistant solution.

**Table 1:** Key components of AI Virtual Assistant powered by Intel® Technologies

Area	Technical Consideration	Applicable Intel® Technology
<b>AI Models for ASR/NLP/TTS</b>	<ul style="list-style-type: none"> <li>Low speech recognition accuracy for accented and multilingual use-case</li> <li>Requires lots of labeled data to train to yield model with good accuracy</li> <li>High processing latency and low inference speed due to model not optimized for hardware</li> </ul>	<ul style="list-style-type: none"> <li>Intel® OpenVINO™</li> <li>Intel® Gaussian and Neural Accelerator (GNA)</li> </ul>
<b>Ambient Noise</b>	<ul style="list-style-type: none"> <li>The environment where the speech recognition system is deployed maybe reverberant, have varied noise profile and the presence of deterministic / non-deterministic noise source.</li> </ul>	<ul style="list-style-type: none"> <li>Microphone Array with Intel® Smart Sound Technology</li> <li>Dynamic Noise Suppression with Intel® Audio DSP</li> </ul>
<b>Digital Human Interface (Edge rendering)</b>	<ul style="list-style-type: none"> <li>Real-time phoneme to lip motion rendering on 2D/3D head mesh can be computationally expensive.</li> </ul>	<ul style="list-style-type: none"> <li>Intel® Integrated Graphics</li> </ul>
<b>Digital Human Interface (Cloud rendering)</b>	<ul style="list-style-type: none"> <li>The digital human rendered in the Cloud typically gets encoded into video frames and streamed to the local device for playback. When streaming at high resolution, software video decoders may cause jitter or jerkiness due to repeated drop frames in the video stream.</li> </ul>	<ul style="list-style-type: none"> <li>Intel® Media SDK</li> <li>Intel® Collaboration Suite for WebRTC</li> </ul>

## Intel® Partner Solutions

Table 2 refers to some of the ecosystem Solution Integrators (SI) and Independent Software Vendors (ISVs) with conversational AI speech and avatar solution offering.

**Table 2:** Intel® Partner Solutions

Ecosystem ISV Partner	Description
<b>Avaamo</b> Website: <a href="http://avaamo.ai">avaamo.ai</a>	Avaamo is a deep-learning software company that specializes in conversational interfaces to solve specific high impact problems in the enterprise. Avaamo is building fundamental AI technology across a broad area of neural networks, speech synthesis, and deep learning to make conversational computing for the enterprise a reality.
<b>Verbio Speech Analytics</b> Website: <a href="http://verbio.com">verbio.com</a>	Verbio Speech and Text Analytics solution extracts information from dialogues, users and processes and actionable insights about what has been said, who said it and how it has been said. Every interaction by voice channel or text is analyzed in real-time to generate valuable reports, notifications, or alarms about critic situations. This makes it possible to understand the reason for complaints from customers, monitor the quality of the service offered and ultimately calculate experience satisfaction of each interaction. With the power speech recognition engine merged NLU, you will finally assure the quality of the attention in contact centers, or the emotional state, helping your team to deliver memorable experiences.
<b>Gnani Voice Assistant</b> Website: <a href="http://gnani.ai">gnani.ai</a>	Gnani’s enterprise-ready Voice Assistant turns text into human-like speech, allowing you to create applications that talk and build entirely new categories of speech-enabled products. Gnani.ai helps to address the problem of speech recognition for multiple accents and dialects efficiently using speech recognition engines and NLP modules. Gnani’s AI-powered speech recognition and the contextual NLP engine transform user engagement. It can be tailored to fit in perfectly with the required domain and supports multiple Indic languages. Gnani’s advanced speech analytics lets

Ecosystem ISV Partner	Description
	you monitor agent's performance in a contact center environment with parameters like script adherence and in-call behavior, It also provides qualitative feedback for agents to improve efficiency, up-sell and cross-sell using the emotion, intent, and keywords captured, CSAT scores, churn rates, retention rates, and forecast models by taking insights from customer interactions.
<b>iFLYTEK</b> Website: iflytek.com	Founded in 1999, iFLYTEK has established a leading international position in such technologies as speech recognition and Natural Language Processing and has captured more than 70% share of the Chinese speech technology market. iFLYTEK is continuously making progression in cognitive fields on the basis of its iFLYTEK Cloud. This platform builds upon iFLYTEK AI technology as its core engine, incorporates data and expert knowledge from industries, and can enable a more effective AI industry ecosystem.
<b>AI Speech</b> Website: aispeech.com	A company specializing in development of intelligent voice interaction technology designed to improve human-machine interaction. The company develops human-computer dialogue operating system, and artificial intelligence chip modules to improve speech recognition, speech synthesis, natural language understanding and voice-print recognition, enabling clients to access intelligent natural language interactive services.
<b>Avaya Intelligent Conversational Platform</b>	Avaya Conversational Intelligence is an innovative, end-to-end AI solution that automatically transcribes voice interactions into text, so contact centers can improve the customer experience they deliver and create loyal customers. Avaya Conversational Intelligence substantially reduces after-call agent work, summarizes interaction details into actionable intelligence, initiates workflow actions and records voice interactions to assist with regulatory compliance.

Ecosystem ISV Partner	Description
<b>Dave.AI</b> Website: iamdave.ai	Dave.AI enables brands to create a virtual sales avatar that can create an impactful sales experience both online and offline.
<b>FaceUnity/FUCreator</b> Website: faceunity.com	FaceUnity's FUCreator is an efficient, convenient AR software for 2D/3D avatar creation for deployment online and offline.

For a more comprehensive list of Intel® partners, refer to [Intel® AI Builders](#), and [Intel® AI: In Production](#) website.

## Summary

AI-powered Virtual Assistant can play an important role in branch banking transformation. It can be the first touchpoint in the customer journey, and handling of the standard and non-differentiated banking transactions and provides an opportunity for the bank to optimize its branch operation and network, for cost saving, with improved efficiency.

*"Banks learn to balance the adoption of chatbot in rendering service to customers in one hand and enjoy cost-effectiveness, efficiency and productivity in their operations with trustworthy image on the other hand (Baruah, 2018; Dole et al, 2015; Patil et al, 2019)."*

<https://zantworldpress.com/wp-content/uploads/2020/03/13.-601-Tama-Saha.pdf>

Leveraging Intel® Technologies, banks can reap benefits of the AI Virtual Assistant in their branch transformation projects, for example, in creation of seamless experience across physical and digital touchpoints.

## About Intel®

You may know us for our processors, but we do a lot more! Intel® invents at the boundaries of technology to make amazing experiences possible for business and society, and for every person on earth. By harnessing the capability of Cloud, the ubiquity of Internet of Things, the latest advances in memory and programmable solutions, our rich portfolio of AI technologies, and the promise of always-on connectivity, Intel® is boosting the health and life sciences industry and helping solve the toughest challenges.

Recommended Intel® Compute Platforms for contactless Kiosks/digital signages are:

- [Intel® Open Pluggable Specification](#)
- [Intel® Smart Display Module](#)
- [Intel® Smart Kiosk Module](#)

Other recommended Intel® Compute Platforms are:

- Intel® NUC
- Mini-ITX motherboards
- Third-party compute platforms based on Intel® Core™ processors
- Intel® Modular Edge Compute Architecture (MECA)



<sup>1</sup> <http://legal.intel.com/Marketing/Pages/Notices-Disclaimers-Examples.aspx>

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