



FUTURE OF CONTACT CENTERS

in the Banking Sector

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TABLE OF CONTENTS

INTRODUCTION – RELEVANCE OF AUDIO SIGNAL PROCESSING IN THE BANKING SECTOR	03
NON-PERFORMING ASSETS CONTINUE TO HAUNT THE BANKING SECTOR	04
RELEVANCE OF NPAS	04
THE NEED OF THE HOUR: AN EXCELLENT EARLY DETECTION SYSTEM	05
AUDIO SIGNAL PROCESSING METHODOLOGY	06
THE PREREQUISITES	07
SIGNS OF POTENTIAL DEFAULTERS	07
DECODING MFCCS TO IDENTIFY POTENTIAL DEFAULTERS	07
SEQUENCE DIAGRAM OF THE WORKING PROTOTYPE	09
ROLE OF CREDIT SCORE IN IDENTIFYING DEFAULTERS	09

INTRODUCTION - **RELEVANCE OF AUDIO SIGNAL PROCESSING IN THE BANKING SECTOR**

A majority of large enterprises set up contact centers or customer interaction/service centers as the central point of customer contact, and in addition to call handling regulations, the performance of these contact centers mainly depends on the performance of its customer service representatives (CSRs) or agents. Contact centers generally gather information from customer interactions, and this data is then used to analyze and improve performance of CSRs.

Fortunately, today, data mining has travelled a long way and contact centers apply it to analyze customer behavior. Advancement in audio signal processing technology has helped achieve technical breakthroughs in: the mel frequency cepstral coefficients (MFCCs) feature, speaker diarization, sentiment analysis, etc. While data mining and audio signal processing help teams with quality assessment, time management and business processing aspects, did you know they can be applied to predict customer actions too? Now is the time to use "sound" technology to solve real-life business problems, and this whitepaper explains how the banking sector can leverage the power of audio signal processing to address real-life scenarios.

Non-performing assets (NPAs), increasing number of defaulters, and a high number of fraud cases have been curbing the growth of the banking sector. While fraudulent activities are generally well-planned, defaulting is mostly by accident. One of India's leading banks with branches across the globe made an interesting observation. Over a long period of time, the bank noticed that defaulters got in touch with the bank's contact center just before or after defaulting—to gather certain details. Careful analysis of the calls led the bank to derive a pattern and understand if: i) the customer would default, ii) the person would be willing to negotiate with the bank and restructure the loan or settle on mutually agreeable terms of repayment, in case of defaulting, and iii) the defaulter would be inflexible and not pay back the due amount to the bank. Paying attention to all calls and examining them can help banks in understanding customers better as well as in taking preventive actions to stop customers from defaulting.

Our team combined audio signal processing techniques with a deep learning model to develop a working prototype that would enable banks to analyze calls and text from contact centers. It would also help them identify the presence of a political or legal stronghold. This white paper discusses the theoretical aspects of audio signal processing as well as its practical use.



NON-PERFORMING ASSETS CONTINUE TO HAUNT THE BANKING SECTOR



When loans or advances are in default or when there are arrears on scheduled principal or interest payments, they are referred to as non-performing assets or NPAs. Typically, debt is considered as an NPA when no payment has been made to the bank or financial institution for a period of 90 days. In other words, if a borrower fails to make an interest payment to the bank for three consecutive months, the bank will categorize the loan as a non-performing asset to meet regulatory requirements. However, based on terms and conditions of each loan, the elapsed time for debt to fall into the NPA category may be shorter or longer. A loan can fall into the NPA category even if the borrower makes all interest payments but is unable to repay the principal at maturity.

RELEVANCE OF NPAS

As NPAs continue to spiral, banks and financial institutions are experiencing their worst nightmare. NPAs do not look good on the balance sheet, and they place a three-way burden on lenders: i) Arrears due to failure in paying interest or principal reduces cash flow for the bank, disrupting budgets and impacting the bank's revenue. ii) The bank's loan loss provisions—which are generally reserved to cover potential losses—negatively impact the capital available to offer subsequent loans. iii) After analyzing actual losses from defaulted loans, they are usually written off against earnings.

No financial institution likes to have NPAs on its balance sheet. Considering the fact that due diligence is done earlier, banks expect borrowers to fulfill their obligations. However, despite this and the implementation of strong mechanisms such as the Minimum Requirements for Risk Management (MaRisk) program, banks are clearly unable to prevent NPAs. Situations change and so do the intentions of borrowers.

Lenders have been unable to successfully prevent the repetitive occurrence of NPAs and the best way to address the situation would be to tackle it even before a loan falls into the NPA category. Once a loan or any other form of borrowing from a bank is processed, it is important for the bank to immediately leverage one or more early detection systems to check for the possibility of a loan default.

THE NEED OF THE HOUR: AN EXCELLENT EARLY DETECTION SYSTEM

Existing early detection models and techniques have their own challenges and a mixed rate of success. A forecasting system that predicts near-accurate results—with minimal false positives—is the need of the hour.

Let's have a look at forecasting models currently deployed in the market:

Rule-based models: Here, loans are constantly monitored and audited based on a few pre-set rules. However, these rules can be changed only periodically. High clarity between auditors and implementors make these models quite popular. Unfortunately, they have a low detection rate and do not have the ability to accommodate newer trends.

Stochastic models: Here, detection rate is higher than the other two models and earlier detection is better too. Implementation of stochastic models is quite elaborate. However, these models are not known to adapt well to newer behavior of borrowers.

Option price models: The key difference between these models and rule-based models is that the option price models use approved financial methods and market data to detect early signs of potential default. But, individual borrower behavior is not considered in its singularity and public data is only known for listed entities.

Due to limitations of these models, it is important to develop an alternative that addresses current situations. The solution should be able to track and analyze calls made to contact centers. Both tone and text of calls will have to be analyzed separately to arrive at a single conclusion: the likelihood of probable default. Our working prototype leverages audio signal processing methodology to achieve this goal.

AUDIO SIGNAL PROCESSING METHODOLOGY



All contact centers in the current digital era are capable of recording calls with consent from the caller. Our team has developed a working prototype that will require these recorded calls in batch mode at a later point of time, or live calls as streaming media, to be channeled into the system. The system then analyzes the voice/tone and textual messages to arrive at a single defaulting probability of likely defaulting % through the cluster model of the two individual techniques. Through complex logic—converging inputs from voice/tone and textual message analysis—the system is able to identify the likelihood of the person defaulting on a loan or credit card payment.

SIGNS OF POTENTIAL DEFAULTERS

Key indicators that help identify potential defaulters include the following:

Stressed voice or an agitated tone while reaching out to a bank's contact center indicate financial stress in many cases.

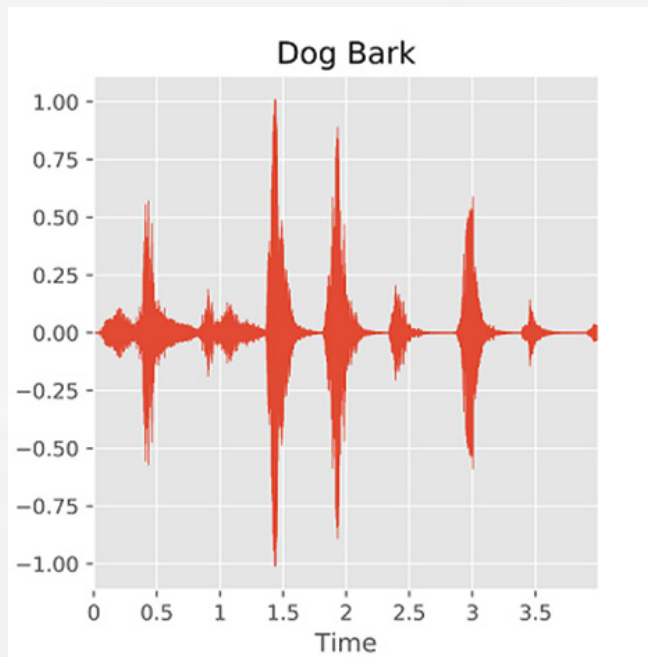
Mention of politically influential people generally indicates that the person is likely to use the connection to avoid repayment.

Sentiments expressed in textual messages help analyze the customer's repayment-related action.

Hence, initial effort from CSRs is imperative for the successful working of our prototype. CSRs should compile a list of calls that arouse suspicion of defaulting needs, and then categorize them into: a) It happened and b) False positives. This "known" data will help train an artificial intelligence-machine learning (AI-ML) model.

DECODING MFCCs TO IDENTIFY POTENTIAL DEFAULTERS

MFCCs take human perception sensitivity with respect to frequencies into consideration, and therefore, are best for speech/speaker recognition. MFCCs of a signal are a small set of features (usually 10-20) which concisely describe the overall shape of a spectral envelope, a short-term power spectrum of a sound. Being short term, they can identify changes in mood and tone in the same conversation by the same speaker in an uninterrupted stretch. The very first MFCC, the 0th coefficient, does not convey information relevant to the overall shape of the spectrum. It only conveys a constant offset, i.e. adding a constant value to the entire spectrum. Therefore, practitioners will generally discard the first MFCC when performing classification. MFCCs are also known to be affected by noise, and hence, it is important to enhance them to cancel noise through mathematical manipulation.

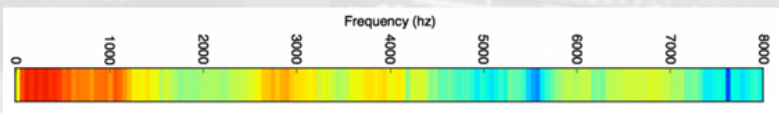


In addition to MFCCs and other derived forms of it, our proposed model utilizes speaker diarization and sentiment analysis to identify what the speaker or debtor intends to do based on the way he/she puts forth queries about different available options in case of failure to repay a loan or any other debt.

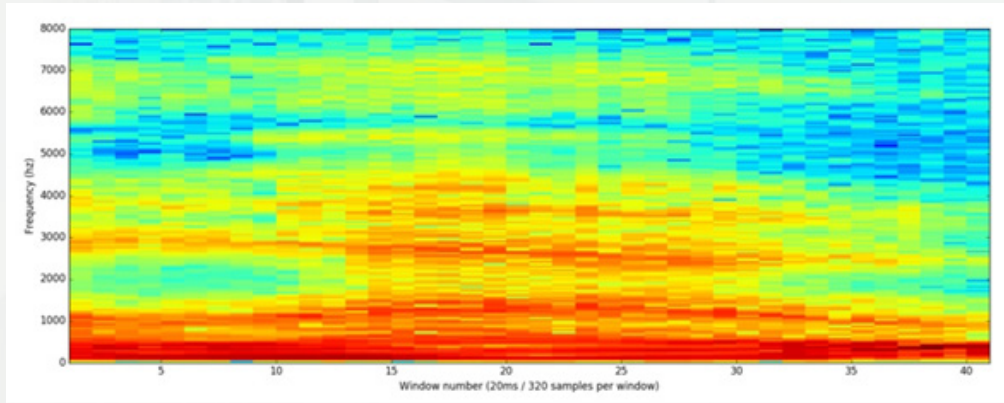
Here are a few samples:

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118 908139371127, 96 413314779219, 100 405806211088, 125 989096891813, 138 816810599910, 176 88679171282, 179 7917711802, 175 53621156229, 176 7172181488, 178 43881138111
159 3662828295659, 163 413314779219, 149 152279391187, 154 3416058290136, 153 461798111397, 152 2967423997939, 143 8887815611279, 156 46832799378, 155 782593861264, 157 179804818783
8 146 1802329799279, 164 172182929228, 138 120265444881, 147 1216465585147, 133 265797983881, 126 517988888181, 118 858611497226, 117 402388912037, 116 85281371148, 115 448812121489
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689, 105 883380381124, 108 538881174247, 116 464881798896, 120 8988170331, 126 43668138861, 118 55817994471, 119 55956153513, 126 14871888888, 108 8937248814, 118 55318134
2971, 123 3381878493814, 123 120391058811, 119 4121242242269, 114 428278334641, 113 37274214997, 101 825673303893, 110 71152438882, 106 847280921381, 108 887792798899, 92 123181179
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95 8071889484341, 43 311703177885)
    
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50hz band of a 20 millisecond audio clip → The raw format file and the graph plotted from there - both the same audio of a male voice



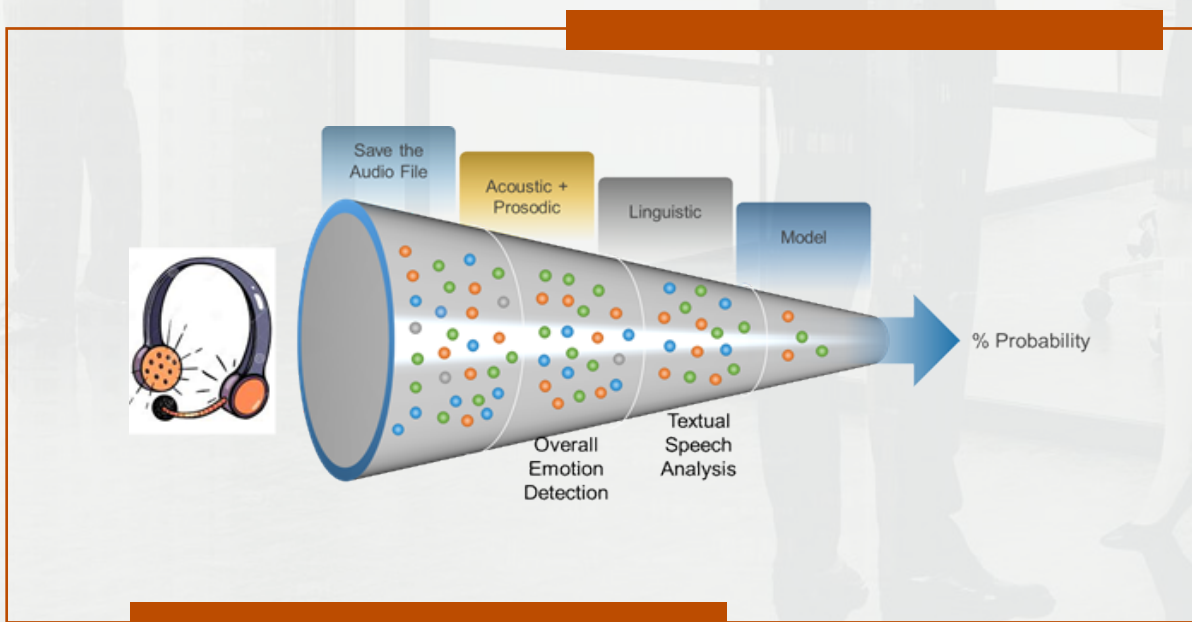
The full spectrogram of the "hello" sound clip

The business situation may assume **two different forms**

Pre-event: This is when the default has not happened yet, but the team tries to predict the possibility from an inquiry call—where the debtor asks the CSR about the legal process or something similar in case of default.

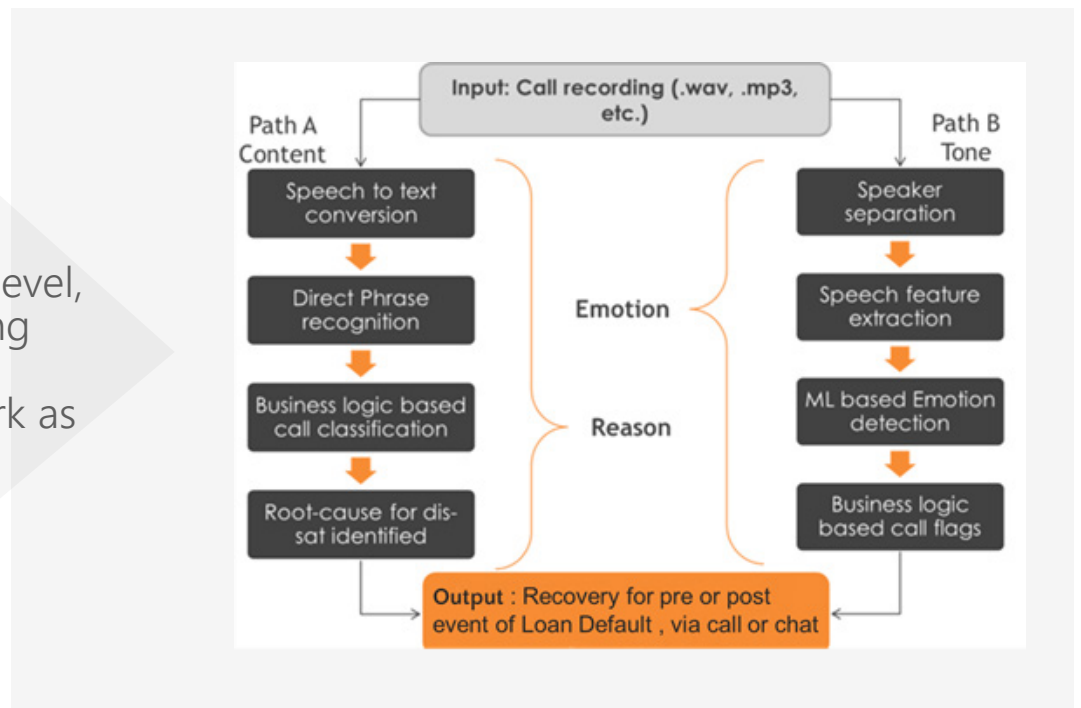
Post-event: This is when the borrower has already defaulted, and the team tries to predict the defaulter's future course of action—if he/she is looking for a loan restructure or if the defaulter will try exercising political power.

The figure depicts the algorithm to train an AI-ML-based model and derive the prediction for defaulting probability.



SEQUENCE DIAGRAM OF THE WORKING PROTOTYPE

At a high level, the working prototype would work as follows:



For more information or a demonstration of the working prototype described in this whitepaper, contact Bhaskar Mondal or Subhajit Pathak.

ROLE OF CREDIT SCORE IN IDENTIFYING DEFAULTERS



Even before a loan is sanctioned, one cannot deny that the borrower's credit score goes a long way in predicting his/her loan repayment behavior. But, is it possible for banks to identify potential defaulters if they do not have credit history? Well, this is common today, especially in a country like India where a majority of people do not have credit history. Such customers do go to banks to avail loans. Happiest Minds helps banks address such situations.

Happiest Minds' Digital Contact CenteModernization (DCCM) solution, embedded with intelligent algorithm, can potentially add some points to credit scores of people who are contacting the bank to avail a loan for the first time. This enables banks to identify potential defaulters, helping them reduce NPAs that would occur due to bad loans.

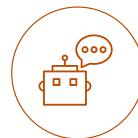
HAPPIEST MINDS' DIGITAL CONTACT CENTER MODERNIZATION SOLUTION

Happiest Minds' DCCM solution focuses specifically on two important actors – the customer and the agent – to transform the way they interact with each other. It is achieved by intervention and intersection of digital technologies (AI, chatbot and analytics), integrated with leading contact center (CC) software such as Avaya, Cisco, Jacada and Ameyo. We leverage contact centers' existing investments in network, infrastructure, platforms and applications to provide compelling digital solutions to customers and agents resulting in improved key performance indicators (KPIs).

Powered by intelligent self-service support (iS3), the DCCM platform transforms customer experience with the following digital disruptors:



Self-service – dynamic and intelligent FAQs, topic, trees, semantic search



Assisted interactions with chatbots, including raising trouble tickets (TT)

From the current transactional view of siloed dashboards, DCCM transforms agent experience too with a Unified Agent Desk (UAD) covering:



360-degree customer view



C2Q (smart snippet)



Intelligent call routing (ICR)

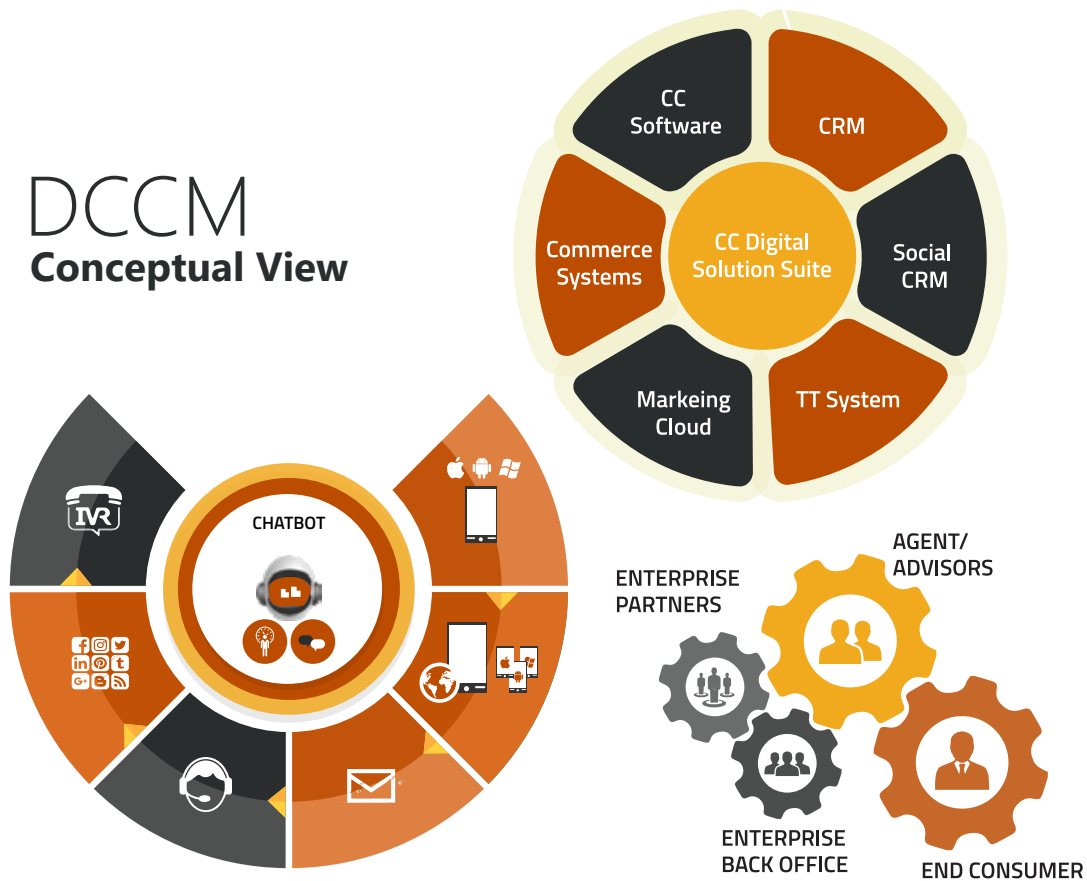


Personalized recommendations



Super-agent (chatbot) and more

DCCM Conceptual View



DCCM BUSINESS IMPACT

Happiest Minds' DCCM solution enables organizations to transform a contact center into an intelligent engagement center to enhance customer, agent and supervisor journeys with digital disruptors. The solution helps convert a traditional cost center into a profit center by creating new operational and strategic capabilities. Happiest Minds empowers organizations to:

<p>Improve KPIs such as cross selling and upselling</p>	<p>Improve C-SAT/NPS since it involves an omni-channel, self-service, assisted, engaging and personalized interaction for resolution</p>	<p>Reduce operations cost due to a decrease in direct agent interactions (live chat/call)</p>
<p>Optimize agent productivity and metrics such as average handle time (AHT), first call resolution (FCR), average wait time (AWT), and CAR</p>	<p>Enhance sales/revenue with a 360-degree customer view and real-time recommendations</p>	<p>Reduce time taken by agents to convert speech to text to write down the call summary.</p>

CONCLUSION – **THE FUTURE OF CONTACT CENTERS**

Traditionally, contact centers or customer service centers are looked at as necessary cost centers to run the business. Such contact centers often have information residing in multiple systems operating in silos, which makes the agents to deal with a plethora of desktop screens while handling customer queries. This impacts agent productivity in servicing customers and affects the overall customer experience. It is time we challenged this paradigm of contact centers as cost centers and transform them from cost to profit and transactions to interactions.

We can achieve this by leveraging the power of audio signal processing as explained in this whitepaper and combining it with an effective contact center modernization solution such as Happiest Minds' DCCM. As call volumes and costs escalate, contact centers of banks definitely need a new customer service strategy that can not only deliver competitive advantage while driving business value creation but also identify and prevent the occurrence of defaulters and NPAs.

The advancement in technology has made it possible to cut down on manual work and train AI-ML models instead—to perform tasks faster and accurately. As banks invest in effective business strategies to convince customers to apply for loans, they should also leverage the trained AI-ML models to predict customer behavior and prevent future defaulting and NPAs. The right investment can enable banks to detect default behavior at an earlier stage, allowing them to undertake corresponding actions to reduce possible loss.

RECOMMENDED **FURTHER READING**

Principles for Effective Risk Data Aggregation and Risk Reporting” published by the Bank for International Settlements (BIS)

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About Happiest Minds Technologies

Happiest Minds, the Mindful IT Company, applies agile methodologies to enable digital transformation for enterprises and technology providers by delivering seamless customer experience, business efficiency and actionable insights. We leverage a spectrum of disruptive technologies such as: Big Data Analytics, AI & Cognitive Computing, Internet of Things, Cloud, Security, SDN-NFV, RPA, Blockchain, etc. Positioned as "Born Digital . Born Agile", our capabilities spans across product engineering, digital business solutions, infrastructure management and security services. We deliver these services across industry sectors such as retail, consumer packaged goods, edutech, e-commerce, banking, insurance, hi-tech, engineering R&D, manufacturing, automotive and travel/transportation/hospitality.

Headquartered in Bangalore, India; Happiest Minds has operations in USA, UK, The Netherlands, Australia and Middle East.