



# ARTIFICIAL INTELLIGENCE IN BANKING

WHERE TO START?

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# EXECUTIVE SUMMARY

## KEY RESEARCH QUESTIONS

- 1 *What is artificial intelligence in a banking context?*
- 2 *Why does AI matter to banks?*
- 3 *How can banks use AI to improve business results?*

Artificial Intelligence (AI) is extraordinarily popular when judged by today's banking headlines, but those headlines have outpaced today's practical banking reality. Relatively few banks have begun production or even full-blown research at this stage. For those who think they're lagging, the good news is that they're not — there's still some time. But make no mistake: lack of progress today doesn't mean that banks can afford to ignore AI; they must formulate a strategy to deal with the opportunities that it promises to them and to their competitors.

We should also note that AI is a big and complicated topic. This report provides an introduction to AI by focusing on six areas.

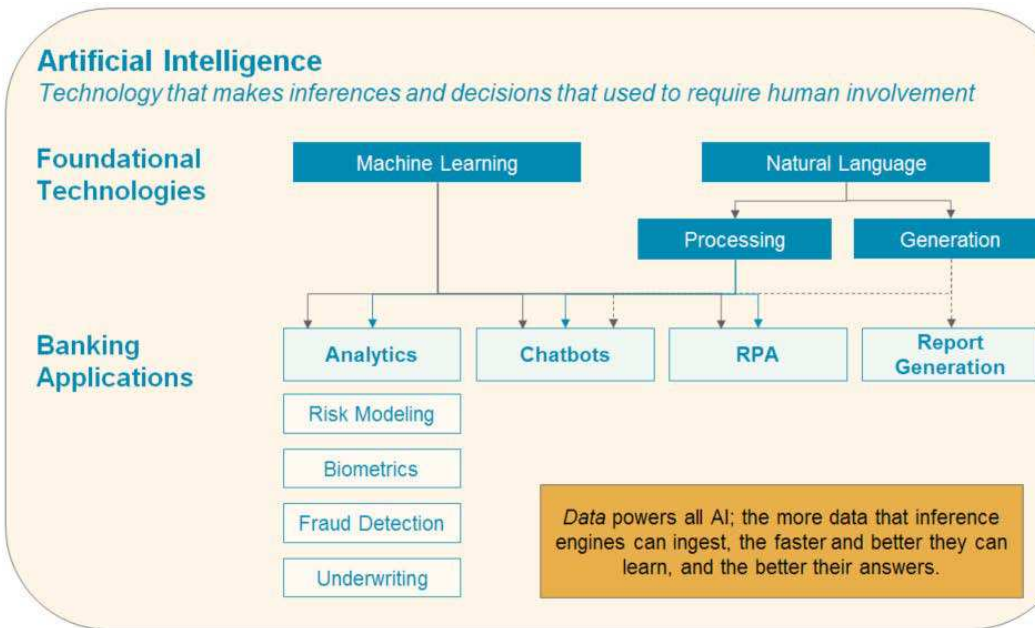
1. Foundational technologies underpinning AI.
2. Key banking applications.
3. Business cases.
4. Relative project value.
5. Areas of impact (front, middle, and back office).
6. Next step for bankers to pursue.

Bankers looking for an introduction to the uses of AI in banking will find this report a useful overview; over time additional reports will dive more deeply into specific areas.

Malastare takes a pragmatic approach that defines AI in banking as technology that makes *inferences and decisions that used to require direct human involvement*.

A series of fundamental and interrelated technologies around **machine learning** and **natural language** underpin all of AI. Crucially, AI is not just better technology. It is not faster processing, bigger data sets, or even thousands of rules rigidly applied. These advances have yielded powerful results, but they're performing old tasks better. That AI can respond to ambiguous real-world inputs probabilistically is one of its critical features. Building off the fundamental technologies to apply them in a banking context yields four main AI applications today: **analytics**; **bots**; **robotic process automation (RPA)**; and **report generation**. Figure 1 lays out the basic AI relationships between the foundational technologies and banking applications; all depend on massive amounts of data, the lifeblood of AI.

Figure 1: Artificial Intelligence in Banking



Source: Malastare AI Research. Arrows represent influence of source on target.

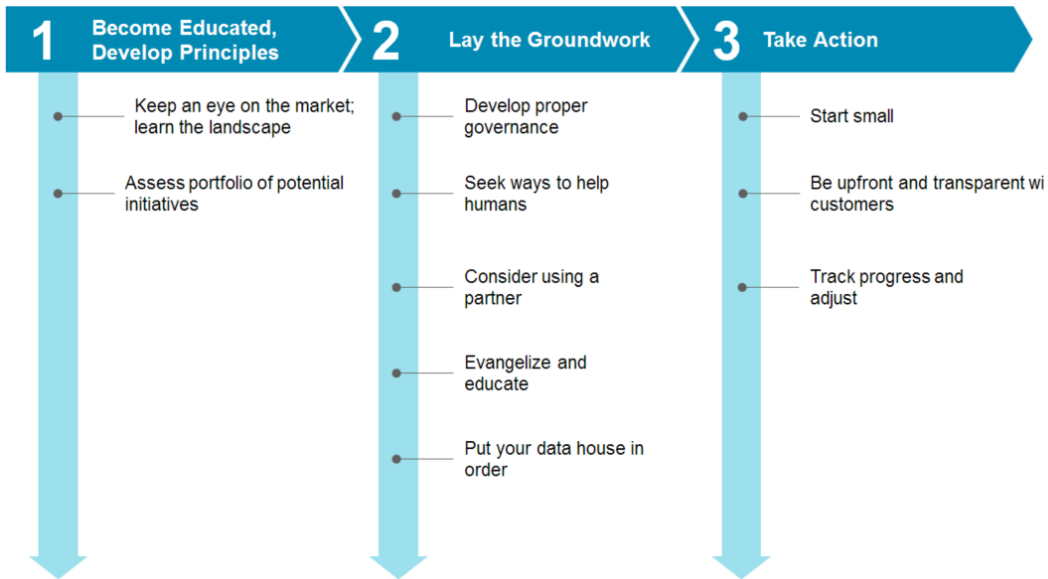
Today's principal business justification for AI lies in cost reduction, but it can also mitigate risks and increase revenues (primarily through the indirect route of improving customer experience). AI is an umbrella term for a host of different technologies and applications; when discussing it, being specific is helpful in narrowing the focus and clarifying whether a solution truly uses AI or merely performs standard tasks better with new technology. AI, for example, has applications in the front, middle, and back office, and can be either customer-facing or employee-facing. Being clear about how, where, and why AI is to be used is critical for a reasoned discussion about its pros and cons.

That being said, banks must develop an AI strategy so that they're not left behind. As they do this, three critical steps are necessary.

- Become educated and develop principles.
- Lay the groundwork.
- Take action.

More detail is provided in Figure 2.

Figure 2: Next Steps on AI



Source: Malastare AI Research.

The line between impressive technology and true AI is sometimes blurry, and we'll try to draw the distinction while recognizing that, in some cases (like RPA), being overly pedantic causes more problems than it solves. And we're not going to cover robo advisors; our colleagues in wealth management have done a great job of that already.

Today's AI is not yet ready to replace humans; instead it will augment them, letting them move into more value-adding activities, freeing them from rote actions, making them more efficient, and performing calculations that would be physically impossible for a single person. We take an optimistic view of AI in banking — for those who embrace it, AI will over time provide a better experience for customers *and* employees while delivering real business value on every dimension.

# BASICS OF ARTIFICIAL INTELLIGENCE

Discussion of AI can rapidly turn philosophical; as much as we like a good debate, we're going to take a very pragmatic approach to a definition for financial services.

***Banking artificial intelligence is technology that makes inferences and decisions that used to require direct human involvement.***

Cross-industry AI has been hot twice before (the term was coined in 1956). Today's third wave has hit banking. So it's useful to highlight the textbook attributes of AI as taught in computer science courses.

- Reasoning
- Knowledge
- Planning
- Learning
- Natural language processing
- Perception
- Manipulating the physical world

The ultimate goal is generalized intelligence: think of the computer in *Star Trek* or the replicants in *Blade Runner*. We're clearly a long way from that, but there's no doubt that we've made significant progress as the forces powering AI — **computing power, data, and algorithms** — have all advanced to the point where the technology can play a meaningful role in banks.

It's also worth noting that the bar that defines which technologies qualify as AI is continually moving; optical character recognition (OCR) used to be thought of as AI, but now it's simply a technology that consumers can access via scanners plugged into their home computers.

It's also necessary to draw the distinction between AI, which infers, and brute force computing, which applies a set of rules, sometimes a very big set of rules, to a set of inputs and returns an answer. If presented with inputs that its rules had never encountered, the brute force method would not be able to respond; any AI worth its salt would at least have a probabilistic answer. Some technologies, RPA in particular, are not technically AI (at least not most of them), but advances are continually moving them closer to using AI methods. While we don't want to be pedantic about defining AI, the term is often used somewhat sloppily. Simply applying a lot of computing power to a lot of data is not AI, no matter how good the initiative might be for marketing.

## Key Research Question

# 1

*What is artificial intelligence in a banking context?*

***Technology that makes inferences and decisions that used to require direct human involvement.***

## ENABLING TECHNOLOGIES

Today's evolving AI is made possible by foundational technologies (computing power, data, and algorithms) and the AI syntheses of those foundations, most notably machine learning and language manipulation. Machine learning has captured a lot of press, but natural language shouldn't be downplayed, particularly because its implementation is often much easier. We should note that vision is a fascinating area of AI research (e.g., a machine being able to recognize an image of a cat), but today's banking applications are limited.

### Machine Learning

Machine learning is a centerpiece technology of true AI.

***Machine learning occurs when computers change their parameters/algorithms on exposure to new data without humans having to reprogram them.***

The biggest benefit of machine learning is that, by processing more data than a human ever could, and then using that data to teach itself by spotting patterns that, again, would be hard for humans to identify, it will be able to draw insights that previously would have remained undiscovered. Although machine learning opens up possibilities, banks should keep in mind three key ideas.

First, we may not know how a machine learning algorithm arrives at its conclusion. Rather than testing hypotheses, as a human might in order to avoid "boiling the ocean," machine learning goes ahead and boils the ocean. It may present answers (generally couched in terms of probabilities) based on the clustering of several obscure and potentially unrelated variables whose causal roots are difficult to describe. In other words, the algorithm may not be able to describe how it got to its answer. This poses obvious auditability issues and makes it difficult to justify decisions to regulators. For example, if AI decides to reject a loan application, what would the adverse action letter say? Researchers are addressing this issue, but it's not solved yet.

Second is that the amount of data that a machine learns from is critical. The more data, the better the results will be. Gathering huge amounts of input will give the algorithms more opportunities to test and learn, thereby refining their rules and, over time, producing better results. Firms with access to more data will have a leg up over those firms whose data is sparser. This is one area where there's a definite size advantage that accrues to larger banks.

Third and finally, learning can be unsupervised or supervised; having a human check in on the results and give the algorithms nudges or feedback, based on perceptions that are intuitive to humans but difficult for models to pick up, can generally speed up the learning process significantly while improving accuracy.

Figure 3: Machine Learning Ideas

### Three key points about Machine Learning

- 1 Explaining the how and why of machine learning conclusions can be difficult
- 2 The more data, the better
- 3 Adding human judgment makes machine learning more efficient and effective

Source: Malastare AI Research.

### Natural Language

One of the most notable areas where artificial intelligence has progressed is in the way it deals with human language. For many years the industry joke was that good voice recognition was just two years away — and that was the refrain for a decade! Today, though, dictating via a phone or giving instructions to an automated voice when calling an 800 number generally gives good results (frustrations with Siri notwithstanding). In an illustration of how AI technologies are mutually useful and reinforcing, many natural language platforms use machine learning to improve their accuracy in recognizing or generating human speech. Speech analytics offer an illustration of how AI technologies are interrelated; speech analytics use machine learning to analyze patterns in speech, learning, for example, how to identify an angry customer.

While natural language processing (NLP) has received the lion's share of attention, Malastare believes that natural language generation (NLG) holds immense potential as a means of turning raw data into useful and easily consumed insights.

### Processing

**Natural language processing is the ability for technology to use human communication, naturally spoken or written, as an input that prompts computer activity.**

NLP is critical to AI because it gives people an intuitive way to communicate their intent to a program. The human's unstructured words are parsed and converted into machine-understandable instructions.<sup>1</sup> Once the program has understood and processed the instructions, it responds. The response can be in a computer-friendly format (think of simply showing a list of transactions when the query is "Show me my last three credit card purchases"), a useful graph, or spoken or written in plain language.

<sup>1</sup>A quick note on *Natural Language Understanding* (NLU), a subset of NLP, is in order. NLU is described as an "AI-hard problem," meaning that it can't be solved by a specific algorithm, nor can it be solved by today's technology alone — it would need human intervention. For our practical purposes, however, we consider NLU to be a more sophisticated type of NLP that takes into account a wide variety of input variations, tonality, irony, implications, and assumptions about pre-existing knowledge. Some service providers say that they provide NLU, but it's generally an aspiration, since true NLU doesn't yet exist.



## Generation

Generating plain language responses is a critical component of being able to eliminate the need for human intervention and can automate many types of routine tasks (think report generation) that today are typically very time-consuming.

**Natural language generation (NLG) is the ability of technology to produce human-quality prose based on a wide variety of inputs.**

NLG can be either written or spoken, although if spoken, the voice quality doesn't necessarily have to be indistinguishable from humans. NLG does not rely on a limited number of predefined responses or fetching a single piece of data for a customer, but instead sorts through large amounts of available data to produce a human-sounding response. It can take the form of speech, or of a multipage report summarizing financial results, as just two examples. See Figure 4 for an example of NLG writing a story on Denny's earnings in 2015 and compare the result to the effort by a talented NPR reporter.

Figure 4: Natural Language Generation in Action

### Over Easy

One of these stories was written by Scott Horsley. One was written by a machine. Which do you like better?

#### Story #1

► Denny's Corporation on Monday reported first-quarter profit of 8.5 million dollars. The Spartanburg, South Carolina-based company said it had profit of 10 cents per share. The results beat Wall Street expectations. The average estimate of four analysts surveyed by Zacks Investment Research was for earnings of 9 cents per share. The restaurant operator posted revenue of \$120.2 million in the period, also beating Street forecasts. Three analysts surveyed by Zacks expected \$117.1 million. Denny's shares have risen nearly 6 percent since the beginning of the year. In the final minutes of trading on Monday, shares hit \$10.90, a climb of 61 percent in the last 12 months.

#### Story #2

► Denny's Corporation notched a grand slam of its own in the first quarter, earning a better-than-expected ten cents a share, as restaurant sales jumped by more than 7-percent. Operating revenues topped \$120 million. Adjusted net income jumped 36 percent to \$8.7 million. Denny's is one of the nation's largest full-service restaurant chains. The growth in sales suggests consumers are opening their pocketbooks for pancakes, eggs, and hash browns. Earnings were also helped by lower costs for raw materials. Denny's results were also helped by the re-opening of the high-volume location inside the Las Vegas Casino Royale restaurant. After sales grew faster than expected in the first three months of the year, managers raised their sales forecast for the remainder of 2015.

Source: Automated Insights

Credit: Quoctrung Bui/NPR

Source: NPR. <http://www.npr.org/sections/money/2015/05/20/406484294/an-npr-reporter-raced-a-machine-to-write-a-news-story-who-won>

With two basic technologies explained, let us now turn to some banking-specific use cases that exploit them.

## APPLICATIONS IN BANKING

AI is not the brute application of computing power to huge databases using a set of static rules, no matter how complicated. A huge set of if-then statements, for example, does not constitute AI (however, if the algorithm constructed new if-then statements based on its prior analyses, that would be a case of machine learning). Remember, AI must make inferences, not just decisions. We'll examine four specific cases of AI in banking, touching on the highlights of each and being mindful that each of these four is worthy of a report in its own right.

### Key Research Question

# 2

*Why does AI matter to banks?*

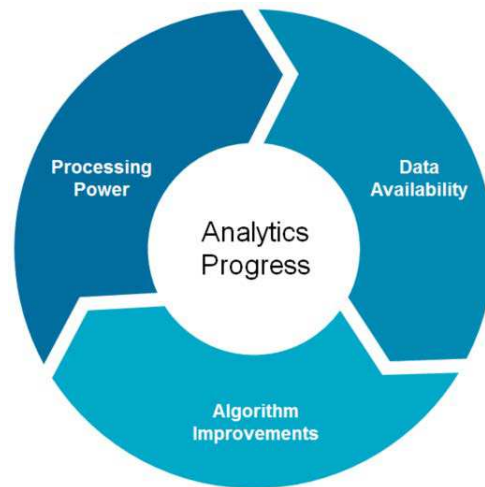
AI can help banks become more efficient and effective by reducing costs, mitigating risk, and increasing revenues by applying newly capable technology in analytics, bots, RPA, and report generation.

### ANALYTICS

An area of intense banking focus for the last several years, analytics has benefited from technological improvements even without AI. Fundamental advances in **processing power** and **data** manipulation have given human analysts increasingly powerful tools. Couple this with **machine learning** progress, and firms have the potential to uncover insights previously undiscoverable.

*AI-driven analytics test vast quantities of data to search for patterns, groupings, and correlations by employing a wide variety of techniques, including data mining and hypothesis testing. Moving from merely descriptive to predictive, near real-time analysis is a key component of some analytics.*

Figure 5: Three Intertwined Technological Advances Driving Analytics



Source: Malastare AI Research.

The amount of **processing power** required is simply beyond the ability of humans to provide. Thousands of transactions are being submitted every minute from all over the world. For one employee to give a timely response to a single transaction is impossible: a human simply couldn't retrieve and analyze the data necessary to make an informed assessment quickly enough. Scaling makes the problem even more intractable. Similarly, analyses that used to take days can now be performed in minutes thanks to technologies like in-memory processing.

This processing power is being brought to bear on ever greater amounts of **data**. Banks have a head start on many industries in that they already possess an immense amount of information about their customers, an asset that they still consistently underutilize, in part because of the siloed nature of their organizations. This data, though, when combined with behavioral information (for example, How many times does the customer interact with the bank? When does the customer make payments?) and external data (Which websites has she been visiting?) can yield valuable insights that can shape how the bank interacts with its customers and make the relationship vastly more personal. And with the vast amounts of data being ingested, there are more chances to learn from mistakes and make corrections. Data is the lifeblood of machine learning, and analytics that rely on huge data sets are ideal use cases.

Finally, improvement in the **algorithms** that power machine learning happen more quickly with more data. Every time a mistake slips through (an erroneous decline, or a missed fraudulent transaction), a program using machine learning notes that and makes an appropriate adjustment. Machine learning speeds the process of improving many types of analytics algorithms, and many different sorts of analytics challenges lend themselves to AI: **risk modeling**, **biometric identification**, **fraud detection**, or **credit underwriting** to name a few. Each of these areas is fascinating, complex, and deep. We'll touch briefly on credit underwriting for the sake of focus.

The situation is familiar to any lender. Will a credit applicant receive a loan, and if so, on what terms (amount, rate, repayment period)? And what criteria will be used to determine the answers to these questions? A properly constructed machine learning algorithm can analyze not only all of the underwriting data used today, but also other factors, assuming that they can be cleanly brought into the data set. The algorithm can be taught by feeding it data from prior underwriting decisions and analyzing which loans performed and which

didn't. Rather than testing hypotheses, the algorithms can simply data-mine the entire portfolio to determine which variables (or clusters of variables) are correlated with performance. It can then reweight the importance assigned to various variables and develop revised underwriting criteria. Each time that it learns more (based on updated performance data), it can tweak its criteria. Of course, in jurisdictions like the US where denying a consumer credit requires an explanation, the bank must be sure of its rationale and willing to defend it to consumers, regulators, and the press.

## CHATBOTS

Perhaps the most visible instance of AI today is the chatbot.

***A chatbot is a technology service powered by algorithms that interacts with a customer in a natural (human-like) manner, either by voice or text.***

Some chatbots are given personas in the form of a virtual agent, which may be named and given some sort of avatar and personality. Typically accessible via a bank's own digital properties, virtual agents are marketed explicitly to customers as non-human technology tools that will let them interact with the bank better than IVR-powered phone trees or call centers.

Chatbots have various levels of sophistication. The more basic accept a limited range of inputs and produce a limited set of answers (think of a host of if-then answers, which mean that they're technically not AI), and at their most basic may be essentially menu-driven. The more sophisticated ones parse customer queries and can detect the questioner's intent even when it's expressed in a wide variety of different ways. Whether an unassuming text interaction or the more explicit virtual agent, the more sophisticated rely on NLP and NLG.

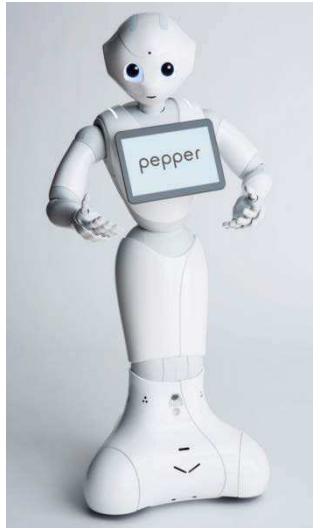
For example, consider the query, "What is my routing number?" A simple rules-based engine may simply pick up on the term "routing number" and direct the customer to the page on the bank's site that tell them how to find it on their checks. A more sophisticated AI would understand the difference between "What is my routing number?" and "What is a routing number for?" In the first case it would simply give the customer her routing number, while in the second, would provide an explanation of its function. In neither case would a customer be directed to a site, but would instead be given the direct answer in the context of that particular chatbot conversation.

It's important to note that chatbots should not be left on their own. When a customer presents a situation that the chatbot is not equipped to deal with, it must quickly hand the interaction off to a human quickly and seamlessly so that the customer isn't dissatisfied. In these relatively early days in particular, it's critical that banks make a good first impression. No one wants a repeat of the disgust that most consumers feel toward IVR systems and their impenetrable menus.

One other form of bot is a physical manifestation of AI, typically in humanoid form (Figure 6). While some banks have begun to experiment with these physical robots to solve for particular use cases (e.g., the need for multilingual interactions for the upcoming Japanese Olympics).

Figure 6: Pepper the Robot

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Source: <http://spectrum.ieee.org/automaton/robotics/humanoids/softbank-pepper-humanoid-robot-us-debut>

## ROBOTIC PROCESS AUTOMATION

Based on a prior caveat, there's an argument to be made that RPA doesn't qualify as AI. Here's why:

***RPA uses a number of techniques to mimic routine human activities automatically, repeatedly, faster, and more accurately.***

In the most basic case, think of any set of routine bank activities performed by junior-level employees sitting in a cube. They receive inputs (whether on paper or digitally), examine those inputs, apply a rule to them (with no discretion in this extreme scenario), and then send the output forward to the next step in the process. In this edge-case, there is no inference required, no latitude allowed. RPA steps into a gray area when interpretation is required. Does the supporting documentation from utility companies suffice to prove continued residency for purposes of a mortgage application, for example? For us, RPA that uses machine learning to continually improve counts as AI; that which simply has a large and ever-expanding library of scenarios, generally accreted manually by human supervisors, is simply plain automation. That's not to say that RPA isn't a valuable technique that many banks should be examining, but simply to emphasize that much RPA isn't in fact AI.

RPA powered by AI is nevertheless the next stage in the evolution of making back offices more efficient. The first wave was labor arbitrage — of moving basic functions to jurisdictions to be performed by lower-paid workers. Replacing those workers with programs aims to lower costs, increase throughput, and improve accuracy. If the first stage of RPA is simply “paving the cowpath,” and the next is adopting new processes based on capabilities of new technology, then AI-powered RPA will make judgments that today require humans and, eventually, begin to suggest and implement process improvements on its own.

## REPORT GENERATION

NLG can turn data into prose. As one example, the first drafts of Little League baseball stories in local papers are being written by NLG technology based on the box scores of games.

NLG vendors tout the use cases of writing reports or synopses that synthesize large amounts of structured data and put them into a prose narrative that highlights the key points. One example might be a quarterly sales report that tracks results from across many different regions and product categories. The NLG platform would ingest the raw data and then write a report distilling the key points. Rather than a human business analyst poring through the raw data, searching for high and low points, calculating CAGRs and rates of change, the NLG engine would do all of this.

Another example might be constructing a spending report for a retail banking client, someone who to date has never had any kind of prose analysis from their bank. Many clients will prefer prose summaries, rather than a set of numbers, tables, and graphs that takes time, and some degree of expertise, to decipher.

It's important to note that NLG should be used to write the first draft, at least for reports that aren't being mass-produced for distribution to thousands of clients. Analysts will want to ensure that what's written reflects their emphases and voice, and also want to confirm that they understand the conclusions!

With four key areas of banking AI laid out, let us now turn to the business justifications of AI.

# BUSINESS CASE FOR AI

As daunting as AI may seem for many banks, Malastare believes that most institutions should be exploring at least the basic forms of the many technologies that fall under its umbrella. The main and most basic benefit is reducing cost, but firms shouldn't ignore risk mitigation (via fraud reduction or better underwriting outcomes, for example) and revenue increases (generally via an improved customer experience or better marketing). We offer some of the more promising use cases that are practical today, with the caveat that this field is rapidly evolving; more implementations may follow in the coming months.

Key  
Research  
Question

3




How can banks use AI to improve business results?

Reducing costs and mitigating risks are the initial benefits of AI; increasing revenue through improved customer experience is more ambitious.

## REDUCE COSTS

There are many ways that well-implemented AI can reduce costs. Several ideas follow in Figure 7; the list is by no means exhaustive. AI may handle many basic inquiries that nevertheless require some degree of judgment. It may help humans do their jobs better or faster. And it can prepare accurate reports that won't miss crucial details.

Figure 7: Reducing Costs with AI

	<b>Shift tasks from humans to AI</b>	<ul style="list-style-type: none"><li>• Handle basic authentication and information requests before handing off to a live representative</li><li>• Shift common inquiries to bots or virtual agents</li><li>• Move rote tasks from humans to RPAs</li></ul>
	<b>Augment humans with AI</b>	<ul style="list-style-type: none"><li>• Speed up response times with NLP-driven queries that respond to the employee</li><li>• Allow customer self-service using NLP, with humans as fall back</li><li>• Keep humans apprised of latest regulatory changes</li></ul>
	<b>Use NLG to prepare reports</b>	<ul style="list-style-type: none"><li>• Save time in sifting through data to prepare first draft of internal reports</li><li>• Prepare prose reports for retail customers for whom it would have hitherto not been cost effective</li><li>• Improve accuracy (no typos or fat fingers)</li></ul>

Source: Malastare AI Research.

Of course, AI technologies never need a day off and can work around the clock. Note that while these actions tend to augment the role of the human for rote or basic tasks, they still need varying degrees of human supervision.

## MITIGATE RISK

Risk is a huge and complicated issue in banking. Figure 8 describes the risks that banks must manage on an ongoing basis.

Figure 8: Malastare Risk Management Taxonomy

1 INTEGRATED RISK MANAGEMENT Risk governance, conduct risk, model risk, enterprise-stress testing							
2 FINANCIAL RISK			3 FINANCIAL CRIME RISK			4 INFORMATION SECURITY	
Credit risk	Market risk	Liquidity/ ALM risk	Fraud risk	AML risk	Compliance	Cyber-crime	Information risk
Default	Commodity	Liquidity	Internal	KYC	Regulatory compliance	Data	Data
Counterparty	Portfolio	Interest rate	Payments	CDD/EDD	AML compliance	Technology	Technology
Credit portfolio	Interest rate	Exchange rate	Check	Customer review	SOX	Operations	Threat mgmt.
Basel II, III	Strategic	Funds transfer pricing	ACH	Sanctions	Controls	Governance	Vulnerability mgmt.
Lending	Pricing analytics	Balance sheet mgmt.	Deposit	PEP screening	Integration of risk and finance accounting	Compliance and controls	Identity and access mgmt.
Credit origination	Deal execution	Basel II, III	Wire	Regulation monitoring		Policies and standards	Encryption
Credit rating	Stress testing	Stress testing	Card	Transaction monitoring		Process	Legal
Sovereign			Channels	Audit		People	Procurement
Stress testing			Cyber crime	Look back			Vendor management
			Counter surveillance				SaaS/cloud
			Trade surveillance				Remediation and resolution planning
							Human capital
5 OPERATIONAL RISK, DATA AGGREGATION & RISK ANALYTICS							

Source: Malastare AI Research.

Technology has, of course, been both a cause of increased risk and a way to mitigate it. While most risk mitigation methods do not have an AI component and are instead applications of “dumb” (but nevertheless sophisticated) algorithms and processes, AI will, over time, be able to help mitigate many of the individual risks described above. Today, credit risk and fraud risk hold the greatest promise for the application of AI.




For credit, origination/underwriting is the specific area that can most benefit from today’s machine learning technology. Banks can use machine learning to evaluate historical underwriting performance by looking for approved applications that later defaulted and analyzing them to see if there are factors that would have had predictive power. Some examples that appear to be predictive on an experimental basis included choice of specific words and whether applicants apply in capital letters. Of course, rejected applications won’t be as useful in this scenario, but even slight improvements in default rates can have a significant impact on the bottom line.

In financial crime, much technological benefit again comes from plain old automation. AI can nevertheless improve outcomes, particularly as the integration of data and algorithms



progresses. To reduce fraud, machine learning can assess a candidate transaction and compare it to stored transactions, both proper and fraudulent, and make a probabilistic assessment as to whether to approve the transaction or flag it for further investigation. As in all cases of machine learning, more data improves outcomes, and the more transactions the algorithm ingests, the better it will perform. Improved authentication is another area where AI can help, often through biometrics.

Figure 9: Mitigating Risk with AI

	<b>Reduce financial risk</b>	<ul style="list-style-type: none"> <li>• Improve loan underwriting through machine learning</li> <li>• Perform comprehensive market risk analyses</li> <li>• Run liquidity / ALM / stress testing scenarios</li> </ul>
	<b>Improve financial crime risk</b>	<ul style="list-style-type: none"> <li>• Advance fraud detection</li> <li>• Detect suspicious patterns of activity/behavior</li> <li>• Improve compliance and controls</li> </ul>
	<b>Lessen operational risk</b>	<ul style="list-style-type: none"> <li>• Improve accuracy in transcription and production of documents</li> <li>• Spot anomalous activity (malicious or careless)</li> </ul>

Source: Malastare AI Research.

To implement effective anti-money laundering (AML) procedures, machine learning can again compare candidate transactions to prior versions and make a quicker and more thorough initial assessment of the legitimacy of the transaction. Additionally, the AI should, assuming that it has been programmed properly by humans, always be up to date with the latest regulations. Automation (though not necessarily AI) can provide a suitable audit trail.

For cybercrime, AI's thoroughness and ability to adapt to new techniques can again be very useful. And AI can improve underwriting and credit assessment, assuming that it has access to the right data, properly configured. When assessing credit risk, the ability of the AI to data-mine and identify potentially unrelated clusters of factors that, taken together, correlate with an outcome is another tool in the underwriter's kit.

Error reduction (typos, miscalculations, and misreadings) is another way that AI can help mitigate risk. Because the AI never gets bored or tired, and can calculate flawlessly, it won't be subject to the kinds of errors that humans might.

### INCREASE REVENUE / IMPROVE CX

Despite a great deal of hype today, AI's ability to increase revenue and improve the customer experience has not been widely proven at scale – though some early results are encouraging. In terms of prioritization, at this stage there's more potential to improve the customer experience than there is in increasing sales directly.

Figure 10: Increasing Revenue and Improving Customer Experience with AI

	<b>Increase revenue via offers</b>	<ul style="list-style-type: none"><li>• Serve next best offers</li><li>• Target email and other offers</li><li>• Test and learn; use machine learning to refine process</li></ul>
	<b>Improve employee effectiveness</b>	<ul style="list-style-type: none"><li>• Allow employees to focus on highest value tasks</li><li>• Increase productivity of sales reps</li><li>• Speed up processes through RPA</li></ul>
	<b>Enhance customer experience</b>	<ul style="list-style-type: none"><li>• Use speech analytics to quickly identify cases needing human attention</li><li>• Reduce false positives</li><li>• Give more attention at a reasonable cost to serve</li></ul>

Source: Malastare AI Research.

Many observers gravitate toward using AI to increase revenue, although the challenge with many of these customer-facing activities is that they run the risk of annoying the customer if executed poorly. Banks should apply rigorous testing and quality assurance cycles to any customer-facing AI deployment prior to launch to ensure they don't alienate customers with beta technology.

In areas where processes are working effectively today, it's best to leave well enough alone; focus on where things are broken or could be done appreciably better. Improving employee effectiveness is one instance of this, particularly by relieving them of rote and non-value-added tasks. For example, some early adopter banks say they've seen a reduction in calls to their customer care centers due to customer / chatbot interactions.

Speeding up the customer experience is one more area where improvements can be made in a relatively low-risk way. A good example is the 'always on' nature of AI and how this could allow banks to extend customer support from traditional business hours to a 24/7 model.

## AREAS OF IMPACT

There are many different ways of examining how AI will affect a bank. In addition to business value drivers, another perspective is to examine the functions in the bank that will be affected. AI has the potential to improve all parts of the bank, from front end, customer-facing areas; to the middle office; and through to the back office. While some argue that these terms are becoming obsolete, they're still a useful construct to consider how AI can create business value. In each case we'll look at customer benefits, as well as risks for both the consumer and the bank. The prior section covered the business benefits for the bank

### FRONT OFFICE

Direct customer interactions can either be addressed by AI directly, most prominently with chatbots or virtual agents, or by enabling employees to do their jobs better (that is, by enabling them to be faster or more accurate, or more productive — efficiency), or by augmenting their capabilities (effectiveness). Another area of customer interaction is through next best offers or financial advice or nudges. And finally, AI may simply improve the employee experiences.

Customer-facing AI can be either one-way (a push of offers, for example), or two-way, where an ongoing set of interactions takes place, initiated by either the customer or the bank. The benefits to customers include improved advice, better offers, and saved time.

While the benefits are tangible, there are risks inherent in exposing AI directly to customers. If the implementation is flawed, the mistakes may earn the bank or credit union public ridicule, or it may poison the well of customer perception such that customers who had a bad experience will not willingly interact with the AI again.

### MIDDLE OFFICE

The functions of the middle office include employees supporting other employees, indirectly supporting customers, or conducting compliance activities. Some salient examples are in report generation, underwriting and credit decisioning, and risk and compliance monitoring. While middle office activities are generally an effectiveness play, efficiency has a role, too, as AI technology helps process more work at lower cost. Identifying exceptions (and becoming better at doing so) is one example of AI helping employees become both better and faster at their jobs.

The risks of middle office AI are relatively low from a consumer standpoint as long as outcomes (like false positives) aren't degraded. For all of these AI activities, human supervision is critical. Internal reports generated via NLG, for example, should only be considered first drafts; the responsible analyst should sanity-check them, revise them for tone and voice, and ensure that she knows the substance of the report.

### BACK OFFICE










































Processing and reconciliation, typical back office functions, can use AI to detect anomalies and exceptions. Layered on top of non-AI RPA, they can serve as a backup and a second set of eyes to make sure that processes are proceeding as they should be. Direct benefits to customers are hard to envision in a back-office AI situation, but the risks also aren't as high. A great deal of threat detection and risk mitigation will also take place in the back office. The biggest risks in back office implementations lie in over-reliance on AI and in the cost associated with putting initiatives in place.

## NEXT STEPS

Every bank should develop a strategy for incorporating AI into its technology stack. AI can reduce costs, mitigate risks, and improve the customer experience.

Figure 11 provides a summary of the economic rationale and areas of impact of each of the AI areas we've been discussing.

Figure 11: How and Where AI Can Help Banks

AI Type	Economic Rationale			Areas of Impact		
	Reduce Cost	Mitigate Risk	Raise Revenue/ Improve CX	Front Office	Middle	Back
Enabling Technologies						
						
						
						
FS Applications						
						
						

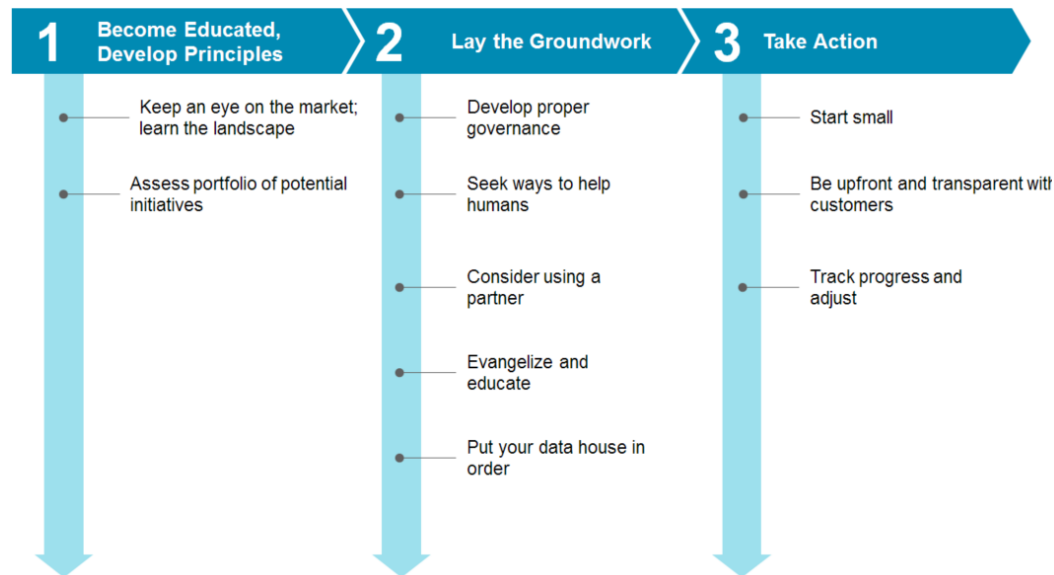
Source: Malastare AI Research.

“Think about how to implement AI” is an unrealistic and unhelpful description. AI is an umbrella term that covers a host of specific technologies and implementations. To break this huge task into manageable pieces, Malastare offers three specific high-level steps to make AI less daunting and more manageable:

- Become educated and develop principles.
- Lay the groundwork.
- Take action.

A summary is provided in Figure 12.

Figure 12: Next Steps on AI



Source: Malastare AI Research.

## BECOME EDUCATED AND DEVELOP PRINCIPLES

- **Keep an eye on the market; learn the landscape.**  
Basic AI technologies are improving rapidly, and bank leaders are making great progress in specific implementations. Monitor market developments as a cost-effective and efficient way of conducting research.
- **Assess portfolio of potential initiatives.**  
Based on your particular situation, evaluate the implementations that will make the most sense for your institution given your strategic priorities. Building on your market analysis, decide when your target technologies are mature enough to begin implementation, or at least experimentation.

## LAY THE GROUNDWORK

- **Develop proper governance.**  
We hear questions from our banking clients on where AI should sit within the organization. There's not a one-size-fits-all answer, but our guidance is that it should mirror a bank's digital efforts. AI governance, though, must include the proper internal stakeholders, determine the initiatives to pursue, and define and measure desired outcomes.
- **Seek ways to help humans, not necessarily replace them.**  
AI is not a panacea, and unrealistic expectations about its capabilities can doom AI efforts. Early AI won't replace humans, but will help them do their jobs better and make those jobs more interesting. Don't expect more than that, at least not in these early days.
- **Consider using a partner.**  
Malastare believes that there is a lack of AI skills within many banking IT departments. This is by no means an indictment of banks, for this a new and emerging technology with relatively few experts. Consider finding a trusted partner who can help you in your AI journey.

- **Evangelize and educate throughout the organization.**  
AI may cause trepidation in the bank. Develop a communications strategy that clearly lays out objectives and keeps colleagues apprised of progress. There are fears that technology and AI will put people out of work. You must address those concerns head on and without platitudes; emphasize that AI can enhance productivity and improve the employee experience.
- **Put your data house in order.**  
AI success is directly correlated to data access; not just how much data you have, but how well you're able to use it. Make sure that you can leverage what you have, and realize that if you're a bigger institution, here's one clear advantage of your scale.

## TAKE ACTION

- **Start small to gain an early win.**  
Succeeding with a small early implementation is more important than failing ambitiously. Pick a well-defined and manageable project whose failure won't be catastrophic and whose success will be inspirational. Consider back-testing on existing data to train the AI and to experiment. Be realistic: AI is not a panacea, nor is it even appropriate for most technology situations. But where it can be helpful, use it, and be ready to shift course quickly based on your learnings.
- **Be upfront and transparent with customers.**  
Transparency is a new banking imperative that customers have learned from other industries. Google became famous for its beta releases — customers (at least initially, before cynicism set in) appreciated that there might be bugs, and generally understood the rationale. Take a leaf from this book and be clear about your goals and methods with your customers.
- **Track progress and adjust.**  
No AI implementation will work perfectly out of the box; design your tracking and feedback mechanisms from the beginning so that you can gauge progress from the outset and make the inevitable adjustments based on full information.

What's considered AI today will likely become just technology tomorrow. Remember OCR. Banks and credit unions should nevertheless think about which specific business challenges AI can help solve and begin to prepare today.

## LEVERAGING MALASTARE-AI RESEARCH EXPERTISE

If you found this report valuable, you might consider engaging with Malastare for custom analysis and research. Our collective experience and the knowledge we gained while working on this report can help you streamline the creation, refinement, or execution of your strategies.

### SUPPORT FOR FINANCIAL INSTITUTIONS

Typical projects we support related to artificial intelligence include:

**Vendor short listing and selection.** We perform discovery specific to you and your business to better understand your unique needs. We then create and administer a custom RFI to selected vendors to assist you in making rapid and accurate vendor choices.

**Business practice evaluations.** We spend time evaluating your business processes, particularly around artificial intelligence. Based on our knowledge of the market, we identify potential process or technology constraints and provide clear insights that will help you implement industry best practices.

**IT and business strategy creation.** We collect perspectives from your executive team, your front line business and IT staff, and your customers. We then analyze your current position, institutional capabilities, and technology against your goals. If necessary, we help you reformulate your technology and business plans to address short-term and long-term needs.

### SUPPORT FOR VENDORS

We provide services that help you refine your product and service offerings. Examples include:

**Product and service strategy evaluation.** We help you assess your market position in terms of functionality, technology, and services. Our strategy workshops will help you target the right customers and map your offerings to their needs.

**Market messaging and collateral review.** Based on our extensive experience with your potential clients, we assess your marketing and sales materials — including your website and any collateral.