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# UPRAVLJANJE TRANSFORMACIJOM BANKARSTVA VOĐENOM VEŠTAČKOM INTELIGENCIJOM: STUDIJA SLUČAJA JPMORGAN CHASE

**Prof. dr Jelena Lukić Nikolić**
Vanredni profesor, Visoka škola modernog biznisa
jelena.lukic@mbs.edu.rs
ORCID:0000-0003-0632-8974

**Rezime:** Pojava onlajn banaka, BigTech i FinTech konkurenata uslovila je transformaciju bankarskog sektora, podstičući tradicionalne banke da primenjuju napredne tehnologije poput veštačke inteligencije kako bi očuvale konkurentnost. U radu je prikazana primena veštačke inteligencije u bankarskom sektoru, sa posebnim osvrtom na generativnu veštačku inteligenciju. Predstavljeni su različiti načini na koje se veštačka inteligencija može primeniti za povećanje efikasnosti, unapređenje usluga i automatizaciju bankarskih procesa. U radu je predstavljena studija slučaja JPMorgan Chase, vodeće globalne finansijske institucije koja je uspešno integrisala veštačku inteligenciju u sve aspekte svog poslovanja. Pored toga, rad pruža pregled trenutnog stanja primene veštačke inteligencije u bankama u Srbiji, ukazujući na napredak koji je ostvarila Narodna banka Srbije i druge komercijalne banke. Ključni zaključak rada usmeren je na transformacioni potencijal veštačke inteligencije u bankarskom sektoru i njenu ulogu u oblikovanju budućnosti finansijskih usluga.

**Ključne reči:** veštačka inteligencija, bankarski sektor, digitalna transformacija, tehnološke inovacije, JPMorgan Chase, banke u Srbiji

**JEL klasifikacija:** O33, L86, G21

# Uvod

Banke se kontinuirano prilagođavaju digitalnoj transformaciji društva uvodeći brojne inovativne proizvode i usluge (Šehović, 2017; Stojmenović, 2020). To uključuje bankomate, kreditne i debitne kartice, razne onlajn platne i investicione usluge, elektronske transfere sredstava, telefonsko i mobilno bankarstvo, mobilne aplikacije, digitalne novčanike i internet bankarstvo (Funcas, 2021). Iako je tehnologija bila sastavni deo bankarskog sektora još od sredine 20. veka, finansijski sektor prolazi kroz značajne promene zbog pojave inovativnih konkurenata, poslovnih modela, proizvoda i usluga. Premda su banke istorijski bile dosta vešte u integraciji novih tehnologija, trenutni ekosistem finansijskih usluga zahteva veći stepen transformacije (Omarini, 2024). U finansijskom sektoru se koristi mnoštvo novih tehnologija poput veštačke inteligencije, napredne analitike podataka, velikih podataka, distribuirane tehnologije glavne knjige, blokčejna, biometrije, identifikacije korisnika na daljinu, računarstva u oblaku, Web3 i metaverzuma (Nowakowski, 2024). Pored toga, pojavljuju se novi tipovi banaka - onlajn banke, koje posluju bez fizičkih ekspozitura. One su nastale kao posledica sve veće digitalizacije finansijskih usluga i namenjene su tehnološki naprednim klijentima koji preferiraju onlajn bankarstvo. Onlajn banke često nude značajne funkcije poput informativnih korisničkih interfejsa, brzog otvaranja računa i nižih naknada u poređenju sa tradicionalnim bankama. Cilj im je da pruže praktičnije i pristupačnije bankarsko iskustvo, posebno za milenijalce i mlađe generacije (Funcas, 2021). Kako bi ostale konkurentne sa novonastalim onlajn bankama i FinTech i BigTech kompanijama, tradicionalne banke moraju da prihvate i integrišu moderna tehnološka rešenja u svoje poslovanje (Waliszewski, 2024). Jedno od tih rešenja je veštačka inteligencija (u nastavku skraćeno VI). VI se odnosi na sposobnost kompjuterskih programa da stiču i primenjuju znanje bez ljudske intervencije. Sistemi VI posmatraju svet oko sebe, samostalno analiziraju informacije, izvode zaključke i preduzimaju odgovarajuće akcije. Oni uče iz svojih prethodnih procena i vremenom poboljšavaju svoje performanse (Kaya, 2019). VI obuhvata niz tehnologija koje omogućavaju mašinama da simuliraju ljudsku inteligenciju, kao što su učenje, rezonovanje, rešavanje problema, percepcija i razumevanje jezika (Ghandour, 2021). U kontekstu bankarstva, VI se odnosi na upotrebu računara i mašina za simuliranje ljudske inteligencije, posebno u analizi događaja i donošenju odluka. VI može da obavlja zadatke koji obično zahtevaju ljudsku inteligenciju, kao što su prepoznavanje obrazaca, učenje iz podataka, donošenje odluka i predviđanje (Boustani, 2022).

Predmet ovog rada je primena VI i generativne VI u bankarskom sektoru. Cilj rada je da na sveobuhvatan način istraži i ukaže na sve mogućnosti primene VI u bankama, uz konkretne primere banaka koje su u svom poslovanju primenile sisteme VI.

Ključna istraživačka pitanja (IP) su:

IP 1: U koje svrhe se VI primenjuje u bankarskom sektoru?

IP 2: Koje su ključne odluke koje treba doneti prilikom implementacije generativne VI u bankama?

IP 3: Koja banka je najnaprednija u primeni VI i koje su ključne primene VI u toj banci?

IP 4: U kojoj meri se VI primenjuje u bankama u Srbiji?

Ovaj rad pruža značajan doprinos za razumevanje uloge VI u bankarstvu, kroz jedinstven pregled novih tehnologija i konkretnih primera njihove primene u vodećim bankama poput JPMorgan Chase. Sa praktičnog aspekta, doprinos rada je u tome što ukazuje na nove smernice za implementaciju generativnog modela VI ukazujući na Evident VI indeks kao značajan i koristan alat za procenu zrelosti banaka u primeni VI u svom poslovanju. Samim tim, značaj ovog rada proizilazi iz prikaza i sinteze postojećih pristupa koje banke primenjuju u cilju razvoja efikasnih strategija i optimalnog korišćenja prednosti VI, postavljajući na taj način nove standarde u bankarskom sektoru.

Rad je strukturiran na sledeći način. Na početku su istaknuti ciljevi istraživanja, ključna istraživačka pitanja, kao i pregled literature koji je posvećen definisanju VI i generativne VI, kao i njenim raznovrsnim mogućnostima primene u bankarskom sektoru. Drugi deo rada je posvećen metodologiji istraživanja i rezultatima. Ukazano je na Evident VI indeks uz objašnjenje njegove strukture i rang liste deset vodećih banaka u primeni VI, a zatim je prikazana studija slučaja JPMorgan Chase kao najbolje rangirane finansijske institucije u pogledu primene VI. Na kraju rada prikazano je trenutno stanje razvoja i implementacije VI u bankarskom sektoru u Srbiji. U zaključku rada su, pored ključnih rezultata, prikazane teorijske i praktične implikacije, ograničenja i pravci za buduća istraživanja na ovu temu imajući u vidu transformativnu ulogu VI u bankarskom sektoru.

# Pregled literature: veštačka inteligencija u bankarskom sektoru

VI može da se definiše kao naučno istraživanje računarskih principa koji stoje iza mišljenja i inteligentnog ponašanja (Skilton & Hovsepian, 2017). Ona predstavlja sposobnost računarskih sistema da se suoče sa složenim problemima, oponašaju reakcije slične ljudskim i ispoljavaju inteligentno ponašanje (Burgess, 2017). U suštini, VI predstavlja skup raznovrsnih tehnologija koje imaju brojne prednosti među kojima su: automatizacija procesa, poboljšanje procesa donošenja odluka, unapređenje korisničkog iskustva i ublažavanje rizika (Boustani, 2022). VI nije jedna tehnologija, već kombinacija različitih tehnologija koje se primenjuju na različite načine. Postoji nekoliko VI tehnologija koje se primenjuju u bankarstvu (Ghandour, 2021):

– Obrada prirodnog jezika i sistemi mašinskog učenja koji se koriste za automatizaciju interakcija sa korisnicima, analizu obrazaca potrošnje i izvršavanje finansijskih transakcija u ime klijenata.

– Sistemi analitike velikih podataka, podstaknuti VI i mašinskim učenjem koji se koriste za pružanje personalizovanih usluga i iskustava klijentima. Ovi sistemi koriste ogromne količine podataka o klijentima kako bi stekli uvid u njihove potrebe i ponašanja, omogućavajući bankama da prilagode proizvode i usluge u skladu sa tim.

– VI podstaknuta analitika velikih podataka takođe pomaže rukovodiocima i menadžerima u donošenju informisanih odluka u vezi sa internim procesima, operacijama, investicijama, rizicima i alokacijom resursa.

– Mašinsko učenje i prediktivna analitika koji se koriste za otkrivanje lažnih transakcija, obezbeđivanje usklađenosti sa internim politikama i propisima, poboljšanje bezbednosti transakcija i predviđanje budućih trendova.

Autori koji su se bavili primenom VI u jordanskim komercijalnim bankama identifikovali su tri sistema VI (Al-Hawamdeh & Alshaer, 2022):

– Ekspertski sistemi: Ovi sistemi čuvaju ljudsko znanje u računarima kako bi rešavali probleme koji obično zahtevaju stručnost ljudi. Oni simuliraju procese razmišljanja stručnjaka, ali ne mogu da uče iz iskustva. Ekspertski sistemi se koriste u bankarstvu za zadatke kao što su kreditno bodovanje, otkrivanje prevara i korisnička podrška.

– Sistemi neuronskih mreža: Ovi sistemi su modelirani po uzoru na neuronske mreže u ljudskom mozgu. Oni mogu da uče iz iskustva i prepoznaju obrasce, što ih čini korisnim za zadatke kao što su prepoznavanje slika, obrada prirodnog jezika i procena rizika.

– Sistemi fazi logike: Ovi sistemi mogu da obrađuju više vrednosti za istu promenljivu, omogućavajući im da reše probleme sa nizom podataka. Koriste se u bankarstvu za zadatke kao što su: odobravanje kredita, upravljanje portfoliom i finansijsko predviđanje.

U tabeli 1 je prikazana klasifikacija primene VI u bankama prema Nicoletti (2021).

**Tabela 1 - Klasifikacija primene VI u bankama**

| VI komponenta | Vrsta |
|---|---|
| Probabilističko rezonovanje (Mašinsko učenje) | Neuronske mreže, prediktivna analitika |
| Računarska logika | Rešavanje problema zasnovano na pravilima, ekspertski sistemi, rešavanje problema zasnovano na ograničenjima, automatizovano rezonovanje |
| Pametni interfejsi | Obrada prirodnog jezika, četbotovi, kompjuterska vizija |
| Pametna automatizacija procesa | Kognitivne tehnologije, robotska automatizacija procesa, robotsko kretanje i manipulacija |

*Izvor: Prilagođeno prema Nicoletti, B. (2021). Banking 5.0. How Fintech will Change Traditional Banks in the "New Normal" Post Pandemic. Palgrave Studies in Financial Service Technology. Switzerland: Palgrave MacMillan.*

Pregledom literature, može se zaključiti da se VI u bankarskom sektoru može primeniti za (Kaya, 2019; Nicoletti, 2021; Boustani, 2022; Mcmullen, 2023):

- **Otkrivanje i sprečavanje prevara:** Algoritmi VI analiziraju ogromne količine podataka o transakcijama u realnom vremenu. Učeći iz istorijskih obrazaca i identifikujući anomalije, VI može brzo da označi sumnjive aktivnosti, kao što su neobični iznosi potrošnje ili neuobičajene lokacije, što može ukazivati na prevaru. Ovo omogućava bankama da preduzmu hitne mere, kao što su blokiranje transakcija ili upozorenje klijenata, kako bi se sprečili finansijski gubici.
- **Naplata i povraćaj dugova:** VI nudi korisne opcije za naplatu i povraćaj dugova, naročito tokom ekonomskih kriza kada se povećava broj neizmirenih obaveza klijenata. Korišćenjem sistema ranog upozorenja i prediktivne analitike, banke mogu znatno da unaprede svoje rezultate u naplati dugova i na taj način mogu da ublaže finansijski rizik.
- **Pojednostavljen proces procene kreditnog rizika:** Korišćenjem modela mašinskog učenja i robotske automatizacije procesa, može se znatno pojednostaviti proces procene kreditnog rizika, posebno kod odobravanja onlajn kredita. Posledično, može se značajno smanjiti vreme koje je potrebno za donošenje odluka o odobravanju kredita.
- **Proces upoznavanja klijenata:** Poznavanje klijenata je ključni regulatorni zahtev za banke koje treba da provere identitet svojih klijenata i procene sve potencijalne rizike. Sistemi VI mogu da automatizuju i pojednostave ovaj proces tako što prikupljaju i proveravaju informacije iz različitih dokumenata, kao što su pasoši, vozačke dozvole i računi za komunalije. Algoritmi VI mogu da upoređuju podatke o klijentima sa eksternim izvorima, kao što su liste sankcija i liste za praćenje, kako bi identifikovali potencijalne rizike.
- **Četbotovi i virtuelni asistenti:** Četbotovi i virtuelni asistenti zasnovani na VI, doveli su do transformacije korisničke podrške u bankarstvu. Ovi inteligentni agenti mogu da obrade širok spektar upita klijenata, od osnovnih provera stanja na računu do kompleksnijih finansijskih saveta. Korišćenjem obrade prirodnog jezika i mašinskog učenja, četbotovi mogu da razumeju i odgovore na upite klijenata, pružajući brzu i efikasnu podršku 24 sata dnevno, 7 dana u nedelji. Ključne prednosti četbotova

su poboljšana korisnička usluga, personalizovano korisničko iskustvo, smanjeno vreme čekanja, smanjeni troškovi, kao i poboljšanje radnih uslova jer zaposleni u bankama mogu da posvete svoje vreme drugim, složenijim i kreativnijim zadacima i aktivnostima (Nicoletti, 2021).

- **Poboljšano korisničko iskustvo:** VI omogućava bankama da personalizuju svoje usluge prema potrebama i afinitetima klijenata. Četbotovi i aplikacije mogu da pruže personalizovane finansijske savete, podsetnike za plaćanje računa i lakši pristup informacijama o računu, čime se poboljšava celokupno korisničko iskustvo.

- **Robo-savetnici i personalizovano finansijsko planiranje:** Robo-savetnici su platforme VI koje nude automatizovane savete za ulaganje i upravljanje portfoliom. Analizirajući podatke o klijentima, kao što su tolerancija na rizik, finansijski ciljevi i preferencije za ulaganja, robo-savetnici mogu da kreiraju personalizovane investicione portfolije i daju preporuke prilagođene individualnim potrebama. Na ovaj način se demokratizuje pristup finansijskim savetima, jer oni postaju pristupačniji široj populaciji klijenata.

- **Analiza i ekstrakcija podataka:** Banke se suočavaju sa ogromnim količinama nestrukturiranih podataka, kao što su pravna dokumenta, ugovori i finansijski izveštaji. Alati zasnovani na VI mogu da analiziraju i izvlače vredne zaključke iz ovih podataka, automatizujući zadatke koji bi inače zahtevali značajan manuelni rad. Na primer, algoritmi VI mogu da identifikuju i izdvoje ključne klauzule iz pravnih dokumenata, da sumiraju finansijske izveštaje, pa čak i da predvide trendove na tržištu na osnovu vesti i sentimenta na društvenim mrežama.

- **Povećana efikasnost i produktivnost:** VI može da automatizuje rutinske zadatke, oslobađajući zaposlene da se fokusiraju na kompleksnije aktivnosti koje zahtevaju kreativnost. Procesom automatizacije mogu da se povećaju efikasnost i ukupna produktivnost banke.

- **Inovacije i konkurentska prednost:** Banke koje primenjuju VI mogu da razvijaju inovativne proizvode i usluge, izdvajajući se od konkurencije i održavajući vodeću poziciju na stalno promenljivom tržištu.

- **Demokratizacija finansijskih usluga:** VI čini finansijske usluge dostupnijim pojednostavljujući procese i smanjujući troškove. Na primer, robo-savetnici mogu da demokratizuju investicije u portfolije čineći ih pristupačnim svim onim klijentima koji ranije nisu mogli da se uključe u ove aktivnosti zbog visokih naknada.

Predstavljene mogućnosti za primenu VI pokazuju njen transformativni potencijal u bankarskom sektoru. Automatizacijom procesa, poboljšanjem procesa donošenja odluka i unapređenjem korisničkog iskustva, VI dovodi do revolucije u pogledu načina na koji banke posluju i pružaju finansijske usluge. Štaviše, VI ima potencijal da značajno utiče na profitabilnost banaka. VI tehnologije mogu da smanje troškove, posebno u oblastima kao što su ljudski resursi i operacije, i da doprinesu generisanju prihoda omogućavajući razvoj novih, personalizovanih proizvoda i usluga koje bolje zadovoljavaju potrebe klijenata. Empirijske studije ukazuju na pozitivnu korelaciju između usvajanja VI i profitabilnosti banke, što implicira da banke koje aktivno ulažu u tehnologije VI imaju tendenciju da budu profitabilnije. Samim tim, važnost implementacije VI za banke je od velikog značaja kako bi se suočile sa izazovima poput slabe profitabilnosti i ostale konkurentne u sve digitalnijem i podacima vođenom finansijskom okruženju (Kaya, 2019).

# Generativna VI i ključne odluke prilikom njene implementacije u bankama

Generativna VI obuhvata kategoriju sistema VI koji su sposobni da stvaraju inovativan i jedinstven sadržaj. Ovi sistemi se tokom faze obuke izlažu velikim količinama podataka, što im omogućava da identifikuju i razumeju obrasce i strukture podataka. Po završetku obuke, ovi sistemi mogu da generišu novi sadržaj koji, iako nikada ranije nije viđen, ima sličnosti sa primerima na kojima su obučeni (Taulli, 2023).

Uvođenje generativne VI zahteva pažljivo razmatranje različitih ključnih oblasti koje su opisane u nastavku ovog rada (Buehler et al., 2024). Prvo, potrebno je da se definiše ko će predvoditi razvoj strategije za generativnu VI, da li će to biti centralizovani napor ili će razvoj strategije biti delegiran pojedinačnim poslovnim jedinicama. Ceo proces transformacije treba da obuhvati definisanje vizije za potencijalne prednosti koje generativna VI može doneti i identifikaciju funkcija i procesa koji će najverovatnije biti pod najvećim uticajem VI. Drugo, važno je odrediti ko ima autoritet da odluči koji delovi organizacije će koristiti generativnu VI i koji specifični slučajevi upotrebe unutar tih delova će imati prioritet. Na taj način se osigurava usklađenost između mogućnosti tehnologije i ciljeva organizacije. Treće, važno je odabrati najprikladniji pristup implementacije generativne VI. To može uključivati nabavku ciljanih rešenja, integraciju sveobuhvatnijih postojećih rešenja ili razvoj sopstvenih rešenja. Svaki model ima svoje prednosti i implikacije za resurse, kontrolu i prilagođavanje. Četvrto, važno je doneti odluke o mehanizmu finansiranja inicijativa za generativnu VI i razmotriti da li će finansiranje biti centralizovano ili decentralizovano, usklađujući odluku sa celokupnim pristupom usvajanju generativne VI unutar organizacije. Peto, potrebno je planirati ljudske resurse i identifikovati neophodne veštine za uspešnu implementaciju generativne VI. To može uključivati zapošljavanje novih talenata, obučavanje postojećih zaposlenih ili angažovanje eksternih izvršilaca za specifične zadatke. Šesto, važno je uspostaviti jasne mere zaštite od rizika, kao što su zaštita podataka o privatnosti i intelektualne svojine, i odrediti ko je odgovoran za definisanje i sprovođenje ovih mera. Potrebno je proceniti da li postojeći okviri za upravljanje rizicima treba da budu prilagođeni rizicima specifičnim za generativnu VI i da li je potrebno dodatno upravljanje za određene slučajeve upotrebe, posebno one koji uključuju interakciju sa korisnicima. Konačno, važno je formirati poseban tim koji će nadgledati sprovođenje sveobuhvatnog plana upravljanja promenama. Ovaj plan treba da se bavi neophodnim promenama u načinu razmišljanja i ponašanja u celoj organizaciji kako bi se obezbedio uspešan prelazak na generativnu VI. U Tabeli 2 su sumirane ključne odluke koje treba doneti prilikom implementacije generativne VI.

**Tabela 2 - Ključne odluke prilikom implementacije generativne VI**

| Oblast | Ključne oblasti odlučivanja |
|---|---|
| Strategija i vizija | Odrediti ko definiše strategiju generativne VI (na nivou cele organizacije ili poslovne jedinice). Razviti viziju potencijalne vrednosti i proceniti funkcije/procese koji će najverovatnije biti pod najvećim uticajem generativne VI. |
| Domeni i slučajevi upotrebe | Odlučiti ko određuje domene organizacije za primenu generativne VI i specifične slučajeve upotrebe unutar tih domena. |
| Model implementacije | Izabrati da li će se nabaviti ciljana rešenja, integrisati šira, sveobuhvatnija rešenja ili razviti sopstvena rešenja. |
| Finansiranje | Odrediti kako će se finansirati slučajevi upotrebe generativne VI, uzimajući u obzir nivo centralizacije/decentralizacije pristupa generativnoj VI. |
| Talenti | Definisati potrebne veštine za uspešnu primenu generativne VI i obezbediti talente putem zapošljavanja, usavršavanja, angažovanja eksternih izvršilaca ili kombinovano. |

| | |
|---|---|
| Rizik | Odrediti ko definiše mere zaštite od rizika (npr. privatnost podataka, intelektualna svojina) i strategije ublažavanja rizika. Odlučiti da li postojeći okviri zahtevaju prilagođavanja za rizike specifične za generativnu VI i da li je potreban dodatni obuhvat za određene slučajeve upotrebe (npr. one koji su okrenuti prema klijentima). |
| Upravljanje promenama | Formirati tim koji će voditi proces upravljanja promenama kako bi se osigurale neophodne promene u načinu razmišljanja i ponašanja za uspešno usvajanje generativne VI u celoj organizaciji. |

*Izvor: prilagođeno prema Buehler, K., Corsi, A., Jurisic, M., Lerner, L., Siani, A., & Weintraub, B. (2024). Scaling gen AI in banking: Choosing the best operating model, dostupno na: https://www.mckinsey.com/industries/financial-services/our-insights/scaling-gen-ai-in-banking-choosing-the-best-operating-model#/ (datum pristupa 4.7.2024.)*

Temeljnim analiziranjem svih navedenih odluka koje treba doneti prilikom primene VI, banke mogu da postave čvrste temelje za iskorišćavanje transformativnog potencijala generativne VI, istovremeno ublažavajući potencijalne rizike i izazove. VI je još uvek relativno nova tehnologija i postoje izazovi koji moraju biti rešeni pre nego što bankarski sektor usvoji ovu tehnologiju, kao što su potreba za više podataka i razvoj sofisticiranijih algoritama za upravljanje složenim finansijskim podacima i rizicima (Farishy, 2023).

Budućnost VI u bankarskom sektoru će verovatno biti obeležena povećanom personalizacijom, efikasnošću i inovacijama. VI će se sve više koristiti za analizu podataka o klijentima kako bi se pružili personalizovani proizvodi i usluge, pojednostavili procesi i smanjili troškovi. Iako VI može da automatizuje određene zadatke i potencijalno zameni neka radna mesta, ona će takođe stvoriti nove mogućnosti u oblastima kao što su: analiza podataka, programiranje i dalji razvoj VI (Boustani, 2022).

Mogućnosti za primenu generativne VI unutar organizacije su neograničene i kontinuirano se šire. Ova tehnologija može da transformiše svaki aspekt poslovanja, od unapređenja interakcije sa klijentima u kontakt centru do podsticanja inovacija u marketingu, razvoju proizvoda i kreiranju sadržaja. Štaviše, može da optimizuje ljudske resurse, poboljša podršku zaposlenima i redefiniše iskustva klijenata (Taulli, 2023).

# Metodologija istraživanja

Metodologija istraživanja primenjena u ovom radu kombinuje kabinetsko istraživanje literature, prikaz i analizu Evident VI indeksa i studiju slučaja JPMorgan Chase. Istraživanje je sprovedeno u periodu od maja do septembra 2024. godine.

Kabinetsko istraživanje je obuhvatilo temeljno proučavanje različitih izvora, poput knjiga, akademskih radova, industrijskih izveštaja i studija slučaja vezanih za primenu VI u bankarskom sektoru. Pregled literature ima za cilj da predstavi trenutno stanje VI u bankarstvu, identifikuje ključne trendove i izazove, i analizira specifične slučajeve implementacije VI. Pored pregleda literature, rad takođe ukazuje na Evident VI indeks i njegovu strukturu, kao i sistem rangiranja koji procenjuje stepen usvajanja VI među najvećim svetskim bankama. Ovaj indeks ocenjuje banke na osnovu četiri stuba: talenta, inovacija, liderstva i transparentnosti. Analizom rezultata indeksa, rad pruža uvid u relativni napredak različitih banaka u pogledu primene VI i identifikuje lidere u ovoj oblasti. Osim toga, u radu je predstavljena i studija slučaja JPMorgan Chase, vodeće globalne banke koja aktivno integriše VI u svoje poslovanje. Studija slučaja ispituje specifične primene VI unutar JPMorgan Chase, kao što su: trgovanje uz pomoć VI, upravljanje rizicima, otkrivanje prevara, korisnička podrška i sajber bezbednost. Kroz studiju slučaja, rad pruža praktičan primer kako se VI koristi za povećanje efikasnosti, poboljšanje procesa donošenja odluka i podsticanje inovacija u bankarskom sektoru.

Kao rezultat primenjenih metoda istraživanja, ovaj rad omogućava detaljno razumevanje teme, pružajući i teorijske uvide i praktične primere implementacije VI u bankarskom sektoru.

## Rezultati istraživanja: Struktura Evident VI indeksa i rangiranje banaka

Evident VI indeks je sveobuhvatan sistem rangiranja osmišljen da proceni zrelost usvajanja i implementacije VI u bankarskom sektoru. On evaluira 50 najvećih svetskih banaka na osnovu preko 100 individualnih indikatora, kategorizovanih u četiri stuba (Evident Insights, 2023):

- **Talenat:** Ovaj stub procenjuje kvantitet, kvalitet i razvoj stručnjaka za VI. Uzima u obzir faktore kao što su broj zaposlenih koji se bave VI, njihovo formalno obrazovanje, kao i inicijative banke za privlačenje, zadržavanje i usavršavanje talenata u ovoj oblasti.

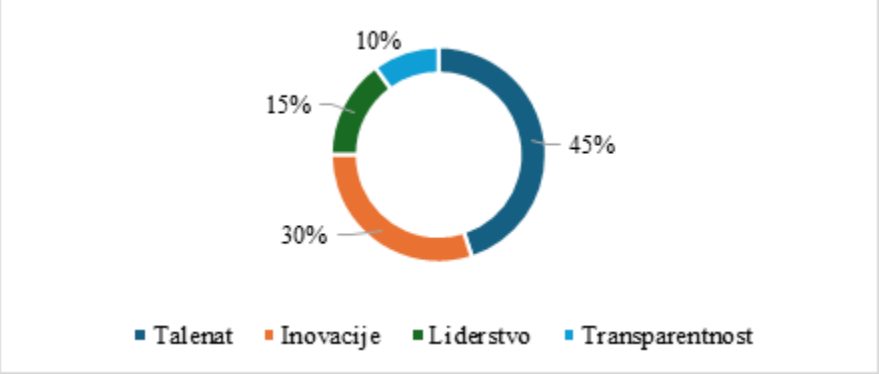
- **Inovacije:** Ovaj stub ocenjuje ulaganje banke u inovacije u oblasti VI, uključujući istraživački rad, prijave patenata, poduhvate, partnerstva i angažovanje u zajednici otvorenog koda. Procenjuje se sposobnost banke da razvija i primenjuje najsavremenije tehnologije VI.

- **Liderstvo:** Ovaj stub meri fokus liderskog tima banke na VI, što se ogleda u njihovoj komunikacionoj strategiji, pozicioniranju rukovodilaca i spoljnom angažovanju u praćenju tema vezanih za VI. Procenjuje se posvećenost i vizija lidera banke u podsticanju transformacije ka VI.

- **Transparentnost:** Ovaj stub ispituje transparentnost banke u pogledu odgovorne primene VI. Razmatra faktore poput postojanja posebnih timova za odgovornu primenu VI, objavljivanja etičkih principa i komunikacije inicijativa o odgovornoj VI.

VI indeks se izračunava korišćenjem ponderisanog sistema bodovanja, gde svaki stub doprinosi određenim procentom ukupnom rezultatu. Ponderi su sledeći (Evident Insights, 2023): talenat sa 45%, inovacije sa 30%, liderstvo sa 15% i transparentnost sa 10% (Slika 1).

**Slika 1 - Ponderisani sistem bodovanja u okviru Evident VI indeksa**




*Izvor: Prilagođeno prema Evident Insights (2023). The Evident AI Index Key Findings Report: The global standard benchmark of AI maturity. Evident Insights.*

Svaka banka se evaluira na osnovu individualnih indikatora unutar svakog stuba. Ponderisani prosek rezultata u sva četiri stuba određuje ukupni rang banke prema Evident VI indeksu.

Evident VI indeks se oslanja isključivo na javno dostupne informacije, obezbeđujući nezavisnu i nepristrasnu procenu zrelosti primene VI svake banke. Služi kao vredan pokazatelj za banke, investitore i savetnike, koji im služi da prate napredak, identifikuju najbolje prakse i donose informisane odluke u vezi sa usvajanjem i transformacijom VI u bankarskom sektoru. Evident VI indeks je važan iz sledećih razloga (Evident Insights, 2023):

- Merenje uspešnosti i praćenje napretka: Indeks omogućava bankama da procene svoju zrelost u oblasti VI u poređenju sa konkurencijom i da prate svoj napredak tokom vremena. Ovo im pomaže da identifikuju oblasti u kojima su uspešni i oblasti u kojima je potrebno unapređenje.

- Identifikovanje najboljih praksi: Rangirajući banke na osnovu različitih kriterijuma, indeks ukazuje na one banke koje prednjače u primeni VI. Ovo omogućava drugim bankama da uče iz njihovih uspeha i primene najbolje prakse.

- Informisano strateško odlučivanje: Indeks pruža važne uvide u različite pristupe koje banke preduzimaju u usvajanju VI. Ove informacije mogu pomoći bankama da donesu informisanije odluke o sopstvenim strategijama i ulaganjima u VI.

- Promovisanje transparentnosti i odgovornosti: Indeks uključuje segmente koji su posvećeni transparentnosti, podstičući na taj način banke da budu otvorenije u pogledu svojih odgovornih praksi u vezi sa VI. Ovo promoviše veću odgovornost i poverenje u korišćenje VI u finansijskom sektoru.

- Podsticanje konkurencije i inovacija: Isticanjem lidera u primeni VI, indeks podstiče konkurentno okruženje koje ohrabruje banke da inoviraju i ubrzaju svoje napore u transformaciji ka VI.

U tabeli 3 je prikazano prvih deset banaka prema vrednosti Evident VI indeksa za 2023. godinu. Prema vrednostima indeksa, JPMorgan Chase je pozicioniran na prvo mesto.

**Tabela 3 - Rang lista prvih deset banaka prema vrednosti Evident VI indeksa**

| Banka | Rang | Talenat | Inovacije | Liderstvo | Transparentnost |
|---|---|---|---|---|---|
| JPMorgan Chase | 1 | 2 | 1 | 2 | 1 |
| Capital One | 2 | 1 | 2 | 8 | 5 |
| Royal Bank of Canada | 3 | 7 | 3 | 5 | 2 |
| Wells Fargo | 4 | 4 | 5 | 32 | 10 |
| UBS | 5 | 3 | 19 | 17 | 22 |
| CommBank | 6 | 16 | 20 | 3 | 4 |
| Goldman Sachs | 7 | 8 | 4 | 15 | 49 |
| ING | 8 | 6 | 10 | 19 | 15 |
| Citigroup | 9 | 5 | 8 | 26 | 31 |
| DBS | 10 | 22 | 34 | 1 | 12 |

*Izvor: prilagođeno prema Evident Insights (2023). The Evident AI Index Key Findings Report: The global standard benchmark of AI maturity. Evident Insights.*

# Studija slučaja: JPMorgan Chase

JPMorgan Chase je globalna kompanija za finansijske usluge sa istorijom dugom više od dva veka. Pruža raznovrsne finansijske usluge, uključujući upravljanje imovinom, komercijalno bankarstvo, bankarstvo za fizička lica i investiciono bankarstvo. Ključni poslovni principi kompanije su izuzetna usluga za klijente, operativna izvrsnost, posvećenost integritetu i kultura pobedničkog duha. JPMorgan Chase nastoji da premaši očekivanja svojih klijenata pružajući im visokokvalitetne proizvode i usluge. Kompanija takođe naglašava integritet i pravičnost u svim poslovnim oblastima i odnosima. JPMorgan Chase veruje da je jaka organizaciona kultura ključna za uspeh i neguje timski rad (https://www.jpmorganchase.com/about/business-principles).

JPMorgan Chase prednjači u procesu integracije VI u svoje poslovne operacije, proizvode i usluge. Ova studija slučaja prikazuje strateški pristup JPMorgan Chase banke pri primeni VI, ističući ključne primere upotrebe, organizacionu strukturu i uticaj VI na performanse banke i širi finansijski sistem. JPMorgan Chase koristi VI u različitim oblastima, kao što su: upravljanje rizicima, otkrivanje prevara, trgovanje i korisnički servis. Banka je razvila sopstvenog VI virtuelnog asistenta za korporativne klijente i aktivno istražuje upotrebu generativne VI. Dominantna pozicija JPMorgan Chase banke je direktan rezultat ulaganja u talente za istraživanje VI. Banka zapošljava preko 200 istraživača VI (Business Wire, 2024). Takođe, JPMorgan Chase ima poseban tim za istraživanje VI koji sarađuje sa akademskim institucijama i partnerima iz industrije kako bi istražio najsavremenije tehnologije VI. Štaviše, JPMorgan Chase je uspostavio Centar izvrsnosti za objašnjivu VI sa ciljem podsticanja saradnje unutar organizacije i obezbeđivanja usklađenosti VI inicijativa sa poslovnim ciljevima (https://www.jpmorgan.com/technology/artificial-intelligence/initiatives/explainable-ai-center-of-excellence). VI se koristi za automatizaciju zadataka, unapređenje donošenja odluka i kreiranje novih proizvoda i usluga. Neki od načina na koje JPMorgan Chase koristi VI su (Erdoes, 2024):

- Identifikuje mogućnosti za implementaciju VI u celoj organizaciji.
- Automatizuje zadatke i efikasnije vodi celokupno poslovanje.
- Sarađuje sa stručnjacima ili pojedincima koji imaju znanje i razumevanje VI kako bi pomogli rukovodiocima da identifikuju sve mogućnosti.

U tabeli 4 su prikazane ključne primene VI u JPMorgan Chase banci.

**Tabela 4 - Primena VI u JPMorgan Chase banci**

| Primena VI | Opis | Uticaj |
|---|---|---|
| **Trgovanje i upravljanje rizicima** | | |
| Algoritamsko trgovanje | Algoritmi VI izvršavaju brze trgovine i prate performanse portfolija. | Poboljšava izvršenje trgovine i upravljanje rizicima. |
| Procena rizika | Modeli mašinskog učenja analiziraju ogromne količine podataka kako bi procenili kreditne rizike, volatilnost tržišta i potencijalne prilike. | Poboljšava sposobnost banke da efikasno upravlja rizicima. |
| Otkrivanje prevara | Sistemi VI kontinuirano prate transakcije kako bi identifikovali sumnjivu aktivnost u realnom vremenu. | Smanjuje finansijske gubitke usled prevara i jača bezbednost. |

| | | |
|---|---|---|
| **Inicijative usmerene na klijente** | | |
| Četbotovi i virtuelni asistenti | VI četbotovi i virtuelni asistenti pružaju trenutnu podršku klijentima i odgovaraju na upite. | Povećava efikasnost i dostupnost korisničkog servisa. |
| Personalizovane preporuke | Algoritmi VI analiziraju istoriju transakcija i ponašanje klijenata kako bi ponudili personalizovane predloge proizvoda. | Povećava mogućnosti unakrsne prodaje identifikovanjem relevantnih proizvoda za klijente. |
| Kreditno bodovanje | Modeli VI procenjuju kreditnu sposobnost preciznije od tradicionalnih metoda. | Omogućava banci da proširi kredite i zajmove na širi spektar klijenata uz poboljšanu procenu rizika. |
| **Operativna izvrsnost** | | |
| Analitika podataka | Mašinsko učenje i analitika velikih podataka pomažu banci da izvuče korisne uvide iz ogromnih skupova podataka. | Informiše strateško donošenje odluka i poboljšava upravljanje rizicima. |
| Automatizacija | Robotska automatizacija procesa automatizuje repetitivne zadatke. | Smanjuje operativne troškove, minimizira greške i oslobađa zaposlene za složenije zadatke. |
| Sprečavanje pranja novca | Algoritmi VI unapređuju procese koji se odnose na sprečavanje pranja novca identifikovanjem sumnjivih transakcija i smanjenjem lažno pozitivnih rezultata. | Povećava efikasnost i tačnost praćenja sumnjivih transakcija. |
| **VI i sajber bezbednost** | | |
| Otkrivanje pretnji | Sistemi VI za sajber bezbednost identifikuju i neutrališu sajber pretnje analizirajući obrasce i anomalije u mrežnom saobraćaju. | Jača bezbednosnu poziciju banke i smanjuje rizik od sajber napada. |
| **VI i održivo finansiranje** | | |
| Analitika vezana za održivost finansiranja | Alati VI analiziraju podatke o životnoj sredini, društvenoj odgovornosti i upravljanju (engl. environmental, society, governance - ESG) kako bi procenili rizike i prilike za ulaganja povezane sa održivošću. | Podržava posvećenost banke odgovornom ulaganju. |

*Izvor: prilagođeno prema Verma, N. (2023). JP Morgan Chase: Revolutionizing Banking Through AI – Case Study, dostupno na: https://medium.com/@vermanikhil605/jp-morgan-chase-revolutionizing-banking-through-ai-case-study-a659c0b0957f (datum pristupa 1.7.2024)*

Ciljevi istraživanja VI koje sprovodi JPMorgan Chase jesu da se VI iskoristi za razumevanje i upravljanje složenim ekonomskim sistemima, predviđanje i sprečavanje finansijskog kriminala, omogućavanje bezbedne razmene podataka, poboljšanje iskustva klijenata, osnaživanje zaposlenih i obezbeđivanje usklađenosti sa propisima. Sveobuhvatni cilj je da se razvije i primeni etička VI koja koristi ne samo kompaniji već i njenim klijentima, zaposlenima i društvu u celini (https://www.jpmorgan.com/technology/artificial-intelligence).

## Trenutno stanje primene veštačke inteligencije u bankama u Srbiji

VI ima potencijal da pruži značajne i vredne koristi za centralne banke (Martin, 2024). Narodna banka Srbije (NBS) koristi širok spektar tehnika VI u različite svrhe, kao što su (Tabaković, 2023):

- **Upravljanje rizicima i otkrivanje prevara:** NBS primenjuje prediktivnu analitiku i algoritme mašinskog učenja, konkretno samoorganizujuće mape (engl. Self-Organizing Maps) i Lasso logističku regresiju, u svom sistemu ranog upozoravanja za predviđanje potencijalnih teškoća u bankarskim operacijama. Na ovaj način je omogućeno proaktivno praćenje i ublažavanje rizika.

- **Makroekonomska analiza:** Modeli mašinskog učenja se koriste za procenu makroekonomskog okruženja, pomažući u scenarijima testiranja otpornosti bankarskog sektora. Takođe, služe kao podrška u projektovanju referentnog vodiča za stopu kontracikличne rezerve kapitala, doprinoseći finansijskoj stabilnosti.

- **Praćenje inflacije u realnom vremenu:** NBS je razvila inovativni model za trenutnu procenu inflacije zasnovan na veb skrejping tehnologiji. Ovaj model automatski prikuplja podatke o cenama sa preko 130 veb sajtova, pokrivajući oko 90% korpe potrošačkih cena. Prikupljeni podaci se zatim obrađuju pomoću automatizovanih algoritama kako bi se pružili uvidi u realnom vremenu o trendovima inflacije. Ovo omogućava NBS da prati inflaciju na dnevnom ili nedeljnom nivou, omogućavajući pravovremene intervencije.

NBS je uspešno integrisala VI u svoje poslovanje, demonstrirajući sveobuhvatan pristup korišćenja VI za različite potrebe i svrhe. Upotreba VI u upravljanju rizicima, otkrivanju prevara, makroekonomskoj analizi i praćenju inflacije u realnom vremenu pokazuje posvećenost banke inovacijama i donošenju odluka zasnovanih na podacima.

Na osnovu podataka od 1. jula 2024. godine u bankarskom sektoru Srbije postoji 20 poslovnih banaka, od čega su dve državne banke, tri domaće privatne banke i 15 stranih banaka (https://www.nbs.rs/sr/finansijske-institucije/banke/spisak-banaka/). Odlukom o utvrđivanju liste sistemski značajnih banaka u Srbiji od 10. maja 2024. godine utvrđeno je da postoji devet banaka koje u Srbiji predstavljaju sistemski značajne banke (https://nbs.rs/sr_RS/ciljevi-i-funkcije/finansijska-stabilnost/zastitni_slojevi_kapitala/sistemski-znacajne-banke/). Prema istraživanju koje je sprovela NBS 2023. godine, utvrđeno je da banke u Srbiji koriste VI na različite načine. Sedam banaka koristi prediktivnu analitiku, šest koristi robotsku automatizaciju procesa, četiri koriste mašinsko učenje, a tri koriste analitiku u realnom vremenu (Tabela 5).

**Tabela 5 - Primena VI u bankama u Srbiji**

| Primena VI | Broj banaka | Procenat u odnosu na ukupan broj banaka |
|---|---|---|
| Prediktivna analitika | 7 | 35% |
| Robotska automatizacija procesa | 6 | 30% |
| Mašinsko učenje | 4 | 20% |
| Analitika u realnom vremenu | 3 | 15% |
| Ne primenjuju, ali planiraju da primene u budućnosti | 5 | 25% |

*Izvor: prilagođeno prema Tabaković, J. (2023). Governor Tabaković's speech at Finticipate vol. 2 – SEE Fintech Forum, dostupno na: https://nbs.rs/en/scripts/showcontent/index.html?id=18981 (datum pristupa 1.7.2024)*

U svom izveštaju NBS nije navela nazive, niti je izložila vlasničku strukturu banaka koje primenjuju VI u svom poslovanju. Stoga su u ovom radu isključivo prikazani javno dostupni podaci do kojih se moglo doći pretraživanjem Internet sajtova banaka i drugih javnih izvora, a koji se odnose na primenu VI u bankama. Raspoloživi podaci o primeni VI u bankama u Srbiji ukazuju da tu spadaju četiri sistemski značajne banke - Raiffeisen, Intesa Sanpaolo, UniCredit i OTP banka i jedna banka koja nije svrstana u sistemski značajne banke - 3Banka. Posledično, može se zaključiti da procenat sistemski značajnih banaka u Srbiji koje primenjuju VI u svom poslovanju iznosi 44,44%.

Raiffeisen banka je bila predvodnik primene VI u Srbiji uvođenjem usluge zasnovane na VI u vidu virtuelnog asistenta, četbota po imenu Rea (engl. Raiffeisen Electronic Assistant). Rea pruža korisničku podršku non-stop na različitim platformama poput Viber-a, Facebook-a i veb sajta banke. Rea prvenstveno odgovara na pitanja o ponudi banke, ali i edukuje korisnike o drugim digitalnim uslugama. Inicijalno je konstruisana za predstavljanje proizvoda banke, ali je vremenom Rea evoluirala kako bi pomogla registrovanim korisnicima u različitim zadacima, kao što su: provera stanja na računu, obavljanje plaćanja, slanje novca putem QR koda i plaćanje računa (Dukić, 2023). Preuzimajući jednostavne i uobičajene upite, Rea omogućava zaposlenima banke da se fokusiraju na klijente sa složenijim potrebama. Rea funkcioniše u potpunosti u skladu sa standardima elektronskog bankarstva i bezbednosnim i kulturnim normama svog okruženja. Posvećenost bezbednosti i etičkoj upotrebi VI predstavlja način na koji Raiffeisen banka pristupa ovoj tehnologiji (Buha & Bjegović, 2023). Pored opisanog, Raiffeisen banka koristi VI i u drugim oblastima svog poslovanja. Na primer, sistem za upravljanje odnosima sa klijentima pod nazivom Selecta (sistem kompanije Saga (https://selectacrm.app/?lang=sr)) koristi pristup 360°, izgrađujući sveobuhvatne korisničke profile na osnovu interakcija na različitim kanalima, uključujući mobilno bankarstvo, imejl, četbotove, bankomate, kontakt centre i ekspoziture. Ovaj integrisani pristup omogućava Raiffeisen banci da pruži personalizovano i efikasnije korisničko iskustvo (Buha & Bjegović, 2023).

Banka Intesa Sanpaolo ima posebnu laboratoriju za VI u okviru koje se razvijaju praktična rešenja i sprovode teorijska istraživanja kako bi se pripremila za specifične izazove poslovnog i finansijskog sektora. Koristeći sveobuhvatnu bazu znanja, primarni cilj banke je zaštita finansijskih portfolija od značajnih tržišnih fluktuacija. Iskorišćavanjem potencijala VI, tim stručnjaka može da analizira velike skupove faktora rizika za samo nekoliko sekundi, drastično smanjujući vreme koje se nekada merilo nedeljama (Banka Intesa, 2021). Pored toga, Intesa Sanpaolo primenjuje sisteme VI za automatizaciju poslovnih procesa, pripremu personalizovanih ponuda klijentima, preciznije targetiranje klijenata i sprečavanje zloupotreba (Urošević, 2023).

VI se još uvek dominantno primenjuje u aktivnostima koje se odnose na informisanje klijenata i komunikaciju sa njima. Na primer, UniCredit i OTP banka koriste virtuelne asistente, odnosno četbotove, koji pružaju odgovore na različita pitanja klijenata o proizvodima i uslugama. OTP banka, pored OTI četbota, već nekoliko godina primenjuje VI u upravljanju odnosima sa klijentima, kao i u odeljenju za rizike. Od banaka koje nisu klasifikovane kao sistemski značajne banke, a primenjuju VI značajno je istaći 3Banku (poznatija kao Opportunity banka do 2021. godine). Ova banka je još 2015. godine primenjivala tehničko rešenje koje je na osnovu podataka prikupljenih sa terena automatski donosilo odluke o odobrenju kredita (Marković, 2023).

# Zaključak

VI, a posebno generativna VI, revolucionarno menja bankarski sektor. VI se koristi za povećanje efikasnosti, poboljšanje korisničkog iskustva i automatizaciju različitih procesa unutar banaka. Vodeće finansijske institucije poput JPMorgan Chase uspešno su integrisale VI u svoje poslovanje, koristeći je za zadatke kao što su: trgovanje, upravljanje rizicima, otkrivanje prevara, korisnički servis i sajber bezbednost. Od 20 banaka koje posluju u Srbiji (na dan 1. jul 2024. godine), sedam banaka koristi prediktivnu analitiku, šest banaka robotsku automatizaciju procesa, četiri banke mašinsko učenje i tri banke analitiku u realnom vremenu. Dostupni podaci ukazuju da u Srbiji četiri od ukupno devet sistemski značajnih banaka primenjuju VI u svom poslovanju. Takođe, značajno je istaći i da Narodna banka Srbije, kao centralna banka, primenjuje VI za upravljanje rizicima, otkrivanje prevara, makroekonomsku analizu i praćenje inflacije u realnom vremenu.

Ovaj rad pruža nekoliko teorijskih i praktičnih implikacija za razumevanje i primenu VI u bankarskom sektoru. Sa teorijskog stanovišta, rad se bavi novom oblašću generativne VI, ističući njen potencijal da transformiše različite aspekte bankarstva. To doprinosi rastućem korpusu znanja o ulozi VI u bankarskom sektoru. Rad pruža pregled tehnologija VI i njihovih mogućnosti primene u bankarstvu, obogaćujući teorijsko razumevanje ove oblasti. Studija slučaja JPMorgan Chase banke nudi uvid u to kako vodeća banka koristi VI za unapređenje svojih operacija i performansi. Ova analiza doprinosi teorijskom razumevanju odnosa između primene VI i profitabilnosti banke.

Sa praktičnog stanovišta, rad pruža značajne praktične smernice za banke koje razmatraju primenu VI. Rad ističe ključne odluke koje treba doneti prilikom implementacije generativnog operativnog modela VI, pomažući na taj način bankama da se lakše snađu u složenom procesu integracije VI. Evident VI indeks, koji je detaljno predstavljen u radu, služi kao vredan alat za banke da procene svoju zrelost u oblasti VI u poređenju sa liderima u ovom sektoru i identifikuju najbolje prakse. Samim tim, banke imaju jasne smernice u pogledu razvoja efektivnih strategija VI i maksimiziranju koristi od primene VI.

Rad ima određena ograničenja. Prvenstveno, orijentisan je samo na pozitivne aspekte VI u bankarstvu, ističući njene potencijalne koristi. Međutim, nedostaje kritička analiza potencijalnih rizika i izazova povezanih sa primenom VI, kao što su gubitak radnih mesta i pretnje sajber bezbednosti. Iako su u radu primenjeni različiti izvori, treba napomenuti da se rad isključivo oslanja na sekundarne podatke koji mogu biti podložni pristrasnosti i subjektivnosti.

Predlog za buduća istraživanja je da se sprovede detaljnija analiza i diskusija o pozitivnim i negativnim aspektima primene VI u bankarskom sektoru. Kako bi se stekao dublji uvid u ovu problematiku, neophodno je sprovesti istraživanje zasnovano na prikupljanju primarnih podataka. Konkretnije, sprovođenje istraživanja putem upitnika ili intervjua sa zaposlenima u bankama, klijentima banaka, kao i sa stručnjacima iz oblasti VI i finansija. Ovakav pristup bi omogućio prikupljanje kvalitativnih i kvantitativnih podataka koji bi pružili širu sliku o uticaju VI na bankarski sektor, kao i o percepciji i iskustvima različitih aktera u ovom procesu.

# Literatura

1. Al-Hawamdeh, S., & Alshaer, M. M. (2022). Artificial Intelligence Applications as a Modern Trend to Achieve Organizational Innovation in Jordanian Commercial Banks. Journal of Asian Finance Economics and Business, 9(3), 257-263. https://doi.org/10.13106/jafeb.2022.vol9.no3.0257
2. Banka Intesa (2021). Veštačka inteligencija je tu da ostane, dostupno na: https://www.bancaintesa. rs/stanovnistvo/nas-svet/upoznajte-nas-svet/vestacka-inteligencija-trajno-resenje.html(datum pristupa 1.7.2024)
3. Boustani, N. M. (2022). Artificial intelligence impact on banks clients and employees in an Asian developing country. Journal of Asia Business Studies, 16(2), 267-278. https://doi.org/10.1108/JABS-09-2020-0376
4. Buehler, K., Corsi, A., Jurisic, M., Lerner, L., Siani, A., & Weintraub, B. (2024). Scaling gen AI in banking: Choosing the best operating model, dostupno na: https://www.mckinsey.com/industries/financial-services/our-insights/scaling-gen-ai-in-banking-choosing-the-best-operating-model#/ (datum pristupa 4.7.2024)
5. Buha, V., & Bjegović, M. (2023). Application of artificial intelligence in the banking sector. Bezbednost,65(1), 87-106. DOI: 10.5937/bezbednost2301087B
6. Burgess, A. (2017). The executive guide to artificial intelligence: How to find and implement applications for AI in your organization. Springer, Cham, Switzerland.
7. Business Wire (2024). JPMorgan Chase Dominates AI Research In Banking As Future Challengers Emerge,dostupno na: https://aijourn.com/jpmorgan-chase-dominates-ai-research-in-banking-as-future-challengers-emerge/ (datum pristupa 4.7.2024)
8. Dukić, M. (2023). Kako veštačka inteligencija može da se upotrebi u bankarstvu?, dostupno na:https://www.kamatica.com/analiza/kako-vestacka-inteligencija-moze-da-se-upotrebi-u-bankarstvu/70096 (datum pristupa 7.7.2024)
9. Erdoes, M. (2024). Leading with AI, dostupno na: https://www.jpmorgan.com/technology/news/leading-with-AI (pristupljeno 6.7.2024)
10. Evident Insights (2023). The Evident AI Index Key Findings Report: The global standard benchmark of AI maturity. Evident Insights.
11. Farishy, R. (2023). The Use of Artificial Intelligence in Banking Industry. International Journal of Social Service and Research, 3(7), 1724-1731.
12. Funcas (2021). The Future of Banking Jobs. A Sector in Transformation. Funcas.
13. Ghandour, A. (2021). Opportunities and challenges of artificial intelligence in banking: Systematic literature review. TEM Journal, 10(4), 1581-1587. https://doi.org/10.18421/TEM104-12
14. Kaya, O. (2019). Artificial intelligence in banking: A lever for profitability with limited implementation to date (EU Monitor). Deutsche Bank Research.
15. Marković, K. (2023). Veštačka inteligencija među bankarima, dostupno na: https://bonitet.com/vestacka-inteligencija-medju-bankarima/ (datum pristupa 9. 9. 2024).
16. Martin, V. (2024). Integrating artificial intelligence into central banking: Opportunities, challenges, and implications. Journal of Process Management and New Technologies, 12(1-2), 49-60.
17. Mcmullen, M. (2023). AI in Finance - 5 Benefits for Better Banking. Towards AWS, dostupno na: https://towardsaws.com/ai-in-finance-5-benefits-for-better-banking-70cbaae31911 (datum pristupa 5.7.2024)
18. Nicoletti, B. (2021). Banking 5.0. How Fintech will Change Traditional Banks in the "New Normal"Post Pandemic. Palgrave Studies in Financial Service Technology. Switzerland: Palgrave MacMillan.

19. Nowakowski, M. (2024). Ethical FinTech: The Importance of Ethics in Creating Secure Financial Products and Services. In: Lasak, P., & Williams, J. (Eds.), Digital Transformation and the Economics of Banking. Economic, Institutional and Social Dimensions (pp. 81-98). London and New York: Routledge, Taylor & Francis Group.
20. Omarini, A. (2024). From Digital Technologies to New Economics in Banking: How to Drive the Future of Digital Money and Data Information Knowledge. In: Lasak, P., & Williams, J. (Eds.), Digital Transformation and the Economics of Banking. Economic, Institutional and Social Dimensions (pp. 31-49). London and New York: Routledge, Taylor & Francis Group.
21. Šehović, D. (2017). Sajber otpornost finansijskih institucija. Bankarstvo, 46(4), 134-151. https://doi.org/10.5937 /bankarstvo1704134S
22. Skilton, M., & Hovsepian, F. (2017). The 4th industrial revolution: Responding to the impact of artificial intelligence on busssiness. Springer. Cham, Switzerland.
23. Stojmenović, M. (2020). Društveno-ekonomski aspekti povlačenja gotovine iz upotrebe. Bankarstvo, 49(3), 102-127. https://doi.org/10.5937/bankarstvo2003102S
24. Tabaković, J. (2023). Governor Tabaković's speech at Finticipate vol. 2 – SEE Fintech Forum, dostupno na: https://nbs.rs/en/scripts/showcontent/index.html?id=18981 (datum pristupa 1.7.2024)
25. Taulli, T. (2023). Generative AI: How ChatGPT and Other AI Tools Will Revolutionize Business. Apress. https://doi.org/10.1007/978-1-4842-9367-6
26. Urošević, B. (2023). Od sprečavanja zločina do procene rizika – kako srpske banke koriste AI, dostupno na:https://rs.bloombergadria.com/a-c/tehnologija/digitalizacija/58637/ai-malim-banka-ma-moze-da-pomogne-da-stignu-velike (datum pristupa 9.9.2024)
27. Verma, N. (2023). JP Morgan Chase: Revolutionizing Banking Through AI — Case Study, dostupno na:https://medium.com/@vermanikhil605/jp-morgan-chase-revolutionizing-banking-through-ai-case-study-a659c0b0957f (datum pristupa 1.7.2024)
28. Waliszewski, K. (2024). Banking-as-a-Service and Embedded Banking as Innovative Methods of Providing Banking Services. In: Lasak, P., & Williams, J. (Eds.), Digital Transformation and the Economics of Banking. Economic, Institutional and Social Dimensions (pp. 50-66). London and New York: Routledge, Taylor & Francis Group.
29. https://www.jpmorganchase.com/about/business-principles (datum pristupa 1.7.2024)
30. https://www.jpmorgan.com/technology/artificial-intelligence (datum pristupa 1.7.2024)
31. https://www.jpmorgan.com/technology/artificial-intelligence/initiatives/explainable-ai-center-of- excellence (datum pristupa 1.7.2024)
32. https://selectacrm.app/?lang=sr (datum pristupa 10.7.2024)
33. https://www.nbs.rs/sr/finansijske-institucije/banke/spisak-banaka/ (datum pristupa 9.9.2024)
34. https://nbs.rs/sr_RS/ciljevi-i-funkcije/finansijska-stabilnost/zastitni_slojevi_kapitala/sistemski-znacajne -banke/ (datum pristupa 9.9.2024)

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# MANAGING THE ARTIFICIAL INTELLIGENCE DRIVEN BANKING TRANSFORMATION: A CASE STUDY OF JPMORGAN CHASE

**Prof. Jelena Lukić Nikolić PhD**
Professor, Modern Business School
jelena.lukic@mbs.edu.rs
ORCID:0000-0003-0632-8974

**Abstract:** The emergence of neo-banks, BigTech, and FinTech competitors is rapidly transforming the banking sector, forcing traditional banks to adopt advanced technologies like artificial intelligence to remain competitive. This paper examines the application of artificial intelligence in the banking sector, with a specific focus on generative artificial intelligence. It explores the various ways artificial intelligence is being used to enhance efficiency, improve customer service, and automate processes within banks. The paper presents a case study of JPMorgan Chase, a leading global financial institution that has successfully integrated artificial intelligence into its operations. Additionally, it provides an overview of the current state of artificial intelligence adoption in banks in Serbia, highlighting the progress made by the National Bank of Serbia and other commercial banks in utilizing artificial intelligence. The paper concludes by emphasizing the transformative potential of artificial intelligence in the banking sector and its role in shaping the future of financial services.

**Keywords:** artificial intelligence, banking sector, digital transformation, technological innovation, JPMorgan Chase, Serbian banks

**JEL classification:** O33, L86, G21

# Introduction

Banks have continuously adapted to society's digital transformation, introducing numerous innovative products and services (Šehović, 2017; Stojmenović, 2020). These include ATMs, credit and debit cards, various online payment and investment services, electronic fund transfers, telephone and mobile banking, mobile applications, digital wallets, and internet banking (Funcas, 2021). While technology has been integral to the banking sector since the mid-20th century, the financial landscape is undergoing a profound shift due to the emergence of innovative competitors, business models, products, and services. Although banks have historically been adept at integrating technology, the current financial services ecosystem demands a deeper transformation (Omarini, 2024). There are many new technologies used in finance such as artificial intelligence, advanced data analytics, big data, distributed ledger technology, blockchain, biometrics, remote user identification, cloud computing, Web3, and metaverse (Nowakowski, 2024). Furthermore, new types of banks, so-called neo-banks are emerging, as digital-only banks that operate entirely online or through mobile applications, without physical branches. They emerged due to the increasing digitalization of financial services and cater to tech-savvy customers who prefer online banking. Neo-banks often offer features like user-friendly interfaces, quick account opening, and lower fees compared to traditional banks. They aim to provide a more convenient and accessible banking experience, particularly for millennials and younger generations (Funcas, 2021). To remain competitive with emerging neo-banks and rivals like FinTech and BigTech companies, traditional banks must embrace and integrate modern technological solutions into their operations (Waliszewski, 2024). One of those solutions is artificial intelligence (AI). AI refers to the ability of computer programs to acquire and apply knowledge without human intervention. AI systems observe the world around them, analyze information autonomously, draw conclusions, and take appropriate actions. They learn from their previous judgments and improve their performances over time (Kaya, 2019). AI encompasses a range of technologies that enable machines to simulate human intelligence, such as learning, reasoning, problem-solving, perception, and language understanding (Ghandour, 2021). In the context of banking, AI refers to the use of computers and machines to simulate human intelligence, particularly in analyzing events and making decisions. AI systems can perform tasks that typically require human intelligence, such as recognizing patterns, learning from data, making decisions and predictions (Boustani, 2022).

The subject of this paper is the application of AI and generative AI in the banking sector. The paper's purpose is to thoroughly study and highlight all of the options for adopting AI in banks, using specific examples of banks that have already used AI systems in their business operations.

The key research questions (RQ) are:

RQ 1: How is AI applied in the banking sector?

RQ 2: What are the key decisions that need to be made when implementing generative AI in a bank?

RQ 3: Which bank is the most advanced in AI and what are the key applications of AI?

RQ 4: What is the level of AI adoption among Serbian banks?

This paper makes an important contribution to the general understanding of the role of AI in banking by providing a comprehensive overview of emerging technologies and practical examples of their use in top banks such as JPMorgan Chase. From a practical standpoint, the paper's value is that

it provides new instructions for implementing the generative AI model, highlighting the Evident AI index as a significant and valuable instrument for assessing banks' maturity in the usage of AI in their operations. As a result, the significance of this paper stems from its overview and synthesis of existing methodologies that banks use in order to design effective strategies and maximize the benefits of AI, consequently defining new standards in the banking sector.

This paper is structured as follows: It begins by outlining the research aims and key research questions, followed by a thorough literature review regarding the fundamentals of AI and generative AI, its diverse applications within the banking sector, and key definitions. The second part of the paper is devoted to research methodology and results. The Evident AI index was pointed out with an explanation of its structure and a ranking of the ten leading banks in the application of AI, followed by a case study of JPMorgan Chase as the best ranked financial institution in terms of the application of AI. The paper then highlights the current state of AI development and implementation in the Serbian banking sector. The paper concludes by summarizing key findings and offering theoretical and practical implications. It acknowledges limitations and proposes avenues for future research, contributing to the ongoing discourse on AI's transformative role in banking.

## Literature Review: Artificial Intelligence in the Banking Sector

AI can be defined as the scientific exploration of the computational principles behind thought and intelligent behavior (Skilton & Hovsepian, 2017). It represents the ability of computer systems to tackle complex problems, mimic human-like responses, and exhibit intelligent behavior (Burgess, 2017). In essence, AI is a collection of diverse technologies that has numerous advantages such as: automating processes, improving decision-making, enhancing customer experiences, and mitigating risks (Boustani, 2022). AI is not a single technology, but a combination of different technologies applied to various use cases. There are several AI technologies that are applied in banking (Ghandour, 2021):

– Natural Language Processing (NLP) and machine learning systems are employed to automate customer service interactions, analyze spending patterns, and execute financial transactions on behalf of customers.

– Big data analytics systems, powered by AI and machine learning, are utilized to deliver personalized customer services and experiences. These systems leverage vast amounts of customer data to gain insights into their needs and behaviors, enabling banks to tailor products and services accordingly.

– AI-powered big data analytics also aids executives and managers in making informed decisions regarding internal processes, operations, investments, risks, and resource allocation.

– Machine learning and predictive analytics are employed to detect fraudulent transactions, ensure compliance with internal policies and regulations, enhance transaction security, and forecast future trends.

The authors who examined the use of AI in Jordanian commercial banks have identified three AI applications in banks (Al-Hawamdeh & Alshaer, 2022):

– Expert systems: These systems store human knowledge in computers to solve problems that typically require human expertise. They simulate expert thought processes but cannot learn from experience. Expert systems are used in banking for tasks such as credit scoring, fraud detection, and customer service.

– Neural network systems: These systems are modeled after the neural networks in the human brain. They can learn from experience and recognize patterns, making them useful for tasks such as image recognition, natural language processing, and risk assessment.

– Fuzzy logic systems: These systems can process multiple values for the same variable, allowing them to solve problems with a range of data. They are used in banking for tasks such as loan approval, portfolio management, and financial forecasting.

In Table 1 is presented classification of AI components in banks by Nicoletti (2021).

**Table 1 - Classification of AI Components in Banks**

| AI components | Types |
|---|---|
| Probabilistic reasoning (Machine learning) | Neural networks, Predictive analytics |
| Computational logic | Rule-based reasoning, Expert systems, Constraint-based reasoning, Automated reasoning |
| Smart interfaces | Natural language, Chatbots, Computer vision |
| Smart process automation | Cognitive technologies, Robotic process automation, Robotics motion and manipulation |

*Source: Adapted from Nicoletti, B. (2021). Banking 5.0. How Fintech will Change Traditional Banks in the "New Normal" Post Pandemic. Palgrave Studies in Financial Service Technology. Switzerland: Palgrave MacMillan.*

By reviewing the literature, AI in the banking sector can be applied for (Kaya, 2019; Nicoletti, 2021; Boustani, 2022; Mcmullen, 2023):

- **Fraud detection and prevention:** AI algorithms analyze massive volumes of transaction data in real time. By learning from historical patterns and identifying anomalies, AI can quickly flag suspicious activities, such as unusual spending amounts or locations, that may indicate fraudulent behavior. This enables banks to take immediate action, such as blocking transactions or alerting customers, to prevent financial losses.

- **Debt collection and recovery:** AI offers valuable solutions for debt collection and recovery, particularly during economic downturns when customer defaults increase. By employing AI-powered early warning systems and predictive analytics, businesses can significantly enhance their debt collection efforts and mitigate financial risk.

- **Streamlined underwriting process:** Leveraging machine learning models and robotic process automation can significantly streamline the underwriting process, particularly in online loan approvals. This synergy can drastically reduce the time typically required for loan decisions.

- **Know Your Customer (KYC) processes:** KYC is a critical regulatory requirement for banks to verify the identities of their customers and assess potential risks. AI-powered systems can automate and streamline this process by extracting and verifying information from various documents, such as passports, driver's licenses, and utility bills. AI algorithms can also cross-reference customer data with external sources, such as sanctions lists and watchlists, to identify any potential red flags.

- **Chatbots and virtual assistants:** AI-powered chatbots and virtual assistants are transforming customer service in banking. These intelligent agents can handle a wide range of customer inquiries, from basic account balance checks to more complex financial advice. By leveraging natural language processing (NLP) and machine learning, chatbots can understand and respond to customer queries in a conversational manner, providing quick and efficient support 24/7. The key benefits of chatbots include improved customer service, a personalized customer journey, reduced waiting times, and cost savings. Additionally, they allow bank employees to focus on more complex and creative tasks, potentially leading to improved job satisfaction (Nicoletti, 2021).

- **Improved customer experience:** AI enables banks to personalize their services to customer needs and behaviors. AI-powered chatbots and applications can provide personalized financial advice, bill payment reminders, and easier access to account information, enhancing the overall customer experience.

- **Robo-advisors and personalized financial planning:** Robo-advisors are AI-driven platforms that offer automated investment advice and portfolio management services. By analyzing customer data, such as risk tolerance, financial goals, and investment preferences, robo-advisors can create personalized investment portfolios and provide recommendations tailored to individual needs. This democratizes access to financial advice, making it more affordable and accessible to a wider range of customers.

- **Data analysis and extraction:** Banks deal with vast amounts of unstructured data, such as legal documents, contracts, and financial reports. AI-powered tools can analyze and extract valuable insights from this data, automating tasks that would otherwise require significant manual effort. For example, AI algorithms can identify and extract key clauses from legal documents, summarize financial reports, and even predict market trends based on news and social media sentiment.

- **Increased efficiency and productivity:** AI can automate routine tasks, freeing employees to focus on more complex activities that require creativity. This increases efficiency within the bank and its overall productivity.

- **Innovation and competitive advantage:** Banks that adopt AI can develop innovative products and services, differentiating themselves from competitors and maintaining a leading position in the ever-evolving market.

- **Democratization of financial services:** AI is making financial services more accessible by simplifying processes and reducing costs. For instance, robo-advisors are prepared to democratize portfolio investment by making it affordable for customer groups who were previously excluded due to high fees.

These applications demonstrate the transformative potential of AI in the banking sector. By automating processes, improving decision-making, and enhancing customer experiences, AI is revolutionizing how banks operate and deliver financial services. Furthermore, AI has the potential to significantly impact bank profitability. AI technologies can reduce costs, particularly in areas like labor and operations, and contribute to revenue generation by enabling the development of new, tailored products and services that better meet customer needs. Empirical analysis suggests a positive correlation between AI adoption and bank profitability, indicating that banks actively investing in AI technologies tend to be more profitable. This highlights the importance of AI implementation for banks to address challenges like weak profitability and remain competitive in an increasingly digital and data-driven financial landscape (Kaya, 2019).

# Generative AI and Key Decisions for its Implementation in the Banking Sector

Generative AI encompasses a category of artificial intelligence systems capable of producing innovative and unique content. These systems are exposed to extensive datasets during their training phase, enabling them to identify and understand the patterns and structures inherent in the data. Upon completion of training, these systems can generate new content that, while never encountered before, bears a resemblance to the examples they were trained on (Taulli, 2023).

Introducing generative AI into an organization requires careful consideration across various key areas described in this paper (Buehler et al., 2024). First, it should be defined who will lead the development of the generative AI strategy, whether it is a centralized effort or delegated to individual business units. Establishing a vision for the potential value that generative AI can bring and identifying the functions and processes likely to be most impacted will guide the implementation process. Second, it is important to determine who has the authority to decide which enterprise domains will utilize generative AI and what specific use cases within those domains will be prioritized. This ensures alignment between the technology's capabilities and the organization's objectives. Third, it is important to choose the most suitable approach for implementing generative AI. This could involve procuring targeted solutions ("taker"), integrating broader solutions ("shaper"), or developing in-house solutions ("maker"). Each model has its own advantages and implications for resources, control, and customization. Fourth, it is important to make decisions on the funding mechanism for generative AI initiatives and to consider whether funding will be centralized or decentralized, aligning with the overall approach to generative AI adoption within the organization. Fifth, human resources should be planned with identification of the necessary skills required for successful generative AI implementation. This could involve hiring new talent, upskilling existing employees, or outsourcing specific tasks. Sixth, it is important to establish clear risk guardrails, such as data privacy and intellectual property protection, and determine who is responsible for defining and enforcing these safeguards. Assess whether existing risk management frameworks need to be adjusted for generative AI-specific risks and whether additional governance is necessary for certain use cases, especially those involving customer interaction. Finally, it is important to create a dedicated committee to oversee the execution of a comprehensive change management plan. This plan should address the necessary shifts in mindsets and behaviors across the organization to ensure a successful transition towards widespread generative AI adoption. Table 2 summarizes key decision areas for implementing a generative AI operating model.

**Table 2 - Key Decision Areas for Implementing a Generative AI Operating Model**

| Area | Key Decision Areas |
|---|---|
| Strategy and vision | Determine who defines the generative AI strategy (enterprise-wide or business unit level). Develop a vision for potential value and assess functions/processes most likely to be affected by generative AI. |
| Domains and use cases | Decide who determines the enterprise domains of generative AI use cases and the specific use cases within those domains. |
| Deployment model | Choose whether to be a "taker" (procure targeted solutions), a "shaper" (integrate broader solutions), or a "maker" (develop in-house solutions). |
| Funding | Determine how generative AI use cases will be funded, considering the level of centralization/decentralization of the generative AI approach. |
| Talent | Define the necessary skills for generative AI initiatives and acquire talent through hiring, upskilling, outsourcing, or a combination. |

| | |
|---|---|
| Risk | Determine who defines risk guardrails (e.g., data privacy, intellectual property) and mitigation strategies. Decide whether existing frameworks need adjustments for generative AI-specific risks and whether additional governance is required for certain use cases (e.g. customer-facing ones). |
| Change management | Establish a committee to lead the execution of a change management plan to ensure necessary shifts in mindsets and behaviors for successful generative AI adoption across the enterprise. |

*Source: adapted from Buehler, K., Corsi, A., Jurisic, M., Lerner, L., Siani, A., & Weintraub, B. (2024). Scaling gen AI in banking: Choosing the best operating model, available on: https://www.mckinsey.com/industries/financial-services/our-insights/scaling-gen-ai-in-banking-choosing-the-best-operating-model#/ (Accessed 4 July 2024)*

By thoroughly addressing these key decision points, banks can lay a strong foundation for harnessing the transformative potential of generative AI while mitigating potential risks and challenges. AI is still a relatively new technology, and there are challenges that need to be addressed before it can be fully adopted by the banking sector such as the need for more data to train AI algorithms effectively and the development of more sophisticated algorithms to handle the complexity of financial data and tasks (Farishy, 2023).

The future of AI in the banking sector is likely to be characterized by increased personalization, efficiency, and innovation. AI will be used to analyze customer data to provide tailored products and services, streamline processes, and reduce costs. While AI may automate certain tasks and potentially displace some jobs, it will also create new opportunities in areas such as data analysis, programming, and further AI development (Boustani, 2022).

The potential applications of generative AI within the enterprise are limitless and continually expanding. This technology may revolutionize every facet of business, from enhancing customer interactions in the contact center to driving innovation in marketing, product development, and content creation. Moreover, it can optimize human resources, elevate employee support, and redefine customer experiences (Taulli, 2023).

# Research Methodology

The research methodology employed in this paper combines desk research with the analysis of the Evident AI Index and a case study of JPMorgan Chase. The research was conducted in the period from May to September 2024.

Desk research encompassed a thorough examination of various sources, such as books, academic papers, industry reports, and case studies related to the application of AI in the banking sector. The literature review aims to understand the current state of AI adoption in banking, identify key trends and challenges, and analyze specific use cases of AI implementation. In addition to the literature review, the paper also explores the Evident AI Index, a ranking system that assesses the maturity of AI adoption among the world's largest banks. This index evaluates banks based on four pillars: talent, innovation, leadership, and transparency. By analyzing the index scores, the paper gains insights into the relative progress of different banks in their AI journeys and identifies leaders in the field. Furthermore, the paper presents a case study of JPMorgan Chase, a leading global bank that has been actively integrating AI into its operations. The case study examines specific AI applications within JPMorgan Chase, such as AI-powered trading, risk management, fraud detection, customer service, and cybersecurity. By examining this case study, the paper provides a practical example of how AI is being leveraged to enhance efficiency, improve decision-making, and drive innovation in the banking sector.

As a result, this paper allows for a thorough examination of the topic, providing both theoretical insights and practical examples of AI implementation in the banking sector.

# Research Results: Structure of Evident AI Index and Rank of the Banks

The Evident AI Index is a comprehensive ranking system designed to assess the maturity of AI adoption and implementation within the banking sector. It evaluates 50 of the world's largest banks based on over 100 individual indicators, categorized into four pillars (Evident Insights, 2023):

- **Talent:** This pillar assesses the quantity, quality, and development of AI and data professionals within the bank. It considers factors such as the number of AI employees, their academic backgrounds, and the bank's initiatives to attract, retain, and upskill talent in this field.

- **Innovation:** This pillar evaluates the bank's investment in AI innovation, including research output, patent filings, ventures, partnerships, and engagement with the open-source community. It assesses the bank's ability to develop and adopt cutting-edge AI technologies.

- **Leadership:** This pillar measures the AI focus of the bank's leadership team, as reflected in their communication strategy, executive positioning, and external engagement on AI topics. It assesses the commitment and vision of the bank's leaders in driving AI transformation.

- **Transparency:** This pillar examines the bank's transparency regarding its responsible AI practices. It considers factors such as the presence of dedicated responsible AI teams, publication of ethical principles, and communication of responsible AI initiatives.

The AI Index is calculated using a weighted scoring system, where each pillar contributes a specific percentage to the overall score. The weights assigned to each pillar are as follows (Evident Insights, 2023): talent (45%), innovation (30%), leadership (15%), and transparency (10%) (Figure 1).

**Figure 1 - Weighed scoring system in Evident AI Index**


*Source: Adapted from Evident Insights (2023). The Evident AI Index Key Findings Report: The global standard benchmark of AI maturity. Evident Insights.*

Each bank is evaluated on the individual indicators within each pillar, and their performance is converted into a score. The weighted average of the scores across all four pillars determines the bank's overall AI Index ranking.

The Evident AI Index relies solely on publicly available information, ensuring an independent and unbiased assessment of each bank's AI maturity. It serves as a valuable tool for banks, investors, and advisors to track progress, identify best practices, and make informed decisions regarding AI adoption and transformation in the banking sector. The Evident AI Index is important for the following reasons (Evident Insights, 2023):

- Benchmarking and tracking progress: The index allows banks to assess their AI maturity compared to their peers and track their progress over time. This helps them identify areas where they are excelling and areas where they need to improve.
- Identifying best practices: By ranking banks based on various AI-related criteria, the index highlights institutions that are leading the way in AI adoption. This allows other banks to learn from their successes and adopt best practices.
- Informing strategic decision-making: The index provides valuable insights into the different approaches banks are taking to AI adoption. This information can help banks make more informed decisions about their own AI strategies and investments.
- Promoting transparency and responsibility: The index includes a pillar dedicated to transparency, encouraging banks to be more open about their responsible AI practices. This promotes greater accountability and trust in the use of AI in the financial sector.
- Driving competition and innovation: By showcasing the leaders in AI adoption, the index fosters a competitive environment that encourages banks to innovate and accelerate their AI transformation efforts.

In table 3 are presented the top ten banks according to Evident AI Index for 2023 year. JPMorgan Chase is in first place according to the values of Evident AI Index.

**Table 3 - The Top Ten Banks According to Evident AI Index**

| Bank | Rank | Talent | Innovation | Leadership | Transparency |
|---|---|---|---|---|---|
| JPMorgan Chase | 1 | 2 | 1 | 2 | 1 |
| Capital One | 2 | 1 | 2 | 8 | 5 |
| Royal Bank of Canada | 3 | 7 | 3 | 5 | 2 |
| Wells Fargo | 4 | 4 | 5 | 32 | 10 |
| UBS | 5 | 3 | 19 | 17 | 22 |
| CommBank | 6 | 16 | 20 | 3 | 4 |
| Goldman Sachs | 7 | 8 | 4 | 15 | 49 |
| ING | 8 | 6 | 10 | 19 | 15 |
| Citigroup | 9 | 5 | 8 | 26 | 31 |
| DBS | 10 | 22 | 34 | 1 | 12 |

*Source: adapted from Evident Insights (2023). The Evident AI Index Key Findings Report: The global standard benchmark of AI maturity. Evident Insights.*

# Case study: JPMorgan Chase

JPMorgan Chase is a global financial services firm with a rich history of over two centuries. It provides a variety of financial services including asset management, commercial banking, consumer banking, and investment banking, while its key business principles are: exceptional client service, operational excellence, a commitment to integrity and a winning culture. JPMorgan Chase strives to exceed its customers' expectations by providing them with high-quality products and services. The company also emphasizes acting with integrity and fairness in all business areas and relationships. JPMorgan Chase believes that a strong organizational culture is essential to its success, and it fosters a teamwork (https://www.jpmorganchase.com/about/business-principles).

JPMorgan Chase has been at the forefront of integrating AI into its operations, products, and services. This case study presents JPMorgan Chase's strategic approach to AI, highlighting key use cases, organizational structures, and the impact of AI on the company's performance and the broader financial landscape. JPMorgan Chase uses AI in various areas, such as risk management, fraud detection, trading, and customer service. It has developed its own AI-powered virtual assistant for corporate clients and is actively exploring the use of generative AI. JPMorgan Chase's dominance is a direct result of its investment in AI research talent. The bank employs over 200 AI researchers (Business Wire, 2024). It has a dedicated AI research team that collaborates with academic institutions and industry partners to explore cutting-edge AI technologies. Furthermore, JPMorgan Chase has also established an Explainable AI Center of Excellence (XAI COE) to foster collaboration across the organization and ensure that AI initiatives are aligned with business goals (https://www.jpmorgan.com/technology/artificial-intelligence/initiatives/explainable-ai-center-of-excellence). AI is used to automate tasks, improve decision-making, and create new products and services. Here are some of the ways JPMorgan Chase is using AI (Erdoes, 2024):

- Identify opportunities to embed AI throughout the company.
- Automate tasks and run the business more efficiently.
- Partner with experts or individuals who have knowledge and understanding of AI to help leaders identify all the opportunities.

Table 4 features the key AI applications in JPMorgan Chase.

**Table 4 - AI Applications in JPMorgan Chase**

| AI Application | Description | Impact |
|---|---|---|
| **Trading and risk management** | | |
| Algorithmic trading | AI algorithms execute high-speed trades and monitor portfolio performance. | Improves trade execution and risk management. |
| Risk estimation | Machine learning models analyze vast amounts of data to assess credit risks, market volatility, and potential opportunities. | Enhances the bank's ability to manage risks effectively. |
| Fraud detection | AI-powered systems continuously monitor transactions to identify suspicious activity in real time. | Reduces financial losses due to fraud and strengthens security. |

| | | |
|---|---|---|
| **Customer-centric initiatives** | | |
| Chatbots and virtual assistants | AI-powered chatbots and virtual assistants provide immediate customer support and answer queries. | Enhances customer service efficiency and accessibility. |
| Personalized recommendations | AI algorithms analyze customer transaction history and behavior to offer tailored product suggestions. | Boosts cross-selling opportunities by identifying relevant products for clients. |
| Credit scoring | AI models assess creditworthiness more accurately than traditional methods. | Enables the bank to extend loans and credit to a wider range of customers with improved risk assessment. |
| **Operational excellence** | | |
| Data analytics | Machine learning and big data analytics help the bank extract valuable insights from massive datasets. | Informs strategic decision-making and improves risk management. |
| Automation | Robotic Process Automation (RPA) automates repetitive tasks. | Reduces operational costs, minimizes errors, and frees up employees for more complex tasks. |
| Anti-money laundering (AML) | AI algorithms enhance AML processes by identifying suspicious transactions and reducing false positives. | Increases the efficiency and accuracy of AML monitoring. |
| **AI and cybersecurity** | | |
| Threat detection | AI-powered cybersecurity systems identify and neutralize cyber threats by analyzing patterns and anomalies in network traffic. | Strengthens the bank's security posture and reduces the risk of cyberattacks. |
| **Sustainable finance** | | |
| ESG analytics | AI tools analyze environmental, social, and governance (ESG) data to assess sustainability-related investment risks and opportunities. | Supports the bank's commitment to responsible investing by aligning financial decisions with ESG factors. |

*Source: adapted from Verma, N. (2023). JP Morgan Chase: Revolutionizing Banking Through AI – Case Study, available on: https://medium.com/@vermanikhil605/jp-morgan-chase-revolutionizing-banking-through-ai-case-study-a659c0b0957f (Accessed 1 July 2024)*

JPMorgan Chase's AI research goals are to leverage artificial intelligence to understand and manage complex economic systems, predict and prevent financial crime, enable secure data sharing, improve client experiences, empower employees, and ensure regulatory compliance. Its overarching objective is to develop and deploy ethical AI that benefits not only the company but also its clients, employees, and society as a whole (https://www.jpmorgan.com/technology/artificial-intelligence).

# Current State of AI Usage in Banks in Serbia

AI has significant potential to provide valuable benefits in central banking systems (Martin, 2024). The National Bank of Serbia (NBS) utilizes a wide array of AI techniques for diverse purposes, such as (Tabaković, 2023):

- **Risk management and fraud detection:** The NBS employs predictive analytics and machine learning algorithms, specifically Self-Organizing Maps and Lasso logistic regression, in its early warning system to predict potential difficulties in banking operations. This allows for proactive monitoring and mitigation of risks.

- **Macroeconomic analysis:** Machine learning models are employed to assess the macroeconomic environment, aiding in stress testing scenarios for the banking sector. They also serve as a supporting tool in projecting the reference guide for the countercyclical capital buffer rate, contributing to financial stability.

- **Real-time inflation monitoring:** The NBS has developed an innovative inflation nowcasting model based on web scraping. This model automatically collects price data from over 130 websites, covering around 90% of the Consumer Price Index (CPI) basket. The collected data is then processed using automated algorithms to provide real-time insights into inflation trends. This enables the NBS to monitor inflation on a daily or weekly basis, allowing for timely policy interventions.

The NBS has effectively integrated AI into its operations, demonstrating a comprehensive approach to leveraging AI for various functions. The use of AI in risk management, fraud detection, macroeconomic analysis, and real-time inflation monitoring showcases the bank's commitment to innovation and data-driven decision-making.

Based on data from July 1, 2024, there are 20 commercial banks in the banking sector of Serbia, of which two are state banks, three domestic private banks and 15 foreign banks (https://www.nbs.rs/en/ciljevi-i-funkcije/finansijska-stabilnost/zastitni_slojevi_kapitala/sistemski-znacajne-banke/index.html). The decision on determining the list of systemically significant banks in Serbia from May 10, 2024 highlighted that in Serbia nine banks represent systemically significant banks (https://nbs.rs/sr_RS/ciljevi-i-funkcije/finansijska-stabilnost/zastitni_slojevi_kapitala/sistemski-znacajne-banke/). Survey conducted by the National Bank of Serbia in 2023 revealed that Serbian banks are utilizing AI in various ways. Seven banks employ predictive analytics, six utilize robotic process automation, four use machine learning, and three leverage real-time analytics (Table 5).

**Table 5 - Use of AI in banks in Serbia**

| Use of AI | Number of banks | Percentage in relation to the total number of banks |
|---|---|---|
| Predictive analytics | 7 | 35% |
| Robotic process automation | 6 | 30% |
| Machine learning | 4 | 20% |
| Real-time analytics | 3 | 15% |
| Not use, but have intention to use | 5 | 25% |

*Izvor: prilagođeno prema Tabaković, J. (2023). Governor Tabaković's speech at Finticipate vol. 2 – SEE Fintech Forum, dostupno na: https://nbs.rs/en/scripts/showcontent/index.html?id=18981 (datum pristupa 1.7.2024)*

The NBS did not name the banks that use AI in its report, nor did it detail their ownership structures. As a result, this paper only includes publicly available data that can be found by browsing bank websites and other public sources, and that refer to the use of AI in banks. According to available data there are four systemically significant banks in Serbia that use AI - Raiffeisen, Intesa Sanpaolo, UniCredit, and OTP bank, as well as one non-systemically significant bank - 3Banka. As a result, it can be concluded that 44.44% of Serbia's systemically significant banks use AI in their operations.

Raiffeisen bank led the way in Serbia by introducing a service powered by AI. Their electronic assistant, a chatbot named Rea (Raiffeisen Electronic Assistant), provides round-the-clock customer support across multiple platforms like Viber, Facebook, and the bank's website. Rea primarily answers questions about the bank's offerings but also educates users on other digital services. Initially designed to showcase the bank's products, Rea has evolved to assist registered users with various tasks, such as checking account balances, making payments, sending money via QR code, and paying bills (Dukić, 2023). By handling simple and common queries, Rea frees up bank staff to focus on clients with more complex needs. Rea operates in full compliance with electronic banking standards and the security and cultural norms of its environment. This commitment to security and ethical AI use is a hallmark of Raiffeisen's approach to technology (Buha & Bjegović, 2023). Beyond Rea, Raiffeisen leverages AI in other areas of its operations. For instance, the customer relationship management (CRM) system named Selecta (developed by Saga company (https://selectacrm.app/?lang=sr)) utilizes a 360° approach, building comprehensive user profiles based on interactions across various channels, including m-banking, email, chatbots, ATMs, contact centers, and branches. This integrated approach allows Raiffeisen to provide a more personalized and efficient customer experience (Buha & Bjegović, 2023).

Among other banks in Serbia, Intesa Sanpaolo's dedicated AI laboratory develops practical solutions and theoretical research to address the specific challenges of the business and financial sector. Leveraging a comprehensive knowledge base, their primary objective is to safeguard financial portfolios from significant market fluctuations. By harnessing the power of AI, the team can analyze vast sets of risk factors in mere seconds, drastically reducing the time it once took weeks to complete such analysis (Banka Intesa, 2021). Furthermore, Intesa Sanpaolo uses AI systems to automate business operations, provide customized offers for clients, target clients more precisely, and avoid frauds (Urošević, 2023).

AI continues to be prevalent in operations involving informing clients and communicating with them. UniCredit and OTP bank, for example, deploy virtual assistants, or chatbots, to answer a variety of client questions about products and services. OTP bank, in addition to the OTI chatbot, has been using AI in customer relationship management and the risk department for many years. Of the banks that are not categorized as systemically significant but use AI, 3Bank (better known as Opportunity Bank until 2021) deserves special mention. As early as 2015, this bank implemented a technical solution that, based on data obtained from the field, automatically generated loan approval decisions (Marković, 2023).

# Conclusion

AI, particularly generative AI, is revolutionizing the banking sector. AI is being employed to enhance efficiency, improve customer service, and automate various processes within banks. Leading financial institutions like JPMorgan Chase have successfully integrated AI into their operations, leveraging it for tasks such as trading, risk management, fraud detection, customer service, and cybersecurity. Of the 20 banks operating in Serbia (as of July 1, 2024), seven use predictive analytics, six use robotic process automation, four use machine learning, and three use real-time analytics. Available data indicate that in Serbia, four out of a total of nine systemically significant banks apply AI in their operations. Also, it is important to point out that the National Bank of Serbia, as a central bank, applies AI for risk management, fraud detection, macroeconomic analysis and real-time inflation monitoring.

This paper offers several theoretical and practical implications for understanding and implementing AI in the banking sector. From a theoretical standpoint, the paper delves into the emerging field of generative AI, highlighting its potential to revolutionize various aspects of banking. It contributes to the growing body of knowledge on AI's role in the banking sector. It provides a comprehensive overview of AI technologies and their diverse applications in banking, enriching the theoretical understanding of this evolving field. The case study of JPMorgan Chase offers insights into how a leading bank is leveraging AI to enhance its operations and performance. This analysis contributes to the theoretical understanding of the relationship between AI adoption and bank profitability.

From a practical standpoint, the paper provides valuable practical guidance for banks considering AI adoption. It outlines key decision areas for implementing a generative AI operating model, helping banks navigate the complexities of AI integration. The Evident AI Index, discussed in the paper, serves as a valuable tool for banks to benchmark their AI maturity against industry leaders and identify best practices. This can guide banks in developing effective AI strategies and maximizing the benefits of AI adoption.

The paper has some limitations. First of all, its orientation is only on a positive outlook on AI in banking, highlighting its potential benefits. However, it lacks a critical analysis of the potential risks and challenges associated with AI adoption, such as job displacement and cybersecurity threats. While the paper references various sources, it relies heavily on secondary data which may be prone to biases and subjectivity.

The proposition for future research is to conduct a more balanced discussion of both the positive and negative aspects of AI and to conduct research based on collection of primary data. More specifically, it is suggested to carry out research through questionnaires or interviews with bank employees, bank clients, as well as with experts in the field of AI and finance. This approach would enable the collection of qualitative and quantitative data that would provide a broader overview of the impact of AI on the banking sector, as well as the perception and experiences of various actors

# References

1. Al-Hawamdeh, S., & Alshaer, M. M. (2022). Artificial Intelligence Applications as a Modern Trend to Achieve Organizational Innovation in Jordanian Commercial Banks. Journal of Asian Finance Economics and Business, 9(3), 257-263. https://doi.org/10.13106/jafeb.2022.vol9.no3.0257
2. Banka Intesa (2021). Veštačka inteligencija je tu da ostane, dostupno na: https://www.bancaintesa.rs/stanovnistvo/nas-svet/upoznajte-nas-svet/vestacka-inteligencija-trajno-resenje.html (datum pristupa 1.7.2024)
3. Boustani, N. M. (2022). Artificial intelligence impact on banks clients and employees in an Asian developing country. Journal of Asia Business Studies, 16(2), 267-278. https://doi.org/10.1108/JABS-09-2020-0376
4. Buehler, K., Corsi, A., Jurisic, M., Lerner, L., Siani, A., & Weintraub, B. (2024). Scaling gen AI in banking: Choosing the best operating model, dostupno na: https://www.mckinsey.com/industries/financial-services/our-insights/scaling-gen-ai-in-banking-choosing-the-best-operating-model#/ (datum pristupa 4.7.2024)
5. Buha, V., & Bjegović, M. (2023). Application of artificial intelligence in the banking sector. Bezbednost,65(1), 87-106. DOI: 10.5937/bezbednost2301087B
6. Burgess, A. (2017). The executive guide to artificial intelligence: How to find and implement applications for AI in your organization. Springer, Cham, Switzerland.
7. Business Wire (2024). JPMorgan Chase Dominates AI Research In Banking As Future Challengers Emerge,dostupno na: https://aijourn.com/jpmorgan-chase-dominates-ai-research-in-banking-as-future-challengers-emerge/ (datum pristupa 4.7.2024)
8. Dukić, M. (2023). Kako veštačka inteligencija može da se upotrebi u bankarstvu?, dostupno na:https://www.kamatica.com/analiza/kako-vestacka-inteligencija-moze-da-se-upotrebi-u-bankarstvu/70096 (datum pristupa 7.7.2024)
9. Erdoes, M. (2024). Leading with AI, dostupno na: https://www.jpmorgan.com/technology/news/leading-with-AI (pristupljeno 6.7.2024)
10. Evident Insights (2023). The Evident AI Index Key Findings Report: The global standard benchmark of AI maturity. Evident Insights.
11. Farishy, R. (2023). The Use of Artificial Intelligence in Banking Industry. International Journal of Social Service and Research, 3(7), 1724-1731.
12. Funcas (2021). The Future of Banking Jobs. A Sector in Transformation. Funcas.
13. Ghandour, A. (2021). Opportunities and challenges of artificial intelligence in banking: Systematic literature review. TEM Journal, 10(4), 1581-1587. https://doi.org/10.18421/TEM104-12
14. Kaya, O. (2019). Artificial intelligence in banking: A lever for profitability with limited implementation to date (EU Monitor). Deutsche Bank Research.
15. Marković, K. (2023). Veštačka inteligencija među bankarima, dostupno na: https://bonitet.com/vestacka-inteligencija-medju-bankarima/ (datum pristupa 9. 9. 2024).
16. Martin, V. (2024). Integrating artificial intelligence into central banking: Opportunities, challenges, and implications. Journal of Process Management and New Technologies, 12(1-2), 49-60.
17. Mcmullen, M. (2023). AI in Finance - 5 Benefits for Better Banking. Towards AWS, dostupno na: https://towardsaws.com/ai-in-finance-5-benefits-for-better-banking-70cbaae31911 (datum pristupa 5.7.2024)
18. Nicoletti, B. (2021). Banking 5.0. How Fintech will Change Traditional Banks in the "New Normal" Post Pandemic. Palgrave Studies in Financial Service Technology. Switzerland: Palgrave MacMillan.
19. Nowakowski, M. (2024). Ethical FinTech: The Importance of Ethics in Creating Secure Financial Products and Services. In: Lasak, P., & Williams, J. (Eds.), Digital Transformation and the Economics of Banking.

20. Omarini, A. (2024). From Digital Technologies to New Economics in Banking: How to Drive the Future of Digital Money and Data Information Knowledge. In: Lasak, P., & Williams, J. (Eds.), Digital Transformation and the Economics of Banking. Economic, Institutional and Social Dimensions (pp. 31-49). London and New York: Routledge, Taylor & Francis Group.
21. Šehović, D. (2017). Sajber otpornost finansijskih institucija. Bankarstvo, 46(4), 134-151. https://doi.org/10.5937/bankarstvo1704134S
22. Skilton, M., & Hovsepian, F. (2017). The 4th industrial revolution: Responding to the impact of artificial intelligence on busssiness. Springer. Cham, Switzerland.
23. Stojmenović, M. (2020). Društveno-ekonomski aspekti povlačenja gotovine iz upotrebe. Bankarstvo, 49(3), 102-127. https://doi.org/10.5937/bankarstvo2003102S
24. Tabaković, J. (2023). Governor Tabaković's speech at Finticipate vol. 2 – SEE Fintech Forum, dostupno na: https://nbs.rs/en/scripts/showcontent/index.html?id=18981 (datum pristupa 1.7.2024)
25. Taulli, T. (2023). Generative AI: How ChatGPT and Other AI Tools Will Revolutionize Business. Apress. https://doi.org/10.1007/978-1-4842-9367-6
26. Urošević, B. (2023). Od sprečavanja zločina do procene rizika – kako srpske banke koriste AI, dostupno na: https://rs.bloombergadria.com/a-c/tehnologija/digitalizacija/58637/ai-malim-bankama-moze-da-pomogne-da-stignu-velike (datum pristupa 9.9.2024)
27. Verma, N. (2023). JP Morgan Chase: Revolutionizing Banking Through AI — Case Study, dostupno na: https://medium.com/@vermanikhil605/jp-morgan-chase-revolutionizing-banking-through-ai-case-study-a659c0b0957f (datum pristupa 1.7.2024)
28. Waliszewski, K. (2024). Banking-as-a-Service and Embedded Banking as Innovative Methods of Providing Banking Services. In: Lasak, P., & Williams, J. (Eds.), Digital Transformation and the Economics of Banking. Economic, Institutional and Social Dimensions (pp. 50-66). London and New York: Routledge, Taylor & Francis Group.
29. https://www.jpmorganchase.com/about/business-principles (datum pristupa 1.7.2024)
30. https://www.jpmorgan.com/technology/artificial-intelligence (datum pristupa 1.7.2024)
31. https://www.jpmorgan.com/technology/artificial-intelligence/initiatives/explainable-ai-center-of-excellence (datum pristupa 1.7.2024)
32. https://selectacrm.app/?lang=sr (datum pristupa 10.7.2024)
33. https://www.nbs.rs/sr/finansijske-institucije/banke/spisak-banaka/ (datum pristupa 9.9.2024)
34. https://nbs.rs/sr_RS/ciljevi-i-funkcije/finansijska-stabilnost/zastitni_slojevi_kapitala/sistemski-znacajne-banke/ (datum pristupa 9.9.2024)