

PRIMENA ROBOTSKE AUTOMATIZACIJE PROCESA U FINANSIJSKIM INSTITUCIJAMA

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Apstrakt

Digitalna transformacija je kreirala izazove u svim industrijama i poslovnim sektorima. Njen kontinuirani razvoj je jasno inicirao pojavu FinTech inicijativa, koje su prepoznate kao jedna od najvažnijih inovacija u finansijskoj industriji. Banke i druge finansijske institucije su se našle pod velikim pritiskom za unapređivanje kvaliteta usluga, smanjivanje troškova i povećanje efikasnosti. Vođeni ovim pritiscima i željama, finansijski sektor je prepoznao potencijal relativno nove tehnologije - robotske automatizacije procesa (RPA). Njena snaga se ogleda u mogućnosti automatizacije i oslobođanja zaposlenih od obavljanja manuelnih i ponavljajućih aktivnosti koje su karakteristične upravo za finansijski sektor. **Svrha:** Cilj ovog rada je upoznavanje sa mogućnostima primene softverskih roboata u finansijskim institucijama. **Dizajn/metodologija/pristup istraživanju:** Imajući na umu pomenutu svrhu istraživanja, sproveden je sistematski pregled literature pretragom indeksnih baza Web of Science i SCOPUS. **Rezultati/zaključci:** Rezultati sistematskog pregleda literature ukazuju na već postojeću primenu tehnologije robotske automatizacije procesa na različite aktivnosti finansijskog sektora.

Ključne reči: Robotic Process Automation, FinTech, Financial Institution, Banking Sector, Systematic Literature Review

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Uvod

Digitalna transformacija poslovanja predstavlja dobro poznat koncept, kako u akademskoj zajednici, tako i u privredi. Zahvaljujući tehnologiji koja se u današnje vreme brzo razvija, značajan broj privrednih sektora se već digitalizovao i promenio. Ovo međutim nije eliminisalo izazove digitalne transformacije s kojima se sve organizacije susreću, niti otklonilo pritisak na njih da se dalje transformišu pod uticajem novih i razvojem postojećih tehnologija (Ahmet Unal & Bolukbas, 2021; Suryono et al., 2020). Od ovih uticaja nije izuzet ni finansijski sektor. Suryono et al. (2020) su jasno izdvojili digitalnu transformaciju kao nešto što je iniciralo pojаву finansijskih tehnologija – „*FinTech*“, koje smatraju jednom od najznačajnijih inovacija u finansijskom sektoru. Uprkos rastućem interesovanju za *FinTech* i činjenici da su u prvoj polovini 2021. godine investicije u finansijske tehnologije dostigle 33,4 milijarde dolara, još uvek ne postoji opšteprihvaćena definicija ovog pojma, niti opšta saglasnost istraživača o njegovom sadržaju (Milian et al., 2019; Stankevičienė & Kabulova, 2022), a svega nekoliko autora je ponudilo konkretnu definiciju. Najjednostavnije, a time i najopštije tumačenje *FinTech*-a su dali Arner et al., (2015), navodeći da se pod ovim pojmom podrazumeva upotreba tehnologije u finansijama. Leong & Sung, (2018) su istakli da *FinTech* predstavlja multidisciplinarnu oblast koja uključuje finansije, upravljanje tehnologijom i upravljanje inovacijama, dok su Utami et al., (2021) istakli da da dostupnost *FinTech*-a olakšava klijentima organizaciju u finansijskom sektoru pristup različitim finansijskim proizvodima putem digitalizovanih platformi. Schueffel, (2017) je definisao *FinTech* kao „novu granu finansijskog sektora koja nastoji da unapredi finansijske aktivnosti primenom tehnologije. Sva pomenuta tumačenja u svojoj srži ističu ulogu tehnologije, što i ne predstavlja iznenadenje, s obzirom na to da je i sam naziv *FinTech* nastao spajanjem termina „finansije“ i „tehnologija“ (Singh et al., 2021).

Analizirana literatura pruža uvid u širok spektar finansijskih tehnologija. Nabila et al. (2018) su se fokusirali na dve tehnologije iz domena *FinTech*-a – elektronski novčanik zasnovan na karticama i digitalnu gotovinu koja se zasniva na aplikaciji – istražujući ključne faktore za njihovo prihvatanje od strane korisnika s niskim primanjima. Karsen et al. (2019) su se u svom istraživanju posvetili plaćanju putem mobilnih uređaja, kao jednom od vidova plaćanja potpomognutih *FinTech*-om. Dawood et al., (2022) dodaju da je mobilna tehnologija postala glavno područje inovacije u *FinTech*-u, osnovni kanal za pružanje *FinTech* usluga i okosnica mnogih poslovnih modela. Veliyeva, (2021) u istraživanju usmerenom na definisanje smernica za dugoročni razvoj bankarskog sektora Azerbejdžana je istakla ključnu ulogu *FinTech*-a u modernizaciji bankarskog sektora i njegovog uspešnog razvoja. Aldulaimi et al., (2022) govore u korist primene *FinTech*-a u islamskom bankarstvu, to jest, pružanja finansijskih usluga putem savremenih tehnologija, medija i pametnih uređaja u cilju unapređenja performansi i poboljšanja konkurentske pozicije. Među najčešće pominjanim tehnološkim inovacijama u finansijskom sektoru sreću se: društveni mediji, računarstvo u oblaku (engl. *cloud computing*), Peer to Peer (P2P)

platforme, *blokčejn* (engl. *blockchain*) koji je usko povezan sa digitalnim valutama, veštačka inteligencija (engl. *artificial Intelligence - AI*), mašinsko učenje (engl. *machine learning*), robotska automatizacija procesa (engl. *robotic process automation*), masovni podaci (engl. *big data*), internet stvari (engl. *internet of things*) i sajber bezbednost (engl. *cyber security*) (Aldulaimi et al., 2022; H. Dawood et al., 2022; H. M. Dawood et al., 2022; Ferraro et al., 2022; Ghandour, 2021; Gotthardt et al., 2020; Khan et al., 2022; Milian et al., 2019; Suryono et al., 2019, 2020). Na slici 1 su prikazane tehnologije koje su Singh et al. (2021) identifikovali kao najznačajnije za inovacije u finansijskom sektoru.

Slika 1: Najznačajnije finansijske tehnologije



Izvor: Prerađeno prema Singh et al. (2021)

Percepcija potrošača o karakteristikama proizvoda se smatra ključnom za njegovo usvajanje, pa je stoga većina studija fokusirana na razumevanje njihovog ponašanja (Utami et al., 2021), faktora koji utiču na njih (Karsen et al., 2019) i pronalaženje novih načina za izazivanje pozitivnih reakcija na tehnologiju. Iako je većina radova koji se tiču *FinTech*-a fokusirana relativno usko, tj. na konkretnu oblast ili tehnologiju, mali broj autora se bavio tehnologijom robotske automatizacije procesa. Identifikovani jaz u dostupnoj literaturi je poslužio kao motivacija za sprovođenje sistematskog pregleda literature sa ciljem da se identifikuju područja poslovanja i poslovni procesi u finansijskom sektoru u okviru kojih se najčešće implementira

tehnologija robotske automatizacije procesa. U skladu s ovim ciljem, formulisano je i sledeće istraživačko pitanje:

IP.1 Koja su najčešća područja primene robotske automatizacije procesa u finansijskim institucijama?

Rad je struktuiran na sledeći način: nakon uvoda, opisan je metodološki pristup korišćen u istraživanju. Treći odeljak sadrži prikaz rezultata istraživanja i daje odgovor na definisano istraživačko pitanje, a prate ga zaključna razmatranja.

Metodologija

Ovo istraživanje je izvedeno u skladu sa smernicama za sistematski pregled literature Barbare Kitchenham, (2004), i u skladu s tim, sastojalo se od tri faze: planiranja pregleda literature i kreiranja protokola istraživanja, realizacije pregleda literature i izveštavanja o sprovedenom pregledu i dobijenim rezultatima. Detaljan prikaz aktivnosti u navedenim fazama sistematskog pregleda literature prikazan je na slici 2.

Istraživačko pitanje koje je predstavljalo vodilju za sve ostale aktivnosti u toku realizacije ovog istraživanja je glasilo:

IP.1 Koja su najčešća područja primene robotske automatizacije procesa u finansijskim institucijama?

IP.1 doprinosi postavljenom cilju istraživanja, pružajući detaljan pregled poslovnih primena robotske automatizacije procesa u finansijskom sektoru.

Opšti cilj istraživanja je teorijsko upoznavanje tehnologije robotske automatizacije procesa sa posebnim osvrtom na mogućnost njene primene u oblasti finansija. Iz definisanog istraživačkog pitanja kao i opšteg cilja istraživanja izведен je sledeći specifičan cilj:

C.1 Identifikovani najpodesnije poslovne procese za primenu tehnologije robotske automatizacije procesa u finansijskom sektoru.

Slika 2: Metodologija sistematskog pregleda literature



Izvor: Autori, prema Kitchenham (2004)

Nakon formulisanja istraživačkog cilja i pitanja usledilo je definisanje ključnih reči i primarnih izvora publikacija. Kao ključne reči za pretragu indeksnih baza Web of Science (WoS) i SCOPUS, dve najznačajnije bibliografske baze (Raković et al., 2022), korišćene su „Robotic Process Automation“, „*FinTech*“, „Financial institution“, „Banking sector“ i „Systematic literature review“. Definisane ključne reči su se prilikom pretraživanja prethodno pomenutih baza radova kombinovale na različite načine. Korišćene kombinacije ključnih reči, kao i broj ostvarenih podataka (bibliografskih jedinica) za svaku kombinaciju prikazan je u tabeli 1.

Tabela 1: Ključne reči i broj pogodaka

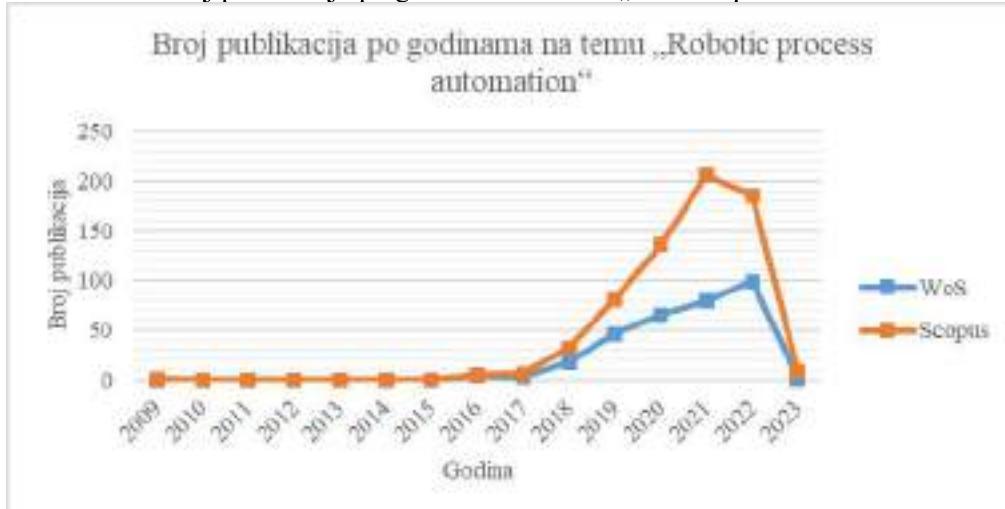
Ključne reči	Broj pogodaka (WoS)	Broj pogodaka (Scopus)
"Robotic Process Automation" AND " <i>FinTech</i> "	0	8
"Robotic Process Automation" AND "Financial institution"	3	7
"Robotic Process Automation" AND "Banking sector"	3	13
" <i>FinTech</i> " AND "Systematic literature review"	27	37
Ukupno	33	65

Izvor: Autori

U cilju minimiziranja subjektivnosti i usmeravanja pažnje na detaljno čitanje i analizu samo onih radova koji odgovaraju predmetu istraživanja, definisani su kriterijumi za uključenje i isključenje radova, koji se mogu svrstati u dve grupe (Taušan et al., 2017).

Prva grupa kriterijuma je zasnovana na bibliometrijskim podacima, i podrazumevala je isključivanje iz dalje analize radove koji: 1) nisu bili napisani na engleskom jeziku i 2) su fokusirani na neku drugu tehnologiju, umesto robotske automatizacije procesa. Kretanja broja publikacija iz rezultata pretrage po godinama objavljivanja prikazanih na grafikonima 1 i 2 ukazuju na to da finansijske tehnologije i robotska automatizacija procesa predstavljaju novost u akademskom svetu, i da se sa njihovim istraživanjem počelo pre otprilike 6-7 godina. Zbog toga, vreme objavljivanja nije razmatrano kao relevantan kriterijum za isključenje radova. Druga grupa kriterijuma je bazirana na sadržaju naslova i apstrakta. Svim radovima iz rezultata pretrage su pregledani naslovi i apstrakti, a iz daljeg istraživanja su izostavljeni oni koji po sadržaju ne doprinose cilju istraživanja

Grafikon 1: Broj publikacija po godinama na temu „Robotic process automation“



Izvor: Autori

Od ukupno 98 pogodaka, 32 rada je uključeno u konačan skup radova koji su kasnije analizirani u celosti. Eliminisano je 23 duplikata. Najviše radova je odbačeno zbog njihove usmerenosti ka nekoj drugoj finansijskoj tehnologiji, prvenstveno *blokčejnu* (13 radova). 9 pogodaka je eliminisano jer su zapravo predstavljali celovito izdanje sa konferencija. Za 9 radova nisu pronađeni celi tekstovi, ili autori nisu odobrili njihovo čitanje. 1 rad je bio na španskom jeziku, 4 rada je odbijeno na osnovu sadržaja, dok ostalih 7 radova nije bilo povezano sa finansijskim sektorom.

Grafikon 2: Broj publikacija po godinama na temu „FinTech“



Izvor: Autor

Kroz *forward* i *backward* analizu je uključeno još 4 rada. Na taj način se došlo do 36 radova koji su bili u potpunosti uključeni u ovo istraživanja. Svi radovi koji su prihvaćeni za dalju analizu su preuzeti u punom sadržaju i analizirani u kontekstu definisanog cilja istraživanja.

Rezultati istraživanja

U ovom odeljku prikazan je pregled rezultata istraživanja koji daju odgovor na definisano istraživačko pitanje.

U okviru celokupnog trenda digitalne transformacije poslovanja, svoju ulogu je pronašla i tehnologija robotske automatizacije procesa (Thekkethil et al., 2021). Iako literatura potvrđuje njenu primenu u mnogim industrijama (Sivula et al., 2021), najpogodnije oblasti za implementaciju čine visoko regulisani sektori, poput finansija (Rameshbabu, 2021). Banke i druge finansijske institucije su prepoznale potencijal upotrebe softverskih robota za unapređenje performansi svojih procesa i korisničkog iskustva (Rameshbabu, 2021).

Literatura ukazuje na mnogobrojne rutinske i ponavljajuće zadatke koji se mogu automatizovati upotrebom robotske automatizacije procesa (Lacurezeanu et al., 2020). Kod ovakvog pristupa automatizaciji, softverski roboti oponašaju načine na koji ljudi obavljaju svoje manuelne, struktuirane i često dosadne poslove (Ahmet Unal & Bolukbas, 2021). Primeri ovakvih poslova su, neposredno odgovaranje na veliki broj upita klijenata sa kojima se banke svakodnevno suočavaju (Choubey & Sharma, 2021), izračunavanje performansi, kreiranje različitih dokumenata, masovno slanje datoteka elektronskom poštom, priprema personalizovanog sadržaja i slanje mejlova. Sve ove korake može da obavlja sistem bez ikakve intervencije i pomoći čoveka (Rashed et al., 2023). Pred toga, robotskom automatizacijom procesa moguće je vršiti i filtriranje i čitanje podataka iz sistema (npr. elektronske pošte), obradu ovih informacija na osnovu različitih, unapred definisanih pravila, kao i automatizovati unos obrađenih informacija u druge sisteme, poput sistema za planiranje resursa preduzeća (ERP) ili upravljanja odnosima sa kupcima (CRM) (Maček et al., 2020).

Banke su oduvek bile poznate po obilju i manuelnih procedura koje negativno utiču na produktivnost i zadovoljstvo klijenata (Choubey & Sharma, 2021). Uz primenu softverskih robota, zajmodavci, na primer, mogu da automatizuju proces obrade kredita, počev od prikupljanja informacija o klijentu, određivanja uslova, odobravanja kredita, pa sve do praćenja njegove otplate (Thekkethil et al., 2021). Abdulla et al., (2022) navode i druge aktivnosti koje se mogu automatizovati u procesu kreditiranja, poput provere kvalifikovanosti klijenta, obrade dokumenata, finansijskih poređenja i kontrole kvaliteta. Britanska banka „Barclays“ je implementirala robotsku automatizaciju procesa u velikom broju procedura, među kojima je i obrada zahteva za odobravanje kredita zajedno sa praćenjem rizika (Choubey & Sharma, 2021). U MUFG Union banci, robotska automatizacija procesa je doprinela realizaciji težnji da se ubrza proces kreditiranja tako što implementirani softverski robot preuzima podatke o klijentu koji se unose u onlajn zahtevu, proverava validnost podataka, te na

osnovu analize donosi odluku i šalje klijentu predlog ponude za zajam (Maček et al., 2020).

Tehnologija robotske automatizacije procesa je sposobna da obavlja složene proračune, kao i da na sebe preuzme donošenje jednostavnijih odluka (Bisht et al., 2022). Obrada zahteva za izdavanje kreditnih kartica predstavlja primer strukturisane operativne procedure koja se svakodnevno ponavlja, te je dobar kandidat za automatizaciju softverskim robotima, koji mogu da preuzmu na sebe proveru ispunjenosti uslova za izdavanje kartice na osnovu prikupljenih podataka o klijentu i provere njegove kreditne sposobnosti (Rameshbabu, 2021). Na ovaj način se omogućava preusmeravanje zaposlenih ka aktivnostima koje doprinose stvaranju veće vrednosti.

U prirodi je čoveka da mu motivacija opadne usled kontinuiranog obavljanja istog posla, što po pravilu dovodi do porasta broja grešaka (Rashed et al., 2023). Kanakov & Prokhorov (2020) navode otvaranje računa, ažuriranje informacija o klijentima, konsolidaciju finansijskih izveštaja i obradu ulazno/izlaznih plaćanja kao najčešće bankarske procese koji podležu automatizaciji upotrebom robotske automatizacije procesa. Implementacijom softverskih roboata, zahtevan proces otvaranja novog računa postaje lakši, direktniji i tačniji (Choubey & Sharma, 2021). Robotska automatizacija procesa je omogućila banci „State Bank of Hyderabad“ (SBH) da svakom klijentu u svakom trenutku pruži sveobuhvatan obračun dodatnih naknada za neplaćene kamate ukoliko planira da raskine postojeće ugovore pre isteka roka. Pre automatizacije, ovaj proces je bio manuelan i izvršavao se samo na zahtev klijenata (Herm et al., 2022). Indijska privatna banka „ICICI“ je upotrebom softverskih roboata automatizovala preko milion bankarskih transakcija svakog dana, smanjujući vreme realizacije za 60%, a ujedno povećavajući i njihovu stopu tačnosti (Choubey & Sharma, 2021).

Finansijske institucije u okviru svog redovnog poslovanja svakodnevno prikupljaju i obrađuju velike količine osetljivih podataka. Uprkos tome što se smatraju jednim od najbolje organizovanih sektora na svetu, finansijski sektor se takođe suočava sa izazovima iz oblasti bezbednosti podataka, upravljanja rizicima i neefikasnosti (Abdulla et al., 2022). Zbog toga, banke, osiguravajuća društva i druge finansijske institucije pribegavaju automatizaciji u cilju identifikovanja bezbednosnih rizika i njihovog prevazilaženja, otkrivanju prevara i sprečavanju krađa podataka (Thekkethil et al., 2021). Automatizovano praćenje transakcija omogućava otkrivanje bilo kakvih nepravilnosti i potencijalno neželjenih šablonu u transakcijama. U takvim situacijama, softverski roboati mogu da blokiraju račune i zaustave transakcije (Abdulla et al., 2022). Turska je u okviru mera protiv ilegalnog poslovanja i pranja novca obavezala banke na sprovođenje analize klijenata i njihovih transakcija. Sumnjive transakcije otkrivene ovim analizama se prijavljuju Odboru za istragu finansijskih krivičnih dela (MASAK). Pošto je manuelnim analizama i praćenjem transakcija gotovo nemoguće otkriti pretnje, „Vakif Participation Bank“ je za pomenuti proces razvio softverskog roboata (Ahmet Unal & Bolukbas, 2021).

Nezavisna holandska banka KAS je 2016. godine prepoznala značaj i potencijal unapređivanja internih poslovnih procesa radi povećavanja stepena zadovoljstva klijenata. Nakon perioda ispitivanja mogućnosti robotske automatizacije procesa, počeli su s njenom implementacijom u svakodnevno poslovanje. Danas KAS banka ima 20 automatizovanih finansijskih poslovnih procesa, poput poslova trezora, plaćanja obaveza, obračuna i knjiženja, upravljanja podacima klijenata itd. (Oshri & Plugge, 2022).

U oblasti računovodstva i revizije, Fernandez & Aman, (2018) ističu fakturisanje, obračun plata, pripremu finansijskih izveštaja i finansijsko planiranje kao procese pogodne za automatizaciju. Računovodstvo podrazumeva hronološko i sistematsko evidentiranje transakcija kroz dobro definisane korake, što omogućava kompanijama koje nude računovodstvene usluge da iskoriste mogućnosti automatizacije (Lacurezeanu et al., 2020). Huang and Vasarhelyi (2019) navode da je primena robotske automatizacije procesa u reviziji zaostala zbog svoje jedinstvene prirode, ali da su procedure revizije dobro definisane jer nijedan od koraka ne zahteva profesionalnu procenu i svi se mogu izvršiti na osnovu eksplicitnih pravila. Konkretno, tokom revizije finansijskih izveštaja, revizor obavlja niz operacija koje je moguće automatizovati (Lacurezeanu et al., 2020).

Robotska automatizacija procesa je od značaja i za osiguravajuće kuće (Benkalai et al., 2020). Ranije je već pomenuto da je RPA od posebne koristi kompanijama koje upravljaju ogromnim količinama podataka, što posebno važi za osiguravajuća društva. One na dnevnom nivou mogu da imaju milione transakcija, od kojih većina ima veoma kratko vreme obrade (Benkalai et al., 2020). Osiguravajuća društva mogu da primene automatizaciju u nekoliko područja, kao što su otkrivanje prevara, kreditna analiza, izrada profila i segmentacija kupaca, dizajn proizvoda i procena osiguranja i potraživanja (Abdulla et al., 2022). Obrada zahteva za osiguranje automobila i osiguranje kredita kroz automatsku verifikaciju prihoda/rashoda i procenu rizika se navode kao neke od najčešćih aktivnosti osiguravajućih kuća (Chakraborti et al., 2020; Devarajan, 2018). Tabela 2. sadrži sistematizovan prikaz procesa koji se najčešće automatizuju u finansijskim institucijama upotrebom RPA tehnologije.

Tabela 2: Najčešće automatizovani procesi u finansijskim institucijama

Redni broj	Proces	Izvor
1	Otvaranje računa	Choubey & Sharma, 2021; Kanakov & Prokhorov, 2020; Oshri & Plugge, 2022
2	Manipulacija postojećim podacima o klijentima	Abdulla et al., 2022; Benkalai et al., 2020; Choubey & Sharma, 2021; Herm et al., 2022; Kanakov & Prokhorov, 2020; Lacurezeanu et al., 2020; Maček et al., 2020; Oshri & Plugge, 2022
3	Obrada kreditnog zahteva	Abdulla et al., 2022; Benkalai et al., 2020; Choubey & Sharma, 2021; Maček et al., 2020; Rameshbabu, 2021; Thekkethil et al., 2021

4	Obrada zahteva za izdavanje kreditne kartice	Abdulla et al., 2022; Devarajan, 2018; Rameshbabu, 2021
5	Prikupljanje podataka sa veba	Villar & Khan, 2021
6	Kreiranje različitih dokumenata i izveštaja	Abdulla et al., 2022; Lacurezeanu et al., 2020; Maček et al., 2020; Rashed et al., 2023; Villar & Khan, 2021
7	Otkrivanje prevara i praćenje rizika	Abdulla et al., 2022; Ahmet Unal & Bolukbas, 2021; Benkalai et al., 2020; Choubey & Sharma, 2021; Thekkethil et al., 2021
Redni broj	Proces	Izvor
8	Blokiranje računa i transakcija	Abdulla et al., 2022; Ahmet Unal & Bolukbas, 2021
9	Nepovoljni medijski skrining	(Villar & Khan, 2021)
10	Fakturisanje	Benkalai et al., 2020; Fernandez & Aman, 2018; Lacurezeanu et al., 2020; Oshri & Plugge, 2022
11	Obračun plata	Devarajan, 2018; Fernandez & Aman, 2018; Lacurezeanu et al., 2020
12	Priprema finansijskih izveštaja	Fernandez & Aman, 2018; Kanakov & Prokhorov, 2020
13	Finansijsko planiranje	Fernandez & Aman, 2018; Lacurezeanu et al., 2020
14	Kreiranje bilansa	Sivula et al., 2021
15	Utvrđivanje poreza i naknada	Lacurezeanu et al., 2020
16	Zatvaranje bilansa stanja	Lacurezeanu et al., 2020
17	Obrada zahteva za osiguranje	Benkalai et al., 2020; Chakraborti et al., 2020

Izvor: Autori

Zaključak

Napredak tehnologije je oduvek predstavljao pokretačku snagu promena. Svet u kojem danas živimo se brzo razvija te svakodnevno prezentuje nove i komplikovanije izazove. U tom kontekstu, finansijske institucije nastoje da kontinuirano ostvaruju rast produktivnosti, i efikasnosti u upravljanju svojim resursima koji su obično oskudni i skupi (Benkalai et al. 2020). Cilj ovog istraživanja je bio da se identifikuje uloga relativno nove tehnologije - robotske automatizacije procesa u finansijskim institucijama.

Danas se u gotovo svim organizacijama odvija proces digitalne transformacije, koji nije zaobišao ni finansijske institucije. Uticaj digitalne transformacije i potreba za napretkom u sektoru finansija je doveo do razvoja finansijskih tehnologija - *FinTech* i robotske automatizacije procesa, koja je bila u fokusu ovog rada. Poslovi koji se svakodnevno odvijaju u finansijskim institucijama su najčešće manuelni, repetitivni, struktuirani i ne zahtevaju ljudsko rasudivanje ili stručno znanje zaposlenih. Iz tog razloga se ističu kao odlični kandidati za automatizaciju pomoću softverskih roboata. Njihovom automatizacijom se otvara prostor da se zaposleni mogu preusmeriti na poslove koji su kreativni, nestruktuirani i koji zahtevaju donošenje kompleksnijih odluka i dublja stručna znanja. Obrada kreditnog zahteva, otvaranje računa, obračun zarada, fakturisanje, izrada izveštaja su samo neki od operativnih procesa koji su u praksi već automatizovani (Lacurezeanu et al., 2020). Pored toga, literatura svedoči o upotrebi robotske automatizacije procesa kao odgovor na potpuno nove zahteve i procedure koje se po prvi put implementiraju, pre svega u domenu sprečavanja pranja novca i nelegalnog poslovanja. S obzirom na to da interesovanje istraživača za primenu robotske automatizacije procesa u finansijskom sektoru neprestano raste od same pojave ove tehnologije pa sve do danas, realno je očekivati da će se njena primena intenzivirati i proširiti i na ostale procese finansijskih institucija, a čak postati i standardan deo procesa u ovom sektoru.

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APPLICATION OF ROBOTIC PROCESS AUTOMATION IN FINANCIAL INSTITUTIONS

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Abstract

Digital transformation has created challenges in all industries and business sectors. Its continuous development has clearly initiated the emergence of FinTech initiatives, which are recognized as one of the most important innovations in the financial industry. Banks and other financial institutions have found themselves under great pressure to improve the quality of services, reduce costs and increase efficiency. Driven by these pressures and desires, the financial sector recognized the potential of a relatively new technology - robotic process automation (RPA). Its strength is reflected in the possibility of automation and freeing employees from performing manual and repetitive activities that are characteristic of the financial sector.

Purpose: The aim of this paper is to familiarize with the possibilities of application of software robots in financial institutions. **Research design/methodology/approach:** Keeping in mind the aforementioned research purpose, a systematic literature review was conducted by searching the Web of Science and SCOPUS index databases. **Results/conclusions:** The results of the systematic literature review indicate the already existing application of robotic process automation technology to various activities of the financial sector.

Keywords: Robotic Process Automation, FinTech, Financial Institution, Banking Sector, Systematic Literature Review

JEL: O16, O31

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Introduction

The digital transformation of business is a well-known concept, both in the academic community and in the economy. Thanks to technology that is rapidly developing today, a significant number of economic sectors have already been digitized and changed. This, however, did not eliminate the challenges of digital transformation that all organizations face, nor did it remove the pressure on them to further transform under the influence of new and the development of existing technologies (Ahmet Unal & Bolukbas, 2021; Suryono et al., 2020) . The financial sector is not exempt from these influences. Suryono et al. (2020) clearly singled out digital transformation as something that initiated the emergence of financial technologies - " *FinTech*", which they consider one of the most significant innovations in the financial sector. Despite the growing interest in *FinTech* and the fact that in the first half of 2021 investments in financial technologies reached 33.4 billion dollars, there is still no generally accepted definition of this term, nor a general consensus among researchers about its content (Milian et al., 2019; Stankevičienė & Kabulova, 2022) , and only a few authors offered a concrete definition. The simplest and thus the most general interpretation of *FinTech* was given by Arner et al., (2015), stating that this term refers to the use of technology in finance. Leong & Sung, (2018) pointed out that *FinTech* is a multidisciplinary field that includes finance, technology management and innovation management, while Utami et al., (2021) pointed out that the availability of *FinTech* makes it easier for clients of organizations in the financial sector to access various financial products through digitized platforms. Schueffel, (2017) defined *FinTech* as "a new branch of the financial sector that seeks to improve financial activities through the application of technology. All mentioned interpretations at their core highlight the role of technology, which is not surprising, given that the name *FinTech* itself was created by combining the terms "finance" and "technology" (Singh et al., 2021) .

The analyzed literature provides insight into a wide range of financial technologies. Nabila et al. (2018) focused on two *FinTech technologies* – card-based electronic wallet and application-based digital cash – investigating the key factors for their adoption by low-income users. Karsen et al. (2019) in their research focused on payments via mobile devices, as one of the types of payments supported by *FinTech*. Dawood et al., (2022) add that mobile technology has become the main area of innovation in *FinTech*, the basic channel for providing *FinTech* services and the backbone of many business models. Veliyeva, (2021) in research aimed at defining guidelines for the long-term development of the banking sector of Azerbaijan highlighted the key role of *FinTech* in the modernization of the banking sector and its successful development. Aldulaimi et al., (2022) speak in favor of the application of *FinTech* in Islamic banking, that is, the provision of financial services through modern technologies, media and smart devices in order to improve performance and improve the competitive position. Among the most frequently mentioned technological innovations in the financial sector are: social media, cloud computing, *Peer to Peer* (P2P) platforms, *blockchain*, which is closely related to digital

currencies, artificial intelligence *artificial intelligence - AI*), machine learning, *robotic process automation*, *big data*, *internet of things* and *cyber security* (eng. *cyber security*) (Aldulaimi et al., 2022; H. Dawood et al., 2022; HM Dawood et al., 2022; Ferraro et al., 2022; Ghandour, 2021; Gotthardt et al., 2020; Khan et al., 2022; Milian et al., 2019; Suryono et al., 2019, 2020) . Figure 1 shows the technologies that Singh et al. (2021) identified as the most significant for innovation in the financial sector.

Figure 1: The most significant financial technologies



Source: Adapted from Singh et al. (2021)

Consumers' perception of product features is considered key to its adoption, and therefore most studies are focused on understanding their behavior (Utami et al., 2021) , the factors that influence them (Karsen et al., 2019) and finding new ways to induce positive reactions to technology. Although most of the works concerning *FinTech* are focused relatively narrowly, i.e. to a specific field or technology, a small number of authors dealt with robotic process automation technology. The identified gap in the available literature served as motivation for conducting a systematic review of the literature with the aim of identifying business areas and business processes in the financial sector in which robotic process automation technology is most often implemented. In accordance with this goal, the following research question was formulated:

IP.1 What are the most common areas of application of robotic process automation in financial institutions?

The paper is structured as follows: after the introduction, the methodological approach used in the research is described. The third section contains a presentation of the research results and provides an answer to the defined research question, followed by concluding remarks.

Methodology

This research was conducted in accordance with the guidelines for a systematic literature review by Barbara Kitchenham, (2004) , and accordingly, it consisted of three phases: planning the literature review and creating a research protocol, implementing the literature review, and reporting on the conducted review and the results obtained. A detailed description of the activities in the mentioned stages of the systematic literature review is shown in Figure 2.

The research question that was the guiding principle for all other activities during the realization of this research was:

IP.1 What are the most common areas of application of robotic process automation in financial institutions?

IP.1 contributes to the stated research objective, providing a detailed overview of business applications of robotic process automation in the financial sector.

The general goal of the research is a theoretical introduction to the robotic process automation technology with a special focus on the possibility of its application in the field of finance. From the defined research question as well as the general goal of the research, the following specific goal was derived:

C.1 Identified the most suitable business processes for the application of robotic process automation technology in the financial sector.

Figure 2: Methodology of systematic literature review



Source: Authors, according to Kitchenham (2004)

After the formulation of the research objective and questions followed the definition of key words and primary sources of publications. "Robotic Process Automation", "FinTech", " Financial institution", "Banking sector" were used as keywords for

searching the index databases Web of Science (WoS) and SCOPUS, the two most important bibliographic databases (Raković et al., 2022). and "Systematic literature review" Defined keywords were combined in different ways during the search of the previously mentioned databases. The key word combinations used, as well as the number of generated data (bibliographic units) for each combination are shown in table 1.

Table 1: Keywords and number of hits

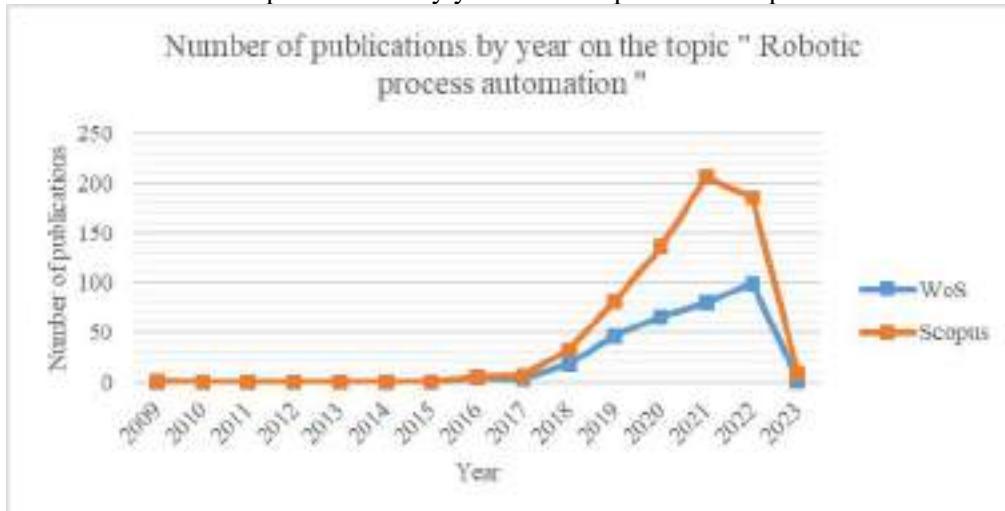
Key words	Number of Hits (WoS)	Number of hits (Scopus)
"Robotic Process Automation" AND " <i>FinTech</i> "	0	8
"Robotic Process Automation" AND "Financial institution"	3	7
"Robotic Process Automation" AND "Banking sector"	3	13
" <i>FinTech</i> " AND "Systematic literature review"	27	37
In total	33	65

Source: Authors

In order to minimize subjectivity and direct attention to the detailed reading and analysis of only those works that correspond to the subject of the research, criteria for the inclusion and exclusion of works were defined, which can be classified into two groups (Taušan et al., 2017).

The first group of criteria was based on bibliometric data, and included the exclusion from further analysis of papers that: 1) were not written in English and 2) were focused on some other technology, instead of robotic process automation. The trends in the number of publications from the search results by year of publication shown in graphs 1 and 2 indicate that financial technologies and robotic process automation are new in the academic world, and that their research began approximately 6-7 years ago. Therefore, the time of publication was not considered as a relevant criterion for the exclusion of works. The second group of criteria is based on the content of the title and abstract. The titles and abstracts of all works from the search results were reviewed, and those whose content did not contribute to the research goal were omitted from further research.

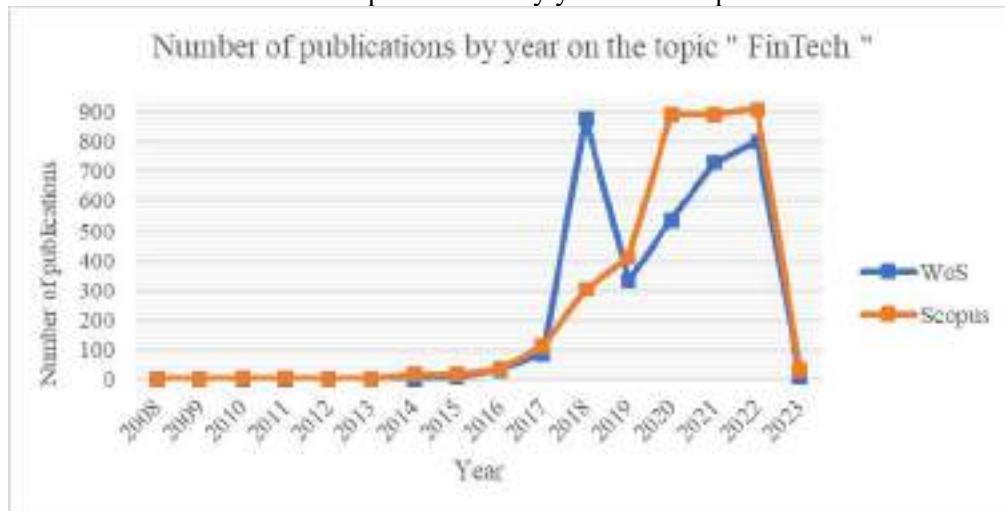
Chart 1: Number of publications by year on the topic "Robotic process automation"



Source: Authors

Out of a total of 98 hits, 32 papers were included in the final set of papers that were later analyzed in their entirety. 23 duplicates were eliminated. Most papers were rejected due to their focus on some other financial technology, primarily *blockchain* (13 papers). 9 hits were eliminated because they actually represented a complete release from the conferences. For 9 papers, the full texts were not found, or the authors did not approve their reading. 1 paper was in Spanish, 4 papers were rejected based on content, while the other 7 papers were not related to the financial sector.

Chart 2: Number of publications by year on the topic "FinTech "



Source: Author

Through *forward* and *backward* analysis, 4 more papers were included. In this way, 36 works were reached that were fully included in this research. All papers that were accepted for further analysis were downloaded in full and analyzed in the context of the defined research objective.

Research results

This section presents an overview of research results that provide an answer to the defined research question.

Within the overall trend of digital business transformation, robotic process automation technology has also found its role (Thekkethil et al., 2021). Although the literature confirms its application in many industries (Sivula et al., 2021), the most suitable areas for implementation are highly regulated sectors, such as finance (Rameshbabu, 2021). Banks and other financial institutions have recognized the potential of using software robots to improve the performance of their processes and customer experience (Rameshbabu, 2021).

The literature points to numerous routine and repetitive tasks that can be automated using robotic process automation (Lacurezeanu et al., 2020). In this approach to automation, software robots imitate the ways in which people perform their manual, structured and often boring jobs (Ahmet Unal & Bolukbas, 2021). Examples of such jobs are directly responding to a large number of client inquiries that banks face every day (Choubey & Sharma, 2021), performance calculation, creating various documents, mass sending files by electronic mail, preparing personalized content and sending emails. All these steps can be performed by the system without any human intervention and assistance (Rashed et al., 2023). Before that, with robotic process automation, it is possible to filter and read data from the system (e.g. e-mail), process this information based on different, predefined rules, as well as automate the input of processed information into other systems, such as the company's resource planning system (ERP) or customer relationship management (CRM) (Macek et al., 2020).

Banks have always been known for the abundance of manual procedures that negatively affect productivity and customer satisfaction (Choubey & Sharma, 2021). With the application of software robots, lenders, for example, can automate the loan processing process, starting from collecting information about the client, determining terms, approving the loan, and all the way to monitoring its repayment (Thekkethil et al., 2021). Abdulla et al., (2022) mention other activities that can be automated in the lending process, such as customer eligibility verification, document processing, financial comparisons and quality control. The British bank "Barclays" has implemented robotic process automation in a large number of procedures, among which is the processing of loan approval requests along with risk monitoring (Choubey & Sharma, 2021). At MUFG Union Bank, robotic process automation has contributed to the realization of aspirations to speed up the crediting process by implementing a software robot that takes data about the client that is entered in the online request, checks the validity of the data, and based on the analysis, makes a decision and sends the client a proposal for a loan (Macek et al., 2020).

The robotic process automation technology is capable of performing complex calculations, as well as taking over the making of simpler decisions (Bisht et al., 2022) . The processing of credit card requests is an example of a structured operational procedure that is repeated daily, and is a good candidate for automation by software robots, which can take over the verification of the fulfillment of the conditions for issuing a card based on the collected data about the client and checking his creditworthiness (Rameshbabu, 2021) . In this way, it is possible to redirect employees towards activities that contribute to the creation of greater value.

It is in the nature of man that his motivation decreases due to continuous performance of the same work, which as a rule leads to an increase in the number of mistakes (Rashed et al., 2023) . Kanakov & Prokhorov (2020) list opening accounts, updating customer information, consolidating financial statements and processing incoming/outgoing payments as the most common banking processes subject to automation using robotic process automation. By implementing software robots, the demanding process of opening a new account becomes easier, more direct and more accurate (Choubey & Sharma, 2021) . Robotic process automation has enabled State Bank of Hyderabad (SBH) to provide every customer with a comprehensive calculation of additional charges for unpaid interest at any time if they plan to terminate existing contracts before the expiry date. Before automation, this process was manual and performed only at the request of clients (Herm et al., 2022) . The Indian private bank "ICICI" used software robots to automate over a million banking transactions every day, reducing the time of realization by 60%, and at the same time increasing their accuracy rate (Choubey & Sharma, 2021) .

Financial institutions collect and process large amounts of sensitive data on a daily basis as part of their regular operations. Despite being considered one of the best organized sectors in the world, the financial sector also faces challenges in the areas of data security, risk management and inefficiencies (Abdulla et al., 2022) . Therefore, banks, insurance companies and other financial institutions resort to automation in order to identify security risks and overcome them, detect fraud and prevent data theft (Thekkethil et al., 2021) . Automated transaction monitoring enables detection of any irregularities and potentially unwanted patterns in transactions. In such situations, software robots can block accounts and stop transactions (Abdulla et al., 2022) . As part of measures against illegal business and money laundering, Turkey has obliged banks to conduct analysis of clients and their transactions. Suspicious transactions detected by these analyzes are reported to the Committee for the Investigation of Financial Crimes (MASAK). Since it is almost impossible to detect threats through manual analysis and monitoring of transactions, "Vakıf Participation Bank" has developed a software robot for the aforementioned process (Ahmet Unal & Bolukbas, 2021) .

In 2016, the independent Dutch bank KAS recognized the importance and potential of improving internal business processes in order to increase the level of client satisfaction. After a period of testing the possibility of robotic process automation, they started with its implementation in everyday business. Today, KAS banka has 20

automated financial business processes, such as treasury operations, payment of liabilities, accounting and posting, management of client data, etc. (Oshri & Plugge, 2022).

In the field of accounting and auditing, Fernandez & Aman, (2018) highlight invoicing, payroll, preparation of financial statements and financial planning as processes suitable for automation. Accounting involves the chronological and systematic recording of transactions through well-defined steps, which allows companies that offer accounting services to take advantage of automation opportunities (Lacurezeanu et al., 2020). Huang and Vasarhelyi (2019) state that the application of robotic process automation in auditing has lagged behind due to its unique nature, but that auditing procedures are well defined because none of the steps require professional judgment and all can be performed based on explicit rules. Specifically, during the audit of financial statements, the auditor performs a series of operations that can be automated (Lacurezeanu et al., 2020).

Robotic process automation is also important for insurance companies (Benkalai et al., 2020). It was mentioned earlier that RPA is of particular benefit to companies that manage huge amounts of data, which is especially true for insurance companies. They can have millions of transactions on a daily basis, most of which have a very short processing time (Benkalai et al., 2020). Insurance companies can apply automation in several areas, such as fraud detection, credit analysis, customer profiling and segmentation, product design, and insurance and claims assessment (Abdulla et al., 2022). Claim processing for car insurance and credit insurance through automatic income/expense verification and risk assessment are cited as some of the most common activities of insurance companies (Chakraborti et al., 2020; Devarajan, 2018). Table 2 contains a systematized overview of processes that are most often automated in financial institutions using RPA technology.

Table 2: The most common automated processes in financial institutions

Serial number	The process	Source
1	Account opening	Choubey & Sharma, 2021; Kanakov & Prokhorov, 2020; Oshri & Plugge, 2022
2	Manipulation of existing customer data	Abdulla et al., 2022; Benkalai et al., 2020; Choubey & Sharma, 2021; Herm et al., 2022; Kanakov & Prokhorov, 2020; Lacurezeanu et al., 2020; Macek et al., 2020; Oshri & Plugge, 2022
3	Credit application processing	Abdulla et al., 2022; Benkalai et al., 2020; Choubey & Sharma, 2021; Macek et al., 2020; Rameshbabu, 2021; Thekkethil et al., 2021
4	Credit card application processing	Abdulla et al., 2022; Devarajan, 2018; Rameshbabu, 2021
5	Collecting data from the web	Villar & Khan, 2021

6	Creation of various documents and reports	Abdulla et al., 2022; Lacurezeanu et al., 2020; Macek et al., 2020; Rashed et al., 2023; Villar & Khan, 2021
7	Fraud detection and risk monitoring	Abdulla et al., 2022; Ahmet Unal & Bolukbas, 2021; Benkalai et al., 2020; Choubey & Sharma, 2021; Thekkethil et al., 2021
Serial number	The process	Source
8	Blocking accounts and transactions	Abdulla et al., 2022; Ahmet Unal & Bolukbas, 2021
9	Unfavorable media screening	(Villar & Khan, 2021)
10	Invoicing	Benkalai et al., 2020; Fernandez & Amman, 2018; Lacurezeanu et al., 2020; Oshri & Plugge, 2022
11	Payroll calculation	Devarajan, 2018; Fernandez & Amman, 2018; Lacurezeanu et al., 2020
12	Preparation of financial statements	Fernandez & Amman, 2018; Kanakov & Prokhorov, 2020
13	Financial planning	Fernandez & Amman, 2018; Lacurezeanu et al., 2020
14	Creating a balance sheet	Sivula et al., 2021
15	Determination of taxes and fees	Lacurezeanu et al., 2020
16	Closing balance sheet	Lacurezeanu et al., 2020
17	Processing of insurance claims	Benkalai et al., 2020; Chakraborty et al., 2020

Source: Authors

Conclusion

Advances in technology have always been the driving force behind change. The world we live in today is developing rapidly and presents new and more complicated challenges every day. In this context, financial institutions strive to achieve continuous growth in productivity and efficiency in managing their resources, which are usually scarce and expensive (Benkalai et al. 2020). The aim of this research was to identify the role of a relatively new technology - robotic process automation in financial institutions.

Today, the process of digital transformation is taking place in almost all organizations, which has not bypassed even financial institutions. The impact of digital transformation and the need for progress in the financial sector led to the development of financial technologies - *FinTech* and robotic process automation, which was the focus of this paper. The jobs that take place every day in financial

institutions are mostly manual, repetitive, structured and do not require human judgment or professional knowledge of the employees. For this reason, they stand out as excellent candidates for automation using software robots. Their automation opens up space for employees to be redirected to jobs that are creative, unstructured and that require making more complex decisions and deeper professional knowledge. Credit application processing, account opening, salary calculation, invoicing, report creation are just some of the operational processes that are already automated in practice (Lacurezeanu et al., 2020). In addition, the literature testifies to the use of robotic process automation as a response to completely new requirements and procedures that are being implemented for the first time, primarily in the domain of preventing money laundering and illegal business. Given that the interest of researchers in the application of robotic automation of processes in the financial sector has been constantly growing since the appearance of this technology until today, it is realistic to expect that its application will intensify and expand to other processes of financial institutions, and even become standard part of the process in this sector.

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