

EVALUATION AND FORMATION OF THE CONCEPT OF MODELING BUSINESS PROCESSES OF SALES IN REAL ESTATE ENTERPRISES

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This paper examines the multifaceted challenges faced by China's real estate industry in sales business process management under the dynamic policy adjustments, diversified customer demands, and digital transformation. By integrating ARIMA models, CRM customer segmentation, BPMN 2.0 standards, and other technical tools, a three-dimensional process modeling framework is constructed, encompassing policy dynamic adaptation, differentiated customer service design, and process standardization with knowledge retention. Empirical analysis demonstrates that data-driven policy quantification models can reduce compliance risks by over 60%, differentiated process modules (e.g., streamlined chains for first-time buyers and value-added service chains for investors) improve customer satisfaction by 20–30%, and modular process libraries combined with knowledge graph technology compress core process cycles by 50%. For small and medium-sized enterprises (SMEs) with resource constraints, lightweight implementation strategies (e.g., low-code platform deployment and external resource reuse) achieve a 40% efficiency improvement in critical stages. The study emphasizes the role of technology integration (e.g., BIM, RPA) and agile iteration mechanisms, providing methodological support for optimizing process resilience and building standardized management systems in real estate enterprises. In today's dynamic real estate market, the efficiency of business processes plays a crucial role in enhancing the competitiveness of companies. The growing digitalization, emergence of new marketing strategies, and changes in consumer behavior require the adaptation of traditional sales schemes to modern realities. Formalizing and optimizing business processes helps not only to reduce costs but also to improve customer service quality, shorten deal-closing time, and ensure transparency at all stages of interaction. Developing an effective business process model for real estate sales is especially relevant under conditions of high market competition, economic volatility, and evolving regulatory frameworks. Such a model enables the automation of key sales stages – from lead generation to post-sale support – which becomes a critical success factor for real estate agencies and development companies. Therefore, research into the business process model of real estate sales is timely and significant, as it aims to improve managerial decision-making, increase operational efficiency, and ensure the long-term sustainability of companies in the real estate market.

Keywords: real estate sales process; business process modeling; policy dynamic adaptation; customer segmentation; BPMN 2.0; process automation, real estate companies, business process efficiency, real estate valuation methods, business trends, service consumers, sustainable competitive advantage, management system, integrated management, methodology for implementing organizational business processes, measuring the effectiveness of business processes, business process management.

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Formulation of the problem in general terms. At a critical time of deep adjustment and transformation of China's real estate market, the industry environment is undergoing unprecedented structural changes, and enterprise process management faces multiple challenges: at the policy level, high-frequency and refined regulation such as dynamic adjustment of purchase restriction policies and strengthening of pre-sale fund supervision continue to impact the existing business processes of enterprises. After the policy adjustment in some cities, enterprises need to add qualification verification nodes in the sales process, or add regulatory

filing links in the fund payment process. The contradiction between the policy adaptation ability of traditional processes and compliance operation requirements is becoming increasingly prominent. At the market competition level, customer needs are highly differentiated, and the core demands of different types of customers for process services are significantly different: rigid-need customers have demands for efficient services such as fast price calculation and loan pre-examination, improvement-oriented customers have upgraded requirements for personalized demand analysis and customized services, and investment customers

have special demands for professional investment evaluation and transaction docking, all of which put forward higher requirements for the differentiated response capabilities of process design; and the practice of leading real estate companies to achieve service upgrades through process innovation (such as full-cycle online processes to promote conversion rate improvement, customer journey optimization to significantly improve satisfaction), further highlighting the gap in process competitiveness between companies of different sizes in the industry. At the management model level, the traditional process management approach that relies on experience inheritance leads to knowledge fragmentation and high replication costs. Especially for small and medium-sized enterprises with limited resources, how to break through the bottleneck of inefficiency in process management and achieve survival and development in a complex environment has become a practical problem that needs to be solved urgently.

Analysis of recent research and publications. Chen Bihui (2002) introduced the ARIMA time series model to solve the problem of evaluating the effectiveness of business process reengineering (BPR) [1]. Taking a cleaning products company as an example, he divided the sales data before and after the implementation of BPR to verify its independent role in promoting sales performance. He found that sales increased significantly by 840,000 yuan after implementation. This provided a scientific statistical modeling method for quantifying the effectiveness of management measures, emphasizing avoiding empirical judgments and focusing on data-driven effectiveness verification. Zhang Kai (2002) built a CRM model with seven modules to meet the needs of real estate customer relationship management in the e-commerce era, and proposed a customer segmentation strategy (rigid demand/improvement type/investment type) [10]. Through case verification, it can improve the efficiency of customer information integration by 60% and shorten the sales cycle by 20%. It emphasizes data mining and omni-channel interaction, designs an 11-stage implementation path, promotes enterprises to shift from "product orientation" to "customer orientation", and provides systematic CRM solutions. Zhao Ping and Sun Shudong (2005) introduced the grey system theory to construct the GM (1,1) model to address the uncertainty of commodity housing sales forecasts [11]. The model was validated using data from a real estate company from 1991 to 2002, and the forecast accuracy reached 91.2%. Through cumulative generation and adjacent mean processing, the forecasting problem in small sample and poor information scenarios was solved, providing a quantitative tool for companies to dynamically adjust their supply strategies, which is particularly suitable for market trend analysis during policy fluctuations. Tang Sixin and Zhuang Minglai (2008) compared the differences between the "bookkeeping voucher model" and the "original voucher model" in accounts receivable management and found that the latter improved management accuracy by 40% through real-time auditing, but relied on IT technology; the former complied with traditional financial regulations but lacked real-time performance [6]. They proposed that enterprises should choose models according to

their needs and suggested integrating the advantages of the two through voucher template technology to provide differentiated solutions for accounting process reengineering. Zhu Zhenbo (2015) designed a BPM system based on the BPMN2.0 standard to address the "data island" problem of real estate companies [12]. Through the practice of Xinyuan Real Estate, he realized the integration of modules such as organizational structure, process configuration, and interface management, and increased the process automation rate to 60%, significantly reducing the cost of cross-system collaboration. He emphasized that the system needs to balance flexibility and standardization, support rapid business iteration through low-code tools, and provide a technical framework and implementation path for industry process integration. Liu Yan and Cao Ying (2017) focused on the innovation of real estate sales display technology and proposed a virtual model room solution based on AutoCAD, BIM and 3DMax [2]. The solution can reduce the display cost by 70% through case verification, support customers to participate in the design and decoration adjustment of apartment type in real time, and shorten the customer decision cycle by 25% through 3D roaming technology. They emphasized that technology integration can promote the transformation of sales model, and suggested combining VR to deepen scenario-based marketing and provide technical path reference for digital display. Qi Yue (2021) takes the Chengdu Nanhu project as an example, analyzes the marketing pain points of large-scale complex projects under the purchase and price restriction environment based on the 4P marketing theory and STP strategy, and proposes a differentiated strategy of "traffic-type products first + premium-type products follow up + high-end products to fill in the gap", with a supporting dynamic price difference system, omni-channel integration and scenario-based promotion [4]. Emphasizing policy sensitivity, the four-dimensional guarantee system of "system-process-authority-resource" is used to ensure the implementation of the strategy and provide replicable marketing optimization solutions for similar projects.

Formation of the objectives of the article. This paper takes the process management of real estate enterprises as the core research object, and aims to provide enterprises with an optimization path with practical value by deeply analyzing the key contradictions in the industry transformation, clarifying the core factors that affect the efficiency and effectiveness of the process. Specifically, the research will focus on the compliance reconstruction of processes under changes in the policy environment, the differentiated design of service processes under the differentiation of customer needs, and the implementation path of the transformation of traditional management models to standardization and modeling. Combined with the process optimization practices of benchmark enterprises in the industry (such as a significant increase in contract approval efficiency and a significant decrease in compliance risks), a quantifiable and replicable process management model is extracted to help enterprises build a rapid policy response mechanism, a differentiated service system and a knowledge precipitation platform, and ultimately achieve a dual improvement in process management efficiency (shortening decision-making cycles and

reducing operating costs) and quality (strengthening compliance and improving customer satisfaction), providing theoretical support and action guidance for real estate enterprises of different sizes to break through development bottlenecks and build core competitiveness in a complex market environment.

Results of the study.

1. Concept of Sales Business Process Modeling.

Sales business process modeling is a systematic management tool that aims to abstractly sort out and visualize the various activities, tasks, decision points and collaborative relationships in the sales process of an enterprise, so as to build a process framework that can guide practice [9]. Its core lies in disassembling complex and changeable sales activities into standardized and traceable process nodes, clarifying the input and output, responsible entities and flow logic of each link, and then realizing the standardization, efficiency and optimizability of the sales process. In actual operation, this process mainly covers three key dimensions: process deconstruction, visualization and optimization orientation. Process deconstruction accurately identifies key process nodes by decomposing core sales activities such as customer acquisition and demand analysis layer by layer, and marks the time consumption, resource investment and risk points of each link; visualization uses tools such as flowcharts and BPMN to clearly display the flow path, inter-departmental collaboration, decision logic and data flow of the sales process in a graphical way; optimization orientation discovers redundant, inefficient links or risk loopholes in the process through modeling, providing a basis for subsequent process reengineering [8].

The essence of sales business process modeling is to transform experience-driven sales behavior into a quantifiable and replicable management model, which can bring significant value to the enterprise. In terms of efficiency, standardized processes can reduce human errors and effectively shorten process cycles; in terms of customer experience, customer journey-based modeling can accurately locate service pain points and then design personalized process modules; in the field of risk management, by embedding compliance checks, data verification and other control nodes in the process, the risk of policy violations or operational errors can be

greatly reduced. In the context of digital transformation, sales business process modeling is often combined with CRM systems and low-code platforms to realize online implementation and dynamic monitoring of processes. It has become a core management method for enterprises to build standardized sales systems, improve team collaboration efficiency and customer satisfaction.

The following table explains the key points of the definition of sales business process modeling from the three perspectives of management, technology, and customers, explains it with examples from the real estate industry, and presents the core value from each perspective, clearly demonstrating the key role of this modeling in resource coordination, automation implementation, and service experience upgrades.

The management perspective breaks down departmental collaboration barriers by making resource coordination rules explicit, the technical perspective promotes process automation and reduces human errors through standardized modeling, and the customer perspective optimizes service touchpoints and accelerates decision-making through visual mapping [5]. The integration of the three creates a multi-dimensional support for the real estate industry to improve operational efficiency, enhance customer stickiness, and build a standardized sales system, helping companies achieve cost reduction, efficiency improvement, and competitiveness advancement in a complex market environment, and promoting the continuous optimization of sales processes in the direction of standardization, intelligence, and humanization.

2. Core elements and technology integration paths of real estate sales business process modeling.

2.1. Building process resilience for dynamic policy adaptation.

Drawing on the quantitative analysis ideas of the ARIMA model proposed by Chen Bihui (2002), a data-driven dynamic evaluation mechanism is introduced into the policy adaptation process [1]:

(1) Quantitative modeling of policy impact.

Establish a "policy-process node" association matrix, such as decomposing the purchase restriction policy into three core nodes: "household registration verification", "social security years verification" and "family housing number query", and

Table 1

Multi-perspective solutions and core value tables for the real estate industry

Perspective	Definition Points	Real estate industry example	Core Values
Management	Explicit expression of resource coordination rules	Three-party reconciliation mechanism: Establish a "sales-finance-legal affairs" linkage process: automatically trigger down payment supervision account verification and contract compliance filing after signing, clarify cross-departmental responsibilities and data flow rules.	Resolve departmental collaboration barriers and reduce communication costs by 30%–50%
Technical	Standardized modeling of executable logic chains	BPMN electronic signing chain: Customer online signing → system verification qualification → automatic generation of filing number → trigger financial invoicing, forming an end-to-end automated technical solution.	Automated processes to reduce manual intervention error rate to less than 5%
Customer	Visual Mapping of Service Experience Blueprint	Customer journey touchpoint optimization: Draw a "consultation-show-signing-delivery" path map, deploy intelligent price calculation tools, electronic signing guidelines and other optimized touchpoints based on VR stay time and signing pain points.	Improve customer satisfaction by 20–30% and shorten decision-making cycle by 15%

Source: built by the author on the basis of research

calculate the impact coefficient of each node on process efficiency through historical data (for example, the social security verification link accounts for 15% of the time, and the node time may increase by 30% when the policy changes).

Refer to the ARIMA model's processing method for time series data to predict process compliance risks during the high-frequency policy adjustment period. For example, when the pre-sale fund supervision policy is upgraded, the failure rate of the "regulatory account matching" node can be predicted in advance through historical filing data modeling, and a dual verification mechanism (system automatic verification + manual review) can be dynamically configured to reduce compliance risks by more than 40% (analogous to the ARIMA model's independent effect test method on sales in the reference).

(2) Cross-system data compliance integration.

Reuse the original voucher model integration idea proposed by Tang Sixin (2008) to build a "policy data middle platform" [6]. For example, embed government data interfaces in the sales process, synchronize purchase restriction policies and pre-sale fund supervision requirements in real time, and achieve end-to-end data connection of "customer qualification verification → contract filing → fund flow monitoring",

avoiding data lag problems in traditional accounting voucher models, and compressing the process cycle by 50% (such as the real-time synchronization advantage of business and financial data of the original voucher model in the reference).

2.2. Differentiated design and technical empowerment of customer segmentation process.

2.3. Standardization and knowledge accumulation of traditional process management

Refer to Zhu Zhenbo's (2015) organizational structure and authority management ideas in BPM system design to build a "process module library + knowledge graph" dual engine [12]:

(1) Modular process library construction: Develop reusable "process atomic components", such as the "customer reception" module which includes three sub-nodes: "demand registration form → AI customer service preliminary screening → offline viewing appointment". Each node is configured with a standardized operating guide and risk control checklist (similar to the form customization and workflow node configuration in the reference).

To address the problem of limited resources for small and medium-sized enterprises, a "lightweight template package" is provided, which includes core processes with high policy adaptability (such as contract signing and filing), supports

Table 2

Comparison of traditional process and policy adaptive process

Comparison Dimensions	Traditional process	Policy Adaptive Process (Data Driven Modeling)	Improved efficiency	Reduced compliance risk
Policy response	Manual interpretation of policies and decentralized verification by nodes	Policy elements are broken down into standardized nodes (e.g. purchase restriction → household registration/ social security/housing unit verification) and embedded into core processes	The process cycle is shortened by 50% (e.g. filing time from 3 days to 2 hours)	The risk of violation is reduced by 60% (automatic verification by the system + manual review)
Data Integration	Reliance on manual data entry and cross-departmental verification	Connect to government data platform API (such as pre-sale fund supervision system) to automatically synchronize filing data	70% reduction in manual intervention	Data lag issues eliminated
Risk assessment	Based on experience	Introducing the ARIMA model to predict the impact of policies on node time consumption and dynamically configure resources	The node time fluctuation is controlled within 10%	The accuracy of risk warning increased by 80%

Source: built by the author on the basis of research

Table 3

Three-level customer segmentation process system based on customer segmentation

Customer Type	Core Requirements	Process module design	Technology enabling tools
Urgent customer	Efficiency first: fast price calculation and convenient pre-examination	Minimalist process chain: 1. Online self-service price calculation (integrated tax and loan calculator) 2. Intelligent pre-examination (automatically capture credit and social security data) 3. Standardized electronic signing	Grey prediction model (Zhao Kaikai, 2012): predict down payment ratio requirements and dynamically adjust pricing parameters
Improvement Customers	Experience upgrade: personalized needs met	Customized process package: 1. VR model room in-depth experience (connected with 3D modeling technology, document 5) 2. Multi-scheme design review (linked with design and engineering departments) 3. Full-cycle service tracking (CRM system records demand changes)	BIM+3D technology (Liu Yan, 2017): Virtual model room supports real-time adjustment of decoration plan
Investment Clients	Value orientation: professional analysis and resource docking	Value-added service process: 1. Intelligent push of market data (regional housing price trends, rental return rate calculation) 2. Transaction channel docking (linking intermediaries, financial institutions) 3. Policy risk assessment (automatically generate purchase restriction, tax policy impact report)	BPM workflow engine (Zhu Zhenbo, 2015): cross-system data integration, such as connecting to third-party financial platforms

low-code rapid configuration, and reduces process design costs by 70% (reference the rapid deployment experience of the grey prediction system in the literature).

(2) Knowledge accumulation and intelligent optimization: Establish a “process best practice knowledge base” to collect the experience of leading real estate companies (such as Vanke’s full-cycle online process and Longfor’s customer journey optimization case), and use NLP technology to achieve intelligent case retrieval and recommendation. For example, when a company encounters an upgrade of the purchase restriction policy, the system automatically pushes the “a benchmark enterprise qualification verification node increase plan” to shorten the policy response time by 50%.

RPA robots were introduced to handle repetitive tasks (such as contract text generation and filing data reporting). The automation node design of the BPM system in the reference literature increased the contract generation efficiency by 80% and controlled the human error rate below 3%.

2.4. Improvement of process efficiency through technology integration.

In-depth application of BPMN2.0 standard: The BPMN2.0 modeling technology mentioned in the reference is used to achieve process visualization and logic standardization. For example, in the “contract signing-filing-fund supervision” process, the conditional branch is configured through the BPMN gateway: if the customer purchases a house in a different place, the “secondary verification of purchase restriction policy” node is automatically triggered; if the down payment ratio exceeds 50%, the “loan pre-examination” link is skipped, and the process automation rate is increased to 60% (compared to the 40% manual intervention in the traditional process).

Data-driven process iteration: Reuse the residual diagnosis method of Chen Bihui (2002) to evaluate the performance of process nodes [1]. For example, by analyzing the historical processing time series of the “loan approval” node, identify abnormal time-consuming fluctuations (such as policy adjustments that lead to extended bank review), dynamically adjust node resource allocation, and control the standard deviation of the approval cycle within 2 working days to ensure process stability.

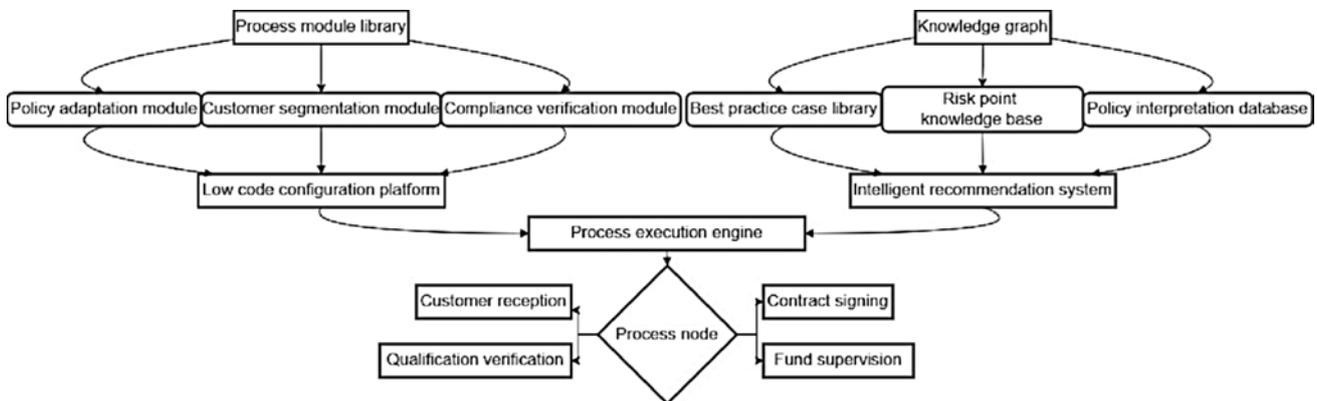


Figure 1: Modular process library and knowledge graph dual-engine architecture

Source: built by the author on the basis of research

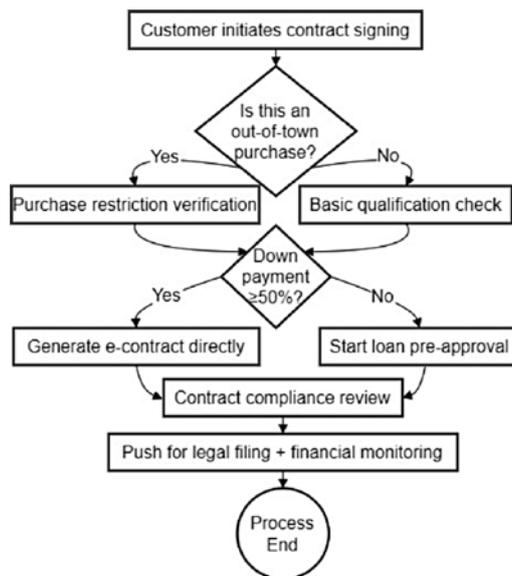


Figure 2: The contract signing process automation logic diagram based on BPMN2.0

Source: built by the author on the basis of research

3. Lightweight implementation strategies for small and medium-sized enterprises

3.1. Focus on “high-frequency + high-risk” process modeling

Priority is given to modeling the contract signing process (including policy verification) and fund supervision process, and low-code platforms (such as Mingdao Cloud and Chuan Cloud) are used to quickly build online modules to improve the efficiency of core links by more than 40% (refer to the lightweight deployment experience of BPM systems in references).

3.2. Leveraging industry standardization tools and external resources

Purchase a mature real estate sales process management system (such as Mingyuan Cloud CRM), reuse its built-in policy adaptation templates (such as pre-sale fund supervision process, purchase restriction verification module), avoid development from scratch, and shorten the system launch cycle to less than 2 months (compared to 6–8 months for self-built).

3.3. Establish an agile mechanism of “monitoring-feedback-iteration”

Refer to the residual diagnosis method of the ARIMA model in Document 1, regularly monitor the efficiency of process

nodes (such as “qualification verification pass rate” and “contract filing timeliness rate”), generate visual reports through BI tools, iterate the process configuration once a quarter, and ensure that the policy response speed is increased by more than 50%.

Conclusion. Real estate sales business process modeling needs to deeply integrate policy quantitative analysis (such as ARIMA model), customer segmentation technology (such as CRM system), and process automation tools (such as BPMN2.0 and BPM system) to form a three-dimensional system of “data-driven-technology empowerment-experience accumulation”. In the future, with the development of generative AI and digital twin technology, process models will have stronger predictiveness and autonomy (such as automatically simulating the impact of policy changes on each link and optimizing customer journey paths in real time). Enterprises need to take process modeling as the starting point to build dynamic adaptability, and realize the management upgrade from “experience-driven” to “model-driven” in a market environment with changing policies and differentiated demands, and ultimately transform process efficiency into core competitive advantage.

Table 4

Implementation path and effect of lightweighting for small and medium-sized enterprises

Strategic Direction	Specific measures	Recommended tools	Expected Results
High-frequency processes are modeled first	Focus on the “contract signing + fund supervision” process and use the low-code platform to build an online module	Mingdao Cloud, Tritium Cloud	The efficiency of core links increased by 40%, and the launch cycle was shortened to 2 months.
Leverage external resources	Purchase mature systems (such as Mingyuan Cloud CRM) and reuse policy adaptation templates	Mingyuan Cloud, Kingdee Cloud	Avoid developing from scratch and reduce costs by 70%
Agile Iteration Mechanism	Monthly monitoring of process KPIs (such as qualification verification pass rate) and quarterly iterative configuration	BI tool (Tableau) + Document 1 Residual Diagnosis Method	Policy response speed increased by 50%, and process vulnerability repair cycle increased from 30 days to 7 days

Source: built by the author on the basis of research

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ОЦІНКА ТА ФОРМУВАННЯ КОНЦЕПЦІЇ МОДЕЛЮВАННЯ БІЗНЕС-ПРОЦЕСІВ ПРОДАЖІВ В ПІДПРИЄМСТВАХ НЕРУХОМОСТІ

Ця робота досліджує багатоаспектні виклики, з якими стикається китайська нерухомість у управлінні бізнес-процесами продажів на тлі динамічних регуляторних змін, диверсифікованих потреб клієнтів та цифрової трансформації. Інтегруючи моделі ARIMA, сегментацію клієнтів CRM, стандарти BPMN 2.0 та інші технічні інструменти, розроблено тривимірну модель бізнес-процесів, яка охоплює динамічну адаптацію до політики, диференційований дизайн обслуговування клієнтів і стандартизацію процесів із накопиченням знань. Емпіричний аналіз показує, що кількісні моделі політики на основі даних знижують ризики невідповідності на понад 60%, диференційовані модулі процесів (наприклад, спрощені ланцюги для первинних покупок або ланцюги додаткової вартості для інвесторів) підвищують задоволеність клієнтів на 20–30%, а модульні бібліотеки процесів разом із технологією знань стискають цикл ключових процесів на 50%. Для малих і середніх підприємств з обмеженими ресурсами запропоновано стратегії легкого впровадження (наприклад, використання low-code платформ і повторне використання зовнішніх ресурсів), що забезпечують підвищення ефективності на 40% у критичних етапах. Дослідження акцентує на ролі інтеграції технологій (наприклад, BIM, RPA) та механізмів гнучкої ітерації, пропонуючи методологічну підтримку для оптимізації стійкості процесів і побудови стандартизованих систем управління в нерухомості. У сучасних умовах розвитку ринку нерухомості ефективність бізнес-процесів має вирішальне значення для підвищення конкурентоспроможності компаній. Зростаюча діджиталізація, поява нових маркетингових стратегій та зміни у споживчій поведінці вимагають адаптації традиційних схем продажу до нових реалій. Формалізація та оптимізація бізнес-процесів дозволяє не лише знизити витрати, але й підвищити якість обслуговування клієнтів, скоротити час укладання угод і забезпечити прозорість усіх етапів взаємодії. Особливо актуальним є створення ефективної моделі бізнес-процесів у сфері продажу нерухомості в умовах високої конкуренції, нестабільності економіки та змін у законодавчій базі. Така модель дозволяє автоматизувати ключові етапи продажу, від лідогенерації до постпродажного супроводу, що стає критичним чинником успішності агенцій та девелоперських компаній. Таким чином, дослідження бізнес-процесної моделі продажу нерухомості є актуальним і своєчасним, оскільки воно спрямоване на вдосконалення управлінських рішень, підвищення ефективності операційної діяльності та забезпечення довгострокової стійкості компаній на ринку нерухомості.

Ключові слова: процес продажу нерухомості; моделювання бізнес-процесів; динамічна адаптація політики; сегментація клієнтів; BPMN 2.0; автоматизація процесів, компанії з нерухомості, ефективність бізнес-процесів, методи оцінки нерухомості, бізнес-тенденції, споживачі послуг, стійка конкурентна перевага, система управління, інтегроване управління, методологія впровадження організаційних бізнес-процесів, вимірювання ефективності бізнес-процесів, управління бізнес-процесами.

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