

# Bare Demo of IEEEtran.cls for IEEE Journals

Rafael Ribeiro, *Mestrando*, UNIPAMPA, John Doe, *Fellow*, OSA, and Jane Doe, *Life Fellow*, IEEE

**Abstract—Context:** In the software lifecycle, the market introduction phase presents significant challenges related to business model definition and selection. This raises questions such as which business models are available, which are most commonly adopted, which best fit the proposed solution, what benefits and limitations they present, and how to choose the most appropriate model. **Objective:** This study aims to map and categorize software business models, providing a structured view that supports understanding, comparison, and strategic selection. **Method:** A Systematic Literature Review (SLR) was conducted using primary studies from the last decade (2014–2024) indexed in the ACM, IEEE Xplore, and Scopus digital libraries. Data extraction employed 33 extraction questions (12 closed-ended and 21 open-ended), with qualitative analysis using a coding scheme of 61 codes organized in 9 classes. **Results:** The search retrieved 2,889 studies, with 216 removed as duplicates. After title and abstract screening, 312 studies were considered potentially relevant, and the full-text quality assessment resulted in 67 studies included in the final synthesis. The analysis identified platform-based models (391 mentions), SaaS (289), freemium (264), and open source (188) as the most prevalent. Subscription-based revenue dominated at 76.1%, with multi-tenant SaaS present in 71.6% of studies. Key success factors include ecosystem management (138 mentions) and market expansion (84), while main challenges involve security concerns (41) and revenue stream transformation (38). **Conclusion:** The consolidated results provide a three-dimensional taxonomy (delivery, monetization, ecosystem) and serve as conceptual foundation for developing an ontology to represent software business models, contributing to the systematization of knowledge and supporting evidence-based strategic decision-making.

**Index Terms—**Business Model, Software, Systematic Literature Review.

## I. INTRODUCTION

SOFTWARE development is a dynamic process that extends beyond code creation or feature delivery. In the software lifecycle, the market introduction phase presents itself as a crucial moment, where decisions related to monetization and financial sustainability must be carefully planned. In this context, business modeling plays a central role, providing frameworks to align the organization’s strategic objectives with market needs.

Different business models, such as licensing, the freemium model, or Software as a Service (SaaS), have been widely explored in the software industry. However, choosing the most suitable model for a specific product involves considering various factors, such as market trends, implementation challenges,

and effective practices for risk mitigation. Furthermore, the literature on business models often addresses varied aspects, making it difficult to identify emerging and successful approaches in the sector.

Given this complexity, this study aims to explore business models applied to the software industry through a systematic literature review (SLR) of the last 10 years (2014–2024). The research seeks to answer fundamental questions about which models have been used, which factors influence their selection, and which practices have been effective in overcoming implementation challenges. To this end, rigorous criteria were defined for selection, evaluation, and data extraction, ensuring the quality and relevance of the analyzed studies.

The results of this work aim to contribute to the creation of an ontology that supports both researchers and practitioners in the selection and implementation of effective business models for software products. By understanding the characteristics, success factors, and challenges of each approach, this study provides valuable insights for strategic decisions in the software industry.

The remainder of this article is organized as follows: Section IV presents the methodology used, including the research questions, selection criteria, and extraction strategy; Section V presents the analysis of results organized by research question; Section VI discusses the main findings and their implications; Section VII addresses threats to validity; and Section VIII presents conclusions and future work.

## II. THEORETICAL FOUNDATION

### III. RELATED WORK

### IV. METHODOLOGY

SEVERAL guidelines have been proposed for conducting Systematic Literature Reviews (SLR) and Systematic Mapping Studies (SMS), such as those presented by [1], [2], and [3]. This study primarily followed the guidelines described by [3], which establish a structured process to identify research gaps, classify, and map the retrieved articles. According to the authors, systematic mapping should follow the process illustrated in Figure 1.

The first step of the process consists of defining the research questions, enabling the identification of keywords for database searches. Subsequently, articles that do not meet the inclusion criteria, defined based on the research questions, are filtered out. The remaining articles are classified based on keywords found, especially in the abstracts. From the data extracted from the articles, a systematic map is constructed, which may

M. Shell was with the Department of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA, 30332 USA e-mail: (see <http://www.michaelshell.org/contact.html>).

J. Doe and J. Doe are with Anonymous University.

Manuscript received April 19, 2005; revised August 26, 2015.

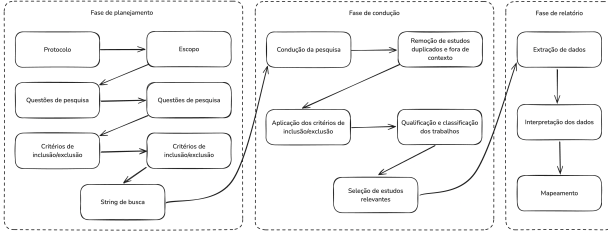


Fig. 1. Systematic Mapping Process [3]

include charts and tables to illustrate the results, as described by [3].

### A. Research Questions

The motivation of this study is to understand the business models currently employed for software product monetization.

Based on this motivation, we formulated the following Research Questions (RQ):

These questions guided the search for relevant studies, enabling the identification of applied business models and contextual factors that influence the success of each approach.

The search strategy was developed based on terms related to the topic “software business models” and their synonyms. Thus, the following steps were adopted:

- **Data Sources:** The databases selected for study collection were ACM Digital Library, IEEE Xplore, and Scopus;
- **Search Terms:** The terms “Business model” and “Software” were used, combined with Boolean operators to optimize results;
- **Search Period:** Studies published between 2014 and 2024 were considered, covering the last decade;
- **Language:** Only studies written in English were included in the research, ensuring uniformity in the analysis.

To expand the scope of the research, synonyms and related terms were identified and organized in Table I. This table served as the basis for constructing the search string used in the databases. The search string was elaborated using Boolean operators (AND, OR) to ensure precision and relevance of results. The final formulation of the search string is presented in Figure 3. The application of this search string to the databases resulted in the collection of studies aligned with the objectives of this work.

TABLE I  
TERMS AND SYNONYMS

Term	Synonyms
Business model	Revenue model, Financial model, Commercial proposal, Monetization plan, Subscription model, Go-to-market strategy, and Monetization strategy
Software	App, Information system, SAAS

This approach ensured comprehensiveness and relevance in the selection of studies, enabling the identification of publications pertinent to the investigated topic.

- RQ1. Business Model Identification and Taxonomy:** What business models have been identified in the literature for software product monetization, and how are they defined, classified, and differentiated from each other?
- RQ2. Application Context and Market Segmentation:** In which application contexts (vertical segments, customer types, geographies, and company sizes) have different software business models been implemented, and what segmentation patterns emerge from this distribution?
- RQ3. Technical and Architectural Characteristics:** What are the technical, architectural, and delivery characteristics that distinguish different software business models, and how do these characteristics influence monetization?
- RQ4. Monetization and Pricing Strategies:** What are the monetization and pricing strategies used in different software business models, and how do these strategies relate to the characteristics of the model and the market?
- RQ5. Ecosystem Dynamics and Go-to-Market:** What are the ecosystem dynamics (roles, relationships, network effects) and go-to-market strategies (acquisition channels, marketplaces) associated with different software business models?
- RQ6. Motivations, Success Factors, and Adoption Conditions:** What are the motivations for adoption, the factors that contribute to success, and the necessary conditions (prerequisites) for successful implementation of different software business models?
- RQ7. Implementation Challenges and Mitigation:** What are the main challenges faced in implementing different software business models, and what effective practices have been used to mitigate these challenges?
- RQ8. Temporal Evolution and Future Trends:** What is the temporal evolution and maturity of the different software business models identified in the literature, and what are the future trends and projected evolution directions?
- RQ9. Business Model Canvas Elements:** What are the distinctive characteristics and constituent elements (Business Model Canvas) of each identified software business model, and how do these elements relate to each other to create value?
- RQ10. Empirical Evidence and Methodologies:** What types of empirical evidence and research methodologies have been used to study software business models, and what are the patterns of available evidence for each model?

Fig. 2. Research Questions

("Business model" OR "Revenue model" OR "Financial model" OR "Commercial proposal" OR "Monetization plan" OR "Subscription model" OR "Go-to-market strategy" OR "Monetization strategy") AND ("Software" OR "App" OR "Information system" OR "SAAS")

Fig. 3. Search String.

### B. Study Selection Criteria

The selection criteria were established to ensure the relevance and quality of the studies included in the review:

#### Inclusion Criteria (IC):

- IC1. Access Availability:** Studies that are fully accessible for analysis;

- IC2. Minimum Depth:** Studies with at least six pages, ensuring more detailed and well-founded discussions;
- IC3. Focus on Software Business Models:** Studies that explicitly address business models applied to the software industry, including practical, theoretical, or hybrid approaches.

#### Exclusion Criteria (EC):

- EC1. Incomplete Documents:** Works with restricted access, extended abstracts, presentations, or posters;
- EC2. Short Papers:** Works with fewer than six pages, as they do not present sufficient analytical depth;
- EC3. Excessive Technical Focus:** Studies whose main topic is technical (such as architectures, algorithms, or software performance), in which business models play a secondary or irrelevant role.

#### C. Study Quality Criteria

To assess the quality of the selected studies, the following Quality Questions (QQ) were defined, which serve as the basis for clarifying and applying the evaluation criteria:

- QQ1.** Does the study present a specific business model for software? (Weight 4)
- QQ2.** Does the study justify the choice of a business model based on relevant factors? (Weight 1)
- QQ3.** Does the study identify business model(s) as emerging trends in recent literature? (Weight 1)
- QQ4.** Does the study discuss success factors and challenges faced by software companies in implementing business models? (Weight 1)
- QQ5.** Does the study present practices to mitigate challenges related to the implementation of software business models? (Weight 1)
- QQ6.** Does the study describe in detail the characteristics of the analyzed business models? (Weight 2)

The quality assessment of studies was structured to prioritize information most relevant to the research objectives. Quality Question **QQ1.** was defined as mandatory, as it is essential that each study analyze at least one business model applied to software. Quality Question **QQ6.** also stands out, as it contributes a detailed description of the characteristics of the presented models. The remaining questions (**QQ2.–QQ5.**) are considered complementary and enrich the analysis, although their absence does not directly compromise the quality of the study in the review.

To classify studies based on their quality, weights were defined for each quality question and a scale that categorizes studies into six levels:

- **Poor:** 0 to 0.99 points.
- **Weak:** 1 to 1.99 points.
- **Fair:** 2 to 3.99 points.
- **Good:** 4 to 5.99 points.
- **Very Good:** 6 to 7.99 points.
- **Excellent:** 8 to 10 points.

The final score of each study is calculated based on the weights assigned to each quality question, allowing for an objective and systematic evaluation. Thus, studies classified

as “Excellent” are included in the final synthesis, ensuring greater relevance and depth to the research results.

#### D. Data Extraction Strategy

Data extraction was performed based on the previously defined research questions. For this purpose, the following Extraction Questions (EQ) were used, which guide the collection and organization of relevant information:

- EQ1.** Which software business models are presented in the study? (**RQ1.**)
- EQ2.** Which factors were justified for choosing the business model? (**RQ2.**)
- EQ3.** Is the presented business model indicated as an emerging trend? (**RQ8.**)
- EQ4.** Which success factors are highlighted in the implementation of the business model by software companies? (**RQ6.**)
- EQ5.** Which challenges are faced by software companies in implementing the business model? (**RQ7.**)
- EQ6.** Which practices were indicated in the study to mitigate the challenges of business model implementation? (**RQ7.**)
- EQ7.** What are the characteristics of each business model addressed in the study? (**RQ3., RQ4., RQ9.**)

#### E. Extracted Data Synthesis

The data synthesis was performed qualitatively, seeking to answer the research questions. The results were organized in a thematic map, identifying:

- **Business Model Categories:** An overview of the models identified in the studies;
- **Success Factors and Challenges:** A cross-analysis of factors that impact the success of models;
- **Emerging Trends:** Identification of new models and approaches adopted by software companies since 2014.

#### F. Study Execution

The execution of this study began at the end of November 2024, following the protocol described and illustrated in Figure 1. To support the planning and execution phases of the SMS, complementary tools were used. The main tool employed was *Thoth*, in its second version<sup>1</sup>. However, since *Thoth* was still under development and testing, *Google Sheets*<sup>2</sup> was used as an additional resource to ensure efficient data organization and management.

For all selected databases, the search was limited to the “Abstract” and “Title” fields to increase the precision of results and avoid irrelevant articles. Additionally, date filters were applied directly in the databases, restricting the publication interval to the period from 2014 to 2024.

Figure 4 shows that the application of the search strategy resulted in the retrieval of 2,889 articles in total, distributed among the three selected databases: ACM Digital Library, IEEE Xplore, and Scopus.

<sup>1</sup><https://thoth-slr.com/>

<sup>2</sup>[https://docs.google.com/spreadsheets/?usp=sheets\\_ald](https://docs.google.com/spreadsheets/?usp=sheets_ald)

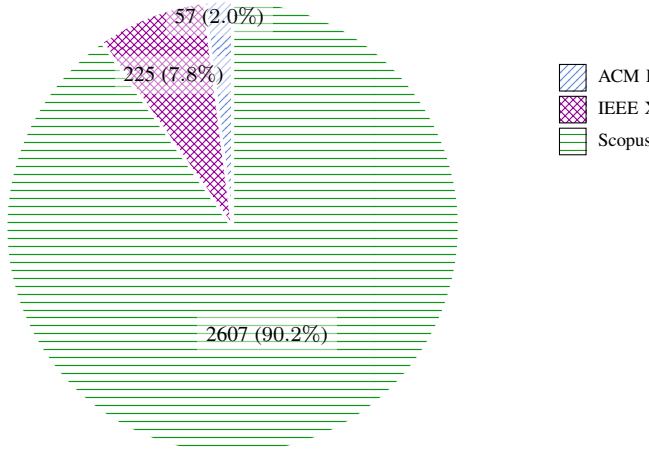


Fig. 4. Studies per Database.

1) *Study Selection*: In the first phase of selection, 216 duplicate articles were identified and removed. Subsequently, the inclusion and exclusion criteria were applied through analysis of titles and abstracts. As a result of this screening, 312 studies were considered potentially relevant and selected for full-text reading in the next phase.

2) *Study Quality Assessment*: Of the 312 potentially relevant studies, 138 were submitted to full-text reading and quality assessment based on the Quality Questions (QQ) defined in Section IV-C. After this rigorous analysis, 67 studies were classified as “Excellent” and accepted for inclusion in the final synthesis, fully meeting the established quality criteria and presenting relevant contributions to answer the research questions.

Figure 5 presents the distribution of the 138 studies according to the classification obtained in the quality assessment. Of the evaluated studies, 67 (48.6%) were classified as “Excellent”, 24 (17.4%) as “Very Good”, 3 (2.2%) as “Good”, 4 (2.9%) as “Fair”, 1 (0.7%) as “Weak”, and 39 (28.3%) as “Poor”.

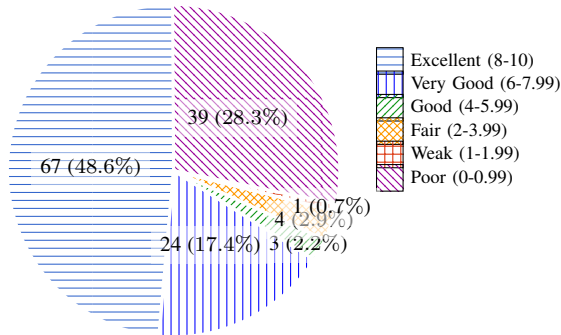


Fig. 5. Study Classification in Quality Assessment.

3) *Data Extraction*: Data extraction was performed on the 67 included studies, using a structured form with 33 extraction questions (EQ), organized into closed-ended questions (12 questions with predefined categories) and open-ended ques-

tions (21 questions for capturing qualitative information). The response rate varied according to the nature of the question: questions about model identification, application context, and success factors obtained rates close to 100%, while more specific questions about licensing and billing periodicity presented lower rates (37–39%), indicating that not all studies address these operational aspects.

For the qualitative analysis of open-ended questions, a coding scheme was developed with 61 codes organized into 9 classes and 35 subclasses, resulting in 4,630 quote classifications extracted from the studies. This coding process enabled the identification of patterns, categorization of recurring concepts, and establishment of relationships among the different aspects of the analyzed business models.

## V. RESULTS ANALYSIS

This section presents the results of the analysis of the 67 studies included in the systematic review, organized according to the research questions defined in Section IV-A.

### A. RQ1: Business Model Identification and Taxonomy

The analysis of the studies enabled the identification of a diverse set of business models applied to the software industry. Table II presents the main models identified and their frequency in the analyzed studies.

TABLE II  
DISTRIBUTION OF MAIN IDENTIFIED BUSINESS MODELS

Business Model	Mentions	%
Platform business model	391	8.4%
SaaS (Software as a Service)	289	6.2%
Mobile app market	279	6.0%
Freemium model	264	5.7%
Open source business model	188	4.1%
B2B business model	161	3.5%
Subscription-based pricing	153	3.3%
Cloud delivery model	152	3.3%
Service-oriented model	144	3.1%
Network effects	133	2.9%
<b>Total classifications</b>	<b>4,630</b>	<b>100%</b>

Note: Percentages calculated over the total of 4,630 quote classifications. A single study may mention multiple models.

The Platform business model was the most frequently discussed, appearing in 391 mentions across the studies, followed by Software as a Service (SaaS) with 289 mentions. The mobile app market represented 279 mentions, evidencing the relevance of this segment. The Freemium model appeared in 264 mentions, demonstrating its popularity as a monetization strategy. Open source-based models were identified in 188 mentions.

Regarding delivery mode, 71.6% of the studies mentioned the Multi-tenant SaaS model as the predominant form of software delivery. The cloud delivery model was referenced

in 152 mentions, confirming the trend of migration to cloud-based infrastructures.

Concerning revenue sources, the Subscription model was identified as the main source in 76.1% of the studies, followed by Usage/consumption (usage-based) with 41.8% and Transaction (transactional) with 32.8%. Advertising-based models represented 19.4% of the studies, particularly relevant in mobile applications and freemium platforms. Figure 6 illustrates the distribution of identified revenue sources.

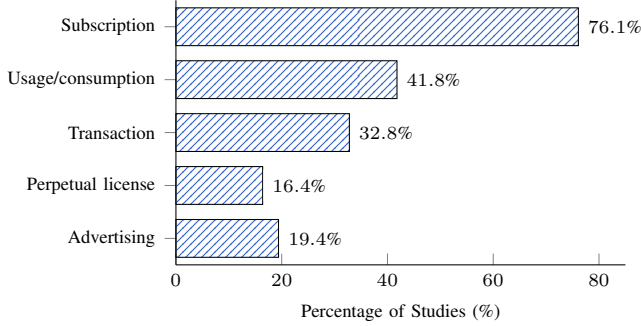


Fig. 6. Revenue Sources Identified in the Studies.

### B. RQ2: Application Context and Market Segmentation

The factors that influence the choice of monetization model can be categorized into: customer type, product/service type, acquisition channels, and network effects.

1) *Target Customer Type*: The analysis revealed that 53.7% of the studies focused on Business-to-Business (B2B) models, while 41.8% addressed Business-to-Consumer (B2C) models. The Enterprise segment was detailed in 7.5% of the studies, while the focus on small and medium enterprises (SME) appeared in 35.8%. Notably, many studies addressed multiple segments simultaneously, indicating the flexibility of software business models in serving different audiences. Figure 7 presents the distribution of target customer types.

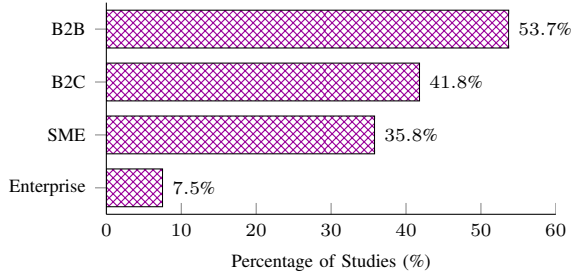


Fig. 7. Identified Target Customer Types.

2) *Product or Service Type*: Regarding offering type, 89.6% of the studies addressed Applications (software applications), and 79.1% addressed Platforms. Managed Services were discussed in 35.8% of the studies, while Infrastructure represented 13.4%. APIs were mentioned in 7.5% of the studies as a form of value delivery.

3) *Customer Acquisition Channels*: The most frequent acquisition channels were: Direct sales in 47.8% of the studies, Product-led Growth in 41.8%, Partners/channels in 38.8%, and Digital marketing in 37.3%. The use of Marketplaces as a distribution channel was identified in 22.4% of the studies. Figure 8 presents the distribution of acquisition channels.

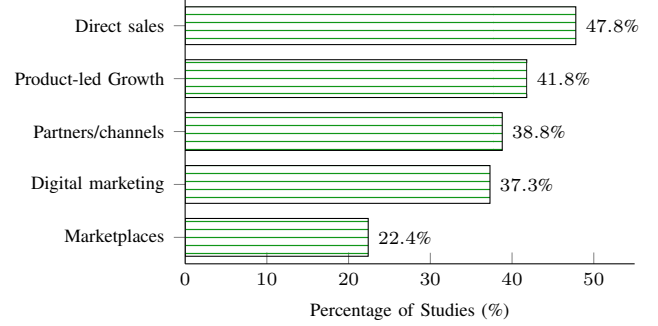


Fig. 8. Customer Acquisition Channels.

4) *Network Effects*: Network effects were categorized into three main types: direct effects (Direct network effects—more users generate more value) in 35.8% of the studies; cross-sided effects (Cross-sided effects—distinct groups benefit mutually) in 31.3%; and data-based effects (Data network effects—more data improves the product) in 22.4%. The presence of network effects was identified as a determining factor in the choice of platform and marketplace models. Figure 9 illustrates the distribution of network effect types.

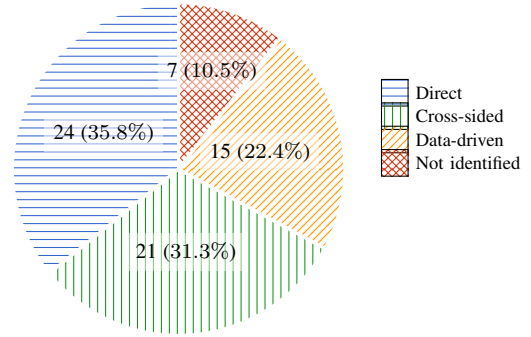


Fig. 9. Identified Network Effect Types.

### C. RQ8: Temporal Evolution and Future Trends

The temporal and thematic analysis of the studies revealed emerging trends in software business models. The Technology evolution code was identified in 83 mentions, indicating the importance of continuous technological adaptation. Future growth potential appeared in 49 mentions.

In terms of model maturity, 85 mentions were classified as growing business models, 80 as emerging business models, and 23 as consolidated business models.

Regarding the use of marketplaces and distribution platforms, the Apple App Store was mentioned in 20.9% of the studies and the Google Play Store in 19.4%, evidencing the dominance of mobile app stores. Enterprise cloud



marketplaces (AWS, Azure, Google Cloud) still showed low penetration in the studies (3% each), suggesting an area of growth.

Specific trends identified include: the integration of ecological sustainability in digital business models; the convergence between digital and sustainable transformation; the growth of Everything as a Service (XaaS) based models; and the increasing importance of data and artificial intelligence in value creation.

#### D. RQ6 & RQ7: Success Factors, Challenges, and Mitigation Practices

1) **Success Factors:** The main success factors identified were organized into five categories:

- 1) **Ecosystem management:** With 138 mentions, this was the most cited factor. It involves effective management of relationships with partners, developers, and stakeholders.
- 2) **Market expansion:** Identified in 84 mentions, it refers to the strategy of expanding the customer base to achieve economies of scale.
- 3) **Organizational preparedness:** With 64 mentions, it highlights the importance of the company's readiness to implement changes in the business model.
- 4) **Service quality improvement:** Present in 36 mentions, it emphasizes the need for continuous improvement for customer retention.
- 5) **Value-based orientation:** With 36 mentions, it represents the strategy of focusing on delivering customer-perceived value.

Figure 10 presents the distribution of identified success factors.

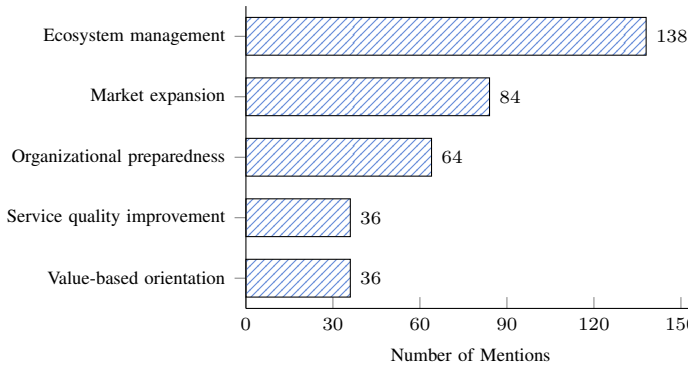


Fig. 10. Success Factors in Business Model Implementation.

2) **Implementation Challenges:** The main challenges identified were categorized according to Table III:

- 1) **Security concerns:** With 41 mentions, this represents the main barrier identified by customers, especially in cloud-based models.
- 2) **Revenue stream transformation:** Identified in 38 mentions, it refers to the challenge of migrating from one-time payments to recurring revenue models.
- 3) **Organizational readiness:** With 23 mentions, it highlights the capability of customer organizations to adopt new business models.

TABLE III  
IDENTIFIED IMPLEMENTATION CHALLENGES

Challenge	Category	Mentions
Security concerns	Customer barriers	41
Revenue stream transformation	Financial impact	38
Organizational readiness	Customer barriers	23
Partner ecosystem disruption	Ecosystem impact	23
Customer trust maintenance	Customer barriers	19
Quality management	Operational impact	15
<b>Total</b>		<b>159</b>

Note: Challenges identified through qualitative coding of open-ended questions.

- 4) **Partner ecosystem disruption:** Present in 23 mentions, it evidences the impact of business model changes on relationships with partners and resellers.
- 5) **Customer trust maintenance:** With 19 mentions, it represents the challenge of maintaining trust during business model transitions.

3) **Mitigation Practices (RQ7 continued):** The practices identified to mitigate implementation challenges were:

- 1) **Flexible pricing strategies:** With 58 mentions, this was the most cited practice. It involves adapting pricing models to accommodate different customer needs and profiles.
- 2) **Hybrid model adoption:** Identified in 13 mentions, it refers to the strategy of simultaneously maintaining old and new models during transition periods.
- 3) **Pilot implementation:** With 8 mentions, it represents the approach of conducting controlled deployments with selected customers before large-scale adoption.
- 4) **Partner compensation:** Present in 3 mentions, it involves financial support for partners affected by business model changes.

#### E. RQ3, RQ4, RQ5 & RQ9: Business Model Characteristics

The characteristics of business models were organized into dimensions according to the developed coding scheme. The Business model characteristics class concentrated 2,290 classified quotes, representing the highest density of extracted information.

1) **Pricing Strategies:** Four main strategies were identified:

- **Subscription-based pricing** (153 mentions): Recurring payment model with monthly or annual billing for software access.
- **Pay-as-you-go pricing** (40 mentions): Consumption-based model where the customer pays for what they use.
- **Value-based pricing** (33 mentions): Pricing based on customer-perceived value.
- **Cost-based pricing** (15 mentions): Pricing based on vendor costs.

2) **Revenue Models:** The main revenue models identified were:

- **Freemium model** (264 mentions): Offers a free basic version with paid premium features.

- **Open source business model** (188 mentions): Based on open source software with various commercialization strategies.
- **Data-driven monetization** (108 mentions): Revenue generation from data and analytics.
- **Perpetual licensing** (14 mentions): Traditional licensing model with one-time payment.

3) *Technical Architecture*: The technical infrastructure was characterized by:

- **Cloud computing infrastructure** (95 mentions): Enabling infrastructure for cloud delivery.
- **Multi-tenant architecture** (24 mentions): Architecture where a single instance serves multiple customers.
- **On-demand access** (24 mentions): Software access available immediately when needed.
- **Remote hosting** (18 mentions): Software hosted on external servers.

4) *Value Creation*: Value creation mechanisms include:

- **Platform business model** (391 mentions): Value creation through ecosystems of external connections.
- **Network effects** (133 mentions): Benefit where value increases with more users.
- **Marketplace model** (63 mentions): Facilitation of transactions between multiple parties.

## VI. DISCUSSION

This section discusses the main findings of the systematic review, presenting an integrated synthesis of results and their implications for researchers and practitioners.

### A. Synthesis of Main Findings

The analysis of 67 studies revealed a rich and diverse landscape of software business models. The predominance of the SaaS model (76.1% of studies mentioning subscription as a revenue source) confirms the fundamental transformation that occurred in the software industry over the last decade. This model offers advantages both for vendors—predictable recurring revenue, piracy reduction, continuous update cycles—and for customers—lower initial investment, scalability, and access to constant updates.

The strong presence of platform models (391 mentions) and associated network effects (133 mentions) evidence the growing importance of ecosystems in the software market. Successful companies not only sell products but orchestrate ecosystems that connect developers, users, and partners, creating value through positive network effects.

The freemium model (264 mentions) emerged as a relevant strategy, particularly in B2C markets and mobile applications. This approach reduces entry barriers for users, allowing experimentation before conversion to paid versions. However, the studies indicate that freemium success depends on specific factor configurations, not being universally applicable.

### B. Identified Patterns and Correlations

Cross-analysis of the data revealed important patterns:

1) *Correlation between Customer Type and Acquisition Channels*: B2B models tend to use direct sales (75%) and channel partners (61%), while B2C models favor Product-led Growth (68%), digital marketing (54%), and marketplaces (39%). This differentiation reflects the distinct purchase journeys and decision-making processes of each segment.

2) *Correlation between Ecosystem Role and Network Effects*: Companies with a bilateral platform role (Two-sided platform) predominantly present cross-sided network effects (76%), while standalone products show more varied distribution between direct effects (50%) and absence of network effects (30%).

3) *Evolution of Pricing Models*: The data indicate an evolution from perpetual licensing-based models (14 mentions) to subscription (153 mentions) and consumption (40 mentions) models. This transition represents a fundamental change in the relationship between vendors and customers, from single transaction to continuous relationship.

### C. Comparison with Prior Literature

The results of this review confirm and expand findings from previous studies on software business models. The predominance of SaaS corroborates the growth predictions identified in studies from the beginning of the decade. The importance of network effects, highlighted by [1], was empirically confirmed, with more than one-third of the studies identifying some type of network effect.

The identification of challenges related to revenue stream transformation and partner ecosystem disruption adds detail to the existing literature on business model transitions. Prior literature frequently focused on the benefits of migrating to SaaS, while this review balances the perspective by systematically documenting the challenges faced.

### D. Emerging Taxonomy

Based on the analysis, a taxonomy of software business models organized into three main dimensions is proposed:

- 1) **Delivery Dimension**: How software is delivered (SaaS multi-tenant, single-tenant, on-premises, hybrid, mobile).
- 2) **Monetization Dimension**: How revenue is generated (subscription, usage-based, freemium, perpetual license, advertising, transaction fees).
- 3) **Ecosystem Dimension**: The company's role and value creation mechanisms (standalone product, two-sided platform, marketplace, plugin/complement).

This taxonomy allows for systematic classification and comparison of software business models, facilitating the analysis of strategic options for companies in the sector.

### E. Implications for Practice

For practitioners and managers of software companies, the results suggest:

- 1) **Gradual transition strategy**: The adoption of hybrid models during transition periods reduces risks and allows adjustments based on market feedback.

- 2) **Ecosystem investment:** Effective management of partners and stakeholders is the most cited success factor, indicating the need for investments in this area.
- 3) **Pricing flexibility:** Flexible pricing strategies that accommodate different customer profiles are essential for maximizing adoption and revenue.
- 4) **Security attention:** Security concerns are the main identified barrier, requiring investments in certifications, transparency, and communication.
- 5) **Channel-customer alignment:** The choice of acquisition channels should be aligned with the target customer type (B2B vs. B2C).

#### F. Implications for Research

For researchers, the findings indicate:

- 1) **Gap in experimental studies:** Only 3% of studies used experimental methods, indicating an opportunity for research that establishes causal relationships.
- 2) **Underexploration of cloud marketplaces:** The low percentage of studies on AWS Marketplace, Azure Marketplace, and similar (3% each) suggests an emerging area for investigation.
- 3) **Need for longitudinal studies:** Most studies present cross-sectional views; longitudinal studies on business model evolution are necessary.
- 4) **Integration with sustainability:** The emergence of sustainable digital business models represents a promising research frontier.

### VII. THREATS TO VALIDITY

This section discusses the main threats to the validity of this study, organized according to the categories proposed by [3].

#### A. Construct Validity

Construct validity refers to the adequacy of the measures used to capture the investigated concepts.

**Research question definition:** The research questions were defined based on prior literature reviews and validated through discussions among researchers. However, the breadth of the questions may have resulted in heterogeneous responses, making synthesis difficult.

**Extraction form:** The form with 33 extraction questions was developed iteratively and tested on a subset of studies before full application. Despite this, some questions presented low response rates (37–39% for questions about licensing and billing periodicity), indicating possible misalignment between the questions and study content.

**Coding scheme:** The 61 codes used in qualitative analysis were developed iteratively through an inductive-deductive process. Coding validity was verified through cross-review of a sample of classifications.

#### B. Internal Validity

Internal validity refers to the reliability of study execution processes.

**Selection bias:** Study selection was performed following predefined criteria. However, the screening of 2,889 articles by a single researcher in the initial phase may have introduced bias. To mitigate this risk, doubtful cases were discussed with co-researchers.

**Extraction bias:** Data extraction was performed by one researcher, with sampling verification by a second researcher. The agreement rate was satisfactory, but occasional divergences may have occurred in ambiguous cases.

**Qualitative coding:** The assignment of codes to extracted quotes involved interpretive judgment. To increase reliability, detailed descriptions were developed for each code and periodic consistency reviews were conducted.

#### C. External Validity

External validity refers to the generalization of results.

**Temporal scope:** The study was limited to publications from 2014 to 2024, a period that captures SaaS model maturation but may not reflect more recent trends, such as generative artificial intelligence-based models.

**Database scope:** Three databases were used (ACM, IEEE Xplore, Scopus). Although representative of software engineering and information systems literature, studies published in other sources (management conferences, gray literature) may not have been captured.

**Publication bias:** Published studies tend to report positive or significant results, potentially under-representing failure experiences or neutral results in business model implementation.

**Geographic and industrial context:** The analyzed studies show predominance of North American and European contexts, and sectors such as mobile applications and enterprise platforms. Generalization to other contexts should be done with caution.

#### D. Reliability

Reliability refers to the possibility of study replication.

**Protocol documentation:** The research protocol was documented in detail, including search string, inclusion/exclusion criteria, and extraction questions. Raw data and analysis codes are available in a public repository for verification.

**Tools used:** The combined use of tools (Thoth and Google Sheets) for data management may hinder exact replication. However, procedures were documented to allow equivalent reproduction.

#### E. Adopted Mitigations

To mitigate the identified threats, the following strategies were adopted:

- Prior definition and documentation of the research protocol;
- Iterative development of the extraction form with pilot testing;
- Creation of a hierarchical coding scheme with explicit definitions;
- Cross-review of selection, extraction, and coding samples;
- Availability of data and materials in an open repository;
- Triangulation of quantitative (closed-ended questions) and qualitative (open-ended questions) data.



## VIII. CONCLUSION

This study presented a systematic literature review on software business models, analyzing 67 studies published between 2014 and 2024. The research addressed the ten proposed research questions, contributing to the systematization of knowledge in the area.

### A. Main Contributions

The main contributions of this work are:

- 1) **Comprehensive mapping:** Identification and categorization of 61 codes organized into 9 classes, representing different aspects of software business models, from technical characteristics to success factors and challenges.
- 2) **Quantitative evidence:** Consolidation of data on the prevalence of different models, highlighting SaaS/subscription (76.1%), platforms (391 mentions), and freemium (264 mentions).
- 3) **Model taxonomy:** Proposition of a three-dimensional taxonomy (delivery, monetization, ecosystem) for classifying software business models.
- 4) **Synthesis of challenges and mitigations:** Systematic documentation of 159 mentions of implementation challenges and 82 mentions of mitigation practices.
- 5) **Trend identification:** Mapping of emerging trends, including sustainability integration, data-based network effects, and platform-based models.

### B. Answers to Research Questions

**RQ1:** The most commonly used models are based on platforms, SaaS, freemium, and open source, with predominance of cloud delivery and subscription-based monetization.

**RQ2:** Models are implemented across diverse contexts, with 53.7% focusing on B2B, 41.8% on B2C, and varying distribution across vertical segments and company sizes.

**RQ3:** Technical characteristics include multi-tenant SaaS delivery (71.6%), cloud infrastructure (95 mentions), multi-tenant architecture (24 mentions), and on-demand access (24 mentions).

**RQ4:** Monetization strategies include subscription (76.1%), usage-based (41.8%), and transaction-based (32.8%), with pricing models varying from value-based to pay-as-you-go.

**RQ5:** Ecosystem dynamics involve platform roles (391 mentions), network effects (133 mentions), with go-to-market strategies including direct sales (47.8%) and product-led growth (41.8%).

**RQ6:** Main success factors are ecosystem management (138 mentions), market expansion (84), and organizational preparedness (64).

**RQ7:** Challenges include security concerns (41 mentions), revenue stream transformation (38), and partner disruption (23). Effective mitigation practices include flexible pricing strategies (58 mentions) and hybrid model adoption (13).

**RQ8:** Emerging trends include technology evolution (83 mentions), with 85 growing models and 80 emerging models identified.

**RQ9:** Models are characterized by delivery dimensions (SaaS multi-tenant, cloud), monetization dimensions (subscription, freemium), and ecosystem dimensions (platform, marketplace).

**RQ10:** Studies employ diverse methodologies, with predominance of case studies and empirical analyses, though experimental studies remain underrepresented (3%).

### C. Future Work

Based on the results and identified gaps, the following directions for future research are suggested:

- Development of a formal ontology for representing software business models, enabling automated reasoning and decision support;
- Experimental studies that establish causal relationships between business model configurations and performance;
- In-depth investigation of business models based on artificial intelligence and machine learning;
- Longitudinal analysis of business model evolution in specific companies;
- Studies on the effectiveness of enterprise cloud marketplaces as a distribution channel.

The consolidated results of this systematic review provide a solid conceptual foundation for the development of tools and frameworks that support researchers and practitioners in understanding, comparing, and selecting business models for software products.

## ACKNOWLEDGMENT

The authors would like to thank...

## REFERENCES

- [1] S. Keele *et al.*, "Guidelines for performing systematic literature reviews in software engineering," Technical report, ver. 2.3 ebse technical report. ebse, Tech. Rep., 2007.
- [2] E. Engström and P. Runeson, "Software product line testing—a systematic mapping study," *Information and Software Technology*, vol. 53, no. 1, pp. 2–13, 2011.
- [3] K. Petersen, R. Feldt, S. Mujtaba, and M. Mattsson, "Systematic mapping studies in software engineering," in *Proceedings of the 12th international conference on Evaluation and Assessment in Software Engineering*, 2008, pp. 68–77.

**Michael Shell** Biography text here.

PLACE  
PHOTO  
HERE

**John Doe** Biography text here.

**Jane Doe** Biography text here.