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Formulating Application Portfolios from IS/IT Strategy and Business Processes: A Systematic Literature Review

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Abstract. This study systematically examines how application portfolios are formulated from information systems/information technology (IS/IT) strategy and business processes. Following the Kitchenham and Charters guidelines and PRISMA reporting logic, searches across seven sources yielded 844 records. After duplicate removal, screening, full-text assessment, and quality evaluation, 22 primary studies published between 2015 and 2025 were included. The synthesis identifies five categories of approaches: Enterprise Architecture, IS/IT Strategic Planning, Application Portfolio Management and Portfolio Assessment, Model/Framework Development and Design Science, and Resource Allocation and Portfolio Decision Analysis. Across these categories, application candidates are derived through strategic analysis, business-process analysis, enterprise architecture modeling, portfolio assessment, and decision-analysis techniques. However, existing approaches remain fragmented and rarely provide a traceable process linking strategic objectives and business processes to application candidates, prioritization decisions, and final portfolio representations. To address this gap, the study proposes a four-stage conceptual model comprising input identification, application candidate derivation, evaluation and prioritization, and final portfolio representation. The proposed taxonomy and conceptual model provide an integrated foundation for connecting organizational strategy, business processes, application identification, portfolio evaluation, and representation, while supporting future development and empirical validation of application portfolio formulation methods across organizations.

Keywords: Application Portfolio Formulation; IS/IT Strategy; Business Process; Enterprise Architecture; Systematic Literature Review

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1. INTRODUCTION

Application portfolios formulation in this review is defined as the systematic process of identifying, deriving, evaluating, prioritizing, and representing current and future applications that support organizational strategy and business processes. Application portfolios comprise existing, planned, and potential applications that are assessed based on their business contribution [1]. Unlike the broader IT portfolio, which includes applications, projects, infrastructure, services, assets, and other IT investments [2]. Application Portfolio Management (APM), meanwhile, focuses specifically on evaluating and optimizing applications from business and technical perspectives to support organizational objectives [3]. Accordingly, this review concentrates on the application portfolios formulation by examining how application candidates are derived from IS/IT strategies and business processes. Portfolio assessment is included only when it directly supports formulation, such as through evaluating current applications, prioritizing migrated, or eliminated. Assessment as independent management activity is beyond the scope of this review.

The need for this formulation focused perspective has become increasingly important with the acceleration of digital transformation. The widespread adoption of information technology has produced increasingly complex and heterogeneous application landscapes, often resulting in redundancy, higher costs, and inefficient resource utilization [4], [5], [6]. Consequently, organizations require well-formulated application portfolios to ensure that IS/IT investments remain aligned with business strategy and operational processes [7], [8]. Well-designed application portfolios enable organizations to identify strategic and high-potential applications, optimize IT resources, eliminate redundant systems, and support better investment and retirement decisions [7], [9]. Beyond technical efficiency, effective APM also improves organizational performance by strengthening cross-functional coordination, service quality, responsiveness, and operational agility [10], [11], [12], [13].

However, determining which applications should be included in a portfolio is only one aspect of making the portfolio useful. Its managerial value also depends on how clearly the resulting applications and related decisions are presented. Portfolio presentation formats, including classification matrices, application catalogues, architecture diagrams,

and implementation roadmaps, support understanding, comparison, and decision-making by highlighting business contribution, redundancy, technical condition, and future investment priorities [3], [14]. These representations therefore serve not only as documentation but also as practical decision-support tools.

Despite the practical importance of both portfolio formulation and presentation, existing reviews provide only partial insight into how these activities are connected. Previous reviews generally examine Enterprise Architecture (EA), Strategic Information Systems Planning (SISP), business–IT alignment, or APM as separate research domains. General EA reviews focus on frameworks, implementation, benefits, and challenges [15], whereas SISP reviews classify planning literature according to research themes and methods [16]. In contrast, this review synthesizes how these approaches are applied specifically to formulate application portfolios from two explicit inputs, namely IS/IT strategy and business processes. Covering studies published between 2015 and 2025, this review captures contemporary developments associated with cloud computing, IoT, big data, enterprise architecture modeling, and sustainability oriented digital transformation.

Therefore, this systematic literature review aims to synthesize the approaches used to formulate application portfolios, explain how application candidates are derived from IS/IT strategies and business processes, and identify how resulting portfolios are represented. Following the guidelines of [17], this study addresses the following research questions:

1) RQ1: Which approaches are used to formulate application portfolios?
2) RQ2: How are application candidates derived from IS/IT strategy and business processes?
3) RQ3: How are application portfolios presented based on IS/IT strategy and business processes?

2. METHODS

This systematic literature review identified, evaluated, and synthesized studies on the application portfolios formulation from IS/IT strategy and business processes. The review followed [17] and used the PRISMA reporting logic to document identification, screening, eligibility, and inclusion [18]. The review steps are shown in Figure 1.

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Figure 1 SLR Method

Research identification was conducted to find literature on application portfolios formulation from IS/IT strategy and business processes. The search used IEEE Xplore, ScienceDirect, Emerald, SpringerLink, Taylor & Francis, Wiley, and Google Scholar. Google Scholar was used as a supplementary source to complement the main academic databases, because it retrieves large numbers of records and ranks them by relevance, screening was limited to the first 200 results per query to reduce ranking bias [19]. The initial search used keywords designed to capture studies directly related to the review focus. The same search logic was applied across the selected repositories, with adjustments only when required by database search syntax. The search queries were as follows.

1) ("application portfolio" OR "application portfolio management" OR "IT application portfolio" OR "application architecture") AND ("IS/IT Strategy" OR "IS

Strategy" OR "IT Strategy" OR "Information system strategy" OR "IS strategic planning" OR "enterprise architecture")

2) ("application portfolio" OR "application portfolio management" OR "IT application portfolio" OR "application architecture") AND ("Business process" OR "Business process reengineering" OR "Business process redesign" OR "Business-IT alignment")

Table 1 reports the database sources, search dates, and numbers of records retrieved. For each source, the reported count combines the results of Query 1 and Query 2 and represents the total before duplicate removal. After the results from all sources were merged, duplicate removal was performed manually in a spreadsheet rather than with reference management software. Records were matched first by DOI and, when a DOI was unavailable, by title, authors, and publication year. Google Scholar records that duplicated records from the six publisher databases were removed during the same cross database process. Records found only through Google Scholar were not automatically excluded, they were retained only when they were identifiable as final journal articles or conference proceedings and satisfied all other eligibility criteria. Grey literature and other ineligible publication types were excluded. Backward and forward snowballing were not conducted as separate search procedures because they require a repeatable process for backward reference tracing and forward citation searching [20]. Consequently, the final study set was produced solely through database searching, manual duplicate removal, screening, full text assessment, and quality assessment, and no additional snowballing records were added to the PRISMA flow diagram.

Table 1 Search Sources, Search Dates, and Records Retrieved

Database	Exact Search Date	Records Retrieved	Notes
ScienceDirect	July 1st 2026	75	Publisher database search using Query 1 and Query 2
IEEE Xplore	July 1st 2026	117	Publisher database search using Query 1 and Query 2
Emerald	July 1st 2026	53	Publisher database search using Query 1 and Query 2

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Database	Exact Search Date	Records Retrieved	Notes
SpringerLink	July 1st 2026	102	Publisher database search using Query 1 and Query 2
Taylor & Francis	July 1st 2026	43	Publisher database search using Query 1 and Query 2
Wiley	July 1st 2026	54	Publisher database search using Query 1 and Query 2
Google Scholar	July 1st 2026	400	Supplementary search. First 200 results from each query were screened

Initial screening was conducted based on inclusion and exclusion criteria, namely as follows.

1) Only studies published between 2015 and 2025 were included, while studies published outside this range were excluded.
2) Only considered journal articles and conference proceedings, whereas book chapters, review papers, tutorials, seminars, interviews, letters, and blogs were excluded.
3) Only studies written in English were included, while non-English publications were excluded.
4) Only full-text studies were considered eligible, while studies that were not available in full text were excluded.
5) The selected studies had to be related to application portfolio, IS/IT strategy, and business processes, while studies irrelevant to these topics were excluded.
6) Only publications within the scope of application portfolio or IT portfolio, IS/IT strategy, and business processes were included, whereas publications outside these areas were excluded
7) Only final published studies were included, while unpublished works or studies still in press were excluded.

Screening and eligibility assessment were conducted by two reviewers. The first reviewer performed the initial search, manual duplicate removal, and preliminary title and abstract screening, while the second reviewer independently checked title and abstract screening

and full text eligibility decisions against the inclusion and exclusion criteria. Studies with uncertain relevance were retained for full text checking. Both reviewers also applied the same five criteria during quality assessment. Initial disagreements were not tabulated as a separate quantitative variable, therefore, an exact disagreement count and a formal inter-rater agreement coefficient could not be reported. Nevertheless, every difference in judgment was resolved through consensus discussion, namely the reviewers reread the relevant full text passages, reconsidered the applicable eligibility or quality criteria, and compared the evidence with the research questions. A final inclusion, exclusion, or quality decision was made only after both reviewers agreed and no third reviewer was required.

After screening, the remaining articles were evaluated for quality before inclusion in the final study catalogue. Each criterion was scored on a 0-2 scale (0 = disagree, 1 = partially agree, 2 = agree), covering relevance to the research questions, clarity of objectives, methodological rigor, contribution to application portfolios formulation, and completeness of reporting. Total scores ranged from 0 to 10, and the minimum inclusion threshold was set at 8. Table 2 shows the criteria, while Table 3 presents the complete quality assessment results.

Table 2 Study Quality Criteria

Criteria	Description	Score
Clarity of Objectives	Are the research objectives focused and connected on the application portfolios formulation?	0-2
Relevance to Research Questions	To what extent is the study relevant to the SLR research questions (RQ1–RQ3)?	0-2
Methodological Rigor	Does the study use clear, valid, and appropriate research methods?	0-2
Contribution to Application Portfolios Formulation	Does the study make a direct contribution to the application portfolios formulation?	0-2
Clarity and Completeness of Reporting	Is the writing structure neat and important information such as context, methods and results explained completely?	0-2

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Table 3 Quality Assessment Results for Selected Studies

Articles	C1	C2	C3	C4	C5	Total	Quality
[21]	2	2	1	2	1	8	High
[22]	2	2	1	2	2	9	High
[23]	2	2	1	2	1	8	High
[24]	2	2	2	2	2	10	High
[25]	2	2	2	1	2	9	High
[26]	2	2	2	1	2	9	High
[27]	1	2	2	1	2	8	High
[28]	2	2	2	2	2	10	High
[29]	2	2	2	2	2	10	High
[30]	1	2	2	1	2	8	High
[31]	2	1	2	1	2	8	High
[32]	2	2	2	2	2	10	High
[33]	1	2	2	1	2	8	High
[34]	2	2	2	2	2	10	High
[35]	2	2	2	2	2	10	High
[36]	1	2	2	1	2	8	High
[37]	1	2	2	1	2	8	High
[38]	2	1	1	2	2	8	High
[39]	1	2	2	1	2	8	High
[40]	2	2	2	2	2	10	High
[41]	1	2	2	1	2	8	High
[42]	2	2	2	2	2	10	High

Figure 2 summarises the study selection process and shows the final number of studies included in the review. The database search retrieved 844 records, namely ScienceDirect (75), IEEE Xplore (117), Emerald (53), Taylor & Francis (43), SpringerLink (102), Wiley (54), and Google Scholar (400). After 444 duplicates were removed, 400 records were screened. The inclusion and exclusion criteria eliminated 236 records, leaving 164 reports for title and abstract review. Of these, 27 reports were assessed through full text review, and 5 were excluded because their quality scores were below the threshold. In total, 22 studies met all criteria and were included in the final review.

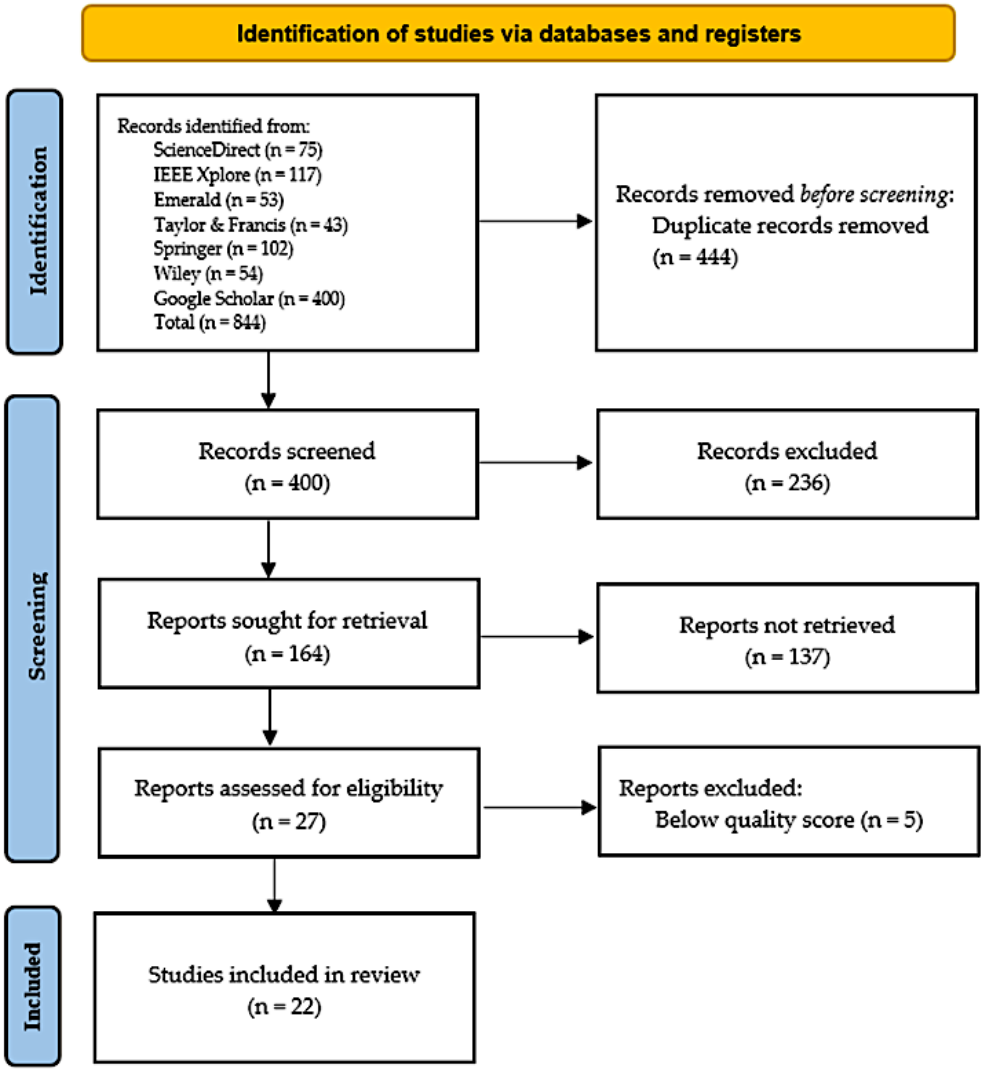

Figure 2 PRISMA Diagram

3. RESULTS AND DISCUSSION

3.1. Review findings

This section presents the findings from 22 selected primary studies, including theoretical studies, case studies, and methodological designs. The results are organized according to the research questions, namely approaches for application portfolios formulation, derivation of application candidates from IS/IT strategy and business processes, and portfolio presentation or implementation formats. Table 4 summarizes the data extracted and also grouped into five categories, while the detailed data extraction results are shown in Appendix A.

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Table 4 Summary of Data Extraction

Category	Studies	Methods	Sector Coverage
Application Portfolio Management and Portfolio Assessment	4 studies [21], [23], [24], [25]	Application inventories, surveys, value-chain analysis, cost/risk assessment, APP/APA, TIME, and McFarlan	SMEs, cross-industry, public sector, and finance
IS/IT Strategic Planning	5 studies [28], [29], [32], [34], [40]	SWOT/PEST, CSFs, IT Balanced Scorecard, and Ward & Peppard analysis	Industrial, health, entertainment, and education
Enterprise Architecture	8 studies [30], [31], [33], [35], [37], [38], [41], [42]	TOGAF, Zachman, ArchiMate	Education, health, logistics, energy, and enterprise IT
Resource Allocation and Portfolio Decision Analysis	2 studies [26], [27]	Business–IT alignment criteria, costs, benefits, resource constraints, PDA, and dynamic allocation	Manufacturing
Model / Framework Development and Design Science	3 studies [22], [36], [39]	DSRM, and DSR	Industrial, education, and cross-industry

Table 4 shows that the 22 studies were grouped into five categories, namely Application Portfolio Management and Portfolio Assessment, IS/IT Strategic Planning, Enterprise Architecture, Resource Allocation and Portfolio Decision Analysis, and Model/Framework Development and Design Science. This categorization shows the diversity of methods used to formulate application portfolios that align with strategy and business processes. Figure 3 shows the visual taxonomy diagram.

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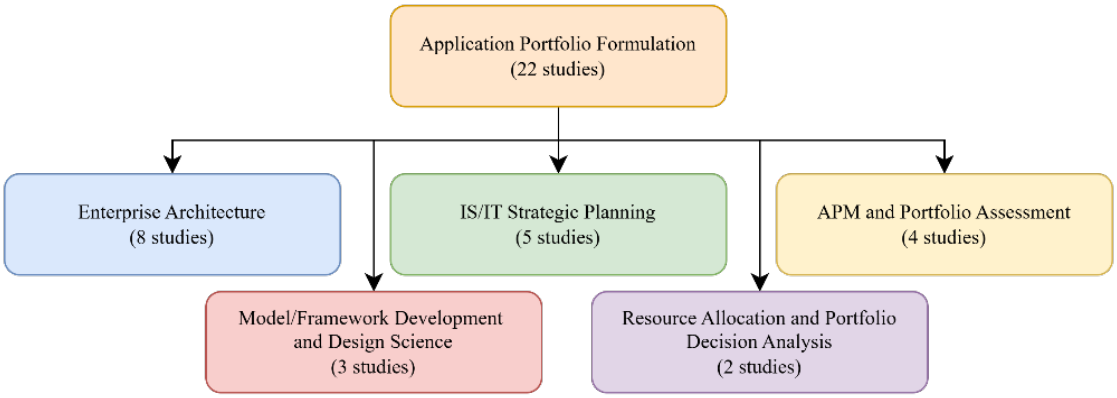

Figure 3 Taxonomy Diagram

Several borderline studies were retained even though their stated objectives were broader than application portfolio formulation. Studies [22], [36], [39] focus primarily on sustainability-oriented model development, service oriented big data architecture, or strategic IT benchmarking. Studies [26], [27] focus on business–IT alignment and resource allocation, and studies [41], [42] emphasize enterprise architecture modeling. These studies were included because they provide an explicit, traceable contribution to at least one formulation activity, namely deriving application candidates, selecting or evaluating portfolio alternatives, or representing applications through architecture or portfolio artifacts. Broader studies without such a direct contribution were excluded. Publication trend analysis was conducted to describe the distribution of selected studies by year and sector. This analysis shows how application portfolios formulation research has developed over time and across organizational contexts. Table 5 presents the distribution.

Table 5 Distribution by Year and Sector

Sector	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Enterprise IT	1	-	-	-	-	-	-	-	-	-	-
Health	-	-	-	-	-	1	1	-	1	-	-
Education	-	-	-	-	-	-	-	2	1	1	-
Cross-industry	-	1	1	-	-	-	-	-	-	-	-
Energy	-	1	-	-	-	1	-	-	-	-	-
Industrial	-	-	-	-	-	-	-	-	2	1	-
Entertainment	-	1	-	-	-	-	-	-	-	-	-
Logistic	-	-	-	-	-	1	-	-	-	-	-

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Sector	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Manufacture	-	-	-	1	1	-	-	-	-	-	-
Finance	-	-	-	-	-	-	1	-	-	-	-
Public Sector	-	-	-	-	-	-	-	-	1	-	-
SMEs	-	1	-	-	-	-	-	-	-	-	-

The sector categories include Enterprise IT, Health, Education, Cross-industry, Energy, Industrial, Entertainment, Logistic, Manufacture, Finance, Public Sector, and SMEs. The studies were published between 2015 and 2025, with the highest number in 2023, followed by 2016 and 2020. This pattern indicates continued interest in application portfolios formulation, IS/IT strategic planning, enterprise architecture, and business processes. By sector, Education was the most represented, followed by Health and Industrial contexts, while Cross-industry, Energy, Entertainment, Manufacture, Enterprise IT, Logistics, Finance, Public Sector, and SMEs appeared less frequently. Thus, application portfolio formulation has been applied in various contexts but remains more visible in service oriented and operationally complex sectors such as education and healthcare. Overall, application portfolios research is not limited to a single sector. However, the uneven sector distribution suggests that further studies are still needed in less-represented contexts such as finance, logistics, public sector, SMEs, and entertainment. The next analysis identifies the frameworks most frequently used in the selected studies, as shown in Table 7.

Table 6 Framework and Frequency

Framework / Method / Analysis Tool	Number of Studies	Percentage (from 22 papers)
TOGAF / TOGAF ADM	5	22.7%
Ward and Peppard Framework	4	18.2%
McFarlan Strategic Grid / McFarlan Portfolio Grid	4	18.2%
Application Portfolio Management (APM)	3	13.6%
Design Science Research / Design Theory Framework	2	9.1%
Zachman Framework	1	4.5%
Anita Cassidy	1	4.5%

Framework / Method / Analysis Tool	Number of Studies	Percentage (from 22 papers)
Gartner TIME Model	1	4.5%
Cloud Computing Considerations for Companies (CCCC)	1	4.5%
BITA Maturity Framework / BITA Conceptual Framework	1	4.5%
SOA-BDAF Framework	1	4.5%
Circular Economy E-business Model Portfolio Framework	1	4.5%

TOGAF/TOGAF ADM was the most frequently cited framework, appearing in five papers. It was mainly used in studies focusing on enterprise architecture, information system architecture, and As-Is/To-Be architecture development. Ward and Peppard and the McFarlan Strategic Grid were the next most frequent frameworks, each appearing in four papers. Ward and Peppard was used for strategic IS/IT planning, while McFarlan was used to classify applications within a portfolio.

The reviewed studies also reveal several method-combination patterns. Ward and Peppard is often combined with the McFarlan Strategic Grid, where Ward and Peppard supports business strategy, IS/IT condition, and future application needs analysis, while McFarlan classifies the resulting applications by strategic impact and operational contribution. TOGAF is commonly combined with an application catalogue or portfolio catalogue, where TOGAF links business and application architecture and the catalogue presents identified applications in a structured format. Portfolio Decision Analysis is also combined with optimization techniques to evaluate and prioritize application alternatives under specific constraints.

3.1.1. RQ1: Which approaches are used to formulate application portfolios?

Based on the analysis of 22 articles, the approaches used to formulate application portfolios can be grouped into five main categories. These categories are presented from the most commonly used to the least frequently applied in the selected studies.

1) Enterprise Architecture
2) IS/IT Strategy

3) Application Portfolio Management and Portfolio Assessment
4) Model / Framework Development and Design Science
5) Resource Allocation and Portfolio Decision Analysis

3.1.2. RQ2: How are application candidates derived from IS/IT strategy and business processes?

Deriving application candidates from IS/IT strategy and business processes is a critical step in ensuring that IT assets align with organizational objectives. Table 8 summarizes how applications are derived in the reviewed studies and highlights the similarities, differences, and methodological trends in application portfolios development.

Table 7 Method to Get Applications for Application Portfolios

Articles	Method to Get Applications for Application Portfolios
[21]	Obtained by combination of an inventory of existing applications and the identification of future application needs based on business processes or value chain.
[22]	Obtained from literature analysis and field interviews with experts and industry players, then selected and grouped based on relevance and needs using the SPLE method.
[23]	Obtained through the Application Portfolio Management (APM) process, namely inventorying and classifying applications into four business contribution categories: Strategic, High Potential, Key Operations, and Support (Ward & Peppard).
[24]	Obtained from 41 BPPT 2019 digital transformation applications, collected through user and developer surveys and interviews, then 25 applications with complete data were analyzed for the portfolio using the McFarlan and Gartner TIME models.
[25]	Identified through the application portfolio profiling (APP) and assessed through the application portfolio assessment) APA. The APP involves interviews with business stakeholders to obtain a business plan and collect baseline data. The APA identifies application dependencies, roles, affinities, and cost-saving opportunities.

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Articles	Method to Get Applications for Application Portfolios
[26]	Obtained from a combination of old and new applications identified from business needs and functions, then evaluated quantitatively using a PDA approach to select the most optimal application portfolio that supports Business-IT Alignment (BITA).
[27]	Obtained through mapping business and IS/IT functions in Enterprise Architecture, then adjusted through add, change, replace, or delete strategies so that the portfolio aligns with business needs.
[28]	Obtained through the Ward and Peppard method with Value Chain analysis and future portfolio mapping using the McFarlan Strategic Grid based on the contribution and dependence of IT/IS on the business.
[29]	Obtained through Strategic Planning with the Ward and Peppard framework, starting from Value Chain and SWOT analysis, then IS/IT solutions are mapped to the Future Application Portfolio using McFarlan's Grid
[30]	Derived in the Information System Architecture (Application Architecture) phase of TOGAF ADM, where candidate applications are identified to manage data and support the business.
[31]	Obtained from the results of the analysis of business process needs mapped into the Zachman Framework and EAP, then reduced to six applications according to the company's main functions.
[32]	Obtained through an analysis of the business strategy and IS/IT environment using SWOT, McFarlan's Grid, and the IT Balanced Scorecard. The results of this analysis determine the position and contribution of each application to the business process.
[33]	Obtained from identifying existing applications and mapping business requirements through the TOGAF ADM Application Architecture phase.
[34]	Obtained through a strategic planning process that aligns technology strategy with business strategy. The method used is a combination of Ward and Peppard and Anita Cassidy
[35]	Obtained through analysis of the school's business and technology needs based on observations and interviews, then designed with the TOGAF framework.

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Articles	Method to Get Applications for Application Portfolios
[36]	Obtained from documents provided by the institution, data was collected through interviews and discussions with the ICT team, and a case study template was used to ask about ICT applications that support the institution.
[37]	Obtained from an inventory of existing systems, plus new applications if needed, then validated through an integration view to align with business functions and objectives.
[38]	Derived from user needs to address business process problems
[39]	Obtained from internal company data through the SITBM questionnaire in the IT Applications domain which includes the type, number and cost of applications.
[40]	Obtained through analysis of business needs and running systems with Ward & Peppard (SWOT, Value Chain, CSF, McFarlan Grid) until SIBIMA was determined as a strategic application.
[41]	Achieved through modeling business and application architecture using a combination of ArchiMate, BPMN, and UML. Each application is identified as supporting a specific business process and then described in the application layer as part of the organization's application portfolio.
[42]	Obtained by combination of interviews, document analysis, and participant observation, which was then analyzed using open coding and triangulation.

Table 8 shows that application candidates are generally derived through a combination of business strategy analysis, business process analysis, existing application inventory, and future application need identification. The process usually begins by examining the organization's strategic direction, business objectives, and IS/IT environment. Several studies used SWOT, Value Chain, CSF, IT Balanced Scorecard, and Ward and Peppard's framework to identify information system needs that support business goals [28], [29], [32], [34], [40].

Business process analysis is another common source of application candidates. Applications are identified by mapping business functions, operational activities, and process requirements. Several studies used business process models and enterprise

architecture frameworks, such as TOGAF/TOGAF ADM [30], [33], [35], Zachman [31], ArchiMate, BPMN, and UML [37], [41], [42], to connect processes with supporting applications. This approach helps ensure that each portfolio item is linked to specific business needs, process improvements, or organizational functions.

Existing application inventory is also an important input in application candidate formulation. [24] began their APM study by identifying 41 digital transformation applications and then developing an application catalogue that recorded each application's name, version, function, users, operating system, owner, and security aspects before assessing business value and IT quality. [25] also emphasized the need to baseline application data through Application Portfolio Profiling and Application Portfolio Assessment, including information on application usage, dependencies, complexity, criticality, business impact, and cost-saving opportunities. This inventory enables organizations to compare current applications with business and IS/IT needs in order to identify gaps, redundancies, and improvement opportunities. In addition, [37] show that application candidates may come from existing system inventories and new applications when needed, while Ebner et al. demonstrate that application related data such as application type, number, and cost can support IT evaluation activities. Future application needs can also be derived from stakeholder input, documents, surveys, and digital transformation requirements, as shown by [34] through interviews, observation, documentation, and questionnaires, and by [42] through stakeholder interviews, institutional documents, participant observation, As-Is/To-Be analysis, gap identification, and viable solutions.

3.1.3. RQ3: How are application portfolios presented from IS/IT strategy and business processes?

Application portfolio presentation is the stage where identified applications are organized, visualized, and communicated in a structured format for managerial decision-making. Its purpose is to show how each application supports business functions and to facilitate evaluation, prioritization, and future system development planning. Table 9 summarizes the portfolio presentation methods used in the selected studies.

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Table 8 Method to Present the Application Portfolios

Articles	Method to Present the Application Portfolios
[21]	Presented using a value chain-based application portfolio matrix. Applications are mapped against value chain activities to show existing and future application support, while portfolio decisions are represented through triage categories such as eliminate, tolerate, replace/migrate, and invest.
[22]	Presented in a tiered table (strategic, tactical, operational) and end-to-end system diagram that displays ESG-based application priorities.
[23]	Classified according to Ward & Peppard into four categories (Strategic, High Potential, Key Operations, and Support), and presented in a structured inventory containing the main attributes of each application throughout its life cycle.
[24]	Presented in two main matrices, namely McFarlan's Strategic Grid (categories Strategic, High Potential, Key Operational, Support) and Gartner's TIME Model (categories Invest, Migrate, Tolerate, Eliminate).
[25]	Presented in the form of tables and classification tables that display the results of the analysis of two main stages, APP and APA.
[26]	Presented in the form of a mapping table between business functions and applications, a table listing efficient portfolios resulting from PDA analysis, and a core index graph showing the main applications that appear most frequently in the optimal portfolio.
[27]	Compiled using EA and PDA-based Dynamic Resource Allocation Algorithm to select the optimal application combination, then presented in a business function and application mapping diagram.
[28]	Presented in the form of system recommendations prioritized using the McFarlan Strategic Grid.
[29]	Presented using McFarlan's Grid, it divides proposed IS/IT solutions into Strategic, High Potential, Key Operational, and Support. This portfolio is also used to develop the IS Development Roadmap.
[30]	Presented in the Application Portfolio Catalog in the TOGAF ADM Information System Architecture phase and the Application Relationship Matrix which maps application support to business functions.

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Articles	Method to Present the Application Portfolios
[31]	Presented in the Application Portfolio table which classifies applications into four categories (Strategic, Key Operational, High-oriented, and Supporting) to determine the implementation sequence.
[32]	Presented using McFarlan's Grid (Strategic, High Potential, Key Operational, and Support).
[33]	Presented in the form of an Application Portfolio Catalogue in the TOGAF ADM Application Architecture phase.
[34]	Presented in a table that maps new business functions and applications according to the results of the Ward & Peppard–Cassidy analysis
[35]	Presented in the form of an Application Portfolio Catalog table and a four-quadrant classification matrix (strategic, high potential, key operational, support).
[36]	Presented in a table that identifies the ISA Application portfolio that supports the Business Architecture, including the application names, services, functions, and processes offered by the applications that exist in the institution.
[37]	Presented in the form of an executable model in the application view of the Executable Model Driven Framework.
[38]	Presented with Application Architecture and Information Technology Architecture as part of Enterprise Architecture
[39]	Presented as an indicator of performance and maturity level of IT Applications domains as a result of benchmarking between organizations.
[40]	Presented using the McFarlan Strategic Grid which divides applications into four categories: Strategic, High Potential, Key Operational, and Support.
[41]	Presented as an application architecture model with ArchiMate that displays the relationships of applications, services, and business processes in a visual map of the portfolio.
[42]	Presented using ArchiMate-based application architecture diagrams within a TOGAF based IS architecture model.

Table 9 shows that the selected studies present application portfolios through classification matrices, portfolio tables [21], [22], [25], [26], [27], application catalogues [30],

[33], [42], architecture diagrams [30], [41], [42], and implementation roadmaps [24]. The most common format is the portfolio classification matrix, particularly McFarlan's Strategic Grid, which classifies applications into Strategic, High Potential, Key Operational, and Support categories [24], [28], [29], [32], [40]. This format helps organizations understand each application's strategic contribution and determine which applications are critical for current operations or future development.

Another frequently used presentation method is the Gartner TIME model, which classifies applications into Tolerate, Invest, Migrate, and Eliminate categories [24]. This model supports decisions based on business value and technical condition. Several studies also used value chain analysis [21], [29], [34], [35], [40] to map applications against business activities and show the relationship between applications and organizational processes.

Application portfolios are also presented as tables and catalogues that list applications, related business functions, roles, supported services, implementation priorities, and recommended actions. In enterprise architecture studies, the portfolio is often shown as an Application Portfolio Catalogue within the TOGAF ADM Application Architecture phase [30], [33], [35]. This format provides a structured view of existing and future applications and explains how each application supports business functions and processes.

Some studies present the portfolio through architecture diagrams, including ArchiMate, BPMN, UML, and TOGAF-based application architecture diagrams [37], [41], [42]. These diagrams visualize relationships between business processes, application services, application components, and information flows. This format is useful because it shows not only what applications exist, but also how they interact with business processes and organizational needs.

Other studies present portfolios as recommendations, roadmaps [34], or prioritization results derived from strategic planning [28], quantitative analysis [25], benchmarking (Ebner 2016), or portfolio decision analysis (Zhang 2019). These outputs indicate which applications should be invest, eliminate, migrate, or tolerate [21], [24]. Therefore, the application portfolio functions not only as documentation, but also as a basis for IS/IT planning and decision making.

3.2. Discussion

Enterprise Architecture emerged as the most frequent category because many selected studies do not only plan applications, but also explain how those applications fit within business processes, data, technology, and organizational goals. EA therefore provides a comprehensive mechanism for translating business needs into application architectures or application portfolios. Within the 22 studies, the EA approach appears in papers using TOGAF, Zachman, ArchiMate, Model-Driven Engineering, and architecture modeling. These studies typically produce baseline architecture, target architecture, application architecture, data architecture, technology architecture, gap analysis, blueprints, roadmaps, or As-Is and To-Be models. [30] uses TOGAF to produce data, application, and technology architectures that support university business processes, while [42] use TOGAF 9.2, ArchiMate, and Archi to develop As-Is and To-Be IS architectures for university hospitals.

IS/IT strategic planning differs from EA in focus and output. Using frameworks such as Ward and Peppard, this approach emphasizes the identification of IS/IT needs, strategies, and application recommendations based on business and technology analysis. [28], for instance, use Value Chain, SWOT, PEST, IS/IT environmental analysis, and the McFarlan Strategic Grid to generate application recommendations and application portfolios. [40] also uses Ward and Peppard to design a strategic plan for a student guidance information system. In simple terms, IS/IT strategic planning explains what applications are needed and why they matter, while EA explains how those applications should be structured, integrated, and positioned within the wider organizational architecture. Table 10 summarizes the strengths and weaknesses of each approach.

Table 9 Strengths and Weakness of Each Method

Method	Input	Output	Strengths	Weaknesses
Application Portfolio Management and Portfolio Assessment	Existing application inventory, value, risk, cost	Evaluation result, rationalization decision	Strong for portfolio optimization	Often focuses on existing systems rather than new candidates

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Method	Input	Output	Strengths	Weaknesses
IS/IT Strategic Planning	Business strategy, CSF, KPI, internal and external analysis	Application recommendations, portfolio grid	Strong strategic alignment	Often less detailed in architecture and implementation
Enterprise Architecture	Business process, data, application	Application architecture, catalogue, roadmap	Strong traceability and integration	Can be complex and resource intensive
Resource Allocation and Portfolio Decision Analysis	Criteria, constraints, costs, benefits	Optimized portfolio decision	More objective and measurable	Requires reliable data and may simplify qualitative factors
Model / Framework Development dan Design Science	Problem context, design requirements	Conceptual model, framework, tool	Produces reusable artefacts	May need stronger empirical validation

The methodological strengths and weaknesses in Table 10 show that application portfolios formulation rarely relies on a single approach. Instead, it is shaped by several stages. IS/IT strategy inputs are generally derived from organizational objectives, information needs, internal and external conditions, and business priorities. Business process inputs are captured by identifying activities, actors, data, workflows, process issues, duplicate work, manual tasks, and cross-departmental integration needs.

The reviewed studies provide three main types of evidence. First, several studies produce real portfolios or concrete artifacts, especially those using Application Portfolio Management, IS/IT Strategic Planning, and Enterprise Architecture. These outputs are presented not only as application portfolio tables, but also as evaluation results, rationalization decisions, application recommendations, portfolio grids, application architectures, catalogues, or roadmaps. [24] map applications using the McFarlan Strategic Grid and Gartner TIME Model to recommend maintenance, investment, and

removal actions. [30] produces an Application Portfolio Catalog, System/Function Matrix, and Application Communication Catalog, while [42] produce TOGAF based IS architecture artifacts describing current and future ICT processes, gaps, and feasible governance solutions.

Second, studies categorized as Model/Framework Development and Design Science tend to produce conceptual models, frameworks, or methodological artifacts rather than directly implementable portfolios. [22], for example, propose a feature-based circular economy e-business model to support ESG and sustainability performance. [36] develop SOA-BDAF using Design Science Research Methodology, while [41] proposes a hybrid enterprise architecture modeling approach based on the evaluation of ArchiMate, BPMN, UML, FAML, SoaML, and BMM. These studies contribute reusable conceptual artifacts, although stronger empirical validation may still be needed.

Third, several studies produce evaluation tools or decision-support mechanisms, especially within Portfolio Assessment, Resource Allocation, and Portfolio Decision Analysis. [25] develop Application Portfolio Profiling and Application Portfolio Assessment to evaluate cloud migration feasibility and portfolio costs. [26] apply Portfolio Decision Analysis to optimize portfolio decisions, while [27] develop a dynamic resource allocation algorithm to adjust the application portfolio when business-IT alignment changes. Thus, application portfolios formulation may result in real portfolio artifacts, conceptual models, or evaluation tools, depending on the methodological approach used.

Among the presentation methods, the McFarlan Strategic Grid remains the dominant portfolio-classification device for several related reasons. First, its two underlying dimensions, an application's current operational importance and its potential future strategic impact, correspond directly to the current-and-future orientation of portfolio formulation. Second, its four familiar quadrants, namely Strategic, High Potential, Key Operational, and Support, compress a heterogeneous application landscape into a vocabulary that business and technical stakeholders can readily understand and discuss. Third, the grid requires less data, analytical expertise, and computational effort than multi-criteria scoring or optimization methods, allowing it to be applied in interviews and planning workshops even when portfolio data are incomplete. Finally, it is embedded in Ward and Peppard-based strategic planning and therefore provides a natural endpoint

for classifying application recommendations generated through strategic analysis. Its continued use thus reflects its conceptual fit, low implementation burden, and communication value rather than comprehensive analytical power. However, this simplicity also limits the grid when application portfolios are dynamic. A static classification records an application's position at a single assessment point and generally treats the quadrants as discrete, stable, and mutually exclusive. In practice, user demand, business criticality, technical health, cost, cybersecurity exposure, regulatory obligations, vendor support, cloud migration options, and dependency relationships may change at different rates. An application may also be classified as Key Operational because it supports a core process while simultaneously being Strategic because it enables a new digital channel, meaning that assigning it to only one quadrant may obscure its dual role. Furthermore, the grid does not rank applications within a quadrant, quantify uncertainty for proposed applications, reveal shared platforms and data dependencies, or incorporate migration effort, architectural fit, and technical debt. Consequently, relying solely on quadrant labels may encourage oversimplified investment, retention, or retirement decisions and produce classifications that become outdated soon after assessment. Based on these findings, this review proposes a conceptual model for formulating application portfolios from IS/IT strategy and business processes.

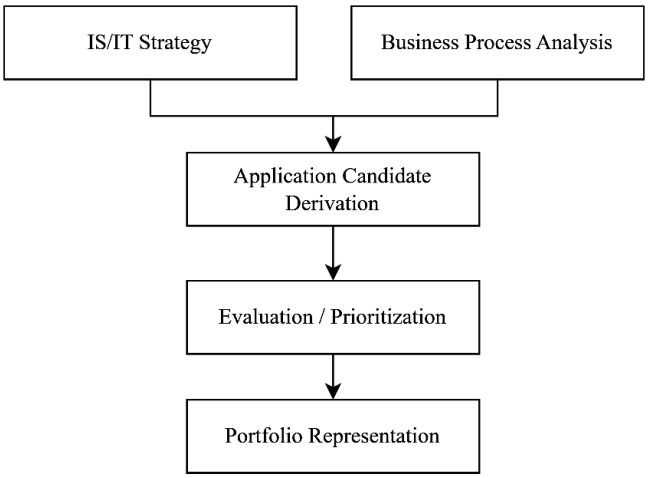

Figure 4 Conceptual Model

Figure 4 presents the proposed conceptual model for formulating application portfolios from IS/IT strategy and business processes. The model begins with two main inputs, namely IS/IT strategy and business process analysis. On the strategic side, organizational

objectives, critical success factors, performance targets, policy or regulatory pressures, and internal and external IS/IT conditions are first interpreted as required business capabilities and information needs. Tools such as SWOT, PEST, value-chain analysis, and the Ward and Peppard analyses expose opportunities, threats, weaknesses, and priority value activities. These findings are then expressed as IS implications and decomposed into candidate application services or systems. This intermediate step prevents a weakly justified leap from a broad objective, such as improving service quality, directly to a named application.

On the business-process side, As-Is and To-Be models, interviews, observations, documents, and process maps identify actors, activities, handoffs, decisions, data flows, manual work, bottlenecks, duplication, and missing integration. Each issue or future-state change is converted into functional, data, workflow, reporting, and interface requirements. These requirements are compared with the existing application catalogue and architecture to determine whether the need can be met by retaining or extending a current application, integrating or consolidating several applications, or introducing a new candidate, obsolete or overlapping applications are simultaneously flagged for migration or retirement. The strategic and process streams are then reconciled through a traceability mapping from objective and process issue to requirement, application candidate, and expected benefit. Stakeholder validation and gap-and-overlap analysis confirm candidate scope before evaluation and prioritization. Portfolio assessment is relevant at this point only insofar as it supports formulation by selecting among candidates and determining the treatment of current applications

These inputs are integrated to produce candidate applications, namely then evaluated and prioritized based on strategic alignment, business process relevance, organizational value, and implementation feasibility. The final output is application portfolios that supports both strategic objectives and business process improvement. Future research should empirically validate the proposed formulation model to assess whether its stages are clear, traceable, and effective in linking strategic inputs, business process evidence, application candidate derivation, portfolio evaluation, and portfolio representation. Further studies should also develop dynamic portfolio simulation, real time portfolio scoring, multi-criteria decision making, and AI-assisted optimization to account for changing strategies, risks, budgets, dependencies, application conditions, and investment

priorities. These approaches should support transparent recommendations for retaining, improving, migrating, consolidating, replacing, or retiring applications and be evaluated using real organizational outcomes while ensuring explainability, human oversight, data quality, bias control, and security.

4. CONCLUSION

This systematic literature review synthesized 22 studies published between 2015 and 2025 on application portfolio formulation based on IS/IT strategy and business processes. For RQ1, five approach categories were identified, namely Enterprise Architecture (EA), IS/IT Strategic Planning, Application Portfolio Management and Assessment, Model/Framework Development and Design Science, and Resource Allocation and Portfolio Decision Analysis. EA was the most dominant because it integrates business, data, application, and technology layers, while IS/IT Strategic Planning translates organizational objectives and environmental conditions into application needs. For RQ2, application candidates are derived from strategic inputs, such as objectives, critical success factors, and priorities, as well as process inputs, including activities, actors, data flows, problems, manual tasks, and integration needs. For RQ3, the resulting portfolios are commonly presented through McFarlan Strategic Grids, application catalogues, matrices, architecture diagrams, EA views, and assessment models such as Gartner TIME. The review's main contribution is a five-category taxonomy supported by a four stages conceptual model covering input identification, application candidate derivation, evaluation and prioritization, and portfolio representation, that still requires future empirical validation. However, the review is limited by its search terms, reliance on Google Scholar, and exclusion of non-English studies. Future research should broaden database and keyword coverage and validate an integrated application portfolio formulation framework using expert reviews, comparative case studies, design science evaluation, and real organizational data.

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APPENDIX A. Data Extraction

Title	Authors	Year	Sector	Source	Method	Contribution
E-business Adoption and Application Portfolio Management in Remanufacturing Small and Medium Enterprises	[21]	2016	SMEs	IEEE	Exploratory Study and Value Chain Analysis	Demonstrating a value chain-based approach for formulating application portfolios.

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Title	Authors	Year	Sector	Source	Method	Contribution
Circular Economy E-business Model Portfolio Development for E-business Applications: Impacts on ESG and Sustainability Performance	[22]	2023	Industrial (Circular Economy)	Science Direct	Literature Review and Development of a Conceptual/Feature Based Circular Economy E-Business Model Portfolio.	Demonstrating how an application portfolio can be developed from circular economy business processes and sustainability-oriented business needs.
Reducing IT Costs and Ensuring Safe Operation with Application of the Portfolio Management	[23]	2017	Cross-industry	Google Scholar	Case studies dan Interview, Application Portfolio Management, Cost-benefit Analysis, and Risk analysis.	Supporting literature for an Application Portfolio Management approach based on application rationalization, cost efficiency, and risk management.
Exploring Application Portfolio Management in Indonesia: A Case Study of the Indonesia Agency for the Assessment and Application of Technology	[24]	2023	Public Sector	Google Scholar	McFarlan's strategic grid, Gartner's TIME model, data collection was conducted through an online questionnaire/survey (items adapted from ISO 25010) and expert interviews.	An approach to evaluating and compiling an APM-based application portfolio, particularly through a combination of the McFarlan Strategic Grid and the Gartner TIME Model.
Enterprise Adoption of Cloud Computing with Application Portfolio Profiling and Application Portfolio Assessment	[25]	2021	Finance	Springer	Application Portfolio Profiling (APP) and Application Portfolio Assessment (APA) as part of Cloud Computing Considerations for Companies (CCCC)	Provides a quantitative and structured method for evaluating existing application portfolios to ensure they align with the cloud adoption strategy and business needs.
Resource Allocation Approach to Associate Business-IT Alignment to Enterprise Architecture Design	[26]	2019	Manufacture (Garment/Apparel)	IEEE	Portfolio Decision Analysis, the EA-BITA Framework and an Illustrative Case Study.	A quantitative and Enterprise Architecture based approach to defining an application portfolio.

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Title	Authors	Year	Sector	Source	Method	Contribution
Evolvement of Business-IT Alignment: A Conceptual Model and Intervening Changes from Resource Allocation	[27]	2018	Manufacture (Garment/Apparel)	IEEE	Conceptual model, Dynamic Resource Allocation Algorithm, Illustrative Case Study.	A quantitative approach based on Business–IT Alignment and Enterprise Architecture to establish or adjust the application portfolio
The IS/IT Strategy Planning Through Ward and Peppard Method in Automotive Spareparts Company	[28]	2024	Industrial (Automotive)	Google Scholar	Ward and Peppard.	An empirical example of an application portfolio formulation based on Ward and Peppard's IS/IT strategic planning framework.
The Development of Information System with Strategic Planning for Integrated System in the Indonesian Pharmaceutical Company	[29]	2020	Health	Google Scholar	Ward and Peppard and interviews.	An empirical example of formulating a future application portfolio based on IS/IT strategic planning and business process analysis.
Model Enterprise Architecture for Information Technology Services in Universities	[30]	2022	Education	Google Scholar	Qualitative descriptive and using TOGAF, Value Chain, SWOT, PEST, Porter's Five Force, and Critical Success Factor (CSF).	An example of an approach to formulating an application portfolio based on Enterprise Architecture.
Redesign the Forwarding Company's Business Processes Using the Zachman Framework	[31]	2020	Logistic	Google Scholar	Zachman framework, SWOT, literature study, interviews with workers and management, and direct observation.	An example of an application portfolio can be formulated based on business process analysis and enterprise architecture planning.

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Title	Authors	Year	Sector	Source	Method	Contribution
IT/IS strategic Development for Journalism System Implementation on Television Industry: Study Case on NET Television Station	[32]	2016	Entertainment	IEEE	SWOT, IT BSC, dan McFarlan's Strategic Grid	Demonstrates the formulation of an application portfolio based on an IS/IT strategy, particularly by combining business/IT environmental analysis, SWOT analysis, the IT Balanced Scorecard, and the McFarlan Strategic Grid.
Development of an Enterprise Architecture for Healthcare using TOGAF ADM	[33]	2021	Health	Google Scholar	TOGAF ADM, discussions and interviews with key stakeholders and secondary data collection.	Shows that an application portfolio can be formulated using a TOGAF ADM-based Enterprise Architecture approach.
Identification of Business and Technology Strategies based on the Ward Peppard-Cassidy Method	[34]	2023	Industrial (Electrical Equipment Distribution)	Google Scholar	Ward and Peppard combined with the Anita Cassidy method, in-depth interviews, direct field observation, SWOT, and PEST	Illustrates the process of formulating an application portfolio based on business strategies, IS/IT strategies, and business process analysis.
Designing Information System Architecture Based on Education 4.0 Case Study: Senior High School Institutions of Indonesia	[35]	2022	Education	Google Scholar	Qualitative, case study research, TOGAF, EA stages following TOGAF ADM, observation, and interviews.	As an example of a TOGAF based Enterprise Architecture approach to building an application portfolio.

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Title	Authors	Year	Sector	Source	Method	Contribution
Towards the Development of SOA-Based Big Data Model for Adoption in the HEI in Bahrain- Case Study	[36]	2024	Education	IEEE	A combination of Design Science Research Methodology (DSRM) to develop artifacts (SOA-BDAF) and a holistic single case study for data collection and analysis.	Demonstrating how enterprise architecture and service-oriented architecture can be used to align institutional strategic objectives, business processes, and information systems architecture in a higher education context.
An Executable Model Driven Framework for Enterprise Architecture Application to the Smart Grids Context	[37]	2016	Energy / Electric Power	IEEE	Model Driven Engineering (MDE) and simulation through a multi-view modeling approach.	Providing a Model-Driven Enterprise Architecture approach that connects business goals, business processes, functional blocks, and application modules.
Designing Enterprise Architecture for Gasoline Distribution Monitoring System Using IoT Technology	[38]	2020	Energy / Oil and Gas	Google Scholar	Observation and interviews, Enterprise Architecture design.	Provides an example of how an Enterprise Architecture (EA) approach can be used to derive an information system solution from business process problems and user requirements.
Assessing IT Management's Performance: A Design Theory for Strategic IT Benchmarking	[39]	2016	Cross-industry	IEEE	Design Science Research (DSR), Qualitative, and Open and Selective Coding.	As a study on strategic evaluation and benchmarking of IT management, especially in relation to the application portfolio domain.

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Strategic Planning For Student Guidance Information System Design in Tourism Department using Ward and Peppard Framework	[40]	2023	Education	Google Scholar	Ward and Peppard. Results are based on interviews and observations with actors.	Providing an example of how an application portfolio can be formulated from IS/IT strategic planning using the Ward and Peppard framework and the McFarlan Grid Portfolio.
Agile Enterprise Architecture Modelling: Evaluating the Applicability and Integration of Six Modelling Standards	[41]	2015	Enterprise IT	Science Direct	Developing qualitative questionnaire-based evaluation criteria based on the TOGAF framework.	Shows how an application portfolio can be represented and traced from business processes to application services and application components.
Toward an Information Systems Architecture Model for University Hospitals: A Case Study in a Brazilian Public Hospital	[42]	2023	Health	Wiley	Qualitative case study method. The resulting information systems architecture was modeled using TOGAF, ArchiMate, and Archi.	Showing how an enterprise architecture approach can be used to formulate or represent an application portfolio.