Towards an Application Life-Cycle Approach for Selective Outsourcing

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Abstract

Selecting outsourcing has been proven to be more likely to succeed in achieving efficiency targets. For application services outsourcing (ASO), selecting applications to outsource is critical for successful outsourcing. Therefore, the implementation of application portfolio management (APM) is essential, in order to provide the necessary transparency throughout the entire life-cycle of an application. APM enables the classification of applications which guides the outsourcing decision. Furthermore, the application life-cycle perspective allows a differentiated and comprehensive view, which is required for selecting applications for ASO. In combination with common selection criteria identified by prior research, we studied the decision to in- or outsource an application. We evaluated outsourcing decisions in a comparative cross-case study with 37 German and Swiss companies. Our research revealed that the life-cycle perspective allows a differentiated view on outsourcing decisions.

1. Introduction

Outsourcing is a common accepted practice and applied in various forms to archive different targets. Previous scholars proved that selective outsourcing is most likely to aid efficiency [1, 2]. The selective outsourcing approach implies the outsourcing of particular parts and functions of information systems (IS) [3]. Even though selective outsourcing could possess several advantages such as flexibility or risk mitigation, deciding which IS assets, functions, and/or services to outsource, however, must be well considered [4]. Looking at the decision on application services outsourcing (ASO), today many companies are confronted with historically grown application landscapes that are now “cluttered with obsolete information technology (IT) systems and applications that no longer deliver full value to the business” [5].

To counteract this phenomenon, companies implement IT portfolio management (IT PM), a IT governance process that balances business requirements and IT investments [6]. As a pillar of IT PM, application portfolio management (APM) aims to improve and maintain the application landscape to better meet business demand by categorizing, assessing, and rationalizing the application portfolio [7]. Thus, APM continuously plans, controls, and manages applications throughout their life-cycle from initial design to decommissioning [7]. According to Forrester Research, APM supports “better outsourcing agreements” by providing transparency over the application inventory and thus establishing the selection and improvement of outsourcing arrangements [8]. Hence, APM enables the selection of applications feasible for outsourcing.

Thus far, analyses against the background of ASO decisions are relatively rare [9]. Furthermore, insight into how to improve the decision process is needed [10]. In the case of selective ASO, the criteria driving the decision to outsource a particular application contain a major leverage for improvement. Looking from an APM perspective, the application life-cycle allows a comprehensive and long-term view to assess an application’s evolution, which is particularly important for the outsourcing decision for two major reasons: (1) Outsourcing options can be viewed more differentiated for one application taking the life-cycle stage into account to allow shorter contract durations and smaller application packages. This facilitates more flexibility and mitigates lock-in effects [11]. (2) Selective outsourcing is not a “one-shot decision” but rather an ongoing series of decisions as part of a process maximizing the value of IT [12]. Therefore, we studied the decision to in- or outsource different degrees of an application’s strategic impact and business criticality, as prior identified application characteristics crucial for selective outsourcing, in
each life-cycle stage to broaden the options of selective outsourcing based on APM. This motivates the following research question:

*How does the application life-cycle affect the selective outsourcing decision?*

The remainder of the paper is structured as follows: In the next section, we provide an overview of related literature, place the subject of this research in the general APM context and its relation to ASO, and describe the application life-cycle concept. In the following section, we describe the research methodology, including the data collection and evaluation processes. Subsequently, the results of the data analysis are presented, followed by the final section, which includes the conclusion.

2. Related work

2.1. Application Services Outsourcing and Application Portfolio Management

IS outsourcing is "a decision taken by an organization to contract-out or sell the organization’s IT assets, people, and/or activities to a third party vendor, who in exchange provides and manages assets and services for monetary returns over an agreed period of time" [13]. Lacity and Hirschheim [3] distinguish between three types of IS outsourcing described by the percentage of the IS budget transferred to the vendor. **Total out- and insourcing** is defined as the purchase of more than 80% or less than 20% of the IS assets, licenses, staff, and management for the IS services from a single third-party vendor. The transfer of between 20% and 80% of the IS budget by sourcing selected IS services from external multiple providers is **selective outsourcing**. Moreover, Lacity et al. [4] state that prior research studies proved that companies that use a well-considered, incremental, and selective approach to outsourcing are more successful, particularly when they outsource to improve efficiency [2]. Furthermore, outsourcing varies in the outsourced IT services (e.g., [14, 15]). As the subject of the study is the organization’s applications as part of APM, our research focuses on outsourcing application services, defined as “all services associated with the acquisition, development, and deployment of an IT application” [16].

As part of enterprise IT governance, IT PM is a “prioritization process for IT investments and projects in which business and IT is involved” [17]. As one of the most effective IT governance processes (4.13/5), IT PM is assigned to the minimum baseline, i.e., one of the top 10 IT governance practices [6]. APM, in turn, is an important pillar of IT PM focusing on assessing and developing the application landscape. Assessing the health of the application portfolio allows IS managers and business managers to determine the value of the portfolio, and therefore leads to a “greater shared understanding and purpose between IS and its business unit customer” [18]. Through evaluating existing, new, and potential applications, the “portfolio perspective” helps determine the business value of an application and supports decisions about replacing, retiring, or further investing in applications throughout their entire life-cycle [7]. Application portfolio models are defined as an instrument to leverage the improvement from information systems investments [21]. Simon et al. [22] furthermore divide the APM process into four major sub-processes: data collection, analysis, decision-making, and optimization. APM enables to achieve a greater alignment between business and IT and to ensure the optimal deployment of IT [7]. Research that refers to APM predominantly includes portfolio analysis for classifying applications, identifying the portfolio condition, and determining actions to improve the portfolio condition (e.g., [18-20]). This enables the selection of applications feasible for outsourcing.

Research combining outsourcing with aspects of APM is scant. Existing scholars address the influence of the portfolio structure as the sum of all applications in terms of their interactions regarding the outsourcing decision (e.g., [23]). Furthermore, prior researchers investigated the application characteristics that influence the decision to outsource or not (e.g., [4]). Prahalad and Krishnan [24] introduced an application scorecard that determines the degree of outsourcing based on the application characteristics and the interdependencies between applications. McKeen and Smith [7] state that selecting which applications to outsource is facilitated by the portfolio transparency and planning provided by the APM. Therefore, we investigate application characteristics that drive the ASO decisions identified by prior scholars and examine the characteristics in light of the application life-cycle.

2.2. Explored application characteristics salient for ASO decisions

APM provides various characteristics to describe an application, ranging from economic to technical attributes [22]. We concentrate on the major
characteristics related to business value proven by previous studies to influence outsourcing.

Prior outsourcing research identifies two application-specific criteria that dominantly guide the decision to outsource: (1) strategic impact and (2) business criticality [4, 25, 26]. Pati and Desai [25] see the main objective of IT in the deployment of IT systems for “the support of organizational processes in order to create operational, tactical, and strategic business value.” They define the strategic business value of an IT system as “the value that can create sustainable competitive advantages for an organization.” Their definition is based on Mata et al.’s [27] resource-based sustainable competitive advantage framework, which defines “a competitive advantage as a capability that is valuable, dissimilarly distributed across the competing firm, and cannot easily be imitated, acquired or stolen.” Ward [26] defines a strategic application as “critical to sustaining the future business needs.” In the following, this characteristic is called strategic impact.

Ward [26] introduces a comprehensive typology, which structures the contribution of systems to the business. Turnaround and high potential applications might be important for future business success. Support applications are valuable but not critical for success. Factory and key applications are systems “the organization currently depends on for success.” Lacity et al. [4] define two criteria for selecting outsourcing candidates: (1) the contribution of IT activities to business operations and (2) the contribution of IT activities to business positioning. The second criterion represents the strategic impact, and the first criterion addresses the degree of availability and stability required for business operations. Applications, on which business operations strongly depend, are business critical and belong to Ward’s factory and key applications [26]. Therefore, we consider the strategic impact and business criticality the most important application characteristics related to business value in selective outsourcing decisions to evaluate in the application life-cycle.

2.3. Life-cycle orientation in APM and outsourcing decisions

The life-cycle concept originally stems from product marketing and manufacturing [28-30]. Within APM, an application’s life-cycle is seen from different perspectives. One perspective involves determining the life-cycle stage according to the strategic importance or business contribution provided by an application (e.g., [18, 31]). Another perspective is oriented toward the applied functions in each phase (e.g., [32]). In the following, we use the second perspective of the application life-cycle, as selective outsourcing mainly results in separate outsourcing of IT functions, for one or multiple applications supporting the same business process or based on the same technology [4].

For software development, various models structure the activities of application management such as the Waterfall Model [33], the V-Model [34], and the Spiral Model [35]. These models have drawbacks [36]: They focus on the developer’s involvement in different phases and barely emphasize maintenance and retirement. The Information Technology Infrastructure Library (ITIL) introduced an application management life-cycle, an iterative process consisting of six equally crucial phases: Requirements (1), Design (2), Build (3), Deploy (4), Operate (5), and Optimize (6). In the Requirements phase (1), the organization’s business needs are translated into different types of requirements, which are collected in a product requirements document. In the Design phase (2), a detailed functional specification of the application and the environment the application has to run in are created. These specifications contain detailed descriptions of the required application and systems architecture. The Build phase (3) covers coding, acquiring, integrating, and testing applications and system environments. The Deploy phase (4) encompasses installing the new environment and the application in the existing IT environment. This is managed during the release and deployment management process and includes testing and early life support. In the Operate phase (5), the application delivers IT services. Application performance is continually monitored against the service levels. In the Optimize phase (6), the service performance is analyzed and acted upon. Potential courses of action include initiating improvements through a life-cycle iteration and retiring applications [36].

Zarnekow and Brenner [37] show that for a typical application with a life period of five years approximately 80% of the total life-cycle costs are incurred during the operation and further development phases. The authors criticize that the assessment of new applications is limited to the non-recurring costs of developing the application and neglects the recurring operational costs. McKeen and Smith [7] emphasize the importance of a life-cycle perspective in application portfolio management, i.e., the “ongoing management process of categorization, assessment, and rationalization of the IT application portfolio.” They propose considering the life-cycle
status for managing inventory and as decision input for rationalizing the application portfolio.

Even though the application life-cycle is a well-accepted concept in application management, life-cycle-oriented outsourcing decisions have rarely been studied. Some authors discuss ASO in terms of specific life-cycle phases. Saarinen and Vespäläinen [38], for example, focus on the build stage of the application life-cycle and investigate how the specificity and uncertainty of an application influence the outsourcing decision. Gable et al. [39] concentrate on the maintenance of large packaged applications such as ERP systems. Their research emphasizes the importance of an application life-cycle-wide view but does not include the specifics of each life-cycle stage. In summary, the importance of the application life-cycle perspective for application management has been widely acknowledged. The combined effect of an application’s life-cycle stage with other application characteristics (strategic impact and business criticality) on the outsourcing decision has not been satisfactorily studied.

3. Research design, methodology, and data collection

We chose a multiple holistic case study research design for the following reasons [40-42]: Our research subject, the application of life-cycle-oriented sourcing decision, is a contemporary phenomenon, which cannot be studied outside its context. Behavioral events cannot be controlled. Furthermore, we seek explanations (in the sense of how and why the life-cycle stage is relevant for outsourcing decisions) rather than testing already established hypotheses. Whereas in hypothesis testing research the constructs and measures must be specified a priori, they emerge during the course of the analysis in case study research [43]. Before data is collected, the research design should be guided by theoretical propositions [40, 44]. Our research design is guided by the general proposition that the life-cycle stage of an application combined with other (and already well-discussed) application characteristics is a crucial component of the decision for ASO. This proposition helps us redefine and explicitly measure the constructs, which most likely are considered within an outsourcing decision, based on prior literature [42, 43].

For the case study design, we used the five design components introduced by Yin [40]. The research question (1) was derived from limited knowledge about the role of an application’s life-cycle in the outsourcing decision. We did not formulate a priori propositions (2), however. Our exploratory research had a clear purpose and success criteria. We aim to clearly understand how the combination of an application’s life-cycle stage with other application characteristics affects a firm’s tendency to outsource selectively. We chose the decision that considers application characteristics as the unit of analysis (3). To link our data to the general proposition (4), we match and compare decisions patterns and use

Table 1: Characteristics of companies, interview partners, and data sets

<table>
<thead>
<tr>
<th>Revenue (in € Mio.)</th>
<th>100-1000 (5)</th>
<th>1000-2000 (7)</th>
<th>2000 -10 000 (12)</th>
<th>10 000 -50 000 (9)</th>
<th>≥ 50 000 (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>Banking &amp; Financial Services (9)</td>
<td>Manufacturing (7)</td>
<td>Information &amp; Communication (6)</td>
<td>Transportation &amp; Logistics (5)</td>
<td>Pharmaceuticals &amp; chemicals (4)</td>
</tr>
<tr>
<td>IT Budget</td>
<td>1-50 Mio. EUR (8)</td>
<td>50-200 Mio. EUR (9)</td>
<td>200-1000 Mio. EUR (8)</td>
<td>&gt;1000 Mio. EUR (5)</td>
<td>n.a. (7)</td>
</tr>
<tr>
<td>Position of interview partner</td>
<td>CIO (13)</td>
<td>Direct Report to the CIO (29)</td>
<td>IT Manager (4)</td>
<td>Technical IT Staff (4)</td>
<td>Central Function (3)</td>
</tr>
<tr>
<td>Data base</td>
<td>Interview transcript (37)</td>
<td>Preparation call minutes (37)</td>
<td>Questionnaire (37)</td>
<td>Factsheets (37)</td>
<td>Internal documents (6)</td>
</tr>
</tbody>
</table>

research subject, the application of life-cycle-oriented sourcing decision, is a contemporary phenomenon, which cannot be studied outside its context. Behavioral events cannot be controlled. Furthermore, we seek explanations (in the sense of how and why the life-cycle stage is relevant for outsourcing available literature to interpret these findings (5) [42].

3.1. Data collection

To collect data, we pursued a theoretical sampling strategy rather than statistically sampling the cases
from a chosen population [42, 43, 45]. To limit inter-case differences due to firm size and cultural reasons, we focused on large German and Swiss companies with a turnover of €50 million or more [46]. Furthermore, we selected companies from various industries to generalize the results. We ended up with a case base of 37 companies shown in Table 1.

For the data collection and analysis process, we began with a literature review to identify the relevant constructs regarding application characteristics and application life-cycle models (see above). Based on these constructs, we deduced an interview guideline with standardized open-ended questions [48] and a questionnaire with closed questions. We chose a survey and a face-to-face interview because data from the closed questions facilitates the analysis of qualitative data and can support the findings [43]. We pretested the guideline and the questionnaire with two CIOs. Before the face-to-face interview, we provided the interviewees the questionnaire with closed questions and then collected it. We also collected external data about the companies and consolidated it in company factsheets. In a preparation call, we discussed the questionnaire and explained the scope of the face-to-face interview. During the preparation call, we took notes about. We then asked the interviewees to invite colleagues to the interview following the principles of snowball sampling [49, 50]. At least two researchers participated in each interview: One moderated the interview, and the other took notes [43, 49]. The interview protocol was again reviewed by the interviewee(s) to ensure data validity.

#### 3.2. Data analysis

The data was analyzed in an iterative mode [51]. We initially used constructs of outsourcing types and decision criteria derived from previous literature (see above) to create the coding scheme shown in Table 2.

The coding included the interview protocol, the minutes of the preparation call, the factsheets, the notes and internal documents (such as organizational charts and portfolio documentation provided by the interviewees). After the initial coding, we searched for cross-case patterns [43] to repeat the coding with an adjusted coding scheme. The results were also validated by a senior researcher, who is familiar with the field of research but who was not initially involved in analyzing the data. Therefore, we provided a description of the coding scheme for the researcher to code a randomly selected sample (10%) of the data set [56]. The inter-rater reliability was 87%. The risk of bias in data collection was limited as two senior researchers jointly collected and analyzed the data (investigator triangulation) [48].

### 4. Research results

In the following section, we present and discuss the patterns detected during the data evaluation during the application life-cycle stages Requirements, Design and Build, Deploy, Operate, and Retire using two different values (high and low) in strategic value and business criticality. For 14 of the 37 cases, we discovered patterns aligning the ASO decision with the application life-cycle. The remaining cases did not show such patterns for various reasons. In some companies, we identified a lack of APM maturity, which made a decision based on application characteristics impossible. Other participating companies had a selection scheme oriented toward the IS functions only and did not consider the application characteristics.

#### 4.1. Requirements

To define the requirements, business needs are translated into a system’s characteristics. The data
showed a broad consensus to maintain full responsibility for this activity in-house. “Even though the development and maintenance of an application is planned to be outsourced, the understanding of business requirements stays a core competence of the organization” [CIO, ID 7]. Studies have shown that the definition of requirements in an outsourcing relationship stays with the internal organization [13].

4.2. Design and Build

According to DIN 69901-5, the definition of functional specifications is the responsibility of the instance that also implements the software [52]. Thus, we merged the stages Design and Build into one stage in the evaluation model. When an application has a high strategic impact, companies always kept development in-house. “The development of software creating a differentiation advantage for the organization will remain internally, while we seek to outsource the rest of the development” [Direct to the CIO, ID 4].

Whereas the strategic impact is a dominant factor, high business criticality is not relevant to the outsourcing decision: “Even though the core system supporting the sales force is business critical, the system contains no differentiating value. Thus, there is no need to develop the software internally instead of purchasing the standard software available on the market” [CIO, ID 34]. Developing business-critical applications internally does not create value for the organization per se, especially when standards are available. Nevertheless, organizations carefully evaluate whether the external market can design and build an application, and meet business needs for lower costs: “An application specific to our company often needs deep business know-how, and thus, the business case for outsourcing is not valuable” [Direct to the CIO, ID 10].

4.3. Deploy

We discovered companies tended to rely on planned or performed outsourcing during the stages Design and Build stages as well as the Operate stage. Furthermore, the deployment in some cases is an integrated part of operations: “As time-to-market gets more and more important, testing is in some cases part of the operations” [Direct to the CIO, ID 5]. When a business-critical application was operated and managed internally, most companies chose to deploy systems with internal resources even though the development was external. “While the new core systems rely on standard software customized externally, the deployment and the operations will be conducted internally” [CIO, ID 33]. Thus, in this case there is a correlation between the business criticality and insourcing due to the internal operations of business-critical application. The decision to conduct the deployment internally therefore is crucial due to access to critical running systems and the knowledge required for stable operations as application downtime can cause essential damage to the business. In the case of strategic impact, we discovered both the internal and external deployment, as for operations, the strategic impact was not a salient criterion, as further described in section 4.4. In some cases, the deployment was nevertheless carried out internally as the design and build were conducted internally and thus relied on the decision in the Design and Build phase.

Nevertheless, in several cases, the sub-activity testing was considered for outsourcing. “In order to leverage external offshore capabilities within development projects, we installed a testing environment with artificial data” [CIO, ID 31]. Even in the case of internal development and maintenance, testing is transferred to an external provider as testing can be executed highly standardized. “One of our business units, which has a high degree of internal individual development, does outsource the testing” [Direct to the CIO, ID 2]. The factor that influences the outsourcing decision in this case is the high standardization degree of the testing that is required to decouple the decision to outsource the testing from the outsourcing decision due to the strategic impact and business criticality of an application.

4.4. Operate

During the Operate stage, business criticality is the most important criterion for the sourcing decision. “The maintenance of applications critical to the business, e.g., if in the event of a systems failure lives are in danger, it remains internally” [Direct to the CIO, ID 29].

Nevertheless, one company outsourced the operations of business-critical applications because the software was highly standardized and the company trusted the vendor to deliver the required quality. “This can also mean that we outsource business-critical application if we believe that the quality of the service provider is better than our internal quality” [CIO, ID 22]. Business-critical applications do not always but require a high degree of firm-specific knowledge. Thus, highly standardized and professionalized services can be available on the market.
Strategic impact alone nevertheless not drive insourcing. “In our business domain, the CRM is highly strategic, but not business critical. Thus, we outsourced the operations of the system in order to reduce maintenance costs” [IT Manager, ID 6].

4.5. Retire

The Retire stage replaces the Optimize phase of the ITIL definition in our evaluation model. Optimize has two major activities: (1) deciding about the further evolution of an application, which can lead to an enhancement and iteration within the life-cycle or the application to be retired, and (2) managing the retirement of applications. In outsourcing, managing the retirement of an application is the actual function, which can be outsourced in this phase. However, just because an application is retired, the functionalities supporting the business process do not have to become obsolete. “Outsourcing offers the opportunity to transfer the retirement of legacy systems to a third party” [CIO, ID 31]. In this case, outsourcing the retirement of an application can create a desirable distance between the application and its necessity and IT staff as well as users. “IT staff therefore is available for other tasks or could be transferred to the service provider to slim down the IT organization” [Direct to the CIO, ID 25]. With less availability and lower service times, cost can be decreased, and users “can get out of the comfort zone without blaming the internal organization” [IT Manager, ID 25].

APM objectives such as reducing complexity, eliminating redundant functionality across applications, and modernizing application landscapes can be supported by outsourcing during this phase. In our interviews, application retirement was often linked to replacement with standard software. “Our portfolio strategy targets an increase in the use of standard software for replacing the individual developed core system (high criticality). This also includes that half of the modules having redundant functionalities were obsoleted and retired” [CIO, ID 33]. Business-critical applications, which are planned to be retired, are mostly replaced by new applications due to the business need for the functionality. “In order to implement a new and single group-wide core system, we transfer the old system to a third party to support the system transformation” [CIO, ID 4]. The outsourcing decision of this phase can be combined with the decision to outsource designing and building the new application. With the outsourcing of the “old” application, the whole transformation toward the “new” application is combined to guarantee a smooth transformation. Thus, outsourcing is an instrument for APM for a transformation in terms of modernizing and reducing complexity.

However, we could not clearly identify the influence of the strategic impact as one case included a strategic and critical application whose retirement was managed internally. No application with a high strategic impact and a low business criticality appeared in the interviews.

4.6. Cross-case results and extant literature

The cross-case analysis reveals characteristic sourcing patterns in the different life-cycle stages, which are depicted in Figure 1.

The model describes the dominant or feasible in-and outsourcing choices discovered from the data coding for four combinations of values for strategic impact and business criticality in relation to the application life-cycle stage. The case comparison provides five main implications: keeping requirements specifications in-house (1), the varying influence of the strategic impact (2) and business criticality (3) on the phase-specific sourcing decisions, the use of outsourcing for modernizing and transforming the application landscape (4), and the general influence of the standard software, which may overrule the decisions (5). The data clearly shows that there is a broad agreement to carry out the requirements activities in-house (1). These activities require a core IS capability that Feeny and Willcocks [53] refer to as business systems thinking: the understanding of the link between business processes and technology. Due to the business specificity of such knowledge, it is usually kept in-house. The strategic impact of an application (2) influences the outsourcing decision particularly in the Build and Deploy phase. In the case of a high strategic impact business, systems thinking represents a core competency that drives an application’s value contribution through a business-oriented functional design [54]. The business criticality (3) strongly influences the outsourcing decision in the Operate phase, in which the capability “making technology work” plays a major role [53]. The more critical an application, the higher the dependency on this application [39], which explains the companies’ tendency to keep these applications in-house. During the Retire phase, outsourcing can modernize and transform the application landscape as a target of APM (4) supported by the outsourcing partner, often related to standard software. This confirms the results provided by Ross and Beat [9], who investigated outsourcing as an instrument for transforming the application landscape to increase architectural maturity.
We also detected that standard software (5) may overrule the decision. This is due to the availability of development and operations know-how for such applications on the market. Here, outsourcing is used to avoid a competitive disadvantage [15].

Overall, applications with low strategic impact and business criticality, such as software supporting shared functions, are most likely to be selected for outsourcing. This can also result in outsourcing the end-to-end responsibility to an application service provider responsible for all life-cycle stages. “For our travel expenses, we purchase a Software-as-a-Service solution” [Direct to the CIO, ID 30]. “An extreme case for the reduction of internal added value regarding commodity systems was the transfer of mail and calendar functions to Google Mail” [IT Manager, ID 27].

5. Conclusion

In order to evaluate the impact of an application’s life-cycle stage on the outsourcing decision as an APM activity, we analyzed the outsourcing decision chosen or planned by 37 German and Swiss companies. To do so, we examined application characteristics related to the business value already validated in prior research: the strategic impact and the business criticality. Although during the Design and Build phase the strategic impact of an application is the crucial factor that keeps an application in-house, the business criticality strongly influences the outsourcing decision during the Operate stage. Identifying requirements is a core competence of IT organizations and largely kept in-house. To retire a legacy application, outsourcing can transfer management of the retirement to a third party so the organization can concentrate on strategic functions. Additionally, we found a positive correlation between standard software and outsourcing, which overruled the decision intended in some cases. Gable et al. [39] introduced the standardization degree of an application as a criterion to decide whether to in- or outsource parts of the functions necessary to develop, implement, and maintain an application or to outsource the responsibility.

Compared to prior outsourcing decision principles based on application characteristics related to the business value, the perspective of the application life-cycle provides a differentiated and comprehensive view of the potential of outsourcing to increase efficiency and deploy resources over the lifetime of an application. These insights not only support organizations in making outsourcing decisions as part of portfolio planning. Since many companies seek to evaluate their current sourcing portfolio and the possibility of back-sourcing [55], the pattern could help identify applications or application clusters to reintegrate into the organization.

Nevertheless, the research ignores the perspective of available outsourcing partnership models above selective outsourcing for efficiency reasons, such as strategic alliances. Ross and Beath [11], for example, addressed how outsourcing can support the harmonization and modernization of an application landscape. Our research does not involve the overall structure of the outsourcing portfolio in terms of the complexity caused by intensive interfaces between applications, for example. The complexity of a

<table>
<thead>
<tr>
<th>Strategic Impact</th>
<th>Business Criticality</th>
<th>Insourcing</th>
<th>Outsourcing</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High</td>
<td>1 2 3 4</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>1 2 3 4</td>
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<tr>
<td>Low</td>
<td>Low</td>
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*Not statements for case 2 available from the interviews.*

Figure 1: Outsourcing selection patterns of applications with different values in strategic impact, business criticality and software
portfolio structure can influence the suitability of outsourcing strategies in general [23, 24]. A large-scale survey could provide empirical evidence for the patterns identified. To create knowledge for practitioners, further application criteria could be evaluated in terms of importance in the decision to define a criteria catalogue that supports selecting ASO packages. Investigating path interdependencies between the application life-cycle phases could also provide interesting insights for outsourcing decisions.

10. References


