

Aalto University
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Transaction Automation: Selecting Suppliers for Business-to-Business Network Integration Projects

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**ABSTRACT OF
 MASTER'S THESIS**

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<p>The focal company’s sourcing division wants to find and select the most suitable suppliers for business-to-business integration (B2Bi) projects where the supplier enterprise resource planning (ERP) system will be linked to their own ERP back-end through SAP Business Network digital sourcing ecosystem (DSE) platform to increase transaction automation. The challenge comes from finding the most optimal 10% out of a pool of 376 direct material suppliers for doing so and then prioritizing them in an appropriate manner. Because B2Bi projects take vast amount of time, money and resources, the suppliers selected should satisfy multiple criteria to be considered worthy.</p> <p>The study aims to find the prerequisites and criteria that make a supplier suitable and pinpoint challenges that may arise from mutual process alignment efforts. For doing so, a benefit-to-effort two-times-two matrix is constructed and suppliers compared against it to see which enablement strategy would work the best for them. The study helps the focal company in devising an ideal supplier selection process and timetable for the upcoming integration projects and works as a prediction tool on what is to come per individual supplier. Limited research seems to have explored supplier selection process, criteria or best practices for integration timeline optimization. Even though the study comes with refined scope and limitations, the main contribution is the method in which supplier selection logic can be built through multiple criteria-setting and input gathering to mitigate risks and to identify the essential resources and knowledge necessary for successfully completing strategic projects.</p>			
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<p>Tutkitun yrityksen hankintaosasto haluaa löytää ja valita sopivimmat toimittajat liiketoimintojen välisille integraatioprojekteille (B2Bi), joissa toimittajan toiminnanohjausjärjestelmä (ERP) liitetään yrityksen oman ERP:n takajärjestelmään SAP Business Network digitaalisen hankintaekosysteemin (DSE) alustan kautta. Haasteena on löytää optimaalisimmat 10% 376:n suoran materiaalityöntekijän joukosta tähän tarkoitukseen ja priorisoida heidät asianmukaisella tavalla. Koska B2Bi-projektit vaativat suuren määrän aikaa, rahaa ja resursseja, valittujen toimittajien tulee täyttää useita kriteerejä tullakseen harkituiksi.</p>			
<p>Tutkimuksen tavoitteena on löytää ne edellytykset ja kriteerit, jotka tekevät toimittajasta sopivan, sekä tunnistaa haasteet, jotka voivat syntyä yhteisten prosessien linjaamiseksi. Tätä varten luodaan hyöty vs. vaiva kaksikertaa-kaksi -matriisi toimittajien vertailemiseksi, jotta voidaan selvittää, mikä aktivointistrategia toimii heille parhaiten. Tutkimus auttaa kyseistä yritystä laatimaan ihanteellisen toimittajan valintaprosessin ja aikataulun tuleville integraatioprojekteille ja toimii ennustetyökaluna yksittäisten toimittajien projektien kulun arvioitaessa. Aikaisemmin on rajoitetusti tutkittu toimittajan valintaprosessia, kriteereitä tai parhaita käytäntöjä integraation aikataulun optimoinnissa, jolloin tutkimus tuo rikastetun näkökulman rajatussa ympäristössä. Sen keskeisin panos on menetelmä, jonka avulla toimittajan valintalogiikkaa voidaan rakentaa useiden kriteerien ja tietojenkeruun kautta riskien vähentämiseksi sekä välttämättömien resurssien ja tietämyksen tunnistamiseksi onnistuneen strategisen projektin toteuttamiseksi.</p>			
Asiasanat:	Hankinta, verkkointegraatio, ERP, SAP Business Network, DSE, transaktioiden automatisointi, toimitusketjun hallinta		
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Espoo, July 28, 2023

Tella Taskinen

Abbreviations and Acronyms

SC	Supply chain
SCM	Supply chain management
DSE	Digital sourcing ecosystem
ERP	Enterprise resource planning
BPR	Business process re-engineering
SCC	Supply chain collaboration
SCI	Supply chain integration
SAP BN	SAP Business Network
TA	Transaction automation
EDI	Electronic data interchange
B2Bi	Business-to-business integration
DM	Direct material
FTE	Full-time equivalent
VMI	Vendor-managed inventory
GR	Goods receipt
IT	Information technology
E2E	End-to-end
BA	Business area
ROI	Return on investment
SMI	Supply market intelligence
AHP	Analytical hierarchy process
MCDM	Multi-criteria decision-making
DEA	Data envelopment analysis
SESM	Supplier evaluation and selection model
RBV	Resource-based view
IS	Information system
LSS	Lean six sigma
VRIO	Valuable, rare, inimitable, and organized
SRM	Supply relationship management
CMMI	Capability maturity model integration

IOIS	Interorganizational information system
TCE	Transaction cost economics
StP	Source-to-Pay
PtR	Procure-to-Receipt
MRP	Material requirement planning
StC	Source-to-Contract
ItP	Invoice-to-Pay
MDM	Master data management
RPA	Robotic process automation
PO	Purchase order
OC	Order confirmation
SA	Scheduling agreement
ASN	Advanced shipping notice
SIFL	Seller integration functional lead
3WM	Three-way matching
API	Application programming interface
AI	Artificial intelligence
ML	Machine learning
cXML	Commerce extensible markup language
EFT	Electronic funds transfer
EPS	Electronic payment system
CRM	Customer relationship management
VCRP	Visibility, consistency, recovery, and permanence
CIG	Cloud integration gateway
IDoc	intermediate document
VMD	Vendor master data
GOA	Global outline agreement
IR	Info record
UAT	User acceptance test
SML	Supplier master list
PNL	Project notification letter
SIT	System integration test
SI	System integrator
UoM	Units of measure
MM	Material master
GI	Goods issue
ANID	Ariba Network identifier
WTO	Wet tons
TO	Tons
SME	Small and medium-sized enterprise
BIX	Business information exchange

DMS	Document management system
EDICT	Expectation, deadline, incentive, consequence and togetherness
RFx	Request for x
IoT	Internet of things

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Chapter 1

Introduction

Sourcing is a sensitive business area, prone to encounter instant distractions from worldwide events, let it be the blockage of the Suez Canal, COVID19, floods in middle Europe, major strikes, earthquakes in Turkey, Russian aggression in Ukraine, the energy crisis, inflation or recession to list a few recent. The cyclical, rather mature, and declining paper industry in no exception as it has global supply chains (SC) that are easily affected due to increasing volatility and resource scarcity in the environment. Therefore, sourcing trends focus on aims to achieve success and optimization through digitization and increasing automated collaboration. This is done to ensure availability and stable pricing in all, expected and unexpected, disruptive scenarios, and to move from reactive approach towards that of proactive.

Another extensively researched and partially overlapping trend is the lean philosophy, which emphasizes a shift in focus from localized resource optimization to encompassing the entire process flow (Auramo et al., 2008; Modig and Åhlström, 2012). An example of this approach is the implementation of six sigma, which aims to enhance consistency and reduce variation through incremental process improvements (Smith, 2010). Similarly, in the realm of procurement and supply chain management (SCM), there is a growing number of projects that integrate stakeholders into a common digital sourcing ecosystem (DSE) (Smith, 2022). These initiatives offer numerous benefits such as centralized data management for improved security, streamlined processes to ensure timely progress, and reduced transaction efforts, time, and errors associated with operational tasks. Furthermore, these advancements open up intriguing possibilities for product information, including the integration of sustainability metrics driven by regulations and carbon dioxide reduction targets, identification of new vendors, transparency across multi-tier suppliers, enhanced risk management opportunities, and deeper relationship

building. (Krause et al., 2011).

When dealing with a large number of suppliers, the variance among end-users can pose challenges and require significant resources for a successful mass integration implementation approach (Kauremaa et al., 2004). According to Gadde and Snehota (2000), deeper partnerships, such as those necessary for integrating enterprise resource planning (ERP) systems, should only be pursued if the long-term benefits outweigh the costs and efforts associated with extended involvement. However, since the benefits or the time taken cannot be definitively determined before initiating the implementation, the decision to select a specific supplier should be based on meeting predefined, established criteria and assessing the business relevance in a comprehensive way. Suppliers often have unique processes that require non-standardized adaptations, which may conflict with the initial notion of a universal platform solution (Yu et al., 2014; Aier et al., 2016; Hagiú and Wright, 2017). Platforms come with inherent limitations that cannot be customized for individual suppliers, instead expecting end-users to adapt through practices like business process re-engineering (BPR) or resource acquisition (Liu and Magee, 2013; Bartl et al., 2016). Consequently, not all companies have the willingness, capabilities, or resources to complete such exercises, and therefore, only feasible and business-critical partnerships should be pursued.

In order to integrate ERP systems with the single case study focal company, potential partner companies are first identified, then segmented, and lastly assessed for their readiness to initiate integration projects. The objective is to establish the criteria for project initiation, address challenges related, and identify success factors through a review of literature, interviews, and surveys. The study's contribution lies in providing valuable insights on effectively integrating existing knowledge with new information and identifying the necessary input to foster confidence in engaging with strategic relationship-building projects. Furthermore, the study provides guidelines and best practices for supply chain collaboration (SCC) integration, offering insights to both customers and suppliers prior to implementation. In other words, this means creating an executable supplier selection process that can be extended. While significant attention has been given to supply chain integration (SCI) modules and their impact on cost savings, there is a noticeable gap in knowledge regarding the development of an optimal vendor selection, enablement, and prioritization process that can benefit stakeholders across various industries preparing for network integration projects.

1.1 Significance

The quality of the platform services tends to improve when organizations have control over the system and when new standard operating models are deeply rooted in the values, practices, and processes of the organization (Smith, 2021). With this in mind, the case company aims to implement SAP Business Network (SAP BN), a 3rd party transaction hub, to streamline tasks employing both supplier and internal procurement personnel. This implementation encompasses strategic and operational procurement activities, as well as solutions for direct spend. The goal is to become a preferred customer by offering SC visibility, increased levels of transaction automation (TA), operational efficiency, and standardization. As highlighted by Gunasekaran et al. (2008), improving e-collaboration acts as an enabler for enhancing sourcing productivity and competitiveness. This type of public electronic data interchange (EDI) business-to-business integration (B2Bi), is wanted especially for the business critical, laborious and repetitive transactions and therefore the suppliers to be integrated should be prioritized accordingly (Auramo et al., 2008; Nurmilaakso and Kauremaa, 2012).

In terms of efficiency gains, estimates suggest that automated ordering can lead to a time reduction of 30-40% per purchase order (Brown and Wilson, 2019). Considering that the focal company handles over 500,000 direct material (DM) transactions annually, there is a clear motivation to minimize time and reduce the number of full-time equivalents (FTE) required. Moreover, the implementation of vendor-managed inventory (VMI) could incentivize suppliers to lower prices by up to 0.6%, while more accurate forecasts have the potential to decrease cost impact and availability risks by up to 10% (Gupta and Goyal, 2013). When it comes to order processing, estimates indicate that automated ordering can lead to a 75% reduction in processing time, along with an increase in accuracy by 45-60% (Ng and Lee, 2017). Within warehouses, manual goods receipt (GR) posting can result in errors and delays, leading to manual invoice approvals for approximately 16,000 DM cases per year. Each approval case takes approximately half an hour and requires the involvement of multiple FTEs, including buyers, production/warehouse workers, and mill controllers for verification, correction, and approval. Additionally, the lack of real-time inventory/traceability data necessitates time-consuming manual monthly inventory stock-taking, which takes about a day per production line annually. Resources are further wasted on manual archiving of delivery documents. (Internal documentation).

In terms of suppliers, the transaction costs associated with interaction are typically covered, while the responsibility for establishing connectivity lies with the suppliers themselves. Therefore, it is crucial to motivate suppliers to go through the integration process efficiently, as once initiated, should not be halted until fully operational, except in rare cases where a complete failure occurs. However, according to the integration expert at the focal company, project delays often arise due to a lack of urgency on the part of suppliers and varying levels of cooperation, which raises the question of how to effectively communicate the importance of timely engagement in future endeavors. The focal company utilizes hybrid governance forms with key suppliers, but the distinction between unilateral and bilateral forms and their applicability to the integration project are still being explored (Kauremaa and Tanskanen, 2016). What are the prerequisites and criteria that make a supplier suitable or attractive for integration initiation? And how can mutual process alignment be ensured before integration? These questions warrant further examination to establish effective strategies and mechanisms.

1.2 Research Problem

The primary challenge lies in categorizing nearly 400 direct material suppliers, with approximately 10% targeted for integration in the coming years, and creating an actionable integration timeline based on this classification. The first step involves identifying and excluding unsuitable candidates, followed by ranking the remaining suppliers based on the potential benefits of integration relative to the associated effort. It is also crucial to select the most relevant business, organizational, technical requirements, capabilities, and resources from the numerous factors influencing the success of B2Bi projects. The selected criteria can serve as quality gates during implementation, aiding in integration planning and preparation (Sarkis et al., 2011). Without such predefined criteria, these phases can become protracted due to their iterative and regressive nature. Graetz et al. (2006) emphasize that ERP integration is likely to encounter obstacles without mutual understanding and a well-defined escalation plan.

According to Auramo et al. (2008), the simultaneous implementation of upward and downward information technology (IT) integration is relatively uncommon, and it appears that customers offering transaction platforms to suppliers is slightly more prevalent than the reverse scenario. This justifies the direction taken by the case company. The supplier-partnering hierarchy model, extensively employed by Toyota and Honda, aligns with the project

objectives by emphasizing shared goals, supervisory levels, development of suppliers' technical capabilities, and selective information sharing. While the study primarily aims to understand individual supplier expectations, it presents an opportunity for the case company: by identifying commonalities, such as shared features or capabilities within specific criteria groupings, joint improvement initiatives can be undertaken to address areas that are most commonly lacking. This approach enhances the potential for successful implementation by ensuring that high expectations are met with corresponding levels of support (Liker and Choi, 2004).

Having a common platform is considered a prerequisite for remaining relevant to future supplier demands, rather than a strategy to attain competitive advantage through innovation. Kone, for instance, has been providing its major suppliers with direct access to an ERP message when a customer order is received, and some suppliers have adopted a similar approach for their logistics operations as well (Auramo et al., 2015). Kone is at the forefront in this regard, as it has already established connections for both inbound and outbound deliveries. Similarly, Auramo et al. (2015) presented a case where a logistics company had visibility into Optiroc customer orders. The possibility of integrating external logistics operators on a public cloud platform that communicates with SAP and SAP BN would be worth exploring. This solution is seen as scalable and, ideally, would enable end-to-end (E2E) workflow connectivity between external logistics providers and customers on a unified platform in the future.

1.3 Research Questions

Integrating an ERP system with existing organizational systems presents complex challenges, requiring commitment, resources, and technical capabilities. The success of such projects hinges on multiple factors, including supplier support and maintenance. However, even before project initiation, potential pitfalls arise if the integration timeline is not optimized and suppliers selected appropriately. In light of these considerations, the research question arising from the identified research problems is formulated as follows:

How to devise an ideal supplier selection process and timetable for integration projects?

The research question can be further divided into the following sub-questions:

Q1. What criteria (technical, procedural, and organizational competencies, assets, and levels of maturity) has to be satisfied when choosing suppliers for integration projects?

Q2. Which best practices should be followed in timing the suppliers for an effective implementation timeline?

Despite the extensive literature on ERP integrations, limited research has explored supplier selection process, criteria or best practices for integration timeline optimization (Das et al., 2006; Hou et al., 2022). Additionally, there is a lack of research on ensuring ongoing supplier support and maintenance, which can greatly impact project success by avoiding delays and resource wastage. Therefore, this study aims to fill these gaps by examining these critical factors in greater detail. By addressing the identified gaps, the study aims to provide practical insights for organizations to successfully undertake ERP integration projects and assist the case company in developing an effective integration strategy.

This study also works as a prediction tool on which projects will be easy to implement and which will pose delays and may result in failure and on what metric. Developing the supplier selection process further is crucial for accessing integration benefits with ease. The study provides a justified way of choosing the best suppliers for network integration projects and is not tied to a specific industry or category of products. One of the main contributions is therefore the supplier selection logic that can be distributed to other business areas (BA).

1.4 Structure

The study is organized as follows. After the introduction chapter and setting the basis, the theoretical part, literature review, of the study prevails. First, relevant theories and concepts from previous research are walked through as to build the theoretical framework. Then the empirical context, study scope and setting are described and needed definitions given to help the reader to formulate a cohesive picture of the area in which the work is done. Also, as to set the background for the study, the old projects in other than DM area inside the focal company are compared and their experiences recorded.

Research of the supplier base is introduced in methods section and the

sampling for the data acquisition methodologies opened with the limitations pointed out. The results are analysed with respect to the theoretical framework built previously and the solution is portrayed when reporting the results. Then, further evaluation of the chosen method is done. Lastly, the results are discussed together with implications for the field to provide directions for future research.

Chapter 2

Theoretical Framework

When examining supplier selection of any sort, it is important to note that the most prevalent perspective is typically focused on sourcing. Normally, sourcing involves the identification, evaluation, and selection of suppliers based on criteria such as cost, quality, reliability, and delivery capabilities. This perspective emphasizes finding suppliers that can provide the required goods or services at the most competitive terms. However, it is worth mentioning that supplier selection can also extend beyond this traditional setting, particularly in the context of strategic projects or network integration initiatives. In these cases, additional factors such as compatibility with existing systems, technological capabilities, collaborative potential, and long-term strategic alignment may take over. The goal is not only to find suppliers that meet the conservative sourcing criteria but also to identify partners who can contribute to the organization's strategic objectives and actively participate in its initiatives.

While sourcing remains the primary focus in supplier selection, it is crucial to recognize the importance of considering broader factors when embarking on strategic projects or network integration endeavors. This broader perspective ensures that suppliers are not only capable of meeting immediate sourcing needs but also possess the qualities necessary for long-term collaboration and mutual success. However, selecting suppliers for sourcing purposes and strategic projects may share some common steps, but they have distinct differences. Consequently, the theoretical framework presented in this chapter should incorporate relevant supplier selection theories to address the research question outlined in chapter one and to allow the development of an optimal supplier selection process for network integration projects later on.

By integrating key theories and identifying the prospect suppliers, it is pos-

sible to segment them by employing a benefit-to-effort matrix, allowing to assess and compare the readiness to benefits in a comprehensive and suitable manner. First, a literature review is conducted to elaborate on the variables relevant to B2Bi. Subsequently, the crucial criteria linking to the research questions, and the criteria seen worthwhile by the case company, are carefully selected to establish a list of grouped variables to be questioned in methods section. The criteria-setting provides valuable insights into the necessary input required from the suppliers. The theoretical model is then constructed laying foundations on other identified supplier selection concepts and theories and justified further by comparing it to other potential concepts.

2.1 Integration Project Variables

To put it simply, there are numerous variables affecting integration projects spanning from themes of business objectives, scope, organizational readiness and changeability, resources, stakeholders, data migration and integrity, other systems affected, experience, customization and flexibility, scalability, training and support, security, return on investment (ROI) to project management and risk assessment. To make matters worse, these all have some influence on the supplier selection for integration projects but the significance of each criteria is not equal. Therefore, the aim is to find the criteria that resonates the most and compare the suppliers against it. Before however, it is important to acknowledge different variables that could have been used for the analysis.

Diverse procurement strategies adopted by different suppliers can have a negative impact on network integration scalability. Additionally, factors such as the need for risk management activities and the high complexity or novelty of suppliers can further contribute to these challenges (Choi and Lee, 2011). However, some of these challenges can be partially mitigated by integrating suppliers within specific timelines and prioritization groups. It is assumed that suppliers with capable IT departments, well-managed resources, and simple organizational structures are more likely to encounter fewer difficulties compared to their peers (Buonanno et al., 2005). When selecting suppliers, it is advisable to begin with simpler cases to gain knowledge and experience before gradually moving towards more complex ones (Sarkis and Talluri, 2002). An attractive supplier is one that possesses relevant experience, plays a critical role in the success of the business, has sufficient available resources, and demonstrates a willingness to collaborate (Yusuf et al., 2004).

According to Auramo et al. (2008), prioritizing supplier volume and longevity lacks adequacy. Additionally, it is essential to consider suppliers who are already utilizing other lean IT solutions. This highlights the necessity for additional research on SC planning and collaboration, specifically through mechanisms like VMI, to assess supplier capabilities in integrating their ERP systems into a network. However, the sharing of forecast and demand information raises concerns regarding the sense of fulfillment and resistance to change, along with the potential reduction in opportunities for process improvement (Tatikonda et al., 2005). Hence, having a VMI solution in place has both advantages and disadvantages when initiating B2Bi.

To foster the formation of cross-organizational capabilities, providing additional incentives such as e-collaboration discounts can be beneficial (Nurmilaakso and Kauremaa, 2012). These incentives serve to motivate organizations to embrace collaboration and overcome potential obstacles during the integration process. According to research by Terpend and Krause (2015), contract renewals, additional business opportunities, and increased purchase volumes can serve as motivating factors for suppliers to participate. However, considering the dynamic nature of the solution, it is more likely that cooperative incentives like joint training, support provision, and sharing of cost savings would prove to be more effective in promoting supplier cooperation (Vokurka and Goldsby, 2005).

According to Gadde and Snehota (2000), when determining the order of integration, it is important to consider the nature of the business, coordination of activities, and people involved. While prioritizing dominant suppliers based on spend and products, it is also crucial to take into account the characteristics of the relationship and the existence of previous and ongoing common projects and more specifically those that have IT involvement. The success of integration depends on constant monitoring, atmosphere setting, and mutual adaptations of resources. Process and system readiness, organizational compliance, and overall willingness are identified as the biggest threats to success. Auramo et al. (2008) propose that supplier provided order tracking and use of outside logistics delivery coordination drives the use of IT also with the customer.

The similarities between companies to be integrated play a crucial role in developing an effective implementation plan (Choi and Lee, 2011). Therefore, when selecting suppliers, it is important to compare their abilities to meet the identified criteria. Suppliers with similar scores can be integrated into the same prioritization group, streamlining the integration process. In

the context of supply market intelligence (SMI) acquisition, Lorentz et al. (2020) propose a model that identifies grouped uncertainties as drivers for information processing needs in supply markets. This model can be extended to the setting of SCI, where synthesized drivers for uncertainty in SMI acquisition can be identified, helping to decrease information processing needs. This way organizations can gain valuable insights into managing uncertainties, enhancing their ability to acquire and process supply market intelligence effectively, enabling improved integration outcomes.

One set of negative drivers in the case company includes the complexity of the environment, such as the number of components, product complexity, customization needs, a large pool of suppliers, and the rate of technological change (Lorentz et al., 2020). There are several negative drivers that can hinder SCI, including the need for sequential processing, asset specificity, task interdependence, and the lack of interdepartmental understanding. On the other hand, positive drivers for integration include task maturity and a good level of mutual trust. In the context of sustainable supply chains, task-related positive drivers are presumed to occur automatically, be predictable, and have few dimensions, and thus be not too complex in nature. However, factors such as task scale, location distance, and the number of tiers in the supply chain are viewed as inhibitors. The suppliers' economic contribution and overall fit of sourcing strategies, translated as importance, are to be emphasized (Gadde and Snehota, 2000).

Barriers to integration may also arise due to the lack of prior e-business expertise, inadequate top-management support, and high costs associated with implementation, operation, and maintenance, as well as the already-mentioned complexity of the organizational structure. The timeliness of deliveries and their frequency is one aspect as in high requirement cases, the applicability of integration is higher (Nurmilaakso and Kauremaa, 2012). Still to be studied are the effects of many mills being supplied to, having a 3rd party IT provider, and the wanted direction of the relationship. Auramo et al. (2015) propose that the change must be tied to serious business process re-engineering efforts; in conservative settings, an outside wish to develop might go unheard. Nurmilaakso and Kauremaa (2012) state that also the criticality of the products should drive integration as they can be stated to be business-critical and hence relate back to timeliness. The costs of integration might overtake the expected savings in transaction costs and supply handling in very difficult cases (Nurmilaakso and Kauremaa, 2012; Gadde and Snehota, 2000).

One factor for prioritization based on Terpend and Krause (2015) would be to favor those that already have some expertise in SAP SCC integration module. Other factors found from literature are capability to align the organization and stakeholders to support the new culture, structure and processes (Somers and Nelson, 2001). Also data quality and complexity in systems due to customization proves to increase risks of delays and errors (Gunasekaran and Ngai, 2005). Increasingly so, if the supplier ERP system has been configured for special cases or the processes concerning order document exchange have been set up differently. Change management is critical to facilitate the disruption in operations caused by projects and to ensure sufficient in-house training and support (Hong and Kim, 2002; Shehab et al., 2004). To summarize, table 2.1 gives the fore-mentioned factors per supplier, grouped into suitable entities.

Table 2.1: The most important integration variables per supplier grouped

Human-centric variables	Technical variables
Assigned persons	Automatic process triggering
Escalation pathway	BPR; digitization, data matching
Organizational complexity	Integration feasibility with ERP
Positive expectations	IT services offered
Priority alignment	Mills supplied and tiers occupied
Resource availability and efficiency	Prior experience
3 rd parties and communication	System architecture

It can be stated, that the above-mentioned variables like relationship, nature of business, willingness, alignment, tiers, coordination of activities and risk management needed can be accessed through the chosen human-centric variables. Whereas, technical variables including order tracking, outside logistics delivery coordination, experience, data quality and processes' ERP format and document sharing. All of these variables are linked to the conditions of procurement strategies meaning spend and economic contribution and frequency of transactions as well as complexity and novelty of the suppliers.

The variables that will be omitted from further analysis based on the lack in their descriptiveness or identified challenges in measurability are organizational structure/compliance, longevity, VMI considerations, personalized e-collaboration benefits, monitoring methods, and criticality of products. These may prove as important criteria when discussing B2Bi but having reliable and comparable data on these given by suppliers, inside analytics or outside databases, proves to be too hard of a task. As Kar and Pani (2014)

gather in the figure 2.1, the variables are plenty and have different emphasis when discussing B2Bi.

Different supplier evaluation criteria used across literature and their significance for B2Bi		
Product quality	Delivery reliability	Warranties
Product pricing	Production capability	Technical capability
Management capability	Supplier's reputation	Financial position
Labor relations	Service quality experience	Past business records
Reciporal arrangements	Cultural fitment	Communication barriers
Geographical distance	Foreign exchange rates	Trade tariffs
Trade restrictions	Buyer's commitment	E-transaction capabilities
Quality management	IT standards	Cost reduction capability
Documentation	Design capability	Supply variety
Lead time/response time	Indirect costs	Response flexibility
Innovation	Facility planning	Safety adherence
Domain experience	Exporting status	Conflict resolution systems
Customs duties	Product line diversity	Intimacy of relationships
Inventory position	Electronic data interchange	Value added productivity
Total cost of acquisition	Risk perception	Certification and standards
Research and development	Organizational culture	Availability of parts
Sub-component pricing	Regulatory compliance	Self-audits
Billing accuracy	Cost reduction performance	Direct costs
Service quality credence	Supplier's commitment	Skill level of staff
Exporting status	Packaging capability	Intellectual property rights
Data administration	improvement commitment	Procedural compliance

Figure 2.1: Supplier evaluation criteria emphasis, modified from (Kar and Pani, 2014)

2.2 Supplier Selection Concepts

There are various existing frameworks used in supplier evaluation and selection processes and in order to find the most optimal for the focal company, these have to be reviewed. Table 2.2 showcases the concepts to be covered in this section.

Table 2.2: The most important concepts of supplier selection

Source	Approach
De Boer et al. (1998)	Supplier selection framework
Bhattacharya and Sharma (2018)	Supplier selection criteria
Rabbani (2017)	Supplier selection methods
Pizzolato and Del Baldo (2018)	Supplier selection challenges
Ertek and Bozkaya (2011)	Supplier selection evaluation
Jia and Ng (2016)	Supplier selection applications
Barratt (2004)	Selection criteria and method evolution
Monczka et al. (2011)	Supplier audit and selection

De Boer et al. (1998) introduce a framework to aid in selection of suppliers to cover various situations. It utilizes the work of Kraljic (1983) by identifying business importance as one main consideration (non-critical/routine, leverage, strategic and bottleneck) related to the specific purchasing steps. The key takeaway from the work is the indication that analysing the purchasing portfolio against scope, importance, and criteria allows guiding the strategy and actions correctly against the ranking. Figure 2.2 shows the supplier selection framework by De Boer et al. (1998).

	<i>New task</i>	<i>Modified rebuy (leverage items)</i>	<i>Straight rebuy (routine items)</i>	<i>Straight rebuy (strategic/bottleneck)</i>
Problem definition	<i>Use a supplier or not?</i>	<i>Use more, fewer or other suppliers?</i>	<i>Replacing the current supplier?</i>	<i>How to deal with the supplier?</i>
Formulation of criteria	<i>Varying importance</i>	<i>Moderate/high importance</i>	<i>Low/moderate importance</i>	<i>High importance</i>
	<i>One-off decision</i>	<i>Repeating decision</i>	<i>Repeating decision</i>	<i>Repeating decision</i>
	<i>No historical data on suppliers available</i>	<i>Historical data on suppliers available</i>	<i>Historical data on suppliers available</i>	<i>Historical data on suppliers available, yet very few actual selections</i>
	<i>No previously used criteria available</i>	<i>Previously used criteria available</i>	<i>Previously used criteria available</i>	<i>Previously used criteria available</i>
Qualification	<i>Varying importance</i>			
	<i>Small initial set of suppliers</i>	<i>Large set of initial suppliers</i>	<i>Large set of initial suppliers</i>	<i>Very small set of suppliers</i>
	<i>Sorting rather than raking</i>	<i>Sorting as well as raking</i>	<i>Sorting rather than raking</i>	<i>Sorting rather than raking</i>
	<i>No historical records available</i>	<i>Historical data available</i>	<i>Historical data available</i>	<i>Historical data available</i>
Choice	<i>Small initial set of suppliers</i>	<i>Small to moderate set of initial suppliers</i>	<i>Small to moderate set of initial suppliers</i>	<i>Very small set of suppliers (often only one)</i>
	<i>Ranking rather than sorting</i>	<i>Ranking rather than sorting</i>	<i>Ranking rather than sorting</i>	<i>Historical data available</i>
	<i>Many criteria</i>	<i>Also: how to allocate volume?</i>	<i>Fewer criteria</i>	<i>Evaluation rather selection</i>
	<i>Much interaction</i>		<i>Less interaction</i>	<i>Sole sourcing</i>
	<i>No historical records available</i>	<i>Fewer criteria</i>	<i>Historical data available</i>	
	<i>Varying importance</i>	<i>Less interaction</i>	<i>Model used again</i>	
	<i>Model used once</i>	<i>Historical data available</i>	<i>Single sourcing rather than multiple sourcing</i>	
		<i>Model used again</i>		

Figure 2.2: Supplier selection framework (De Boer et al., 1998)

Bhattacharya and Sharma (2018) explored different dimensions by using existing research to identify factors and criteria that organizations consider when selecting suppliers, some of which were repetitive to the previous sec-

tion described **Integration Project Variables**. In other words, limiting the criteria to cost, quality, delivery performance, reliability, flexibility, technological capabilities, financial stability, social and environmental responsibility, and relationship management is an erroneous approach to be taken here (Pizzolato and Del Baldo, 2018; Barratt, 2004). The articles give insights on how to approach the selection of most important criteria per use case as not all can or should be taken into account.

Rabbani (2017); Ertek and Bozkaya (2011); Jia and Ng (2016) compare different most often used supplier selection methods such as analytical hierarchy process (AHP) multi-criteria decision-making (MCDM) techniques, fuzzy logic, mathematical programming models, data envelopment analysis (DEA), genetic algorithms, fuzzy logic, case-based reasoning and expert opinion. This assists in selecting the suitable approach for the evaluation as to pay respect to the context constraints, preferences of the focal company and outside requirements by synthesizing what is already known to the obtaining of new information. Also Hao et al. (2015) introduce a supplier evaluation and selection model (SESM) that combines the AHP with the integrated fuzzy technique for order of preference by similarity to ideal solution. AHP could well be utilized to determine the weights of evaluation criteria, while the fuzzy method could be employed to rank the suppliers.

Barratt (2004) discusses the growing role of technology and data analytics, and the need for closer collaboration and integration with suppliers but also states that using analytical approaches, like AHP, is not always the key to the happiness. Therefore, the key takeaway is to somewhat follow the lean philosophy (see figure 2.3) in the supplier selection approach; by first identifying all available suppliers, then shortlisting them based on qualifications and finally evaluating and selecting the best ones.

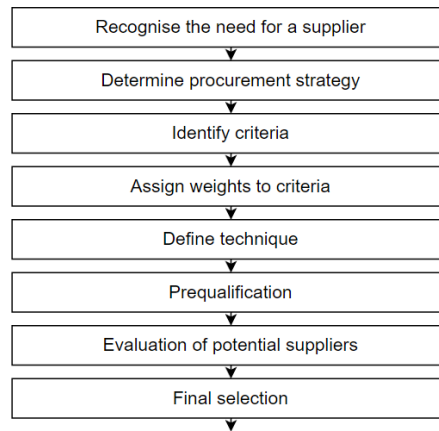


Figure 2.3: Supplier selection with lean philosophy, modified from (Kshirsagar et al., 2014)

Monczka et al. (2011) supplement the lean philosophy seen in figure 2.3 with continuous improvement of identifying requirements, evaluating the needs, identifying suppliers, ensuring that payment occurs in time and measuring supplier performance. This is described in figure 2.4.

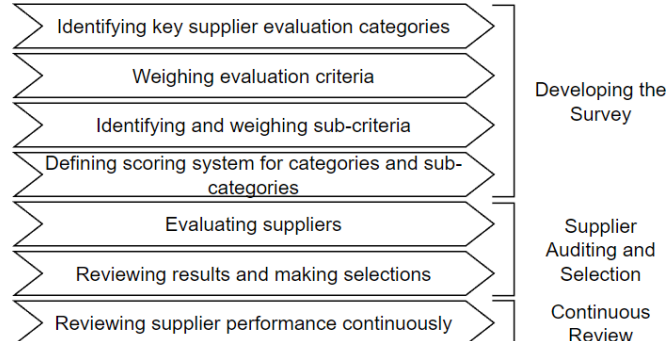


Figure 2.4: Supplier selection method, modified from (Monczka et al., 2011)

2.3 Building the Theoretical Model

As introduced in **Supplier Selection Concepts** the possibilities for selecting the criteria for the supplier selection process are numerous and at least partially configurable for the context of B2Bi. The most optimal approach would seem to be to follow Monczka et al. (2011) supplemented lean philosophy by first finding the criteria and then collecting data of it through a

survey. This would then allow weighing the criteria and making a scoring system to evaluate suppliers as to make the final selection decisions. Together with identifying the criteria, the supplier need and strategy must be recognized and compared to the criteria scoring like in De Boer et al. (1998) selection framework. To follow this logic, a benefit-to-effort framework is constructed from the impact-to-effort matrix legacy (Al-Subaie et al., 2021; Helmke, 2022) to help prioritize supplier projects correctly.

Therefore, I focus on explaining how the theoretical model is built from the approach of first finding the crucial criteria using resource-based view (RBV) and what is needed for its realization in the methods section. RBV serves to introduce the rationale behind the interest in supplier resources and capabilities, while also enabling the effective categorization of suppliers (Saaty, 1987). The suppliers are then tested on how well they fulfill the set criteria against their financial and transactional position. In order to devise an ideal selection process and timetable, the suppliers must be scored and ranked and the timeline constructed based on the scoring, supplemented with satisfying additional considerations. Cox (1999) suggests a segmentation strategy to prioritize strategic partners based on importance and risk to minimize disruptions caused by suppliers in implementation.

2.3.1 Resource-based View

Older research by Wernerfelt (1984) discusses the positioning of RBV theory in strategic management, focusing on how a company's unique resources and capabilities contribute to competitive advantage and performance (Wernerfelt, 1984). This study modifies RBV by identifying key criteria for competitive advantages and comparing supplier positioning accordingly, considering resource heterogeneity and immobility as important factors for synergies. According to Wade and Hulland (2004), there is a connection between Information Systems (IS) and RBV. They highlight the evaluation of IT infrastructure and knowledge management systems using an extended RBV framework, emphasizing IT-based strategic assets and agility in the context of B2Bi (Wade and Hulland, 2004). Bharadwaj (2000) investigate the contribution of unique and valuable IT resources and capabilities to firm performance, linking IT capability to performance dimensions through key IT resources (Bharadwaj, 2000).

The findings of Yu et al. (2018) show that a data-driven SC positively affects coordination and responsiveness, enabling improved procurement outcomes, cost reduction, and enhanced supplier relationships. Similarly, Ordanini and

Rubera (2008) emphasize the role of capabilities and internet resources in B2B procurement, suggesting that firms with strategic capabilities and the utilization of e-procurement systems achieve superior procurement performance (Ordanini and Rubera, 2008). Ruivo et al. (2015) utilize RBV to explore the values of ERP options, evaluating productivity, management, and customer-related factor groupings. Newbert (2008) highlight the versatility of RBV in investigating concepts beyond competitive advantage, while Laosirihongthong et al. (2014) emphasize the importance of resource availability and diversity for success (Newbert, 2008; Laosirihongthong et al., 2014).

Regarding resource-based enabling factors, Somsuk and Laosirihongthong (2014) identify and prioritize human, technological, financial, and organizational resources using fuzzy AHP. Barney (2001, 1991) stress the development and leverage of firm-specific resources and capabilities, offering insights for understanding supplier dynamics and strategic decision-making. Yuen et al. (2019) explore critical success factors for achieving SCI, including information sharing, collaboration, technological capabilities, organizational culture, and human resources.

The interplay of technological competencies and human resources, as highlighted by Tyler (2001), demonstrates the importance of understanding how competencies reinforce each other in integration efforts. Similarly to Sony (2019), this study aims to revise supplier resources and capabilities for implementing B2Bi as opposed to the introduced lean six sigma (LSS), assisting organizations in achieving benefits with minimal effort. Overall, aligning objectives and strategies with an organization's unique resources and capabilities, as emphasized by RBV theory, enhances the effectiveness of initiatives (Wernerfelt, 1984).

2.3.2 Criteria

The value and effort involved in on-boarding suppliers to a network are influenced by multiple factors as discussed. Different enablement requirements require varying levels of commitment, leading to significant differences in attractiveness of suppliers. To efficiently achieve business targets, it is crucial to thoroughly assess the supplier base and establish appropriate priorities in the implementation plan called the integration flight plan. Having a well-defined, to be integrated, supplier base, is seen advantageous.

To have a clear focus from all possible variables for the rest of the study,

some previously listed had to be omitted completely whilst some assumed more important than others. All variables can not and should not be analyzed any further. Based on the literature, the data acquisition is only partially guided by the research questions formed before.

Therefore, in addition, a theoretical model should be built to guide the analysis and the data acquisition methods. The figure 2.5 amplifies the main drivers for supplier selection decision outside the scope of individual supplier capabilities. The negative, orange balloons have already been somewhat gone through, but the opportunities and guiding principles, green, will be focused on more later.

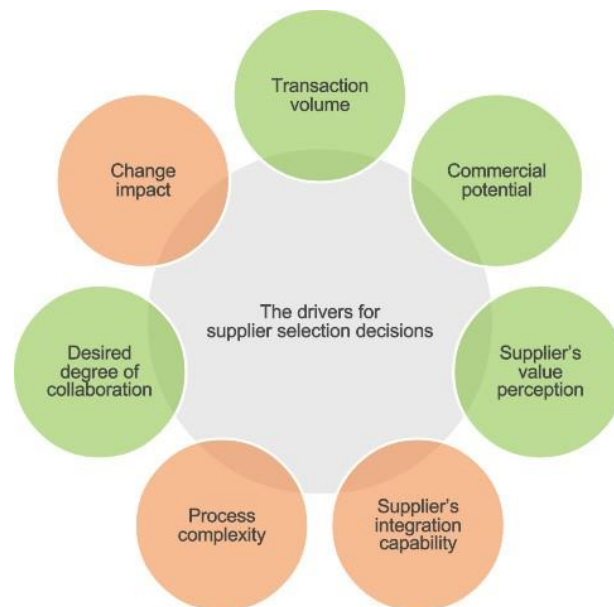


Figure 2.5: Drivers of Supplier Selection

If an organization can align its competitive advantages concerning IT capabilities by leveraging IT knowledge as a RBV asset, it will be better equipped to address multiple customer requests through the efficient implementation of IT integrations, yielding faster results (Kearns and Lederer, 2003). Even though one can not scale a project learning across all integration projects with certain success rates, they can develop assets that are valuable, rare, inimitable and organizationally supported (VRIO) (Chatzoglou et al., 2018). Further, by doing so they increase customer switching-costs, combat competitors, and raise market entry barriers. Kearns and Lederer (2003) conclude that alignment that can be seen as communication and decision-making

between IT and business is important to get the expected returns on IT investments.

Therefore the criteria assumed to work as positive drivers of the integration for the first sub-question covering both human-centrism and technical variables, are as follows;

- 1.a. Having an assigned business person on supplier side
- 1.b. Having an escalation pathway towards ERP/Middleware resources
- 1.c. Ability to digitize processes
- 1.d. Proper communication and reactivity of stakeholders
- 1.e. Having experience in IT development projects, B2Bi, or SAP BN
- 1.f. Having available business, IT and middleware resources
- 1.g. Technical ability to integrate documents

Inhibitors in timing suppliers for integration initiation, answering for the second sub-question are as follows;

- 2.a. More interfaces and outsourced resources cause delays
- 2.b. System developments or ERP changes cause delays
- 2.c. Integration initiation time preference far in future

A conceptual model is given in figure 2.6 to highlight the relationship of the chosen criteria to the research questions.

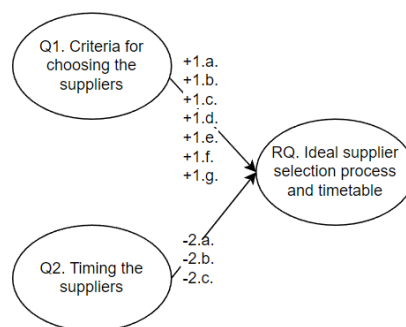


Figure 2.6: Conceptual model

2.3.3 Building the Benefit-to-Effort Matrix

The concept of a benefits-to-effort matrix for supplier comparison and selection helps in visualizing and prioritizing suppliers that are similar and attractive. The axles are chosen because of their descriptiveness: benefit relates to the transaction volume a certain supplier has as well as their financial positioning. This translates to the impact and urgency of the business (here called benefit) to the focal company.

Effort on the other hand, describes how much work would have to be put in in order to get the expected savings. Both of these considerations alone are of vain; as integrating a company simply because it is easy to do so, may prove lacking in benefits in the long run and vice versa starting to integrate the most business critical companies without considering their readiness, delays the project break-even of cost to the benefits further in to the future. Therefore, it is important to compare the suppliers head-to-head to find the best ones to be integrated.

The criteria above is used to describe the easiness to integrate a certain supplier. The benefits will be analyzed through transaction volume as well as spend. The methods therefore have to assess both of these considerations to be able to build the matrix and pinpoint suppliers to it. Making a decision to integrate solely on the knowledge of individual supplier capabilities does not give indications on what metrics are acceptable to be missing and which criteria should be at least in place.

The matrix involves plotting suppliers, options for B2Bi projects, on a two-dimensional grid, with the benefit or value provided by the supplier on one axis and the effort required to engage with the supplier on the other axis. The effort includes the factors described above. By using the matrix, decision-makers can easily and visually compare and prioritize suppliers based on their relative value and the associated efforts required. Suppliers with high benefit-to-effort ratios are typically considered more favorable options, as they offer greater benefits relative to the effort needed to engage with them. This matrix helps organizations identify suppliers that offer significant value while minimizing resource allocation and implementation challenges.

2.3.4 Other Relevant Theories Justified

The study will build on the frameworks described above mainly. However, there are several more to be used on the side not yet mentioned. Accord-

ing to Mettler and Rohner (2009), supply relationship management (SRM) can be reviewed from management-oriented view or from technology-focused view. This research focuses on technical capabilities needed for implementing suppliers, so the conceptual foundation will be mainly set on the latter. This means focus on the needs for BPR to support process development along with capability maturity model integration (CMMI) instead of theories of relationships (Lee et al., 2017; Ahn et al., 2015; Esteves and Pastor, 2001).

However, in addition to technical considerations also resources and relational and managerial practices are of importance as can be agreed based on the generated theoretical model and the criteria selected. The views are partially overlapping, meaning that none can be completely omitted, but the selection to focus on these considerations seems reasonable as the objectives are in improving selection process quality and timeliness of projects by leveraging supplier capabilities, instead of encouraging innovation (Mettler and Rohner, 2009). This gets also highlighted when explaining the selected data acquisition.

To rephrase, SCI in general, considers relational and operational levels. One key objective of SCM is supporting inter-organizational cooperation, and the other is creating operational linkages (Kauremaa et al., 2010). However, it is assumed that the most demanding part of these projects is in change management instead of challenges occurring from technicalities (SAP, 2021b; Lee and Kwon, 2019). Kauremaa and Tanskanen (2016) discuss a framework for designing an interorganizational information system (IOIS) and its prerequisites, giving insights on what characteristics to seek in suppliers when wanting to integrate efficiently. This also leads to partitioning the existing supplier pool based on their score to blocks that will be explained along when the matrix is constructed.

One obvious choice, transaction cost economics (TCE) is dismissed due to the confidentiality clauses of the case companies, as well as suppliers, and also because of the nature of integration projects (Teece, 1986). A defined bill of materials in the form of costs and benefits per process can not be done without significant error margins. Davenport (2000) agree that there is no idea in calculating various costs based on transaction cost economics to balance with realized/unrealized benefits, because of the ambiguity across cases, but proposes analyzing systematically where the most important drivers and barriers origin from and what actions exist to address them properly. However, this model is applied on a high level, when choosing the suppliers by looking at the expected business priorities (strategic sourcing partners). The

focal company might benefit from comparing the costs of realized projects, once data is available.

Another option, SRM focuses vastly on the relationship side which is relevant for the study but not the sole purpose of it (Stentoft, 2013). SRM framework is therefore utilized to some extent, by finding suppliers that are willing and able to collaborate. BPR is used to find the needs to redesign business processes to support the change and for finding the escalation pathways (Hammer and Champy, 1993). When selecting suppliers, one must ensure to have a project specific escalation pathway in case an integration starts to drag. In the context of TA, BPR suggests to choose suppliers that are able to refine their processes to support the automation.

Also, CMMI could have been chosen as the main framework for choosing suppliers for integration. But, as Gupta et al. (2015) describes, it primarily suggests choosing those that have demonstrated their ability to consistently deliver and have achieved a high level of capability maturity in their processes. These considerations are practically impossible to measure on the span of the study and are also too high level. The described other frameworks are taken into consideration in practice when approaching the suppliers to ask relevant questions from them so the question formulation uses the considerations above. The theories also well complement the model created, revolving around RBV, matrix creation and lean.

Chapter 3

Empirical Context

In the following chapter, I will describe more in detail the setting of the study and after, how the data acquisition is conducted. One objective of this research, not yet described, is to investigate the reasons behind the significant variation in integration timelines, ranging from a few months to several years. Primarily, the study aims to identify the essential resources and knowledge necessary for successful integration and based on this to choose the suppliers. Further, the purpose is to introduce a logic or means to choose suppliers going forward. To achieve these objectives, the benefits and challenges of the network will be analyzed from an operational and efficiency perspective, excluding commercial and financial factors. The focus will be on examining the viewpoints of suppliers.

This chapter provides the reader the empirical context and scope of the study, necessary to understand to proceed to the methods. TA and the SAP BN integration are opened to find the expected benefits and challenges of going through the integration projects and to explain why they are seen needed in this specific setting. The need for innovation in technology solutions for self-billing is evident from the findings of Auramo et al. (2015), which reported that the focal case company, was the only company in the comparable area without any such solutions.

3.1 Scope

UPM's paper businesses, Communication and Specialty Papers, operate across 15 mills and aim to combat decreasing margins by enhancing competitiveness, attractiveness, and productivity in processes that account for the majority of expenditures. The implementation scope is global, encompassing Finland,

UK, central Europe and China. Specifically, the Source-to-Pay operations (StP) and its sub-process, Procure-to-Receipt (PtR), exhibit a lower level of digitization compared to competitors. PtR involves tasks such as demand and requirements planning, purchase order processing, and inbound inventory management, which are currently managed by material requirement planning (MRP) planners, operative buyers, and clerks. StP also experiences the impact of these deficiencies in TA across other areas, including category management in strategy, supplier management in Source-to-Contract (StC), invoice processing in Invoice-to-Pay (ItP), as well as in master data management (MDM) and Analytics (refer to figure 3.1 for the affected processes and for the level of impact).

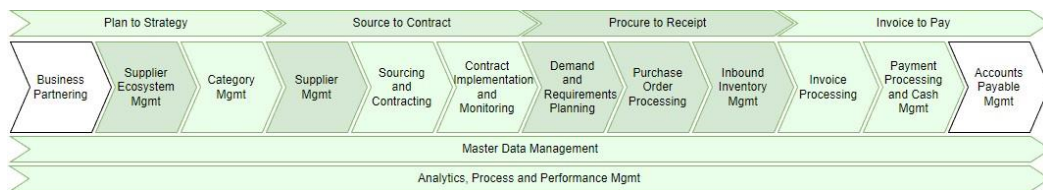


Figure 3.1: Source-to-Pay Operations structure and sub-processes affected

PtR consists of the following table 3.1 lower levels affected by integration. The documents to be integrated flow through these processes.

Table 3.1: Procure-to-Receipt Sub-processes affected by B2Bi

Demand & Requirements Planning	Purchase Order Processing	Inbound Inventory Management
Create Demand and Forecast Plan*	Manage Buying Channels**	Receive Materials and Services
Create Supply Plan and Define Supply Solution	Process Purchase Orders*	Manage and Optimize Inventory*
Plan Material Requirements and Scheduling	Monitor Purchase Order Pipeline*	Determine Discrepant Material Disposition
Manage Inbound Supply	Process Claims*	Manage Inbound Warehousing
Generate and Approve Requisitions*	* <i>Some effect</i>	** <i>Significant effect</i>

Due to the scale of the business entities under consideration, the flow between sourcing, procurement, and production exhibits gaps that necessitate

an unified ecosystem for consolidating all process functionalities and documents. Moreover, when reviewed over businesses, the function responsible for the project considers global functions. The DSE project is geared towards achieving SCC by adopting a comprehensive approach involving either thoroughly integrating suppliers' ERP systems into the SAP BN or streamlining the collection of suppliers' order-related information in a standardized format through SAP BN, as opposed to relying on emails, supplier portals, or robotic process automation (RPA).

The long-term objective of the project is to encompass billions in spend and nearly 400 suppliers on the direct material side, 50 of whom are already involved in VMI. The project will leverage existing capabilities and learnings from the indirect materials side, where the solution is already operative. The DM side includes supplier categories such as pulp, pigments/chemicals, packaging materials, and production consumables of which about a 40 unique suppliers are to be integrated. The aim is to implement a global template in areas of purchase order (PO) processing, order confirmation (OC), scheduling agreement (SA), vendor consignment, multi-tier collaboration, and label generation for advanced shipping notices (ASN)¹. In practical terms, this means that the business network will facilitate the sharing of not only PO, OC, SA, ASN, and GR documents, but also SMI, demand, inventory, consumption, and self-billing data from UPM, along with replenishment notifications from suppliers. For the business process coverage, see figure 3.2.

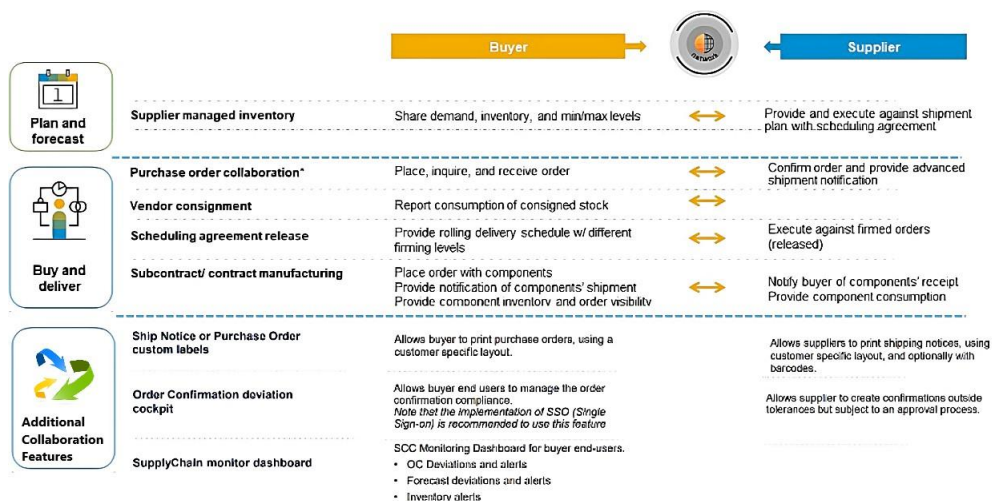


Figure 3.2: SAP BN SCC business processes, modified from (SAP, 2021a)

¹See Appendix A for the detailed definitions.

Pulp and Biochemical business areas will be done partially in parallel to Paper but for now, the scope is only on DM side of paper businesses. The project has moved from study, design and plan phases to realization. Integrations are done in priority waves and the goal is that 100% of DM suppliers are selected to use either portal or B2Bi by the end of 2023. The plan is to then implement the SCC module solution to all remaining BAs. Different ERPs will be integrated to SCC after the ongoing pilot project which entails ten portal pilot suppliers and two integrated suppliers. A 100% of deliveries in 2023 will use ASN and have POs with automated OC over SAP BN. All the new suppliers will be using SAP BN. Figure 3.4 gives the transacting options.

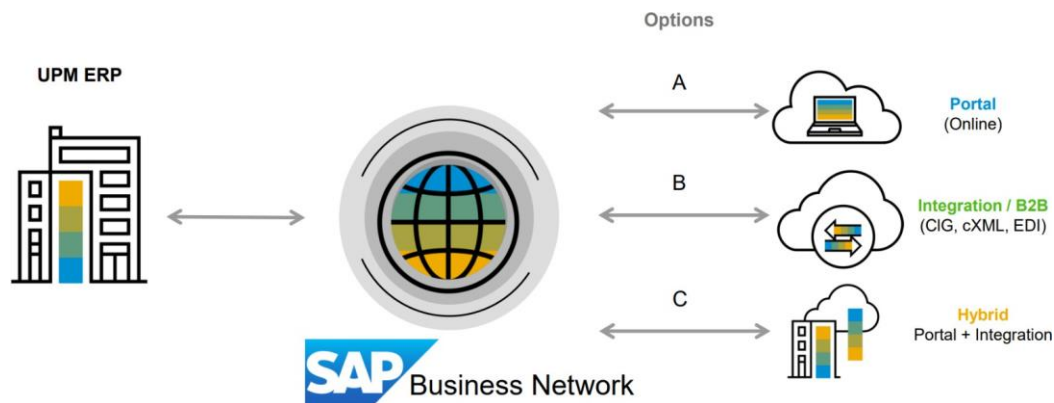


Figure 3.3: Transacting options for suppliers, modified from (Alstom, 2022)

Every project is designed based on considerations on processes including complexity of business processes in scope, locations, plants to be included, and businesses embedded. Also end-users as well as the scope extension possibilities are considered along with the long-term strategy, goals and targeted dates for enablement. The supplier selection logic is crucial to be in place not only for the selection of suppliers for B2Bi but also for the purposes of scaling the project to other BAs.

3.2 Change Management

Supplier management and relationship building are important components for effective B2Bi. Supplier management involves first identifying and selecting suppliers, and later establishing and maintaining relationships with them. On the SAP BN platform, companies can use various tools to manage their suppliers, including performance monitoring, supplier scorecards, and

risk management. Supplier onboarding, including registration, qualification and certification stages, has to be designed carefully. To mitigate all risks, it is essential to have a clear project plan, engage all relevant stakeholders early on, establish open communication channels, and regularly assess and address changes. It is also crucial to have a skilled and experienced project team that can navigate. Even with these best practices in mind, resistance to change on supplier side might happen, be it in the automation of manual processes and communication, stricter lookout on quality metrics and compliance, or negotiations switching to the centralized platform. (Nazaruk and Arlbjørn, 2021).

Moreover, it seems that most companies have an outside operators and middleware providers that must be kept in loop through the supplier as they are the ones carrying out the technical parts of the B2Bi. To achieve commitment and common understanding of roadblocks, all relevant stakeholders will likely have to come together to agree on a dedicated pool of resources, expertise and plans, particularly the escalation plan (Johnston and Snehota, 2017). Also, a project organization must be clear and its hierarchies acknowledged to be able to contact various people. SAP has defined certain roles dedicated to the seller integration process.

The seller integration functional lead (SIFL) is the main point of contact for project coordination, driving timeline and needed calls and aids in the creation of the seller integration guideline document. A testing contact reviews test plans, generates test documents and validates test transactions. ERP/Integration technical resource will assist in troubleshooting document failure on UPM side and perform data mapping. Key user/planner defines day-to-day activities and confirms with supplier the scope, MDM and procedures. Regular weekly status calls are done to check the status and revise risks and blocking points. The performance metric expectation, meaning criteria communication, could motivate suppliers to answer to the challenge and check whether they possess what is needed for B2Bi (Handfield and Nichols, 2009).

Gefen and Carmel (2005) state that the solution itself streamlines the supplier management; e-procurement reduces manual processes, giving time for more strategic collaboration and activities for improving the relationship being a self-reinforcing positive feedback loop. One point of the whole exercise seems to be also to encourage joint planning. The standardized ways of working allow comparability and point out areas of improvement by automatic feedback, incentivising to take action on those and to develop processes accordingly (Narasimhan and Das, 1999; Gadde and Håkansson, 2009). One

aim is to make the collaboration and communication so easy that suppliers prefer working with the focal company over others and to ensure the cooperation also in the future. Optimizing supplier management processes can also be done through ensuring compliance; Ketchen Jr and Hult (2011) argue that risk mitigation and quality control across SC can be done by monitoring the safety, quality and environmental standards.

Category management commitment is needed to find customer success factor person from supplier side. This in turn allows finding the gaps in the process, operation principles and clear responsibility sharing. One of the big high-level risks recognized is the unwillingness to adopt e-collaboration on supplier side. Therefore careful flight planning and change management practices are important. Also the availability of resources is a consideration that has to be actively screened to inhibit scarcity from realizing. When talking about escalation plan, it is seen as the last resort to resolve the conflicts hindering the progress in supplier side. Usually it means escalating the problem to a higher level of management (Wang and Zhang, 2017).

In their research, Kauremaa and Tanskanen (2016) make a compelling case for distinguishing between information sharing and transaction execution in management. This study primarily focuses on the latter aspect, exploring topics such as supplier and change management, organizational support, top-management guidance, and technical aspects of network integration. Considering that the scope and purpose of SAP BN integration involve a mix of unilateral and bilateral relationships and transaction execution, several factors influence these elements, including the organizational and company structure, integration customization requirements, concurrent platform usage, supplied mills, the existence of data integration layer(s), and the number of entities supplying through the ERP system.

Building upon the work of Kauremaa and Tanskanen (2016), a bilateral system-to-system technical framework with horizontal standards is utilized. While suppliers have the option to opt for a system-to-human, portal-based approach, this study concentrates on B2Bi, which is considered a more challenging business case. By the end of 2023, every supplier is expected to choose between a portal or B2Bi solution, making this study both timely and significant for the focal company.

3.3 Transaction Automation

"A transaction is a transformation from one state to another." (Wang and Yang, 2008). In business context it means an agreement to change an asset or a good, for a corresponding payment, whereas transaction automation is the use of technology to automate manual and repetitive processes that relate to any part or document of this exchange. In the new TA solution, suppliers will send ASNs via network with production batch data taken from the created POs and OCs. This in turn automates the GR posting based on the data and ensures correct real-time process. For supplier, this would mean getting paid on time, as three way matching (3WM) that considers order, GR, and invoice would get automatically processed instead of having to go through additional manual inspection round. Optionally, integrated VMI data would enable suppliers to automate their planning processes and to reduce costs when automating the sales process. Currently VMI is handled through E2E SC portal with constant demand and inventory data available. The overview of the SAP BN SCC module automated transactions are in figure 3.4.

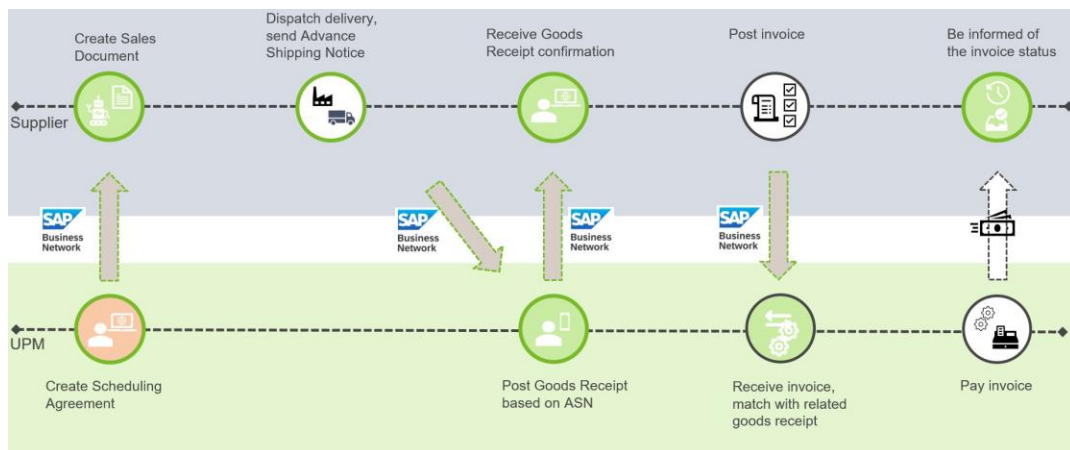


Figure 3.4: Inbound delivery process with automated transactions

As discussed, UPM has chosen SAP BN to realize the TA strategy. SAP BN combines rules-based and machine learning to streamline processes; the TA logic works by automatically triggering actions based on predefined rules. It is supplied with other web services and applications but these are not relevant for the scope of the study so they will be omitted. This solution however, is certainly not the only way to increase TA in business. I will next briefly introduce some other options for network integration for achieving increased levels of TA.

3.3.1 Different Types of Network Integrations

Robotic process automation is increasingly used as it involves using software bots to automate tasks, such as data entry and processing and can be used for updating prices, processing invoices, PO generation or contract management (KPMG, 2018; Research, 2020). RPA proves handy in smaller scale transformations as it can work as an add-on rather than introducing a need for a complete process re-engineering. It is usually easy to incorporate and less costly than more comprehensive solutions.

Chen et al. (2019) explain how application programming interfaces (API) allow systems to talk to each other in order to exchange data integrating organization's different systems already in use. Therefore, nevertheless the TA type chosen, API is most likely utilized in combination with all of the solutions. Whereas Thakur and Thakur (2019) argue artificial intelligence (AI) to simulate intelligence in processes by learning from data and sensing patterns to make decisions on set limits. Machine learning (ML) is a subset of AI focusing on training algorithms for predictive decisions based on the data it is supplied with (Turban et al., 2019). It takes time to train the models to make them actually useful but these are proven to improve accuracy over time (Lipton, 2018).

Blockchain technology is a decentralized, distributed ledger technology that records transactions securely and transparently (Swan, 2015). Blockchain technology can be used to automate smart contracts, which are self-executing contracts that automatically trigger when certain conditions are met (Tapscott and Tapscott, 2016). Therefore in this context, blockchain technology as well as shortly introduced EDI are the closest to the selected solution of SAP BN as these do not replace decision-making but record transactions with improved functionalities.

EDI is a standard format for document exchange which makes it another option for suppliers willing for B2Bi. However, the cons are that it is complex and expensive to implement, requires specialized software and hardware, and has limited scalability possibilities. SAP BN does support EDI primarily and its standard like EDIFACT and ANSI X12 but prefers the native language commerce extensible markup language (cXML). (Chen et al., 2018). Electronic funds transfer (EFT) or electronic payment systems (EPS) work as electronic invoicing and payments options that transfer funds to automate payment processes (Kumar and Kumar, 2019).

SCM systems and customer relationship management (CRM) systems automate the flow of goods and mostly services from the point of origin to the consumption (Lambert et al., 2008). They can track inventory levels, manage orders and shipments, and provide real-time visibility into the SC (Bidgoli, 2010). CRM systems on the other hand automate the management of customer interactions, including sales, marketing, and customer service (Buttle and Maklan, 2015).

Automated order fulfillment relates to all services that automate either Richards and Waters (2014) warehouse operations, Relph and Milner (2017) inventory management, order management or labeling and packaging. In addition to software, these often involve using robots, conveyors, and other types of automation to handle the picking, packing, and shipping of orders. According to Kilgore (2010), automated order fulfillment has profound effects also on logistics.

To conclude, different technologies serve unique purposes for optimizing TA, such as RPA and API for automating tasks and AI and ML for improving decision-making. Blockchain adds security and transparency, while EDI and EFT/EPS streamline communication and transactions. Integrating SCM and CRM systems optimizes SC and customer management. These technologies can be customized to create an efficient and automated transaction system, saving time, reducing errors, and increasing profitability. Visibility, consistency, recovery, and permanence (VCRP) properties can be used to evaluate these technologies per use case (Wang and Yang, 2008).

3.3.2 SAP Business Network

SAP Business Network (previously known as Ariba Network) is a cloud-based platform that allows suppliers and buyers to exchange documents online. The first option, B2Bi, automatically posts the documents on UPM SAP back-end system when supplier issues them in their own ERP system. The other, portal, requires supplier to log into an online account and issue OC and ASN there manually. Either way, the input received remains in the same standard format. The way in which SAP BN SCC module works is by sharing business processes through the network.

SAP BN connects UPM ERP with a cloud integration gateway (CIG) to the SAP BN that in turn is connected on the other side to cXML native used for the transformation of the files with defined transport protocol to the suppliers' back-end system. The logic works by providing URL:s on the

file locations and by matching SAP intermediate document (iDoc) - information on each document, based on the cXML mappings. Also other than cXML options remain for achieving connectivity, but as they are not preferred and cause problems like in change PO, I will focus on cXML integrations. Simplified picture of the SAP Business Network is in figure 3.5.

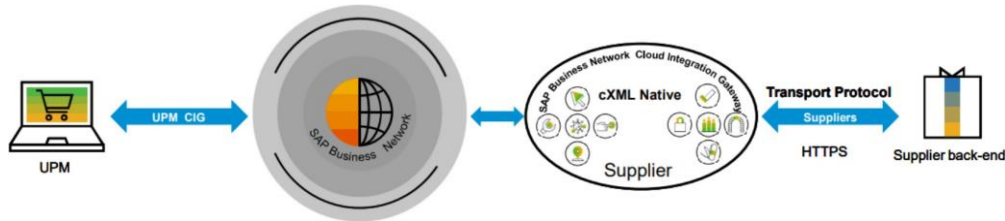


Figure 3.5: SAP Business Network logic, modified from (Surve, 2018)

Some changes are needed in supplier ERP, such as adding the right output type through a certain transmission medium. Also, vendor master data (VMD) has to be supplied with right purchasing organization data and confirmation control key per plant. The valid contracts, global outline agreements (GOA) and/or purchase info records (IR), must be updated to use the corresponding confirmation control key. The IT department must add a partner profile for the certain supplier and the Network supplier must be enabled.

UPM has done their own overall configuration in three blocks, one being the network configuration in which SCC entitlement has been requested and documents routed with suitable features. Then the CIG got enabled along with SAP business system identification number in the network. After, SAP ERP has been configured installing missing add-ons and configurations. To get the SAP BN CIG configured, UPM integration project has been done, maintaining cross references to send SAP connectivity data to CIG. (Internal documentation).

SCC Supplier Integration is always done in a relation to the dependency with the UPM integration that is basically the mother of the portal and integration solutions. When registering to SAP BN, UPM has done the user acceptance test (UAT) for different scenarios to ensure processes, document flow and content are working properly. After, the trading relationship with a certain supplier is accepted in supplier summit and the integration project may begin.

UPM proposes the enterprise account as the most suitable option for all

suppliers with whom there are more than 500 documents annually shared. Compared to standard account, enterprise account has additional features like getting reports to track transactions and sales activities. SAP offers BN supplier onboarding specialist to guide through the account creation, setup and configuration with more extensive access to SAP BN support. To get a more comprehensive look on the solution and its layers, see figure 3.6.

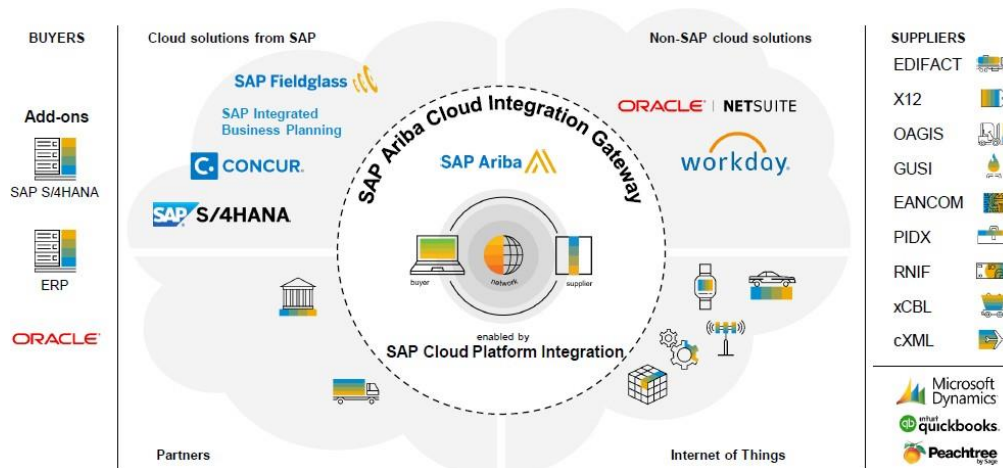


Figure 3.6: SAP Business Network overview (Surve, 2018)

3.3.2.1 SAP Business Network Integration Process

Supplier integration is about connecting a supplier's ERP to the network via an electronic method to transact via a touchless process. First the suppliers get chosen for the projects in waves. Then their enablement is started by creating supplier master list (SML) and making data quality check. At this point, high priority suppliers get flagged and the flight plan approved. Next, the data needed is filled in for selected suppliers and summits booked through project notification letter (PNL). At the summit, the importance and benefits are communicated and timelines agreed.

The onboarding gets started, by accepting a relationship on SAP BN as well as attending weekly registration status review statistics support sessions, followed up on nonresponsive vendors. Contacts get validated and trading relationship confirmed and accepted. Necessary trainings are held and change managerial practices taken as to agree on the process. Supplier accounts are set up, tested and moved to production and SCC flag indicated. Suppliers must then register and configure the account, after which go live

happens when transactions start flowing electronically. Electronic transaction data must be communicated and legacy information considered along with created user roles and users. Each deployment e.g. PO collaboration or VMI can be treated as a separate project.

Integration should take two months in case PO and OC are integrated and three months if these are supplied with ASN, the timeline depending on the account type, document types, and if catalogues are in scope. The business processes and requirements in the shape of documents shared must be agreed with the end-user before the system integration and onboarding via activate methodology. Supplier integration specifics are designed, tested, confirmed and documented. Then system integration test (SIT) and UAT are done on this order and parallel to supplier build and unit test phase. When supplier goes on to SIT, UPM cuts over and hypercares, after which supplier UAT is possible. Onboarding requires UPM, Supplier and SAP SCC system integrator (SI) participation under the functional leadership of the UPM.

The project is cyclical. It starts with initiation, strategy, design and build preparation followed by executing the pilot wave and enabling suppliers, finally deploying and going live. Post go-live, the network is grown. After the pilots in explore phase, the supplier segmentation and flight plan strategy is created requiring communication and data/vendor upload files. Another supplier summit is prepared and workshops conducted. The changes are done in sprints and the project starts with basic processes like PO collaboration (PO and OC) after which ASN, GR and SA are introduced. Consignment, invoice, VMI and multi-tier are more advanced processes so these will be done the last.

Either there is an existing process with the supplier or a need to negotiate a completely new one. In the former option, the tasks needed are cleaning existing procedures and making sure the data to be shared is uniform and the legacy data handled. When the process is totally new, the business agreements must be done at the same time as the integration process proceeds. These include agreeing on day-to-day procedures and how often the data gets shared. Therefore, it seems a better option to first choose suppliers that already have common procedures with UPM.

The technical effort is done in parts. First, the technical connectivity is ensured so that the files can flow. Supplier network account is established and one test account created. Business processes are aligned and master data in test loaded with commodity codes and units of measure (UoM) and

catalog created if applicable. Then the file format is translated to make sure each participant have the files in a format that works automatically in their ERP and finally, the back-end is internally mapped. This means ensuring the content within the internal supplier back-end flows and the data collection/export is compliant with the UPM requirements, from the internal supplier's back-end. Supplier connectivity is ensured and realize started by troubleshooting, testing in SIT, UAT, E2E, signing off and finalizing guides. Deploy and run start with cut over in production (catalog load) and maintaining connection, growing model processes and making additional changes.

Supplier and a 3rd party provider will receive a seller integration guideline document as training material for beginning the internal design and mapping activities. It has description of the project along with excel delta file with sample files and set of UPM sample files in required format. The document is shared as to discuss and agree on the business scope, business procedures, commercial agreements/contracts, logistic and operational procedures, material master (MM) data, change management activities and disaster recovery plans. The document will be reviewed after the pilots.

In case the document must be modified during the integration, it will pause all progress as it has to go through various sign-offs and the same fixes must be done for all ongoing integrations. Therefore, a quality gate between each task should be agreed. UPM is responsible of making a holistic seller integration guideline document to decrease time needed in meetings, implementation and testing. This also allows having a common standard across suppliers in scope and to decrease misunderstandings and risk of operational issues.

The accuracy and readiness of VMD will have a direct impact to the enablement timeline. Supplier data must be validated to avoid having duplicates or non-active supplier locations in the final solution. Also, all missing contacts must be gathered when defining the scope with the supplier as well as identifying suppliers transactions with different BAs and ERPs. Supplier integration solution blueprint communicates project dynamics per mini project. In practice, it states the roles and responsibilities on SAP, UPM and supplier sides as well as the timelines per process step. This also helps in communicating the project scope and defining document requirements in multiple levels. It gathers profile information like identification code, middleware providers and classifications for establishing connectivity. Figure 3.8 opens the integration timeline and steps.

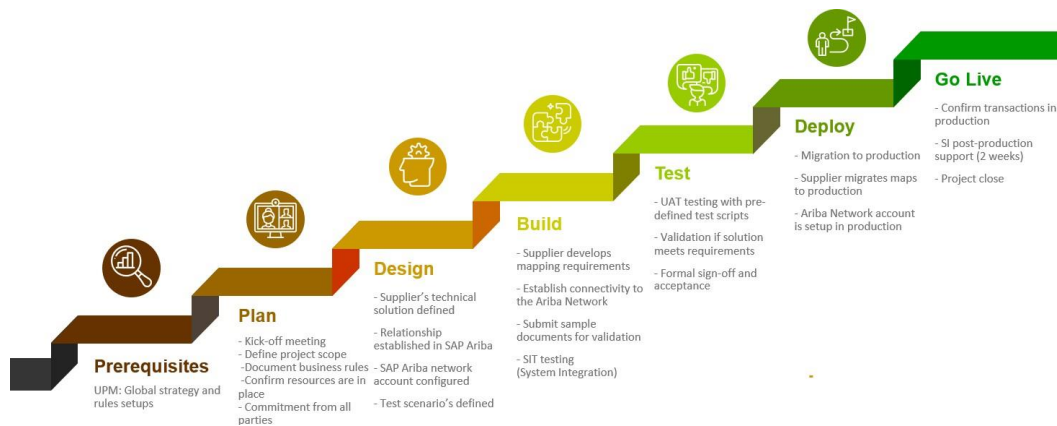


Figure 3.7: SAP Business Network Integration timeline

3.3.3 Expected Benefits

The immediate expected benefits from adopting a network approach are those of strategic procurement relating to the easiness of supplier management and risk, sourcing contracts and spend visibility. From operational point of view, the buying and invoicing is most likely to become more guided whereas on general the supply base transparency and comprehensive information centralized can help drive supplier performance development and optimization of supply solutions even on item level.

Kauremaa and Tanskanen (2016) argue that the mode of the relationship in the IOIS depends on the distribution of benefits. In this case it will depend on the supplier, as the integration will primarily benefit UPM but the system is not solely aimed for individual benefits like the portal is. Therefore the mode of relationship is stated to be somewhere in between unilateral and bilateral approaches. The integration will in theory, bring the following upper level benefits:

- Standardized price lists that enable automated real-time price updates
- Increase in TA that improves PtP data quality and compliance and decreases process complexity and cost
- Physical evidences, such as ASN, RFID and camera recognized barcode labels, enable streamlining warehouse operations through real-time inventory management, automated ordering and raw material traceability
- Integrated VMI/consignment models improve supply security, reduce manual scheduling and enable further SC optimization

- Harmonized and transparent quality e-collaboration process improves production efficiency and product development

In the traditional SC context, assistance is provided to address issues arising from insufficient information about the origin of goods, absence of real-time information, inadequate traceability, a high volume of documents, lack of transparency, unreliable stakeholders, and the potential for non-compliance with the terms of the agreement (Cerny et al., 2021). Integrating both back- and front-end ERPs to SAP BN allows uninterrupted, error-free, and automated documentation flow whilst also harmonizing order processes across different BAs.

ASN data will enable further digitization of warehouse operations. ASNs are needed for automated truck identification at mill as well as automated weighbridge usage. This also supports further developments and intentions to generate shipping label or packing slip with bar codes for supplier to print unit-label handling units for materials to match with ASN. ASN, complemented with RFID/barcode labels, enable tracking and tracing of goods in a material batch level all the way from suppliers to customers. This supports supplier quality management and allows complying with ISO standard requirements.

Real-time inventory data enables automated ordering and supply chain optimization. Automated or semi-automated goods issue (GI) process secures 3WM and on-time payment. Further, e-archiving of documents could be potentially done based on ASN. SAP BN provides standard platform for VMI/consignment data integration enabling efficient VMI scale-up, flexibility to change supplier if needed and standard solution for cross BA suppliers. VMI data integrations are currently customized per business area, limiting scale-up potential and flexibility to change suppliers. These are however beneficial as VMI reduces UPM's needs of planning and scheduling. The decrease of lead time and scrapping cost has already been realized with VMI improved visibility of forecasts to suppliers.

Automation of the quality notes and claim processes will decrease the lead time for the resolution and improve the productivity. Main savings come from cutting time per purchase, lower processing cost per purchase and price savings in case of integrated suppliers through better commercial terms. Commercial benefits are not realized automatically, but it requires strategic planning and right decisions and actions from contract owners.

In the case of a call-off, ERP, emails and phone calls are used based on the case to contact and agree with the supplier as there is no harmonized electronic process. The big volume suppliers have more incentives to join but because of the complexity of these organizations' SCIs, there is more distinction between benefits and trade-offs. This gap can be closed with study on managerial and technical aspects affecting implementation that is left for the stakeholder in the leader position of the platform. In future, it is only expected that TA will increase inside and out of the focal company as the benefits start to realize. It is therefore important to invest to the back-end system capabilities. This helps in centralizing the buyer organizations in different geographies as there are differences in regions'/categories' ability to capture commercial benefits.

3.3.4 Expected Challenges

Buyers often encounter several challenges when integrating suppliers into their processes. One common challenge is resourcing, as inadequate staffing and the need for dedicated resources, including 3rd party consulting teams, can hinder smooth integration. Another resourcing challenge lies in identifying the right individuals with the technical and business expertise necessary to support the integration efforts effectively. Competing priorities within the project implementation phase can also pose a challenge, as different tasks and objectives may demand simultaneous attention.

Additionally, buyers often rely on the supplier's ability to meet timelines and be ready for the go live phase, which can be a risk if the supplier falls behind or encounters delays. Furthermore, not considering suppliers as stakeholders when designing the solution, such as overlooking their input in business processes, workflows, requirements, and catalog requirements, can create integration challenges. Continuous changes to the design and requirements during the development phase further complicate the integration process, making it harder to achieve a cohesive and efficient solution. Lastly, inadequate preparation of supplier test scripts can impede effective testing and validation, causing delays and potential issues during integration.

Suppliers too often face various challenges when integrating with buyers' systems. One common challenge is the lead time required to make development changes, which can delay the integration process and hinder responsiveness to buyer's needs. Additionally, suppliers often operate with small and lean teams, making it difficult to provide adequate coverage, particularly when team members are out of the office. Suppliers may also face dependencies

on their own system upgrades, changes, or freezes, which can impact their ability to integrate smoothly with the buyer's systems.

Suppliers might also rely on 3rd party providers, such as OpenText, Liaison, VAN, etc., to coordinate development work or support troubleshooting for error notifications, which can introduce additional complexities and potential for delays. Another challenge is when suppliers are not fully aware or knowledgeable about the buyer's business processes, which can result in misalignment and difficulties in achieving seamless integration. System limitations can arise, where the supplier's system may not be sophisticated enough to meet the customer's requirements or workflows, especially if customizations on platforms like SAP BN are involved. These limitations can impede the integration process and require additional effort to find workarounds or alternative solutions.

Missing capability to process service orders and lack of hard measures for supplier registration are becoming bottlenecks for supplier enablement and benefit realization. Kauremaa et al. (2010) point out that EDI integrations have not always been able to reach the set objectives. In the suppliers' point of view, in order for the benefits to realize, visibility and access might also be offered to other relevant forest industry cluster companies in logistics and machinery (Kauremaa and Tanskanen, 2016; Diesen, 2007). The reliability of the system data accesses and response times are of great importance as are the administrative expenses and time taken to implement.

Suppliers' motivation may lie in the fact that current VMI solutions do not support standard system integration which causes manual production and logistics planning for them. If a supplier were to deliver batches for various UPM businesses it would have to create separate VMI/consignment models as no harmonized solution exists. Lack of real time inventory data and limited VMI scale-up capabilities cause manual ordering and scheduling and sometimes ad-hoc situations for suppliers that may present as availability issues. Other considerations like technology failures and security risks must be screened beforehand which takes resources.

Other challenges include master data alignment. This means material master items and numbers are to be matched with those of suppliers'. At least material identifiers, units of measure and prices must be exactly the same on both sides in order for the solution to work as intended. Each supplier must also be provided with a list of the buyer locations and plants as they will create a unique identification key in their back-end system (ship-to and

bill-to). When a file/document arrives to an ERP/back-end, the verification is done automatically against the internal MM identification. Any discrepancies are flashed out and delay the project. This will mean additional tasks for suppliers and UPM.

When multiple processes are in scope, supplier usually has completely different teams working with each and sometimes they even have different mappings or use different back-end systems per process expanding the scope with scope creep phenomenon (Komal et al., 2020). The supplier may have all the described documents in scope but will choose to only integrate a couple as internal/technical limitations may dictate the choice. Internal integration costs on the supplier side will reflect the complexity of the project in terms of number of back-end/applications involved, number of internal/external resources needed for mapping and achieving connectivity.

One major limitation is the recommendation for the supplier to have cXML and not EDIFACT format as the seller integration guidelines are done per file and integration format. It is possible to create a second document reflecting another format. However, the integration would take vastly more time as an extension framework may be needed. Traditional EDI has also gone under pressure due to its complexity, implementation costs and reliance on proprietary networks (Kauremaa et al., 2010). Traditional EDI requires companies to set up and maintain their own EDI systems while SAP BN promises to provide a more integrated and automated approach, allowing companies to manage their SC processes with increased services. The same fear of having only semi-automated integrations exists.

There are no limitations related to the ERP or the ERP version used by the supplier as long as it is able to process the files in the specification of UPM project and provide back files that comply with UPM requirements. This is because the actual back-end of the supplier is not transparent for the project. However, it helps if the supplier uses SAP already and even better if there already is some cooperation with UPM via SAP BN. There are also no limitations related to the 3rd party provider that the supplier is using, allowing them to choose whatever integration solutions, applications, middleware or service providers best suited for their internal policies. However, from experience, the middlemen tend to make the project longer and more complex. The expected challenges are gathered to figure 3.8.

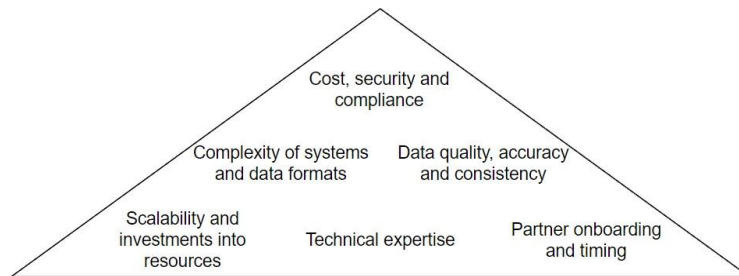


Figure 3.8: Hierarchy of SAP Business Network Integration challenges

One additional problem identified is the inability to standardize business processes and transaction output across ERP backends, UPM organizational levels and suppliers, with slow and complex decision making processes. This may cause too optimistic project timelines.

Chapter 4

Methods

The almost 400 identified DM supplier companies had to be reviewed for the study purpose, finding the ones suitable for B2Bi, based on the current knowledge before choosing any for additional data acquisition. This was done as not to contact the ones unfit or to cause extra trouble for the suppliers. The sampling was done in phases; first, DM suppliers that fulfilled certain prerequisite were identified. Then, these suppliers were offered a survey to find out more about their capabilities for integration implementation. After, based on the results obtained, a refined set of suppliers were given a list of concerns that were pointed out from their answers to be discussed along with the potential implementation timeline. This chapter explains how these methods were used for accumulating new knowledge on the supplier base status in this context. Also the data already gathered previously is discussed and how it contributed to the study with respect to the limitations noticed.

Selecting companies was done in steps. First interviews for previously integrated suppliers and related internal expert were kept to determine what questions to be asked from the potential B2Bi suppliers. Then, the pilot supplier selection logic was revised and its deficiencies for B2Bi supplier selection pointed out. This was supplied by analyzing the previously made supplier survey results as well as reviewing category manager stated integration priorities and preferred data integration types. Self-study on Sievo Spend Analytics on spend and transaction volumes allowed accessing the benefits. From these results, the sample to be additionally surveyed could be justified and further, based on the analysis of the answers to the survey, the suppliers chosen for B2Bi. As a background, during the study, the pilot suppliers were onboarded, so the supplier selection process described gives indications on how the problem of selecting suppliers was approached before and why this logic could not be used as it is going forward.

4.1 Previous Integration Project Experiences

As a part of this study, a series of discussions were conducted with different representatives to gain insights into their experiences and perspectives to the integration implementation, particularly for the causes of delays or success factors encountered to ensure the right variables were selected as criteria. This was done also to find the best questions to be asked from the chosen DM suppliers in the empirical part of the study. A couple of integrated indirect material suppliers and UPM internal expert were interviewed¹ along with a DM supplier, that was integrated through EDIfact logic previously.

To ensure the comparability of the results, all the representatives were from business, having worked as an intermediate between UPM and the respective IT department and, in cases applicable, a 3rd party integrator, middleware provider. The semi-structured interviews were audio recorded and transcribed, with attention paid to capturing the repetitive nuances and trends. Several key themes emerged that will be presented in this section. The key results are highlighted in the conclusions subsection. All the company names are changed for confidentiality reasons.

4.1.1 Direct Material Supplier - Sunny

With Sunny, a direct material company with an annual turnover of over 10 million, the integration implementation took about 21 months as opposed to the goal of two. However, the project marked a pilot for both UPM and Sunny. The connectivity was achieved in SAP Ariba, creating different Ariba Network IDs (ANID) per suppliers inside the same corporation. The project still goes on as only Finnish transactions are currently integrated and couple of other supplying countries are to be implemented similarly soon.

Sunny expects other projects to go smoother as they now have the experience on integration implementation, mappings, and the same ERP applies across BAs. However, some processes might need to be revised per country but technically the solution is easy to scale. The reason the project got delayed primarily was due to the special cases arising during the test phase; they had not tested the document sharing with mass operations and some problems occurred case-by-case meaning they could not have prepared for them in advance even though a thorough process and special case review had been made with the help of an UPM expert. There was also a big ERP

¹Interview structure and questions are in Appendix B.

integration project ongoing during the time which meant putting this project to ice for a while as other EDI changes were being made.

What caused even more problems were the different operating models; when UPM sent a FO, it looked like a PO to Sunny. They previously used only the order number to create separate POs per FO but this logic does not work in Ariba. When the order comes through EDI, it must use the order instead of only using the number as the information in the order must transcend also to OC and ASN to be returned to the customer. This caused problems in Sunny reporting as the processes had to be changed and aligned. They also had to make executive decisions to give up some special processes or continue to accept their manual nature.

The personnel in charge changed during the project due to normal staff rotation. If there were previously fixed errors, it became uncertain how these had been fixed or whether there had ever been an error in the first place. Everybody were in the same page on what needed to be done but as IT did not know business side by heart, a better holistic view from the project leaders would have ensured smoother knowledge transfer from one side to another when looking at IT changes. One example of this was that IT thought at one point that the whole project was just an intermediate product and not the final solution. Also, the representative pointed out that first mappings are important to be done as carefully as possible to avoid mistakes in the following.

Sunny also mentioned having problems with ship-to addresses in cases where bill-to addresses were different. Sunny raised a concern on whether all suppliers have the capability to use the same order number in their invoices and other documents. Also the dates and units of measure used to have a different meaning for UPM and Sunny; UPM ordered products on wet tons (WTO) or tons (TO) but Sunny handled products based on their lot sizes (IPC cont) meaning, there was a need to convert material units to match as with prices. Their reporting also emphasized the date when the batch was ordered and delivered, whereas UPM was only interested in delivery dates.

One more noticed problem was with multiple line orders. Multiple line orders leave UPM as one order with many rows and deliveries for different mills. Sunny on the other hand has a business model to operate one business per mill which means having one order per mill, so the order has to be cut into pieces with a preset logic. OC works in these cases but with order changes the process stops, as it can not receive one special change per row.

This caused extra training to take place in mills as the orders looked different.

Mappings were done by a 3rd party middleware provider OpenText. They had identified achieving connectivity and mapping to be the most time consuming activities of the project. Sunny stated that using middlemen caused delay as there were a many to be contacted and invited to meetings and emails waiting for somebody to take action without clearly pointed out person. This then caused escalations to take place and frustration on both sides. The support model towards UPM was clear but the project organization outside the two companies might have been too big or complex, passivating people.

The benefits were clear from the start and the representative could describe them from many angles. They pointed out having less returns as the orders went right the first way around. If it were for the portal, more personnel would have had to be hired. Interestingly also, Sunny said that ASN does not bring supplier any benefits but linked to the integration package, does not feel as laborious to implement. This could mean that UPM receiving ASN is easier through the integration project than through the portal. Also the language requirements disappear from the customer service as anyone can handle the orders which is a benefit not yet recognized.

4.1.2 Indirect Material Suppliers - Hallel, Omane and Alto

With Hallel, the integration implementation was done in record time; go-live was in six weeks from the kick-off call. Omane took the standard eight weeks which is also impressive but according to them, could have been even less. The similarities between the two included having small in-house integration team that was well-aligned and experienced in even more complex cases than the one proposed by UPM. The benefits were well-known and the volumes ordered justified the temporary additional work. UPM was said to offer enough support and flexibility to compromise when the companies ran into problems. Both also had been able to communicate the sense of urgency from business towards IT, making them prioritize integration projects over others whenever possible. With Alto, the experience was different; the implementation took over a year, mostly due to the outside integrator operator.

Hallel took action independently by conducting weekly meetings for feedback on project status and to connect departments. This allowed to foresee issues that could occur in the following stages. The most important as-

pect, according to Hallel representative, was that they had vast experience in Ariba and therefore knew what needed to be done in all document combination scenarios. What also contributed to Hallel's success could have been the missing 3rd party integrator and middleware, guiding the requests for support straight towards their own capable IT team and UPM without interference of middlemen.

What set the Hallel integration apart from the rest was that it did not include SAP team in other forms but the professional portfolio. The leading IT person was attending weekly meetings as he knew what they could and could not do in their ERP setting the boundaries for the exercise from the start. Also the size of the team working on the project was small allowing agility and clear role distribution. Hallel integrated Ariba catalogs and omitted free text orders which helped cleansing product numbers, prices, and units. In this case the standard implementation time was undercut but they had had cases where SC disruptions or unexpected events affected initial plans, delaying ongoing projects. A possible threat recognized, was IT not attending the meetings as then somebody would have to translate business requirements to them separately.

Omane on the other hand had even more experience in Ariba, spanning over a decade and resulting in numerous integrations. They thought the two months it took was longer than it should have been because of their ERP being changed to a new system. The potential challenges Omene found were actually contradictory to Hallel; they thought making IT lead participate into the meetings was taking his/her resources off the core work as the person was very capable even without. Surprisingly also, they felt that waiting for the kick-off meeting delayed the implementation initiation in some cases. Like with Sunny, the bill-to and ship-to addresses caused problems in case of many different invoice addresses.

Other identified bottlenecks were with resources; IT lead was the only person that could program the needed things to the ERP system and had always many integrations to work simultaneously on. Further, there were some issues with e-catalogs as they had to use a 3rd party for the creation of the punchout catalog to take over the old ERP system catalogs. Resources required from the customer were stated to be the invoice addresses, ship-to and bill-to addresses, and technical documentation. Omene stated that EDI integration could be done in a week if all of this information was in place but with the punchout catalog it should not take more than a couple of weeks. In the case of punchouts, the most problems were caused by changes needed or by having

no experience in Ariba. The representative summarized *"it is hard to explain what is needed"* and *"I think a lot of suppliers, if the project is new for them, they see the costs, it is a lot but if you see the changes, it's very good for us."*

Alto described the integration to be challenging. For them this was the first EDI network integration but straight ERP to ERP integrations had been in place long before. Time was wasted as the timeline was not clear and only after UPM pointed out the delay, they turned to their operator. Turns out, the operator had had vast changes and the personnel were inexperienced to perform when it came to Ariba integration. The best practice of a small group size was implemented but due to being the first Ariba integration to the operator representative, he did not know how to do the technical part and had lacking certificates. When asked, the operator guided their resources themselves so Alto did not have a say in who would operate. The requirements for Alto business side were clear but not the roles and how to manage the interface between the layers; without clear leadership, the escalation did not take place soon enough. SAP offered an integration specialist support and Alto's own IT did what it could together with the operator. Like in many other integrations, the test phase took time as it was done with trial-and-error approach.

4.1.3 Focal Company Representative

UPM business representative said his main role was to ensure right things got done on the implementation phase and act upon the test results to ensure they were appropriately passed. This was done by screening the result documents for possible faults. Together with suppliers, the representative chose the cases to be tested. Many projects also required guidance and goal communication to define the scope and aims for both sides. The representative nominated the gap between IT and business to be a significant factor contributing to the success; IT usually lacks the view on the benefits and therefore does not perceive the importance in the same way.

Further, the length of the cooperation with business is important but it also means IT is less informed as the communication is guided towards the business by UPM so the direction of the effect is debatable. Integrations have been challenging for UPM as can be seen by the delays. This may be due to inexperienced suppliers, as in the case of suppliers that had done dozens, the time limits stayed close to the targets. UPM does not have visibility to the supplier processes so the wait times are increased every time a new layer is added and it is hard to say where the issues stem from. What is certain

however is that coordination is challenged in more complex organizations and lost in translation phenomenon happens as the messages (mostly emails even when calls would be preferred) are not received by the key players.

UPM is good at building the picture of the target state and the understanding right from the start but after the integration team comes to play, the pace usually halts. The capability of the integrator to understand the supplier environment is lacking which causes friction right from the start; integration team participates in the kick-off meeting but the ERP change team or the 3rd party middleware provider may not. Therefore the setup understanding is lacking, resulting in only starting to find the right people after the kick-off call.

The project lead is currently a representative of SAP but UPM leads the weekly calls. Sometimes the SAP integrator comes to the meetings with their own agenda, dates, or needs for explanation, even if the themes are clear for UPM and the supplier and something else has already been agreed. In most cases, the right things are done, but arguably too slow and through problems as the projects require giving attention to the details and have case specific problems. When the operator has chosen to integrate a document in a specific way, it may be that after working on it for two months, the operator has decided it to be bad format from their point of view, and wanting to make changes. Then there is a need to go back and start again with a new format.

4.1.4 Conclusion from the Previous Projects

Having already done integrations is very important when wanting to integrate a supplier quickly. However, Hallel and Omane had different views on how many integrations the supplier should have done previously to have sufficient experience. Hallel proposed five whilst Omane had a higher number in mind. Hallel pointed out that even though the project is unique for everybody, they could start predicting what would be asked in each phase and the mappings started to repeat themselves after five times. They closed the problem of customization per supplier by stating that *"Ariba gives great flexibility for customers, but not for suppliers. That means, when we have integration, we should map everything new for every customer because every customer would place the pieces in different places. So one customer will provide delivery address in one field, another in other field. One customer would like to have complete OC and others do not. And, you know, the different pieces and order itself is repeated, so normally that's pretty quickly done."*

Two indirect suppliers had a fast project and they both had a small in-house IT team as well as platinum profile on Ariba, meaning available and immediate support for an additional cost. Similarly, it was evident that they reviewed and filtered requests from their customers only to pick the most suitable cases that could be justified; similar to what UPM is aiming for with this study. The list of requested documents was highly important in these considerations. Also, similarities could be found from UPM and Hallel representative statements, arguing that if a customer chooses to change the mappings and the data, the whole project falls back about a month or two; one must communicate even on the kick-off on what is possible and what is not.

It seems that going alone helped Omane and Hallel. In Sunny and Alto cases the outsourced middleware provider and IT coordination caused delays. Even further, when the staff changed during the project or the personnel were inexperienced. UPM should look for suppliers not having any ERP change projects ongoing during the implementation. There has to be clear instructions for the mappings and an investigation for which places the materials are supplied to and where the materials are to be invoiced. The bill-to and ship-to addresses caused problems in case of many different invoice addresses so extra care should be taken to ensure these are described clearly in the technical documentation. Also UPM should provide an example of PO and supplier provided OC to combine dates, units of measure and price units unequivocally. Alto had an additional request concerning putting mill identifiers and details more clearly. Catalogs help this significantly.

Alto mentioned having difficulties because of supplying to many of the UPM businesses separately; UPM representatives were only covering their own business side in discussions that resulted in Alto having to do the integration to each business separately. However, as the connectivity has already been established, the scope of the project was far less going forward but had to take into account different practices and systems. Therefore UPM could coordinate their business integrations better with suppliers that supply to more than one BAs. Moreover, it seems Alto did not have a sense of urgency or was not on the map on the expected benefits. The supplier must be able to communicate the sense of urgency even if the organization is complex and there are many layers to it.

The understanding between the organizations could be added. Integration in the supplier side is the biggest challenge as there is not enough knowledge

on integration forms, information package inputs, cXML/EDifact message package or technicalities. This could be helped by describing the text formats clearly on what they mean in practice and what is their difference. The roles seem to be clearly defined in most cases but not so much on who takes action on a specific task and who attends which meeting. Connection establishment would need additional planning in the future. If supplier has the same back-end they want to connect to the same ANID it makes the process quicker.

To sum up, suppliers doing integration projects as a pilot will most likely introduce delays as do organizational complexity and added interfaces, special order cases, ongoing ERP changes in supplier end and the gap between IT and business. These can be helped partially by doing case reviews in advance, ensuring urgency is communicated and roles clearly shared. For structured approach in documentation and constant follow-up, a change backlog (mainly related to the technical fixes and/or business process clarifications that are needed) should be utilized more extensively which works as a list of change requirements and their underlying reason, responsible person and implementation schedule. This would bring more clarity to the open items.

UPM should prioritize suppliers with small in-house ERP change teams that have experience and that understand the target state well. The technical integration build functional requirement instructions could be clarified. Further, requesting feedback about the timeline from the parties that are involved before reviewing a detailed timeline that have been planned could increase commitment and find limitations like holiday periods to be considered in the project plan. As one already integrated supplier representative stated *"new project supplier see the costs feel heavy but the changes are really good"*.

The main conclusion is that previously the focal company has mainly focused on integrating suppliers based on two metrics; their interest as well as the scope of the business but going forward, more criteria must be introduced to avoid delays. UPM must be able to offer support and flexibility like it has in the past so identifying the lacks will benefit providing support.

4.2 Pilot Supplier Selection

The selection logic for the two pilot integration suppliers was as follows. The chosen supplier had to have more than 500 annual transactions or otherwise the portal solution would prove to be more applicable. Also, the supplier had

to be a small or medium-sized enterprise (SME) as the biggest, more complex cases, wanted to be incorporated only with more accumulated knowledge, preferably after having a portal solution already in place. Other selection criteria in addition to these is given in figure 4.1. To open, the supplier is preferred if it is supplying across many regions and categories and wants all crucial business transactions included. These considerations were reviewed by looking at the business priorities, experience in the network and positive answers to the supplier survey to be discussed shortly, as to avoid change resistance.

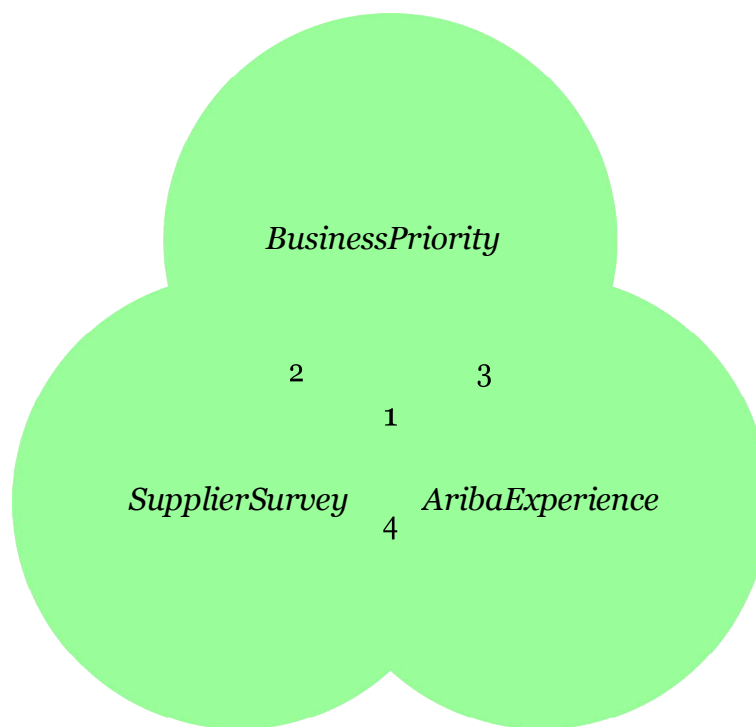


Figure 4.1: Venn diagram of the pilot supplier selection logic

By distributing the data sets based on the figure, it was possible to identify priority groups, that are numbered. Business priorities were evaluated by the corresponding category managers as high, medium or low. Supplier survey answers were either positive or negative based on replies and if no red flags presented themselves when contacting. Ariba experience was acquired with the help of Sievo Procurement Analytics and with the help of SAP. SAP ran a matching process to ensure vendor appropriateness and to ensure the suppliers for pilots. Criteria included quite similarly; priority, relationship type, enterprise account, transaction frequency, experience on integration and vendor location. Further, an integration qualification questionnaire was sent by

SAP. The obtained answers were about comprehension of integration, simultaneous IT releases, resource availability, transactions to be integrated and interest in integrating other customers.

As a result, in group one, there were only two options both from packaging category and one inside option from UPM. The two outside suppliers were chosen for the pilot phase and the need for this study arose as there was a need to distribute rest of the suppliers to the waves to aid in integration flight planning. The logic used in pilot selection was lacking for the B2Bi as it could only name couple of suppliers based on the categorization and was mostly guided towards pilots. The remaining supplier base situated in other areas of the figure than the most optimal group one, did not have big differences against each other so no conclusions for their readiness for B2Bi could be done.

4.3 Sampling for Survey

An additional supplier survey was conducted for companies that were deemed appropriate for B2Bi based on the criteria concerning previous Supplier Survey, SCC Supplier List and Sievo Spend Analytics. In this section, I will go through how the selection was done in practice. The figure 4.2 opens how the different methods and data samples relate to each other and what knowledge is accumulated and from which sources.

The already there data blocks in red contribute to the new knowledge gathering in green, as following and supplying pilot supplier selection logic ensures forming better selection logic than previously used. The grey knowledge is mostly tacit that needed to be gathered and refined for the study purposes.

4.3.1 Supplier Survey

For checking the supplier maturity, willingness to automate purchasing processes, and to understand expectations, UPM conducted a supplier survey² in the late September of 2022. The survey was sent to 376 unique identified DM suppliers via respective category managers to which 154 replies were obtained. The results allowed to review supplier scope, the willingness and way to use SAP BN, and aided in choosing the suppliers for the pilot phase.

²Questions of the Supplier Survey are in Appendix C.

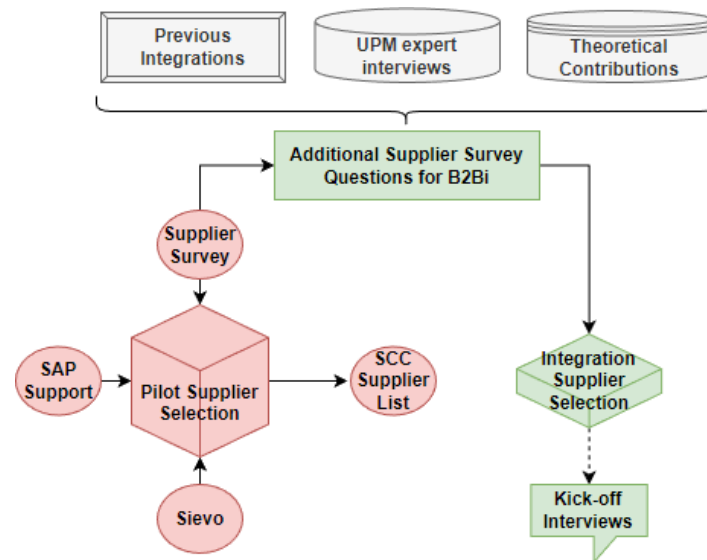


Figure 4.2: Methods for supplier selection and data acquisition

The answers that UPM sought initially and that are relevant for B2Bi were about:

- Provision of OC and ASN
- Interest in sending invoices via network and current satisfaction
- Experience in SAP Business Network
- Beneficial documents for collaboration through SAP Business Network
- Technical capabilities and IT resources for B2Bi
- Interest in integration
- Experience in automation of transaction processes and platforms used

The data was analyzed after cleaning and translating it partly from Chinese to English for interpretational purposes. The preponderance of responses received originated from Chinese suppliers. Some suppliers described having difficulties in planning caused by ad-hoc orders, restricted demand information, and lack of quarterly plans that could be helped with knowledge on

consumption, stock levels and machine run production plans or by early orders. Also, in addition to POs, suppliers ambiguously expected production plans like continuous rolling forecasts, and info on maintenance and shut-downs. However the forecasts were wanted on several different accuracy levels; some preferred annual, some wanted weekly and even requests on an product level were present which indicates a need to study individual suppliers' B2Bi preferences. While the majority of the suppliers (more than 95%) found planning to be relatively easy, seven suppliers encountered significant difficulties in planning production based on the available data as it is.

Other feedback relevant for the study were statements of *no cooperation experience, need for interface documentation, hope to be online soon with automatic order system and invoicing processes*, as well as *requests for additional system training to support and pre-coordination of activities with outside service providers*. Some pointed out there to be difficulties in invoicing due to the existence of different businesses and legal entities. The key words concerning the integration such as; *digital collaboration, automating order/invoice flows, digital platform, VMI integration, EDI, replacing old systems, additional costs, and digital integration*, appeared 34 times in total. Many more also described wishes to deepen collaboration, but on a more general level. The ways of providing invoices at the time were either through paper or by using Basware system with almost even end-user distribution. About five percent were unsatisfied or very unsatisfied in the processes, stemming from late payments. When asking about the interest in sending invoices via SAP BN, most weren't able to answer with the rest dividing evenly for yes and no.

Quite surprisingly, only a little over a fifth could describe other platforms for transacting, with 12 benefits recognized altogether, most being efficiency improvements or additional abilities like having payment notifications sent by the system. These results hint that suppliers have previously been focusing primarily on automating their own processes as over a half still elaborated having experience in automating transaction processes. This tells also a story about the lack in sense of urgency towards integrations. It could be seen that 142 suppliers delivered to Paper mills, of which 14 supplied also to Pulp, three also to Biochemicals and two suppliers supplied to all of the above. In addition there were three suppliers supplying only to Pulp and two to Biochemicals. The distribution of BAs supplied is presented in figure 4.3.

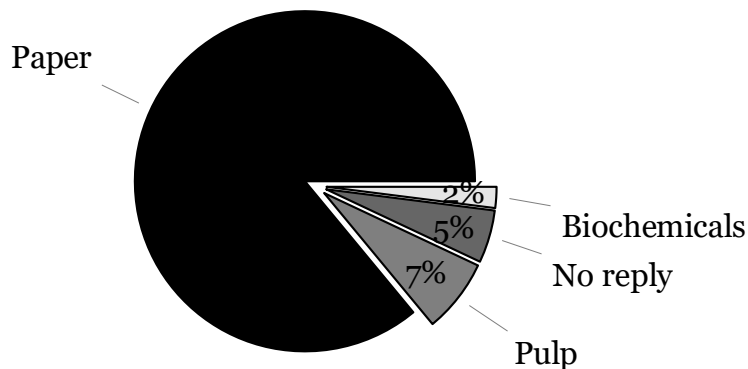


Figure 4.3: Distribution of BAs supplied based on the Supplier Survey

Despite UPM expectations, 17 suppliers identified as not providing OC after PO and three were not able to answer whereas 57 were not providing ASN with 14 not able to answer. Less than a half of suppliers were sure on their abilities to produce both ASN and OC messages through the back-end system which is a very important metric for the success of integration. Based on the prior interviews, integration could potentially help in receiving the ASN to help the automation in mill side. However, suppliers did not feel comfortable in sharing all the possible documents via SAP even on an idea level. When it comes to the integration only 34 suppliers believed to have the required, still undefined, IT resources. From this group 28 believed technical capabilities to be in place also but when asking from interest in integration, the group widened to ten. Altogether, 27 suppliers showed interest in integration some of which did not feel like having the needed IT/technical resources for the implementation.

For deeper analysis for integration supplier selection, the following variables were selected from the Supplier Survey:

- BA supplied
- IT resources for integration
- Technical capabilities
- Back-end and OC messages
- Back-end and ASN messages
- Interest in integration

The variables were partly chosen based on the answer coverage and also because of their integration descriptiveness. Other interesting variables affecting the choice would have been cooperating already with UPM via SAP and existence of 3rd party IT provider but due to the quality of the data,

these variables were omitted. BA was set to be Paper as it is the priority on this wave, leaving 142 potential candidates. IT resources and technical capabilities had to be "yes" as well as back-end OC and ASN messages. This typified the sample size first from 32 to 26 and with messages from 22 to 14. Finally, negative and blank answers from interest in integration were filtered off, leaving a list of six suppliers as it was thought that genuine interest in integration was a prerequisite for success.

Because the group widened to too little, all the suppliers (27) that had showed interest for integration were chosen for the additional supplier survey on this round. This relates to the goal to also integrate those that have an internal policy of doing so even without a proper document count. Even if not having the needed technical and IT capabilities yet, these suppliers could be surveyed to find out what it was that they were still lacking and the capabilities compared to the most optimal scenarios.

Further analysis per BA gives the most room for errors in predicted deliveries as only some suppliers described the amount of deliveries in addition to the mills supplied to. The answers on fields concerning number of people processing POs, OCs and ASNs was also shorthanded (less than 17 answers) so these variables had to be omitted, although they optimally would have given indications on how many FTEs are saved by increased TA levels. ASN might not be needed for smaller packaging material and production consumable companies which means that this consideration can't be the only criteria in supplier selection, not to discriminate potential suppliers. However, as the suppliers in these categories not supplying ASNs are typically of small scale operations, the discrimination is justified.

The answers in Supplier Survey had to be partially questioned, as based on the quantity of not able to answer per company, showed indications of having a single respondent. This also caused concern on whether some answers were too optimistic, aiming to show the supplier in a positive light and not grounded on actual situation. In addition, it might be that the candidates do not actually prove to be suitable even after saying so. The implementation priority, registration status, wanted operating model and data integration level (B2Bi or portal) could not be asked, so the answers had to be supplied with set of considerations made by respective category managers.

4.3.2 SCC Supplier List

UPM BAs and sourcing category teams define their supplier scope for the network as part of the buying channel definition and set their annual targets for the network usage. Therefore, a list called SCC Supplier List, containing all DM suppliers, was created to list suppliers per category manager and for category managers to share additional information about their capabilities towards the network, not visible through systems but that is known through collaboration.

The list was cleaned by deleting duplicates. Then the list got sorted based on data integration preference. As the study focuses on B2Bi, the ones indicated as portal were omitted. This does not mean, that they would not be integrated later, but for various reasons, some suppliers are first wanted to be handled through the portal, meaning that for this project, they are not seen as viable options. The ones unsure about the integration type preference were included. Then, low implementation priority suppliers were left out and the ones not wanting to work with Ariba. How the suppliers were valued as low priority was based on having no discussions of SAP BN collaboration with vendor nor internally, no advanced processes initiated/expected, low spend and/or transactions, and having collaboration difficulties in past.

This left a sample size of 41 suppliers of which eight were already chosen based on the previous Supplier Survey, limiting the group to 33 new suppliers to be added to the survey scope. Therefore, before doing any analysis on Sievo Spend Analytics, the group to be additionally surveyed was 60.

4.3.3 Sievo Analytics

Sievo Spend Analytics was used to find suppliers that had not answered to the Supplier Survey or flagged out in SCC Supplier List but were deemed appropriate for integration due to high number of transactions or by big spend. Self service was used with following considerations: company was set to be either Communication or Specialty Papers, material groups were set to consider all DM groups in addition to production consumables due to the wishes of the focal company (mainly because these had not been integrated along with Indirect material integration phase).

The variables of interest were the sum of PO count and invoice count as in an ideal situation each invoice has a designated ASN and this way the transaction volume could be given a describing value. In addition to this metric

telling the amount of transactions, spend was looked at to identify the most business critical suppliers. The timeline was one year from February of 2022 till January of 2023. Total of 492 suppliers were identified, which can be explained partially with taking production consumables also into consideration and partially because in the set of previously identified 376 suppliers, there were different businesses (supplier ERPs) inside a parent company bundled together as one.

The analysis started by consolidating supplier data as integration will be done on the parent company instead of different business units separately, resulting in 241 suppliers of which first 50 with the biggest amounts of transactions and first 50 in spend were chosen and compared head-to-head. There were only eight suppliers that did not appear in the top 50 of both lists while 42 suppliers did, meaning they were amongst the biggest in spend and in transaction numbers. The list of suppliers were refined further by deleting the ones that were designed to be incorporated through the portal option along with non-manufacturing companies, leaving 42 suppliers of which 13 were already taken into account in either supplier survey or SCC list. The final sample thus considered 89 potential suppliers to be contacted.

4.4 Supplier Selection Logic

The survey was set up into Qualtrics tool and was communicated after a heads-up letter and an integration information package which was formatted to answer the most prominent questions suppliers may have when discussing integration and SAP BN. The survey questions³ were multi-disciplinary, so the personalized link shared was formatted to allow multiple respondents inside a company to give one cohesive answer. Some questions were marked as optional and others popped up only if a certain answer was given. There were simple answer types like yes/no, Likert 1-5 scale and descriptive texts. The questions derived from previous integration experiences, expert interviews and literature review, used for the next section data analysis are opened in table 4.1⁴.

After contacting the category managers per suppliers chosen, a couple of suppliers were dropped off the scope. Six because they were already integrated by a different practice (EDI or Tieto business information exchange (BIX) IDoc), two because one of them was piloting with portal option instead and

³Survey questions presented in Appendix D.

⁴Table details in Appendix E.

Research Question	Sub-questions	Criteria	Survey Answers
RQ	Q1.	1.a.	2.1.
		1.b.	2.3.
		1.c.	2.5., 2.6., 2.7.
		1.d.	3.4.1., 3.4.2., 3.6.1., 3.6.2.
		1.e.	1.4., 1.5., 2.4.
		1.f.	2.2., 3.4., 3.4.3., 3.6., 3.6.3.
		1.g.	4.1., 4.2., 4.3., 4.4.
	Q2.	2.a.	3.5., 4.3.1.1.
		2.b.	3.2., 3.3.
		2.c.	3.1.

Table 4.1: Description of the survey connection to criteria and questions

because one was a retailer. One because even though the spend was big, the cooperation had been either annually or quarterly fixed so integration model was not suitable as deliveries were happening according to demand in place. One more supplier was left out as they were not current supplier anymore during the study, three were merged inside another already chosen, and five were left out because the respective category manager was unable to recognize or provide the contact details. This left 71 personalized survey links sent out, 61 being in English and ten in Chinese.

After sending out the survey, a couple more suppliers were dropped out of the scope based on their response. One had a system conversion ongoing, meaning not having enough resources for the initiation anytime soon, other did not have any ERP system in place and one stated they could not integrate their ERP without further explanations although prompted. This left a final batch of 68 potential answers, of which 37 replies were given in the two weeks timeline with the answer percentage of 54%. Eight of the responses were Chinese.

Of 68, overall 61 suppliers had started the survey. This meant there were 24 suppliers in progress of which top five had done 46-89%. Interestingly, following these suppliers were six suppliers that all had progress rate of 37%. They all had stopped answering to the same question asking to describe the preferred time for integration initiation. This could potentially tell that these suppliers are not committed to integrate. This also raised a question whether

they had kept answering if the question would have popped up later on. The remaining had stopped answering after filling the basic supplier info with progress rates of 2-23%.

4.4.1 Analysis

The criteria answering to the research questions that are linked to the survey answers all describe different aspects of readiness for the integration initiation. However, as there is a need to know what companies to prioritize, effort is not the only consideration one must make. The way in which the study even began was to find the ones that give the focal company most benefit along with the identified criteria. To access benefits of integrating certain suppliers, revisiting their positioning on transaction volume (PO and invoice count) and spend is needed. Then, a two-times-two matrix is constructed to compare the benefits a certain supplier might offer against the simplicity to realize the B2Bi. The assumption is that the effort metric (easiness and simplicity to initiate integration) can be given a score based on the survey answers. The suppliers are according to this lineup categorized into segments to aid in creating an overall implementation approach strategy.

The completed 37 answer results were reviewed based on the criteria set. First, criteria related to sub-question one and criteria related to sub-question two were analysed separately. Analysis started by changing "yes" as 1 when positive and "no" as 0. If "yes" had a negative implication, it was put as 0 and "no" as 1. Similarly "not able to answer" was given a value of 0.5. The Likert scale (1-5) answers were consolidated into a scale where 1 represents 0 and 5 represents 1, using a simple linear transformation. Every response was then subtract with 1 and dividing the result by 4 to scale the values proportionally between 0 and 1. Then the sum of the values concerning criteria one was taken as to describe the criteria for choosing the suppliers, relating back to the sub-question one.

The same was done for the replies concerning criteria two but the preference for the start time was transcribed from free text to the scale of 0-1 as follows; 0 for n/a, empty or symbol responses, 0.125 for tbd or start time after 2025, 0.25 for 2024 initiation, 0.5 for end of 2023, 0.75 for initiation in 1-3 months and 1 for immediate. After the sum, the efforts were comparable; bigger score meant better positioning and better capabilities.

Before plotting the benefit-to-ease matrix, the benefit scale had to be adjusted after consolidating it to the scale of 0-26 to match that of the criteria;

after gathering the data on spend and transaction volumes per suppliers surveyed, the spend was seen secondary to transaction volume so it was divided by three whereas transaction volumes were divided by three and multiplied by two and the sum calculated. The spend and volume of transactions were normalized using min-max normalization technique to be in the same magnitude as in the effort scale and their relative importance assessed by multipliers.

The most variance was in the criteria one as the answers could have potentially spanned from 0 to 21 with the realized minimum being 2 and maximum being 18. Criteria two showed less variance with potential range of 0 to 5, with 1 being the lowest and 5 the highest. However, the one supplier that scored the highest in criteria two was amongst the lowest tenth in criteria one. The individual criteria scores were plotted against benefits⁵.

Summing the numbers presenting scoring on criteria one and two together was justified as to describe the overall easiness parameter that took into account the most prominent criteria and timing concerning integrations. The score relates to the readiness a supplier possesses. The optimal ease would be a big number describing good capabilities for integration once initiating. The overall score for effort was then supplied with benefits and suppliers prioritized accordingly. The figure 4.4 matrix was constructed with respect to the data set average values (lines) obtained. The suppliers could be divided into four quarters (2x2 matrix) based on their positioning compared to the average lines.

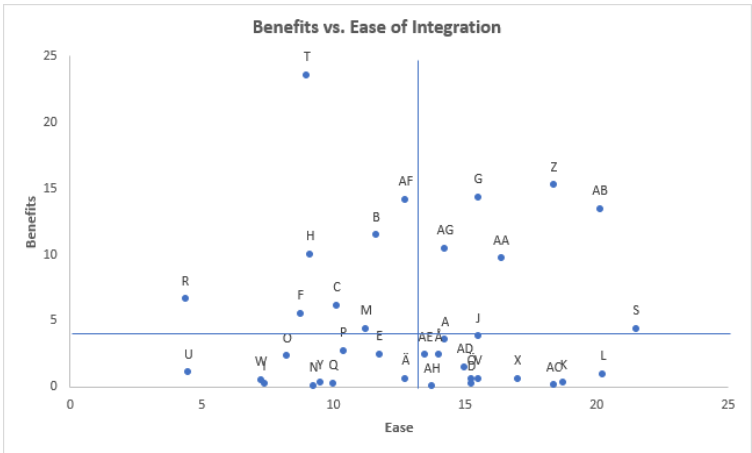


Figure 4.4: Benefit-to-Ease matrix

⁵Plots presented in Appendix F.

4.4.2 Results

Based on the initial model and the matrix created, it could be seen that ten suppliers had below average expected benefits but still a lot of effort would have to be put in to integrate those (bottom left quadrant). On the other hand, the most potential suppliers based on the effort could be found from the right side of the matrix, where six different suppliers in total could be identified in very beneficial positioning (top right quadrant) and thirteen from lower benefit (bottom right quadrant). The order of prioritization, had to be determined by supplying the matrix with a version of fine-tuned criteria scores based on their respective significance a bit later.

Before, however, the remaining quadrant (top left); the one with high effort as in low ease, and high benefits was described. Higher than average benefits were given by eight suppliers giving indications of high complexity together with high benefits. Also, the order inside a quadrant had to be determined and for the simplicity of comparison, both metrics had to be merged to have one to describe the order inside quadrants. Based on these, the preliminary listing of integration order could be done with following considerations:

1. Counting the benefit plus the ease score per supplier

Z, AB, T, G, AF, AA, S, AG, B, L, J, H, K, AC, A, X, AD, Å, C, V, AE, Ö, M, D, F, E, AH, Ä, P, R, O, Q, Y, N, W, I, U

2. Listing the suppliers first based on the quadrant and then the 1. score to table 4.2.

Table 4.2: Supplier Order

Top right	Bottom right	Top left	Bottom left
Z, AB, G, AA, S, AG	L, J, K, AC, A, X, AD, Å, V, AE, Ö, D, AH	T, AF, B, H, C, M, F, R	E, A, P, O, Q, Y, N, W, I, U

Based on the segmentation, it is clear that the top right suppliers should be integrated first. After, bottom right with few exceptions considered from top left and lastly bottom left grouped suppliers. Basically either, the table 4.2 or the listing above could be used, but based on the literature review, the company should aim to integrate as similar companies as possible at a time to have most synergies. Therefore, the proposition is to integrate the

4.4.3 Tuning the Criteria

Ten criteria all have their own variables, with most of them more than one. The unification is started by having just one figure from 0-1 to describe each by counting an average from the variables. This changes the effort number as the new maximum was 10 as opposed to the 26 in the simplified model. This meant that also the benefit had to be scaled for range of 0-10. The comparison is done again by adding the effort from the benefit and sorting the list from maximum to minimum and by plotting figure 4.5.

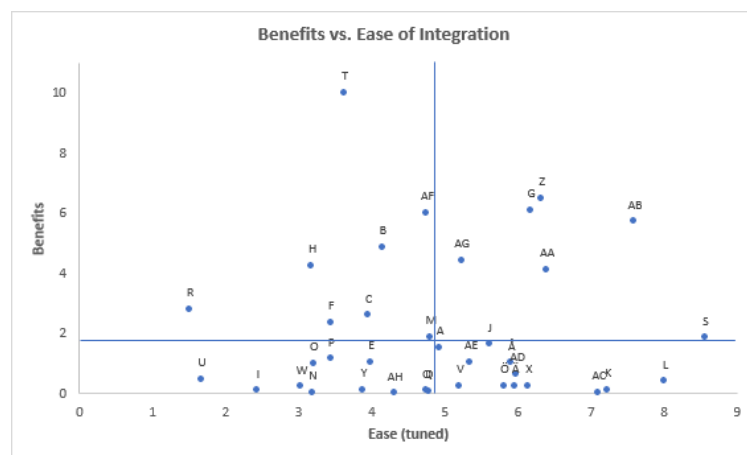


Figure 4.5: Tuned Benefit-to-Ease matrix

T, AB, Z, G, AF, AA, S, AG, B, L, H, K, J, AC, Å, M, AD, C, A, X,
AE, Ä, Ö, F, V, E, D, Q, P, AH, R, O, Y, W, N, I, U

4. Listing the suppliers first based on the quadrant and then the 3. score to table 4.3.

Table 4.3: Supplier Order Revised

Top right	Bottom right	Top left	Bottom left
AB, Z, G, AA, S, AG	L, K, J, AC, Ä, AD, A, X, AE, Ä, Ö, V	T, AF, B, H, M, C, F, R	E, D, Q, P, AH, O, Y, W, N, I, U

While it can be seen based on the figures, the tables and the listings that the order of some suppliers might have changed inside the quadrants, at least the top right quadrant has the exact same suppliers. Supplier order changed a bit inside the quadrants however. Top right switched the positioning of Z and AB whereas top left did the same for M and C. Bottom quadrants had more changes for the positions. Bottom right showed changes in variables K, J, Ä, AD, A, X, AE, and V whereas bottom left had changes in Q, P, N, I, and U. Between quadrants, there were changes with supplier Ä as it

moved to bottom right from bottom left and D and AH moved vice versa so from bottom right to bottom left. This indicates that even when tuning the significance of the chosen criteria, the supplier selection logic based on segmentation works as expected. The tuned model is chosen to be used from now on.

Further tuning the model is done by grouping the criteria under the themes of **change management**, **resource availability** and **technicality** and then doubling each groups' importance to see whether the order changes dramatically. This is done to analyze the impact and trade-offs by evaluating how variations or changes in each criterion group affects the overall decision as some criteria may prove to have a stronger influence similarly to sensitivity analysis. This is done to give some indications for different stakeholders inside the focal company on the development targets per chosen suppliers.

The grouping is done as follows;

Change mgmt

- 1.a. Having an assigned business person on supplier side
- 1.b. Having an escalation pathway towards ERP/Middleware resources
- 1.d. Proper communication and reactivity of stakeholders

Based on the graph, the following conclusions can be drawn; the way in which a certain supplier may become preferred is by focusing efforts on developing the lacking areas. Therefore, development points are opened for the list of the current most attractive suppliers (AB, Z, G, AA, S and AG).

- AB is well positioned for technical implementation but has resources availability issues; there might be a need to order extra or there could be system changes or multiple interfaces to be taken into account.
- Z is mostly lacking in change management practices as well as resources. Developing these by for example introducing project role responsibilities and escalation pathway, would make Z better in terms of implementation prospect.
- G should emphasize mostly gathering the resources or freeing up time for the integration and then the technicalities.
- AA is lacking in technical capabilities so the possibilities to do integrations should be revised. It also might be AA is simply lacking some experience which is not a threshold condition for initiation.
- S seems to have a lot of resources to guide to the project but focusing on technicalities might help.
- AG should develop firstly technical aspects and also managerial practices. Although, AG has quite even distribution in its capability groups so no big difference for improving capabilities is not expected.

It depends on what the focal company sees the easiest and worthwhile to develop within the supplier. Also, some of the points are out of the focal company's reach and the requests for improvement should thus be guided towards the suppliers but it helps, to tell what it is they are missing. The sensitivity analysis gives results that when the weight assigned to different criteria grouping changes, the attractiveness of the supplier changes. This helps to identify the criteria that have the most significant impact on the decision and highlight potential uncertainties. The suppliers score best overall on their resources and the worst in change management with the biggest standard deviation and worst average score.

To model the results differently, benefit consideration per supplier is omitted and the groupings' criteria scores compared.

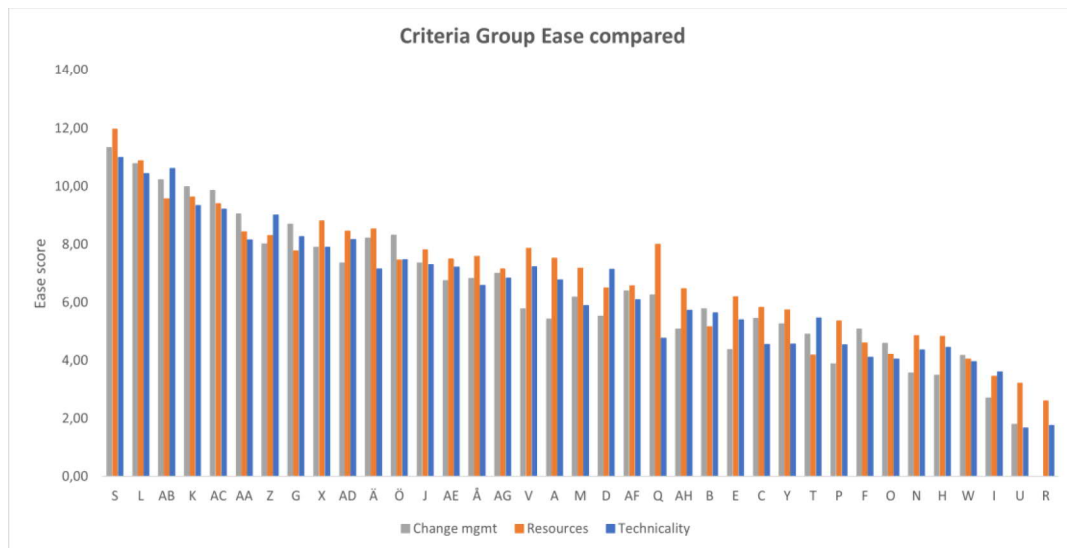


Figure 4.7: Grouped criteria comparisons per supplier

It seems supplier S is best positioned when it comes to integration effort. S also has well balanced capabilities across different groups. Most probably if there would be any problems, they would come from technical considerations. Other suppliers scoring really well on set criteria are L, AB, K, AC, AA, Z and G. One interesting result is with supplier Q; they have above average resources but score below average on technicalities.

4.4.4 Further Considerations

The benefit should not be the main dimension when choosing supplier order for integrations as stated that easier cases give most room for knowledge accumulation. Benefits are obviously important to justify the initiation but in order to get the smoothest first experiences, the least effort needing suppliers should be prioritized nevertheless of benefits. This is why the following suppliers in the right hand side of the matrix, the least effort cases, are chosen for deeper analysis.

The suppliers listed based on least effort are S, L, AB, K, AC, AA, Z, G and X. A more comprehensive review on their capabilities, in addition to the supplier AG, is taken as to compare the suppliers head-to-head and lay the foundation for filling the integration implementation pipeline and hence to contribute for the optimal integration implementation strategy. It is remarkable that not one from the sample of ten had any feedback or concerns to present to UPM. A simple table 4.4 was constructed to compare the supplier

features without the spend consideration covered before.

Table 4.4: Comparison of supplier capabilities

	Mills	Timing	Middleware	Alignment	cXML/https
S	1	Ready	In-house	P/N	Yes
L	1	Ready	In-house	P/N	Yes
AB	10	ERP change	In-house	P/N UoM	Yes
K	NA	Agreeable	In-house	P/N UoM	No
AC	1	Agreeable	In-house	P/N UoM	Yes
AA	2	2025;new ERP	In-house	P/N	Yes
Z	1	2024 changes	In-house	P/N UoM	Yes
G	6	2023 end	OpenText 50%	UoM	Yes
X	1	2024	In-house	P/N	Yes
AG	1	2023 end	LN 69%	-	Yes

All suppliers claimed to be able to digitize the transaction processes and had had B2Bi before but AA, AC and X had not yet established a relationship on SAP BN. SAP BN back-end integration was in place for S, L, K, Z and G. Based on these considerations, the first five suppliers to be proposed for integrations would be S, L, AB, G and AG.

The proposed measures for this list is as follows:

S - Define the documentation scope clearly and align units of measure.

L - Ensure benefits overcome the effort internally, add understanding towards SAP BN integration project, define documentation scope.

AB - Assess how the ERP change affects timing, achieve back-end connectivity, make sure resources (business, ERP) are available, consider toning down the document scope count, align multiple mills and control the complexity.

G - Ensure mill and product number alignment, make sure OpenText with service level of 50% is effective and reactive enough, communicate urgency towards resources and gather learnings from previous B2Bi.

AG - Achieve back-end connectivity, assign a business person from supplier to support the change, gather learnings from previous B2Bi, make LN join meetings and align data based on product numbers and units of measure.

With G and AG, UPM must revise the difficulties in data alignment, making sure that the middleware provider is suitable and to gather learning points from previous integrations as based on the answers, there seems to be some. Also change managerial expectations are to be communicated as to give the suppliers a heads-up on what is coming. It could be said that the more beneficial cases will take a longer time to implement due to their complexity, but the benefits to productivity will be more significant so there is always a trade-off to be balanced when choosing suppliers for network integrations.

The focal company chose to have personalized pre-kick-off meetings as due to the proposition to start covering the main development topics with chosen suppliers. From the list before, it could be justified that interviewing companies help in assessing the possible timelines as to ensure that the proposal made for the focal company is appropriate and nothing else turns out hindering the initiation.

The agenda for the preparative call for alignment (contract owner approvals) is to generally discuss the technical side of the solution, survey answers, implementation timeline and the commitment. More specifically, for AB it means asking how the ERP change affects the project initiation and the potential for achieving connectivity. Further, the allocation and commitment of resources is of importance and which documents would be beneficial to integrate at this stage and on what mills.

4.4.5 Discussion for the Rejected

Based on the study, the focal company was given a proposed order based on their supplier base having columns of ready to integrate and not ready for B2Bi yet. The columns were ordered based on the benefits the company could potentially give. Even with taking into account the whole supplier base sampled, the ones that answered the survey were prioritized because their easiness could be assessed.

The study also gave insights on why a certain supplier should not be integrated now or never. The following comments were given for the suppliers only to be integrated if the business benefits turned out to be way more than the expected effort.

B - Open to discussion but establishing a relationship with SAP BN is needed, along with establishing connectivity. Identified poor engagement

of the business. No specific start time preference due to plans for S/4 HANA implementation project. Currently using outsourced middleware and there is a need to order more. Also, facing problems in including UoM in documents.

AF - The earliest start time would be in 2024. They have experience using a third-party logistic partner that owns/controls ASNs. There are concerns about ensuring data security.

D - Ready to start at the end of 2023 but lacks connectivity. There is a need to engage the business and to resolve the lack of resources. Currently using outsourced middleware and the ASN is controlled by an outside system provider.

Q - No experience and cannot digitize transaction processes. Facing issues with data alignment and no ability to integrate documents through cXML with HTTPS.

AH - There are resources available but no experience and no ability to integrate documents through cXML with HTTPS.

E - Needs connectivity establishment. This would be their first B2Bi project. Their own SAP project is ongoing and will be finished by the end of 2023. They are using outsourced middleware and currently have no ability to integrate documents through cXML with HTTPS.

C - Planning to switch to the new S/4 HANA system, which is not a simple conversion but a complete new system under group supervision for further developments. They also lack the ability to integrate documents through cXML with HTTPS, and some answers are missing.

Y - They require at least six months before starting. System developments are ongoing and data alignment is missing. Logintegra controls ASNs, and SAP BN support is strongly needed.

T - No resources available and plans for start earliest in 2024. Currently working on ongoing projects like SAP HANA and MySales, and using outsourced middleware with a need to order more, which takes approximately six to eight months to get assigned. Data alignment is also needed.

P - Planning to start in 2025, with no prior experience. They require a lot of engagement towards the business. The system has been built inter-

nally and they lack the ability to integrate documents through cXML with HTTPS.

F - Planning to start in 2024, with no prior experience. They have their own ongoing implementation of a new Document management system (DMS). For the order processing, they do not use standard solutions in NAV B.C. and would need to develop a special interface. They are using outsourced middleware and need to order more, with an estimated assignment time of three months. Data alignment also needs to be checked.

The ones not seen applicable for B2Bi and the reason why are given next.

O - Ranked seventh worst in terms of effort. They specifically requested for no integration. They have some experience but are in the process of changing their own ERP environment, with finalization expected in 2024. They are currently using outsourced middleware.

N - Ranked sixth worst in terms of effort. They have some experience and are eager to start, but are lacking in all concrete capabilities.

H - Ranked fifth worst in terms of effort. They have no experience and are planning to start in 2027. They are facing resourcing issues and are currently using outsourced middleware.

W - Ranked fourth worst in terms of effort. They have no experience and are planning to start in 2024. There is a lot of uncertainty in their answers, and they are currently using outsourced middleware.

I - Ranked third worst in terms of effort. They have no experience and have plans for an ERP system upgrade. They are currently using outsourced middleware.

I - Ranked third worst in terms of effort. They have no experience and have plans for an ERP system upgrade. They are currently using outsourced middleware.

R - Ranked as requiring the most effort. They have a preference for starting in 2025 but lack experience. Their own changes in the ERP system are causing delays. They are using outsourced middleware.

Chapter 5

Contributions to the Flight Plan

The flight plan is done to time the integrations and enablements efficiently and is based on the previously done supplier segmentation as to identify opportunities for categories and suppliers. Flight plan considers the readiness and willingness of suppliers to deepen collaboration with UPM as well as the sourcing plan to ensure that also commercial benefits are captured in full. Flight plan defines suppliers to be enabled, used enablement methods and enablement order and allows tracking and reporting progress against plan and the business case.

Business is responsible for creating the flight plan and managing the supplier enablement, project and change management practices. Supplier categorization is achieved by identifying the underlying effort factors and achievable benefits per supplier category. Supplier categorization reflects the desired outcome of the project. With supplier categorization templates adopted per business a flight plan can be created that defines:

Which Suppliers to be enabled for transaction purposes and on what method?

In what order to enable the selected suppliers?

The flight plan must be ensured with assessments of risks and preparation of change management and communication approach; expectation, deadline, incentive, consequence and togetherness (EDICT) (Cooper et al., 2005). After the internal stakeholder hearing, the demand creation is done to reserve IT resources and to calculate estimated costs. Flight plan has to be modified as changes in VMD happen, to get the optimal results.

5.1 Supplier Enablement

Supplier enablement relates strongly to the supplier selection. In supplier enablement the supplier base is onboarded to SAP BN. Technically this means activation of suppliers to transact over SAP BN with UPM which means establishing a trading relationship between UPM and supplier, as well as internal and external change management activities required to reach the commitment and determination to adopt new ways of working. It must take into account that there are several approaches to be agreed and taken based on the case. Executing the supplier enablement activities according to the flight plan can lead to substantial order processing productivity gains. First duplicates and non-active supplier locations are deleted and missing contacts gathered. Then the scope per supplier is set, with respect to the identified complexity. Connections are revised to identify which suppliers transact with which business units, and ERPs. Data collection is done prior to the enablement as not to lengthen the enablement timeline.

Early business level discussions and engagement to provide the integrated supplier with visibility into the future state business process, alignment on scope of spend category, document choreography and SAP BN requirements, procurement content (catalogs, contacts), timing, partnership, expectations and alignment, is very much needed. In addition to preparing resources and exploring the suppliers, realization requires providing the already mentioned architecture flow, functional/technical design document, cXML samples for technical specifications, system transaction validation rules setup, test documents of all types in scope, UoMs, ship- and bill-to IDs, list of incoterms, list of system limitations, custom data extrinsic field on all messages where exists, confirmation on currency and unit price conditions in use, as well as the test plan.

Supplier engagement for digital transactions through contractual terms is mandatory for new suppliers. Clauses for digital transactions are systematically added to contracts during re-negotiations and are available in new contract templates. Line organisation is responsible for implementing the new practice to their processes; request for x (RFx) questions must be included in corresponding templates as default requirements.

5.2 Timing and Risks

Integration project takes optimally 20-32 weeks depending on the scope as in addition to full enablement and onboarding embedded also in portal enablement, there are the integration project, adding about 12-24 weeks together with functional trainings. During implementation, the goal is to enable a sampling of integrated supplier per buy channel, business process, transmission method CIG and transaction type cXML.

Integrated suppliers require additional lead time to plan and staff their resources to support integration in time for the objective of go live. In the run phase, post go live, larger waves than of five suppliers, can be managed at once - given lead time is provided to suppliers. However, this will be affected by the needed legacy considerations and efforts. Also, the vendor and legal entities must be revised. Suppliers may experience long pauses in the midst of the process if quality contact data is not provided up front correctly.

Extended lead times of supplier integration projects could be avoided by following the logic of starting the projects with portal enablement before the integration project to capture benefits quickly. Long lead times in supplier registration may cause a bottleneck for supplier enablement and frustrate stakeholders so high effort must be put on process improvement by managing potential delays with proper flight planning, change management and impact considerations.

Suppliers' technical capabilities to integrate are assessed with this study by identifying gaps in criteria. Also, the complexity, capability and willingness info are important input for prioritization as a pre-study and to supplement the VMD. The study was done as to provide a method to create a plan for strategic supplier outreach and to use the opportunity to define goals and set up a timetable for enablement. Figure 5.1 opens the timeline and steps for the creation of the flight plan.

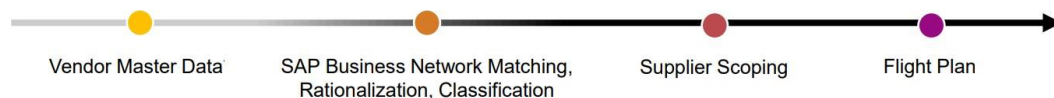


Figure 5.1: Steps leading for the creation of flight plan

The results to the survey showcased lack in business role sharing. Therefore, supplier ought to assign at least a clear project lead, connectivity expert, doc-

ument mapping expert and testing contact to ensure understanding, back-end connection, integration and data mapping, document failure troubleshooting and confirming test plans and validating transactions plus coordinating go-live. Supplier data validation consists of data cleansing, gathering (accounts payable and procurement systems), scoping, and connections.

One significant factor for varying integration times is the complexity of the integration itself. Integrating complex systems that have multiple dependencies and intricate data mapping requirements generally takes longer than integrating simpler systems. The integration process is also influenced by the systems being integrated. Outdated or systems with limited APIs may require more manual work and custom development, resulting in longer integration times.

Additionally, the availability of resources plays a crucial role. Organizations with limited resources or budget may experience longer integration timelines as they prioritize other activities or face constraints in allocation. Proper testing and debugging are essential stages of the integration process, and the time required for these tasks can differ based on the quality of the code and the thoroughness of the testing procedures. Changes in requirements can significantly impact the integration time. If there are mid-way alterations, the integration process might need to be restarted, resulting in delays and extended timelines. Moreover, third-party dependencies, such as third-party APIs, can also elongate the integration process.

5.3 Proposed B2Bi Waves

First, I identified which suppliers to be enabled on the network with transaction method B2Bi. Now, the initial plan for first groups of suppliers for outreach and enablement (wave approach) can be done. Technical readiness confirmation as well as other considerations were assessed through the survey to ensure suppliers' ERP system can be integrated with SAP BN. As there should be a maximum of five integrations simultaneously in the pipeline, defined by SAP, the following order is proposed based on the survey answers.

Waves

1st: S, L, AB, K, AC

2nd: AA, Z, G, X, AG

3rd: AD, J, AE, Å, V

4th: A, Ä, Ö, M, B, (optionally also H, AF)

There is high variance with suppliers’ maturity. Before contacting the suppliers however, the business level discussion and KPI agreement has to be done to confirm the suppliers and complete the segmentation logic.

5.4 Supplier Selection Logic

Integrated suppliers typically represent the bulk of transaction volumes and are the key to unlocking adoption goals and realizing the automation benefits quickly. The focus in this study was mainly guided towards suppliers with previous experience. According to SAP professional, flight planning can have two dimensions. Either the focus can be on on business processes, document types and differences between processes in buyer/supplier geographical plant locations or on document count and spend data. The latter was chosen for this study and supplier analysis conducted based on the results. The solution utilized segmentation to the benefit versus efforts shown in figure 5.2 as to distribute the suppliers to waves for B2Bi.

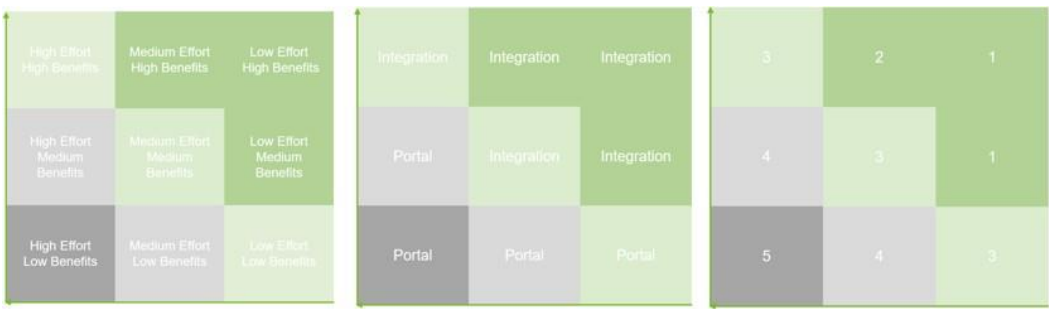


Figure 5.2: Supplier segmentation approach

The suppliers can be divided based on the matrix to categories for the enablement plan to follow accordingly. Figure 5.3 shows in more detail how the enablement plan can be set based on the supplier positioning in the matrix.

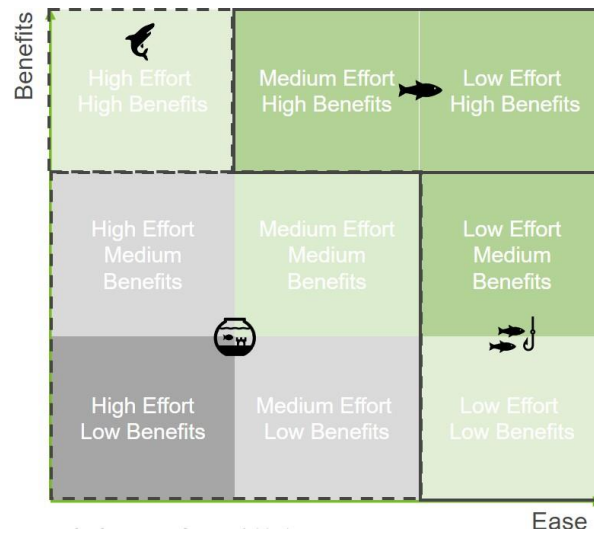


Figure 5.3: Placement in matrix effect to strategy

The global suppliers, *the big fish*, have to be coordinated centrally as to handle the complexity, however there are only a few and the benefits due to the size of the business are extensive. Regional priorities, *normal fish*, are integrated in cases of high-volume and/or high benefit supplier case-by-case as their size is relatively big, quantity low and complexity something in between. Regional, *low-hanging fruits*, are to be primarily done with portal and mass enablement approach. However, some chances for B2Bi may exist and should thus be screened. This enablement should be started with least complex cases with low levels of change impact needed; identification of such suppliers can be done by their small size, high quantity and low complexity. New suppliers, *the bowl*, are given the opportunity to choose, but most likely, due to the lack of experience in transacting with them, are to be corporated first with portal. Their features like size and complexity alters but the expected quantity is high due to the changing market conditions and increased competition.

From the figures alone, it is obvious that most focus should be with the top right quadrant suppliers (small number and indicated as integration), the regional priorities, as these cover most of the transaction volumes. Global suppliers are treated as a strategic business partners and the strategy and approach for e-collaboration is designed and agreed mutually with the aim to agree an approach that can be rolled out globally, still considering the local requirements. Enablement method is agreed with the suppliers depending on their willingness and ability. As could be seen from the results of the

analysis, suppliers could be categorized based on the matrix to complex big players, easily enableable, not to be integrated now or never and everything in between. There is operational and commercial readiness in supplier base that has to be assessed to introduce suppliers for B2Bi with confidence. The main to do list after the analysis includes;

- E2E business process review and agreement upon with each supplier
- Addressing commercial contract aspects
- Addressing logistical and warehouse impacts
- Addressing plants and/or material specific variants
- Agreeing upon operational details

Chapter 6

Evaluation and Discussion

Because the B2Bi projects take vast amount of time, the implications of this study will remain unknown until the suppliers are enabled and there are available data on the integrated suppliers to be compared to the study findings. It would be interesting to see how a chosen supplier for the four first waves would differ in integration timelines and challenges faced to a supplier that was not chosen or that was advised not to be integrated. Further, also worthwhile would be to compare the complexity of the business to the time taken to integrate.

The method of benefit-to-effort matrix was chosen for flight plan supplier selection but there remains some open questions on whether the matrix should have been supplied with further considerations such as SAP BN complexity index, or potential for commercial or relational benefits through automation. Further, it is debatable whether the benefits and the effort score chosen criteria had all the most suitable selected variables.

6.1 Limitations

The applicability of the study is hindered due to the small batch of suppliers that took the survey, meaning that in the initial sample, there should be even more potential suppliers to be integrated. If all answered the survey or the survey would have been sent to a bigger group, how would have the results changed? Moreover, if there was no imply for the preference of the start time, would more progress among those that left the study at 37% exist? The hypothesis for this would be that in case of more responses, there would have been even more suppliers to integrate, found from the "good groups" as the suppliers approached were sampled carefully.

One noticed limitation of this study is the sole focus on project management and not on how the categories support it with processual and operative vendor relation management. Even though the collaborative initiatives were asked in the survey, category management most likely has some input to give about whom should be integrated based on the history and therefore the proposed listing must be gone through one by one which hinders the potential to use the method proposed alone. Also mill personnel are needed to ensure appropriateness of the selection. As the criteria used for supplier selection is objective, it has to be extended with background stories and considerations of how the globality of the business affects the implementation.

Selection has to go through various approval rounds, as for example, one company that was proposed for the selection, will be phased out shortly and the business awarded to another supplier even after decades of big volumes. These considerations could not be included in the analysis as the supplier base changes yearly, quarterly or even monthly. After discussing the suppliers selected with category managers, it became evident that also categorization by products could be useful. This means that it is not sensible for integrating all suppliers from same product categories, even if proved to be the most attractive ones, but first only one to two the most strategic ones per material group.

Analysis was done on UPM approved metrics; results change if benefit is revised or other criteria considerations are put to dominate. However, based on the analysis, there is confidence that the questions and criteria chosen do describe well the needed capabilities from different angles. It will prove interesting to see how the project proceeds as there are significant differences between BAs and whether the solution presented in this study will be adopted to other areas as well with areally refined or added questions.

6.2 Future Research

Scientists, academics and sourcing professionals could have interest in the topic. The applicability of the study is refined as it focuses on a selected set of suppliers in paper industry DM but room for application in other industries does exist. Automatically copying benefits or successes is not possible, however according to Gadde and Snehota (2000) common similarities and guidelines do exist. Even though the study is conducted as a limited case study, it is worth doing, as it helps in planning an implementation of many projects and accumulates knowledge across stakeholders.

Areas for future research for supplier selection in context of B2Bi most likely includes themes of multihoming, advanced data analytics (ML, predictive analytics), SC resilience, sustainable and ethical sourcing, innovations, blockchain, internet of things (IoT), logistic regulatory requirements, globality and reshoring and nearsourcing trends. In addition to the listed themes, suppliers' role as end users will most likely be of increased importance due to how change managerial considerations' importance dominated when comparing different kinds of capabilities.

One interesting continuation for the research would be to find the best motivators. Could the enablement process be aided the best with e-collaboration discounts to motivate embracing collaboration and overcoming potential obstacles during integration process (Nurmilaakso and Kauremaa, 2012)? Or similarly, Terpend and Krause (2015) would the best approach be promoting contract renewals, additional business opportunities, and increased purchase volumes? Considering the dynamic nature of the solution, it is more likely that cooperative incentives like joint training, support provision, and sharing of cost savings work the best.

Chapter 7

Conclusions

The supplier's products or services should be compatible with the existing systems or platforms that need to be integrated. This ensures that the integration runs smoothly and there are no compatibility issues. The supplier should also have the necessary capabilities. They should be able to adjust their processes to meet the specific integration requirements of the focal organization. The supplier should be responsive and available to provide support when needed. Ideally they would also have experience from B2Bi or at least nothing hindering the technical implementation initiation. All of these critical listed criteria have to be ensured before choosing a supplier for B2Bi and even more can be introduced if needed. Also, the level of the cooperation has to be revised with considerations of what is the best enablement method according to the nature of the business. Further, even if a supplier is very important to the customer the business criticality vice versa has to be ensured with the help of the stakeholders.

It is crucial to establish realistic timelines that consider the complexity of the integration, the required resources, and any potential challenges that may arise. Prioritizing suppliers helps in saving resources and achieving the expected goals on time. By identifying task dependencies and ensuring they are completed in the correct order, organizations can streamline the integration process and allocate resources effectively. By including stakeholders in the planning phase, organizations can identify their requirements, expectations, and potential roadblocks. This early involvement ensures alignment and proactive problem-solving, minimizing delays during the integration.

Proper change management is a key success factor. Business stakeholders must be engaged through active involvement in the project work such as identification and validation of business-specific use cases, testing, supplier

identification, supplier communication and engagement. Project approach should be reviewed and validated with the business stakeholders. If there are needs for adjustments based on their feedback, those proposals should be carefully considered. Storytelling skills are needed internally and when communicating the urgency and expectations outside.

Agile methodologies, such as Scrum or Kanban, provide frameworks for managing the integration process effectively (Rosenberg et al., 2020). Breaking down the integration into smaller, manageable tasks allows for shorter iterations, early issue identification, and prompt resolution. Agile methodologies promote adaptability, collaboration, and continuous improvement throughout the integration process (Patcha, 2009; Schubert et al., 2023). The progress must be monitored and risks handled using a RACI model or similar (de Man and Arica, 2019).

By first selecting the suppliers right and then incorporating these strategies into the integration process, organizations can optimize the timeline, reduce delays, and achieve successful integration of complex systems. What is known is that the more beneficial cases will take a longer time to implement due to their complexity, but the benefits to productivity will be more significant so there is always a trade-off to be balanced when choosing suppliers for network integrations (Samtani, 2002).

As a result of the analysis, UPM may give instructions and communicate their doubts for the suppliers, and create a justified prioritization order. The focal company ended up benefitting from the method by using the proposed suppliers on flight planning, timing and grouping B2Bi suppliers and started the work by mapping the respective affected mills and processes. They also decided to start simple and move onto more complex cases later as suggested (Sarkis and Talluri, 2002). Integrated solution enable suppliers to automate their order processing activities and gain efficiency benefits. But commercial benefits are not realized automatically, requiring strategic planning and right decisions and actions from contract owners.

The main findings include that the most effort as it is, should be guided towards developing change management practices. I also found that gathering data and plotting suppliers into a matrix to create a segmentation works in selecting appropriate suppliers for B2Bi projects. The prerequisites and criteria setting that make a supplier suitable or attractive for integration initiation can vary but the questioned input is scalable to other areas as well when paying respect to taking area specific nuances, mutual alignment and

processes into account. The study method can be used as a prediction tool to state which supplier integrations will run smoothly and stay in timelines and which will introduce stress and delays and based on which findings.

Due to the sample size a clear identification of commonalities of the best suppliers and their contributing features could not be done, but the quadrant model ensures that the capabilities of the suppliers match and the ones to be integrated are on sufficient level. The contribution is the method used in this study that allows devising an ideal supplier selection process and timetable for integration projects. Future research should focus more on how to ensure ongoing maintenance as due to the result of having to work most on change managerial aspects in the shape of joint trainings.

The strengths of using the benefit-to-effort matrix approach for supplier selection is that it is simple if one possesses the needed procurement data. The matrix enables comprehensive and objective evaluation and helps in identifying suppliers that offer the highest value for integration projects to support strategic decision-making in supplier selection. This approach is suitable for integration projects as it allows using multiple criteria and tweaking their significance with different emphasis. Based on the literature review and supporting evidence, the benefit-to-effort matrix is the most suitable choice in this context for comparing suppliers head-to-head and selecting them for integration projects. The method can be used for making forecasts about the timing as well as the success of B2Bi.

The conclusions drawn from the analysis offer valuable insights into optimizing supplier selection and integration processes for B2Bi projects by ensuring compatibility, and supplier capabilities like stakeholder involvement, resources, and change managerial practices. Employing the methodology of data gathering and supplier segmentation aids in selecting appropriate suppliers for B2Bi projects. In summary, by carefully considering multiple criteria and analyzing the supplier base against, organizations can streamline integration processes, maximize efficiency, and achieve successful B2Bi supplier integrations.

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Appendix A

Common Terms and Explanations

FO - Framework Order is a procurement document utilized to purchase materials from external suppliers with extended delivery dates. It can be used when suppliers are unable to confirm delivery times for frequent deliveries.

GOA - Global Outline Agreement is a procurement document negotiated between a strategic purchaser and a vendor to establish the terms of the agreement between the two parties.

ASN - Advanced shipping notice is a document that notifies the customer about the shipment and provides information about its characteristics so that the customer can prepare to receive it.

Call-off - refer to standard Purchase Orders that the buyer creates in accordance with UPM Scheduling.

OC - A Purchase Order Confirmation is a confirmation from an external supplier indicating their agreement to deliver a specified quantity of goods at a specified price within a specified timeframe.

Consignment Withdrawal - is a process where the buyer transfers ownership of goods from consigned stocks to their own through a transfer posting in SAP.

Consignment Settlement - is a process where the buyer creates a consignment settlement invoice based on the material document generated by the consignment withdrawal.

The Return Process - is a business process that involves returning goods to the vendor and receiving credit for the returned items. The process can be managed with or without a delivery reference to a return PO or an existing PO.

SAP Business Network (previously Ariba Network) - The SAP Business Network is a cloud-based collaborative B2B platform that allows for managing interactions between buyers, vendors, and other partners involved in procurement and selling flows.

Ariba Network - Ariba Network is a hosted service that connects suppliers to buying organizations, allowing them to conduct transactions over the internet.

SCC - Supply Chain Collaboration encompasses a set of collaborative processes and functionalities associated with direct supply chain events within the SAP BN.

A Return PO - also known as a Rejection Purchase Order, is used to return goods to the supplier due to defects noticed during production, quality checks, or issues with the stocked quantity, after they have been inwarded in the system.

A Credit Note - is a financial document sent by a supplier to a buyer, indicating that a certain amount has been credited to the buyer's account.

A Line Item Credit Memo - is a financial document used for receiving credit for a specific returned line item from a supplier.

SAP Business Network PunchOut catalogs – A consumer-like shopping experience that lets customers select purchases from a customized, shopping cart-enabled website. SAP Business Network PunchOut acts as a connector that bridges e-commerce domain with the SAP Business Network interface.

Supplier Selection Logic - The process of identifying which suppliers to enable and what order and grouping to enable them. Supplier flight plan is the output.

Supplier Enablement - The process of “enabling” suppliers to transact electronically, then making sure that they continue to do so.

Appendix B

Interview Structure and Questions

Opening

Introduction for both parties

Brief to topic and background

Ask if it is allowed to record the interview

Interview

1. Who are you and what is your current role?
2. What was your role in the B2Bi? Has there been previous projects?
3. How do you feel the B2Bi went and how big of a project was this to you?
4. What were the main challenges?
5. What changes had to be done for the solution to work?
6. What do you think of the timing of the overall process?
7. Did you have clear responsibilities from the start and where there communication issues between layers?
8. How was the urgency communicated and what are the recognized benefits?
9. What are the key takeaways and success factors from the project?
10. How could have UPM made the project even smoother for you? Anything else, you want to mention?

Closing

Short interview recap to ensure there are no misconceptions

Next steps: how the study will use the gathered data

Thank you's and closing the call

Appendix C

Supplier Survey Questions

1. Supplier in numbers

- 1.1. Company Name:
- 1.2. For how many years has your company been co-operating with UPM?
- 1.3. Please estimate your company's annual turnover (in euros):
- 1.4. How much of your company's turnover comes from UPM (in euros)?
- 1.5. What percentage of your business unit's turnover comes from UPM?

2. Cooperation with UPM

- 2.1. Please list your main point of contact at UPM:
- 2.2. Please list business areas where you deliver goods to UPM:
 - 1. Biochemicals 2. Paper 3. Pulp
 - 2.2.1. Will you deliver goods to UPM Biochemical plant (start-up in 2023)? To which plant will you deliver? How many times in year do you assume to deliver there?
 - 2.2.2. To which UPM Paper plant do you deliver goods?
 - 2.2.3. To which UPM Pulp plant do you deliver goods? To which plants do you deliver? How many times in year do you deliver there?

3. Current processes

- 3.1. Which data are you expecting to receive from UPM to plan better you production?

3.2. On a scale of 1-5, how smoothly is your company able to plan its production based on the Purchase Orders received from UPM? (1 = With difficulty, 5 = Very easily)

3.2.1. Please describe your planning difficulties:

3.3. Do you provide Order Confirmation after Purchase Order received?

3.4. Do you provide Advanced Shipping Notice when informing the Buyer when the goods will be delivered?

3.4.1. What kind of data do you provide in Advanced Shipping Notice?

3.5. In what way do you provide invoices to UPM?

3.6. On a scale of 1-5, how satisfied are you with current invoicing process with UPM? (1 = Very unsatisfied, 5 = Very satisfied)

3.6.1. Please explain why you are unsatisfied:

3.7. Would you be interested in sending invoices via SAP Business Network?

4. SAP Business Network - portal

4.1. Is your company already registered on the SAP Business Network?

4.1.1. Please provide your SAP Business Network ID which you are going to utilize for transactions with UPM and account administrator:

4.1.2. How do you prefer to manage your SAP Business Network account in case of multiple vendor numbers?

4.1.3. Do you already cooperate with UPM via SAP Business Network?

4.1.4. Please indicate how many people process these documents in SAP Business Network in below areas (if applicable):

1. Purchase Order 2. Order Confirmation 3. Advanced Shipping Notice

4.1.5. Do you have any experience with Supply Chain Collaboration module?

4.1.6. What kind of documents are you currently exchanging using SCC module?

4.2. What kind of documents do you find beneficial to collaborate with UPM via SAP Business Network?

5. SAP Business Network - integration

5.1. Do you have IT resources to start the integration project between your ERP and SAP Business Network?

5.2. Which ERP system does your company use?

5.3. Do you have technical capabilities in order to connect your ERP with SAP Business Network?

5.4. Is your back-end system able to produce Order Confirmation messages that might be utilized with UPM?

5.5. Is your back-end system able to produce Advanced Shipping Notice messages that might be utilized with UPM?

5.6. If you send documents in digital format (e.g., EDIFACT, cXML), do you use third-party IT company provider?

5.7. Is your company interested in integration of your ERP with SAP Business Network?

5.7.1. What kind of ERP documents would you like to integrate with SAP Business Network and UPM?

6. Awareness of change

6.1. Does your company have experience in the automation of the transaction processes?

6.2. In what way or to which direction would you like to develop your business relationship with UPM?

6.3. Do you have other feedback or topical issues you would like to bring to UPM's attention in terms of transacting?

6.4. Do you use other platforms for transacting with other buyers?

6.4.1. What is this other platform and what kind of benefits does it provide?

7. Main contacts

7.1. To ensure more efficient start, please provide us with the contact details of these process owners who could be part of this project.

1. Finance 2. IT 3. Logistics

7.2. Please nominate someone with whom we can discuss the deployment of SAP Business Network Supply Chain Collaboration. SCC Contact

Appendix D

Additional Survey Questions

1. Supplier info

1.1. Company name:

1.2. Respondents and titles:

1.3. UPM mills supplied:

1.4. Have you had prior common IT development projects with UPM?

1.4.1. If yes, how well did it go from 1-5?

1.5. Do you have experience with SAP Business Network?

1.5.1. If yes, have you already established a relationship on SAP Business Network?

1.5.2. If yes, how well (1-5) do you understand the SAP Business Network integration process?

1.5.3. If yes, is your back-end already integrated with SAP Business Network (connectivity achieved)?

2. Business and processes

2.1. Have you assigned a business person to adopt, communicate, and support the change in an integration project?

2.1.1. If yes, who is this assigned business person and what is his/her title?

2.2. How well (1-5) can you allocate business personnel for an integration project?

2.3. Do you have a pre-defined escalation pathway towards your ERP/Middleware resources in case a certain phase of a common project gets delayed from the agreed blueprint timelines?

2.4. Do you have (or have you had) Business-to-Business integration before?

2.4.1. If yes, how well did the integration implementation go from 1-5?

2.5. Is your system automatically triggering invoice processes at any point of the transaction processes?

2.6. Do you offer IT services (e.g. RFID or PIDT) for your customers to track and/or expedite deliveries from you?

2.7. Are you able to digitalize the transaction processes now run manually?

3. Resources and availability

3.1. Please specify your preference for the start time of the integration project.

3.2. Are you planning any system developments that might affect the initiation of integration project?

3.2.1. If yes, please describe the schedules affecting initiation of integration project.

3.3. Are there any other known reasons why standard implementation timeline (couple of months depending on the documents to be integrated) would be exceeded?

3.3.1. If yes or not able to answer, please describe the expected reasons for exceeding integration implementation standard timelines.

3.4. How well (1-5) can you allocate ERP IT team/personnel for the integration project?

3.4.1 How quickly (1-5) does your ERP IT team/personnel react to solve the requests presented?

3.4.2. How well (1-5) is your business able to communicate and get the wanted results from your ERP IT team/personnel based on your experience?

3.4.3. Is there a need to order extra ERP IT team/personnel resources?

3.4.3.1. What is the usual timeline to get your ERP IT team/personnel assigned to the project? Please describe the schedules.

3.5. Do you use an outsourced Middleware provider or do you have in-house Middleware resources?

3.5.1. In case of an outsourced Middleware provider, which outsourced Middleware provider are you using?

3.5.2. In case of an outsourced Middleware provider, what is the service level agreement with the outsourced Middleware provider?

3.6. How well (1-5) can you allocate Middleware personnel for the integration project?

3.6.1 How quickly (1-5) do the Middleware personnel react to solve the requests presented?

3.6.2. How well (1-5) is your business able to communicate and get the wanted results from the Middleware personnel based on your experience?

3.6.3. Is there a need to order extra Middleware resources?

3.6.3.1. What is the usual timeline to get the Middleware personnel assigned to the project? Please describe the schedules.

4. Technical implementation

4.1. Are you able to revise and align your product data based on UPM product number?

4.1.1. If yes, are you able to include UPM product number in all the documents to be integrated?

4.2. Are you able to revise and align your product data based on UPM Units of Measure (UoM)?

4.2.1. If yes, are you able to include UPM Units of Measures in all the documents to be integrated?

4.3. Are you able to integrate documents through cXML with HTTPS?

4.3.1. If yes, are you able to produce the following messages from your back-end system that can be translated to cXML format and sent to SAP Business Network through HTTPS protocol? Please select all that apply.

Order Confirmation (OC)

Advanced Shipping Notice (ASN)

Invoices (IV)

4.3.1.1. Are you using a third party logistic partner that owns/controls Advanced Shipping Notices (ASN) or order tracking?

4.3.1.1.1. If yes, please specify who controls your Advanced Shipping Notices (ASN) or order tracking.

4.4. Are you able to receive a message to your back-end system from SAP Business Network?

4.4.1. Are you able to receive the following messages to your back-end system?

Purchase Order (PO) and/or Scheduling Agreement (SA)

Consignment stock movement message

Goods Receipt (GR)

4.4.1.1. If Purchase Order (PO) and/or Scheduling Agreement (SA) is selected, are you able to receive the following messages to your back-end system?

A multiple line Purchase Order (PO)

Purchase Order (PO) change message

4.4.1.1.1. If A multiple line Purchase Order (PO) is selected, are you able to store the Purchase Order (PO) line numbers?

5. Feedback

5.1. Do you have any questions, concerns or feedback at this point you would like to present to UPM?

5.1.1. If yes, please describe.

Appendix E

Table Opened

Research Question	Sub-questions	Criteria	Related survey answers
How to devise an ideal supplier selection process and timetable for integration projects?	What criteria (technical, procedural, and organizational competencies, assets, and levels of maturity) has to be satisfied when choosing suppliers for integration projects?	Having an assigned business person on supplier side	Assigned business person to adopt, communicate, and support the integration
		Having an escalation pathway for ERP/Middleware	A predefined escalation pathway towards ERP/Middleware resources in case a certain phase of a common project gets delayed from the agreed blueprint timelines
		Ability to digitize processes	Automatic triggering of invoice processes during transaction processes Offering IT services related to orders Ability to digitalize the transaction processes now run manually
		Proper communication and reactivity of stakeholders	Reaction time of ERP/IT personnel to solving requests Ability to communicate and get results from ERP/IT personnel Reaction time of Middleware personnel to solving requests Ability to communicate and get results from Middleware personnel
		Experience in IT development, B2Bi, or SAP BN	Had prior common IT development projects with UPM Experience with SAP Business Network Previous Business-to-Business integrations
		Available business, IT and middleware resources	Availability to allocate business personnel for integrations Availability to allocate ERP IT personnel for integrations No need to order extra ERP IT personnel resources Availability to allocate middleware personnel for integrations
		Technical ability to integrate documents	Ability to revise and align product data on UPM product number Ability to revise and align product data on UPM UoM Ability to integrate documents through cXML with HTTPS Ability to receive a message to back-end system from SAP Business Network
		Interfaces and outsourced resources cause delays	Outsourced Middleware resources Third-party company owning ASNs or order tracking
	Which best practices should be followed in timing the suppliers for an effective implementation timeline?	System developments or ERP changes cause delays	Planned system developments affecting initiation Other reasons for exceeding standard implementation timeline
		Integration initiation time preference far in future	Start time preference for the project

Figure E.1: The survey connection to theory and methods

Appendix F

Plots

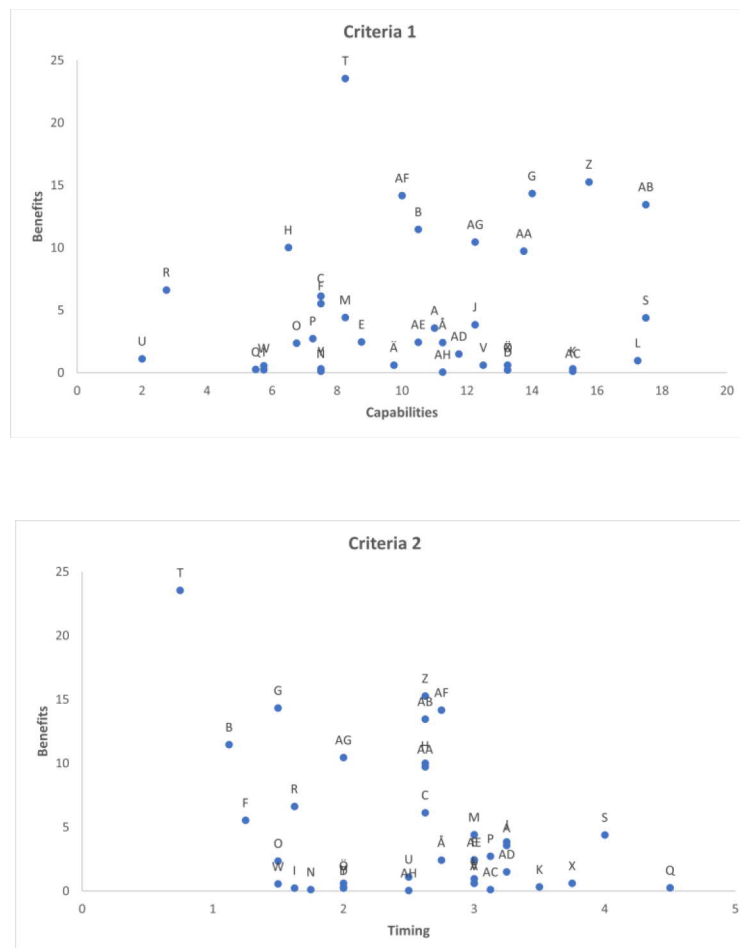


Figure F.1: Plots of hypotheses testing