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**Master thesis**

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**Design and implementation of a supplier portal using an empirical snapshot**

Case example of Case Company

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**Abstract**

Several firms have recognised the importance of embedding supplier portals and e-procurement systems in their processes. However, many companies are also unsure about how to apply such a system and which functionalities to select. This research gives insight in the current application of e-procurement systems and supplier portals in the market. An empirical snapshot is captured by conducting interviews with procurement employees of companies, as well as analysing online information. Through the snapshot, insights are provided into the companies' objectives and functionalities of their supplier portals, as well as the accompanying risks and critical success factors for successful implementation. Through analysing the correlations between objectives and combined company functionalities, a framework is proposed. The framework suggests whenever having specific objectives for a supplier portal, certain accompanying functionalities should be selected. To apply the framework, a case company is used.

*Keywords:* e-procurement; supplier portal; framework; case study; e-sourcing; e-informing; e-ordering; supplier relationship management.

**Management summary**

The case company for this research is Case Company. Due to Case Company's goal of improving cooperation between several Case Company locations spread out over Europe and its wish to automate and standardise work methods, the company is looking at implementing a supplier portal.

To do so, information was gathered through a literature research regarding the functionalities that a supplier portal can possibly include. Next to this, through conducting interviews at different companies and analysing public information about supplier portals, an empirical snapshot was captured of how other companies have applied a supplier portal. In this snapshot, information was gathered regarding the objectives companies had for implementing a supplier portal, the functionalities, critical success factors for implementation and risks that occur with using a supplier portal.

Before going further into designing a supplier portal, Case Company's current work methods and procurement processes are analysed by conducting interviews with employees. Through these interviews, several small problems are identified, which all have same core problem: a high degree of decentralised information and communication, together with unstandardised and manual processes. Therefore, improvement potential is identified, which could be seized by implementing a supplier portal, so that information could be centralised, and work methods could be automated and standardised.

In order to capitalise on this improvement potential, functionalities for a supplier portal should be selected. For this, a framework is built, using the information gathered in the empirical snapshot. By analysing correlations between objectives of companies and the functionalities that are combined, a framework was posed, as shown in Table 1. Meaning, whenever a company has a certain objective (X), functionalities (Y) should be included.

Table 1 - Functionality selection framework

<b>Objective (X)</b>	<b>Functionalities (Y)</b>
Efficiency improvement & cost reduction through automation.	Supplier registration, qualification, certification, e-invoicing, supplier self-service. <i>Optional: logistics, communicate POs, catalog buying.</i>
Send POs & receive order confirmation. Easy invoice & payment processing.	Communicate POs, e-invoicing, supplier self-service.
Centralising and standardising sourcing functions.	Supplier registration, qualification, e-tendering, communicate POs, catalog buying, reverse auctioning.
Centralising supplier information and processes.	Supplier registration, vendor rating, supplier collaboration & innovation tools. <i>Optional: sharing of technical drawings, complaint communication.</i>
Improving compliance of processes.	Supplier registration, qualification, certification, e-tendering.
Increased shared-data visibility in the supply chain.	Vendor rating. <i>Optional: complaint communication.</i>
Supplier collaboration & supplier development programs.	Supplier collaboration & innovation tools, vendor rating. <i>Optional: sharing of technical drawings, complaint communication.</i>

Through the interviews with Case Company senior management, its objectives for implementing are identified, and are fivefold:

1. To automate and standardise processes
2. Identify supply problems
3. Improve process compliance
4. Increase document and payment processing efficiency
5. Realise a centralised communication platform

These five objectives are then compared to the objectives shown in the functionality selection framework. Through this, functionalities for Case Company's supplier portal could be selected, and are shown in Figure 1 below.

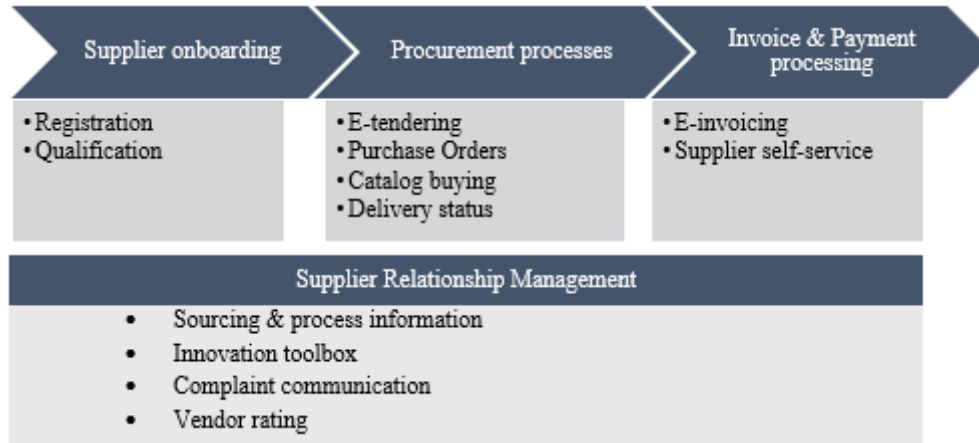


Figure 1 - Case Company functionality selection

After the functionality selection, recommendations for the implementation of the supplier portal are given, using information about the risks and critical success factors companies indicated in the empirical snapshot. It is important for Case Company to firstly segment the supplier base and create a time planning regarding which suppliers should adopt the portal at a certain time period. Next to this, Case Company should focus on convincing suppliers to use the portal and embed it in their processes. It is also vital to provide trainings for employees of Case Company and its suppliers, to deal with suppliers that do not possess the technological readiness or capabilities and to ensure that employees can extract the maximum from the possibilities the supplier portal provides.

To conclude, the implementation of Case Company's supplier portal will lead to efficiency improvements, as employees spend less time performing manual actions and can focus more on activities that are value-adding. Supply chain accuracy will be improved too, through that more and more accurate information is available. The document and payment processing will go more smoothly and quicker, and process compliance will improve. The supplier portal will provide a centralised communication platform between all production locations of Case Company and its suppliers.

**Preface**

This master thesis is the final step in obtaining my degree in Business Administration at the University of Twente. I could never have performed this assignment without the help of my colleagues. There are countless people that have contributed and helped me with the analysis of the. Therefore, I would like to take this opportunity to thank everyone at Case Company that has been involved in the realisation of this research.

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I am excited to see what the future brings me. I am proud to present the results of my graduation assignment and hope you will enjoy reading it.

Tom Snijders

Tubbergen, 2019

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**List of Abbreviations**

CoMaS	Contract Management System
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
ITT	Invitation to Tender
KPI	Key Performance Indicator
MRO	Maintenance, Repair and Overhaul
MRP	Material Requirement Planning
PO	Purchase Order
PR	Purchase Requisition
RFI	Request for Information
RFQ	Request for Quotation
RFP	Request for Proposal
SLM	Supplier Lifecycle Management
SRM	Supplier Relationship Management

## 1. Introduction: Case Company and its wish to implement a supplier portal

### 1.1. E-procurement systems: digitising and automating the procurement process

In recent times, the procurement organisation within companies has grown towards a more strategic position in companies.<sup>1</sup> Companies recognise that having an excellent procurement organisation can result in gaining a competitive advantage. Typically, over 60% of the turnover is spent on purchasing, which indicates that its role should be considered of strategic importance, as value can be created through procurement, as well as significant cost reductions.<sup>2</sup>

The standard purchasing process includes six steps, as described by Van Weele in Figure 2.<sup>3</sup> Firstly, the specification of the internal demand must be identified, regarding product requirements, type and volume. Then, the right supplier must be selected to order products at. After a tender process, offers are evaluated and the best supplier is selected. The logical next step is to negotiate a contract with the selected supplier. These first three steps can be defined as the tactical purchasing process, after which the operational purchasing process is set into motion. In the fourth step, order routines are established, resulting in the ordering of the products, through sending a Purchase Order document to the customer. The agreement and the orders are then monitored, regarding the status of the order, as well as the verification of the received invoices. The last step is after-care, in which suppliers are evaluated, claims are handled, and contract problems are settled.



Figure 2 - Purchasing process, according to Van Weele (2005)

This all-encompassing process is time- and cost-intensive, which indicates that it is important to have excellent processes and methods in house to gain a competitive advantage. To improve these purchasing processes, e-procurement systems have been applied and implemented over the last decade, which result into automation and digitisation of the purchasing process. Presutti (2003) described e-procurement simply as a “technology

<sup>1</sup> See Monczka, Handfield, Giunipero, & Patterson (2009), see p. 6.

<sup>2</sup> See Mohr (2018), p.18, Deloitte (2016).

<sup>3</sup> See Van Weele, (2005), p. 19.

solution that facilitates corporate buying using the internet”.<sup>4</sup> This indicates that e-procurement would only be good for ordering products and goods at suppliers and the processes that are linked with that. E-procurement is broader than this. Croom and Brandon-Jones (2007) refer to e-procurement as the “*use of integrated (commonly web-based) communication systems for the conduct of part or all of the purchasing process; a process that may incorporate stages from the initial need identification by users, through search, sourcing, negotiation, ordering, receipt and post-purchase review.*”<sup>5</sup> Caniato et al. (2011) agree with this definition, as they conclude that e-procurement includes most (if not, all) steps of the purchasing process, and the mechanisms that register receipt and trigger payment.<sup>6</sup>

## **1.2. Case company Case Company: description of the company and its procurement organisation**

The case company for this research is Company. Case Company has the wish to design and implement a supplier portal, which is a type of e-procurement system. Before going deeper into Case Company’s wish for a supplier portal, a description of the company and procurement organisation will be provided.

Case Company was founded in X and has since grown to an international company located in over multiple countries in Europe, with a reputation for high quality and innovation. Spread over these countries, it has over 5000 employees, with a turnover of 1.6 billion euros. Outside Europe, Case Company is using license holders, distributors and agents for the sale of its products. The goal of the company is to improve cooperation between the Case Company locations spread over Europe. Currently, each Case Company location has its own way of working and own methods to reach their specific company targets. Through new methods, Case Company tries to centralise its information and decision making, next to standardising work methods, to create uniform processes for all locations.

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<sup>4</sup> See Presutti Jr. (2003), p. 221.

<sup>5</sup> See Croom & Brandon-Jones (2007), p. 2.

<sup>6</sup> Caniato, Longoni, & Moretto (2011), p. 938.

This process of centralisation and standardising is also applicable to Case Company's procurement processes. Its procurement organisation is shown in Figure 3. Case Company's Group Procurement Director manages several procurement functionalities, spread over 31 employees. Case Company has split up responsibilities for procurement in Europe into three different categories for the European Category Leaders: raw materials, components & MRO and indirect procurement. These categories consist of ten specific (material) groups. Each Category Manager is responsible for an individual group. They manage the entire strategic sourcing process of their respective material: selecting suppliers, negotiating and contracting. The two Procurement Managers are responsible for managing the operational purchasers for materials (i.e. stock materials) for the production locations in either country in Western Europe or Eastern Europe. This order placement is done on an operational level (marked in dark blue) by the Territory Buyers and the Supply Planning Coordinators. In total there are 13 operational buyers. The entire procurement process is supported by six Process Support Coordinators, which support procurement employees, but also improve purchasing processes.

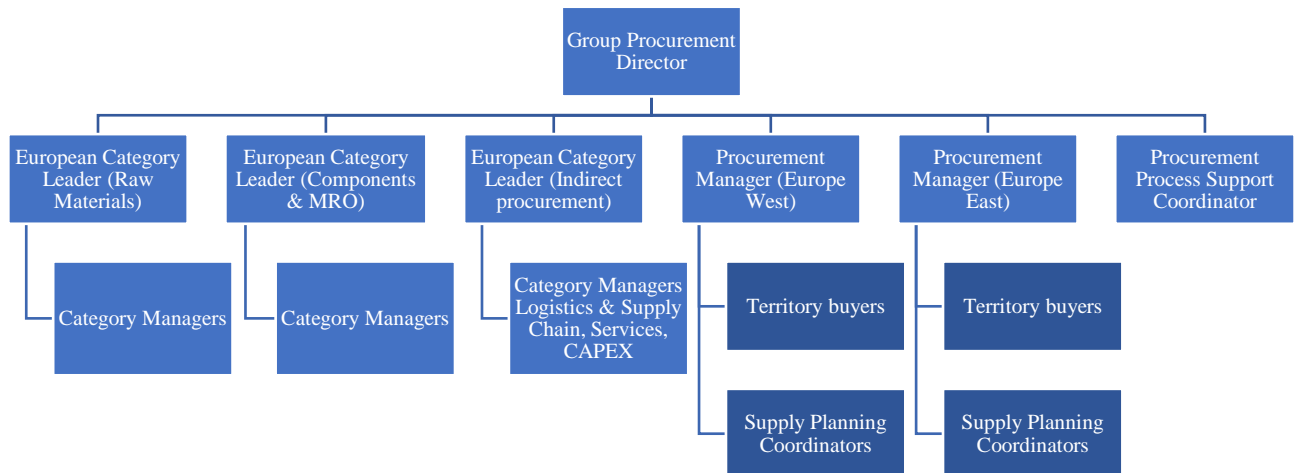


Figure 3 - Organogram Case Company procurement

### 1.3. Research outline: Designing a supplier portal to automate and standardise Case Company's key procurement processes

Case Company's wish for implementing a supplier portal derives from the goal of improving cooperation and centralisation. So, in order to automate and standardise its key procurement processes, Case Company wants to develop and implement a supplier portal, which will be the subject of this research. A supplier portal is a type of e-procurement system and forms a central platform in which suppliers can find required information and forms a communication channel between Case Company and its suppliers. The research goal of developing a supplier portal leads to the following research question:

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*How should Case Company design and implement a supplier portal to improve its key procurement processes?*

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To answer the central research question, information regarding three categories should be gathered.

1. How are supplier portals currently implemented at companies and what can be learned from implementation of e-procurement applications?

This sub question will be answered through performing a *literature review*. Here, learnings from the design, application and implementation of supplier portals and other e-procurement systems will be regarded.

2. What are characteristics of a best-in-class supplier portal?

This sub question will be answered by capturing an *empirical snapshot*. The objectives, functionalities, critical success factors and risks of supplier portals of several other companies will be captured. Through this, the characteristics of a best-in-class supplier portal will be determined.

3. How can Case Company's procurement processes be improved to achieve its objectives?

To answer this sub question, an *internal analysis* at Case Company will be performed, through conducting interviews with employees and reviewing internal documents. Firstly, the procurement processes of Case Company will be analysed and improvement opportunities will be identified. Secondly, the objectives of Case Company for implementing a supplier portal should be identified. By connecting the findings of this sub question with the best-in-class supplier portal characteristics, functionalities can be selected for Case Company's supplier portal



The end product will be a functional design for Case Company's supplier portal, indicating which functionalities the company should include. Also, a recommendation for implementation will be made, looking at how to deal with risks and include the determined critical success factors. The general approach has been summed up in Figure 4.

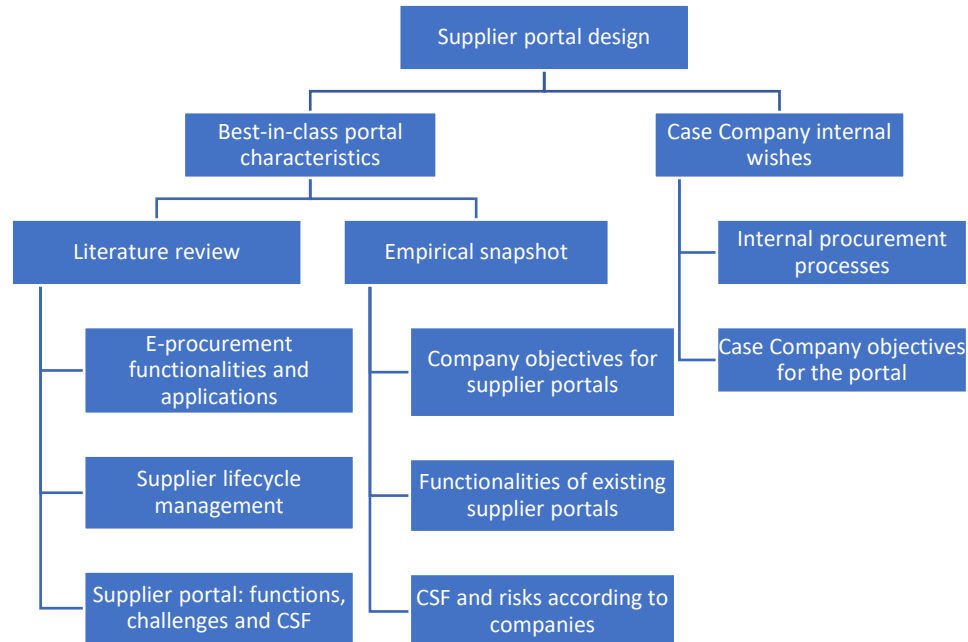


Figure 4 - General approach

#### 1.4. Thesis outline per chapter

After the introduction of e-procurement, Case Company as a company and the research outline in Chapter 1, the literature review will be described in Chapter 2. Here, a more detailed background will be provided regarding e-procurement and its positive influence on Supplier Relationship Management. Furthermore, a definition of supplier portals, its benefits, risks and critical success factors will be explained, before describing a method for designing a supplier portal. In Chapter 3, the methodology of this research will be described in further detail, elaborating on the empirical snapshot and reviewing Case Company's internal procurement processes and objectives. In Chapter 4, the results of the Case Company process analysis and empirical snapshot will be explained. These results will be used in Chapter 5, in which a model is created to base the selection of functionalities for Case Company's supplier portal on. Using the model, functionalities are selected and a recommendation for the implementation of the supplier portal is made. In Chapter 6, the contribution to literature, managerial implications and limitations and future research are discussed, before answering the central research question in Chapter 7.

## 2. Literature: supplier portal background and the learnings of e-procurement implementation

### 2.1. Describing and categorising e-procurement systems into e-sourcing, e-transaction and e-informing tools

After having provided a brief explanation of e-procurement systems and its goals, the different functionalities of e-procurement systems will be explained to form a view of what can be achieved through e-procurement. As there are many variants of systems, there are different ways of accessing an e-procurement system too. De Boer et al. (2001) describe three different access types: <sup>7</sup> (1) Intranets are systems that can only be accessed by employees of the organisation that owns the e-procurement system. (2) Extranets can be accessed by own employees, but also by employees of certain designated organisations. On (3) electronic (public) market places, buyers and sellers are brought together to facilitate the various forms of e-procurement<sup>8</sup>.

On these three types of access to e-procurement systems, several forms of applications can be accessed. De Boer et al. (2001) describe six functionalities, that will be described and briefly explained below and will be used throughout this chapter.<sup>9</sup>

1. Web-based Enterprise Resource Planning (ERP)
2. E-Maintenance, Repair and Operations (MRO)
3. E-sourcing
4. E-tendering
5. E-reverse auctioning
6. E-informing

In a (1) *Web-based ERP system*, which is based on internet technology, different activities of the purchasing process, such as order placement and goods receivals, are embedded, as well as production planning and demand forecasting<sup>10</sup>. (2) *E-MRO* provides the same activities as a Web-based ERP system, but is only applied to MRO supplies, which are not related to a product.<sup>11</sup> When a company is looking for new suppliers, (3) *e-sourcing* is used.

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<sup>7</sup> See De Boer, Harink, & Heijboer (2002), p. 26.

<sup>8</sup> See Dai & Kauffman (2006), p. 10.

<sup>9</sup> See De Boer, Harink, & Heijboer (2002), p. 26.

<sup>10</sup> See De Boer, Harink, & Heijboer (2002), p. 26.

<sup>11</sup> See De Boer, Harink, & Heijboer (2002), p. 26.

By making use of the internet, new suppliers can be identified, with the advantage that through the internet the search range is increased.<sup>12</sup>

Internet is also used for (4) *e-tendering*: in this procedure, several (selected) suppliers can be asked to send their bids (price and information) in order to be awarded by the buying company to produce a certain product or service.<sup>13</sup> The company that has put out the tender, awards the supplier with the best bid to make the product for the company.

With (5) *e-reverse auctioning*, the purchasing company puts out an online auction for e.g. a certain type and number of products, to which suppliers can submit their bids.<sup>14</sup> The purchasing company then awards the tender to the supplier with the best, most likely the cheapest, bid. Through an (6) *e-informing* platform, the internet is used to gather and communicate purchasing information to and from suppliers or other external parties.<sup>15</sup>

To these six applications of e-procurement, Baily et al (2010) add an extra type: *e-market sales*, which has high similarities with online web shops such as Amazon.<sup>16</sup> Preferred suppliers and services provide online access to its products, so that buyers can add products to their ‘shopping carts’, process e-invoices, et cetera. This system is integrated with the supply chain of the supplier and the financial systems of the buyer.

These seven electronic procurement technologies can be grouped into three main categories, namely *e-sourcing tools*, *e-process tools* and *e-transaction tools*.<sup>17</sup> The six steps in the entire purchasing process are covered by these three categories too. Here, e-sourcing tools are in support of the internal sourcing process: from specifying product requirements to supplier selection and negotiation. E-process tools support the work flows of an organisation, for example by placing orders digitally. Finally, e-transaction tools support the communication between the purchasing company and its suppliers, as well as EDI and online invoicing.

By comparing similarities the characteristics of the categories and the e-procurement applications, the applications can be categorised as shown in Table 2.<sup>18</sup> For example, e-sourcing, tendering and reverse auctioning are categorised in e-sourcing, as these are

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<sup>12</sup> See De Boer, Harink, & Heijboer (2002), p. 26.

<sup>13</sup> See De Boer, Harink, & Heijboer (2002), p. 26.

<sup>14</sup> See De Boer, Harink, & Heijboer (2002), p. 27.

<sup>15</sup> See De Boer, Harink, & Heijboer (2002), p. 27.

<sup>16</sup> See Baily, Farmer, Crocker, Jessop, & Jones (2008).

<sup>17</sup> See Kauppi, Brandon-Jones, Ronchi, & Van Raaij (2013), p. 4

<sup>18</sup> See Presutti Jr. (2003), p 221. , Hartley, Lane, & Hong (2004), p. 156, Bartezzaghi & Ronchi (2005), p. 408, Croom S. R. (2006), p. 5, Croom & Brandon-Jones (2007), p. 2.

applications that support supplier search and selection processes. The categories and applications will be used later in this research to base the framework on.

*Table 2 - E-procurement applications categorised*

<b>Category</b>	<b>Application</b>
E-sourcing tools	E-sourcing, E-tendering, E-reverse auctioning
E-process tools	Web-based ERP, E-MRO, E-market sales
E-transaction tools	E-informing

## **2.2. Importance of Supplier Relationship Management to extract the maximum out of a supplier from cradle to grave**

Over the years, it has become increasingly important for companies to have a good supplier relationship management system or processes in place, as managing relationships with different companies has become a more complex task in comparison to only managing single purchasing transactions with different suppliers.<sup>19</sup> Therefore, the concept of Supplier Relationship Management will be explained. Herrman and Hodgson (2001) described Supplier Relationship Management (SRM) as a system focused on “maximising the value of a manufacturer’s supply base by providing an integrated and holistic set of management tools focused on the interaction of the manufacturer with its suppliers.”<sup>20</sup> SRM has been defined by Moeller et al. (2006) as “the process of engaging in activities of setting up, developing, stabilising and dissolving relationships with in-suppliers as well as the observation of out-suppliers to create and enhance value within relationships.”<sup>21</sup> Moeller et al. divide the management of suppliers into three categories.<sup>22</sup>

- out-supplier management: observation of suppliers who do not already have a relationship with the purchasing company.
- in-supplier management: after the first transaction with the company, the status of the out-supplier is changed to an in-supplier. In this phase, the objective is to build up and develop relationships with in-suppliers.
- in-supplier dissolution management: if an unwanted relationship is identified and must be ended.

<sup>19</sup> See Park, Shin, Chang & Park (2010), p. 495.

<sup>20</sup> See Herrmann & Hodgson (2001), p. 1.

<sup>21</sup> See Müller, Fassnacht, & Klose (2006), p. 73.

<sup>22</sup> See Müller, Fassnacht, & Klose (2006), p. 73.

The relationship of a purchasing company with a supplier starts after their first (out-supplier) contact and is intensified after having selected the supplier and awarded it a contract, becoming an in-supplier. After this process, several activities are performed by both the supplier and the buyer, until eventually (possibly) out phasing the supplier and dissolving the relationship. All activities that happen between the first contact and the ending of the relationship fall under the term SRM.

A slightly different term for SRM is “supplier lifecycle management”, which is becoming more known through it being used by large business software developers like SAP and Oracle.<sup>23</sup> These companies embed SLM in their e-procurement systems, which makes it interesting to look further into for this research. There is a high similarity between supplier lifecycle management (SLM), and the SRM definition of Moeller. Smith (2012) described SLM as “an end-to-end, cradle-to-grave approach to managing suppliers in a transparent, structure and integrated manner.”<sup>24</sup> Meaning that the supplier is to be managed during its entire lifecycle, from selection (cradle) to possibly being phased out (grave).

### **2.3. Supplier life cycle and the positive influence by the application of e-procurement systems**

In the previous section, a definition of Supplier Lifecycle Management has been provided. As the big software developers are embedding SLM in their software, it is necessary to identify what a supplier lifecycle is and find out how e-procurement systems can influence the lifecycles. A typical supplier lifecycle is described in Figure 5, as extracted from Smith (2012).<sup>25</sup> The cycle for a supplier starts at the top: if a certain company wants to become a supplier and has submitted a bid, it should meet the qualification requirements of the purchasing company. If these requirements are met, the bid of the supplier is evaluated and compared to other bids of different companies, after which a risk assessment study will be carried out.<sup>26</sup> The company with the best bid will then be selected and contracted. After concluding the contract negotiations, the supplier must be onboarded: it should deliver relevant company data in order to be onboarded in the purchasing company’s processes. If the supplier has been onboarded successfully, products can be ordered by the purchasing company. The performance of the supplier should continuously be monitored and managed,

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<sup>23</sup> See SAP Ariba (2019).

<sup>24</sup> See Smith (2012), p. 2.

<sup>25</sup> See Smith (2012), p. 4.

<sup>26</sup> See Smith (2012), p. 4.

to develop and establish a good relationship with the supplier. The following step is to conduct spend analyses in order to identify potential cost reductions. Finally, in the rationalisation phase, the company looks for methods to take the identified waste and redundancy out of the supply chain.<sup>27</sup> The cycle then starts over, as shown in Figure 5.



Figure 5 - Supplier life cycle, according to Smith (2012)

In the supplier life cycle, the relationship management step is posed as a single, simple step. However, SRM should not be approached as such. Bemelmans et al (2012) go deeper into the approach of SRM: the first step and goal of SRM should be the optimisation of the supplier base, by determining the most suitable suppliers for the company.<sup>28</sup> For the suppliers that are under contract at the purchasing company, it should be decided which strategy should be used to approach them, mostly done with the help of Kraljic' portfolio model.<sup>29</sup> So, depending on the type of supplier to the company (e.g. a strategic or leverage supplier), a relationship should be developed, managed and optimised.

According to a CPO survey of consultancy company PriceWaterhouseCoopers, the most important objectives of companies having an SRM system are: leveraging on supplier capabilities, deliver on cost reduction targets, improve security of supply, become a preferred

<sup>27</sup> See Spekman, Kamauff, & Spear (1999), p. 107.

<sup>28</sup> See Bemelmans, Voordijk, Vos & Buter (2012), p. 164.

<sup>29</sup> See Park, Shin, Chang, & Park (2010), p. 497, Zolkiewski & Turnbull (2002), p. 578.

customer, manage supply risk, enhance supplier relationships and to source sustainably.<sup>30</sup> It is interesting to dig into the influence of e-procurement systems on SRM. For example, e-procurement sourcing tools like e-auctioning and tendering can be used to leverage a supplier on its capabilities and achieve cost reductions, which is a facet of SRM. As Smart & Harrison (2003) pose, these applications can be used in both a collaborative and competitive relationship by also inviting other suppliers than the existing ones, with the main objective to e.g. check on whether existing key suppliers maintain market prices, or to encourage technological development.<sup>31</sup> This indicates that using e-procurement applications can positively influence SRM by companies. Furthermore, through e-procurement systems it is easier to share information, which is one of the most fundamental factors to develop and enhance an effective relationship.<sup>32</sup> Knowledge sharing improves the efficiency of the supplier and buying organisation, in the end resulting in long-term relationships.<sup>33</sup> According to Stump & Sriram (1997), investments in IT (such as e-procurement) can positively alter the nature of relationships by improving the information management capabilities of buyers and their efficiency of transaction processing.<sup>34</sup> For these reasons, it is likely that the application of e-procurement has a positive influence on most of the above-mentioned SRM-objectives of CPOs.

## **2.4. Supplier portals: definition and its influence on company processes**

### **2.4.1. Supplier portals: efficiency increasing technological platforms enabling supplier collaboration and access to personalised procurement applications**

Going deeper into the application and solutions regarding e-procurement systems, the concept of supplier portals will be explained in this section. As Baglieri and Secchi (2007) state in their paper, over the years a lot of definitions have been suggested regarding portals in general, but not so many are specifically about supplier portals.<sup>35</sup> In Table 3, a selection of several portal definitions is shown.

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<sup>30</sup> See PriceWaterhouseCoopers (2013), p.10.

<sup>31</sup> See Smart & Harrison (2003), p. 26.

<sup>32</sup> See McLoughlin & Horan (2011), p. 94.

<sup>33</sup> See Gupta & Narain (2012), p. 98.

<sup>34</sup> See Stump & Sriram (1997), p. 129.

<sup>35</sup> See Baglieri, Secchi, & Croom (2007), p. 1012.

Table 3 - Portal definitions

<b>Author<sup>36</sup></b>	<b>Definition</b>
Gartner Group (1998)	A technological solution providing a unified application access, information management, and knowledge management both within enterprises and between enterprises and their suppliers, trading partners, and channel partners.
Gerst (2004)	A linked electronic platform with a single point-of-entry, independent of time and space that enables collaboration through access to multiple sources of information.
Hartman & Sifonis (2000)	A site that serves as a starting point for accessing the web and from which the user may access many other sites, with the most important function of collecting buyers and suppliers to make the transaction easier for the buyer and more efficient for the supplier
Shilakes & Tylman (1998)	Applications that enable companies to unlock internally and externally stored information and provide users a single gateway to personalised information needed to make informed business decisions.
Benbya (2004)	An integration platform focusing on unification, oriented towards the business processes of the company and creating a single view into the organisation's intellectual capital.

There are several similarities between the five selected definitions from Table 3. Most definitions describe a technological solution or platform with a single-entry point, after which the user can go on to access the several company selected functionalities of the portal. Looking at the procurement subject: a supplier portal collects buyers and suppliers in one place, in which information and knowledge management is unified in order to improve processes of the enterprise and between the buyer and the supplier. Through combining and updating the above definitions, a new supplier portal definition is extracted, which will be used throughout the paper: *a supplier portal is a technological platform with a single-entry point for buyers and suppliers, that enables collaboration with other enterprises and that enables access to unified and personalised information and knowledge management and procurement applications.*

<sup>36</sup> See Gartner Group (1998), Gerst, (2004), p. 464, Hartman, Sifonis, & Kador (2000), Shilakes & Tylman (1998), Benbya, Belbaly, & Passiante (2004), p. 205.



Baglieri and Secchi (2007) distinguish two types of portals.<sup>37</sup> External portals can be used to manage relationships and interactions with external organisations. Internal portals are used to support knowledge management and internal communication to promote efficiency of the procurement staff, such as the handling of the different internal procurement processes. It is important to know that in a future portal there can be a distinction between parts that are accessible by employees only, and by both the supplier and the employees.

The use of a supplier portal can lead to improved efficiency in transactions with a supplier base and improve logistic flows between the buyer and the supplier, through better information sharing.<sup>38</sup> The use of portals can lead to improved methods of collaboration and cooperation between a supplier and buyer and lead to strategic relationships with suppliers.<sup>39</sup> Regarding SRM-processes, supplier portals can support supplier development programs or increase the stability of the relationship and the loyalty of the supplier to the company, which can possibly lead to the purchasing company becoming a preferred customer.<sup>40</sup> The latter has positive influence on supplier innovativeness and supplier benevolent pricing behaviour.<sup>41</sup>

In order to obtain these supplier portal objectives, several general procurement functionalities that can be included in a supplier portal have been posed in literature:<sup>42</sup>

- Communication of standard quality procedures and archiving of supplier contracts
- Communication and confirmation of order placement at suppliers through Electronic Data Interchange
- Communication of delivery schedule or potential delays
- Platform for company communications and event management
- Archiving of designs and technical drawings
- Communication of supplier performance and quality control problems
- Electronic auctions and requests for quotation
- Electronic invoicing

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<sup>37</sup> See Baglieri & Secchi (2007), p. 539.

<sup>38</sup> See McIvor & McHugh (2000) p. 17, See Dwyer (2001), p. 48.

<sup>39</sup> See Bendavid & Cassivi (2010), p. 4, Teresko (2000), Wilder, Davis, & Dalton (1999).

<sup>40</sup> See Roberts (1999), p. 118., Schiele, Veldman, & Hüttinger (2011), p. 8.

<sup>41</sup> Schiele, Veldman, & Hüttinger (2011), p. 16.

<sup>42</sup> See Baglieri, Secchi, & Croom (2007), p. 1012, Lee & Cheng (2007), p. 3, Keifer (2011), p. 39.

### 2.4.2. Supplier portals: benefits, risks and critical success factors for internal and external adoption

After describing what a supplier portal is and which functionalities it could entail, the next step is to describe the benefits and risks that go with the application of a supplier portal. Furthermore, in order to successfully implement a supplier portal, it is important to understand the critical success factors that must be dealt with. There are lessons to be learned from the implementation of e-procurement systems, that can be applied to the development and implementation of a supplier portal.

#### *Benefits*

Before the adoption of e-procurement type systems, data sharing was a challenge for companies. Supplier portals are growing into a key tool in the collaboration between companies and their suppliers.<sup>43</sup> A supplier portal provides a possibility for companies to more easily and more accurately share demand and supply capacity data with suppliers, being able to coordinate operational flows and empower collaborative processes and improve transparency.<sup>44</sup> This will improve the supplier relationship and increase efficiency of the supplier: the earlier the supplier has information about, e.g. demand forecasts, the better it can schedule its production, leading to efficiency gains and possible cost reduction.<sup>45</sup> When more accurate information is available to the supplier, this will lead to fewer errors and a higher percentage on-time deliveries.<sup>46</sup> Furthermore, by having the option that both the supplying and buying company can modify and input data digitally (such as company information), corporate buyers will waste less time on non-value adding activities, such as manual data entry and correcting errors.<sup>47</sup> Next to this, in the supplier portal it is possible to personalise authorisation per purchasing employee, which will increase control over maverick spending, and in the end reduce it.<sup>48</sup> Concluding, implementing e-procurement systems, positively affect the firm's financial, operational and supply chain performance.<sup>49</sup>

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<sup>43</sup> See Garcia & Grabot (2017), p. 4.

<sup>44</sup> See Andrade, Alturas, & Oliveira (2010), p. 37, Boyson, Corsi, & Verbraeck (2003), p. 177, McIvor & McHugh (2000), p. 17., Szabo (2015), p. 3.

<sup>45</sup> See Gupta & Narain (2012), p. 98., McLoughlin & Horan (2011), p. 94.

<sup>46</sup> See Neef (2001).

<sup>47</sup> See Turban, King & Lee (2006).

<sup>48</sup> See Keifer (2011), p. 39.

<sup>49</sup> Kim, Suresh, & Kocabasoglu-Hillmer (2015), p. 14.

For suppliers, the adoption of an e-procurement system or supplier portal can be an opportunity to expand their sales.<sup>50</sup> As there are multiple companies connected to a single supplier portal or platform, the opportunity arises for suppliers to get into contact with these other companies, easily and cost effectively, which could lead to a sales growth. Furthermore, according to Gerst (2004), through a supplier portal, suppliers could undergo organisational changes and process improvements as well.<sup>51</sup> This is due to the purchasing company standardising its procurement processes, for example by centralising communication to and from suppliers, or centralised order placement.

One of the supplier portal applications mentioned in section 2.4 is e-invoicing, which can have a positive impact for both the buying and supplying company.<sup>52</sup> In an e-invoicing system, the invoice will be sent digitally to the buying company, which can validate it automatically. Next to this, after having submitted the invoice electronically, the supplier has the possibility to check the payment status of the invoice itself. This all leads to cost (and paper) savings.<sup>53</sup>

#### *Risks and critical success factors for implementation*

However, next to the posed benefits of adopting a supplier portal, there are risks involved and barriers to overcome for successful implementation and use. One of the disadvantages is that the relationship with between the supplier and the buying company might become more formal, as more activities involve digital communication and there are less face-to-face meetings.<sup>54</sup> Next to this, there is the internal risk of not having a good integration with the information infrastructure that is already put into place, leading to repetitive actions.<sup>55</sup>

The most important challenge for successfully implementing a supplier portal, is to ensure that all suppliers want to and are able to adopt the technology.<sup>56</sup> The organisation should make an impact analysis of implementing a supplier portal on the processes of its suppliers and convince them that the use of a supplier portal is also in their best interests.<sup>57</sup> Close buyer-supplier relationships have a strong positive influence on the adoption of e-

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<sup>50</sup> See Sharifi, Kehoe & Hopkins (2006), p. 487.

<sup>51</sup> See Gerst (2004), p. 467.

<sup>52</sup> See Keifer (2011), p. 39.

<sup>53</sup> See Keifer (2011), p. 39.

<sup>54</sup> See Gerst (2004), p. 464.

<sup>55</sup> See Parida & Sophonthummapharn (2008), p. 41.

<sup>56</sup> See De Mattos & Laurindo (2017), p. 51., Ibem et al.(2016) p.64.

<sup>57</sup> See Purchase & Dooley (2006), p. 438.

procurement, and thus a supplier portal.<sup>58</sup> However, there are suppliers who do not have the technological readiness to implement the system.<sup>59</sup> Suppliers could also have concerns or a lack of knowledge about security and legal issues, as there are different laws and rules in each country, that may avoid them from using a supplier portal.<sup>60</sup> For these suppliers, resources should be dedicated and proper integration solutions and adequate training programs should be provided in order for them to take full advantage of the portal.<sup>61</sup> There are cases of companies pressuring their suppliers into adopting a supplier portal, which is not of a positive influence on the adoption rate. These companies mentioned that eventual support from the buying company was crucial for the eventual adoption and information assimilation.<sup>62</sup>

There is also the issue of which organisation pays for the adoption of a supplier portal. In some cases, the purchasing company ensures that the suppliers can use the portal for free, in other cases, suppliers must pay a subscription fee to use the portal. If the supplier has to pay a fee for the usage, the chance of successful adoption will decrease, especially if the supplier is relatively small-sized.<sup>63</sup> Next to this, for suppliers who are selling to multiple customers, there is a good possibility that these have to use supplier portals of their customers too, meaning that they must register on these portals separately, which could make the process become burdensome for the supplier and also slows down the speed of adoption.<sup>64</sup>

For a company that wants to implement a supplier portal, there are internal challenges that must be overcome as well. A supplier portal will use data from a data pool, or the supplier master database. This database often proves to be insufficient or inaccurate. In order to implement a successful portal, the database must be accurate and well structured.<sup>65</sup> Furthermore, companies should focus on having standardised procurement processes in

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<sup>58</sup> See Ellram, Zsidisin, Perrott Siferd, & Stanly (2006), p. 11.

<sup>59</sup> See Andrade, Alturas, & Oliveira (2010), p. 37., Daoud & Ibrahim (2018), p. 3.

<sup>60</sup> See Andrade, Alturas, & Oliveira (2010), p.46, Parida & Sophonthummapharn (2008), p. 40., Ibem & Laryea (2015), p. 17.

<sup>61</sup> See Baglieri & Secchi (2007), p. 546, Parida & Sophonthummapharn (2008), p. 44.

<sup>62</sup> See De Mattos & Laurindo (2017), p. 54.

<sup>63</sup> See Hackett Group (2015), p.3, Keifer (2011), p. 39

<sup>64</sup> See Keifer (2011), p. 40, Baglieri & Secchi (2007), p. 541.

<sup>65</sup> See Andrade, Alturas, & Oliveira (2010), p. 20.

place, or maybe reengineer these processes, to include them in a supplier portal.<sup>66</sup> Internal top management support for the implementation of its supplier portal is vital as well.<sup>67</sup>

## **2.5. Defining internal procurement processes and objectives, and different design drivers as steps towards the development and implementation of a supplier portal**

### **2.5.1. Define business objectives for the supplier portal by determining information and material flows and portal dimensions**

After identifying the definition and functionalities of a supplier portal, its benefits and risks and challenges for implementation, the following step is to describe the design of the portal. For this, the five Ds of portal strategy of Clarke & Flaherty (2003) will be used, which are shown in Figure 6.<sup>68</sup>



Figure 6 - Five Ds of portal strategy, after Clarke & Flaherty (2003)

In the *define* phase, measurable business objectives for the portal should be defined, as well as the size and scope of the portal, the target audience (user group) and the business processes, types of information and services that are to be included in the eventual portal. In their portal development framework, Chan & Chung (2002) support the article of Clarke & Flaherty (2003), through describing four flows that must be analysed in the *Define* stage.<sup>69</sup> Firstly, the *information flow* of the company should be determined, i.e. the degree of data sharing with partners: how well does the company share its information? Secondly, the *material flow*: which data and what type of information is shared with suppliers and how does the company deploy the information? Thirdly, the *monetary flow*: how can partners be financially engaged in the supply chain? For example, whether the companies rely on IT for financial management. Fourthly, a *dynamic business model* is regarded, looking at how well the company uses the information to create business opportunities. These four flows should be analysed to help define the business objectives of the portal.

Furthermore, there are different types and purposes for using a portal. Before starting the design of a portal, the actual purpose of the portal must be determined, for which Clarke et

<sup>66</sup> See Huber, Sweeney, & Smyth (2004), p. 5.

<sup>67</sup> See Andrade, Alturas, & Oliveira (2010), p. 35., Baglieri & Secchi (2007), p 545.

<sup>68</sup> See Clarke & Flaherty (2003), p. 20.

<sup>69</sup> See Chan & Chung (2002), p. 121.

al. describe three dimensions.<sup>70</sup> A portal can have a *transactional* nature, e.g. to make online exchanges with customers, or it can have an *informational* purpose, i.e. to share valuable information with visitors of the portal. The second dimension is the audience that is to be reached through a portal: in a *horizontal* portal, a large number of general topics is covered for a very broad and wide audience range. In a *vertical* portal, information is more focused on a specific target audience. For example, only for companies in a specific type of industry. The third dimension is whether the portal is *public*, with access to the portal for anyone on the internet, or *private*, in which there is a restricted access to a specific group of users.

Baglieri and Secchi (2007) state furthermore that there are three design drivers for developing a supplier portal, which can also be used in an implementation plan.<sup>71</sup> Through the factor *penetration*, the number of suppliers that will be involved in the use of the supplier portal, compared to the total number of suppliers, is measured. It must be determined before designing the portal, which and how many suppliers are going to be using the supplier portal. As mentioned before in section 2.3, it is possible and common to use Kraljic' matrix for this.<sup>72</sup> Secondly, through *breadth* the number of procurement (related) processes that can be managed in the portal will be determined. Thirdly, through *depth*, the synchronisation of the inter-company processes is measured.

### **2.5.2. Designing and developing a supplier portal by selecting functionalities and testing them to reach the infusion stage**

The *design* stage consists of different phases. Firstly, the systems and applications that will be included in the portal should be selected and designed. Secondly, the information content that will be provided on the portal should be created, before finally designing the appearance, navigation and interface of the portal. Regarding the design of a portal, Detlor (2000) describes an information-based model of a corporate portal.<sup>73</sup> A portal will eventually exist of a *content space*, in which information access is provided. In the *communication space*, the channels for interaction with e.g. suppliers are facilitated. Thirdly, in the *coordination space*, work flows and routines to support cooperative action are placed. The overlap of these three spaces is placed in the portal: a shared information workspace. This is visualised in

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<sup>70</sup> See Clarke & Flaherty (2003), p. 17.

<sup>71</sup> See Secchi & Baglieri (2007), p. 543.

<sup>72</sup> See Zolkiewski & Turnbull (2002), p. 578.

<sup>73</sup> See Detlor (2000), p. 93.

Figure 7. In the design phase, the infrastructure for these shared information workspaces should be filled in.

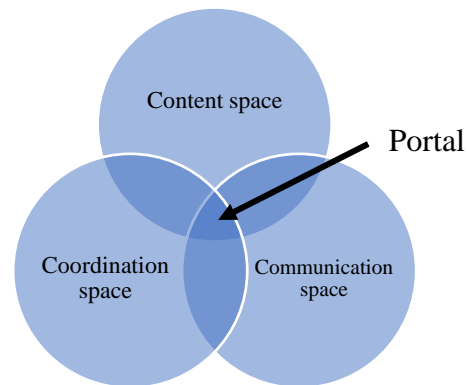


Figure 7 - Shared information workspace, according to Detlor (2000)

The next stage according to Clarke & Flaherty is *develop*, which entails the testing of the portal on a small group of end-users, for example suppliers, and from that developing the portal further. Key suppliers should be an integral part in the development phase, in order to adopt a good change management process.<sup>74</sup> In the *deliver* stage, the development of the portal is finished, and the portal is delivered to the audience that was selected in the *define* stage. In the actual use of the portal, the assimilative capacity of the user is dependent of whether the user accepts or rejects the technology, whether the system is institutionalised in the user's company business processes and the availability of support for the user.<sup>75</sup> Cooper & Zmud (1990) describe six stages of the process of implementing an IT system in an organisation: after the self-explanatory stages of (1) *introduction*, (2) *adoption*, (3) *adaptation* and (4) *acceptance*, there is the stage of (5) *routinisation*, in which the technology is seen as a normal activity.<sup>76</sup> The final stage is called (6) *infusion*, in which the technology is applied in an integrated manner to support organisational processes. In order to create value through the technology, the organisation should reach this final level. Finally, in the *defend* stage of portal strategy, the owner of a portal should ensure that the portal 'remains a viable online entity'.

<sup>74</sup> See Neef (2001).

<sup>75</sup> See De Mattos & Laurindo (2017), p. 49.

<sup>76</sup> See Cooper & Zmud (1990), p. 131.

## 2.6. Chapter conclusion

In this chapter, a background into e-procurement systems and its different applications is described. Seven different e-procurement applications are grouped into three categories of e-procurement tools: e-sourcing, e-transaction and e-informing tools. Furthermore, SRM encompasses observing out-suppliers, setting-up or onboarding these suppliers after selecting them, engaging in activities with in-suppliers until their eventual possible dissolution. E-procurement systems have a positive influence on SRM, through that it provides opportunities for knowledge sharing with suppliers. Next, a definition of a supplier portal is formed: *a supplier portal is a technological platform that enables collaboration and enables access to information and knowledge management, and procurement applications*. For a supplier portal, several functionalities, benefits, risks and critical success factors are identified through literature. In order to design and implement such a supplier portal, the 5 Ds of portal strategy are chosen as a basis for developing a supplier portal. The define and design analysis will be performed in this research later, which will help selecting functionalities to fill in the content, communication and coordination spaces. The supplier portal will consist of the overlap of these three spaces.



### **3. Methodology: design a supplier portal based on a market research and by conducting internal and external interviews**

#### **3.1. Literature review into supplier portal and e-procurement applications**

The first step towards the design of a supplier portal, is to perform a literature study, as is shown in Chapter 2. The literature study will provide a solid basis to perform an empirical snapshot of other companies' supplier portals on, in which the focus will be on identifying objectives, functionalities, risks and critical success factors for implementation.

In the literature research, topics regarding the different functions and applications of e-procurement will be reviewed, as well as ways to categorise these applications, in order to form an introduction to the topic. Furthermore, as Case Company wants to improve its Supplier Relationship Management processes, it is interesting to find out what the impact that implementation of e-procurement, i.e. a supplier portal, is on SRM and the supplier life cycle.

After this, it was important to focus more on supplier portals specifically, as this is what Case Company wants to implement. Firstly, literature is sought regarding definitions of supplier portals, to clarify the subject. After that, the logical step is to look at case studies and review the experiences and learnings that can be taken from implementation of supplier portals at other companies. The criterion used for determining whether an article is applicable to this research is to look at the industry the case company is in and the country the company is located in. In the end, as this research is intended to select functionalities for the design of Case Company's supplier portal, literature is reviewed regarding the design of supplier portals. Through this, the to be taken steps for designing and implementing a supplier portal will be examined.

It can be observed that the amount of recent literature about supplier portals and e-procurement applications is limited. This is due to that most literature about these topics stem in the previous decade. Therefore, it is interesting to see whether these articles are still applicable to current practices. Another reason for the, somewhat, grey literature, is that most recent e-procurement literature covers the topic in countries outside Europe with different cultures (such as India and Bangladesh) or are regarding public procurement, which is why those articles are not relevant to this research.

## 3.2. Creating an empirical snapshot of why and how companies use supplier portals

### 3.2.1. Using in-depth semi-structured interviews to gather data about existing supplier portals

Previously, in the literature review, a basis was formed of the knowledge of e-procurement, supplier life cycle management and supplier portals. As indicated in the research outline (section 1.3), the next step in this research is to create an “empirical snapshot” of the supplier portals that are in use by other companies. This is done to define the characteristics of a best-in-class supplier portal: which components of a supplier portal are used for certain company objectives?

This research can be categorised as inductive, or explanatory, as it seeks to gain insight into the application of supplier portals, and its implementation in organisations. Using this information, a high-quality supplier portal design can be determined, and its implementation can be optimised. There are different methods to perform an inductive research, such as performing a literature review, organising a world café, focus groups, analyse case studies, in-depth individual interviews, making observations and surveys.<sup>77</sup>

In order to determine which method or combination of methods suits this research best, it is necessary to first look at the type of information that is required to be taken in the empirical snapshot. For this, Case Company required information about the following categories:

- **Objectives** companies have for designing and implementing a supplier portal
- **Functionalities** included in the supplier portal
- **Critical success factors** for implementation
- **Risks** and **benefits** of having a supplier portal
- **Communication** to the supplier: how does a company profile itself towards a supplier

To obtain information regarding the abovementioned categories, a possibility is to use a questionnaire. However, this would lead to results that would be too general. For example, it would be difficult for a company to explain its experience with implementation and risks of a supplier portal, as an online questionnaire does not provide much space for a company to describe these factors in sufficient detail.

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<sup>77</sup> See Bondarouk (2018), Ritchie, Lewis, Nicholls, & Ormston (2013), p. 37.

The goal of using a world café or focus groups, is to reach a consensus with participants regarding a certain topic or statement, with the additional benefit to gather a high amount of data in a short period of time. However, this method is not a good option, due to that it is infeasible to gather the to be analysed companies to participate in such a group-based interview.

Individual, in-depth interviews are more time-intensive, but provide a high amount of detailed data, too. The advantage of this, is that these data do not tend towards the consensus of the group (like in the focus group) but is shaped towards the perception of the interviewee (or company) itself. This method is the most appropriate fit for this research, as the goal of this research is to analyse companies' supplier portals individually, to see whether correlations between companies' objectives and functionalities in the portal can be found. In the individual interviews, the interviewee can provide further detail into the company's supplier portal and cannot be influenced by the answers of other people, which would be the case in a group-based interview.

These individual interviews will have a semi-structured form, meaning that there is a predefined set of questions (Table 4) that will be asked to the interviewee, but that there is room to go deeper into a subject after every question. These are all open questions, which will increase the depth and value of the information gathered.

*Table 4 - Questions asked in semi-structured interviews*

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1. What were the company's objectives or goals for designing a supplier portal?
  2. How was the supplier portal developed and which stakeholders were involved?
  3. Which functionalities does the portal have, and why did the company choose for them?
  4. What are critical factors for successfully implementing a supplier portal?
  5. What are risks that accompany a supplier portal and how does the company deal with this?
  6. How many suppliers have adopted the supplier portal, and how did the company get them to adopt it?
  7. How satisfied is the company with the supplier portal and why?
  8. (How) is the supplier portal integrated with other business applications?
-

### 3.2.2. Sampling: selecting companies to conduct external interviews with and the use of other sources of information

After having defined the method of information gathering and the different aspects the supplier portals are analysed on, the next step is to collect the data. In cooperation with Case Company, it was decided to look for companies that have similarities with Case Company. Firstly, the sample was restricted to manufacturing companies with a turnover of more than 200 million euros. Also, larger companies are more likely to have supplier portals. Secondly, the company should have offices in the Netherlands or Germany, to increase the chance of establishing contact with company employees. Lastly, through a web search, companies that have a supplier portal were identified, as they would obviously be able to provide information about the subject of this research. After determining a sample of companies, 45 companies were selected with the help of Case Company employees and were approached to provide information.

Through LinkedIn search, employees of these 45 selected companies were identified. These prospects were identified using the criterion that an employee should either be directly involved with the supplier portal or has knowledge of or experience with the (development of a) supplier portal. Of all companies, seven have provided the opportunity for an interview, which is shown in Table 5. The interviewees were contacted by email, in which the research goal was explained, as well as the subjects that the interviewees were going to be receive questions about. The interviews were conducted through either face-to-face meetings or via a Skype call.

*Table 5 - External interviewee overview*

<b>Company</b>	<b>Function title interviewee</b>	<b>Duration of interview</b>
Company A	Senior Buyer, Sales & Marketing	0:35 hr.
Company B	Senior Director Procurement	0:57 hr.
Company C	Sourcing Manager General Purchase	0:25 hr.
Company D	Global C&P Process Expert Lead	1:13 hr.
Company E	Purchasing Manager	2:30 hr.
Company F	IT Specialist	1:15 hr.
Company G	Technical Purchaser	0:45 hr.

In the interviews, valuable information was obtained regarding the information categories as described in 3.2.1. Extensive minutes of the meetings with those companies were made after the interview was conducted, and were later shown to the company for validation, ensuring that the information was correct, and no information was missing. In the end, a set of primary data was acquired.

Next to the primary data that was gathered through conducting external interviews, secondary data could be acquired through collecting information available on public sections of companies' supplier portals. Several companies, that did not respond, provide publicly accessible documents or process information about their supplier portals. This information is also included in the empirical snapshot. In total, supplier portals and manuals of 10 different supplier portals provided information (secondary data) about the objectives and functionalities that are included in their supplier portal.

Besides looking at supplier portal functionalities, Case Company desires to set up an online supplier information page, as mentioned in section 1.3. The goal of this, is to better profile itself towards a supplier, and provide the supplier of sufficient information about Case Company's expectations of suppliers. Not every company has such a supplier page, so a selection was made of companies with similarities to Case Company (in terms of size and industry) was made. In total, the supplier pages of 29 companies are analysed to see which type of information is communicated to the outside world.

### **3.2.3. Analysing gathered data to build a framework for the selection of supplier portal functionalities**

After having gathered data using seven interviews and assessing ten publicly available manuals of supplier portals, the next step is to analyse these primary and secondary data in order to build a framework for selecting functionalities for Case Company's supplier portal.

To do so, an overview of the retrieved information was made, in which firstly the objectives companies posed for their supplier portals are summed up. The objectives with high similarities were merged, resulting in 8 remaining supplier portal objectives. The same was done regarding functionalities, risks and critical success factors.

The market analysis is a qualitative research, indicating that the comparing responses of the companies to these seven categories is a subjective process. Meaning, it is impossible to say conclude that, for example, one company's objectives are better than the objectives of

another company. However, combining and comparing the answers companies provided to the questions, gave a good indication of what a best-in-class supplier portal encompasses.

The main goal of this research is to select functionalities that fit with Case Company's supplier portal objectives. Therefore, a framework will be made to base the functionality selection on. The framework will consist of the different objectives and the functionalities that are combined with these objectives, by analysing information from the market analysis. Here, the framework will recommend using a specific set of functionalities when having a certain objective.

The first step towards the framework is to hypothesise expected combinations: here, functionalities that are likely to be combined with certain objectives are selected. Together with Case Company employees, expected combinations of objectives and functionalities. These expectations were then tested on correlation, using the overview with the information from the market analysis. For each possible combination (objective "X" with functionality "Y"), it is calculated how often a functionality is combined with an objective in practice. For example, 10 companies have objective X for their supplier portal and 9 of these ten companies include functionality Y. The assumption can then be made that when companies have objective X, they should include functionality Y.

Through these simplified correlation calculations for every possible combination, it can be regarded which combinations are as expected, which are not as expected, and which combinations came through unexpectedly. Using this information, a framework can be created: per objective it is shown which functionalities are recommended to be included in the supplier portal, and which functionalities are optional.

Next to only looking at the objectives and functionalities, information regarding risks and critical success factors for implementations was gathered and analysed. By analysing how often a certain risk or success factor occurred, the importance and difficulty of overcoming and dealing with them is looked at.

### **3.3. Reviewing Case Company's internal procurement processes and identifying objectives for implementing a supplier portal**

After capturing the empirical snapshot, the next step is to determine and identify internal processes at Case Company that will be included in a supplier portal, next to the portal

objective or purpose.<sup>78</sup> In order to make a good recommendation, it is necessary to review the internal Case Company procurement processes to see whether they can be included in a supplier portal and to seek improvement potential by including these functions in a supplier portal.

These internal processes will be regarded and analysed by reviewing internal documents and by performing interviews with Case Company employees. There is a procurement manual available within Case Company, which provides a lot of information. Through interviews with employees, the depth of the knowledge of procurement processes is increased. In Table 6, an overview is shown containing the employees an interview was conducted with. Most interviews are conducted with employees from the procurement department, to map the current procurement processes, either on a strategic, tactical or operational level. With the Procurement and Supply Chain directors, the objectives for developing a supplier portal were determined, which were validated in the interviews with other procurement employees. Furthermore, interviews were conducted regarding the internal development of a Customer Relationship Management-system, as there are similarities between a CRM-system and a supplier portal. Following from that, an interview with an IT-manager was conducted to clarify which information the IT-department needed for the development of a supplier portal.

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<sup>78</sup> See Clarke & Flaherty (2003), p.20.

*Table 6 - Conducted interviews with Case Company employees*

<b>Job title</b>	<b>Subject</b>	<b>Duration</b>
Procurement Director	Strategic procurement processes and Case Company supplier portal objectives	2:45 hr.
Supply Chain Director	Supplier portal objectives	0:45 hr.
Category Leader Components & MRO.	Supplier relationship management, tendering activities	1:35 hr.
Category Leader Raw Materials	Supplier relationship management, tendering activities	1:12 hr.
Category Manager Components	Tactical procurement processes, tendering activities and supplier rating	1:45 hr.
Process Coordinator Corporate Purchasing	Purchasing & procurement processes, Shared Service Centre activities, complaint handling	3:15 hr.
Strategic Purchasing Project Manager	Experience with supplier portals	0:25 hr.
Territory Process Support	Supplier onboarding, complaint handling	1:30 hr.
Procurement Planner	Purchase Order placement process	0:40 hr.
Manager Digital & E-business	Experience with development of CRM-system	0:45 hr.
Manager IT Business Applications	Information required by IT for development & implementation supplier portal	0:30 hr.

In the interviews, again a semi-structured approach was taken. There is a predefined set of questions (Table 7), that are asked to the interviewee, but with sufficient room to go deeper into a subject after every question. The questions asked are based on the standard purchasing process of Van Weele.<sup>79</sup> For each individual step, the relevant questions are asked to the interviewee. So, not all questions are asked in each interview: depending on the function of the interviewee, a set of questions is asked. For example, a procurement planner was asked to explain the ordering process, and the Category Managers explained everything regarding

<sup>79</sup> See Van Weele, (2005), p. 19.



the first stages of the purchasing process. The information gathered in the interviews was later validated with other Case Company employees.

*Table 7 - Questions asked in Case Company employee interviews*

<b>Step</b>	<b>Question</b>
Specification	1. How are new suppliers identified? 2. How is market research done and how does Case Company determine the volume of the products?
Selection	3. What does the selection process of Case Company look like? 4. How are these suppliers onboarded (registration, qualification)? 5. Are, and if so, how, are RfX and reverse auctioning procedures used?
Contracting	6. What steps are undertaken in the negotiating and contracting phase? 7. Where are contracts saved?
Ordering	8. How are products and goods ordered at suppliers? 9. Which applications are used for this?
Monitoring	10. How does Case Company monitor the status of its orders? 11. How are suppliers evaluated? 12. How can a supplier monitor the status of the invoice?
After care	13. How does Case Company deal with complaint handling?
General	14. Which communication methods are used by employees in each step? (e.g. mail/SAP)

### **3.4. Selecting functionalities for Case Company's supplier portal by comparing**

#### **Case Company objectives with market research objectives and functionalities**

After reviewing and analysing current procurement processes and determining the Case Company objectives for implementing a supplier portal, the next step is to establish a connection between the findings from the market analysis and Case Company's objectives. An important aspect in the supplier portal development is the selection of functionalities that should be included in the portal. For this, the framework (as mentioned in 3.2.3) will be used.

In the framework, functionalities are linked to specific objectives. Through matching Case Company objectives with the objectives posed in the framework, functionalities can be

selected. Following from this, an implementation plan will be described. Here, a recommendation will be given in order to make the implementation successful, by describing how to deal with the posed risks and critical success factors, that are derived from the market analysis.

### **3.5. Measures to ensure reliability and validity of the research**

It is important in scientific research that measures are undertaken to ensure reliability and validity. Reliability is defined by Joppe (1998) as “the extent to which results are consistent over time (...) and if the results can be reproduced under a similar methodology, then the research instrument is considered to be reliable”.<sup>80</sup> To ensure reproducibility, a fixed set of questions to use in the semi-structured interviews was created, which was used in each interview. This results in a high degree of stability, which means the results are repeatable.<sup>81</sup> This set of questions was sent to the interviewee beforehand, providing the opportunity to prepare for the interview, resulting in more accurate and valuable information. The obtained information was sent to the interviewee afterwards, to confirm the accuracy. Furthermore, reliability was increased by interviewing one employee at the time, to prevent possible colleagues from influencing the interviewee.

Next to reliability, it is important to ensure the validity of this research. “Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are.”<sup>82</sup> In other words, whether the research results represent the reality of the phenomenon researched. One of the main aspects of validity, is content validity.<sup>83</sup> This is achieved through constantly including Case Company and the interviewees in the feedback loop, to ensure that research is still going in the right direction, as well as that interviewees recognise the information gathered.

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<sup>80</sup> See Joppe (1998), p.1, Kirk & Miller (1986), p. 41.

<sup>81</sup> See Charles (1995).

<sup>82</sup> See Joppe (1998), p.1.

<sup>83</sup> See Johnson & Long (2000), p.31

## **4. Results: reviewing the current procurement processes and analysing existing supplier portals as a basis for Case Company's supplier portal design**

### **4.1. Empirical snapshot: analysing characteristics of supplier portals to determine elements of a best-in-class supplier portal**

#### **4.1.1. Analysing objectives for developing a supplier portal: centralising information and improving efficiency of procurement processes**

The first step towards building a functionality selection framework, is to capture the empirical snapshot of companies' existing supplier portals, and analyse their objectives, functionalities, critical success factors for implementation and the risks that accompany a supplier portal. As mentioned in section 3.2, seven companies provided the opportunity for an interview regarding their supplier portal, resulting in the possibility to go deeper into their motives for using a supplier portal. Furthermore, ten companies provide information on the public section of their supplier portals, for example through a User Manual, regarding the functionalities and their objectives for the supplier portal. The analysed supplier portals of the seven companies that have provided an interview will be shortly described in Appendix II.

The first step in the empirical snapshot is to look at the objectives companies have for designing and using a supplier portal. The results of this analysis are shown in Figure 8. On the vertical axis, the different objectives are shown. On the horizontal axis, the different analysed companies are shown, where the primary information concerns the companies that provided an interview and the secondary information concerns information gathered through assessing public supplier portals. If a cell is coloured grey, the company uses the related objective for its supplier portal.

	Total	Primary information							Secondary information				
		Company A	Company B	Company C	Company D	Company E	Company F	Company G	Henkel	Siemens	Unilever	Enel Group	Procter & Gamble
Centralizing supplier information and processes	7												
Efficiency improvement, no manual actions, automatization & reduce cost	7												
Supplier registration, qualification, certification	7												
Shared-data visibility in the supply chain	5												
Sending PO's and receiving order confirmation	5												
Improve compliance with processes	4												
Easy invoice & payment processing	4												
Supplier collaboration	3												
Digitizing the supply chain	3												
Standardizing procurement processes	2												
Dashboards: supplier rating	2												
Expand sales	2												
Strengthen relationship with suppliers	2												
Supplier validation	1												
Reduce error occurrence by automation	1												

Figure 8 - Empirical snapshot: Company objectives

In most of the analysed supplier portals, (1) *centralising supplier information and providing information about (procurement) processes* was an objective. Company B mentioned that a supplier portal provides a communication platform, through which all communication with its suppliers is done. Company C argued the same objective, as they mentioned the need to standardise its communication and communication methods regarding its indirect spend. Furthermore, Company E mentioned that through a supplier portal, information and communication will be secured: for example, when a procurement employee leaves Company E, the successor immediately has access to the previous communication between Company E and the supplier the employee was responsible for. Lastly, through centralising information, employees have access to up-to-date information about all suppliers and sourcing processes, which has the advantage that when e.g. an employee doesn't have (enough) time to evaluate a supplier, a colleague can be asked for support, as this person also has access to the same information.

(2) *Efficiency improvement by reducing the amount of manual actions and automating processes* is an objective for most companies. Company D mentioned this objective, in order to "free up the contract procurement frontline", leading to less administrative work for procurement employees which enables them to focus on the activities that actually bring value to Company D. The same objective is maintained by Company E: before implementing

a supplier portal, supplier information data had to be put in by an employee manually, this is now done by the supplier itself, after which an automated check is performed, improving Company E' efficiency. Lastly, Company F and Company G add to the objective that by automating processes, the error sensitivity is reduced, as information is filled in automatically, whereas before there was a probability of typos occurring.

Following from (2), the objective (3) *Supplier registration, qualification and certification* can be closely linked. Companies use the supplier portal to onboard their suppliers to the company. Company E' main objective is namely to onboard the suppliers, to release them in the system so that purchasers can order products at a certain supplier. Through making the onboarding process more efficient (by e.g. letting the supplier follow an automated path), procurement employees spend less time correcting and checking supplier information.

Furthermore, the automation of processes provided an opportunity for the companies to (4) *centralise and standardise their procurement functions*, which was an objective for some companies as well. Through having functionalities regarding, for example, the sourcing process (e.g. a RfQ-tender) centralised and standardised, all procurement employees will have to use the same working methods in order to find new suppliers. This leads to the objective companies have in (5) *improving compliance with company processes*.

Another objective posed by some companies is to (6) *increase the visibility of shared-data in the supply chain*. This is one of the main objectives of Company B' supplier portal: by automatically providing the suppliers of up-to-date information (and vice versa) regarding activities in their supply chain, quality of decision making will be improved. Furthermore, Company B mentioned that e.g. in an evaluation meeting with the supplier, there always firstly is a discussion about the accuracy of the data, as both companies have their own performance dataset. However, when agreeing on using a shared-dataset (i.e. both using the same data), this discussion does not take place any more and more focus can lie on the evaluation process. The similar is mentioned by Company A: on a dashboard in their portal, performances of the supplier on several KPIs can be found, improving the visibility of these shared-data.

As mentioned before, several companies use their supplier portal with the objective (7) *to send purchase orders and receive order confirmation*. This is the case at Company F and Company G: instead of emailing the supplier a purchase order, the document is communicated through the portal, after which the supplier is notified. This objective is

closely connected to centralising information and improving efficiency, as employees no longer have to send emails with a PO to their suppliers. At Company D, over 70% of their POs is done paperless.

Next, the objective of (8) *easy invoice & payment processing* is often used. Previously, invoicing and the payment process required a lot of manual actions, but companies like Siemens wished to automate these processes through a supplier portal.

Lastly, an objective is (9) *to improve and facilitate supplier collaboration and development*. Company A is using its supplier portal to provide ‘workshops’ for suppliers, in order to improve supplier performance. Of course, if a supplier improves its efficiency (with the help of Company A), this is of positive influence on the performance of Company A as well.

#### 4.1.2. Identifying commonly used supplier portal functionalities that add value to the entire procurement process

After the objectives, the next step is to analyse the functionalities that companies have included in their supplier portals. The results of this are shown in Figure 9. The features are categorised using the three e-procurement applications categories from section 2.1.

Category	Feature	Total	Primary information							Secondary information								
			Company A	Company B	Company C	Company D	Company E	Company F	Company G	Henkel	Siemens	Unilever	Enel Group	Procter & Gamble	Technische Unite	ThyssenKrupp	KLM	Bol.com
E-transaction	Information provision about sourcing and contracts	15	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-transaction	Electronic invoicing	14	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-sourcing	Supplier registration	13	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-sourcing	Supplier qualification	11	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-sourcing	E-tendering: RFQ, RfP and other bids	10	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-transaction	Supplier self-service (invoice & payment status inquiries)	9	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-sourcing	Reverse auction	9	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-transaction	Vendor rating	6	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-sourcing	Supplier certification	5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-sourcing	Catalog buying	5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-process	Communicate purchase orders	5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-process	Update and report delivery status	4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-sourcing	Supplier collaboration & innovation platform	4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-transaction	Company news, agendas & meetings	3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-process	Sharing of technical drawings	2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-sourcing	Settling complaints about (wrong) deliveries etc.	3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
E-transaction	Cash Discount Management Capabilities	1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Figure 9 - Empirical snapshot: Portal functionalities

In most supplier portals (13 out of the examined 17), companies included functionalities for *supplier registration and qualification*. Whenever a supplier is asked to register on the portal, it needs to fill in company related information, such as their address, payment information, et cetera. After the registration process, the supplier needs to qualify itself to show that it meets the company's supplier requirements. At Company E, this is the most important functionality in the supplier portal. Suppliers can qualify themselves by delivering several financial documents and filling in questionnaires (e.g. regarding sustainability). After the supplier has filled in all required information, Company E determines whether the supplier is qualified: if so, the supplier is put in Company E's ERP-system so that purchasers are enabled to place purchase orders at the supplier. At Company D, due to efficiency and cost gains, the qualification process is often done by an external party, to which the suppliers send their documents. However, Company D indicated that in the future, the qualification process can be fully automated and integrated in their portal: then, when supplier registers, the system indicates to Company D that e.g. it is possibly a high-risk supplier and recommends assessing specific risks into further detail.

Some of the companies have added *automated certification functionalities* to the registration and qualification process. Here, suppliers must upload the relevant and required certificates onto the portals, in order to be eligible to receive purchase orders. The advantage of this is that, whenever a certificate expires, the supplier gets a notification so that it can immediately upload an up-to-date certificate.

In 14 out of the 17 examined supplier portals, companies have included *e-invoicing* possibilities, sometimes integrated in the portal and sometimes done by an external party. With e-invoicing, the supplier uploads their invoice (for example, in PDF-format or through EDI) to the supplier on the portal, instead of through an email. On the portal, the purchase order, goods receipt and invoice are compared and automatically checked for a three-way match. If this is the case, the company can proceed with the payment of the invoice, which is often done automatically as well. Furthermore, companies have added a *supplier self-service* function to the portal. Here, the supplier can fill in the invoice number online and immediately check the payment status for the invoice, instead of having to call or email their contact person. This saves time for both the supplier and the buying company.

Many companies also have included e-sourcing functions in their supplier portals. For example, *e-tendering* functionalities: here, the buying company writes out a Request for

Quotation, to which the suppliers can upload their offers in the supplier portal. According to Company E, this ensures that these RfX-processes are standardised and performed confirm the procedure, as several checks and balances are included in the portal, resulting in improved process compliance. Furthermore, the tender procedures are logged, so that there is a possibility to explain why a certain supplier won or lost the tender, even in the far future.

*Catalog buying* is a functionality that can be found in several supplier portals as well. At Company A, the supplier creates a catalog of its own products (also including goods that Company A has never bought before), through which Company A can purchase products. Both companies profit from this, as the supplier expands its sales, whereas the buying company expands its product range. At other companies, such as Company B, Company D and Procter & Gamble, catalog buying is used for purchasing indirect goods, only at existing suppliers.

Next to this, companies (Company F, Company G, Unilever and ThyssenKrupp) have the functionality of *communicating POs* to suppliers, and for suppliers the need to *confirm the PO*, in order to improve efficiency and reduce costs. Company F has the option to *share technical drawings*, along with the POs with their suppliers, too.

Regarding the logistical aspect of the supply chain, the supplier can *announce delivery dates* to the buying companies through the supplier portal, or possibly report on the real-time delivery status. Elaborating on this, another functionality is to *communicate complaints about delivered goods* to suppliers. Instead of communicating these complaints by phone or email, this is done through the portal, ensuring that there is a better overview or bundling of the complaints per supplier.

*Vendor rating methods* are also often included in a supplier portal. Here, companies provide a dashboard on their portal, on which the supplier can easily see its performance on several KPIs. This contributes to the objective of improving the shared-data visibility.

Next, Company A has put up a *supplier workshop* on its supplier portal, to facilitate supplier collaboration and development. Here, the company, for example, helps developing suppliers by providing them of insights of their own research. E.g. when a supplier buys a certain product in multiple countries, it advises the supplier to bundle these purchases and advices them, based on own experience, how to do so. Furthermore, Company B has an *innovation platform* on their supplier portal. Here, suppliers can submit their own ideas and innovations



that can be of value to Company B, which might lead to Company B supporting the supplier in developing the innovation.

Lastly, all companies have e-informing tools on their portals, to *provide information about their sourcing processes or contracts*. This contains, for example, the purchase terms and conditions or the supplier code of conduct. Several companies also provide company news, agendas, meetings and upcoming events on their supplier portals. In section 4.1.5, this will be explained in further detail.

#### 4.1.3. For implementation of a supplier portal, critical success factors must be considered

After describing the functionalities and functionalities that are included in several companies' supplier portals, the next step is to look at the critical success factors the companies posed for successfully developing and implementing a supplier portal. In Figure 10, the results of the analysis are shown.

	Total	Primary information						
		Company A	Company B	Company C	Company D	Company E	Company F	Company G
Training employees into using portal	7	■	■	■	■	■	■	■
Convince suppliers of the benefits	7	■	■	■	■	■	■	■
Segmenting the supplier base	3		■			■	■	
Legal and security issues	3					■	■	■
Continuous improvement	2		■				■	
Subscription fees	1		■					
Change impact assessment	1		■					
Embed system in process of other business lines	1				■			

Figure 10 - Empirical snapshot: Critical Success Factors

Fundamental to a successful implementation is the *training of employees* of Case Company and of the supplier. After deciding on 'going live' with the supplier portal, employees need to be able to work with the portal and know which functionalities can be used when and what for. Company A invites its new and existing suppliers for a supplier portal training each quarter, developing employees' skills into using the portal, but also further convincing suppliers to use the portal.

One of the most important factors for a high adoption rate, mentioned by all interviewed companies, is to *convince suppliers of the importance and benefits to use the portal*. As

mentioned before, suppliers are likely having to register on multiple portals, meaning that they must invest time and resources into managing this technology. By explaining the benefits that suppliers have through using the portal (e.g. efficiency gains), but also by creating an understanding at the supplier of the importance for the company to set up a supplier portal, the supplier adoption rate is increased.

When designing functionalities for global suppliers, the developing company must take *legal and security issues* into account. Company F mentioned that they found some functionalities in the portal to be allowed by law in some countries, but in some countries these functionalities were prohibited. Therefore, it is to be recommended that the legal team is closely involved in the development process. Next to the legal issues, security issues must be dealt with, too. In cooperation with the IT-department, secured connections with the supplier through the portal must be established, to make sure that no (confidential) information can get leaked through an insecure supplier portal.

When developing the portal, it is important to make a good *change impact assessment*: looking at the persons and departments who are going to be affected by implementing the system. Company D mentioned that the identified stakeholders must be involved in the development process, so that they regard the supplier portal as their own tool and not only as a 'procurement tool'. They learned that, as they did not do this perfectly in hindsight, when not engaging other lines of business in the development, people look at the supplier portal as a compliance tool (only ensuring that the specified procedures are followed) instead of an enabler of efficiency.

Before looking at how to get suppliers to use the developed supplier portal and to extract the potential of the platform, companies advise to *segment the supplier base*: meaning to decide which suppliers will make use of the portal and whether every supplier has access to all functionalities. Company B did exactly this: instead of immediately registering all suppliers in the supplier base on the portal, it decided to firstly only include the strategic and preferred suppliers, before moving on to smaller suppliers. ThyssenKrupp have their own method for this: they make a distinction between 'fully enabled suppliers' and 'light enabled suppliers'. The reason for this is that the company uses SAP Ariba, which requires a subscription fee for using all functionalities in the portal. This is the 'fully enabled suppliers'-group, the other group only has access to the ordering functionality of the portal. Company E is flexible in dealing with different types of suppliers, which is exemplified in their supplier registration

process. Larger corporations (with more power) do not always want to go to the entire process of registration, as they must do this at so many companies. Company E dealt with this by e.g. not having these corporations filling in the entire questionnaire but asking the companies to provide them of some documents to prove that they, for example, meet the sustainability requirements.

Then there is the *issue of the company that pays* for the use of the supplier portal. At Company D and ThyssenKrupp, there is the possibility to use the portal for free, with only a selected number of options available. For suppliers to use a full-option portal, they must pay a subscription fee. Company B mentioned that when a supplier must pay, it slows down the supplier adoption rate.

As final critical success factor, Company B and Company F mentioned that the supplier portal must receive a *continuous improvement approach* and should not be considered as a one-off project.

#### 4.1.4. Description of risks that accompany implementing and using a supplier portal

With all benefits that go with the supplier portal, there are risks that accompany using and implementing a supplier portal. The final step in the empirical snapshot is therefore the analysis of the risks companies experienced. The results of this are shown in Figure 11.

	Total	Primary information						
		Company A	Company B	Company C	Company D	Company E	Company F	Company G
Poor or no integration with (other) company applications	5	■	■		■	■		■
Technological readiness and capabilities of supplier	2		■				■	
Portal not embedded in employee processes	1				■			
Do not keep promises made regarding portal	1		■					
Poor continuous support for employees	1				■			
Burden for suppliers to use portal	1					■		
Internal resistance from employees	1						■	
High company complexity makes it difficult to create a portal	1		■					
Only communication from company to the supplier	1						■	

Figure 11 - Empirical snapshot: Risks

Of all seven companies interviewed, six posed the risk of a negative impact if there is *no integration of the portal with the company ERP-systems*. If the supplier portal is not built

with a software provider such as Coupa and SAP Ariba, it can be quite complex to develop an integration between the portal and the ERP-system. If there is no integration with the ERP-system, having a supplier portal does not improve the company process efficiency, as e.g. purchase orders must still be put manually. For example, Company F has mentioned difficulties in establishing two-way communication between the company and the supplier. In their self-developed portal, communication only goes from Company F to the supplier. The supplier does not have the possibility to modify information posed in the portal. The company is currently trying to establish communication from the supplier's systems into Company F's portal and therefore its ERP-system, but this has proven to be difficult.

Adding on this, Company B mentioned that *a high company complexity makes it difficult to create a portal*. If the company has high complexity, there are many different and varying processes that must be embedded in the supplier portal, which could lead to an enormous application. Therefore, the decision must be made to either standardise these processes, to embed them easier in a portal, or to create an all-encompassing supplier portal, facilitating each individual process. Furthermore, there are suppliers who do not possess the *technological readiness and capabilities* to use the portal. Company B stated that there are suppliers that already have difficulties using email, "let alone them using a supplier portal". For these suppliers, only providing training possibilities might not be sufficient and the company must decide how to act on this.

Elaborating on the importance of the training of employees in using the supplier portal, there is the risk of the portal *not being embedded in employees' processes*. This means that employees do not include the activities that can be done in the supplier portal in their standard work methods, resulting in that the frequency of use of the portal will go down. Next to this, *employees can resist* to implementing a supplier portal, as they fear their jobs will disappear. At Company F however, this was not the case. Therefore, there must be *continuous support for employees* and *promises must be kept*. Lastly, as beforementioned: the implementation of a portal could be a *burden for suppliers*, as registering on a portal and actually having to use could be a lot of extra work. This could result in a lower number of suppliers adopting and using the supplier portal.

### 4.1.5. Supplier information web pages are used by companies to profile themselves to suppliers

Next to the empirical snapshot regarding the supplier portals of seventeen companies, a goal of this research is to analyse supplier information web pages. Therefore, an analysis was done regarding the information provided by companies on their public supplier information web pages. The results of this are shown in Figure 12. Here, the vertical axis shows the companies that are analysed. The percentage next to a company indicates how much of the researched information factors is used by a company. For example, Schneider Electric includes 12 of the 18 researched information factors on its website (67%). In the horizontal axis, the type of information or the document provided on the company website is shown, the percentage indicates how often a certain information type is provided in the 29 researched web pages. For example, the Code of Conduct is provided on 20 of the 29 web pages, which is 69%.

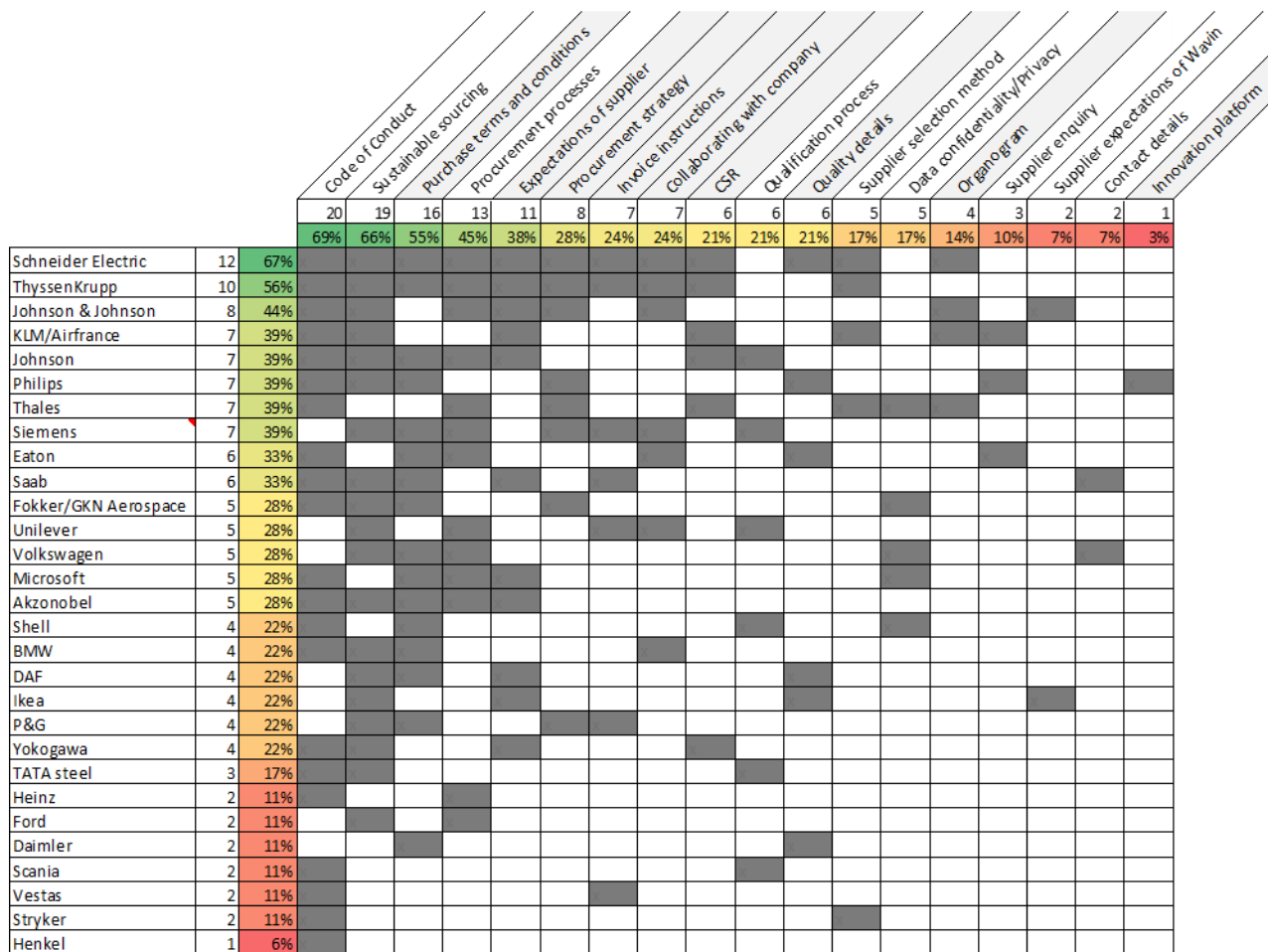


Figure 12 – Results: Supplier web pages

Many examined companies have placed several important documents on their websites. 69% of them have a Supplier Code of Conduct and/or an Ethics Code available for download. In order to become a supplier, suppliers must sign these documents, ensuring the purchasing company that “working conditions at the supplier and its own supplier are safe, that employees are treated with respect and dignity, and that business operations are environmentally responsible and conducted ethically”.<sup>84</sup> Several companies have also provided a statement regarding Slavery and Human Trafficking as well. Connecting to the supplier portal functionalities analysis, suppliers often must to sign and upload the respective Code of Conduct in order to qualify as a supplier. Adding onto the downloadable documents: 55% of the companies provide the General Terms and Conditions of Purchase on their public supplier page to inform existing and future suppliers of this.

One of the trends in today’s society is sustainability, which is picked up by the industry as well. There are not many companies that have not dedicated a page on their website to the sustainability of the company. An important factor of this is the sustainability of the company’s suppliers, to which companies do not always dedicate a separate page. However, 66% of the examined companies do so. A good example of this is Company B: on their page, they describe their systematic approach to improving the supply chain sustainability, dedicated programs and policies regarding supplier requirements, as well as their sustainability performance. Relatable to sustainability, companies (21%) state their Corporate Social Responsibility expectations on their supplier pages as well. Furthermore, almost half of the companies (45%) have described their procurement processes online. Company E, for example, uses graphs on their website to show the process a supplier typically goes through. Furthermore, companies describe their sourcing methods, entailing subjects such as supplier collaboration (24%) or the opportunity to apply as a supplier (10%). 21% of the companies have placed the qualification process on their website, indicating which different documents and type of information the supplier must deliver to the company in order to be qualified. A somewhat smaller amount of the companies communicate their supplier selection methods, for example the selection criteria that are used. Similar to the above, several companies have placed their procurement strategies online, such as aiming to reduce their supplier bases.

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<sup>84</sup> See Schneider Electric (2018).

Lastly, next to explaining a company's internal processes, about a quarter of the companies provide (electronic) invoicing instructions to the suppliers: where to send the invoices, how and in what format. A small amount of companies provides information about the procurement organisation, either through providing contact details or showing an organogram.

## **4.2. Reviewing Case Company's current procurement processes and applications and communication methods used**

### **4.2.1. Case Company procure-to-pay-process: improvement potential due to decentralised information, unstandardised processes and manual handling**

After creating the empirical snapshot, the next step is to look at the company that is used as a case example in this research: Case Company. In section 1.2, a short introduction to Case Company is provided. In this chapter, Case Company's procurement processes, applications and communication methods that are used are analysed. To get a good view of the company, information is provided regarding Case Company's procurement strategy, principles and goals in Appendix III.

In its internal procurement manual, Case Company has posed a typical procurement cycle, as shown in Figure 13. This cycle has high similarities to the purchasing cycle as posed by Van Weele (2005). Firstly, in the specification phase, the business need and product specifications are determined. After this, the supplier is selected and contracted using different Invitations to Tender or RfQs, which are then analysed and a supplier is selected. Purchase orders can then be sent to this supplier, who then expedites the goods, that will be

received by Case Company. After receipt, the final step is payment. Case Company's procurement processes will be elaborated on using this cycle.

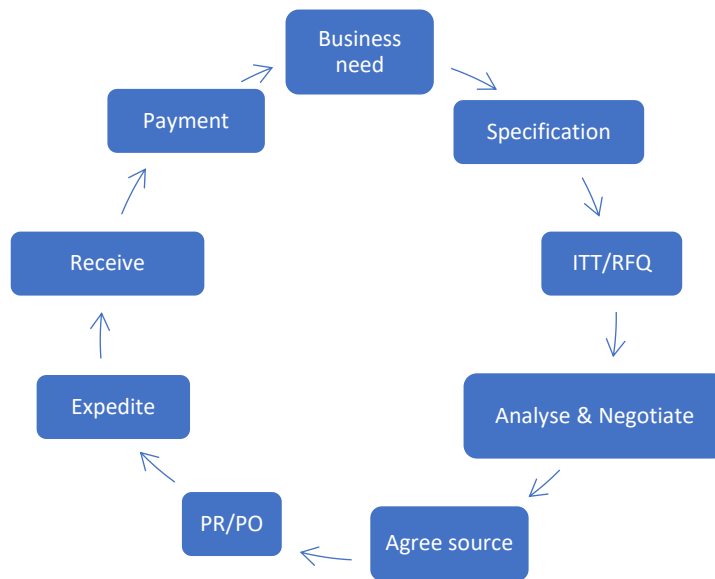


Figure 13 - Case Company procurement cycle

Before determining which functionalities of a supplier portal to include in the Case Company supplier portal, it is necessary to analyse the procurement processes that are currently in place. The goal of this is to determine which steps are undertaken in order to get to a purchase order, and to look at the applications and communication methods are used for this, next to identifying improvement potential that can possibly be seized by implementing a supplier portal.

After having identified a certain business need in the company, the specifications of the product or project must be determined. This encompasses the determination of the scope of the project, the type and volume of the to be sourced product and the technical requirements that are aligned with the product. After specifying the need, the next step is to approach the market and send out an Invitation to Tender (ITT) or Request for Quotation (RfQ) to suppliers. RfQs are mostly used, as the products that are purchased are relatively standard (stock) products. For using RfQs, procedures are in place to determine the number of suppliers that should be invited (e.g. for an indirect purchase above €50.000, a minimum of three quotations is required). Then, after having received the required number of bids from different suppliers, the analysis (evaluation) process starts. There is no uniform method or central platform for supplier selection in place at Case Company: each procurement employee has its own methods of doing so. However, there are fixed evaluation criteria that



must be used and rules on how much weight must be assigned to each criterion. In the criteria, extra emphasis is placed on focusing on the whole-of-life cost of a product, thereby including maintenance costs and spare parts and other criteria such as quality, past performance, on-time delivery and health and safety.

Before finalising the supplier selection, the suppliers undergo a qualification process to mitigate Case Company's supply risk. Here, the financial position of the supplier is assessed, as well as the compliance with Case Company's Code of Conduct and the European REACH declaration. Furthermore, the supplier is asked to provide certificates as proof of certain capabilities. However, to Case Company it is not relevant whether suppliers do or do not have certification, as a supplier would not get rejected for not having certificates. After the selected supplier qualifies for Case Company's requirements, the next step is to negotiate a contract with the supplier. For this, Case Company has an online negotiation preparation tool in their Contract Management System (CoMaS), in which some background information must be put in, along with supplier KPI scores. Through this, the Most and Least Desirable Outcome (MDO and LDO) and Best Alternative to a Negotiated Agreement (BATNA) are determined for both Case Company and the supplier. After successfully negotiating a contract, the contract document is stored online in CoMaS, only accessible for Case Company employees, along with the signed Code of Conduct and Purchasing Conditions.

If the selected supplier is an existing supplier, the company will already have its information and payment information put in the SAP database. Therefore, it is possible to send purchase orders to the company immediately. However, if it concerns a new supplier, the company needs to be registered in the database, for which a certain workflow has been designed. Here, the new supplier sends a PDF document to the responsible purchaser, containing all required info (payment information, tax number, company registration number, addresses, et cetera). The purchasing employee then puts this information in the database, after which a finance & controlling employee, the category manager and an employee in Case Company's Shared Service Centre perform an extra check on whether the information has been put in correctly. This process includes a lot of manual work and takes up much time. Therefore, there is improvement potential here. The next step is to send purchase orders to the new supplier, whenever needed. The demand identification (in the first step) is done through ERP-system SAP, that determines the need (volume) for a certain product through forecast pre-defined rules and calculations. For example, when the stock of a product is below a certain stock threshold, a certain number of products must be ordered. The MRP-software in SAP then

automatically generates purchase requisitions (PR) containing the predetermined order quantities. The purchasing employee then only has to approve the PR, after which a purchase order is sent to the supplier: a PDF by email. The supplier then sends an order confirmation back to Case Company through email. The disadvantage of sending these POs and confirmations through email (decentralised communication) is that the emails sometimes can get 'lost', e.g. through an expired email address, or be responded to slowly, for example when an employee on the sending or receiving end is unavailable (e.g. through illness).

After the transport by the supplier of the goods to Case Company, a Goods Receipt confirmation is put in SAP. Products are sometimes checked on quality and defects, differing per production location. When deviations are found, in some cases an email is sent directly to the supplier by the production employees, in other cases this contact goes via the purchasing department. There is no standardised work method for this, which would be desirable, as it could potentially harm the buyer-supplier relationship (e.g. sending an email for every single defect product identified would not be appreciated by every supplier). Furthermore, complaints are not stored centrally, meaning that it is difficult to evaluate a supplier that supplies goods to multiple Case Company locations. Finally, an invoice is sent by the supplier by email to the Shared Service Centre. A three-way match check is then performed: if the information on the purchase order, the invoice and the goods receipt match, the invoice is paid.

#### **4.2.2. Supplier relationship management and the information and material flow at Case Company**

Besides focusing on total cost improvements and ensuring high quality sourcing, service and compliance, one of the three focus areas in Case Company's procurement strategy is to 'Ensure supplier intimacy'. The goal here is to have Supplier Relationship Management systems in place with selected suppliers and to support the organisation with supplier-based innovation and product optimisation to provide added value for the company.

However, at the moment, there are no SRM-systems in place at Case Company. The management of out-suppliers is decentralised, meaning that every location must take initiatives in order to observe and find new suppliers. The only tool that comes close to an SRM-system, is Case Company's CoMaS, in which a negotiation tool is included, which offers the possibility for purchasers to prepare for negotiations with a supplier through a predetermined set of questions about supplier information. However, this tool is not

embedded in all purchasers' working methods. A centralised SRM-system would be valuable to Case Company's procurement processes.

In section 2.5, the 5 Ds of portal strategy are explained.<sup>85</sup> The first stage is 'define', in which business objectives for the portal should be defined. To do so, it is necessary to first analyse Case Company's current communication (methods) with suppliers. For this analysis, Chan & Chung (2002) determined four flows, of which the information and material flows are most appropriate to this subject.<sup>86</sup> With the information flow, the degree of data sharing with partners is meant, whereas the material flow identifies the type of information that is shared with the partners.

Firstly, the information flow will be looked at. Through conducting interviews and reviewing internal documents, it appears that the degree of data sharing at Case Company is low. Only with strategic suppliers, information is sometimes shared. However, there is no structural information sharing system or process in place, which is characterised that whenever data is shared, this is done by email. In the material flow, the type of information that is shared is identified. Case Company of course shares its Purchase Orders, as obviously otherwise order placement would be rather difficult. With Case Company's most important suppliers, forecasts about production plans are shared for efficiency gains, but this is not done systematically. Furthermore, whenever defect goods are delivered by the supplier to Case Company, information is shared with the supplier regarding the product, batch number and delivery date. However, this is not done in a systematic or standardised way, looking at the different production locations.

Lastly, the delivery performance of the supplier is not communicated back to the supplier: there is no supplier performance evaluation or rating program in place. This is due to that data regarding the delivery performance (whether deliveries are on time in full) are not accurate. This is due to two reasons. Firstly, a Goods Receipt should be put in SAP directly after receiving the goods, but in reality, this is often done a couple days later, meaning that it is possible that the delivery was on time in practice, but in the data, it is registered as too late. Secondly, it occurs that the supplier requests to postpone the delivery date, shortly after receiving the PO. A Case Company purchaser can accept this, but if so, does not change the new delivery date in SAP, resulting in that also here, it can occur that the delivery was on

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<sup>85</sup> See Clarke & Flaherty (2003), p. 20.

<sup>86</sup> See Chan & Chun (2002), p. 121.

time, but according to the data in SAP, it was not. Concluding, as the data on delivery performance are not accurate, Case Company decided to discontinue its supplier rating program. Suppliers are evaluated each year, but this is not done in a standardised way, as each employee has its own methods.

#### **4.2.3. Case Company's main objective for a supplier portal is to automate and standardise key procurement processes**

After previously having determined the material and information flow between Case Company and its suppliers, the next step is to identify which entities are stakeholders in developing and using a supplier portal. It is then possible to determine the objectives these different entities have for a supplier portal, so that the characteristics of a best-in-class supplier portal can be connected to the objectives of the most important stakeholders. This concludes the first stage (define) of the 5Ds of portal strategy. One of the most obvious stakeholders is the procurement department, as the responsible procurement employee is most often the 'face of the company' towards the supplier seeking contact. Other stakeholders are the Shared Service Centre and the supply chain department. Therefore, interviews have been conducted with employees of these departments, after which the following procurement objectives have been formed:

(1) The automation and standardisation of supplier qualification, sourcing, ordering, delivery and payment. At the moment, as described in section 4.2.1, there is a lot of manual processing involved in supplier registration and qualification. Through the supplier portal, these activities should be digitised and taken out of the hands of Case Company employees, possibly letting the supplier fill out the necessary paperwork, only for Case Company employees to check and match the filled in data for accuracy. This will result in reducing the amount of manual work, resulting in purchasers being able to spend more time on value-adding activities.

(2) Identify supply problems and maximise supply chain accuracy and timing, by digitising the supply chain through a supplier portal. Whenever a supplier is encountering problems with producing and/or delivering goods, it could be possible to communicate this through a supplier portal. This increases the communication speed and accuracy, therefore also improving the supply chain performance.

(3) Bring accountability to employee activities and information sharing. Currently, it is complex to check whether purchasing employees, spread over the production locations in

different countries, act according to the agreements made. For example, it is time-intensive to prevent, and control maverick spend. Through a portal, the right checks and balances should be provided. Adding to this objective, Case Company's Supply Chain Director mentioned that compliance issues should be dealt with, meaning a standardised way of data input, for example in the registration process.

Another stakeholder, that has strong connections to the procurement department, is the Shared Service Centre. This centre has taken over most of the administrative duties that were previously done in the different Case Company production locations in Europe. One of these administrative duties is the processing of documents and payments. This is done manually at the moment, which is time-intensive. Therefore, the objective that should be achieved through implementing a supplier portal is (4) increasing the efficiency of the document and payment processing. The supply chain department is stakeholder as well: it is responsible for the entire process from sourcing to the eventual delivery of the product to the customer. Their objectives are, next to efficiency gain (objective 1), (5) to realise a centralised communication platform, ensuring uniform communication to the supplier. This also means a way of profiling Case Company as a company to the suppliers.

Lastly, one of the actual users of the supplier portals are the suppliers themselves. It is important to take their wishes into account, to ensure successful adoption. Suppliers do not have actual objectives for the supplier portal, but the portal must provide benefits for them. Increasing efficiency in the ordering process, ensuring easier and better communication and improving the visibility of shared-data are important factors for suppliers to use the supplier portal. In the functionality selection and design process, it is important to take these factors into account.

### **4.3. Chapter conclusion**

In this chapter, an empirical snapshot is captured: seven companies are interviewed and documentation of ten other companies are analysed. Through this, company objectives for a supplier portal and its corresponding features are identified and analysed. Furthermore, through the interviews, companies provided information about the risks that accompany a supplier portal, next to the critical success factors for implementation. When comparing the information gathered from the empirical snapshot and the literature review, it can be concluded that the practice seems to confirm theory. Most aspects regarding objectives, functionalities, risks and critical success factors that are mentioned in literature, were also

mentioned by companies in the market research. The next step was to analyse the current procurement processes at Case Company and identify Case Company's objectives for realising a supplier portal. Through analysing the procure-to-pay process of Case Company, improvement potential is identified. This potential can be categorised in improving centralisation of information at Case Company, as currently, information is spread out over all Case Company locations. Processes are not standardised and communication with suppliers can be improved. Finally, Case Company's objectives for the supplier portal are fivefold: to automate and standardise processes, identify supply problems, improve process compliance, increase document and payment processing efficiency, and to realise a centralised communication platform.

## **5. Model: selecting functionalities for the new Case Company supplier portal and the implementation steps to improve chances of successful adoption**

### **5.1. Towards creating a framework for functionality selection: Pairwise comparisons of supplier portal objectives with combined functionalities**

In the previous chapter, the objectives, functionalities, critical success factors and risks that companies experienced during the development, implementation and use of their supplier portals have been identified. This information can be used to see which supplier portal objectives are combined with certain functionalities, in order to finally make a recommendation for Case Company's supplier portal.

Through the interviews, a total of 15 different objectives have been identified, of which many of these are highly similar with others. Therefore, the objectives with high similarities are merged, to make a clearer and stronger case. In the end, the 15 existing objectives were merged to a total of 8. The same was done for the functionalities, which were merged from 23 to a total of 15 remaining functionalities.

Then, to create a framework to base the recommendations on, an initial assessment of which objectives go with certain functionalities was made. This is based on internal knowledge at Case Company and on information obtained from the interviews. For example, it is logical that there would be a strong connection between the objective "Efficiency improvement" and a functionality like electronic invoicing. Correlations are analysed for combinations of objectives "X" and functionalities "Y". The functionalities, shown in the comparison figure (Figure 14) are explained using best practices, in Appendix IV.

Keeping these connections in mind, an analysis was done. Per objective, the occurrence of all functionalities is counted. For example, for the companies that have the objective "Efficiency improvement", the occurrence of each functionality is counted. The functionality "Supplier registration" occurred in 5 supplier portals that have the mentioned objective. In total, there are 7 supplier portals with that objective, resulting in that 5 out of 7 of these portals with the objective "Efficiency improvement" have a registration functionality. This is not a statistically significant observation due to the small sample size, but it gives a good indication of which functionality can be used for which objective. This pairwise comparison is done for all objectives with all functionalities. In Figure 14, the comparisons are shown. Regarding the functionalities, a distinction is made through

Strategic Sourcing functionalities, and Operative Procurement functionalities (dark grey), according to Schiele (2019).<sup>87</sup>

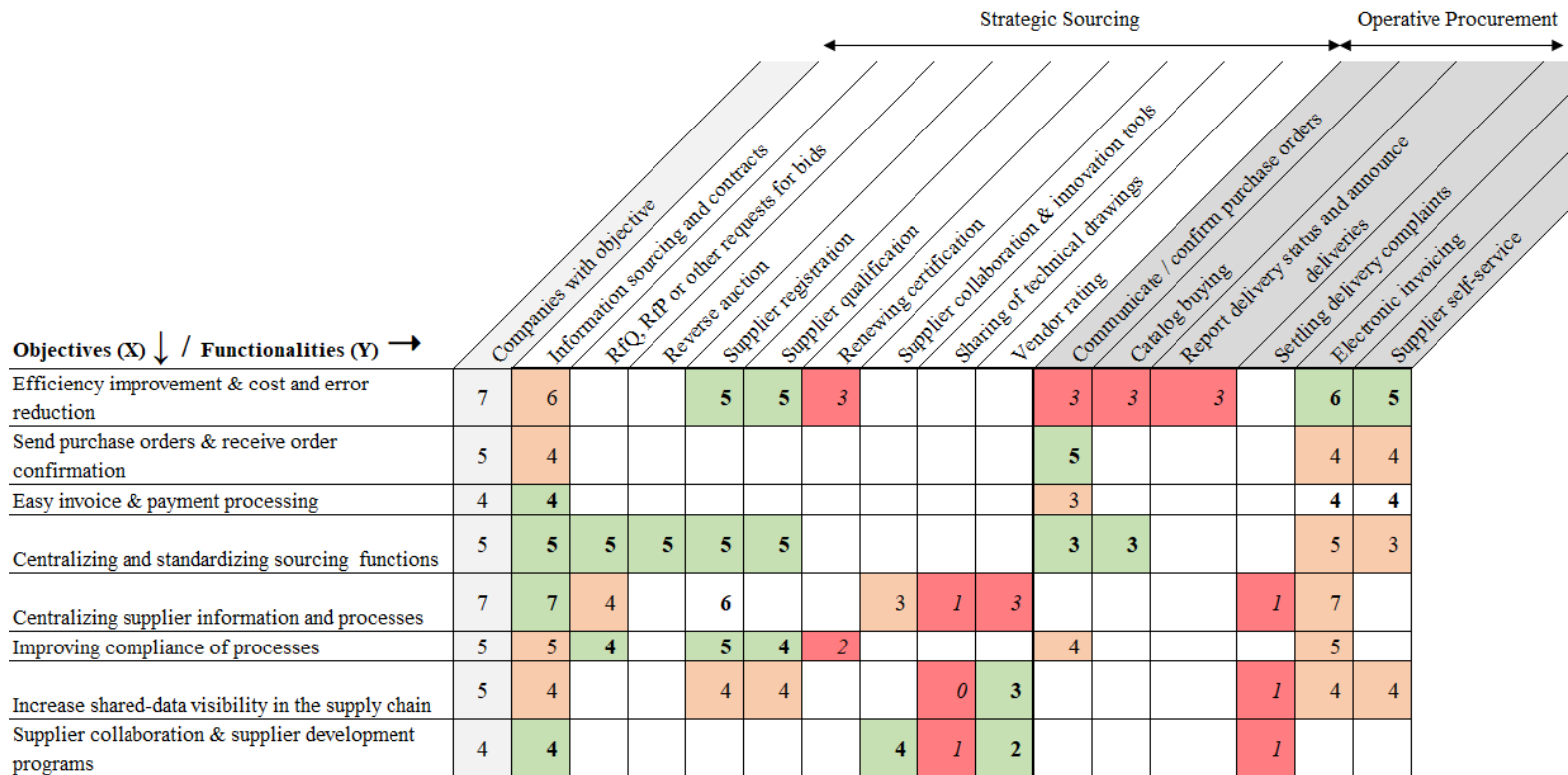


Figure 14 - Comparing objectives versus functionalities

Legend	
1	As expected
1	Less than expected
1	Unexpected

As mentioned, before calculating how often a certain functionality occurs with an objective, an initial assessment was made, based on qualitative information from the interviews. In Figure 14, these combinations (objective with functionalities) are shown in the cells. The green cells mean that the amount corresponds to the expectations (above 50%), the cells in orange show combinations that are unexpectedly high, whereas the red cells show that this amount is lower than the expected outcome (below 50%). Empty cells have no correlation.

### 5.2. Creating a framework for functionality selection by analysing the correlations of objectives and functionalities

Looking at the comparisons in Figure 14, several conclusions can be drawn regarding which functionalities tend belong to certain objectives.

<sup>87</sup> See Schiele (2019) p. 48.



To obtain the objective *efficiency improvement & cost reduction through automation*, the functionalities of supplier registration and qualification, e-invoicing and supplier self-service are most commonly used. These are as expected, as through a standardised supplier registration and qualification, procurement employees will spend less time on these processes, as automated qualification methods are used as well. The benefits of e-invoicing and supplier self-service regarding this objective speak for themselves. The functions of automated renewal processes for certification, supplier reporting about deliveries, communication regarding purchase orders and catalog buying are occurring in supplier portals with these objectives, but fewer than anticipated.

Furthermore, the functionality *providing information about sourcing and contracts* is linked with the beforementioned objective as well. However, as 15 out of the 17 supplier portals include this function, it can be linked to all objectives. Therefore, it can be concluded that this functionality should be included in all supplier portals. The same applies to the e-invoicing function, which is used in 14 out of the 17 portals.

For the objective *sending purchase orders & receiving order confirmation*, the obvious functionality of communicating these purchase orders with suppliers on the portal is used at all suppliers with this objective. Most of these companies also apply e-invoicing and supplier self-service, which is due to the three-way match being processed more easily. The vice versa goes for companies with the objective *easy invoice & payment processing*: these companies obviously have e-invoicing and supplier self-service but include a possibility for PO communication through the portal as well.

Regarding the objective *centralising & standardising sourcing functions*, the expectation was that companies would use possibilities for e-tendering, like RfQ, RfP and reverse auctions, catalog buying and a possibility for sending purchase orders. This is confirmed in the analysis. Companies also use supplier registration and qualification in this category, which is logical regarding the standardisation of sourcing functions.

The objective *Centralising supplier information and processes* is, of course, combined with providing information about sourcing and contracts. However, companies vary in applying functionalities in the portal for this objective. Slightly less than half of the companies apply vendor rating. Some include registration, storing technical drawings or provide the possibility to store information regarding delivery complaints centrally.

In order to achieve the objective *improve compliance of processes*, companies use supplier registration and qualification. By standardising these functionalities, compliance with the processes will be increased, as each supplier must step through each process the same way. Automated certification can be included here as well but is not done by all companies. Furthermore, there is a strong connection between e-tendering and improving compliance, as when performing e.g. an RfQ, a procurement employee is forced to follow the steps according to procedure. Other than anticipated, a high percentage of the companies combine this objective with a purchase order functionality as well: possibly for the same reason of both buyers and suppliers working according to procedures.

Some companies had the objective *to increase shared-data visibility*. A vendor rating system was mostly included for companies having this objective. This was not the case for technical drawing sharing and communication regarding complaints, which was expected.

Lastly, there are companies wanting to facilitate *supplier collaboration & supplier development programs*. All companies with this objective have included several tools, such as an innovation platform (to which supplier can submit innovative ideas). Next to this, vendor rating functions are included, to be able to develop a supplier on important KPIs. Technical drawings and complaint communication (to improve a supplier) are possible applications, too.

Concluding, from this information, a framework is created, showing which functionalities can be used per different objective. So, whenever a company has Objective X, it should include Functionalities Y. This is shown in Table 8.

Table 8 - Objective vs functionalities selection framework

<b>Objective (X)</b>	<b>Functionalities (Y)</b>
Efficiency improvement & cost reduction through automation.	Supplier registration, qualification, certification, e-invoicing, supplier self-service. <i>Optional: logistics, communicate POs, catalog buying.</i>
Send POs & receive order confirmation. Easy invoice & payment processing.	Communicate POs, e-invoicing, supplier self-service.
Centralising and standardising sourcing functions.	Supplier registration, qualification, e-tendering, communicate POs, catalog buying, reverse auctioning.
Centralising supplier information and processes.	Supplier registration, vendor rating, supplier collaboration & innovation tools. <i>Optional: sharing of technical drawings, complaint communication.</i>
Improving compliance of processes.	Supplier registration, qualification, certification, e-tendering.
Increased shared-data visibility in the supply chain.	Vendor rating. <i>Optional: complaint communication.</i>
Supplier collaboration & supplier development programs.	Supplier collaboration & innovation tools, vendor rating. <i>Optional: sharing of technical drawings, complaint communication.</i>

### **5.3. Selecting Case Company portal functionalities by comparing Case Company supplier portal objectives with framework objectives**

In section 4.2.3, the first of the five D-stages of portal strategy (define) has been completed through identifying Case Company's objectives for the supplier portal.<sup>88</sup> The next step in this process is 'design', in which firstly the purpose of the portal should be determined, before selecting (and designing) the system and applications that will feature in the portal.

To determine the purpose of the portal, the three dimensions, mentioned by Clarke et al., will be used. Firstly, the portal will have both a *transactional* and an *informational* purpose. Case Company mentioned in its objectives that it wants to automate and standardise procurement and sourcing processes and increase the efficiency of document and payment

<sup>88</sup> See Clarke & Flaherty (2003), p. 17.

processing, which indicates a transactional nature, as online exchanges with suppliers are executed. Furthermore, the company wants to centralise its communication with its suppliers, indicating an informational purpose as well, as information is shared with visitors of the portal. Secondly, the portal will have a *vertical* nature, as the target audience will be specifically focused on a particular type of visitors: Case Company's suppliers. Thirdly, the portal will be *private*, as there will be restricted access for a specific group of users (the suppliers) that can use the functions included in the portal. However, several information regarding procurement processes will be made *public* as well, on the public section of the supplier portal or on a supplier communication page on the Case Company website.

A key element in the design of a supplier portal is selecting the functionalities that will be included in the supplier portal. For Case Company's case, these functionalities should fit with its objectives. The next step is to compare the Case Company objectives and match these with the objectives in the Functionality Selection Framework, to select the functionalities that should be used in Case Company's supplier portal. To do so, firstly, the five posed Case Company objectives are compared to the objectives from the framework. After consideration with the Case Company procurement department, the five objectives are matched with four corresponding objectives from the framework, as shown in Table 9.

Table 9 – Matching Case Company objectives with framework objectives

<b>Case Company objective</b>	<b>Matched framework objective</b>
The automation and standardisation of supplier qualification, sourcing, ordering delivery and payment	Efficiency improvement & cost and error reduction
Identify supply problems and maximise supply chain accuracy and timing	Efficiency improvement & cost and error reduction
Bring accountability to employee activities and information sharing	Improving process compliance
Increasing the efficiency of the document and payment processing	Easy invoice & payment processing
To realise a centralised communication platform, ensuring uniform communication to the supplier	Centralising supplier information and processes

Now, a link has been made between Case Company's objectives and the objectives that have been put in the framework. In the framework, the functionalities that are linked with all

objectives from the market research are determined. Using this, the functionalities for Case Company's supplier portal are selected.

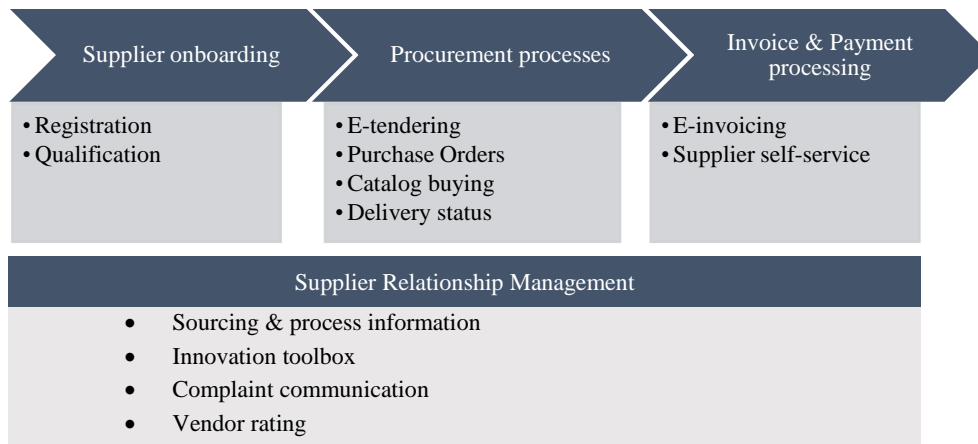


Figure 15 - Case Company supplier portal functionalities

In Figure 15, the selection of supplier portal functionalities is summed up by the different categories these functionalities fall into. Supplier Relationship Management processes and functionalities support the processes for Supplier Onboarding, Procurement and Invoice & Payment processing. In section 5.4, the application and benefits of these functionalities will be described.

#### **5.4. Functionalities of Case Company's supplier portal and the accompanying benefits**

Looking at the Case Company objectives and the functionalities that correspond with them, the Case Company supplier portal will be an all-encompassing platform for procurement functions and the typical life cycle suppliers go through. The design of the portal will be made with the help of Detlor's three information spaces: the content space, communication space and coordination space.<sup>89</sup>

In the *content space* of the public section of the portal, information will be available to all companies that open the supplier portal website. On this page, Case Company should make the Supplier Code of Conduct documents and the Case Company Purchase Terms and Conditions available for download. Furthermore, as it is an important part in Case Company's business, its expectations of suppliers regarding sustainability and CSR should be described. Next to that, explaining procurement processes, such as supplier selection, registration and qualification should be described, to ensure that Case Company's processes

<sup>89</sup> See Detlor (2000), p. 93.

are transparent to the outside world. Lastly, e-invoicing instructions should be provided, to increase efficiency of the suppliers.

After the information provided in the public portal, there is the mentioned overlap between the three spaces. The information necessary for suppliers to work with each functionality (e.g. a user manual) is provided in the *content* space. In the *communication space*, the suppliers can interact and communicate with Case Company. The work flows and routines, that are programmed into the supplier portal, are placed in the *coordination* space.

To be able to access the portal, suppliers must first go through the *registration* process. In this communication space, suppliers should fill in the required company information, payment details, et cetera. Normally, this would be done by a Case Company employee, e.g. in the Shared Service Centre, after receiving documents regarding supplier information. The benefit of registration on the portal is that a Case Company employee will only check whether all information has been filled in and whether it is correct (i.e. the correct address format), which is programmed in work flows in the *coordination space*. Therefore, the supplier becomes responsible for filling in correct information and should keep the information up-to-date itself. This makes for efficiency gain and reducing error probability. After registration, the suppliers go through a *qualification* process in order to become a qualified supplier. In the supplier portal questionnaires will be included (e.g. regarding sustainability), that are mandatory for the suppliers to complete. Case Company can continuously monitor the progress of each supplier in filling in the questionnaire and has the possibility to manage the supplier on this more efficiently. Another option that can be included according to the framework is *supplier certification*, in which the supplier must upload its relevant certificates, and receives a notification if a certificate is nearing its expiration date. This would increase process efficiency as well and lead to up-to-date certification. However, as mentioned in section 4.2.1, Case Company does not strictly expect suppliers to have the relevant certification and does not actively manage them on this. Therefore, this option is not necessary in the near future.

When the supplier has successfully qualified itself to become a Case Company supplier, it has access to more functionalities on the supplier portal. *E-tendering* tools are one of them. Here, *Requests for Quotation*, *Requests for Proposal* or *reverse auctioning* are included. Using these functionalities will result in Case Company improving its compliance with processes, as employees and suppliers are 'forced' to stick with the procedures in the portal.

As these e-tendering possibilities are performed on a central information platform, information can be accessed by each Case Company employee around Europe, improving internal knowledge about suppliers and therefore decision making. Furthermore, by performing reverse auctions, Case Company will know the real market price for the to be purchased goods.

Another functionality included in the supplier portal will be the *communication of Purchase Orders* to the supplier through the portal. A Case Company purchaser will place an order at a certain supplier through the ERP-system, after which the PO is automatically communicated to the supplier in the portal. The supplier then should confirm the order through the portal. This ensures compliance with the process, as well as efficiency gains (less manual work) and higher visibility of data, such as e.g. missing order confirmations. Another main benefit is that, when all POs are communicated through the supplier portal, spend analysis can be done automatically by the system, as all spend goes through the supplier portal. This frees up time for procurement employees, but also ensures that a spend analysis can be done with higher accuracy. It appeared in the empirical snapshot that companies include sharing technical drawings in the communication of POs. However, the products and goods that Case Company purchases are mostly standard products, so a functionality to share drawings is not necessary.

Adding on to the placement of orders through the ERP-system, a *catalog buying* function should be included in the portal as well. This way, suppliers can upload information regarding their products (specifications and prices) to the catalog, through which Case Company can easily purchase goods. This function is comparable to marketplaces like Amazon. As all direct materials are bought through the ERP-system, catalog buying will only be available for indirect spend. The benefit of this is that it increases control over this indirect expenditure, as indirect materials can only be bought through the suppliers that exist in the catalog. This will result in that the supplier base will be reduced and kept at the same level afterwards, as employees cannot buy standard indirect goods at non-existing suppliers.

*E-invoicing* functions, supported by *supplier self-service*, should be combined with communication POs through the portal, and catalog buying. After the goods have been delivered by the supplier, it can send the invoice through the portal. In the portal, a three-way match with the Goods Receipt and the Purchase Order is done automatically, after which the invoice will be processed. Furthermore, by adding a supplier self-service, the supplier

does not have to place a phone call to Case Company's Shared Service Centre to enquire about the payment status of the invoice. In the portal, the supplier can easily fill in the PO-number online and see the payment status. This way, the objective of easy invoice & payment processing is achieved, as well as efficiency gains through less manual labour. In order to increase supply chain accuracy and timing, there should be a possibility for suppliers to update Case Company of the *delivery status of purchased goods* in the supplier portal. If this is done through a central platform, instead of 'static' emails, the responsiveness of the supply chain would be improved, through having more accurate and up-to-date information regarding logistics.

Lastly, as mentioned in section 4.2.2, supplier relationship management is vital to the procurement department, as it is also included in the procurement objectives. Therefore, including functionalities in the portal to improve supplier relationships would be helpful. For this, *supplier collaboration and innovation tools* should be made available. Suppliers should have the opportunity to come up with product improvements or innovations and submit these to Case Company, which can then judge whether these ideas will be of value to the company. It is possible to place this 'innovation toolbox' on the restricted access part of the portal, but to place it in the content space (publicly accessed) seems to be a more appropriate place. This way, non-current suppliers, possibly start-up companies, can also pitch their ideas to Case Company, which could lead to product innovations.

Regarding supplier development, a *vendor rating system* could be implemented, in which the supplier can continuously see its performance on the predetermined set of KPIs on the supplier portal. The most important aspect to judge a supplier on is the delivery performance (on-time in full). Currently, there is no such system, due to that data regarding delivery performance are inaccurate, as explained in 4.2.1. However, due to that suppliers can continuously update the delivery status in the portal and ask for approval for modification of a delivery date, the accuracy of delivery data will improve. Therefore, it will be possible for a vendor rating system to be implemented.

To encourage supplier development, *communication of complaints* about delivered goods can be done through the supplier portal, to improve the supplier's quality in the end. As mentioned in section 4.2.1, when a complaint about a delivery arises, currently the communication goes through many different communication channels over the production locations, which is the reason complaints regarding a certain supplier are never bundled,



resulting in that there is no overview in the delivery and quality performance of a supplier. The supplier portal will provide a platform for centralising issues about several suppliers, so that the quality of the supplier's goods can be improved.

## **5.5. Supplier base segmentation and the implementation process for the Case**

### **Company supplier portal**

After having selected the necessary functionalities in the *define* stage of the 5 Ds of portal strategy, the next stage is to *develop*. There are two options to further develop a supplier portal: either it is developed internally by Case Company's IT department, or it is acquired externally at e.g. a major software company like Coupa or SAP Ariba. Developing a supplier portal internally, as experienced by Company F, has the benefits that the portal can be adapted to the company's own wishes. However, as most companies did and experienced, acquiring an existing portal is the better option. Reason for this is that these portals are already being used in the market, meaning that teething troubles are mostly removed and that the quality of such a system is already on a high level. Next to this, acquired portals ensure a good integration with SAP, whereas when developing a portal internally, this is questionable. Lastly, as multiple companies use the same external portal, integration or cooperation with those companies through the portal is easier.<sup>90</sup> Therefore, it is recommended to acquire a supplier portal system from an external company.

In the *develop* stage of portal strategy, the testing of the portal should be done on a small group of end-users: suppliers. Here, as mentioned before, it is vital that key suppliers are seen as an integral part in the development phase, to adopt a good change management process.<sup>91</sup> Next to this, it is important to take legal and security issues into account, because, as mentioned before, some included functionalities are allowed in certain countries, and in some they are not. As the development stage is not in the scope of this research, the details of this phase will not be further gone into. The *deliver* stage, however, is included. Here, the supplier portal must be delivered to and implemented at the audience that was selected in the *define* phase: the suppliers. To deliver the portal, the three design drivers for developing and implementing a supplier portal were posed: *penetration*, meaning the percentage of Case Company suppliers that will adopt the supplier portal, *breadth* indicates the number of

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<sup>90</sup> See Coupa (2019).

<sup>91</sup> See Neef (2001).

procurement process that can be managed through the portal. Through *depth*, the synchronisation of inter-company processes is measured.<sup>92</sup>

Firstly, the penetration factor will be looked at. As also mentioned by several companies in the market research, the first step regarding the implementation is the segmentation of the supplier base. To do so, the four quadrants of Kraljic' matrix can be used: strategic, leverage, non-critical and bottleneck suppliers. There should be no so-called "big bang", in which all suppliers are invited to the portal at the same time. Instead, as recommended by other companies, suppliers should be invited gradually. The first group of suppliers will be used for testing and development. This will be suppliers that have a high-volume of transactions and money spent and that Case Company have a good relationship with (strategic suppliers), so that these suppliers can help identify improvement possibilities. Through this, the teething problems that still occur in the first period of implementation will be solved. After testing and optimising the supplier portal, the suppliers that are categorised in the Leverage quadrant will be invited to use the supplier portal. The last step would be to get the remaining suppliers (non-critical and bottleneck) suppliers to work with the portal.

An important step towards successful adoption is to convince the suppliers of using the new supplier portal. Here, top management support is of the utmost importance, to show that Case Company is serious in its implementation of a supplier portal. If suppliers are convinced of the benefits that using the Case Company supplier portal will also have for their own businesses, their burden of having to use an extra supplier portal will be lower, leading to a higher adoption rate. Next to this, Case Company should ensure that suppliers can use the supplier portal free of charge.

It is vital that employees of both Case Company and the suppliers that will be included in the portal receive trainings for the use of the portal. A possibility to do so is to invite new suppliers to an (online) training every quarter. It is important for Case Company employees to embed the supplier portal in their own work methods, but also in the processes of other lines of businesses. This way, the system does not seem like a specific procurement tool but is a tool for the entire company to improve its processes. Furthermore, extensively documenting the processes in the portal is important to offer continuous support to users of the portal. Some suppliers will not have the technological readiness or capabilities to use the supplier portal, for which extra training possibilities should be provided. To ensure that inter-

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<sup>92</sup> See Secchi & Baglieri (2007), p. 543.

company processes are synchronised, multiple ways for a supplier to work with the portal need to be available. For example, for e-invoicing, multiple formats that suppliers can work with should be available.

In order to cope with the risks, as mentioned by other companies in section 4.1.4, Case Company must ensure that there is a good integration with their ERP-system, SAP. If this is not the case, a lot of manual labour must still be done, immediately striking a lot of the benefits that come with the supplier portal. By acquiring an external software package, this risk is mitigated, as systems like Coupa and SAP Ariba offer good integration. After having successfully companies adopt the supplier portal, Case Company will come into the *defend* stage of portal strategy, in which the company must ensure that the portal remains a viable online identity. To do so, it must adopt a continuous improvement to the portal and not see the company as a one-off project, as advised by Company B. In the end, Case Company should let its suppliers try to reach the stage of *routinisation*, in which the portal is seen as a normal activity, before reaching the final stage of *infusion*, in which the portal is applied in an integrated manner to support organisational processes.<sup>93</sup>

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<sup>93</sup> See Cooper & Zmud (1990), p. 131.

## **6. Discussion: limitations of this research and future research into supplier portals**

### **6.1. Contribution to literature: Comparing theory to practice and connecting supplier portal objectives to functionalities**

Currently, there is a limited selection of literature available regarding supplier portals. In most supplier portal articles, the definition of Gartner Group is used, which originates from 1998.<sup>94</sup> Since then, supplier portals and e-procurement applications have been developed. Therefore, it was necessary to check whether the existing definitions are still applicable to the current situation. This research provides an updated definition of a supplier portal, which can be uniformly used in the future. Furthermore, in existing literature, functionalities for supplier portals and e-procurement applications are often briefly described.<sup>95</sup> This research adds and extensively elaborates on several new functionalities to the ones mentioned in literature, such as a *supplier innovation platform*. Next to this, literature does not describe when to use which functionalities. Baglieri & Secchi only describe which functionalities are implemented, but not why.<sup>96</sup> This research firstly describes which functionalities should be selected in certain situations and on how to implement these. Through a functionality selection framework, company objectives for a supplier portal are linked to portal functionalities.

Reviewing literature regarding e-procurement and supplier portals and comparing these findings to the information gathered in the market research, provided an opportunity to compare theory to practice and see whether literature is still up-to-date. Supplier portal literature mostly dates from the start of the first decade of the 21st century. As technology is developing rapidly, it could be possible that the conclusions drawn in the literature of that time are no longer valid. However, in this research, confirmation of the literature statements has been found. All risks, benefits and critical success factors that are identified in literature, are confirmed in the empirical snapshot.<sup>97</sup> This research therefore updates the, somewhat, grey literature. However, additional critical success factors and risks were identified and added, such as *segmenting the supplier base*.

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<sup>94</sup> See Gartner Group (1998)

<sup>95</sup> See Baglieri, Secchi, & Croom (2007), p.1012.

<sup>96</sup> See Baglieri & Secchi (2007), p. 539.

<sup>97</sup> Andrade, Alturas, & Oliveira (2010)

Lastly, several papers indicated that the use of supplier portals and e-procurement applications would have a positive influence on supplier relationship management.<sup>98</sup> This is also the case in the recommended model to Case Company, in which Supplier Relationship Management activities are supported by supplier portal functionalities. Here, the entire Supplier Lifecycle is incorporated in the supplier portal. Hence, support is found for the indication in the papers.

## **6.2. Managerial implications: Provide a blueprint for companies wishing to use supplier portals and recommendations for implementation**

Firstly, this research provides information about the current status of supplier portal applications in the market, through an empirical snapshot. It describes the objectives that companies have for using a supplier portal and which functionalities are included for achieving these objectives, the benefits, risks and critical success factors they experienced in and through the implementation. Besides this, an analysis was done into the type of information companies communicate to their suppliers on their dedicated supplier web pages.

Secondly, this research provides recommendations for the implementation of a supplier portal for the case company, Case Company. Through analysing Case Company's procurement processes, improvement opportunities were identified. These opportunities are seized by implementing several functionalities in a supplier portal. By connecting the objectives of Case Company for a supplier portal with the objectives in the framework, functionalities for Case Company's supplier portal were selected. This research describes which supplier portal functionalities should be used for Case Company's case, and recommendations are done to Case Company about how to implement such a portal, taking critical success factors and risks into account.

Thirdly, this research has implications for other companies that are also willing to implement a supplier portal and have characteristics similar to Case Company. The design and development process such a company goes through has been thoroughly described. Such a company can use the posed framework to base its functionality selection on, by matching its own objectives with the objectives in the framework. This research therefore provides a blueprint for companies that want to implement and use a supplier portal.

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<sup>98</sup> See Smart & Harrison (2003), p. 26., McLoughlin & Horan (2011), p. 94.

### **6.3. Limitations and future research: practical validation and research the influence of Industry 4.0**

As with all academic works, this Master thesis also has its limitations. Firstly, looking at the literature used, one could argue that relatively much grey literature is used. This is due to that there is not much recent literature available about the definition, design, effects and implementation of supplier portals. There is more recent literature with the topic of e-procurement, but this mostly involves case studies of e-procurement applications in e.g. Indonesia or in public sectors, which are all not relevant for this study, as it is focused on the design and implication of a supplier portal in a corporate organisation in the Netherlands.

Secondly, regarding the sample of interviewed companies, there was a certain bias towards larger companies. It is likely that mostly, bigger, more advanced companies employ a supplier portal, which is why the search for possible interviews at companies was more focused on the larger companies. Next to this, only companies with a publicly accessible supplier portal could be identified. It is possible that a supplier portal is only accessible when having a private link to open the portal. These “hidden” portals could not be identified, which limited the sample identification. Regarding the proposed framework, a relatively small sample size is used, due to the qualitative nature of this research. In total, information of 17 companies was used to base the framework on. If the sample size would increase, the reliability of the framework would increase with it. This calls for a practical validation of the framework. This could possibly be done by asking companies to fill in a questionnaire, in which the hypothesised combinations of objectives and functionalities are tested, and whether they recognise the posed risks and critical success factors. Through a questionnaire, it would be possible to use quantitative data to validate the framework, which is based on qualitative information. A statistical correlation analysis would be appropriate for this.

Lastly, a current trend in the industry of today is the rise of Industry 4.0. It would be interesting to find out what the influence of Industry 4.0 would be on the use of e-procurement systems and supplier portals. Industry 4.0 encompasses the creation of Smart Factories, in which, amongst others, sensors ensure an increase of real-time data availability and accuracy about machines and products. This will automate production and procurement processes even further, which will have its impact on supplier portals as well, reducing the manual actions that are required.

## **7. Conclusion: The supplier portal will increase Case Company's efficiency by automating, standardising and centralising procurement processes**

In this chapter, an answer to the central research question will be given.

*How should Case Company design and implement a supplier portal to improve its key procurement processes?*

To answer the central research question, firstly a literature review was performed, to create a better understanding of the importance and benefits of e-procurement systems and supplier portals. E-procurement systems have been widely applied in the last decade. Because of this, learnings through literature about its benefits, risks and critical success factors for implementation could be taken and applied in this research. Furthermore, the importance of supplier relationship management has been described. SRM-systems encompass the entire life cycle a supplier typically goes through, from being identified as a potential supplier, to onboarding and engaging in activities while being an in-supplier, to the eventual potential dissolution as a supplier. E-procurement systems have a positive influence on SRM, through that it enables companies to better share knowledge and information, leading to improved relationships. A supplier portal is a derivative of an e-procurement system and is defined in this research as *a technological platform with a single-entry point for buyers and suppliers, that enables collaboration with other enterprises and that enables access to unified and personalised information and knowledge management and procurement applications.*

The design process for Case Company's supplier portal is based on the 5 Ds of portal strategy.<sup>99</sup> The first step is to define the purpose of the portal and identify the internal processes that the company wants to include in the supplier portal. Therefore, it firstly is necessary to review and analyse Case Company's procurement processes, by identifying the *information* and *material* flows at Case Company and its objectives for the supplier portal.

For this, the entire procure-to-pay process of Case Company is identified. Analysing the Case Company procurement processes provided a good opportunity to identify improvement potential, that potentially can be achieved by implementing a supplier portal. Many small problems have been identified, which all have the same core problem: Case Company has a

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<sup>99</sup> See Clarke & Flaherty (2003), p. 20.

high degree of decentralisation regarding information and communication, together with unstandardised processes, as all locations have their own working methods. Case Company's objectives for the supplier portal are fivefold: to automate and standardise processes, identify supply problems, improve process compliance, increase document and payment processing efficiency, and to realise a centralised communication platform.

Next to analysing internal processes, an external market research is performed into the existing supplier portals of other companies. This is done to identify the characteristics of a best-in-class supplier portal. Through conducting interviews and analysing online information, 17 supplier portals are analysed regarding company objectives, portal functionalities, risks and critical success factors for implementation. Using this information, a framework is built, by analysing correlations between objectives and combined functionalities. The framework suggests which functionalities a company should include in their supplier portal, when having certain objectives.

The objectives that Case Company has for the supplier portal are then matched with the objectives from the framework. This leads to the selection of functionalities, in cooperation with Case Company employees. In the end, the Case Company supplier portal will be an all-encompassing platform for procurement activities, with functionalities regarding the three categories of e-procurement tools: e-sourcing, e-transaction and e-informing.

A supplier portal is a good platform to provide information to suppliers regarding the supplier Code of Conduct, Terms and Conditions, as well as expectations for supplier sustainability. On the portal, for suppliers in the beginning of their life cycle, possibilities are provided to register and qualify themselves as a Case Company supplier. These functions ensure efficiency improvement and the reduction of error probability, through decreasing the amount of manual work. Next to this, processes and information will be standardised and centralised. If suppliers are successfully pass the qualification stage, they have access to procurement functionalities, such as e-tendering and e-ordering. This improves the communication methods between Case Company and its suppliers and improves process compliance, as employees are 'forced' to work according to the procedures. Lastly, e-invoicing and supplier self-service are included in the portal, to improve efficiency and ensure easy document and payment processing.

In the end, the designed supplier portal must be delivered to the market, which is the final stage of the 5 Ds. Recommendations for the implementation of the supplier portal are given,



using information about the risks and critical success factors companies found through the empirical snapshot. It is important for Case Company to firstly segment the supplier base, to create a time planning regarding which suppliers should adopt the portal at a certain time period. Next to this, Case Company should focus on convincing suppliers to use the portal and embed it in their processes. It is also vital to provide trainings for employees of Case Company and its suppliers, to deal with suppliers that do not possess the technological readiness or capabilities and to ensure that employees can extract the maximum from the possibilities the supplier portal provides.

To conclude, the implementation of Case Company's supplier portal will lead to efficiency improvements, as employees spend less time performing manual actions and can focus more on activities that are value-adding. Supply chain accuracy will be improved too, through that more and more accurate information is available. The document and payment processing will go more smoothly and quicker, and process compliance will improve. The supplier portal will provide a centralised communication platform between all production locations of Case Company and its suppliers.

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## **Appendix**

### **I. Interview evidence**

Confidential.

### **II. Supplier portal descriptions**

Confidential.

### **III. Description of Case Company's procurement organisation**

Confidential.

#### **IV. Supplier portal functionalities – Best practices**

In this appendix, best practices of the mentioned functionalities will be described, to give the reader a better indication of what each functionality encompasses.

*Information sourcing and contracts.* Company C uses a supplier portal, on which it offers a lot of information to its suppliers. On the website, information regarding its supplier selection process is provided. It explicitly states the requirements a supplier must meet, such as the supplier having a healthy financial status, the supplier must have certain certification and logistic guarantees. Next to this, Company E also offers the stages a supplier typically goes through in a life cycle with the company: from supplier registration, qualification to actually purchasing articles at the supplier.

*Supplier registration and qualification.* All companies with a supplier portal, have included supplier onboarding processes, such as Company E. Here, a new supplier must register itself on the supplier portal. It must fill out several company information, billing address, et cetera, as well as submit financial data about the company. If everything is filled in, an employee checks and validates all data. If all is okay, the supplier is registered. The next step for the supplier is to qualify itself, for this, several thresholds (e.g. financial stability) should be achieved. Furthermore, at Company E, several questionnaires must be filled out by the supplier, for the company to check whether the supplier is compliant to e.g. Company E' ethical standards. A purchasing employee then checks whether this is the case, after which the supplier is finally qualified as a supplier and gets access to all functionalities in the supplier portal.

Company B takes this one step further, by including *supplier certification*. Suppliers are required to have certain certificates, in order to become a Company B supplier. These certificates must be uploaded to the portal. An efficient component of this is that, whenever such a certificate soon expires, the supplier gets a notification of it having to renew its certificates.

*RfQ, RfP or other requests for bids.* Most companies that have this functionality, have implemented in similar manners. ThyssenKrupp provide RfQs and RfPs on their supplier portal that can be accessed without having to register. The company provides an overview of the service or material it requires, with additional information and the remaining time for companies to compete in the tender. Zooming in on a specific RfQ, ThyssenKrupp specifies the articles that are needed, the quantity of it and the requirements the articles should meet.

If a new supplier wants to participate in the tender, it should register itself and qualify as a potential supplier, existing suppliers do not need to do so. If this process is done successfully, the supplier can enter in an RfQ and submit a bid. ThyssenKrupp will then evaluate all offers and award a contract to the best bid.

*Reverse auction.* This is a functionality that is very similar to the RfX processes. Siemens is a company that has incorporated reverse auctioning in its supplier portal. In the portal, an overview is given containing the auctions the supplier is invited for, displaying the auction title, format and status, and start and end time. Siemens maintains two auction formats: a Dutch auction, in which the bid with the lowest price gets awarded the contract, and an English auction, in which the highest bid gets awarded the contract. An auction can have varying durations, but companies must be on the front foot all the time to win the auction. For example, an auction can take half hour, in which the suppliers can submit their bids. If a new bid is submitted in the last three minutes, the remaining time is reset to 3 minutes again. This process continues and stops until no new bid is submitted until the time has run out.

*Catalog buying* is also used by several companies. Here, a supplier can create a catalog containing its own products, that the supplier wants to sell to the company. This is mostly done with indirect products and spend, such as buying standard products like pens and laptops. Company D does so, preventing employees from buying standard products at non-existing suppliers, as they must purchase several goods through the catalog.

*Vendor rating* is used sometimes as well: a nice case example is one at Technische Unie's supplier portal. It includes a dashboard on its supplier portal, showing the performance of the supplier on several KPIs. For example, it shows graphs about the delivery reliability, sales of its products and service level.

*Supplier collaboration & innovation tools* are not widely used. However, both Company B and Siemens include innovation platforms on their websites. For example, Siemens shows several categories for innovation, such as blockchain innovation. Companies can then select the category their innovation can be placed in and can then submit their innovation proposal.

*Sharing of technical drawings.* Sometimes, technical drawings of products must be shared along with the purchase order. Company F does so in its supplier portal and includes these drawings.

*Communicate/confirm purchase orders.* Many companies use the supplier portal to send purchase orders to their suppliers. Such as Company G, its main objective for the portal is this purpose. Through the ERP-system, a PO is created and automatically placed on the supplier portal. The supplier then gets a notification that a new PO has been received and confirms the PO on the supplier portal.

*Logistics: report delivery status and announce deliveries.* At Company F, a good example is shown for this functionality. Suppliers can continuously update the company of the status of the order and the delivery. Through this, more accurate data regarding the delivery of the ordered goods is available, which will have positive influence of the production planning.

*Settling complaints about wrong deliveries.* Obviously, it can occur that whenever goods are delivered, they can have poor quality or the wrong quantity. Bol.com has incorporated a functionality in its supplier portal, in which it communicates these issues with the deliveries of suppliers. The responsible employee then puts in the information regarding the order number and more detailed information about the mistake.

*E-invoicing* is also used by a lot of companies. Company D does so as well. If it has ordered goods at a supplier, the supplier submits the invoice in an XML format to the supplier portal. This invoice is then automatically checked on whether there is a three-way match: if the information on the purchase order, the invoice and the goods receipt match, the invoice is paid. This latter is sometimes also done automatically.

*Supplier self-service.* This is a functionality that is often combined with e-invoicing. For example, at Procter & Gamble, suppliers that want to inquire about the status of their invoices, they can simply type in the invoice number in the self-service page of the portal, through which they can be updated about the status of payment.

*Cash Discount Management Capabilities.* Company B is the only company in the sample that employs this functionality. It provides the opportunity for suppliers to sign up for the program: in return for a small discount, Company B will ensure that the payment is done earlier, which will improve the suppliers cash flow.