BACHELOR THESIS

A formative evaluation, of a workflow management system to integrate contracting and procurement processes at Company X, a case study.

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A formative evaluation, of a workflow management system to integrate contracting and procurement processes at Company X, a case study.

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Abbreviations

CP = Contracting and procurement.
DSR = Design Science Research..
MI = Marketing Intelligence
PoC = Proof of Concept.

Contents

Preface

Dear reader,

In front of you is my thesis and bachelor end project “A formative evaluation, of a workflow management system to integrate contracting and procurement processes at Company X, a case study”. This bachelor thesis is written to complete my bachelor program Industrial Engineering and Management at the University of Twente. This thesis focusses on the evaluation of a first version of a new information system at company X by mapping requirements from different end-users.

The process of writing this document was sometimes tough and the whole COVID situation did not help with that. Therefore I am very grateful for the support from my supervisors, friends, and family.

First of all, I want to thank my university supervisors Guido van Capelleveen and Mike Monson who helped me through the process and give valuable feedback, and where there when I was too uncertain about the process. Most of all I want to thank my company supervisor SB for our weekly calls and his support in times where I was close to giving up, also when his diary did not allow more meetings. Many thanks to NvK too for giving me the opportunity to work in such an inspiring environment. Also many thanks to the dispute Bull&Bear, the jaarclub Inferno, and all my other friends I could call for a talk or a drink. Your support was very meaningful to me.

Last but not least, special thanks to my family who led me stay at my old home again and supported me through the process.

Enjoy reading this bachelor thesis!

David Evers

1. Management summary

Company X is developing an information system that integrates the existing information systems within contracting and procurement with each other. This research focuses on the evaluation of the first version of this new information system that must bring the other systems together, from a viewpoint of category managers. A literature study helped to find out what the important factors are for a successful implementation. Therefore, this research was framed up to dive deeper into the requirements of future everyday users of the new information system. This thesis uses a combination of interview techniques and surveys to find out and verify the requirements of category managers. A small group of category managers is interviewed, and their given requirements are verified amongst a bigger group of category managers. These verified requirements are tested against the Proof of Concept (PoC) to see how much of the requirements are already included or could be included. The developers could use the outcome of the research to include missing requirements from important stakeholders and help to implement and accept the new information system in a better way.

2. Introduction

2.1 Company X

Company X is a company active in the oil and gas industry. The department within Company X that I have been assigned to work with is functionally located with Contracting and Procurement. The purpose of the GameChanger Lab is to run Proof of Concepts across numerous digital initiatives within the Supply Chain to test scalable viability.

The game-changer team started a new way of working within Company X. Instead of implementing a new idea at once, it is formed in a PoC and first tested in a small area. A PoC is a realization of a certain idea or method, that might not yet be complete to test its feasibility and scalability and to gain feedback (Murphy, 2014). A PoC can develop into a pilot when the PoC is found to be successful. A pilot is the testing of a fully functional product that a small group of users can test. In this way, the developer of the product can gain a lot of feedback and see if and how the product is used in the real world. A pilot is bigger and more complete than a PoC. A prototype attempts to test the critical aspects of the full system and is meant to describe how an idea or feature can work whereas a PoC simply shows that it can be done. (The ARC, 2019)

At the moment the new department is working on a new workflow management system that integrates existing information systems. An information system can be regarded as a system of communication between people, it involves the gathering, storing, processing, distribution, disposition, and use of information (International Conference on Information Systems and Development: Methods and Tools & Song, 2011). A workflow is a computerized facilitation or automation of a business process. A workflow management system executes the workflow(s). In the current situation, multiple information systems are a source of data and are working next to each other, without one place to access all the systems at once. The new information system must, among other things, helps category managers to have a better overview of data, by being this one place to access all the other information systems. There are multiple definitions of what a category manager is, but we stick to the definition defining category managers as the following: a category manager is responsible for contracting and procurement of a category of products within a company. With this better overview of the new workflow management system, category managers should have a better overview of the performance of suppliers, which saves a lot of time, and should be better prepared for negotiations with suppliers. Company X and the supplier have a contract with each other. In that contract, it is described how the supplier should perform, think of for example how long the lead time has to be. The new workflow management system helps to keep track of those performances clearer. During the negotiation process with the supplier, category managers are estimated to be better prepared because of this new system and can therefore negotiate a better deal for Company X.

The PoC will be researched from a viewpoint of category managers. The evaluation done is a formative evaluation. The evaluation is formative because there is no final result yet. The formative evaluation helps improve the artefact until the final result is achieved. Only at that point can the result of the assessment be used.

2.2 Motivation

Analysing and connecting data is a process that is becoming more important within companies. Due to the sheer scale of data now becoming available, many companies have organically grown their data sources, which over time has resulted in multiple systems all managing different types of data. As each datapoint has an inherently different purpose, there is often limited connection or integration between the platforms or tools generating this data, hence limiting the ability to gain a wide-scale holistic viewpoint. From internal anecdotes could be learned that Company X is

considered to be losing 5% - 15% cost value through the inability to effectively manage supplier performance data.

There is currently no single platform or dashboard that category managers can access to make reports or see, for example, supplier performance easily and quickly. The systems are limited in integration and data is not connected. The current way of working causes category managers additional time and effort due to the difficulty of obtaining the right data. That results in a limited ability to calculate the right performance metrics of suppliers which ultimately leads to category managers having disadvantages supplier negotiations, discussions, and performance reviews.

Because of the lack of system integration, it is hard to analyse data and to make useful statistics of the data. With the statistics at hand, it could be easier estimated if suppliers still stick to the agreements made and to understand where some extra profit could be made. Currently, most category managers only having data from suppliers themselves, which is not enough. By the absence of proper data analytics, category managers cannot take advantage of smart data analytics and are therefore not on an equal level with suppliers. That gives category managers the disadvantage of a less meaningful data-driven discussion.

The solution defined as a result of this pain point was to source or build a tool that could present data in a single user-intuitive dashboard with content fronted up and integrated from various backend systems.

Through extensive market research, Salesforce's Supplier 360 SRM platform was selected as the tool most likely to deliver the defined results. Salesforce is well known for its CRM systems on the sales side of the business, but supplier 360 was specially designed for the supply side of the supply chain. Because Salesforce is already with Company X, Company X decided to start a PoC with the software, to see if this conceptual solution meets the aims of the desired situation.

3. Literature research

The literature research must help identifying what is already known in the literature, or what methods and methodologies could help during the research. Since this research is about workflows and information systems, the literature review is focused on the design and development of information systems and workflow management systems. This research evaluates the first version of the PoC from the eyes of category managers. Therefore the literature research is built around the questions: "What is a good framework to evaluate an artefact in design science research?" and "What were the main findings of similar case studies?". To frame up a proper evaluation, more information is being gathered about what types of evaluations exist and what could be a good way to design an evaluation. The second question helps us formulate a hypothesis on what we could expect from this project. During the first part of this literature research, the evaluation part is covered. The second part is about other case studies to compare.

3.1 Evaluation framework

Firstly, establish what an evaluation is exactly. An evaluation is the systematic determination of merit, worth, and significance of something or someone. It is used to characterize and appraise subjects of interest in a wide range of human enterprises (A. Hevner & Chatterjee, 2010). This literature review identified three papers to review to identify a general evaluation framework.

An evaluation can be formative or summative and can be done ex-ante or ex-post (Venable et al., 2012). Formative evaluation is used to produce empirically based interpretations that provide a basis for successful action in improving the characteristics or performance of the evaluand (Wiliam & Black, 1996). A summative evaluation is used to produce empirically based interpretations that

provide a basis for creating shared meanings about the evaluand in the face of different contexts. Summative evaluations focus on the meaning and support of the kinds of decisions that intend to influence the selection of the evaluand for an application (Wiliam & Black, 1996).

An ex-ante evaluation is a predictive evaluation that is performed to estimate and evaluate the impact of future situations (Stefanou, 2001). Ex post evaluation is an assessment of the value of the implemented system based on both financial and non-financial measures. An evaluation happens at the end of the project or step (Stefanou, 2001).

Another group where evaluations could be classified are philosophical groupings. Broadly speaking, there are two. The objectivist and the subjectivist (Friedman & Wyatt, 2005). The objectivist approach is derived from a logical positivist philosophical orientation and means that the merit and worth of an information resource can in principle be measured with all observations yielding the same result (Friedman & Wyatt, 2005). In contrast, there is the subjectivist approach. The subjectivist approach is based on assumptions that derive from an intuitionist pluralist philosophical position. This approach tells us that what is observed about a resource depends on fundamental ways on the observer (Friedman & Wyatt, 2005).

An evaluation starts with someone who wants to evaluate something (Figure 3-1). With that person or entity, you have a negotiation on the question which would be your starting point, details of the research, and when the deadline must be. After the contract and questions are clear, the investigation starts, and with that the collection of data. From the gathered data, a conclusion is drawn and written down in a report. (A. Hevner & Chatterjee, 2010)

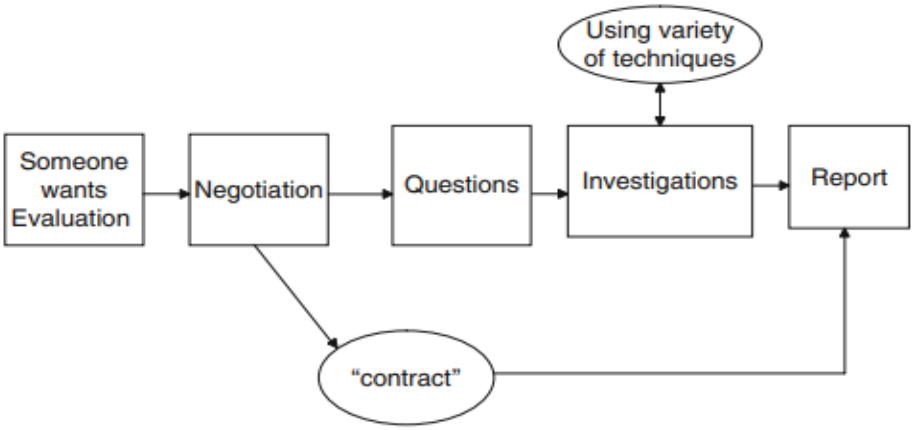

Figure 3-1 Evaluation process

Venable presents a general framework for evaluation in the paper: "a framework for evaluation in design science research". In (Figure 3-2) we see the concepts of formative and summative, but Venable also introduces the concepts of a naturalistic and artificial evaluation. An artificial evaluation entails an empirical or non-empirical and almost always positivist evaluation to test design hypotheses. The main goal is to prove or disprove the design theory and/or the utility of the DSR artefacts. A naturalistic evaluation explores the performance of a solution technology in its real environment, typically within an organisation. A naturalistic evaluation is always empirical and embraces all of the complexities of human practice in real organisations (Gummesson, 1900).

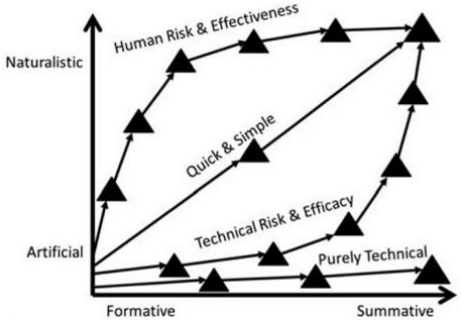

Figure 3-2 Graph of strategies Venable

In (Figure 3-2), four possible evaluation strategies could be identified, namely: human risk & effectiveness, quick & simple, technical risk & efficacy, and purely technical.
The quick and simple strategy conducts relatively little formative evaluations and progresses quickly to summative and more naturalist evaluations. Also, this strategy makes use of little evaluation cycles.

The human risk and effectiveness evaluation strategy emphasize formative evaluations early in the process, possibly with artificial formative evaluations, but the strategy progresses quickly to more naturalistic formative evaluations. In the end, the strategy contains a more summative naturalistic evaluations to focus on the effectiveness of the artefact

The technical risk and efficacy evaluation strategy emphasises artificial formative evaluations iteratively early in the process and is moving towards summative artificial evaluations. Near the end, more naturalistic evaluations are engaged.

The fourth strategy is purely technical, so without the need for human interference. The strategy is similar to the quick and simple strategy but favours artificial over naturalistic evaluations.

To help to decide when a strategy is applicable, the author provided us a table (Table 3-1) (Venable et al., 2012).

DSR evaluation strategies	*Circumstance selection criteria*
Quick & Simple	If small and simple construction of design, with low social and technical risk and uncertainty
Human Risk & Effectiveness	If the major design risk is social or user oriented *and/or* If it is relatively cheap to evaluate with real users in their real context *and/or* If a critical goal of the evaluation is to rigorously establish that the utility/benefit will continue in real situations and over the long run
Technical Risk & Efficacy	If the major design risk is technically oriented *and/or* If it is prohibitively expensive to evaluate with real users and real systems in the real setting and/or If a critical goal of the evaluation is to rigorously establish that the utility/benefit is due to the artefact, not something else
Purely Technical Artefact	If artefact is purely technical (no social aspects) or artefact use will be well in future and not today

Table 3-1 Choosing criteria strategy

Venable also provided us with a heuristic to frame up the evaluation. The heuristic is described below.

1. Explicate the goals of the evaluation.

The author specified four possible goals of the evaluation (Table 3-2). The four possible goals are: Rigour, Uncertainty and risk reduction, Ethics and Efficiency

Goal	**Formative or summative**	**Naturalistic or artificial**
Rigour	Summative, because the researcher can evaluate if the cause is solved.	Naturalistic provides the best and most accurate result.
Uncertainty and risk reduction	Formative, because evaluating uncertainties can significantly reduce risks.	Naturalistic or artificial depends on the situation.
Ethics	The formative evaluation may reduce later risks, but the summative evaluation is the best way to ensure the rigour that reduces risk to the eventual user or artefact.	Naturalistic or artificial depends on the situation.
Efficiency	Formative evaluation can reduce costs by evaluating before incurring the costs of instantiation and theory specification.	The naturalistic evaluation takes longer and will probably more costly than artificial evaluation. Autor does not say which one fits best.

Table 3-2 Possible goals for an evaluation

2. Choose the evaluation strategy.

Depending on the goal, different evaluation strategies are applicable. The author provided us with a heuristic to determine which one is best.

The first step is to prioritise design risks and understand the potential problems the design might face. If the design risk is social or user-oriented, use the human risk and effectiveness strategy. If the biggest risk is technically oriented, use the technical risk and efficacy strategy.
The second step is to look at how costly it would be to evaluate with real users and real systems in a real setting. If it is relatively cheap, continue with the human risk and effectiveness strategy. If it turns out to be more expensive, pursue a technical risk and efficacy strategy.
The third step evaluates if the artefact being developed is purely technical, or that the need for a solution also exists in the future, go with the purely technical strategy.
In the last step look if the construction of the design is small and simple, or large and complex. If the structure is small and simple. If the structure is indeed small and simple, then go with the quick and simple strategy.

3. Determine the properties to evaluate.

The next step regards what to evaluate. What details exactly to evaluate, is specific to each artefact. In order to help the researcher with choosing evaluands, the author provided us with Table 3-3 in where possible evaluands are stated based on different situations.

Sun & Kantor (2006) Adapting levels of granularity	Stufflebeam (2003) Adapting context, input, process, and product	Mathiassen *et al* (2000, based on the ISO standard 9126) Adapting criteria as design goals	Smithson & Hirschheim (1998) Adapting both rationality and understanding
(1) Whether the individual item was retrieved (2) Whether the task-at-hand was completed, and (3) Whether the completed task had a valuable impact on the goals-at-hand	Context: Goals Input: Strategy Process: Work plan Product: Outcomes and side effects	Useable, Secure, Efficient, Correct, Reliable, Maintainable, Testable, Flexible, Comprehensible, Reusable, Portable, and Interoperable	Rationality-efficiency: Quality assurance Rationality-effectiveness: Cost-benefit, User satisfaction, Resource utilisation Understanding: Social action, cognitive Psychology

Table 3-3 table helping to select details to evaluate

The author also provided us with the following heuristic in order to determine the right evaluands.

Step 1: Identify potential evaluands. For doing that, the researcher can use table 4 as inspiration. The outcome will be a list of potential evaluands.

Step 2: Align candidate evaluands with the goals explicated in step 1. Try to answer the question to what extent the evaluand contributes to the goal of the evaluation.

Step 3: Consider the strategy chosen in step 2. Choosing a more naturalistic way, the evaluand should reflect that.

Step 4: Design the individual evaluation episode. When finished the first three steps, an actual evaluation has to be designed. Also, for this step, the author provided us with a heuristic.

Step 1: Identify and analyse the constraints in the environment. Find out what resources are available.
Step 2: Prioritise the above contextual factors to determine which aspects are essential and what aspects are less important.

Step 3: Decide a plan including determination of how many evaluation episodes there will be conducted and in what way (Venable et al., 2012).

Sonnenberg and vom Brocke come up with another framework to evaluate in design science research Figure 3-3. The four evaluation milestones are part of the feedback cycle that runs in the opposite direction as the DSR cycle. (Sonnenberg & vom Brocke, 2012)

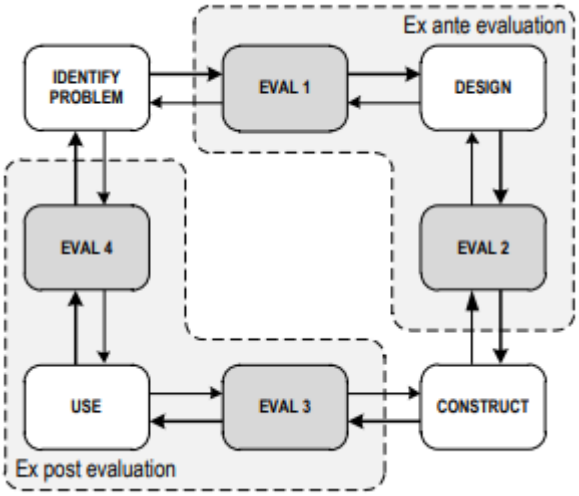

Figure 3-3 Sonnenberg and von Brocke evaluation framework

In evaluation 1, the justify phase, the researcher assures that the problem identified is a meaningful DSR problem. In evaluation 2, formal proof, the design phase is evaluated. To see if the result serves the purpose of showing that an artefact design ingrains the solutions to the stated problem.

Evaluation 3 can be called prototyping.
The evaluation activity serves to demonstrate if and how well the artefact performs while interacting with organizational elements. This step ex-ante and ex-post with each other, so if changes are necessary it can be done here.

Evaluation 4, the case study, is meant to evaluate if the artefact is applicable and useful in practice. Only naturalistic evaluations will be applied here (Sonnenberg & vom Brocke, 2012).

According to Henver, common mistakes during an evaluation are: the researcher setting no goal for the evaluation, working with an unsystematic approach, doing an analysis without the understanding of the problem, working with incorrect performance matrices, and last working with wrong evaluation techniques.

3.2 Comparable implementation case studies

Two case studies to the implementation of a new workflow management system have been studied to gain insights from comparable cases. One case study was about the transition from paper to digital in the City of Charles Sturt (CCS). The second paper was about Nanjing Jin Cheng motorcycle corporation Ltd, searching for a way to implement a new workflow system to connect the supply chain parts.

First, start defining an information system. An information system (IS) can be regarded as a system of communication between people. It is involved in the gathering, storing, processing, distribution, disposition, and use of information (International Conference on Information Systems and Development: Methods and Tools & Song, 2011). Computerized facilitation or automation of a business process in whole or in part, is called a workflow. A workflow management system controls execute and monitors these workflows (International Conference on Information Systems and Development: Methods and Tools & Song, 2011).

The CCS needed to switch from paper to an electronic document and records management system (EDRMS) in the early 2000s. This happened in the context of a lot of upgrades and recently completed systems, mainly within the finance and accounting departments. During a number of

workshops, employees stated concerns about inter-related issues concerning storage and tracking of documents in this paper-based system. The management decided to switch to an EDRM system. During the process the team, which was put in place to select and implement such a system, communicated with the employees often to get a system that meets everybody's requirements. That helps to get almost all workflows included in the system.

After the final design and implementation, the EDRMS was found to be a success. That success consisted out of multiple factors: The support from the senior staff was a major factor for success. Other factors were: clear understanding of the project and requirements by key players of the project, the emphasis on consultation from the earliest days of the project, the pressure for uptake from fellow employees, a set of well- documented IT strategies for records managed, a communication strategy to prevent employees from resistance and a clear idea for design in order to let people want to use the new system, not force them to use it. The researchers also found that the EDRM system has a positive impact on the professional image of the government which was an unanticipated outcome. Improved understanding of records management in the organisation was a second unanticipated positive outcome. A negative unexpected outcome was that employees needed extended training on the definition and concept of a record in the electronic system. Positive with that was that the extended training averted potential problems once the system went live.

In the second case, from Nanjing Jin Cheng motorcycle corporation Ltd, there was a need for a solution to improve business processes efficiency. The plan to achieve this was by integrating its business processes with those of its suppliers as well as sharing and exchanging information smoothly and quickly within the company and with suppliers and retailers over the internet. In order to carry out the cross-enterprise processes over the internet, every independent enterprise had an inner information system. In the requirement analysis, it was indicated that there was neither an efficient integrated management system in the corporation nor in most of its suppliers. Because of this, was decided to develop a common integrated web services component model (WSCM) so that the corporation and its suppliers could manage their inner processes.

The developed WSCM consists of a set of business function agents, a workflow process definition tool, a workflow engine, and an independent integrated interface.

The new supply chain management system provides the following benefits.

- It allows the company to react quickly to changes in the market. Because of the new system, order data and service information of the suppliers and distributors can be returned within one day.
- It enhances stability and operability of the manufacturing plant. For example, the shortage of raw materials has been decreased by 10%.
- It causes inventory to be kept low, due to the accurate and timely information which allows the manufacturer to use inventory control theories and methods.
- The information flow in the supply chain has been speeded significantly.
- The use of working capital in the enterprise has been improved.

Also, lessens has been learned from the implementation.

- Strong support from the top management helps the implementation going smoothly and efficiently.
- Good cooperation and negotiation with suppliers and retailers, helping where necessary to make the system a success.
- The use of open and standard hardware and software systems helps for easier integration.
- The system should be flexible so that it can be adapted to different supplier's requirements.

3.3 Added value for this research

The evaluation done in this research is a formative, naturalistic, ex-ante evaluation. This evaluation is meant to provide information to see if the team is on the right track for further development of the artefact.

If the step by step plan to frame up the evaluation is followed, we find that the higher-level goal is to reduce uncertainty and risk. Company X wants to reduce uncertainty and risk, so they don't have surprises further down the road. The second step is to choose an evaluation strategy. The strategy chosen is the technical Risk and Efficacy strategy. This strategy is meant to avoid expensive evaluations with real users in a real setting. Effectively that is what is happening here because there is not a real PoC yet to make a pilot with. In this early stage of development. The strategy is applicable because the higher-level goal of the research is to reduce risk and uncertainty. The third step is to choose evaluands. The requirements to evaluate are determined in the chapter "Desired situation". The fourth step is to make the actual evaluation, which is a survey in this case.

From the case studies could be learned what the most important factors were in those circumstances. The successes which the implementation of a new information system brings depends on the nature of the system. The successes for the motor company are different than for the CCS. What can be compared, are the fundamentals for successful implementation. Therefore, a new theory could be developed. From both cases, we can learn that support from management is a necessary factor to make a new information system a success. Also, good communication with stakeholders is important to collect requirements and get stakeholders, which are not involved in the project, on board too. It turns out that it is very important to have a properly developed plan too which helps with the implementation and the completion of the project. From the second case can be learned that the use of open and standard hardware and software systems helps for easier integration with other systems intern or with systems from external parties.

4. Problem statement

4.1 Current situation

Company X's supplier management team consists of multiple users, all with differing business area interests but equally all with the same one need, accuracy of data with a simple means of accessing and utilizing the data. The wider team, collectively known as CP, interacts with multiple systems on a daily basis, these systems are displayed in Table 4-1 . Depending on the nature of what the users are searching for drive them to use different systems, tools, and platforms. Internal reports at Company X indicate that this differentiated view causes confusion and frustration amongst users (Woo, 2020).

2020	**Users**	**Comment**
Software tool B	All CP and outside CP (Business Stakeholders, Suppliers)	Used for contract management of suppliers.
Software tool F	CP Leads and Company X / Supplier signers	Used for managing electronic agreements.
Software tool G	Mainly CP Leads, CP Managers	The platform is used for training materials and demos for the adoption of SAP Ariba.
Software tool H	Category/Supplier Management, Suppliers	Supplier performance KPI tracking.
Software tool I	Everyone in CP	From text to speech
Software tool J	CP Leads, Legal	SharePoint based tool to maintain legal clauses and helps with drafting contracts.
Software tool A	Everyone in CP	Provide much of the analytics and reports. Most focused on spend data
Software tool C	Category managers	Provide more detailed spend data.
Software tool E	Category managers	Safety data.

Table 4-1 contains all the different information systems used in Company X's business unit Contracting and Procurement.

4.2 Problem cluster

In Figure 4-1 the problem cluster is shown. The two core problems, causing the observed problems, are marked in red.

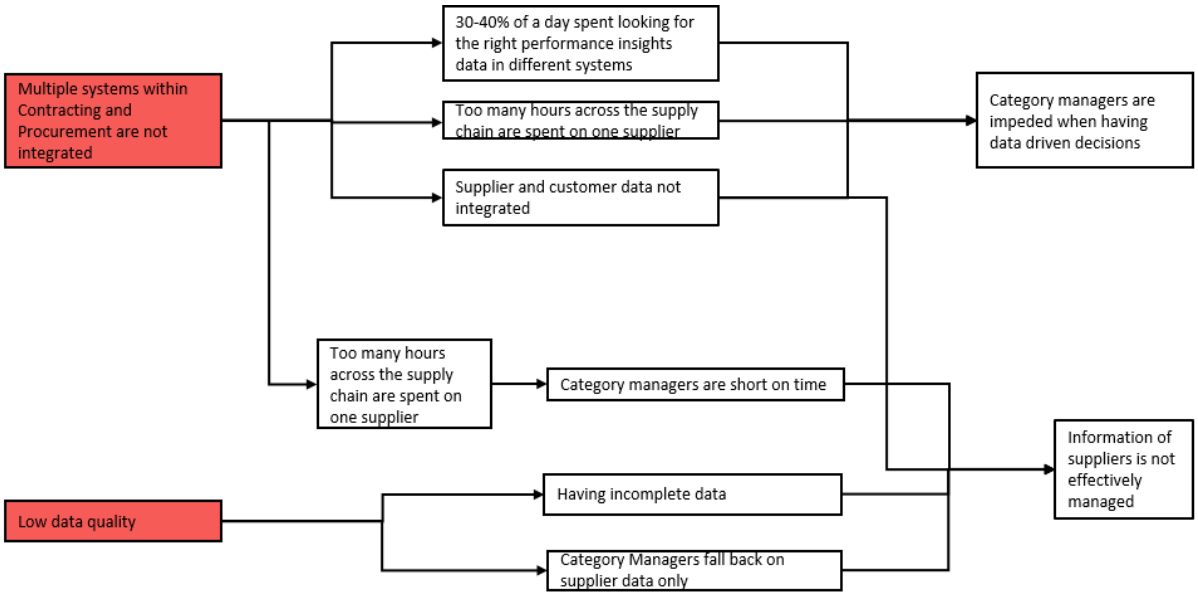

Figure 4-1 Problem cluster

4.3 Problem observed

Figure 4-1 states two observed problems: 1) information of suppliers is not effectively managed and 2) category managers are less informed than they need to be when having data-driven conversations. These problems are observed within the company and find their cause in two root problems.

4.4 Core problem

The problem of category managers within Company X concerns two core problems: problem one is low data quality and the second problem is the lack of integration between multiple information systems. The PoC aims to solve the lack of integration between information systems.

The lack of integration between information systems causes category managers to go to multiple systems in order to obtain the right information. Therefore, it is estimated that 30%-40% of a day is spent searching for the right data. The category managers have to go to every information system individually and must export the needed information in a data analytics program. Therefore, too many hours are spent on a single supplier. Because it is such a maze, finding the right data takes a lot of time and therefore most category managers are short on time. A further issue is that data about suppliers and customers are not integrated. Therefore, a category manager is often unaware of a supplier being a customer and as a result is unable to adopt a stronger negotiation position.

In short, the selected core problem is formulated as follows: information systems within contracting and procurement are not integrated with each other and therefore category managers miss out on key information.

5. Research approach

5.1 Goal of the research

The goal of this research is to do a formative evaluation of the conceptual solutions' ability to meet the aims of the desired situation from the perspective of category managers. Therefore, the second goal is to gain opinions and insights from category managers as much as possible. This is done by accomplishing the smaller sub goals:

1. Map the current business process.
2. Determine the category managers' requirements for a solution by a survey.
3. A proposed solution.
4. An evaluation of the PoC against the proposed solution.

5.2 Research approach, methodology, and research questions

For this research, adopting the design science research methodology (DSRM) is an appropriate method. In this chapter, the steps of the methodology, research question, and the design of the research are described. An overview of the steps in the methodology is presented in Figure 5-1. The methodology must help to answer the main research question:

"To what extend is the PoC successful in meeting the needs of category managers in the identified business unit in contracting and procurement in Company X?"

Company X made an artefact that could be a possible solution for the core problem, the PoC. This research is going to evaluate the first draft of a possible solution to see to what extent the PoC already meets the requirements of category managers. That means that this evaluation is a formative evaluation operating in phases 1 and 2 of the DSRM methodology.

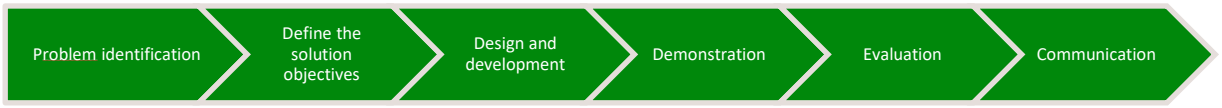

Figure 5-1 Steps in design science research

Phase 1

The first step in the methodology is problem identification and motivation. During the problem identification, the researcher tries to identify the root problem. In the motivation phase, the researcher motivates why the root problem found is a problem worth solving. The justification is important because that helps motivate the researcher and the audience of the research to execute the research. Besides it helps to understand the reasoning associated with the researcher's understanding of the problem (A. R. Hevner & Chatterjee, 2010).

In order to build the foundation of the research, the context can be further investigated. The following knowledge question is formulated to help to discover the current situation:

"What are the steps in the current situation when category managers from the identified business unit need data about supplier performance and need to find that in one of the systems?"

This question is answered by interviewing category managers and by analysing documents from the Company X environment. By understanding how category managers operate now, gives a good opportunity to explore if improvement can be made. The outcome of this research is a BPMN model where the steps are described until the category manager find the information needed. Learned from this question is why the current situation is experienced as a problem.

Phase 2
During the second phase of the DSRM methodology, requirements for a solution are formulated together with the input of category managers. In this phase, I come up with a list of qualitative requirements that the PoC must meet in order to satisfy the category managers. With those requirements, the PoC can be evaluated so recommendations can be made on where the team could improve the PoC to the wishes of the category managers to answer the main research question.

In order to start with the evaluation of the PoC, first knowledge about a proper evaluation framework needs to be gathered. The framework must give a clear idea of how the PoC can be measured against the desires of category managers and what KPIs plays a role here. The following research question helps with that:

"What is a good framework to evaluate an artefact in design science research?"

From the literature study, it could be learned that the evaluation executed is a formative evaluation used to produce empirically based interpretations that can provide a basis for successful action in improving the characteristics or performance of the PoC (Venable et al., 2012). I am using a technical risk and efficacy evaluation strategy meant to use when it is not possible to evaluate the system among a big group of people (Venable et al., 2012).

The first step in the main research is to design a desired situation together with category managers. The following research question helps with that:

"What requirements do the category managers have for the desired situation for the process of finding supplier performance information in the identified business unit?"

Given the circumstances, it is not possible to have an in-depth interview with category managers. Therefore, documentation of Company X and interviews already done by me before I left the company are analysed to gather data. Also, an information video of Salesforce in cooperation with Peer company, a competitor of Company X, is studied. The peer company has already implemented a system similar to the one Company X is planning on developing. From the employees of Company X is learned that the peer company situation is the desired situation for Company X. The outcome of this question is a design in the form of a list of requirements.

Obtained requirements are verified among a bigger group of category managers. A survey was sent to a group of category managers in the identified business unit to validate if the requirements are indeed the one's category managers desire. In that survey, they can indicate on an ordinal level to what extent they agree with the requirement for their ideal situation. When they disagree with a requirement, they are asked why they disagree and asked to come up with a reason and/or alternative for those specific criteria.

Based on the verifications of the category managers, a second survey was made for the developers of the PoC. The second survey is needed to measure the performance of the PoC against the requirements from the first survey and was the last data gathering event. The survey was answered by the project sponsor of the project. The purpose of these sections is to answer the main research question:

"To what extend is the PoC successful in meeting the needs of category managers in the identified business unit in contracting and procurement in Company X?"

The outcome of the second survey must be a percentage number stating to what percentage the PoC meets the requirements from category managers.

In the first survey, the category managers get the possibility to respond to a prepared list of requirements. They have the following options in the survey.

1. Essential. (2 points)
2. Desirable. (1 point)
3. Makes no difference (1/0 point(s))
4. Not desirable (0 points)
5. Definitely not (0 points)

The participant can choose one of the five options for every requirement. Every requirement has the same weight. When the category managers answer: “not desirable” or “definitely not”, the requirement gets zero points and the requirement is not included in the second survey. Also, the participant is asked why the participant disagrees and to come up with an alternative. When a category manager responds with either the answer “essential” or “desirable”, the requirement is considered important and gets one or two-point(s). That means that the requirement has to be included in the final solution.
When the category managers answer: “makes no difference” the requirement was marked with one or zero point(s), dependent on what the category manager answered on the follow-up question in where the survey asked why the participant gave that answer. A requirement is only left out when the majority of the respondents (50% or more) is agreeing on the unimportance of the requirement. From the result, the average amount of points is calculated and afterward compared with the results of the second survey.

The requirements left from the first survey are presented to the participants of the second survey and they are asked to what extend the PoC is already capable of executing these requirements. The participants can choose one of the following possibilities.

1. The PoC can do even more than that requirement. (2 points)
2. The PoC meets that requirement. (1 point)
3. The PoC partly meets that requirement. (1/0 points)
4. The PoC does not meet that requirement, but the requirement could be included in later development. (0 points)
5. The PoC does not meet that requirement at all. (0 points)

When the participant answers option one, there is a pop-up question asking what exactly the PoC can do more. When option two is answered, no further questions are necessary because the PoC meets exactly that requirement. When the PoC doesn’t meet the requirement and the participant fills out options three, four, or five the question is marked with one or zero points, depended on the reason given for their answer.

From every completed survey a total amount of points is obtained. Those scores are summed and dived by the number of submissions to come to an average score. The average score can be at least zero and at maximum the number of requirements times two. To calculate to what extend the PoC concept meet the requirements of category managers, the following formula is used:

$$\%PoC\ meet\ requirements = \frac{Score\ PoC}{Total\ possible\ score} * 100$$

Phase 3
The third step is called design and development. Here the requirements for the desired situation are determined, followed by creating an actual artefact. What the exact requirements are for category managers, is found out in phase 2.

Phase 4
The fourth phase is called demonstration. The demonstration phase is used to test the artefact created and to solve one or more instances of the problem. This could involve the use of the solution in experimentation, simulation, case study, proof, or other appropriate activities.

Phase 5
The fifth step is the evaluation phase. Here the actual evaluation is done and is measured how the solution has performed and to what extent it has solved the problem. The activity involves comparing the objectives of a solution to the actual observed results.

Phase 6
The last phase is the Communication phase. In the last phase the problem and its importance, the artefact with its utility and novelty is communicated to the stakeholders.

5.3 Validity and reliability of the research

When something is valid, it must be reliable. But when something is just reliable, it does not automatically have to be valid. Think of the speedometer in a car. When the speedometer is always measuring the speed correctly, it is valid and reliable. But when the speedometer always overstates your speed by 20 km/h, it is always reliable, but not valid.

Validity defines cooper as the question of whether a measurement accomplishes its claims. There are multiple different types of validity, such as construct-, internal-, and external validity.

Construct validity is about the measurements during the research. Does the measurement indeed measure what it should measure? This is related to the research design. Therefore, the researcher must think carefully about the research design and the risks involved. The research could be invalid when the measurements were done measure, in reality, something else than expected.

Internal validity is about the accuracy, reliability, utility, and quality of the research process. Internal validity concerns the test of relationships. Yin explains the concept of internal validity in the following way: “internal validity is mainly a concern for explanatory case studies when an investigator is trying to explain how and why event x led to event y. If the investigator incorrectly concludes that there is a causal relationship between x and y without knowing that some third event z may have caused y, the research design has failed to deal with some threat to internal validity.” (Yin, 2018).

External validity refers to how much the result can be generalized to other situations. The most important question here is if the outcome of the research can apply to other situations where it can regenerate the same outcome. So when the results of this evaluation are generalized, can they apply to another organization? (Donald R Cooper, 2014)

“Reliability is concerned with estimates of the degree to which a measurement is free of random or unstable error.” (Donald R Cooper, 2014)

A threat to the internal validity in this research is the core process for category managers finding data not researched in-depth and the proposed solution accordingly. It could be that bad data

management is not causing a delay for category managers, but that it is something else causes that. To prevent that from happening, it is important to do in-depth interviews with employees executing the process, about that process. Specific questions have to be asked about the data management system, and accordingly, questions to check that answer are important. It is already clear that data quality also plays a huge role in delay category managers experience. What exactly causes the delay, is important to find out.

A threat to construct validity is how requirements were obtained and validated. This happened by reviewing data that was initially obtained for other reasons than finding out requirements and/or analysing the process. A part of the requirements was obtained by interviewing employees participating in the development team or in some other way connected to the PoC. Therefore, the requirements can include a strong bias for the chosen solution. The way to resolve this problem is to validate the requirements among a bigger group of category managers not related to the PoC. The validation was done by a survey. From a construct validity point of view, it is better to have an open interview without sketching the context of the situation at all and let the participant speaks freely, as is impossible in a survey. Therefore, a bias regards the PoC could be planted into the heads of the participants of the survey. Trying to keep that bias as little as possible, opportunities were given to participants during the survey to respond to the requirement and give their view on the problem and possible solution.

5.4 Intended deliverables

This research delivers the following results:

- A BPMN model about the current situation.
- A list of requirements from category managers.
- Verified requirements from category managers.
- Assessment of the PoC to meet the requirements of the desired situation.

5.5 Limitations and scope of the research

This research is limited to identifying and describing the current problem situation, defining a route towards a solution by mapping out the desired requirements, and by extracting criteria for evaluating possible solutions, and performing a formative evaluation of the PoC in order to provide an assessment of its suitability. It will not recommend new vendors when it appears that Salesforce is not a good fit for Company X. However, when it turns out that the solution is to be found not a suitable solution, the research will be stating why and what is needed to be a proper solution. It will not frame up a new project.

Because the PoC focuses only on the data integration part, no further research is done on the second core problem involving the data quality. The research main focus is the evaluation of the PoC, the data quality is another issue not addressed in this research.

The research is limited by the circumstances the research was executed in. The exact process category managers follow to obtain their information could not be researched in full detail, therefore nothing useful can be said about the process and the suitableness for their job. This limitation was due to the circumstances of the time the research was executed in.

The research done is a single case study, meaning that the new information system is studied in its natural setting. Typical to a case study is that it is hard to generalize results. The results coming from this research are applicable in this specific situation but could be different when being done in another environment.

Last, this research is about the requirements of category managers. There are multiple definitions of what a category manager does. Also, within Company X, the job entails not the same in every department. We stick to the broad definition which says that a category manager is responsible for contracting and procurement of a category of products within a company. Activities might differ per category managers, but in general, there are a few activities which are almost always the same. Those activities are analysing data or insights to evaluate suppliers, build relationships with suppliers, develop a long-term development strategy for products, and forecast product demands to ensure the sustainability of inventory. This is the perspective of where this research will approach the job of a category manager.

6. Results

6.1 Current situation

In this chapter, the current situation is analysed. The purpose of this chapter is to answer the following research question:

"What are the steps in the current situation when category managers from the identified business unit need data about supplier performance and need to find that in one of the systems?"

By interviews, a model could be made (Figure 6-1) about the current situation for obtaining supplier performance.

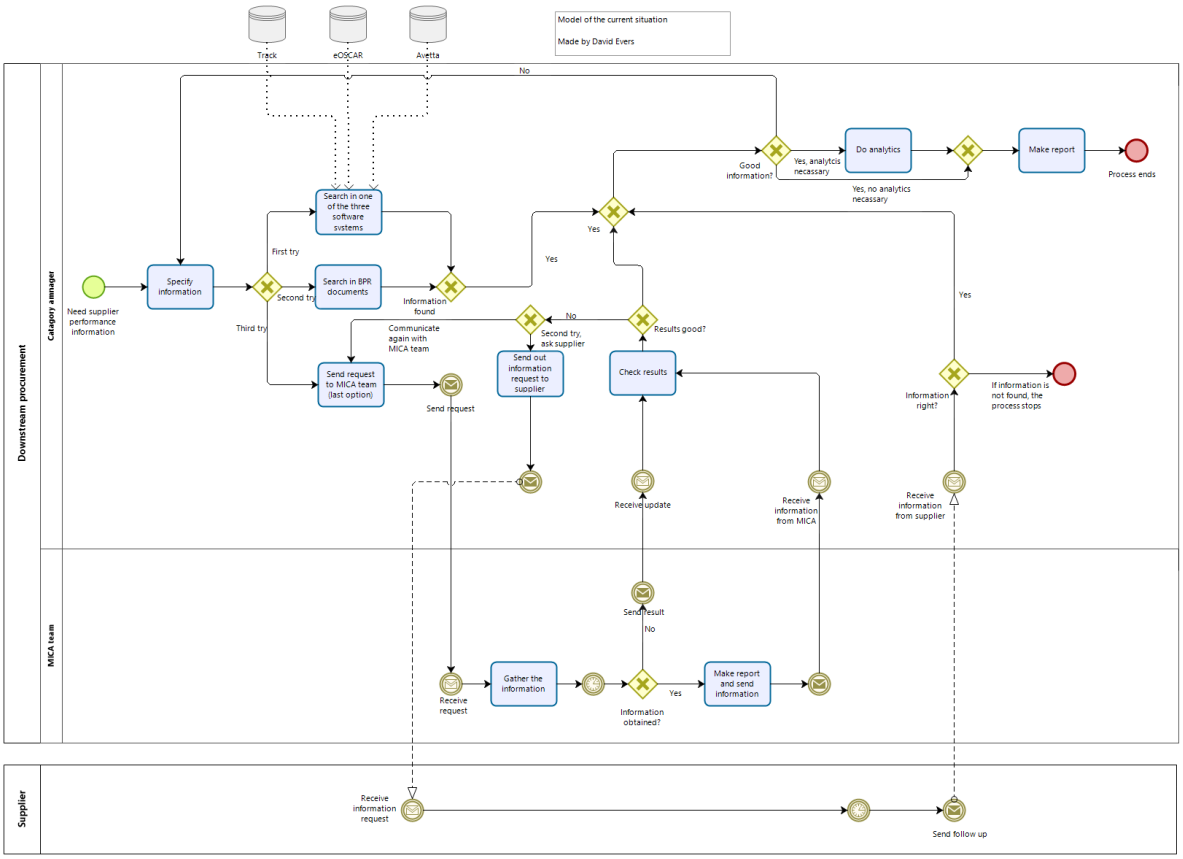

Figure 6-1 BPMN model about the current situation

There are various reasons for starting the process. A category manager could need performance information for review discussions about suppliers, or a line manager could need information and ask a category manager to obtain that information. The first step in the process is to specify as exactly as possible what information is needed. The second step is to look into one of the systems

for the information needed. Because Company X is so big, the systems could differ per business unit, but in the identified business unit there are practically four big systems where information could be stored (Table 6-1).

System	Purpose
Software tool A	Contains a high level spend information.
Software tool B	Contains more detailed spend and cost information.
Software tool C	Contains the broadest information on cost and performance.
Business Performance Review Documents	Static information from the supplier about how they performed. Not automated.

Table 6-1 Systems and there purposes in the identified business unit

When information is not found in one of the four systems, the category manager can raise a request to the Marketing Intelligence (MI) team, to see if they can provide the category manager with the information necessary. If they can't provide the information, the last step is to ask the supplier directly to provide the information. If even the supplier cannot provide the information, the process ends, but these cases are really rare.

When the information is obtained, the category manager checks if indeed everything needed is obtained. When it is, the process continues. Otherwise, the process will start over. If the information is completely obtained, analytics will be done on the data if necessary. This is in most cases done in another system, namely Microsoft power BI or Microsoft Excel. The choice of the system depends on the preference of the category manager.

When the analytics phase is finished, a report is made and the process ends.

From anecdotal evidence can be learned that on average this process can take up to three weeks. Most category managers stated that they prefer it when the systems can be accessed from one portal. The desired situation is worked out in the next chapter.

6.2 Desired situation

Now it is clear why the current situation could be improved and where it is time to frame up the utopian situation for category managers. This chapter aims to find out what category managers want when they can design a system to obtain supplier performance information. Ideally, requirements for an ideal situation were obtained by doing interviews, unfortunately, the circumstances won't let me do that. Therefore, already existing material was used, such as documents, old interviews about different topics, and a sales video from Salesforce.

6.2.1 Requirements

Requirements were obtained as described in the introduction. The exact material used is displayed in Table 6-2.

What	Purpose	Source
Peer company video implementing Salesforce Supplier 360.	The ideal situation for Company X.	Salesforce website.
Interview with business analyst 1.	To obtain information for making a BPMN model about the ideal search process for supplier performance information.	Business analyst MI team.

Interview with category manager 1.	To obtain information for making a BPMN model about the ideal search process for supplier performance information.	Category manager.
Interview with category manager 2.	Get to know the situation.	Category manager, materials, and ST.

Table 6-2 Material used for obtaining requirements

The PEER COMPANY video was a marketing video for peer company and Salesforce. A Company X employee stated that this is the desired situation. Therefore, the video got analysed to discover the experiences of the peer company. The video was watched three times. The first time to get a general impression of the video, the situation of the peer company, and how Salesforce supplier 360 solved that problem. The second time to make notes on the way and to discover requirements for the data performance part. The third time requirements missed during the second time were obtained.

The interviews held were prepared with structured interviews. The interview with category manager 2 was meant for discovering the context. The interviews with business analyst 1 and category manager 2 were meant for obtaining the desired process. The data obtained from those interviews could therefore not directly be used for this research. Therefore, I used the following method to filter requirements out of the context:

1. Make a transcript of the interviews.

The relevant parts of the three interviews are fully worked out. This means the introduction, chit chat, unrelated material, and the end of the conversation were left out. Making a transcript created the possibility of analysing the interviews better than when there is only the sound of the interviews.

2. Scanning through the transcripts to get a general impression.

First, I decided to read through the interviews, to get a general impression of the context, the different opinions, and potential requirements. In this step aspects, where I believe they are important were marked.

3. Coding of the transcripts.

After the reading phase, coding was done. With coding, marking every relevant piece of information is meant. In this phase requirements, were obtained. Every sentence in where the interviewee declared that something could be improved, or where the interviewee named a possible requirement for a solution, that was marked. Especially when multiple interviewees named the same problem and/or requirement.

4. Select relevant codes.

From every sentence that was marked, a final selection was made. Hereby special attention was paid to repeated problems or requirements, or requirements/problems that one single individual named. Also, descriptions of the situation came into the requirement list. Especially when multiple interviewees named the same problem and/or requirement.

5. Translate the codes into requirements and formulate categories.

In the last step, requirements were formulated from the selection of codes from step 4. This list can be found in Appendix 2. The made survey can be found in Appendix 3.
The requirements are classified into three different categories: Integration, Security, and process facilitation. With Integration, the integration of different information systems and data into one information system is meant. Security has to do with requirements from category managers to make the information system more secure and to display data only to people who need to see the data. The category “process facilitation” is about requirements meant to make the process more efficient/convenient for the user. The requirements classified in the categories could also be found in Appendix 2.

6.2.2 Results

In total, seven persons responded to the survey. During the analysis phase, the method for analysing as described in the design research plan was used. There were no requirements where 50% or more of the respondents reacted negatively. Therefore, every requirement got accepted. In Table 6-3 can be read why requirements were accepted where one or more respondents disagreed with or got feedback on.

Requirement	Explanation for accepting
An information system displays data from all current Company X software systems like Software tool A, B, C, D and E in one place	One participant filled out "makes no difference" and made a point about data quality. No people disagreed with this requirement.
The information system should be accessible through the Company X Single Sign-On that defines the role of the user, so that only information will be displayed that is relevant to the user.	One participant marked the requirement as "not desirable". The majority agreed with the requirement.
The information system should have a portal for suppliers where they can fill in their performances over a certain period of time.	Only one respondent disagreed with the requirement and one person is in between. The reason given why that person found the requirement not desirable, is because the respondent wants to enter the date himself. The majority agreed with the requirement.
A simple and easy to use facility for generating questionnaires for specific supplier information.	One respondent marked the question as "not desirable" and one person is in between. Should not have the highest priority the respondent says.
A facility to generate supplier questionnaires at regular intervals (weekly, monthly, quarterly, semi-annually or annually).	One respondent marked the question as "not desirable".
The information system keeps track of the data response time and can send reminders if necessary.	The requirement got accepted because less than 50% disagreed. One respondent marked the question as "not desirable"
The information system must automatically collect data from the Company X databases and process that data to make various graphs automatically.	One person disagreed, one person is in between. The reason given is that the current graphs are not good enough due to the data quality. The majority agreed on this requirement.
The information system must have an integration with an analytical program to do extended analytics on the data without exiting the information system.	The requirement got accepted. Three respondents marked the question as "makes no difference". The reason for this is that they got used to excel already and not sure if the new program works. For some analysing data is out of the scope of their daily work. The majority agreed on the requirements.
Unrestricted emails about and from the supplier should be found at the profile of that specific supplier in the information system and be visible to the authorized user.	One marked the requirement as not desirable and one respondent is in between. The reasons are that email will give too much unnecessary data. The majority agreed.

Table 6-3 reasons why a requirement got accepted/rejected

Table 6-4 shows the results of the survey. The green boxes are the requirements which are accepted, the red boxes are the requirements which are rejected. No red boxes are shown because all requirements got accepted by the category managers.

Accepted and rejected requirements		
An information system displays data from all current Company X software systems like Software tool A, B, C, D and E in one place.	The information system keeps track of the data response time and can send reminders if necessary.	In the information system it must be possible to place comments directly in documents or graphical content without exiting the information system.
The information system should be accessible through the Company X Single Sign On that defines the role of the user, so that only information will be displayed that is relevant to the user.	The information system must automatically collect data from the Company X databases and process that data to make various graphs automatically.	The information system provides a Company X profile of every supplier containing all data Company X has of that supplier.
The information system should have a portal for suppliers where they can fill in their performances over a certain period of time.	The information system must be able to export the obtained data and graphs easily to Microsoft office files.	The Company X team managing the supplier should be presented on the Company X profile of the supplier.
A simple and easy to use facility for generating questionnaires for specific supplier information.	The information system must have an integration with an analytical program to do extended analytics on the data without exiting the information system.	All the data available in the information system must be the latest data available from all the integrated data sources.
A facility to generate supplier questionnaires at regular intervals (weekly, monthly, quarterly, semi-annually or annually).	The information system is able to share documents, graphical content, and information with authorized users in a collaborative environment.	The latest information available from Company X databases must automatically be displayed in dashboards created by Category Managers themselves/created for Category Managers.
The information system should display related BPR documents from the supplier on the Company X profile of the supplier.	Unrestricted emails about and from the supplier should be found at the profile of that specific supplier in the information system and be visible to the authorized user.	The information system should be able to make reports automatically in various design formats on demand containing various data by the choice of the user.
When data is not available in the information system, a request to obtain data from the MI team should be raised from inside the information system.	The information system should be able to automatically rate suppliers on certain categories, for example safety or delivery, according to predetermined criteria and availability of data.	Based on the supplier and if there is safety information available, the information system must be able to provide a dashboard regarding safety issues of a specific supplier automatically and give all the details available.

The information system should keep track of important dates such as, when the contract expires or when a delivery will take place.		

Table 6-4 results survey

In Appendix 5 the scores of all the respondents can be seen. The total average score of the survey (formula can be seen in the design part) is 26,9. That means that the PoC must at least meet the 26,9 score to be as good as category managers expect the new system to be.

6.2.3 Comments

The last question of the survey asked if the participants had any other requirements or remarks the survey did not mention. Some interesting remarks and requirements came out of this question.

The first remark from a category manager mentioned that the data quality was not addressed in the survey. That is indeed correct and that had to do with the problem cluster. In the beginning, the research aim was set to the integration of software systems and not to data quality. The team is aware of the data quality issue, but that is out of the scope of this research. Besides, unfortunately, this research was unable to perform any research on the data quality due to the process and corona situation at the beginning of my internship.

Further, a suggestion/requirement was about a certain KPI to measure quality. The respondent would like to see this requirement included in the result. This requirement is already hidden in one of the existing requirements, namely the requirement to let category managers create their own dashboard. Making KPI's is included in there.

The last participant made multiple suggestions, such as the options to link contract levers such as rebates to the profile and let the program send reminders automatically. Another suggestion from the same participant is about the creation of actions and tasks for people, very much in line with the collaboration requirement already included in this survey. The last suggestion from that participant is to have a space to capture meeting minutes. Company X already has a place for that, called SharePoint. However, this suggestion is something for the team to look into further. Therefore, all the suggestions from this participant are included in the next survey in a separate section.

6.2.4 Participants background

To give some more information about the participants background, data was collected about their employment within the company. This data can be found in Table 6-5.

Participant#	**Background**
1	Category manager
2	Advisor functions and technology CP3
3	Member of MI team, data analyst
4	Category manager within the selected business nit - Category Excellence
5	Category manager
6	Commercial excellence manager
7	Category manager IT

Table 6-5 Participants background

6.3 PoC

The functionality survey was filled in by one member of the PoC team. This member has a good overview of what the first concept of the information system could already do because the member was the project sponsor of the project within Company X. Everyone from the team should come to the same conclusions because the survey does not ask for opinions, but for functionalities. Therefore, the researcher decided, for efficiency reasons, to ask one member of the team to fill out the survey.

6.3.1 Results

In Table 6-6 the results of the second survey can be seen. Remarkable is that only three categories of answers were given, namely the following: “The PoC meets that requirement”, “The PoC partly meets that requirement” and “The PoC does not meet that requirement, but the requirement could be included in later development”. All requirements which the current draft of the PoC does not meet could still be included in later development.

Results of the second survey		
An information system displays data from all current Company X software systems like Software tool A, B, C, D and E in one place.	The information system keeps track of the data response time and can send reminders if necessary.	In the information system it must be possible to place comments directly in documents or graphical content without exiting the information system.
The information system should be accessible through the Company X Single Sign On that defines the role of the user, so that only information will be displayed that is relevant to the user.	The information system must automatically collect data from the Company X databases and process that data to make various graphs automatically.	The information system provides a Company X profile of every supplier containing all data Company X has of that supplier.
The information system should have a portal for suppliers where they can fill in their performances over a certain period of time.	The information system must be able to export the obtained data and graphs easily to Microsoft office files.	The Company X team managing the supplier should be presented on the Company X profile of the supplier.
A simple and easy to use facility for generating questionnaires for specific supplier information.	The information system must have an integration with an analytical program to do extended analytics on the data without exiting the information system.	All the data available in the information system must be the latest data available from all the integrated data sources.
A facility to generate supplier questionnaires at regular intervals (weekly, monthly, quarterly, semi-annually or annually).	The information system is able to share documents, graphical content, and information with authorized users in a collaborative environment.	The latest information available from Company X databases must automatically be displayed in dashboards created by Category Managers themselves/created for Category Managers.
The information system should display related BPR documents from the supplier on the	Unrestricted emails about and from the supplier should be found at the profile of that	The information system should be able to make reports automatically in various design

Company X profile of the supplier.	specific supplier in the information system and be visible to the authorized user.	formats on demand containing various data by the choice of the user.
When data is not available in the information system, a request to obtain data from the MI team should be raised from inside the information system.	The information system should be able to automatically rate suppliers on certain categories, for example safety or delivery, according to predetermined criteria and availability of data.	Based on the supplier and if there is safety information available, the information system must be able to provide a dashboard regarding safety issues of a specific supplier automatically and give all the details available.
The information system should keep track of important dates such as, when the contract expires or when a delivery will take place.		

Table 6-6 Results functionality survey

	#The PoC can do even more than that requirement.
	#The PoC meets that requirement.
	#The PoC partly meets that requirement.
	#The PoC does not meet that requirement, but the requirement could be included in later development
	#The PoC does not meet that requirement at all.

In total, six requirements were marked as: The PoC meets that requirement. Three requirements were marked as: “The PoC partly meets that requirement.”. Thirteen requirements were marked as “The PoC does not meet that requirement, but the requirement could be included in later development”.

Where the participant answers that the requirement partly meets the PoC, the participant leaves a comment on why. During the first draft of the PoC, the team did not make use of live data, while the requirements were about live data. An email conversation with the participant made clear that the PoC made use of production data (not test data), but the data was not live. At the time the PoC could work with live data if that data was pushed, but that was out of the scope of the PoC. Because the PoC worked with real production data and would use live data in a later stadium, the researcher decided to give these three requirements three points.

6.3.2 Categories

In Table 6-7 the answers per category can be seen. In total thirteen requirements were classified in the integration category, eight requirements were classified in the process facilitation categories and one requirement was classified in the security category. 46% percent of the requirements from the integration category was not included in the PoC but could be included in later development. 75% of the requirements in the process facilitation category were marked as not included in the PoC but could be included in later development. The one requirement marked in the security category was marked the same.

This means that there are aspects to improve when Company X decides to include the requirements from category managers in the product.

	The PoC meets that requirement.	**The PoC partly meets that requirement.**	**The PoC does not meet that requirement, but the requirement could be included in later development.**
Integration	4	3	6
Process facilitation	2	0	6
Security	0	0	1

Table 6-7 Answers per category

6.3.3 Score

When grading the functionality survey as described in the design plan, the end score was a nine. Because only six requirements were included in the PoC, six points were assigned to them. Due to the reason described in chapter 6.3.2, three more points were assigned to the total score for the requirements answered with “The PoC partly meets that requirement”. Thirteen requirements were marked as not included in the PoC but could be included in later development, zero points were assigned to those answers. The calculation of the score could be found in Appendix 5.

7. Conclusion, recommendations, and discussions

7.1 Discussion

In this final part of the thesis, are interpreted and the researcher reflects on the process and the results.

7.1.1 Literature theory

In the second chapter of the literature review, we went over two case studies. The case studies described the process of implementing new information systems and the successes and learning points from that. We were specifically interested in what the implementation made a success. The two main points the case studies had in common were one, strong concerned management, and second, participation from stakeholders not directly involved in the project team. The theory could not be tested in-depth in this case study, because this case study does not follow the whole project from beginning to end.

During the PoC stage, the researcher found those two factors present during the development. Stakeholders from outside the project team were involved in the development and the management was corned with the project too. From time to time the manager was involved in calls to get updated on the status of the project and lift management problems. During the beginning of the COVID-19 situation, the project just began. During the first chaotic weeks, the project team managed to develop the first version of the PoC, in time and better than expected. That result gives promising outlooks for the future.

7.1.2 Validity

7.1.2.1 Internal validity

When gaining information and data for my research, I consulted employees given by the researcher's mentor within Company X. Those people were related to the PoC because they were consulted by the team before. Therefore, there could be a bias towards the PoC from the beginning. Also, the Salesforce/Peer company video given by a Company X employee contains a strong bias regarding the result as planned by members of the team. That does not make the research directly invalid, but those are some points to keep in mind when reading the research.

The requirements were verified among a bigger group of category managers. In that bigger group, three of the seven employees were related to the PoC team. Therefore, also in the verification of the requirements, there could be a bias regarding the PoC and regarding Salesforce.
All the analytics done on the results were done by hand. Therefore, it could be that an error occurred during the process. Because all the results are checked multiple times, it decreases the probability of an error.

Last, it could be that the survey was not the best way to obtain and verify requirements. The way requirements were obtained was not by a direct interview, but by deriving requirements from interviews about another subject. Verifying them afterwards by a survey takes away the opportunity of asking people's opinion about the underlying problem and view on a new information system. Better was when interviews were held and included in the design plan. With interviews, people could be asked about their opinions on the problem and their solutions.

7.1.2.2 External validity

The external validity of the research is very small because this research is a specific case study and therefore not applicable to many more companies. Nevertheless, this case study could be applied to other similar situations where companies want to integrate software systems. As long as the context of the situation is kept in mind.

7.1.2.3 Effects of the research

This research could help in developing the PoC to a level where everybody who is going to work with the result, participated in the development of the result. This research could help in collecting all the requirements from one group of stakeholders, to consider and implement these requirements later. This research gives a good idea of what category managers want to see in a solution and what must be developed to make that happen.

7.2 Conclusion

In the problem statement, two core problems were presented. One core problem was about the lack of integration between multiple information systems within contracting and procurement and the second core problem was about the data quality. No research has been done about data quality. The lack of integration between information systems was taken as the main scope of the research. The PoC is aiming on solving the lack of integration. With help of the DSR methodology, the main research question was answered, namely: "To what extend is the PoC successful in meeting the needs of category managers in the identified business unit in contracting and procurement in Company X?". At the end of the research, we can answer this question.

In chapter 6.2 a long list of requirements from category managers was presented. In total 22 requirements which category managers would like to see in a new information system. All respondents agreed to the pre-formulated 22 requirements, so no requirements were rejected. The total score of the requirement survey is 26,86.

The functionality survey from chapter 6.3, in where the requirements from the category managers were tested against the PoC, got a total score of nine. The PoC did not meet most requirements. That means that the PoC meets the needs of category managers within contracting and procurement for 33,5% at this current point in time.

The PoC meeting requirements for only 33,5% means that there are still a lot of aspects which category managers like to see in the new information system, are not implemented yet. From interviews, we learn that the integration of different information systems is important for the success of the new information system. Without the further integration of existing information systems and the display of live data, the project would, obviously, not succeed. The other important aspect learned from interviews is the freedom to create KPI's and create dashboards. We believe the freedom to create dashboards is another very important factor for the success of the project.

However, the other core problem about data quality is not researched in-depth here. We believe that the solution as presented here might not work when the data quality issue is not solved. To quote one of the participants of the first survey: "with the current data quality the system cannot generate the right data". The new system must also solve the data quality issue in order to be a success. As can be learned from the case study of the City of Charles Sturt, the automation of the process for records entry has improved the quality of the data and analytics. That was only possible because the data was of good quality. Therefore, we can expect that without proper data quality, the new information system is less likely to succeed.

7.3 Recommendations

During the research, it became clear that the PoC is a very early draft which leaves room for improvement. Because the PoC only meets nine requirements, that means thirteen requirements could be implemented and investigated further. In Appendix 6 the requirements which are not implemented in the PoC yet, but are verified among category managers, could be found and are worth investigating. Some users also gave suggestions about what could be implemented or could be considered in later stages of development. A list of these points could be found in Appendix 7.

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9. Appendix 1

9.1 Literature review

9.2 Theoretical perspective

For this thesis, two literature reviews will be done. One in order to find out how two workflow processes could be best compared with each other and the second is about how to make a BPMN model. For the proposal, I try to answer the first literature review question, which is about the workflow processes. The following research question is formulated.

"What is a good structure to evaluate a BPMN model by design research?"

In this question, a good way to compare two process models will be found in the available scientific databases. A literature study will be done to see what methods to compare two processes are there and on what aspects they can be best compared in terms. The result would be a method to compare the two workflow models with each other.

9.2.1 Systematic literature review

9.2.1.1 Research question

For the systematic literature review (SLR) I need to know how two workflow models could be best evaluated with each other. The following research question was drafted during the research.

"What is a good structure to evaluate a BPMN model by design research?"

The key concepts used in this research will be:

- Workflow management.
- Design research.
- Evaluation.

9.2.1.2 Selection criteria

Criteria for inclusion:

Inclusion criteria	**Reason**
The title must contain the word evaluation.	That is the most important goal what this SLR tries to accomplish. How to evaluate a workflow process.
Title must include design science research	That is the main concept the evaluation is about.

Exclusion criteria	**Reason**
The study was published in another language than English or Dutch.	I can not read those and Google translate is not a good alternative
If the paper is about an evaluation using simulation.	My research won't do a simulation.
Papers aim to improve processes	The scope is not to improve a process, but to evaluate it.
Papers about the evaluation of workflow processes in a medical situation	Experiences have shown that these papers are in no way comparable with what I need for the SLR.

9.2.1.3 Databases

Databases that will be used for the search are Scopus and web of science. Google will also be used for helping to find search terms. These databases are multidisciplinary and accept Booleans.

9.2.1.4 Search terms

Constructs	Related terms	Broader terms	Narrower terms
Workflow management		Business processes, Process model validation.	Pert, CPM, Business Process Management and Notation, Corporate performance management, Enterprise performance management, Petri net, EPC (Event-driven process chain diagram), UML (unified modelling language), ACM (Adaptive case management)
Design research	Design science research		

9.2.2 Search strategy

Search log

Data	**Database**	**Search term**	**Amount of hits**
03-6-2020	Google Scholar	Evaluate workflow system design research	577000 (at least 1 useful)
3-6-2020	WOS	TS =(design AND research) AND (ALL = (methods))	235977
3-6-2020	WOS	TS = (evaluate*)	53876
3-6-2020	WOS	TS = (evaluate*) AND TS =(design AND research) AND (ALL = (methods))	548
3-6-2020	WOS	ALL = (workflow OR workflows OR workflow* OR "workflow diagram") AND TI = (method*) AND TS = (implementation)AND TS =(design AND research) AND (ALL = (methods))AND TI = (evaluate*)	1 (not useful)
9-6-2020	WOS	TI = (Framework)	186559
9-6-2020	WOS	TI = ("design science research" OR dsr OR "design research")	10045
9-6-2020	WOS	TS = (design NEAR\3 (science OR research))	9
9-6-2020	WOS	TS = (design NEAR\3 (science OR research)) AND TI = (Framework)	0

9-6-2020	WOS	TI = (Framework) AND TI = ("design science research" OR dsr OR "design research")	19 (

Documents found

#	Title	Autor(s)	Reason for inclusion	URL	Search try
1	FEDS: a Framework for Evaluation in Design Science Research	John Venable, Jan Pries-Heje, Richard Baskerville	Gives a general framework for evaluating Design Science Research	https://www.tandfonline.com/doi/full/10.1057/ejis.2014.36	1(google schoolr)
2	Evaluating patterns for design science research artefacts	Christian Sonnenberg, Jan vom Brocke	Describes a framework for evaluating aspects in design science research		3 (WOS)
2	Design research in information systems	Hevner, Alan, Chatterjee, Samir	Chapter nine gives a good overview of evaluation criteria	https://www.springer.com/gp/book/9781441956521#:~:text=The%20study%20of%20Information%20Systems,Alan%20Hevner%20and%20Samir%20Chatterjee.	Tip from supervisor.

9.2.3 Evaluation

9.2.3.1 Documenting

Paper#	Concept
1	An evaluation can be formative or summative. A formative evaluation is used to produce empirically based interpretations that provide a basis for successful action in improving the characteristics or performance of the evaluand (Wiliam & Black, 1996) A summative evaluation is used to produce empirically based interpretations that provide a basis for creating shared meanings about the evaluand in the face of different context summative evaluations focus on meanings and support the kinds of decisions that intend to influence the selection of the evaluand for an application (Wiliam & Black, 1996) A formative evaluation is often regarded as iterative or cyclical in order to measure improvements as development progress. Summative evaluation episodes are more often used to measure the results of a completed development or to appraise a situation before development begins. (Wiliam & Black, 1996) Ex-ante evaluation is the predictive evaluation that is performed in order to estimate and evaluate the impact of future situations (Stefanou, 2001) and if it is necessary to develop a technology or not. Ex post evaluation is an assessment of the value of the implemented system on the basis of both financial and non-financial measures. (Stefanou, 2001) Ex-ante evaluations happen before candidate systems have been chosen, ex-post evaluation regards a chosen and developed system or technology after it has been chosen.

Doing an evaluation, the researcher has to keep in mind the type I and II errors. A type one error is. A type I error occurs when the researcher finds that an artefact works, when in reality it does not work. A type II error occurs when the researcher finds that the artefact does not work, when in reality it does work.

The author provided us with a framework for evaluation in design science research (Figure 5-1)

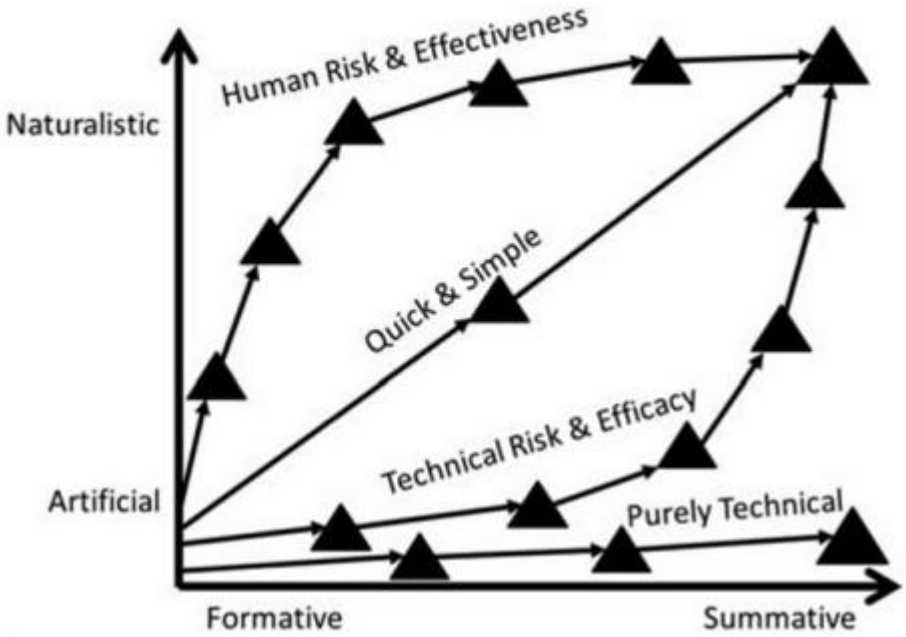


Figure 9-1

On the X axis, dimension 1, the researcher can choose the functional purpose of the evaluation. The researcher can choose between a pure formative, pure summative or everything in between research. The function of a formative evaluation is to help improve the outcomes of the process under evaluation. The functional purpose of a summative evaluation is to judge the extent that the outcomes match expectation.

On the Y axis, the second dimension, the researcher can choose the paradigm of the evolution study. Artificial evaluation may be empirical or non-empirical. It is nearly always positivist and educationist, being used to test design hypotheses. However, interpretive techniques may also be used to attempt to better understand why an artefact works or why it works. Artificial evaluation includes laboratory experiments, simulations, criteria-based analysis, theoretical arguments, and mathematical proofs.

Naturalistic evaluations explores the performance of a solution technology in its real environment, typically within an organisation by performing evaluation in a real environment (Sun & Kantor, 2006). Methods to perform a naturalistic evaluation are typically: case studies, field studied, field experiments, surveys , ethnography, phenomenology, hermeneutic methods and action research.

Figure 5-1 follows a chronological progress through artificial evaluations to more naturalistic evaluations. The increasing use of naturalistic evaluations improves the quality of the knowledge outcomes concerning the artefact's effectiveness in real use. That is how most evaluations are being done, but of course lots of strategies are possible.

	The study identifies four different strategies which could be taken during an evaluation in design science research, namely: quick & simple, human risk & effectiveness evaluation strategy, the technical risk & effectiveness evaluation strategy and last the purely technical artefact strategy. The quick and simple strategy conducts relatively little formative evaluations and progresses quickly to summative and more naturalist evaluations. Also makes this strategy use of little evaluations cycles. The human risk and effectiveness evaluation strategy emphasises formative evaluations early in the process, possibly with artificial formative evaluations, but the strategy progresses quickly to more naturalistic formative evaluations. In the end the strategy contains a more summative naturalistic evaluations to focus on the effectiveness of the artefact The technical risk and efficacy evaluation strategy emphasises artificial formative evaluations iteratively early in the process and is moving towards summative artificial evaluations. Near the end more naturalistic evaluations are engaged. The fourth strategy is purely technical, so without the need for human interference. The strategy is similar to the quick and simple strategy but favours the artificial over naturalistic evaluations. Table 3 shows the circumstances to choose for a strategy.

Table 9-1

DSR evaluation strategies	*Circumstance selection criteria*
Quick & Simple	If small and simple construction of design, with low social and technical risk and uncertainty
Human Risk & Effectiveness	If the major design risk is social or user oriented *and/or* If it is relatively cheap to evaluate with real users in their real context *and/or* If a critical goal of the evaluation is to rigorously establish that the utility/benefit will continue in real situations and over the long run
Technical Risk & Efficacy	If the major design risk is technically oriented *and/or* If it is prohibitively expensive to evaluate with real users and real systems in the real setting and/or If a critical goal of the evaluation is to rigorously establish that the utility/benefit is due to the artefact, not something else
Purely Technical Artefact	If artefact is purely technical (no social aspects) or artefact use will be well in future and not today

In conclusion the author proposes four general steps for an evaluation in DSR.

1. Explicate the goals of the evaluation.

The author specified four possible goals of the evaluation. Some goals are more relevant it other stages of DSR. The for possible goals are: Rigour, Uncertainty and risk reduction, Ethics and efficiency

Goal	Formative or summative	Naturalistic or artificial
Rigour	Summative, because their the researcher can evaluate if the cause is really solved.	Naturalistic provides the best and most accurate result.
Uncertainty and risk reduction	Formative, because evaluating uncertainties can significant reduce risks.	Naturalistic or artificial, depends on the situation.
Ethics	Formative evaluation may reduce later risks, but summative evaluation is the best way to ensure the rigour	Naturalistic or artificial, depends on the situation.

	that reduces risk to the eventual user or artefact.	
Efficiency	Formative evaluation can reduce costs by evaluating before incurring the costs of instantiation and theory specification.	Naturalistic evaluation takes longer and will probably more costly than artificial evaluation. Autor does not say which one fiets best.

2. Choose the evaluation strategy.

Depending on the goal, different evaluation strategies are applicable. The author provided us with a heuristic to determine which one is best.

The first step is to prioritise design risks and understand the potential problems the design might face. If the design risk is social or user oriented, use the human risk and effectiveness strategy. If the biggest risk is technically oriented, use the technical risk and efficacy strategy. The second step is to look how costly it would be to evaluate with real users and real systems in a real setting. If it is relatively cheap, continue with the human risk and effectiveness strategy. If it turns out to be more expensive, pursue a technical risk and efficacy strategy. For the third step evaluate if the artefact being developed is purely technical, or that the need for a solution also exists in the future, go with the purely technical strategy. In the last step look if the construction of the design is small and simple, or large and complex. If the structure is small and simple. If the structure is indeed small and simple, thaen go with the quick and simple strategy.

3. Determine the properties to evaluate.

The next step regards to what to evaluate. What details exactly to evaluate, is specific to each artefact. In order to help the researcher with choosing evaluands, the author provided us with a table in where possible evaluands are stated based on different situations.

Sun & Kantor (2006) Adapting levels of granularity	Stufflebeam (2003) Adapting context, input, process, and product	Mathiassen *et al* (2000, based on the ISO standard 9126) Adapting criteria as design goals	Smithson & Hirschheim (1998) Adapting both rationality and understanding
(1) Whether the individual item was retrieved (2) Whether the task-at-hand was completed, and (3) Whether the completed task had a valuable impact on the goals-at-hand	Context: Goals Input: Strategy Process: Work plan Product: Outcomes and side effects	Useable, Secure, Efficient, Correct, Reliable, Maintainable, Testable, Flexible, Comprehensible, Reusable, Portable, and Interoperable	Rationality-efficiency: Quality assurance Rationality-effectiveness: Cost-benefit, User satisfaction, Resource utilisation Understanding: Social action, cognitive Psychology

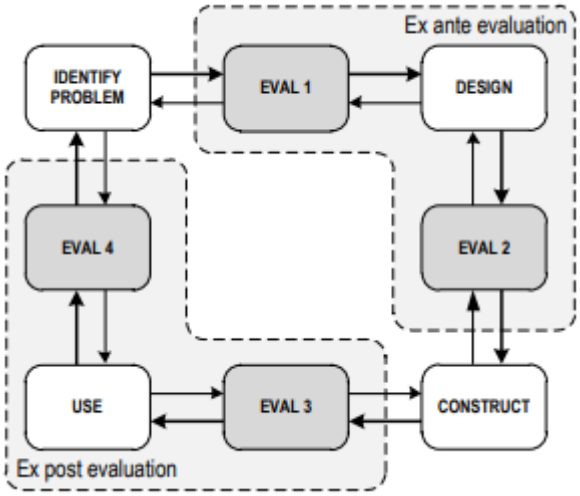
Table 9-2

The author also provided us with the following heuristic, in order to determine the right evaluands.

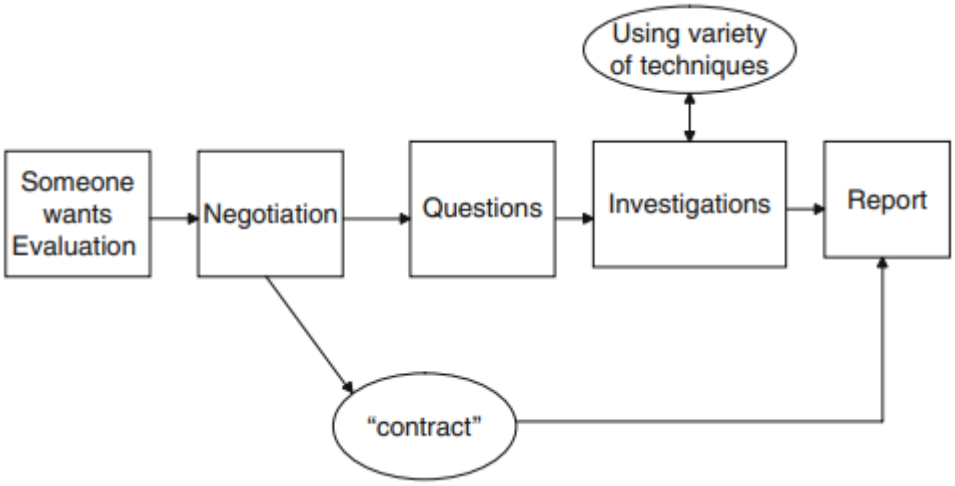
Step 1: Identify potential evaluands. For doing that, the researcher can use table 4 as inspiration. The outcome will be a list with potential evaluands.

Step 2: Align candidate evaluands with the goals explicated in step 1. Try to answer the question to what extent the evaluand will contribute to the goal of the evaluation.

Step 3: Consider the strategy chosen in step 2. Choosing a more naturalistic way, the evaluand should reflect that.

	4. Design the individual evaluation episode. When finished the first three steps, an actual evaluation has to be designed. Also for this step the author provided us with a heuristic. Step 1: Identify and analyse the constraints in the environment. Find out what resources are available Step 2: Prioritise the above contextual factors to determine which aspects are essential and what aspects are less important. Step 3: Decide a plan including determination of how many evaluation episodes there will be conducted and in what way.
2	The paper recommends to do an evaluation after each artefact. Ex ante: evaluations are conducted before the constructions of any artefacts. Ex post: evaluations occur after the construction of any artefact. When adopted the DSR methodology, the author proposes four evaluation points with corresponding activities. The four evaluation milestones are part of the feedback cycle that runs in the opposite direction as the DSR cycle.  In evaluation 1, the justify phase, the researcher assures that the problem identified is a meaningful DSR problem. The author proposes a few methods to do the evaluation: - Assertion. - Literature review. - Review partitioner initiatives. - Expert interview. - Focus groups. - Surveys. In evaluation 2, formal proof, the design phase is evaluated. To see if the result serves the purpose of showing that an artefact design ingrains the solutions to the stated problem. The design could be evaluated on the following aspects: - Feasibility. - Accessibility. - Understandability. - Simplicity.

	- Elegance. - Completeness. - Level of detail. Think of the following methods that could be executed with this evaluation: - Assertion. - Mathematical proof. - Logical reasoning. - Demonstration. - Simulation. - Benchmarking. - Expert interview. - Focus group. In evaluation 3, can be called prototyping, the evaluation activity serves to demonstrate if and how well the artefact performs, while interacting with organizational elements. This step is the step that links ex ante and ex post with each other, so if changes are necessary it can be done here. Possible evaluation criteria are: - Feasibility. - Ease of use. - Effectiveness. - Efficiency. - Fidelity with real word phenomenon . - Operationality. - Robustness. - Suitability. The following evaluation methods could be applied. - Demonstration with prototype. - Experiment with prototype. - Experiment with system. - Benchmarking. - Surveys. - Expert interview. - Focus group. Evaluation 4, the case study, is meant to evaluate if the artefact is applicable and useful in practice. Only naturalistic evaluations will be applied here. Possible design criteria are: - Applicability. - Effectiveness. - Efficiency. - Fidelity with real world phenomenon . - Generality. - Impact on artefact environment and user. - Internal consistency. - External consistency. The following evaluation methods are typically applied here: - Case study. - Field experiment. - Survey.

	- Expert interview. - Focus group.
3	Evaluation is the systematic determination of merit, worth, and significance of something or someone. It is used to characterize and appraise subjects of interest in a wide range of human enterprises. The author also states that it is important to realize what you are evaluating. Is it the performance of the system? Or the overall usefulness to the end-user (socio-technical) or both? Different topics require different evaluation questions, but all evaluation studies have a certain structure in common (figure 5-2)  *Figure 9-2* The evaluation starts with someone who wants to evaluate something. It could be yourself, an organization or a group of people. With that person or entity you have a negotiation on the question which would be your starting point, details of the research and when the deadline must be. After the contract and questions are clear, the investigation starts and with that the collection of data. From the gathered data, a conclusion is drawn and written down in a report. All evaluations could be broadly classified into two major philosophical groupings. Objectivist and subjectivist. "Objectivist" approach is derived from a logical positivist philosophical orientation. All rational persons can and should agree on what attributes of a resource are important to measure and what results of these measurements would be identified as a most desirable correct or positive outcome. Primary objective analysis is conducted using quantitative methods. The other category is the subjectivist. A subjectivist approach based on assumptions that derives from an intuitionist – pluralist philosophical position. This approach says that what is observed about a resource depends in fundamental ways of the observer. Different observers of the same event, might come to different conclusions. A subjective evaluation is mostly done by qualitative data. Common mistakes during an evaluation are: the researcher setting no goal for the valuation, working with an unsystematic approach, doing an analysis without the understanding of the problem, working with incorrect performance metrices and last working with wrong evaluation techniques. To conclude, for technical evaluations a research can use one of the following three tools - Analytical modelling. - Simulation. - Actual measurements.

	When the researcher chooses the organizational impact aspect, then he needs to execute a quantitative method, like a survey or an interview.

9.2.4 Evaluation literature research

During the research, multiple evaluation moments are needed. One moment when the BPMN models of the current and desired situation are finished and one evaluation of the PoC. In the literature, a framework is identified to make a proper evaluation for Design Science Research, to answer the research question: “What is a good structure to evaluate a BPMN model by design research?”

Let’s first establish what an evaluation is exactly. An evaluation is the systematic determination of merit, worth, and significance of something or someone. It is used to characterize and appraise subjects of interest in a wide range of human enterprises. (A. Hevner & Chatterjee, 2010). This literature review identified three papers to review to come up with a general evaluation framework.

An evaluation can be formative or summative and can be done ex-ante or ex-post. (Venable et al., 2012) A formative evaluation is used to produce an empirically based interpretation that provides a basis for successful action in improving the characteristics or performance of the evaluand (Wiliam & Black, 1996). A summative evaluation is used to produce empirically based interpretations that provide a basis for creating shared meanings about the evaluand in the face of different contexts. Summative evaluations focus on the meaning and support of the kinds of decisions that intend to influence the selection of the evaluand for an application (Wiliam & Black, 1996).

An ex-ante evaluation is a predictive evaluation that is performed in order to estimate and evaluate the impact of future situations (Stefanou, 2001). Ex post evaluation is an assessment of the value of the implemented system on the basis of both financial and non-financial measures. An evaluation happening at the end of the project or step. (Stefanou, 2001)

Another group where evaluations could be classified are philosophical groupings. Broadly speaking, there are two. The objectivist and the subjectivist (Friedman & Wyatt, 2005). The objectivist approach is derived from a logical positivist philosophical orientation and means that the merit and worth of an information resource can in principle be measured with all observations yielding the same result (Friedman & Wyatt, 2005). In contrast, there is a subjectivist approach. The subjectivist approach is based on assumptions that derive from an intuitionist pluralist philosophical position. This approach says that what is observed about a resource depends on fundamental ways on the observer (Friedman & Wyatt, 2005).

An evaluation starts with someone who wants to evaluate something (Figure 9-3). With that person or entity, you have a negotiation on the question which would be your starting point, details of the research, and when the deadline must be. After the contract and questions are clear, the

investigation starts and with that the collection of data. From the gathered data, a conclusion is drawn and written down in a report. (A. Hevner & Chatterjee, 2010)

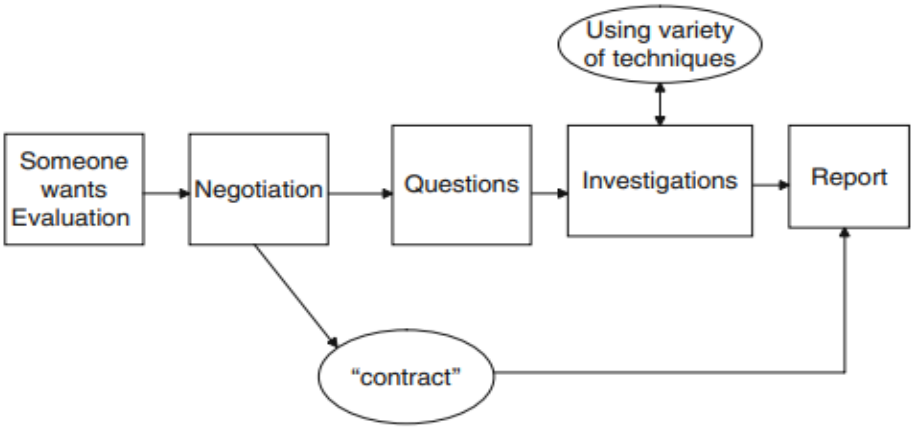


Figure 9-3

Venable comes up with a general framework for evaluation in the paper: a framework for evaluation in design science research (Figure 9-4). In Figure 9-4 we see the concepts of formative and summative, but Venable also introduces the concepts of a naturalistic and artificial evaluation. An artificial evaluation entails an empirical or non-empirical and almost always positivist evaluation to test design hypotheses. The main goal is to prove or disprove the design theory and/or the utility of the DSR artefacts. A naturalistic evaluation explores the performance of a solution technology in its real environment, typically within an organisation. A naturalistic evaluation is always empirical and embraces all of the complexities of human practice in real organisations (Gummesson, 1900).

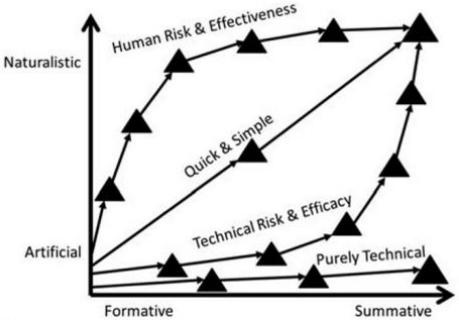


Figure 9-4 Graph of strategies Venable

In Figure 9-4, four possible evaluation strategies could be identified, namely: human risk & effectiveness, quick & simple, technical risk & efficacy and purely technical.

The human risk and effectiveness evaluation strategy emphasises formative evaluations early in the process, possibly with artificial formative evaluations, but the strategy progresses quickly to more naturalistic formative evaluations. In the end the strategy contains a more summative naturalistic evaluations to focus on the effectiveness of the artefact

The quick and simple strategy conducts relatively little formative evaluations and progresses quickly to summative and more naturalist evaluations. Also makes this strategy use of little evaluations cycles.

The technical risk and efficacy evaluation strategy emphasises artificial formative evaluations iteratively early in the process and is moving towards summative artificial evaluations. Near the end more naturalistic evaluations are engaged.

The fourth strategy is purely technical, so without the need for human interference. The strategy is similar to the quick and simple strategy, but favours the artificial over naturalistic evaluations.

For giving indications when a strategy is applicable, the author provided us a table (Table 9-3) (Venable et al., 2012).

DSR evaluation strategies	*Circumstance selection criteria*
Quick & Simple	If small and simple construction of design, with low social and technical risk and uncertainty
Human Risk & Effectiveness	If the major design risk is social or user oriented *and/or* If it is relatively cheap to evaluate with real users in their real context *and/or* If a critical goal of the evaluation is to rigorously establish that the utility/benefit will continue in real situations and over the long run
Technical Risk & Efficacy	If the major design risk is technically oriented *and/or* If it is prohibitively expensive to evaluate with real users and real systems in the real setting and/or If a critical goal of the evaluation is to rigorously establish that the utility/benefit is due to the artefact, not something else
Purely Technical Artefact	If artefact is purely technical (no social aspects) or artefact use will be well in future and not today

Table 9-3 Choosing criteria strategy

Venable also provided us with a heuristic to frame up the evaluation.

6. Explicate the goals of the evaluation.

The author specified four possible goals of the evaluation. The four possible goals are: Rigour, Uncertainty and risk reduction, Ethics and Efficiency

Goal	Formative or summative	Naturalistic or artificial
Rigour	Summative, because their the researcher can evaluate if the cause is really solved.	Naturalistic provides the best and most accurate result.
Uncertainty and risk reduction	Formative, because evaluating uncertainties can significant reduce risks.	Naturalistic or artificial, depends on the situation.
Ethics	Formative evaluation may reduce later risks, but summative evaluation is the best way to ensure the rigour that reduces risk to the eventual user or artefact.	Naturalistic or artificial, depends on the situation.
Efficiency	Formative evaluation can reduce costs by evaluating	Naturalistic evaluation takes longer and will probably

	before incurring the costs of instantiation and theory specification.	more costly than artificial evaluation. Autor does not say which one fiets best.

7. Choose the evaluation strategy.

Depending on the goal, different evaluation strategies are applicable. The author provided us with a heuristic to determine which one is best.

The first step is to prioritise design risks and understand the potential problems the design might face. If the design risk is social or user oriented, use the human risk and effectiveness strategy. If the biggest risk is technically oriented, use the technical risk and efficacy strategy.
The second step is to look how costly it would be to evaluate with real users and real systems in a real setting. If it is relatively cheap, continue with the human risk and effectiveness strategy. If it turns out to be more expensive, pursue a technical risk and efficacy strategy.
The third step evaluate if the artefact being developed is purely technical, or that the need for a solution also exists in the future, go with the purely technical strategy.
In the last step look if the construction of the design is small and simple, or large and complex. If the structure is small and simple. If the structure is indeed small and simple, than go with the quick and simple strategy.

8. Determine the properties to evaluate.

The next step regards to what to evaluate. What details exactly to evaluate, is specific to each artefact. In order to help the researcher with choosing evaluands, the author provided us with a table in where possible evaluands are stated based on different situations.

Sun & Kantor (2006) Adapting levels of granularity	Stufflebeam (2003) Adapting context, input, process, and product	Mathiassen *et al* (2000, based on the ISO standard 9126) Adapting criteria as design goals	Smithson & Hirschheim (1998) Adapting both rationality and understanding
(1) Whether the individual item was retrieved (2) Whether the task-at-hand was completed, and (3) Whether the completed task had a valuable impact on the goals-at-hand	Context: Goals Input: Strategy Process: Work plan Product: Outcomes and side effects	Useable, Secure, Efficient, Correct, Reliable, Maintainable, Testable, Flexible, Comprehensible, Reusable, Portable, and Interoperable	Rationality-efficiency: Quality assurance Rationality-effectiveness: Cost-benefit, User satisfaction, Resource utilisation Understanding: Social action, cognitive Psychology

Table 9-4

The author also provided us with the following heuristic, in order to determine the right evaluands.

Step 1: Identify potential evaluands. For doing that, the researcher can use table 4 as inspiration. The outcome will be a list with potential evaluands.

Step 2: Align candidate evaluands with the goals explicated in step 1. Try to answer the question to what extent the evaluand will contribute to the goal of the evaluation.

Step 3: Consider the strategy chosen in step 2. Choosing a more naturalistic way, the evaluand should reflect that.

9. Design the individual evaluation episode.

When finished the first three steps, an actual evaluation has to be designed. Also for this step the author provided us with a heuristic.

Step 1: Identify and analyse the constraints in the environment. Find out what resources are available.
Step 2: Prioritise the above contextual factors to determine which aspects are essential and what aspects are less important.
Step 3: Decide a plan including determination of how many evaluation episodes there will be conducted and in what way (Venable et al., 2012).

Sonnenberg and vom Brocke come up with another framework to evaluate in design science research Figure 9-5. The four evaluation milestones are part of the feedback cycle that runs in the opposite direction as the DSR cycle. (Sonnenberg & vom Brocke, 2012)

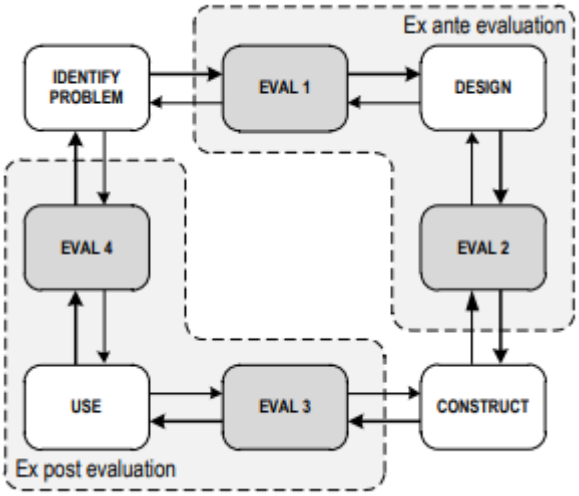


Figure 9-5 Sonnenberg and von Brocke evaluation framework

In evaluation 1, the justify phase, the researcher assures that the problem identified is a meaningful DSR problem.

In evaluation 2, formal proof, the design phase is evaluated. To see if the result serves the purpose of showing that an artefact design ingrains the solutions to the stated problem.

In evaluation 3, can be called prototyping, the evaluation activity serves to demonstrate if and how well the artefact performs, while interacting with organizational elements. This step is the step that links ex ante and ex post with each other, so if changes are necessary it can be done here.

Evaluation 4, the case study, is meant to evaluate if the artefact is applicable and useful in practice. Only naturalistic evaluations will be applied here. (Sonnenberg & vom Brocke, 2012)

According to Henver, common mistakes during an evaluation are: the researcher setting no goal for the valuation, working with an unsystematic approach, doing an analysis without the understanding of the problem, working with incorrect performance matrices and last working with wrong evaluation techniques.

9.3 Appendix 2

1. An information system displays data from all current Company X software systems like software tool C, B and D/E in one place.
2. The information system should be accessible through the Company X Single Sign On that defines the role of the user, so that only information will be displayed that is relevant to the user.
3. The information system should have a portal for suppliers where they can fill in their performances over a certain period of time.
4. A simple and easy to use facility for generating questionnaires for specific supplier information.

5. A facility to generate supplier questionnaires at regular intervals (weekly, monthly, quarterly, semi-annually or annually).

6. The information system keeps track of the data response time and can send reminders if necessary.
7. The information system must automatically collect data from the Company X databases and process that data to make various graphs automatically.
8. The information system must be able to export the obtained data and graphs easily to Microsoft office files.
9. The information system must have an integration with an analytical program to do extended analytics on the data without exiting the information system.
10. The information system is able to share documents, graphical content, and information with authorized users in a collaborative environment.

11. In the information system it must be possible to place comments directly in documents or graphical content without exiting the information system.
12. The information system provides a Company X profile of every supplier containing all data Company X has of that supplier.
13. The Company X team managing the supplier should be presented on the Company X profile of the supplier.
14. All the data available in the information system must be the latest data available from all the integrated data sources.
15. The latest information available from Company X databases must automatically be displayed in dashboards created by Category Managers themselves/created for Category Managers.

16. The information system should display related BPR documents from the supplier on the Company X profile of the supplier.
17. Unrestricted emails about and from the supplier should be found at the profile of that specific supplier in the information system and be visible to the authorized user.
18. The information system should be able to make reports automatically in various design formats on demand containing various data by the choice of the user.
19. When data is not available in the information system, a request to obtain data from the MI team should be raised from inside the information system.
20. The information system should be able to automatically rate suppliers on certain categories, for example safety or delivery, according to predetermined criteria and availability of data.

21. Based on the supplier and if there is safety information available, the information system must be able to provide a dashboard regarding safety issues of a specific supplier automatically and give all the details available.
22. The information system should keep track of important dates such as, when the contract expires or when a delivery will take place.

Integration	Process Facilitation	Security
An information system displays data from all current Company X software systems like Software tool A, B, C, D and E in one place.	A simple and easy to use facility for generating questionnaires for specific supplier information.	The information system should be accessible through the Company X Single Sign On that defines the role of the user, so that only information will be displayed that is relevant to the user.
The information system should have a portal for suppliers where they can fill in their performances over a certain period of time.	A facility to generate supplier questionnaires at regular intervals (weekly, monthly, quarterly, semi-annually or annually).	
The information system should display related BPR documents from the supplier on the Company X profile of the supplier.	When data is not available in the information system, a request to obtain data from the MI team should be raised from inside the information system.	
The information system must automatically collect data from the Company X databases and process that data to make various graphs automatically.	The information system should keep track of important dates such as, when the contract expires or when a delivery will take place.	
The information system must be able to export the obtained data and graphs easily to Microsoft office files.	The information system keeps track of the data response time and can send reminders if necessary.	
The information system must have an integration with an analytical program to do extended analytics on the data without exiting the information system.	The information system should be able to automatically rate suppliers on certain categories, for example safety or delivery, according to predetermined criteria and availability of data.	
The information system is able to share documents, graphical content, and information with authorized users in a collaborative environment.	The Company X team managing the supplier should be presented on the Company X profile of the supplier.	
Unrestricted emails about and from the supplier should be found at the profile of that specific supplier in the information system and be visible to the authorized user.	The information system should be able to make reports automatically in various design formats on demand containing various data by the choice of the user.	
In the information system it must be possible to place comments directly in	Based on the supplier and if there is safety information available, the information	

documents or graphical content without exiting the information system.	system must be able to provide a dashboard regarding safety issues of a specific supplier automatically and give all the details available.	
The information system provides a Company X profile of every supplier containing all data Company X has of that supplier.		
All the data available in the information system must be the latest data available from all the integrated data sources.		
The latest information available from Company X databases must automatically be displayed in dashboards created by Category Managers themselves/created for Category Managers.		

9.4 Appendix 3

Requirement survey

Start of Block: Default Question Block

Q1 Dear category manager, I am David, a graduate student working together with S in the Game Changer team within Contracting and Procurement. The Game Changer process focuses on developing and testing a concept quickly, to see if it works in a small area. The team discovered that it is currently difficult to find the right information about supplier performances in the identified business unit of Company X. Currently, the team is working on a project to make it easier to obtain this information. The team ran a Proof of Concept (PoC) with a possible solution in the form of a new information system that is connecting all the underlying systems. My bachelor graduation assignment focusses on the evaluation of the early stage PoC. In order to do that, I need your input. The PoC aims to bring all systems, like software tool C and A, under one user interface (UI) wrapper so that you can access all systems from one place. This brings the advantage of having everything under one presentational software layer. Equally analytics on the data could be offered, however the question is whether this is really what users are looking for? To evaluate the PoC, I would like to compare the ideal situation for category managers for obtaining supplier performance against the PoC. By conducting interviews and reading internal documents, I came up with a list of 22 requirements category managers may have for a possible new information system in the desired situation. These requirements obtained for the desired situation I would like to verify amongst a larger group of category managers, therefore seeking feedback through this survey. The survey consists of two sections. In the first section, all the requirements for an ideal situation are presented. For each requirement you will have five options. You can mark a requirement: essential, desirable, makes no difference, not desirable or definitely not desirable. When you choose one of the last three options, you will be asked why and if you have an alternative. In the last section you can give all your other comments or requirements which might be missed in the survey. The survey will take about 15 minutes. I realize that going over 22 requirements and spend time to this survey is a lot to ask, but it would really help the team developing the PoC further. I really appreciate your efforts and time to fill out this survey. If you feel this survey misses out on any important points, I would be happy to schedule an appointment with you to discuss the desired situation in more detail. Thanks for your time. Best, David Evers

End of Block: Default Question Block

Start of Block: Block 2

Q2 Welcome to the first section of the survey you get the opportunity to state till what degree you agree with a given requirement for the ideal situation in obtaining supplier performances. The requirements which you can give your opinion on are obtained by several interviews and documents within Company X. As stated before, you can choose out of one of the following five options per requirement: Essential, Desirable, Makes no difference, not desirable, definitely not desirable. When you choose one of the last three options, you get the opportunity of briefly stating why you think the requirement does not make a difference or is not desirable, which helps me further improving my final advice to the team.

Q3 An information system displays data from all current Company X software systems like software tool D, A and D/E in one place.

- ○ Essential (4)
- ○ Desirable (5)
- ○ Makes no difference (7)
- ○ Not desireable (8)
- ○ Definitely not desirable (9)

Q4 Why does the requirement from the previous question makes no difference or is not desireable?
Requirement: ${Q3/QuestionText}

_____

"

Q5 The information system should be accessible through the Company X Single Sign On that defines the role of the user, so that only information will be displayed that is relevant to the user.

- Essential (1)
- Desirable (2)
- Makes no difference (3)
- Not desireable (4)
- Definitely not desirable (5)

Display This Question:

If If The information system should be accessible through the Company X Single Sign On that defines the rol... Makes no difference Is Selected

Or Or The information system should be accessible through the Company X Single Sign On that defines the rol... Not desireable Is Selected

Or Or The information system should be accessible through the Company X Single Sign On that defines the rol... Definitely not desirable Is Selected

Q6 Why does the requirement from the previous question makes no difference or is not desireable?
Requirement: ${Q5/QuestionText}

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"

Q7 The information system should have a portal for suppliers where they can fill in their performances over a certain period of time.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If The information system should have a portal for suppliers where they can fill in their performanc... Makes no difference Is Selected

Or Or The information system should have a portal for suppliers where they can fill in their performanc... Not desireable Is Selected

Or Or The information system should have a portal for suppliers where they can fill in their performanc... Definitely not desirable Is Selected

Q8 Why does the requirement from the previous question makes no difference or is not desireable?
Requirement: ${Q7/QuestionText}

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"

X→

Q9 A simple and easy to use facility for generating questionnaires for specific supplier information.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If A simple and easy to use facility for generating questionnaires for specific supplier information... Makes no difference Is Selected

Or Or A simple and easy to use facility for generating questionnaires for specific supplier information... Definitely not desirable Is Selected

Or Or A simple and easy to use facility for generating questionnaires for specific supplier information... Definitely not desirable Is Selected

Q10 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q9/QuestionText}

_____

"

X→

Q11 A facility to generate supplier questionnaires at regular intervals (weekly, monthly, quarterly, semi-annually or annually).

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If A facility to generate supplier questionnaires at regular intervals (weekly, monthly, quarterly,... Makes no difference Is Selected

Or Or A facility to generate supplier questionnaires at regular intervals (weekly, monthly, quarterly,... Not desireable Is Selected

Or Or A facility to generate supplier questionnaires at regular intervals (weekly, monthly, quarterly,... Definitely not desirable Is Selected

Q12 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q11/QuestionText}

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Page Break

"

Q13 The information system keeps track of the data response time and can send reminders if necessary.

- Essential (1)
- Desirable (2)
- Makes no difference (3)
- Not desireable (4)
- Definitely not desirable (5)

Display This Question:

If If The information system keeps track of the data response time and can send reminders if necessary. Makes no difference Is Selected

Or Or The information system keeps track of the data response time and can send reminders if necessary. Not desireable Is Selected

Or Or The information system keeps track of the data response time and can send reminders if necessary. Definitely not desirable Is Selected

Q14 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q13/QuestionText}

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"

Q15 The information system must automatically collect data from the Company X databases and process that data to make various graphs automatically.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If The information system must automatically collect data from the Company X databases and process that data to make various graphs automatically. Makes no difference Is Selected

Or Or The information system must automatically collect data from the Company X databases and process that data to make various graphs automatically. Not desireable Is Selected

Or Or The information system must automatically collect data from the Company X databases and process that data to make various graphs automatically. Definitely not desirable Is Selected

Q16 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q15/QuestionText}

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"

X→

Q17 The information system must be able to export the obtained data and graphs easily to Microsoft office files.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If The information system must be able to export the obtained data and graphs easily to Microsoft of... Makes no difference Is Selected

Or Or The information system must be able to export the obtained data and graphs easily to Microsoft of... Not desireable Is Selected

Or Or The information system must be able to export the obtained data and graphs easily to Microsoft of... Definitely not desirable Is Selected

Q18 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q17/QuestionText}

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"

X→

Q19 The information system must have an integration with an analytical program to do extended analytics on the data without exiting the information system.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If The information system must have an integration with an analytical program to do extended analytics on the data without exiting the information system. Makes no difference Is Selected

Or Or The information system must have an integration with an analytical program to do extended analytics on the data without exiting the information system. Not desireable Is Selected

Or Or The information system must have an integration with an analytical program to do extended analytics on the data without exiting the information system. Definitely not desirable Is Selected

Q20 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q19/QuestionText}

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"

Q21 The information system is able to share documents, graphical content, and information with authorized users in a collaborative environment.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If The information system is able to share documents, graphical content, and information with author... Makes no difference Is Selected

Or Or The information system is able to share documents, graphical content, and information with author... Not desireable Is Selected

Or Or The information system is able to share documents, graphical content, and information with author... Definitely not desirable Is Selected

Q22 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q21/QuestionText}

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Page Break

"

Q23 In the information system it must be possible to place comments directly in documents or graphical content without exiting the information system.

- Essential (1)
- Desirable (2)
- Makes no difference (3)
- Not desireable (4)
- Definitely not desirable (5)

Display This Question:

If If In the information system it must be possible to place comments directly in documents or graphica... Makes no difference Is Selected

Or Or In the information system it must be possible to place comments directly in documents or graphica... Not desireable Is Selected

Or Or In the information system it must be possible to place comments directly in documents or graphica... Definitely not desirable Is Selected

Q24 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q23/QuestionText}

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"

Q25 The information system provides a Company X profile of every supplier containing all data Company X has of that supplier.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If The information system provides a Company X profile of every supplier containing all data Company X has o... Makes no difference Is Selected

Or Or The information system provides a Company X profile of every supplier containing all data Company X has o... Not desireable Is Selected

Or Or The information system provides a Company X profile of every supplier containing all data Company X has o... Definitely not desirable Is Selected

Q26 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q25/QuestionText}

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"

X→

Q27 The Company X team managing the supplier should be presented on the Company X profile of the supplier.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If The Company X team managing the supplier should be presented on the Company X profile of the supplier. Makes no difference Is Selected

Or Or The Company X team managing the supplier should be presented on the Company X profile of the supplier. Not desireable Is Selected

Or Or The Company X team managing the supplier should be presented on the Company X profile of the supplier. Definitely not desirable Is Selected

Q28 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q27/QuestionText}

_____

"

X→

Q29 All the data available in the information system must be the latest data available from all the integrated data sources.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If All the data available in the information system must be the latest data available from all the i... Makes no difference Is Selected

Or Or All the data available in the information system must be the latest data available from all the i... Not desireable Is Selected

Or Or All the data available in the information system must be the latest data available from all the i... Definitely not desirable Is Selected

Q30 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q29/QuestionText}

_____

"

X→

Q31 The latest information available from Company X databases must automatically be displayed in dashboards created by Category Managers themselves/created for Category Managers.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If The latest information available from Company X databases must automatically be displayed in dashboar... Makes no difference Is Selected

Or Or The latest information available from Company X databases must automatically be displayed in dashboar... Not desireable Is Selected

Or Or The latest information available from Company X databases must automatically be displayed in dashboar... Definitely not desirable Is Selected

Q32 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q31/QuestionText}

_____

Page Break

"

X→

Q33 The information system should display related BPR documents from the supplier on the Company X profile of the supplier.

- Essential (1)
- Desirable (2)
- Makes no difference (3)
- Not desireable (4)
- Definitely not desirable (5)

Display This Question:

If If The information system should display related BPR documents from the supplier on the Company X profil... Makes no difference Is Selected

Or Or The information system should display related BPR documents from the supplier on the Company X profil... Definitely not desirable Is Selected

Or Or The information system should display related BPR documents from the supplier on the Company X profil... Not desireable Is Selected

Q34 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q33/QuestionText}

_____

"

X→

Q35 Unrestricted emails about and from the supplier should be found at the profile of that specific supplier in the information system and be visible to the authorized user.

- Essential (1)
- Desirable (2)
- Makes no difference (3)
- Not desireable (4)
- Definitely not desirable (5)

Display This Question:

If If Unrestricted emails about and from the supplier should be found at the profile of that specific s... Makes no difference Is Selected

Or Or Unrestricted emails about and from the supplier should be found at the profile of that specific s... Not desireable Is Selected

Or Or Unrestricted emails about and from the supplier should be found at the profile of that specific s... Definitely not desirable Is Selected

Q36 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q35/QuestionText}

_____

"

X→

Q37 The information system should be able to make reports automatically in various design formats on demand containing various data by the choice of the user.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If The information system should be able to make reports automatically in various design formats on... Makes no difference Is Selected

Or Or The information system should be able to make reports automatically in various design formats on... Not desireable Is Selected

Or Or The information system should be able to make reports automatically in various design formats on... Definitely not desirable Is Selected

Q38 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q37/QuestionText}

_____

"

X→

Q39 When data is not available in the information system, a request to obtain data from the MI team should be able to raise from inside the information system.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If When data is not available in the information system, a request to obtain data from the MI team... Makes no difference Is Selected

Or Or When data is not available in the information system, a request to obtain data from the MI team... Not desireable Is Selected

Or Or When data is not available in the information system, a request to obtain data from the MI team... Definitely not desirable Is Selected

Q40 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q39/QuestionText}

_____

"

X→

Q41 The information system should be able to automatically rate suppliers on certain categories, for example safety or delivery, according to predetermined criteria and availability of data.

- ○ Essential (1)
- ○ Desirable (2)
- ○ Makes no difference (3)
- ○ Not desireable (4)
- ○ Definitely not desirable (5)

Display This Question:

If If The information system should be able to automatically rate suppliers on certain categories, for... Makes no difference Is Selected

Or Or The information system should be able to automatically rate suppliers on certain categories, for... Not desireable Is Selected

Or Or The information system should be able to automatically rate suppliers on certain categories, for... Definitely not desirable Is Selected

Q42 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q41/QuestionText}

_____

Page Break

"

Q43 Based on the supplier and if there is safety information available, the information system must be able to provide a dashboard regarding safety issues of a specific supplier automatically and give all the details available.

- Essential (1)
- Desirable (2)
- Makes no difference (3)
- Not desireable (4)
- Definitely not desirable (5)

Display This Question:

If If Based on the supplier and if there is safety information available, the information system must b... Makes no difference Is Selected

Or Or Based on the supplier and if there is safety information available, the information system must b... Definitely not desirable Is Selected

Or Or Based on the supplier and if there is safety information available, the information system must b... Not desireable Is Selected

Q44 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q43/QuestionText}

_____

"

Q45 The information system should keep track of important dates such as, when the contract expires or when a delivery will take place.

- Essential (1)
- Desirable (2)
- Makes no difference (3)
- Not desireable (4)
- Definitely not desirable (5)

Display This Question:

If If The information system should keep track of important dates such as, when the contract expires or... Makes no difference Is Selected

Or Or The information system should keep track of important dates such as, when the contract expires or... Not desireable Is Selected

Or Or The information system should keep track of important dates such as, when the contract expires or... Definitely not desirable Is Selected

Q46 Why does the requirement from the previous question makes no difference or is not desireable? Requirement: ${Q45/QuestionText}

_____

End of Block: Block 2

Start of Block: Block 4

Q47 Thank you filling out the first section. If you feel the first section is missing requirements or areas in obtaining supplier performance data which are not covered, can you detail that here?

_____

_____

_____

_____

9.5 Appendix 4

	Respondent 1	Respondent 1 score	Respondent 2	Respondent 2 scor	Respondent 3	Respondent 3 scor	Respondent 4	Respondent 4 score	Respondent 5	Respondent 5 score	Respondent 6	Respondent 6 Score	Respondent 7	Respondent 7 Score
#Essential	0	0	3	6	13	26	2	4	5	10	8	16	15	30
#Desireable	12	12	15	15	7	7	20	20	17	17	9	9	7	7
#Makes no difference	4	3	3	1	1	1	0	0	0	0	5	4	0	0
#Not desireable	6	0	1	0	0	0	0	0	0	0	0	0	0	0
#Definitely not desireabl	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Total	22	15	22	22	22	34	22	24	22	27	22	29	22	37
Average score	26,86													

Table 9-5 results of the requirement survey

9.6 Appendix 5

	PoC	PoC score
#The PoC can do even more than that requirement.	0	0
#The PoC is meets that requirement.	6	6
#The PoC partly meets that requirement.	3	3
#The PoC does not meet that requirement, but the re	13	0
#The PoC does not meet that requirement at all.	0	0
Total	22	9
Average score	9,00	

Table 9-6 Score of the functionality survey

9.7 Appendix 6

The information system should be accessible through the Company X Single Sign On that defines the role of the user, so that only information will be displayed that is relevant to the user.
The information system should have a portal for suppliers where they can fill in their performances over a certain period of time.
A simple and easy to use facility for generating questionnaires for specific supplier information.
A facility to generate supplier questionnaires at regular intervals (weekly, monthly, quarterly, semi-annually or annually).
The information system should display related BPR documents from the supplier on the Company X profile of the supplier.
When data is not available in the information system, a request to obtain data from the MI team should be raised from inside the information system.
The information system keeps track of the data response time and can send reminders if necessary.
Unrestricted emails about and from the supplier should be found at the profile of that specific supplier in the information system and be visible to the authorized user.
In the information system it must be possible to place comments directly in documents or graphical content without exiting the information system.
The information system provides a Company X profile of every supplier containing all data Company X has of that supplier.
The Company X team managing the supplier should be presented on the Company X profile of the supplier.
The information system should be able to make reports automatically in various design formats on demand containing various data by the choice of the user.

9.8 Appendix 7

Link contract levers such as rebates to the profile, and send reminders
Allow creation of actions and tasks
Have a space to capture meeting minutes
Sales and revenues Company X receives from suppliers. this will help get a 360 degree on the spend data between organisations.
Ownership of suppliers - do Company X have a stake in the supplier organisation? do other suppliers have a stake?
there may be specific KPIs at the Statement of Work (SoW) level - this is not always visible unless you go into the specific SoW. So an ability to drill down, and be able to consolidate KPIs by supplier, by class of business, by SoW type (Time & Materials, Fixed Fee, Managed Service, etc)
dashboard to additionally include KPI for Quality: NCR(Non conformances)/ NPT(non productive time)