Framework for executing, measuring and optimizing the sales process.

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Abstract

Organizations always strive to optimize their performance. Universities want to attain students, multimedia shops want to sell televisions and wireless carriers want to have contracts with customers. The students, buyers and clients run through a sales process of different phases. For every phase, theoretical models and technology is present, but they need to be glued together by a framework. That framework is introduced in this thesis.

To achieve this, three theories from the literature were combined. First of all, the ”Level of Need Awareness”, which categorizes how detailed people know what they want. Secondly, ”SPIN”, which introduces different kind of questions and when they should be asked. Thirdly, ”Seven Steps of Selling”, a classical step-by-step guide for sales persons how they should manage the sales process. At the same time, the sales process itself is further defined by conditions and transitions. Conditions can be seen as states of the process and transitions as sets of actions, which should be undertaken to reach the next condition.

We combined the theories to a new model called 7-SSL. Mapping the three theories to the condition-transition-theory conveys how well they collude and reveals a few shortcomings. Those are treated by extensions to the theories. Furthermore, a measurement model is introduced to determine the maturity of the sales process.

With these insights, not only sales persons can improve their performance and managers teach their employees, but IT companies can create software that automates the whole process or supports the staff.
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Chapter 1

Introduction

Today, a huge amount of technologies supports our daily life. This also holds for companies which do not only use them for their administration and production, but also for their sales process. On top of that, several theories and guides teach how to improve that process. This thesis therefore asks: How can those insights be combined and what would that contribute to the whole process?

To answer structurally, we divided the sales process into so-called "conditions" and "transitions". In the first condition the customers do not even know that they need a product. After some transitions ultimately they reach the condition where the contract is signed or a product is delivered.

The conditions and transitions are matched to theoretical models. Firstly, the Level of Need Awareness is defined for every condition. It increases with every transition. That means the customers get a better understanding of what they really want. Secondly, the transitions are investigated. In every transition the employee or the system tries to reach the next condition. This is realized by asking questions of different types, defined by a technique called SPIN. This model helps the selling people to ask the right questions in the right order to convince their customers. Thirdly, the Seven Steps of Selling model defines specific actions to do. Those are also mapped to our transitions. Additionally, we introduce a method to measure the quality of the data to determine the quality and progress of the sales process.

To make this theory more vivid, we introduce Chris. He will appear at the end of each condition or transition with an example.

---

Chris: Hello, my name is Chris. I am 23 years old an I studied Business Management at the Radboud University. Now, I’m looking for a master program.
First of all, the theories from the literature are introduced. After that, our condition-transition-framework is explained. These two components are combined to a new model and shortcomings of the theories are addressed. To determine the progress, a measurements-framework is introduced. Next, for every condition and transition, all those insights are applied and explained in how far they affect or support the progress. At the end, this theory is rated by professionals, who would use it in their business.
Chapter 2

Literature review

In this chapter, three theories will be introduced. They explain the state of mind people have about things they need, type of questions that should be asked in a selling situation and concrete steps a sales person should undertake. These insights will form the foundation of the succeeding chapters.

2.1 Level of Need Awareness

The wish to own something can be of different granularity. Specific levels of granularity are categorized by this theory. According to [7], there are four so-called Levels of Need Awareness. The first level is the visceral need. This is only "a vague sort of dissatisfaction" – the consumers know that they want to have something, but it is not clear to them what exactly that is. As Taylor says, in some cases, this is not even possible to express in linguistic terms. The second level is the conscious need. The consumers have already in mind what they want, but it is still ambiguous. Until now, they can judge a proposal to be appropriate or not, but they need to further define their wish. That is done in the third level, the formalized need. The customers can explicitly say what they need – a "qualified and rational statement of [their] question". They now have their mindset in the context of the system they search in, e.g. within the product range of a company. At the fourth level, the compromised need, the consumers can not only express what they need, but already have an idea of what there can be served by the company. This is the highest level which includes understanding of what the consumers want exactly and in awaiting of the right result, knowing what can be delivered and what to expect.

Table 2.3 shows an overview of this theory, which can be found in the Appendix.
2.2 SPIN

Selling is a topic that a lot of professionals are engaged in. The following two theories cover two small aspects of it. The first one helps salespersons to improve their talking and asking skills.

A model by Neil Rackham defines four kinds of questions that a salesperson should ask. Those four question types are Situation-, Problem-, Implication- and Need-payoff-questions. Rackham uses them to train salespersons in Business to Business (B2B) selling situations. This theory can also be applied to the content of this thesis.

The goal of a Situation question is to clarify the context and to declare some facts. A good salesperson asks only a few Situation questions and tries to get as much information as possible beforehand about customers. In our case, this could be accomplished by analyzing clients or, if they previously bought something, using a CRM application.

The second question type are Problem questions. They help to find out which problems are present that the customers want to solve by buying a product or service. According to Rackham, they reveal "Implied Needs" for the salesperson. The importance is to find the needs that can be solved by the company.

Effects that are caused by those uncovered problems are further clarified by Implication questions. They underline the importance of the shortcomings and higher the motivation of the customers to buy something. They should be asked without talking about a solution to maximize the "induction of pain". At the same time, the salesperson should prepare explicit needs that arise because of the implications.

Those explicit needs form the basis of the Need-Payoff questions. They ask about the improvements that could arise with the new product or service the customers are about to buy. It checks whether the explicit needs are actually there. Through questions, rather than convincing the customers of buying a product, the customers will convince themselves by answering. They tell about the benefits using the product.

2.3 Seven Steps of Selling

The third theory that covers the selling situation is a guideline. It is a roadmap what salesperson should do and when. The model of the Seven Steps of Selling (SSoS) categorizes actions that should be taken by salespersons in order to increase their acquisition rate.

Prospecting The "search for new customers and potential customers", e.g. through referrals, networking and advertising.
**Preapproach** The preparation of the sale or call, e.g. by familiarizing with the customers’ needs or checking previous correspondence.

**Approach** The beginning of the actual contact with the customers, e.g. handshake and opening small talk.

**Presentation** One or more presentations of the actual product, so that the customers get an understanding of what they will buy. This step has to be prepared with care.

**Overcoming objections** By revealing the objections (questions and hesitations) of the customers more needs of them can be identified. The sales persons should prepare themselves for possible objections of the customers.

**Close** The completion of the sale, for which the sales person explicitly should ask. This includes the commitment of the customer to actually buy the product.

**Follow-up** After the order is placed by the clients, all of the following activities are collected in this category. This includes to ask whether everything went well or writing a thank-you letter.
Chapter 3

Selling process theory

We will now introduce principles that are used in the following chapters. “Conditions” and “transitions” are introduced and connected to the theories from the previous chapter. These concepts will form the foundation of our further selling framework development.

3.1 Conditions and transitions

In order to structure the selling process, we introduce conditions for customers. A condition is seen as a state-of-mind that is characterized by properties that are relevant for the selling process. In order to be effective, conditions are defined such that at each moment each customer can be identified as being in some unique condition. Furthermore, conditions are ordered such that they can reflect the various subsequent stages of the selling process.

By defining these conditions, also the differences between them are revealed. We therefore introduce sets of activities to lift the selling process into the proceeding condition. These sets of activities are referred to as the transition from one condition to the following. This is shown in the Condition-Transition-Model (see Figure 3.1).

Each condition has associated properties, which are typically key-value-pairs. Moreover, each transition has associated actions that can be applied. The actual properties and actions are further explained in Chapter 6.

3.2 Integrating the theories from the literature review

In Chapter 2 we introduced three theories: the Level of Need Awareness (LoNA), the Seven Steps of Selling (SSoS) and the SPIN-model (SPIN). These are now integrated in the Condition-Transition-Model from Figure 3.1.
Figure 3.1: The basic Condition-Transition-Model

Figure 3.2: Condition-Transition-Model including LoNA, SSoS and SPIN
As explained, a condition has some properties. In this case, one property is the Level of Need Awareness (see Figure 3.2 "Level"). Due to the scope of this thesis, the Level of Need Awareness is the only property of a condition. When a person has a specific state-of-mind, which means that the person is in a specific condition, then the Level of Need Awareness is defined by that level property. Higher levels include the insights of the levels beneath them. A person’s need awareness is thus always at one unique level. A logical implication is that a condition is only associated with one single level. Through our research, we found out that there is no set of two or more conditions which are associated with the same level. These two findings lead to a bijective function, which is indicated by the fact type Lna. Both predicators have a uniqueness and a total role constraint.

Transitions consist of sets of actions that have to be undertaken. One of those actions is implemented by the Seven Steps of Selling. We found out that in our Condition-Transition-Model, one or two steps should be undertaken per transition. Therefore, the relation is not bijective. At the same time, there is no transition that does not contain at least one step. This causes a total role constraint. In the ORM Schema, the SSoS are represented by the "Step" property.

Another action of a transition is asking questions. SPIN specifies different types of questions. We define those SPIN types for several transitions and found transitions where no questions are asked. Consequently, no SPIN type is defined for them. Therefore, the predicator has no total role constraint. On top of that, every SPIN type is assigned to a transition. That implies the total role constraint for the type property depicted in the ORM schema.
Chapter 4

Designing a framework

In the previous chapters, we introduced theories from the literature (LoNA, SSoS and SPIN) and the Condition-Transition-Model. In this chapter, these theories and concepts are combined to a new model, called 7-SSL. While combining them, some shortcomings are revealed. The Level of Need Awareness misses two levels. One represents absolutely no knowledge about the needs, another represents a situation where a product is already delivered. Furthermore, the SPIN model misses a type of question that covers delivery, finance and other organizational aspects of a sale. To address the shortcomings of LoNA and SPIN, both models are extended.

4.1 Creating the 7-SSL model

Concerning the extended ORM schema of Section 3.2, we derive a new application called the 7-SSL model which combines the conditions and transitions with the 7-Steps-of-Selling-, the SPINS- and the Level of Need Awareness-model shown in Figure 4.1.

In this representation, known theories are printed in black and the extensions of them are highlighted in blue. They will be explained in Section 4.2. The matching of the theories to one condition are shown in orange with numbering (c1 – c6).

On the y-axis, the Level of Need Awareness (Section 2.1) is plotted. A higher position means a higher Level of Need Awareness. On the upper x-axis, which is connected to the y-axis, the SSoS (Section 2.3) are plotted. On the left side, the first step, and on the right side, the last step is located. On the lower x-axis, the SPINS-model (Section 2.2) can be found.

The orange condition markers match horizontally to a Level of Need Awareness. A matching means that the customer has reached that specific level at the given point in time. Between two conditions a transition takes place. All the Steps of Selling which are vertically positioned between those conditions should be executed in that transition. At the same time, the
SPINS model suggests which type or types of questions should be asked (if any). E.g. between \(c_2\) and \(c_3\), transition \(t_2\) takes place. At that transition, step two and three should be executed and questions of type Situation and Problem should be asked. Also, the Level of Need Awareness rises from visceral (\(c_2\)) to conscious (\(c_3\)).

The time line is printed in grey. If it increases less intensive, then more actions have to be undertaken. Actions can be asking questions (SPINS) or taking steps (SSoS).

### 4.2 Extensions

When matching the theories, some shortcomings of SPIN and the Level of Need Awareness are exposed. As already announced in Section [3.2] both are therefore extended now.

#### 4.2.1 Level of Need Awareness

The most obvious missing Level of Need Awareness is *none*. It is the case in condition \(c_1\) of the sales process. In the SSoS model, the first step “prospecting” is to make people aware of your product. Before that took place, e.g. by advertising, the people don’t even know they need it or are aware of its
existence. We call this new level ”none” – persons have absolutely no idea of their need for something. After taking step one of the SSoS model, condition $c_2$ is reached. At that condition, persons feel some dissatisfaction.

The last step of the Level of Need Awareness model is compromised. That level describes that the searchers already have an idea of what they may expect to receive. This could be matched to the situation where customers already have placed their order, but the delivery did not take place yet. The step ”closing” of the SSoS model represents essentially the same situation. They know what they can expect. After they got what they ordered, which means that step seven took place (follow-up), the newly introduced level, called knowing, is the case: they now own what they ordered and are therefore, again, wiser. Their awareness of what they need raised. If they are satisfied, then they got exactly what they wanted. If they are disappointed, then the awareness also raised because they now have a counterexample of their wish.

4.2.2 SPIN

SPIN gives four categories of questions that a sales person should ask in order to achieve a sale. A few of the SSoS steps suggest to ask questions which are also introduced in the SPIN model, but as Figure 4.1 shows, not every step is covered by the SPIN theory. The sixth step ("closing"), is not categorized by any SPIN question type. At that step, an order is placed and the last details for the transition are prompted.

Therefore, we introduce a new question type called Shift question. The theory is now called SPINS. That new question type is also matched in Figure 4.1 to the transition from $c_4$ to $c_5$.

In terms of the SPINS theory, Shift questions ask about how the new product will affect the current workflow. This helps optimizing the change. Are other products necessary? Do employees need to be taught? When, where and how should the product be delivered?

The last type is matched to the seventh Step of Selling. That step includes follow-up activities such as a visit, a phone call, a letter or an email. In those activities, it should be asked whether the transition was good, everything went fine and whether the customer is happy. Those questions match the Shift-category of SPINS and therefore the S of SPINS is matched to the step seven of SSoS.
Chapter 5

Measurement of the progress

In order to measure the progress of the selling situation, values are needed. These values are derived from information that employees get from customers. They will be introduced in Section 5.1. On top of those values, functions are introduced in Section 5.2 to classify options as good or bad. After that, we use the entropy function to get an overall rating of how well the customer is understood. In the next chapter, the insights from this measurement framework will be applied to every condition and transition. This unveils how the values change and how they help finding the best product.

5.1 Model

If we want to measure something, we have to define it carefully and precisely. Therefore, we provide a framework which will be explained in this section. A company has to fill it in as detailed as possible to gain the most insights.

*Products* are offered by the company. Multiple products can be combined to a *category*. Products can participate in no, one or multiple categories. Both a product and a category are also called an *entity*. Entities have an *individual rating*, which is not calculated but determined through utterances the customers made. E.g. if customers say that they like the Philips hue ecosystem, the individual rating of the category Philips hue rises. We define:

\[
\begin{align*}
P &= \text{set of products} \\
C &= \text{set of categories} \\
\text{IndRat}(\text{Philips hue}) &= \text{the individual rating for Philips hue}
\end{align*}
\]

So while the products and the categories are defined by the company, the individual ratings are defined by the customers. For each customer, there is one set of individual ratings that is, as its name already suggests, individually filled in by the likes and dislikes of that customer.
5.2 Functions

A company can define the membership of a product in a category using the \( \text{Cat} \) function, e.g.

\[
\text{E27 lightbulb} \quad \text{Cat} \quad \text{Philips hue}
\]

The information of the individual rating but also the membership function \( \text{Cat} \) play a role in the combined rating \( \text{CombRat} \). That rating is calculated for every product and based on the set of individual ratings. If a product is not member of any category, then its combined rating is equal to its individual rating. Otherwise, the combined rating is calculated as follows:

\[
\text{CombRat}(p) = 0.5 \times \text{IndRat}(p) + 0.5 \times \frac{\sum_{c \in C, \text{Cat} \in C} \text{IndRat}(c)}{\#_{c \in C, \text{Cat} \in C}} \quad (5.1)
\]

It has two evenly weighted parts. The first part is the individual rating of the product. The second part takes the categories that the product is member of into account: It is the average of the individual ratings of those categories.

The ORM schema in Figure 5.1 illustrates the construct of products, categories, entities, individual and combined ratings.
5.3 Certainty

Say we have a set of products, categories and a concrete case with values for individual and combined ratings for a customer. We then use the entropy to rate the quality of our data. It gives us an answer to the question: Do we know what the customer really wants or should we ask more questions and present alternatives?

Unfortunately, the entropy function needs probabilistic values ranging from 0 to 1, while our combined ratings range from -1 to 1. Therefore, we need a mapping from our CombRat value to a probabilistic value. We introduce the function CombToE, where we investigated three different implementations. They are illustrated in Figure 5.2.

The first implementation (red line) is a function that maps all negative CombRat values to 0, a CombRat value of 0 to 0.5 and all positive CombRat values to 1:

\[
y = \begin{cases} 
0, & \text{if } x < 0 \\
0.5, & \text{if } x = 0 \\
1, & \text{if } x > 0
\end{cases}
\]

Obviously, we lose a lot of information here. It is a simple solution which would take little computing power. That is important for big datasets.

The second option is a linear mapping (green line, Equation 5.2), which gives equal weight to all CombRat values:

\[
y = 0.5 \times x + 0.5 \tag{5.2}
\]

While constructing the third option, we thought of five points while the first value \(x\) represents the CombRat value and the second value \(y\) represents the probabilistic value for the entropy function. Those five points are \(A(-1, 0), B(-0.2, 0.49), C(0, 0.5), D(0.2, 0.51)\) and \(E(1, 1)\). As in the other implementations, a customer who absolutely likes something \((x = 1)\) should be represented by the highest value \((y = 1)\) and a clear dislike \((x = -1)\) should be the lowest value \((y = 0)\) (point \(A\) and \(E\)). The neutral value of \(x = 0\) should also be a balanced probabilistic value, which is \(y = 0.5\) (point \(C\)). The difference is that if the customer only has a little (dis-)satisfaction, then it should not be weighted a lot. Therefore, we also chose point \(B\) – a little dislike of \(x = -0.2\) has almost the same value as the neutral value of \(x = 0\). Respectively, we chose point \(D\) for a slight attachment. Using a system of linear equations (see Appendix C.1), we derive the polynomial formula \(y = 0.46875x^3 + 0.03125x + 0.5\). Rounded to one decimal value, we get our third CombToE implementation (blue line, Equation 5.3):
The overall rating of the products is thus determined by the following entropy function:

\[ H(P) = - \sum_{p \in P} \text{CombToE}(\text{CombRat}(p)) \times \log_2 \text{CombToE}(\text{CombRat}(p)) \]  

(5.4)
Chapter 6

Analysis of the Selling Situation

In this chapter, the 7-SSL model will be applied to the actual conditions and transitions of a selling process. To be able to write this down formally, functions for the theories are introduced and applied. At the end of each condition, the changes on the CombRat values are explained.

6.1 Overview

To analyze the selling process, we look at each condition and each transition individually. This helps to apply models and techniques in a structured manner. The conditions are taken from the 7-SSL model from Section 4.1. Furthermore, technologies which support a transition are mentioned.

A condition $c_i$ is the $i^{th}$ state of the selling process. It contains information about the knowledge of a customer and the progress of the overall process measured by the CombRat function. As explained in Section 3.1, the customer’s knowledge development is expressed in the Level of Need Awareness that a customers gained so far. SPINS is not applicable to conditions. There are no actions that take place, while SPINS describes the sort of questions that are asked. Asking a question is an action and therefore SPINS is only relevant for transitions. The SSoS model is also not applicable since they are actions, too.

A transition $t_i$ is the shift from condition $c_i$ to $c_j$ where $j = i + 1$. To execute a shift, actions take place. These actions are executed by the sales
person, by a customer or by a supporting technology. Usually, the Level of Need Awareness rises within a transition because customers can specify what they want more fine-grained afterwards. Plus, the individual ratings become more precise. The questions that are asked by the sales person or the supporting technology can be categorized using SPINS. Actions that are undertaken are described by SSoS.

To summarize, the described situation is defined by the following formulas.

- \( C \) is a set of conditions.
  \[
  C = \{ c_1, c_2, \ldots c_6 \}
  \]

- The set is totally ordered by \( T : C \rightarrow C \) and linearly ordered by the relation \(<\). Let \( n(c) \) be the condition that follows \( c \) in terms of this order relation.

- Between each two subsequent conditions, there will be a transition that represents the transition between these two conditions. These transitions are the tuples that populate the function \( T \). Those tuples are called \( t_1, t_2, \ldots t_5 \). Let \( t \) be the transition from condition \( c \) to \( n(c) \). We will also say \( \text{from}(t) = c \) and \( \text{to}(t) = n(c) \).

- For the extended Level of Need Awareness model, we define the function \( \text{Lna} \) which maps a condition to a level. If the level of \( c_1 \) is ”none”, then:
  \[
  c_1 \text{ Lna} \text{ none}
  \]

- Regarding the model of the Seven Steps of Selling, we define the function \( \text{Stp} \). It will link the transitions to a step within the SSoS model (prospecting, preapproach, approach, presentation, overcoming objections, close and follow-up). These are explained in Section 2.3. If the first step (prospecting) should be executed in transition \( t_1 \), then:
  \[
  t_1 \text{ Stp} 1
  \]

- We define the function \( \text{Qt} \) as the link between a transition and the type of question that should be asked within that transition. If a question of type ”Situation” should be asked in \( t_1 \), then:
  \[
  t_1 \text{ Qt} \text{ Situation}
  \]

If \( \text{ask}(a, b) \) means ”for transition \( a \), questions of type \( b \) should be asked”, then:
∀_{tr} \forall_{qt} [tr \ Q_t \ qt \implies \ ask(tr, qt)] \quad (6.1)

So for every transition and question type, if the function \( Q_t \) contains a tuple of a transition \( tr \) and a question type \( qt \), then questions of type \( qt \) should be asked in transition \( tr \).

### 6.2 Condition 1: Getting customers

It starts with absolutely no idea. The customers are not aware of any product that someone might want to sell them. They may not even know that they need it.

**Level of Need Awareness**

Because they are not aware that there is some solution for a problem or a product that may enrich their life, their Level of Need Awareness is at the lowest possible value, called "none".

\[ c_1 \ Lna \ none \]

**CombRat**

For every product and category, the value is 0. This is a neutral value: no like and no dislike. The reason is, that the company doesn’t know anything about the possible customers.

---

**Chris:** I’m studying Business Administration. I do not know anything about other studies.

---

### 6.3 Transition 1: Getting ads

The selling process starts *before* the sales person and the customers actually meet each other. It starts when customers get to know that there is something they need. This first impression of some product may be advertising, referrals or when the product is seen in daily life.

**Technology**

The second most valuable brand, Google, earned the majority of their money through advertisements. They sell higher positions in their search results.
Their technology, Google AdWords[^3], is therefore one possibility for companies to succeed with transition one. If users are traced throughout the internet, e.g. using cookies, then Google will display commercials depending on what they did. This is called targeted advertisement. In this case, the software calculates what a user could find interesting based on the surf-behavior. You could say that the software is already one level ahead in terms of the Level of Need Awareness.

**SPINS**

There is no direct contact between the sales person and the customers. This implies no questions that are asked by the sales person and therefore nothing can be categorized. SPINS is thus not applicable here.

**SSoS**

According to SSoS, the first step is prospecting. Prospecting is exactly what is done in transition one of the 7-SSL model.

\[
 t_1 \text{ Stp 1 }
\]

---

**Chris:** I got a mail about the Radboud Open Day and a short summary of what the different disciplines contain. I think I will take that opportunity.

---

### 6.4 Condition 2: Customers show buying interest

In this condition, the customers are not yet in contact with a sales person or technology. They arrive at the shop or open a website. Since they do not have any contact with a sales person, they are unsupervised in their shopping process.

**Level of Need Awareness**

Their Level of Need Awareness is still at a low point. They know what they are looking for to some extent. The reason therefore is very simple: they are at that specific shop that offers products of a certain type which matches the type of product they need.

\[
 c_2 \text{ Lna visceral}
\]
CombRat

The fact that they are in a specific shop or at a specific location or section within a shop already influences some broader categories. If customers are e.g. in the television section of a multimedia shop, then IndRat(television) is higher. Another insight is gained through profiling. If a person is a male, then statistically IndRat(car) is higher and IndRat(makeup) is lower compared to women.

Chris: Because of the advertising, I am now at the Radboud Open Day. I know that I have to manage my future study. Since I always wanted to do more with science, I look for more information at the Huygensgebouw to get a better understanding of my possibilities. While walking through the building, I look at the different stalls that present the studies.

6.5 Transition 2: Initial contact

To help the customers find the product they want, and to push the selling process, employees approach the customers. That means that from now on, their shopping process is supervised.

Technology

When shopping online, this approach can be made by a bot on a website. An example is the chatbot "Else" on the website of the Centre for Youth and Family (https://www.centrumjeugdengezin.nl/else), shown in Figure 6.1. It analyzes the text that a customer enters and tries to give an appropriate answer. Some chatbots work with a rule-based system. Professionals add rules to the system that tells it what to do if certain words or certain set of words occur. Other chatbots work with machine learning. They get a huge dataset and distill on their own, which answers fit to which questions. This is a computing-intensive, very sophisticated way to improve the artificial intelligence of a chatbot.

SPINS

Regarding SPINS, sales persons should ask two kinds of questions. To get to know more about the customers, they should ask Situation questions.
This could be very general, e.g. ”What do you look for?”, to get an overall impression. As soon as the context is clear, sales persons need to know which problem the customers want to address with a new product. Therefore, Problem questions should be asked. ”Does X not work if you do Z?” is one example of what they could ask them.

| $t_2$ Qt Situation | $t_2$ Qt Problem |

**SSoS**

According to the SSoS model, the second step (preapproach) is to familiarize with the customer. This happens in the first few seconds before the actual conversation starts. In a shop, sales persons could judge customers by their appearance, age, gender etc. to prepare themselves. The third step (approach) is also part of this transition. Typically, this is some small talk and a few first questions in order to get some context of the customer’s motives.

| $t_2$ Stp 2 | $t_2$ Stp 3 |

**Chris:** A few ambassadors of different institutes at the Faculty of Science address me and want to help. I get a better understanding of what they do. They ask me things like which courses I did and what I’m interested in. Also, they want to know why I don’t want to study Business Administration anymore.

---

6.6 **Condition 3: Customer knows product category**

At condition three, the customers know which type of product would fit their needs. This means that they are now able to talk about that product range and specify it further.

**Level of Need Awareness**

Through the last transition, their Level of Need Awareness raised. Customers are now at the conscious level, meaning that they can judge the relevance. This, in turn, means that they can say whether a specific proposal made by a sales person is appropriate or inappropriate.
In this condition, the values for categories are further defined. The employee asked about the type or category of the product, so those individual ratings are adjusted. Some of them slightly, e.g. curved televisions are liked more than standard televisions. Other categories are excluded, e.g. if the person absolutely wants an LED television, then \text{IndRat}(LCD television) = 0 and \text{IndRat}(Plasma television) = 0.

---

Chris: I now know that I want to study something at the Institute for Information and Computing Sciences. That is way more interesting than the other disciplines like chemistry, mathematics or biology. They gave some examples of what they do, which sounds quite interesting.

---

6.7 Transition 3: Defining product

Thanks to the increased Level of Need Awareness, the customer now compares the different possibilities that the sales person offers. In turn, the Level of Need Awareness self is again raising. The customers get a better understanding of the field while comparing the products. Which one is better and why? Those insights higher the domain knowledge and are important to find the best option.

Technology

In this transition, a Customer Relationship Management (CRM) system like Salesforce[4] can help. It contains information about previous customers. If customers already bought something or are known to the system, it can e.g. exclude certain products which are less relevant or highlight others that may match very well.

SPINS

By asking Implication questions, the sales persons know which issues the product should address. This helps to increase the quality of their approaches towards their customers. The products that the sales persons suggest match the needs of the customers more precisely. Furthermore, Need-payoff questions can help to verify that a candidate is actually the
appropriate one. Given the product is delivered or installed, what would happen? If the final result is positive, it is the right product.

$t_3$ Qt Implication
$t_3$ Qt Need-payoff

**SSoS**

In transition three, steps four and five of the SSoS model are undertaken. The sales person presents some products, guessing what could attract customers the most or what would fit best. While presenting and discussing, the sales person gets more insights and a better understanding of what the customer actually needs.

$t_3$ Stp 4
$t_3$ Stp 5

---

**Chris**: As master student, I can choose between the Master Information Sciences and the Master Computing Sciences, which in turn has different tracks. Since I already did my bachelor at the Radboud University, they are able to automatically check whether I’m eligible to start my Master Information or Computing Sciences or whether I would have to follow a pre-master. What they wanted to know was how I would feel myself if I had to do a lot with computers, programming and management. I answered that this would perfectly match my interests and fits into my life.

---

### 6.8 Condition 4: Customer knows exact product

After comparing different possibilities and judging them, the customers came to a decision which product they want.

**Level of Need Awareness**

Thanks to the decision, the Level of Need Awareness is now formalized. The customer can say explicitly which specific product should be delivered.

$c_4$ Lna formalized

**CombRat**

In this condition, the values for *products* are further defined. Since there was information about the type of product or wishes regarding some product

---

25
categories, the employee were able to suggest some products. Therefore, they got individual ratings. If the customer likes the Philips UE1234 a lot, then $\text{IndRat}(\text{Philips UE1234}) = 0.9$. These individual ratings have a huge influence on their combined rating.

Chris: I now know that I want to study the Master Information Sciences at the Radboud University. One reason is that I do not have to follow a pre-master, according to the Radboud Student System.

6.9 Transition 4: Getting the last details

Customers now know which product they want, but there is no order placed yet. This is done in transition four. Placing an order also includes other processes that they interact with like collecting the last details, e.g. for delivery.

Technology

To get those details, software applications can be used which ask a client to fill in a short form. One example is called Flixcheck. One "check" is a set of elements that the receiver has to fill in. Every element can be of a different type. One element may ask the user for pictures of the desired place of installation, another may ask for a delivery address and a third may ask for a delivery date. Other types are text questions, numbers, time, location (GPS-based), boolean, a rating, a bank account or even a signature that can be drawn on the device. The user then has to answer those elements with the information they ask for. As the check is completed, the data is presented to the company which created and sent the check. Then the information may be transferred e.g. to an Order Management System.

SPINS

The type of questions that a sales person should ask when the order is placed are Shift questions. They specify the shift for the client from a situation where the product is not present to a situation where it is present.

$\begin{array}{c|c|c}
| t_4 & Qt & \text{Shift} \\
\end{array}$

SSoS

As soon as the customer found the right product, the sales person ultimately has to ask "Do you want to buy it?" in order to finish the sale. This is
six, according to the SSoS model.

\[ t_4 \text{ Stp 6} \]

**Chris:** Since I am already registered as a student, they don’t need any further details. Just my student number and everything else, I have to handle on the website ”studielink”, which handles all University applications in the Netherlands. From studielink, I also got a mail where I ultimately had to agree and confirm that I will study Information Sciences at the Radboud University.

---

### 6.10 Condition 5: Customer is about to get product

The sales are finished and the customers placed the orders, now waiting for the product to be delivered.

**Level of Need Awareness**

The Level of Need Awareness is now at its formerly highest point: at the compromised level, customers can not only say what they want but also already know what they may expect. After providing the last simple details, this is the case: they know what they will get, when, how, etc.

\[ c_5 \text{ Lna compromised} \]

**CombRat**

In the last transition, only the last simple details were exchanged. Therefore, there are seldom more insights in the likes and dislikes of the customer. Other factors are more likely to influence the ratings of the products. E.g. if the customer provides a delivery address in Europe after he bought an American WiFi router, then the rating of that product lowers a lot since it may not be used in Europe because of other frequency standards.

---

**Chris:** I am now enjoying my vacation. The semester will start in a few weeks.
6.11 Transition 5: Delivery

After the product has arrived, the sales person or the system should ask the client whether everything went well. Feedback is nowadays very important to companies since they provide useful information to improve their processes.

Technology

When shopping online, these mails are well known: feedback surveys. In a wide range from simple 5-star-ratings up to long surveys, companies want to know how good they performed. This is mostly done automatically after delivery. One of the best-known online survey software is LimeSurvey[2].

SPINS

The SPINS model is only relevant for the actual sale, not the pre- and post-processing. Therefore, there is no type of question a sales person should ask for this transition.

SSoS

The last step of the SSoS model is called follow-up. Employees should ask for feedback that gives them insights to improve their performance.

\[ t_5 \text{ Stp 7} \]

Chris: I got useful information before the study started. Also after it, my study mentor asked me regularly if everything is going well. I also got a mail with a short online survey concerning my visit at the Radboud Open Day.

6.12 Condition 6: Aftersale

At the last condition, the customer got his product.

Level of Need Awareness

For this condition, a new Level of Need Awareness had to be introduced called knowing. The customer got the product and therefore knows whether it was the right decision. If not, the Need Awareness still raised because one counterexample is now known.
\( c_6 \) Lna knowing

**CombRat**

At this point in time, the individual rating of the delivered product can be adjusted. If it was exactly the right one, then \( \text{IndRat}(\text{the delivered product}) = 1 \). If it was not, then the individual rating of that product has to be lowered. Sometimes, also the ratings of the categories the products was member of should be adjusted.

---

**Chris:** After some weeks of studying Information Sciences, I now know that it was the right decision.
Chapter 7

Validation

On May 7, 2017, this thesis were presented to two representatives of the German Denkpark GmbH. The two participants were:

**Andreas Baum** studied Business Administration at the European University of Applied Science. Mr. Baum does not only has international experience, but also worked in the Supply Chain Management and Sales. He was area sales manager and founded the company EmBa in 2011.

**David Simons** also studied Business Administration at the European University of Applied Science. After that, he worked for different companies in Sales and Human Resources.

Both of them are Chief Executive Officers of the startup Denkpark, founded in Neukirchen-Vluyn, Germany, two years ago. Their goal is to *Make things easier* by providing software that support companies in their daily business. Their first product, Moverscan, was launched in 2015. Moving companies can use the software to send a form to customers. That form asks for all the details that the moving companies need to write an offer for the relocation. It lets moving companies save money by letting their customers using a WebApp where they provide all the information which is needed to write an offer, including addresses, dates and photographs. Nowadays, almost every moving company in Germany uses or, at least, is aware of their product Moverscan.

Based on the insights gained with Moverscan, they pushed the thought of getting structural information by a customer further and developed the idea of Flixcheck. How it works is explained in Section **6.9**. It lets a company ask for specific information that the user can give to the company using a smartphone. Denkpark knows from experience that users answer way faster using this technique, compared to email, phone or traditional letter communication. This is the main advantage of Flixcheck.
7.1 Andreas Baum

Mr. Baum would like to see more examples where this thesis can be applied. Talking about this, he came up with an example himself: the German comparison website Check24, where users can search for the best offer for telephone contracts, energy, gas, credits and more. We then matched it together to the five transitions:

**Ads** Check24 uses Google to advertise its service especially to those people who are e.g. looking for a cheaper phone contract. This is targeted advertising.

**Welcome** With the request IP address and a geo location service, Check24 could theoretically match that with a database of neighborhoods and average income per household. It could then show more expensive contracts in rich neighborhoods.

**Consulting** Check24 asks for different criteria dependent on the type of product you are looking for. Getting more information means that it can provide better results, leading ultimately to the best product for the customer (for the lowest price).

**Order** The user can conclude the contract online and has to fill in the last simple details on the same website (e.g. invoice address, delivery date, etc.)

**Delivery** The company where the user bought the product or service then delivers the bought item. This is the only transition which is not executed by Check24. Nevertheless, Check24 asks for feedback by a survey which is sent after the delivery.

Given this example, Mr. Baum asks what the added value of this thesis is. The difference lies in the very restricted area where Check24 can perform: A Check24 comparison is possible only if there are very precise criteria that can be filled in by every product in this category. This thesis uses an algorithm that is not based on a set of predefined properties, but on categories that can contain very different products. Also, Check24 needs a lot of information and definition beforehand to provide that service. This thesis only needs an allocation of products to categories.

Mr. Baum also asked for a specific implementation of the framework of this thesis in the real world. An employee could be equipped with a microphone and a little speaker in his ear. Using the microphone and natural language processing, likes and dislikes of the customer could be identified programmatically. Then, the combined ratings are updated. With that information, the employee gets a hint through the little speaker what he should ask next. This implementation did not convince Mr. Baum. He
thinks that it is more likely to see an implementation of this thesis online. A shopping assistant on a website could help the user to find the best product. This could be done by asking questions as a chatbot.

Regarding our example Chris, Mr. Baum concluded that the main advantage of this thesis is to provide help faster and better for Chris to find the right study. This is positive for the university: More efficiency leads to more people who will study and pay their study fee. That ultimately means more money. Therefore, this thesis is also interesting from a business point of view.

7.2 David Simons

The details are very important to Mr. Simons. While presenting the matching of the theories to the conditions and transitions, he would like to understand the meaning of each cell individually. He therefore suggested to present all those details. This is done in the thesis fine-grained. In his opinion, this should also be explained in the presentation, while Mr. Baum disagrees. A description of each cell would take too much time, energy and attendance of the listeners. Our compromise is to take one column as an example and explain it. Furthermore, the ”gaps” are covered more carefully, which are filled by the extension of the 7-SSL model.

In terms of the conclusiveness, Mr. Simons attests that the presentation is not too complicated, well explained ”step-by-step” and that it appears to be coherent. Asked directly about it, he confirms that this thesis is on a professional level.

Looking to future, Mr. Simons also thinks that this thesis would be interesting online, not offline. Online shops should use more such shopping assistants to lead the customer to the correct product faster, which is actually the goal of this thesis.
Chapter 8

Conclusions

*Catch a man a fish, and you can sell it to him. Teach a man to fish, and you ruin a wonderful business opportunity.*

It is hard to sell things. Convincing people that they need something is a challenge. Finding the exactly right product may be even more difficult. We introduced three theories that support the selling process: SPIN, Seven Steps of Selling and Level of Need Awareness. Combining them to a new model delivered some shortcomings, so we extended the theories and created the new 7-SSL model. After that, we applied it to our own selling process theory with conditions and transitions. To measure the progress and quality of the process, we introduced methods for that.

Chris found the right study, and our framework helped. It gave safety to the advisors bringing Chris on the right track. The 7-SSL model helped them to go from one condition to the following one, while Chris’ Level of Need Awareness raised. The CombRat function analyzed Chris’ decisions and ultimately gave them the feedback which study fits the best. The entropy function gave some certainty that the decision is probably the best one.

Our example took place face-to-face, on a place where humans interact directly with each other. But the IT systems that supported them could also be a platform to execute our framework. We already see this on websites which say ”You bought product X. You may also like ...”. Other relevant products are presented based on what was bought before. This could be taken one level higher to an artificial intelligence (AI) shopping assistant that asks exactly the right question to guide a website user to the right product. Such an AI could use the SSoS steps, could ask SPINS questions and maintain a model of the user’s Level of Need Awareness. Then it asks questions about categories which will have the highest impact, i.e. giving the most insight with just one answer. Ultimately, as soon as the entropy function returns a quality rating that is high enough, it will present the best
products. The user can react and give feedback, which will in turn improve the performance since it gives individual ratings to the products.

This shows that our thesis is able to improve the shopping experience and the revenue for organizations. The individual technologies that are required for the transitions are already available (e.g. Google AdWords, Chatbots, SalesForce, Flixcheck and LimeSurvey). They just need to be combined through a software that implements our 7-SSL and CombRat components. At the end, we receive an intelligent system that supports the execution and measurement of the sales process.
Bibliography


Appendix A

Examples

A.1 CombRat values for Chris

To illustrate our framework, we introduced Chris who looked for a study on the Radboud Open Day. In this section, we look at that example in more detail.

A.1.1 Model

The products of the Radboud University are the different studies, while a faculty or a department represent a category. Our scope contains the following:

- **Products (4 items)**
  - IS Information Sciences
  - CS Computing Sciences
  - MA Mathematics
  - BA Business Administration

- **Categories (3 items)**
  - NSM Nijmegen School of Management
  - FS Faculty of Science
  - ICIS Institute for Computing and Information Sciences

- **Memberships**
  - IS Cat FS
  - IS Cat ICIS
  - CS Cat FS
Every category has an individual rating and every product has both an individual and a combined rating. We thus have \(3 \times 1 + 4 \times 2 = 11\) different values that will change over time. The example values that correspond with the information about the conditions and transitions in Section A.1.2 are shown in Table A.1.

### A.1.2 Conditions and transitions

**c1 Beginning**

The university does not know whether and what Chris wants to study. All values are 0 (neutral), except his current study: \(\text{IndRat}(\text{BA})\) is at 0.25 since statistics show that most of the business administration students continue their bachelor by a master. Also, if they do not continue with business administration, a lot of them still continue with a study in a similar field within the Nijmegen School of Management. \(\text{IndRat}(\text{NSM})\) is thus slightly higher than \(\text{IndRat}(\text{BA})\).

**t1 Invitation for Open Day**

The university sends invitations for the open day to all students. This is a "shoot in the dark", since the university does not know who would like to continue studying for a master degree. At the same time, it is targeted advertising since bachelor students are likely to continue studying for a master. Chris registers for his attendance at the Faculty of Science.

**c2 First decision made**

Chris’ decision for a registration at the Faculty of Science already delivered new information: his rating for the faculty raised to 0.5 since it was a specific, explicit decision. It is not based on statistics and the behavior of others, as in \(c_1\).

**t2 Initial contact**

Chris arrives at the open day and has a first short talk about the disciplines offered at the Faculty of Science. Based on his wishes and interests, the professionals advise him to go to the ICIS. Mathematics does not seem to be interesting for him.
c3 Department chosen

Thanks to the short talk, it is clear that Chris is absolutely right at the Faculty of Science. Therefore, the score of it raises to 0.9. Furthermore, the advise for ICIS also lets the corresponding score increase to 0.5. His dislike against mathematics lowers that score to -0.9.

t3 Proposals

With a docent of the ICIS, Chris talks about two actual proposals the docent gave: Information Sciences and Computing Sciences. Both are very interesting for him. The docent checks his records at OSIRIS and finds out that he can start with Information Sciences without the need of a premaster. That is the reason Chris makes the decision to choose Information Sciences.

c4 Study chosen

Since Chris likes both IS and CS very much, the score of ICIS rises to 0.9. The CS’ score also rises to 0.6, but the score of IS is even higher since he does not have to do a premaster.

t4 Last details

Chris registers via studielink for the Master Information Sciences at the Radboud University.

c5 Before the study

Chris is now waiting for the study to start. Therefore, no new information is gained concerning his likes and dislikes.

t5 Semester starts

Chris is now actual studying Information Sciences and gets the best feeling whether his decision was right or wrong. He also notices what his Computing Sciences colleagues do. A few of their courses would have been a nightmare for him.

c6 Confirmation

After the first few months of studying IS, he is now absolutely sure that Information Sciences is his best choice. Therefore, for ICIS and the Faculty of Science holds the same. Computing Sciences, at the same time, appears not to be his preferred study because of a few courses that he would not have liked. His decision for IS was therefore absolutely right.
A.1.3 Values of CombRat

In this table, the example values are shown for a Course of Events as depicted in Section A.1.2. Note that if a value changes, the new value is highlighted in light orange. The best choice is marked green.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value for</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Categories (individual ratings)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IndRat(FS)</td>
<td></td>
<td>0</td>
<td>0,5</td>
<td>0,9</td>
<td>0,9</td>
<td>0,9</td>
<td>1</td>
</tr>
<tr>
<td>IndRat(ICIS)</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0,5</td>
<td>0,9</td>
<td>0,9</td>
<td>1</td>
</tr>
<tr>
<td>IndRat(NSM)</td>
<td></td>
<td>0,3</td>
<td>0,3</td>
<td>0,3</td>
<td>0,3</td>
<td>0,3</td>
<td>0,3</td>
</tr>
<tr>
<td>Products (individual ratings)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IndRat(IS)</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,9</td>
<td>0,9</td>
<td>1</td>
</tr>
<tr>
<td>IndRat(CS)</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,6</td>
<td>0,6</td>
<td>0,4</td>
</tr>
<tr>
<td>IndRat(MA)</td>
<td></td>
<td>0</td>
<td>0</td>
<td>-0,9</td>
<td>-0,9</td>
<td>-0,9</td>
<td>-0,9</td>
</tr>
<tr>
<td>IndRat(BA)</td>
<td></td>
<td>0,25</td>
<td>0,25</td>
<td>0,25</td>
<td>0,25</td>
<td>0,25</td>
<td>0,25</td>
</tr>
<tr>
<td>Products (combined ratings)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CombRat(IS)</td>
<td></td>
<td>0</td>
<td>0,125</td>
<td>0,35</td>
<td>0,9</td>
<td>0,9</td>
<td>1</td>
</tr>
<tr>
<td>CombRat(CS)</td>
<td></td>
<td>0</td>
<td>0,125</td>
<td>0,35</td>
<td>0,75</td>
<td>0,75</td>
<td>0,7</td>
</tr>
<tr>
<td>CombRat(MA)</td>
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<td>0</td>
<td>0,25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0,05</td>
</tr>
<tr>
<td>CombRat(BA)</td>
<td></td>
<td>0,275</td>
<td>0,275</td>
<td>0,275</td>
<td>0,275</td>
<td>0,275</td>
<td>0,275</td>
</tr>
</tbody>
</table>

Table A.1: Overview of conditions

According to Equation 5.1, the formulas for the example combined ratings above are as follows:

- \( \text{CombRat(IS)} = 0,5 \times \text{IndRat(IS)} + 0,5 \times \frac{\text{IndRat(FS)} + \text{IndRat(ICIS)}}{2} \)
- \( \text{CombRat(CS)} = 0,5 \times \text{IndRat(CS)} + 0,5 \times \frac{\text{IndRat(FS)} + \text{IndRat(ICIS)}}{2} \)
- \( \text{CombRat(MA)} = 0,5 \times \text{IndRat(MA)} + 0,5 \times \text{IndRat(MA)} \)
- \( \text{CombRat(BA)} = 0,5 \times \text{IndRat(BA)} + 0,5 \times \text{IndRat(NSM)} \)
Appendix B

Summaries / overview

B.1 Abbreviations

**CRM** Customer Relationship Management [system], Section 6.9

**LoNA** Level of Need Awareness, Section 2.1

**SPIN** Situation Problem Implication Need-Payoff, Section 2.2

**SPINS** Situation Problem Implication Need-Payoff Shift, Section 4.2.2

**SSoS** Seven Steps of Selling, Section 2.3

B.2 Conditions

In this table, we provide per condition which Level of Need Awareness is reached and how the CombRat values change.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Level of Need Awareness</th>
<th>CombRat changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>$c_1$</td>
<td>none</td>
<td>all values are 0</td>
</tr>
<tr>
<td>$c_2$</td>
<td>visceral</td>
<td>little insight, profiling</td>
</tr>
<tr>
<td>$c_3$</td>
<td>conscious</td>
<td>ratings for categories improved</td>
</tr>
<tr>
<td>$c_4$</td>
<td>formalized</td>
<td>ratings for products improved</td>
</tr>
<tr>
<td>$c_5$</td>
<td>compromised</td>
<td>no change from customer</td>
</tr>
<tr>
<td>$c_6$</td>
<td>knowing</td>
<td>rating of delivered product changes</td>
</tr>
</tbody>
</table>

Table B.1: Overview of conditions
B.3 Transitions

In table B.2, we provide for every transition the technology that can be used, the SPINS type of question and the step of the Seven Steps of Selling (SSoS).

<table>
<thead>
<tr>
<th>Transition</th>
<th>Technology</th>
<th>SPINS</th>
<th>SSoS</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_1$</td>
<td>targeted advertising</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>$t_2$</td>
<td>chatbots</td>
<td>Situation, Problem</td>
<td>2, 3</td>
</tr>
<tr>
<td>$t_3$</td>
<td>CRM</td>
<td>Implication, Need-payoff</td>
<td>4, 5</td>
</tr>
<tr>
<td>$t_4$</td>
<td>form</td>
<td>Shift</td>
<td>6</td>
</tr>
<tr>
<td>$t_5$</td>
<td>survey</td>
<td>–</td>
<td>7</td>
</tr>
</tbody>
</table>

Table B.2: Overview of transitions

B.4 Level of Need Awareness

In table B.3, we summarize the information from Section 2.1 combined with the extensions from Section 4.2.1.

<table>
<thead>
<tr>
<th>Order</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>none</td>
<td>No knowledge about the product or the need</td>
</tr>
<tr>
<td>2</td>
<td>visceral</td>
<td>Vague sort of dissatisfaction</td>
</tr>
<tr>
<td>3</td>
<td>conscious</td>
<td>Ambiguous, can judge proposals</td>
</tr>
<tr>
<td>4</td>
<td>formalized</td>
<td>Qualified and rational statement of their wish</td>
</tr>
<tr>
<td>5</td>
<td>compromised</td>
<td>Understand of what they can expect</td>
</tr>
<tr>
<td>6</td>
<td>knowing</td>
<td>Got what they wanted and know for sure whether it was right</td>
</tr>
</tbody>
</table>

Table B.3: Overview of Extended Level of Need Awareness
Appendix C

Equations

C.1 CombToE

In Section 5.3, we had the following five points:

- $(-1, 0)$
- $(-0.2, 0.49)$
- $(0, 0.5)$
- $(0.2, 0.51)$
- $(1, 1)$

To solve the system of linear equations, we summarize the equations:

\[
\begin{bmatrix}
  a \times (-1)^3 + b \times (-1)^2 + c \times -1 + d = 0 \\
  a \times (-0.2)^3 + b \times (-0.2)^2 + c \times -0.2 + d = 0.49 \\
  a \times 0^3 + b \times 0^2 + c \times 0 + d = 0.5 \\
  a \times 0.2^3 + b \times 0.2^2 + c \times 0.2 + d = 0.51 \\
  a \times 1^3 + b \times 1^2 + c \times 1 + d = 1
\end{bmatrix} \quad \text{(C.1)}
\]

First of all, we make it look more simple:

\[
\begin{bmatrix}
  -a + b + (-c) + d = 0 \\
  (-0.008a) + 0.04b + (-0.2c) + d = 0.49 \\
  d = 0.5 \\
  0.008a + 0.004b + 0.2c + d = 0.51 \\
  a + b + c + d = 1
\end{bmatrix} \quad \text{(C.2)}
\]
We found out that $d = 0.5$. Replacing $d$ in all formulas:

\[
\begin{bmatrix}
-a & + & b & + & (-c) & + & 0.5 & = & 0 \\
(-0.008a) & + & 0.04b & + & (-0.2c) & + & 0.5 & = & 0.49 \\
0.008a & + & 0.004b & + & 0.2c & + & 0.5 & = & 0.51 \\
a & + & b & + & c & + & 0.5 & = & 1
\end{bmatrix}
\tag{C.3}
\]

Rearranging the first row and using that new formula in the last formula (replacing $a$):

\[
\begin{bmatrix}
b & + & (-c) & + & 0.5 & = & a \\
(-0.008a) & + & 0.04b & + & (-0.2c) & + & 0.5 & = & 0.49 \\
0.008a & + & 0.004b & + & 0.2c & + & 0.5 & = & 0.51 \\
(b - c + 0.5) & + & b & + & c & + & 0.5 & = & 1
\end{bmatrix}
\tag{C.4}
\]

Rearranging the last formula:

\[
2b + 1 = 1
\tag{C.5}
\]

\[
b = 0
\tag{C.6}
\]

We found out that $b = 0$. Using this with the second row from Equation C.4 yields:

\[
(-0.008a) + 0.04b + (-0.2c) + 0.5 = 0.49
\tag{C.7}
\]

\[
(-0.2c) + 0.01 = 0.008a
\tag{C.8}
\]

\[
(-25c) + 1.25 = a
\tag{C.9}
\]

Pulling first row from Equation C.4 and replacing $b$ by 0 according to C.6

\[
\begin{bmatrix}
(-c) & + & 0.5 & = & a \\
(-25c) & + & 1.25 & = & a
\end{bmatrix}
\tag{C.10}
\]

\[
c = 0.03125
\tag{C.11}
\]

\[
\begin{bmatrix}
(-c) & + & 0.5 & = & a \\
c & = & 0.03125
\end{bmatrix}
\tag{C.12}
\]

\[
a = 0.46875
\tag{C.13}
\]

As result, we get $a = 0.46875$, $b = 0$, $c = 0.03125$ and $d = 0.5$, leading us to the following equation:

\[
y = 0.46875 \times x^3 + 0.03125 \times x + 0.5
\tag{C.14}
\]